Jimblebar Greenhouse Gas Abatement Study

Basic Vertebrate Fauna Survey

Biologic Environmental Survey

Report to BHP Western Australian Iron Ore

December 2020

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4	C. Knuckey	C. Knuckey	-	03/12/2020
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EXECUTIVE SUMMARY

BHP Western Australia Iron Ore (BHP WAIO) commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a basic (formerly Level 1) vertebrate fauna assessment for the Jimblebar Greenhouse Gas Abatement Study Area (hereafter referred to as the Study Area). The Study Area is located approximately 30 kilometres (km) east of Newman in the Pilbara region, and is approximately 2,438 hectares (ha) in size. The overarching objective of this assessment was to identify the occurrence of terrestrial vertebrate fauna species and their supporting habitats within the Study Area, with a focus on species of conservation significance (i.e. species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), *Biodiversity Conservation Act 2016* (BC Act) and/or by the Department of Biodiversity, Conservation and Attractions (DBCA) as a Priority species). Specifically, the key objectives of the assessment were to:

- conduct a comprehensive desktop assessment (database searches and literature review) to identify vertebrate fauna species potentially occurring within the Study Area;
- conduct a basic (formerly Level 1) survey to identify vertebrate fauna species and fauna habitats occurring in the Study Area;
- define and delineate broad fauna habitats occurring within the Study Area, and describe their significance to vertebrate fauna, particularly species of conservation significance; and
- assess the likelihood and distribution of conservation significant vertebrate fauna species occurring within the Study Area.

The desktop assessment was conducted prior to the field survey to identify all fauna species which have the potential to occur in the Study Area. A single-season basic vertebrate fauna survey was undertaken over six days between 7th and 12th May 2020.

A total of six broad fauna habitat types were recorded and mapped within the Study Area, comprising, in descending extent of occurrence, Hardpan Plain (47.37%, 1,155.08 ha), Stony Plain (18.77%, 457.77 ha), Sand Plain (16.63%, 405.39 ha), Mulga Woodland (13.52%, 329.65 ha), Hillcrest/ Hillslope (2.02%, 49.29 ha) and Major Drainage Line (0.69%, 16.89 ha). The remaining 0.99% (24.22 ha) of the Study Area comprised Cleared/ Disturbed areas, which are associated with the Jimblebar Iron Ore Mine. All fauna habitats mapped within the Study Area are broadly distributed and well represented in the vicinity of the Study Area and across the Pilbara region, and therefore support fauna assemblages which are generally common and widespread.

Of the six broad fauna habitats occurring within the Study Area, all have the potential to support species of conservation significance at varying capacities, though the provision of primary and/or secondary (supporting) breeding, denning, nesting/roosting, foraging and/or dispersal habitat. Sand Plain habitat provides primary breeding, foraging and dispersal habitat for greater bilby, brush-tailed mulgara, spectacled hare-wallaby, night parrot and spotted ctenotus, in addition to foraging and dispersal habitat for ghost bat and peregrine falcon. Hillcrest/ Hillslope habitat provides breeding, foraging and dispersal habitat for long-tailed dunnart, western pebble-mound mouse and the Pilbara flat-headed blind-snake. Furthermore, suitable foraging and dispersal habitat is also provided for northern quoll, Pilbara leaf-nosed bat and peregrine falcon. Suitable breeding, foraging and dispersal habitat is provided for brush-

tailed mulgara, western pebble-mound mouse, night parrot and spotted ctenotus in Stony Plain habitat, with foraging and dispersal habitat provided for long-tailed dunnart, ghost bat and peregrine falcon. Hardpan Plain habitat provides suitable breeding, foraging and dispersal habitat for brush-tailed mulgara and spotted ctenotus, and foraging/ dispersal habitat for peregrine falcon. Mulga Woodland habitat provides breeding and foraging habitat for greater bilby and the Pilbara flat-headed blind-snake and additional foraging habitat for ghost bat. Furthermore, Major Drainage Line habitat provides suitable foraging and dispersal habitat for northern quoll, ghost bat, Pilbara leaf-nosed bat, peregrine falcon and Pilbara olive python. No important habitat features (caves or water features) were recorded within the Study Area during the current survey.

Temporary waterbodies may occur throughout parts of the Study Area where pooling or flowing water may be present following significant rainfall events, primarily within Major Drainage Line habitat, and to a lesser extent Hardpan Plain.

The desktop assessment identified a total of 355 vertebrate fauna species that have previously been recorded within or have the potential to occur in the Study Area, comprising 47 mammals (38 native and nine introduced), 198 birds (197 native and one introduced), 101 reptiles, and nine amphibians. During the current survey, a total of 76 vertebrate fauna species, comprising 14 mammal species (11 native and three introduced), 57 bird species and five reptile species were recorded from the Study Area. All 76 species recorded during the current survey, were previously identified in the desktop assessment. Of the 355 species identified by the desktop assessment, 40 are species listed as conservation significance, comprising nine mammals, 28 birds and three reptiles. No species of conservation significance were recorded within the Study Area during the current survey. However, the following have previously been recorded within the Study Area:

- brush-tailed mulgara (*Dasycercus blythi*; Priority 4 – DBCA);
- western pebble-mound mouse (*Pseudomys chapmani*; Priority 4 – DBCA); and
- spotted ctenotus (*Ctenotus uber* subsp. *johnstonei*; Priority 2 – DBCA).

Based on the habitats present within the Study Area, species distributions, habitat preferences and general ecology, four species identified in the desktop assessment were considered Likely to occur within the Study Area, the:

- ghost bat (*Macroderma gigas;* Vulnerable - EPBC/BC Act);
- long-tailed dunnart (*Sminthopsis longicaudata*; Priority 4 – DBCA);
- grey falcon (*Falco hypoleucos*; Vulnerable - EPBC/BC Act); and
- peregrine falcon (*Falco peregrinus*; Specially Protected – BC Act).

Given the habitats present within the Study Area and locations of nearby records identified during the desktop assessment, the occurrence of a further seven species of conservation significance within the Study Area is considered Possible:

- Pilbara leaf-nosed bat (*Rhinonicteris aurantia* Pilbara form; Vulnerable – EPBC/BC Act);
- greater bilby (*Macrotis lagotis*; Vulnerable – EPBC/BC Act);
- northern quoll (*Dasyurus hallucatus;* Endangered – EPBC/BC Act);

- Pilbara olive python (*Liasis olivaceus barroni*; Vulnerable – EPBC/BC Act);
- spectacled hare-wallaby (*Lagorchestes conspicillatus* subsp. *leichardti*; Priority 4 – DBCA);
- fork-tailed swift (*Apus pacificus*; Migratory – EPBC/BC Act); and
- Pilbara flat-headed blind-snake (*Anilios ganei*; Priority 1 – DBCA).

The remaining 26 species were considered Unlikely or Highly Unlikely to occur within the Study Area due to the absence of suitable habitat or habitat features to support the species and/or the Study Area occurring outside their current known distribution.

All broad fauna habitats mapped, and species assemblages recorded or likely to occur within the Study Area are typical of the Pilbara region, and are not considered significant at a local or regional scale. No vertebrate fauna values occur within the Study Area that are not represented more broadly in the vicinity of the Study Area and across the Pilbara region.

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1 INTRODUCTION

1.1 Background

BHP Western Australian Iron Ore (BHP WAIO) is investigating the biological values relating to the Jimblebar Greenhouse Gas Abatement Study area (hereafter referred to as the Study Area). The Study Area is located approximately 30 kilometres (km) east of Newman in the Pilbara region, and is approximately 2,438 hectares (ha) in size. Four live tenements held by BHP WAIO overlap the Study Area, including one exploration license (E522591-I), one mining lease (M266SA) and two miscellaneous licenses (l52/108 and L52/109) (Figure 1.1). To support this survey, BHP WAIO commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a basic (formerly Level 1) vertebrate fauna survey of the Study Area. This report documents the findings of this survey, which comprised a desktop assessment and a basic field survey.

1.2 Survey Objectives

The overarching objective of this assessment was to identify the occurrence of terrestrial vertebrate fauna species and their supporting habitats within the Study Area, with a focus on species of conservation significance. Specifically, the key objectives of the assessment were to:

- conduct a comprehensive desktop assessment (database searches and literature review) to identify vertebrate fauna species potentially occurring within the Study Area;
- conduct a basic (formerly Level 1) survey to identify vertebrate fauna species and fauna habitats occurring in the Study Area;
- define and delineate broad fauna habitats occurring within the Study Area, and describe their significance to vertebrate fauna, particularly species of conservation significance; and
- assess the likelihood and distribution of conservation significant vertebrate fauna species occurring within the Study Area.

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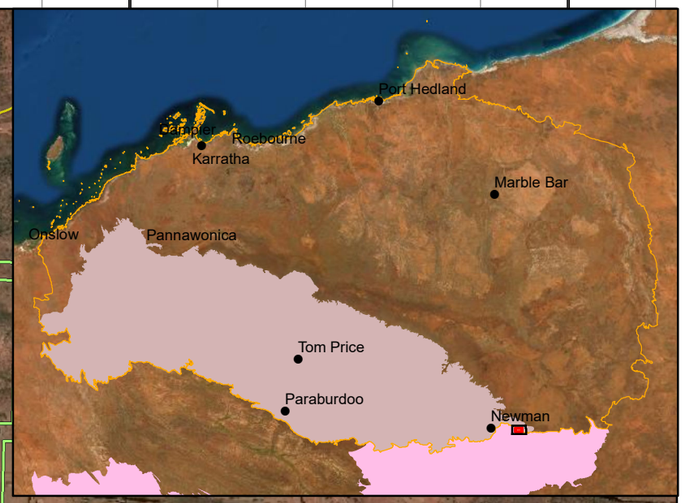

Legend

- Study Area
- BHP Tenements
- Road
- Railroad
- Pilbara Bioregion

IBRA Subregions

- Augustus
- Hamersley

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0 0.275 0.55 1.1 1.65 2.2 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 1.1: Study Area location and adjacent BHP tenure

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 27/07/2020

1.3 Background to the Protection of Fauna

Terrestrial fauna may be significant for a range of reasons (EPA, 2016a), 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.

Native fauna in Western Australia are protected at a state level under BC Act and the *Environmental Protection Act 1986* (EP 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 *Environmental Protection and Biodiversity Conservation Act 1999* (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 BC Act and EPBC Act; migratory bird species that are protected under international agreements and subsequently listed as Migratory under the BC Act or EPBC Act; and species that may be threatened but for which there is not enough information available to allocate a threatened status, and which are subsequently listed as Priority species by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) (Table 1.1).

For the purposes of this assessment, species considered to be of conservation significance are those that are afforded protection under the EPBC Act, BC Act and/or listed as Priority by DBCA (Table 1.1). A summary of applicable legislation and status codes is provided in Table 1.1.

Table 1.1: Definitions and terms for fauna of conservation significance

Act, Agreement or List	Status Codes[1]
Federal	
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)** In Australia, native fauna are 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. Migratory bird species are those listed under international agreements and protected under the EPBC Act as a Matter of National Environmental Significance (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	
***Biodiversity Conservation Act 2016* (BC Act)** In WA, native fauna are 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 *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

[1]See Appendix A for definitions of status codes

2 EXISTING ENVIRONMENT

2.1 Biogeography

As defined by the Interim Biogeographic Regionalisation of Australia (Thackway & Cresswell, 1995), the Study Area is located along the boundary of the Gascoyne and Pilbara bioregions, and occurs primarily within the Augustus (74.8%) and partly within the Hamersley (25.2%) subregions of the bioregions respectively (Table 2.1; Figure 1.1).

Table 2.1: IBRA bioregion and subregion of the Study Area

Bioregion	Subregion	Extent in Study Area	
		Area (ha)	%
Gascoyne Characterised by low, rugged ranges and broad, flat valleys. Vegetation is dominated by open mulga low woodlands (Bastin, 2008).	**Augustus (GAS03)** Comprises rugged low Proterozoic and granite ranges divided by broad flat valleys. Also includes the Narryera Complex and Bryah Basin of the Proterozoic Capricorn Orogen (on northern margins of the Yilgarn Craton), as well as the Archaean Marymia and Sylvania Inliers. Extensive areas of alluvial valley-filled deposits. Mulga woodland with *Triodia* on shallow stony loams on rises, while the shallow earthy loams over hardpan on the plains are covered by mulga parkland (Desmond *et al.*, 2001).	1,824.80	74.8%
Pilbara Characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges. Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses. (Bastin, 2008).	**Hamersley (PIL03)** Comprises the southern section of the Pilbara Craton. Mountainous area of Proterozoic sedimentary ranges and plateau, dissected by gorges (basalt, shale and dolerite). Mulga low woodland over bunch grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils of the ranges (Kendrick, 2001).	613.48	25.2%
	Total	**2,438.28**	**100%**

2.2 Climate

The eastern Gascoyne and Pilbara bioregions have an arid climate with rainfall occurring primarily during summer months (Bastin, 2008). Summer rainfall in both bioregions is usually the result of tropical cyclones that occur to the north and northwest that impacts the coast and move inland, while sporadic winter rainfall is generally the result of cold fronts moving north-easterly across the regions (Leighton, 2004). Average annual in both regions is highly variable, with average rainfall ranging between 200 and 350 millimetres (mm) (Bastin, 2008), although there are significant fluctuations between years with up to 1,200 mm recorded at some locations in the Pilbara some years (BoM, 2020; McKenzie *et al.*, 2009).

Long-term climatic data is not available for the Study Area itself; however, long term climatic data is available from the Bureau of Meteorology (BoM) weather station at Newman Airport (station 7176), approximately 30 km west of the Study Area (BoM, 2020). This weather station is expected to provide the most accurate dataset for historic and current climatic conditions experienced within the Study Area (Figure 2.1). Temperatures vary significantly throughout the year with the highest temperatures recorded between November and March, when mean minimum and maximum temperatures are 22.2°C

and 39.3°C, respectively (Figure 2.1). The lowest temperatures are recorded between June and August, when mean minimum and maximum temperatures are 6.4°C and 26.1°C, respectively (Figure 2.1).

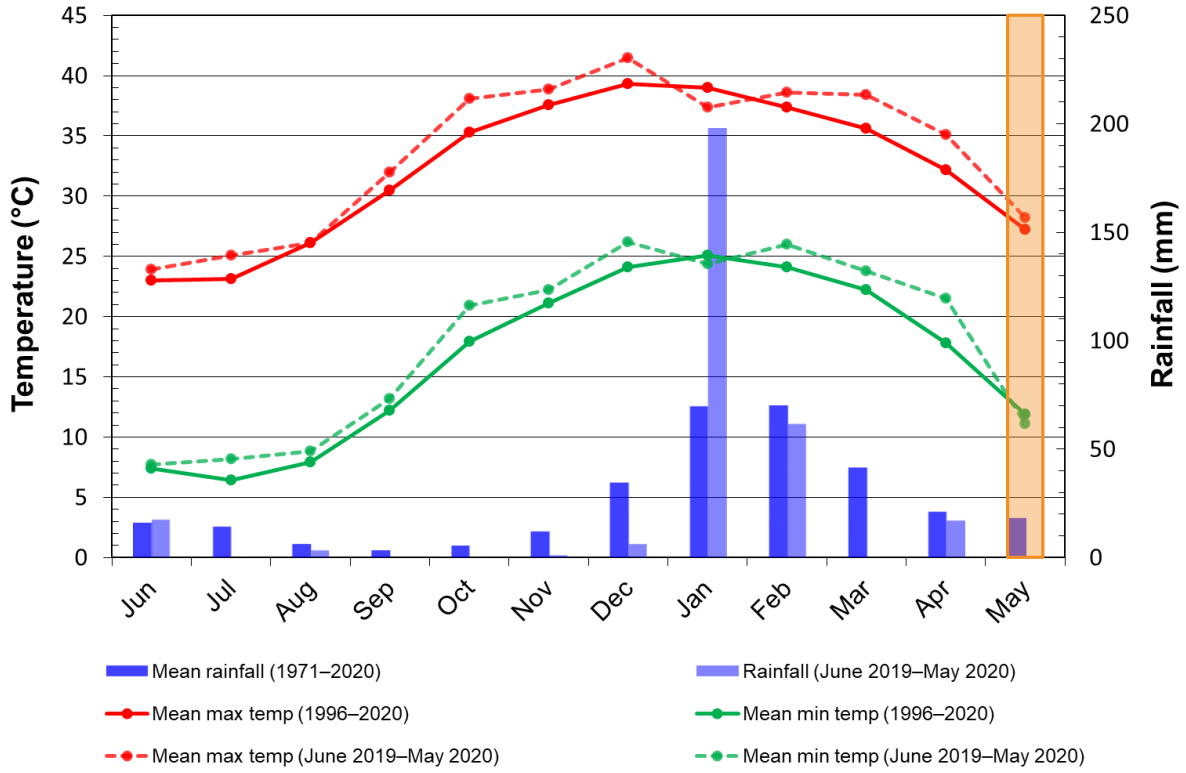

Figure 2.1: Long term average and pre-survey climate data for Newman Airport (Station # 007176) (BoM, 2020) with approximate survey timing shown in shaded boxes

2.3 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 within the Study Area.

The Study Area intercepts seven land systems, comprising Cadgie, Divide, Jamindie, McKay, Newman, Sylvania and Washplain (DPIRD, 2020; Payne *et al.*, 1988; van Vreeswyk *et al.*, 2004) (Figure 2.2; Table 2.2). The dominant land system is the Divide land system, covering approximately 31.4% (765.21 ha) of the Study Area (Figure 2.2; Table 2.2). The Divide land system is defined as “gently undulating sandplains with minor dunes, supporting hard spinifex hummock grasslands with numerous shrubs” (DPIRD, 2020; van Vreeswyk *et al.*, 2004). The second most dominant is the Jamindie land system, covering approximately 16.3% (396.83 ha) of the Study Area (Figure 2.2; Table 2.2). The five remaining land systems (Washplain, Newman Cadgie, McKay and Sylvaia) each occupy less than 15% of the Study Area each (Figure 2.2; Table 2.2).

Of the seven land systems occurring within the Study Area, the Divide, Newman and McKay land system generally contain the most significant habitats for many Matters of National Environmental Significance (MNES) species occurring in the Pilbara. This occurs as sandplains and dunes with

spinifex grasslands associated with the Divide land system which can support greater bilby and as the rocky ridges and mountains associated with Newman and McKay land systems, which can support important refugia and foraging habitats for Pilbara leaf-nosed bat, ghost bat, northern quoll and Pilbara olive python (DBCA, 2020a). None of the land systems occurring within the Study Area are limited in extent or protected as Priority Ecological Communities (DBCA, 2020b) (Figure 2.2; Table 2.2).

Table 2.2: Land systems occurring within the Study Area

Land System	Land Type	Description	Extent in Study Area	
			Area (ha)	%
Divide	Sandplains and occasional dunes with spinifex grasslands	Gently undulating sandplains with minor dunes, supporting hard spinifex hummock grasslands with numerous shrubs	765.20	31.4%
Jamindie	Wash plains on hardpan with mulga shrublands	Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey	396.82	16.3%
Washplain	Wash plains on hardpan with mulga shrublands	Hardpan plains supporting groved mulga shrublands	346.05	14.2%
Newman	Hills and ranges with spinifex grasslands	Rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands	288.89	11.8%
Cadgie	Wash plains and sandy banks on hardpan, with mulga shrublands and wanderrie grasses or spinifex	Hardpan plains with thin sand cover and sandy banks supporting mulga shrublands with soft and hard spinifex	334.08	13.7%
McKay	Hills and ranges with spinifex grasslands	Hills, ridges, plateaux remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts	193.19	7.9%
Sylvania	Stony plains with acacia shrublands	Gritty surfaced plains and low rises on granite supporting acacia-eremophila-cassia shrublands	114.05	4.7%
		Total	**2,438.28**	**100%**

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810000
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7410000

Legend

- Study Area

Land systems

- Cadgie Land System
- Divide Land System
- Jamindie Land System
- McKay Land System
- Newman Land System
- Sylvania Land System
- Washplain Land System

biologic Environmental Survey

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Jimblebar Basic Vertebrate Fauna Survey

Figure 2.2: Land systems of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 04/08/2020

2.4 Geology

The Study Area occurs across four broad (1:500,000) geological units (GSWA, 2016) (Table 2.3; Figure 2.3). The dominant geological unit occurring within the Study Area is the Sylvania Inlier granitic unit, occupying approximately 48.6%, followed by the Jeerinah Formation (37.6%), Marra Mamba Iron Formation (8.8%) and Wittenoom Formation (5.1%) (Table 2.3; Figure 2.3).

Table 2.3: Geological units occurring within the Study Area

Unit code	Unit name	Description	Extent in Study Area	
			Area (ha)	%
A-g-PYV	Sylvania Inlier Granitic Unit	Granite to granodiorite; metamorphosed and variably foliated	1,184.44	48.6%
A-FOj-xs-b	Jeerinah Formation	Siliciclastic sedimentary rocks, mafic volcanic rocks and minor felsic volcanic rocks; local carbonate rocks, chert, and dolerite sills	916.3	37.6%
A-HAm-cib	Marra Mamba Iron Formation	Chert, banded iron-formation, mudstone, and siltstone; minor carbonate; metamorphosed	214.31	8.8%
A-HAd-kd	Wittenoom Formation	Thinly bedded dolomite and dolomitic shale, with minor black chert, shale, banded iron formation and sandstone	123.23	5.1%
		Total	**2,438.28**	**100%**

2.5 Soils

The National Committee on Soil and Terrain (2009) Atlas of Australian Soils described and mapped the soils of Australia following Bettany *et al.* (1967). The Study Area occurs across three soil units, BE6, Oc64 and Fa13 and (Table 2.4; Figure 2.4). The dominant soil unit is Fa13, which covers approximately 73% (1781.83 ha) of the Study Area (Table 2.4; Figure 2.4) and comprises ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations; some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments. The soils are frequently stony and shallow and there are extensive areas without soil cover: chief soils are shallow stony earthy loams (Um5.51) along with some (Uc5.11) soils on the steeper slopes.

The second soil unit, covering approximately 26% (634.21 ha) of the Study Area, is Oc64 (Table 2.4; Figure 2.4). This soil unit comprises low stony hills and dissected pediments on granite with occasional basic dykes. The chief soils are hard alkaline red soils (Dr2.33) having shallow stony horizons. Associated are shallow stony (Uc5.11) soils on steep slopes, (Uc1.22) soils along creek lines, and (Um5.11) soils on patches of calcrete (kunkar). The remaining soil unit, BE6, covers only 0.9% (22.24 ha) of the Study Area and comprises extensive flat and gently sloping plains that sometimes have a surface cover of gravels and on which red-brown hardpan frequently outcrops. The chief soils are shallow earthy loams (Um5.3), with associated (Gn) soils of broad plains (My5O) and extensive flat and gently sloping plains (Mz23).

Table 2.4: Soil units within the Study Area

Soil unit	Description	Extent in Study Area	
		Area (ha)	%
BE6	Extensive flat and gently sloping plains that sometimes have a surface cover of gravels and on which red-brown hardpan frequently outcrops.	22.24	0.9%
Oc64	Low stony hills and dissected pediments on granite with occasional basic dykes.	634.21	26.0%
Fa13	Ranges of banded jaspilite and chert along with shales, dolomites, and iron ore formations; some areas of ferruginous duricrust as well as occasional narrow winding valley plains and steeply dissected pediments.	1,781.83	73.1%
	Total	**2,438.28**	**100%**

2.6 Hydrology and Surface Drainage

The Study Area contains one major watercourse (Shovelanna Creek) which intersects the south-western corner of the Study Area (Figure 2.3). Other minor watercourses and drainage lines may occur throughout the Study Area; however, these are likely to be ephemeral and temporary only during or following large rainfall events.

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7415000 7412500 7410000 7407500

Legend

- Study Area
- Waterway

Geological units

- A-FOj-bbo-HAS
- A-FOj-xs-b-HAS
- A-HAd-kd-HAS
- A-HAm-cib-HAS
- A-g-PSY

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0 0.275 0.55 1.1 1.65 2.2 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 2.3: Broad geology and hydrology of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 04/08/2020

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807500
810000
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Legend

Study Area

Soil units

- BE6
- Fa13
- Oc64

biologic Environmental Survey

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1:25,000

0 0.2 0.4 0.8 1.2 1.6 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 2.4: Soil units of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 04/08/2020

2.7 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.

The Study Area is located in the Fortescue Botanical District, within the Eremaean Province (Beard, 1990). The Fortescue Botanical District is essentially a tree and shrub-steppe with *Eucalyptus* spp. trees, *Acacia* shrubs, *Triodia pungens* and *T. wiseana* (Beard, 1990). Some mulga (*A. aneura* and close relatives) occurs in valleys and there are short-grass plains on alluvia (Beard, 1990).

Three vegetation associations occur within the Study Area (Table 2.5; Figure 2.5) (Shepherd *et al.*, 2002). The dominant vegetation association is association 29, which is defined as "sparse low woodland; mulga, discontinuous in scattered groups" (Shepherd *et al.*, 2002) and covers approximately 71.2% (1,736.78 ha) of the Study Area. The remaining vegetation associations, 82 and 216, cover approximately 15.1% (367.47 ha) and 13.7% (334.03 ha) of the Study Area respectively (Table 2.5; Figure 2.5).

Table 2.5 Vegetation system associations occurring within the Study Area

Vegetation Association	Description (Shepherd *et al.*, 2002)	Extent in Study Area	
		Area (ha)	%
29	Sparse low woodland; mulga, discontinuous in scattered groups	1,736.78	71.2%
82	Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*	367.47	15.1%
216	Low woodland; mulga (with spinifex) on rises	334.03	13.7%
	Total	**2,438.28**	**100%**

805000
807500
810000
812500
7412500
7410000

Legend

Study Area

Vegetation Association

- 29: Sparse low woodland; mulga, discontinuous in scattered groups
- 82: Hummock grasslands, low tree steppe; snappy gum over Triodia wiseana
- 216: Low woodland; mulga (with spinifex) on rises

biologic Environmental Survey

N

1:25,000

0 0.2 0.4 0.8 1.2 1.6 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 2.5: Pre-European vegetation associations of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 04/08/2020

2.8 Threatened and Priority Ecological Communities

No Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) occur within the Study Area (Figure 2.6). One TEC (Ethel Gorge Aquifer Stygobiont Community) and one PEC (Fortescue Valley Sand Dunes) occur within 50 km of the Study Area (Figure 2.6; Table 2.6); however, neither have conservation values related to terrestrial vertebrate fauna.

Table 2.6: Threatened and Priority Ecological Communities within 50 km of the Study Area

Name	Status	Description (DBCA, 2020b)	Distance from Study Area	Applied Buffer
TEC				
Ethel Gorge Aquifer Stygobiont Community	Endangered	Stygofauna communities of the Ethel Gorge Aquifer	45.3 NW	5 km
PEC				
Fortescue Valley Sand Dunes	Priority 3	Vegetation of sand dunes of the Hamersley Range/Fortescue Valley	6.5 km W	500 m

2.9 Land Use and Tenure

The Study Area is located within the northern portion of the Sylvania pastoral lease, which is actively utilised for the grazing of cattle (Figure 1.1). Dominant land use within the Study Area is native pasture to date, with some mining related infrastructure (road and rail) occurring in the north-eastern corner of the Study Area.

Tenure within the Study Area comprises four live tenements which overlap parts of the Study Area, including one exploration license (E522591-I), one mining lease (M266SA) and two miscellaneous licenses (l52/108 and L52/109) (Figure 1.1).

765000 780000 795000 810000 825000 840000 855000

7455000

7440000

7425000

7410000

Legend

Study Area

TEC

Ethel Gorge Aquifer Stygobiont Community

PEC

Fortescue Valley Sand Dunes

biologic Environmental Survey

N

1:275,000

0 2 4 8 12 16 km

BHP Western Australian Iron Ore

Basic Vertebrate Fauna Survey

Figure 2.6: Threatened and Priority Ecological Communities occurring within 50km of the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 04/08/2020

3 DESKTOP ASSESSMENT

3.1 Methods

3.1.1 Database Searches

Five fauna databases were searched, three to obtain information on all species previously recorded in the search area (NatureMap, Birdata and BHP WAIO Fauna Records Database), one to identify locations of species of conservation significance previously recorded (DBCA Threatened Fauna Database), and one to identify species of conservation significance known or likely to occur within the region based on habitat modelling (Protected Matters Search Tool) (Table 3.1).

Table 3.1: Details of database searches conducted

Database	Data Access/ Receival Date	Search Area
DBCA (2020a) NatureMap	12/05/2020	Study Area with a 40 km buffer
DBCA (2020c) Threatened and Priority Fauna Database	15/05/2020	
Birdlife Australia (2020) Birdata	12/05/2020	
Department of Environment and Energy (DoEE, 2020) Protected Matters Search Tool	12/05/2020	
BHP (2020) BHP WAIO Fauna Records Database	01/09/2020	Study Area with 40 km buffer. Includes any biological surveys completed for BHP WAIO within search area.

3.1.2 Literature Review

A review of available literature relevant to the Study Area was undertaken to compile a list of fauna habitats and vertebrate fauna species with the potential to occur within the Study Area. A total of ten assessments were reviewed, comprising four single-season and three two-season detailed (formerly Level 2) surveys, two basic (formerly Level 1) surveys and one desktop assessments (Table 3.2).

Table 3.2: Literature sources used for the review

Survey	Reference	Survey Type	Distance from Study Area (km)
Biologic (2013) South West Jimblebar Vertebrate Fauna Assessment	A	Single-season detailed	Directly adjacent (south) of Study Area
Biologic (2014a) Dynasty Tenement - Desktop Review of Vertebrate Fauna and Habitats	B	Desktop	Within part (western portion) of Study Area
Biologic (2016a) Dynasty Level 1 Vertebrate Fauna Survey	C	Basic	Within part (western portion) of Study Area
Biologic (2016b) Dynasty Level 2 Vertebrate Fauna Survey	D	Single-season detailed	Within part (western portion) of Study Area
Biologic (2018b) Dynasty Vertebrate Fauna Monitoring 2018	E	Single-season detailed	Within part (western portion) of Study Area
ENV (2007) West Jimblebar Lease Fauna Assessment	F	Single-season detailed	Within part (central portion) of Study Area
ENV (2009) Newman to Jimblebar Transmission Line and Newman Town Substation Terrestrial Fauna Assessment	G	Basic	~4 km north-west
Outback Ecology (2009a) Jimblebar Iron Ore Project: Terrestrial vertebrate fauna assessment	H	Duel-season detailed	Within part (eastern portion) of Study Area
Outback Ecology (2009b) Jimblebar Linear Development Terrestrial Vertebrate Assessment	I	Duel-season detailed	~4 km north-west
Outback Ecology (2009c) Wheelarra Hill Iron Ore Mine Modification. Flora and Fauna Assessment	J	Duel-season detailed	~5 km E

3.2 Results

The desktop assessment identified a total of 355 vertebrate fauna species that have been previously recorded in the vicinity of or have the potential to occur, in the Study Area. This comprised 47 mammals (38 native and nine introduced), 198 birds (197 native and one introduced), 101 reptiles, and nine amphibians (Table 3.3; Appendix C). Due to the size of the desktop assessment search area, and likelihood of encompassing habitats which may not occur within the Study Area. Additionally, many species tend to be patchily distributed even where appropriate habitats are present, and many species of birds can occur as regular migrants, occasional visitors or vagrants. Thus, results of the desktop assessment represent an overly conservative list of species for the area, and thus many may not actually occur within the Study Area.

Table 3.3: Species richness recorded by previous surveys and database searches

Source	Mammals (native)	Mammals (introduced)	Birds (native)	Birds (introduced)	Reptiles	Amphibians	Total
Literature Source							
A (Biologic, 2013)	15	6	55		38	2	116
B (Biologic, 2014a)							
C (Biologic, 2016a)	9	4	27		2		42
D (Biologic, 2016b)	15	1	39		32	2	89
E (Biologic, 2018b)	16	2	25		15	4	62
F (ENV, 2007)	4	5	72		27		108
G (ENV, 2009)	7	2	57		12	1	79
H (Outback Ecology, 2009a)	11	6	46		26	2	91
I (Outback Ecology, 2009b)	15	2	80		45	4	146
J (Outback Ecology, 2009c)	10	4	26		20		60
Database searches							
NatureMap (DBCA, 2020a)	33	6	170		92	9	310
Protected Matters (DoEE, 2020)	4	8	1	1	1		30
Birdata (Birdlife Australia, 2020)			162				162
Threatened and Priority Fauna (DBCA, 2020c)	7		3		3		24
BHP WAIO Fauna Records (BHP, 2020)	36	8	178		103	9	334
Total number of species	**38**	**9**	**197**	**1**	**101**	**9**	**355**
Total number of species of conservation significance	**9**		**28**		**3**		**40**

Of the 355 species identified by the desktop assessment, 40 are species listed as conservation significance, comprising nine mammals, 28 birds and three reptiles (Table 3.4; Figure 3.1; Figure 3.2). Of these, the brush-tailed mulgara (*Dasycercus blythi* – Priority 4 DBCA), western pebble-mound mouse (*Pseudomys chapmani* – Priority 4 DBCA) and spotted ctenotus (*Ctenotus uber* subsp. *johnstonei* – Priority 2 DBCA) have previously been recorded within the Study Area (BHP, 2020; Biologic, 2016a, 2016b, 2018b; DBCA, 2020c) (Figure 3.1; Figure 3.2).

Due to the historic nature or record type (i.e. secondary evidence of historic occurrence), some records represent historic occupation of species which have suffered significant declines and are now considered regionally extinct in the vicinity of the Study Area. This includes lesser stick-nest rat (*Leporillus apicalis*), for which is considered extinct in the Pilbara region and records are primarily associated with secondary evidence of past occurrence (i.e. stick-nests) (Burbidge, 2004; Menkhorst & Knight, 2014). The species is considered Highly Unlikely to occur within the Study Area and is not discussed further in this report.

Table 3.4: Species of conservation significance identified by the desktop assessment

Genus and Species	Common Name	Conservation Status			
		EPBC Act	BC Act	DBCA	IUCN
MAMMALS					
DASYURIDAE					
Dasycercus blythi	Brush-tailed mulgara			P4	
Dasyurus hallucatus	Northern quoll	EN	EN		EN
Sminthopsis longicaudata	Long-tailed dunnart			P4	
HIPPOSIDERIDAE					
Rhinonicteris aurantia Pilbara form	Pilbara leaf-nosed bat	VU	VU		
MACROPODIDAE					
Lagorchestes conspicillatus subsp. *leichardti*	Spectacled hare-wallaby			P4	
Petrogale lateralis subsp. *lateralis*	Black-flanked rock-wallaby	EN	EN		NT
MEGADERMATIDAE					
Macroderma gigas	Ghost bat	VU	VU		VU
MURIDAE					
Leporillus apicalis	Lesser stick-nest rat	EX	EX		
Pseudomys chapmani	Western pebble-mound mouse			P4	
THYLACOMYIDAE					
Macrotis lagotis	Greater bilby	VU	VU		VU
AVES					
ANATIDAE					
Anas querquedula	Garganey	MI	MI		
APODIDAE					
Apus pacificus	Fork-tailed swift	MI	MI		
CHARADRIIDAE					
Charadrius dubius	Little ringed plover	MI	MI		
Charadrius veredus	Oriental plover	MI	MI		
CICONIIDAE					
Ephippiorhynchus asiaticus	Black-necked stork				NT
FALCONIDAE					
Falco hypoleucos	Grey falcon	VU	VU		VU
Falco peregrinus	Peregrine falcon		OS		
HIRUNDINIDAE					
Hirundo rustica	Barn swallow	MI	MI		
LARIDAE					
Sterna caspia	Caspian tern	MI	MI		
Gelochelidon nilotica	Gull-billed tern	MI	MI		

Genus and Species	Common Name	Conservation Status			
		EPBC Act	BC Act	DBCA	IUCN
MOTACILLIDAE					
Motacilla cinerea	Grey wagtail	MI	MI		
Motacilla flava	Yellow wagtail	MI	MI		
PSITTACIDAE					
Pezoporus occidentalis	Night parrot	EN	CR		EN
Polytelis alexandrae	Princess parrot	VU		P4	NT
ROSTRATULIDAE					
Rostratula benghalensis subsp. *australis*	Australian painted snipe	EN	EN		EN
SCOLOPACIDAE					
Calidris acuminata	Sharp-tailed sandpiper	MI	MI		
Calidris ferruginea	Curlew sandpiper	CR/ MI	CR/ MI		NT
Calidris melanotos	Pectoral sandpiper	MI	MI		
Calidris ruficollis	Red-necked stint	MI	MI		NT
Calidris subminuta	Long-toed stint	MI	MI		
Limosa limosa	Black-tailed godwit	MI	MI		NT
Philomachus pugnax	Ruff	MI	MI		
Tringa glareola	Wood sandpiper	MI	MI		
Tringa hypoleucos	Common sandpiper	MI	MI		
Tringa nebularia	Common greenshank	MI	MI		
Tringa stagnatilis	Marsh sandpiper	MI	MI		
Tringa totanus	Common redshank	MI	MI		
THRESKIORNITHIDAE					
Plegadis falcinellus	Glossy ibis	MI	MI		
REPTILES					
BOIDAE					
Liasis olivaceus subsp. *barroni*	Pilbara olive python	VU	VU		
SCINCIDAE					
Ctenotus uber subsp. *johnstonei*	Spotted ctenotus			P2	
TYPHLOPIDAE					
Anilios ganei	Pilbara flat-headed blind-snake			P1	

768000 780000 792000 804000 816000 828000 840000

7440000 7428000 7416000 7404000

Species - Status

- Curlew sandpiper - CR/MI
- Black-flanked rock-wallaby - EN
- Ghost bat - VU
- Greater bilby - VU
- Pilbara leaf-nosed bat - VU
- Pilbara olive python - VU
- Peregrine falcon - OS
- Pilbara flat-headed blind-snake - P1
- Spotted ctenotus - P2
- Brush-tailed mulgara - P4
- Spectacled hare-wallaby - P4
- Western pebble-mound mouse - P4
- Caspian tern - MI
- Common greenshank -MI
- Common sandpiper - MI
- Common redshank - MI
- Glossy ibis - MI
- Gull-billed tern - MI
- Long-toed stint - MI
- Marsh sandpiper - MI
- Oriental plover - MI
- Pectoral sandpiper - MI
- Red-necked stint - MI
- Sharp-tailed sandpiper - MI
- Wood sandpiper - MI

Legend

Study Area

biologic Environmental Survey

N

1:215,000

0 1.5 3 6 9 12 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 3.1: Vertebrate fauna species of conservation significance identified by BDCA in the desktop assessment

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 04/08/2020

768000 780000 792000 804000 816000 828000 840000

7440000 7428000 7416000 7404000

Species - Status

- Barn Swallow - MI/MA
- Black-tailed Godwit - MI/MA
- Brush-tailed Mulgara or Ampurta - P4
- Common Greenshank or Greenshank - MI/MA
- Common Redshank - MI/MA
- Common Sandpiper - MI/MA
- Curlew Sandpiper - CR/MI
- Eastern Great Egret - MI/MA
- Fork-tailed Swift - MI/MA
- Garganey - MI/MA
- Ghost Bat - VU
- Glossy Ibis - MI/MA
- Greater Bilby or Dalgyte or Ninu - VU
- Grey Falcon - VU
- Little Ringed Plover - MI/MA
- Long-tailed Dunnart - P4
- Long-toed Stint - MI/MA
- Marsh Sandpiper - MI/MA
- Northern Quoll - EN
- Pectoral Sandpiper - MI/MA
- Peregrine Falcon - OS
- Pilbara Flat-headed Blind-snake - P1
- Pilbara Leaf-nosed Bat - VU
- Pilbara Olive Python - VU
- Rainbow Bee-eater - MI/MA
- Ruff - MI/MA
- Sharp-tailed Sandpiper - MI/MA
- Spotted Ctenotus - P2
- Western Pebble-mound Mouse or Ngadji - P4
- Wood Sandpiper - MI/MA

Legend

Study Area

biologic Environmental Survey

N

1:215,000

0 1.5 3 6 9 12 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 3.2: Vertebrate fauna species of conservation significance identified by BHP in the desktop assessment

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 20/10/2020

4 FIELD SURVEY METHODS

4.1 Conformance

This assessment was carried out in a manner consistent with the following guidelines and recommendations from the EPA, DBCA, the Department of Agriculture, Water and the Environment (DAWE; formerly DEHWA, DSEWPaC, DoE) and BHP WAIO:

- BHP (2017) Guidance for terrestrial vertebrate fauna surveys in the Pilbara. Procedure document number: SPR-IEN-EMS-012;
- DBCA (2017) Guidelines for surveys to detect the presence of bilbies, and assess the importance of habitat in Western Australia;
- DEWHA (2010a) Survey guidelines for Australia's threatened bats;
- DEWHA (2010b) Survey guidelines for Australia's threatened birds;
- DoE (2016) EPBC Act referral guideline for the endangered northern quoll (*Dasyurus hallucatus*);
- DPaW (2017) Interim guidelines for the preliminary surveys of night parrot (*Pezoporus occidentalis*) in Western Australia;
- DSEWPaC (2011a) Survey guidelines for Australia's threatened mammals;
- DSEWPaC (2011b) Survey guidelines for Australia's threatened reptiles;
- DoE (2013) Significant impact guidelines 1.1: Matters of national Environmental significance;
- EPA (2018) Statement of environmental principles, factors and objectives;
- EPA (2020) Technical guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment.

As of July 2020, EPA (2016b) and EPA (2016c) been replaced with EPA (2020) *Technical guidance: terrestrial vertebrate fauna surveys for environmental impact assessment*. The current survey largely conforms with EPA (2020); however, as the timing of the field sampling component of the survey predates the revised guidance, some sampling effort differs (i.e. number recording nights for ultrasonic recorders). Although a

4.2 Timing and Weather

The field survey was undertaken over six days between the 7th and 12th May 2020. Observed temperatures during the survey were comparable to long-term minimum and maximum averages for May (11.1°C and 28.2°C respectively), with minimum temperatures ranging between 11.6–19.1°C (mean 15.8°C) and maximum temperatures ranging between 25.9–29.4°C (mean 28.2°C) (Table 4.1; Figure 2.1). No rainfall was recorded during the survey.

In the 12 months prior to the surveys, mean minimum and maximum temperatures recorded at Newman Airport were similar to or slightly higher than long-term averages for most months, with above average temperatures recorded throughout most of the year (Figure 2.1). Rainfall in the 12 months prior to the

surveys was variable, with below long-term averages recorded throughout most of the year (Figure 2.1). Well above average rainfall was recorded during January 2020, which occurred as a result of multiple cyclones occurring in the north-west and subsequent rainfall (Figure 2.1).

Table 4.1: Daily climate date recorded at Newman Airport during the field survey (BoM, 2020)

Date	Rainfall (mm)	Temperature (°C)	
		Min	Max
07/05/2020	0	15.5	29.2
08/05/2020	0	13.5	29.4
09/05/2020	0	17.9	26.0
10/05/2020	0	19.1	25.9
11/05/2020	0	17.1	29.6
12/05/2020	0	11.6	29.0
Total/Average	**0**	**15.8**	**28.2**

4.3 Survey Team and Licensing

The fauna sampling for this survey was conducted under a DBCA Regulation 27 “Fauna Taking (Biological Assessment) License” (BA27000247) issued to C. Knuckey. The assessment was undertaken by Aidan Williams, a Zoologist with extensive experience with fauna in the Pilbara.

4.4 Sampling and Survey Methods

The field survey was carried out in a manner consistent with the guidelines and recommendations listed in Section 4.1. Survey effort and sampling locations were selected based on a number of principles:

a) Survey effort was focused in areas deemed most likely to record the target species based on the type and quality of habitat present;
b) Survey effort was, where possible, spread across the Study Area to ensure adequate geographical coverage, though was constrained by access;
c) Survey effort focussed on areas that had not had any prior sampling effort (Figure 4.1); and
d) Sampling was often focussed at or near previous records of the target species, including within records from outside the Study Area, though within instances of the same habitat.

4.4.1 Habitat Assessments

Habitat assessments were undertaken in the field to characterise and define habitats and their significance to vertebrate fauna. A total of 95 vertebrate fauna habitat assessments were conducted within the Study Area (Figure 4.1; Appendix B; Appendix D). Habitat assessments were conducted and attributes assessed using attribute terminology prescribed by BHP, which have been modified from the *Australian Soil and Land Survey Field Handbook* (National Committee on Soil and Terrain, 2009). The characteristics recorded during the habitat assessments were:

- site information, photo and location;
- landform: slope, relative inclination of slope, morphological type and landform type;

- vegetation: leaf litter %, wood litter, hollow bearing trees, broad floristic formation, vegetation structure (tall, mid and low), and dominant species;
- land surface: micro relief, sheet erosion, rill erosion, gully erosion, gully depth, abundance and size of coarse fragments, rock outcropping, water bodies, comments on nests, burrows, roosts and diggings;
- soil: texture, colour;
- substrate: bare ground, rock size, rock type, rock outcropping; and
- disturbance: time since last fire, evidence of weeds, grazing, or human disturbances.

Additionally, a further four opportunistic short-range endemic (SRE) invertebrate fauna habitat assessments were conducted within the Study Area (Appendix E). No targeted sampling for SRE invertebrate fauna was undertaken during the field survey and no further analysis of SRE habitats is included in this report.

4.4.2 Targeted Searches

Targeted searches were undertaken throughout the Study Area within habitats considered likely to support species of conservation significance. Targeted searches comprised searching for occurrence of conservation significant species (i.e. direct observation and/or secondary evidence such as tracks, scats and nests) and habitats and/or habitat features of significance (i.e. dens, caves and water features) likely to be utilised by particular species.

Searches were undertaken at all sites within the Study Area where habitat was considered suitable for species of conservation significance, including northern quoll, Pilbara leaf-nosed bat and ghost (cave searches only), greater bilby, spectacled hare-wallaby, brush-tailed mulgara and Pilbara olive python (Figure 4.1; Appendix B). Additionally, more intensive sampling was completed for some conservation significant species where deemed suitable (i.e. targeted sampling for northern quoll, greater bilby, mulgara and night parrot), which are discussed further below.

4.4.3 Ultrasonic Bat Recorders

SongMeter (SM; Wildlife Acoustics Inc.) ultrasonic bat recorders were deployed at three locations within the Study Area (Table 4.2; Figure 4.1). At each location, recorders were placed in or in the vicinity of areas of prospective foraging and/or roosting habitats and features most likely to be utilised by bats, including ghost bat and Pilbara leaf-nosed bat. Recorders were deployed between two and eight nights at each location for a total of 12 recording nights (Table 4.2). The audio settings used for all the SM units followed the manufacturer's recommendations (Wildlife Acoustics, 2011, 2017) in conjunctions with those required to adequately record all species known to occur within the region (Gibson & McKenzie, 2009). Bat calls were analysed by Robert Bullen of Bat Call WA.

Table 4.2: Ultrasonic sampling locations within the Study Area

Site	Habitat	Latitude	Longitude	Sampling Nights
VJMW-001	Stony Plain	-23.3881	120.0188	8
VJMW-007	Hardpan Plain	-23.3669	119.9842	2
VJMW-069	Major Drainage Line	-23.3884	119.9837	2
			Total	**12**

4.4.4 Targeted Sampling – Northern Quoll Camera Transect

Targeted sampling for northern quoll was undertaken by deploying a motion camera transect, which is the "recommended detection technique" of DoE (2016). One northern quoll motion camera transect was established within Hillcrest/ Hillslope habitat during the field survey (VJMW-001; Figure 4.1). The configuration and sampling duration of motion camera sites also followed sampling recommendations of DoE (2016), comprising ten motion cameras placed approximately 50–100 metres apart. Cameras were baited with universal bait (a mixture of oats, peanut butter, and sardines) within a non-reward receptacle and remained deployed for a total of 65 nights each, resulting in a total of 650 motion camera sample nights.

4.4.5 Targeted Sampling – Greater Bilby Plot Searches and Camera Transect

Greater bilby sampling within the Study Area comprised plot searches and deployment of a single motion camera transect (Table 4.3; Figure 4.1). Plot searches within the Study Area comprised 2 ha survey plots (bilby plots) distributed within areas of suitable Sand Plain and Hardpan Plain habitat across the Study Area, in accordance with DBCA survey guidelines for the species (DBCA, 2017) (Table 4.3; Figure 4.1). Each bilby plot was subjected to targeted searches for a minimum of 30 minutes and comprised searches for secondary evidence for the species (i.e. burrows, diggings, tracks and scats, as described by Southgate *et al.* (2019). Additionally, targeted searches for evidence of brush-tailed mulgara (i.e. burrows and tracks) were undertaken concurrently with targeted bilby searches within all bilby plots. Overall, a total of 13 bilby plots were sampled for greater bilby and brush-tailed mulgara during the field survey, with targeted searches for the species totalling 6.5 person hours (Table 4.3).

One motion camera transect comprising six cameras was established within suitable Sand Plain habitat for the species during the field survey (VJMW-008; Figure 4.1). The camera transect was deployed for a total of 65 nights, resulting in a total of 390 motion camera sample nights.

Table 4.3: Bilby plot sampling locations within the Study Area

Site	Habitat	Latitude	Longitude	Search Hours
VJMW-017	Hardpan Plain	-23.3935	119.9885	0.5
VJMW-019	Sand Plain	-23.3826	119.9887	0.5
VJMW-020	Sand Plain	-23.3746	119.9894	0.5
VJMW-021	Sand Plain	-23.3800	119.9939	0.5
VJMW-024	Sand Plain	-23.3925	120.0000	0.5
VJMW-026	Sand Plain	-23.3813	120.0136	0.5
VJMW-032	Hardpan Plain	-23.3753	120.0183	0.5
VJMW-034	Sand Plain	-23.3777	119.9887	0.5
VJMW-038	Hardpan Plain	-23.3842	120.0373	0.5
VJMW-040	Sand Plain	-23.3776	120.0237	0.5
VJMW-041	Sand Plain	-23.3768	120.0293	0.5
VJMW-050	Sand Plain	-23.3755	120.0395	0.5
VJMW-056	Sand Plain	-23.3786	119.9977	0.5
			Total	**6.5**

4.4.6 Targeted Sampling – Night Parrot Acoustic Recorders

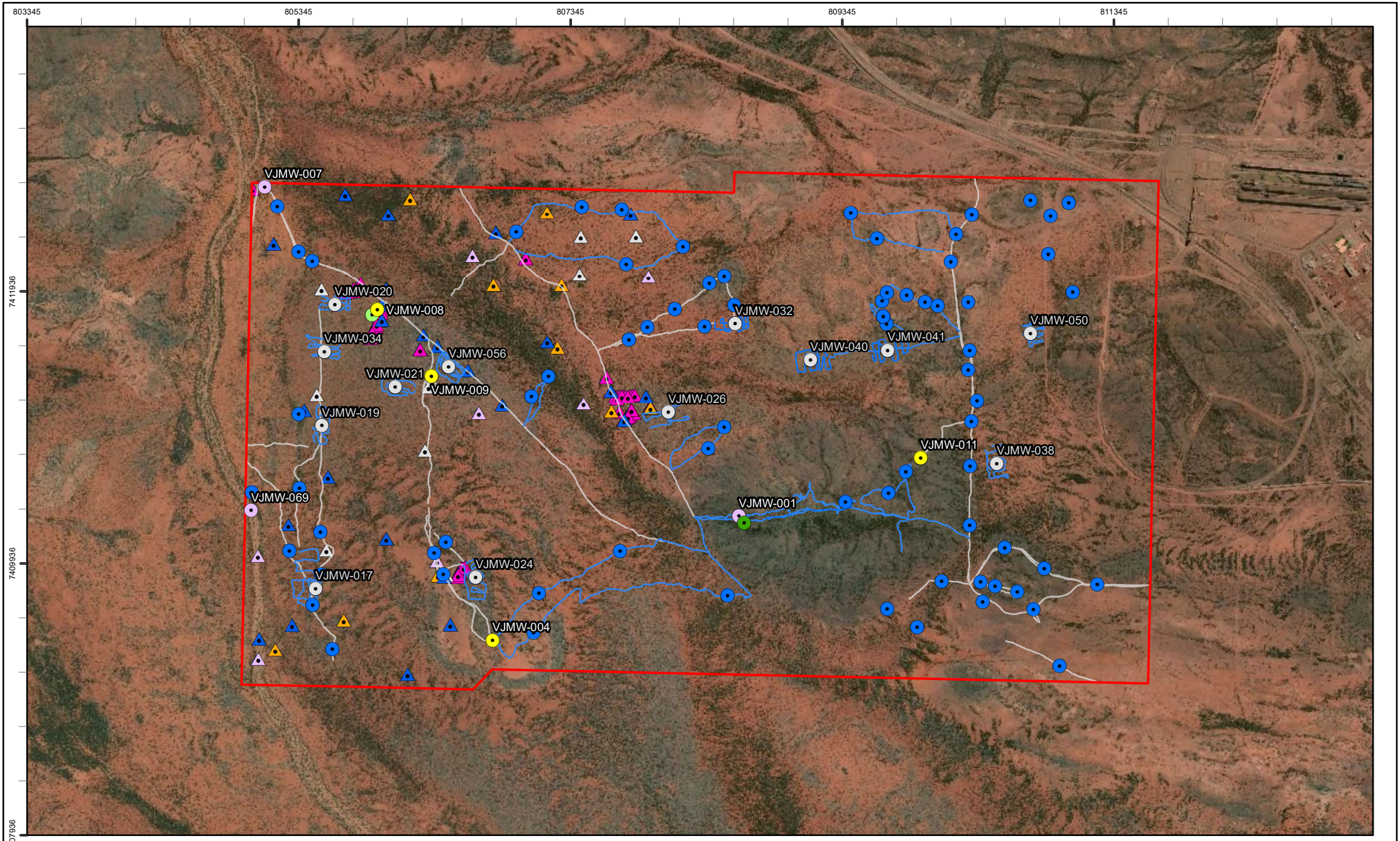
SongMeter (SM; Wildlife Acoustics Inc.) acoustic sound recorders were deployed at four locations within the Study Area (Figure 4.1). In an effort to target night parrot, the SM4 acoustic recorders were deployed in habitat most similar to that recommended within the *Interim Guideline for Preliminary Surveys of Night parrot (Pezoporus occidentalis) in Western Australia* (DPaW, 2017) – "stands of large, old clumps of spinifex (*Triodia*)... especially so if the identified area is part of a paleo-drainage system or contains healthy stands of samphire". SongMeters were deployed for four consecutive nights at each location for a total of 16 recording nights (Table 4.4). Acoustic recordings were analysed for night parrot calls by ornithologist Nigel Jackett using publicly available calls and call information (Leseberg *et al.*, 2019; Night Parrot Recovery Team, 2017). All non-target species recorded at each recorder site was also compiled and incorporated into the results for each site.

Table 4.4: Acoustic sampling locations within the Study Area

Site	Habitat	Latitude	Longitude	Sampling Nights
VJMW-004	Sand Plain	-23.3967	120.0013	4
VJMW-008	Sand Plain	-23.3749	119.9925	4
VJMW-009	Sand Plain	-23.3792	119.9965	4
VJMW-011	Stony Plain	-23.3840	120.0318	4
			Total	**16**

4.4.7 Opportunistic Sightings

At all times while surveying, all records pertaining to species not previously recorded during the survey, rare species, species of conservation significance or other fauna of interest were documented. These records include those from primary (i.e. direct observation of species) or secondary (e.g. burrows, scratching's, diggings and scats) evidence. Efforts were made to target likely microhabitats by turning rocks, logs and anthropogenic debris where present.



Legend

- Study Area

Current Sampling

- GPS Tracks
- Search Transects
- Greater Bilby Motion Camera Transect
- Habitat Assessment
- Northern Quoll Motion Camera Transect
- SoungMeter (acoustic)
- SongMeter (ultrasonic)
- Targeted search

Previous Sampling

- Habitat Assessment
- Motion camera
- SongMeter (ultrasonic)
- Targeted Search
- Trapping

biologic Environmental Survey

N

1:35,000

0 0.4 0.8 1.6 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 4.1: Vertebrate fauna sampling within the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A4. Created 7/01/2020

4.5 Fauna Habitat Mapping and Significance

Fauna habitat mapping was previously completed in the western portion of the Study Area as part of the Dynasty Level 2 Vertebrate Fauna Survey (Biologic, 2016b). During the current survey, fauna habitat mapping was completed using the vertebrate fauna habitat assessments conducted during the field survey, as well as high-resolution aerial imagery, vegetation, topographical, land system and drainage mapping. Habitats were delineated and mapped across the Study Area at a scale of approximately 1:20,000.

Habitats mapped within the Study Area were compiled and used to delineate critical habitat for all conservation significant species identified in the desktop assessment. For the purposes of this assessment, critical habitat followed that of DoE (2013), being areas necessary "for activities such as foraging, breeding, roosting, or dispersal". Within these categories, habitat types were recognised as providing primary habitat (i.e. critical habitat as per the definition above), or secondary habitat (i.e. habitats not critical for foraging, breeding, roosting or dispersal, but may support such activities and/ or habitats of marginal suitability for such activities). Due to differing habitat preferences of conservation significant species (including habitat features and/or microhabitats), habitat significance was assessed on a species by species basis. Where specific habitat criteria are available for species, these defined categories are used (i.e. Pilbara leaf-nosed bat foraging habitat categories as defined by TSSC (2016)).

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 which are required for the species persistence, despite the same habitat occurring outside the Study Area being considered of greater significance. The significance of a 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 primary habitat.

4.6 Likelihood of Vertebrate Fauna Occurrence

The likelihood of occurrence within the Study Area was assessed for all conservation significant species identified in the desktop assessment using the decision matrix shown in Table 4.5. The occurrence assessment was based on known information relating to species' distribution, habitat preferences (landforms, substrates and vegetation associations), locality records from database searches and previous studies within and/or in the vicinity of the Study Area and results of the current survey pertaining to species records and/or habitats occurring within the Study Area. The fauna assessments assigned each species to one of six ratings, ranging from Confirmed to Highly Unlikely.

Due to several factors influencing species occurrence (i.e. known distribution, habitat preferences, ecology and/or dispersal capabilities), interpretation of occurrence assessment criteria may vary between species (i.e. a small species with limited dispersal capabilities previously recorded close to the Study Area may not necessarily occur within the Study Area, whereas larger species with greater dispersal and/or foraging capabilities may have an increased likelihood of occurring).

Where a species determined likelihood of occurrence differs from the assessment criteria in Table 4.5, detailed justification for the determined assessment will be provided in the discussion of that species. For example, historic or presumed erroneous records which may not be representative of species' current known distribution (i.e. locally/regionally extinct species) or limited sampling within or in the vicinity of the Study Area resulting in lack of contextual records which may influence a higher or lower determined likelihood of occurrence to criteria.

Table 4.5: Species likelihood of occurrence decision matrix

Range/occurrence categories (<50 years only)	Habitat Categories (within Study Area)			
	Core/critical habitat present	Foraging/dispersal habitat present	Marginal/intermittent habitat present	No suitable habitat present
Recorded in Study Area	Confirmed	Confirmed	Confirmed	Confirmed
Recorded within 10 km	Highly Likely	Likely	Possible	Possible
Recorded within 10–50km	Likely	Possible	Possible	Unlikely
Recorded within 50–100 km	Possible	Possible	Unlikely	Unlikely
Recorded >100 km	Possible	Unlikely	Unlikely	Highly Unlikely
Species considered locally/regionally extinct	Unlikely	Unlikely	Highly Unlikely	Highly Unlikely

5 FIELD SURVEY RESULTS AND DISCUSSION

5.1 Fauna Habitats

A total of six broad fauna habitat types were recorded and mapped within the Study Area, comprising, in descending extent of occurrence, Hardpan Plain, Stony Plain, Sand Plain, Mulga Woodland, Hillcrest/ Hillslope and Major Drainage Line (Table 5.1; Figure 5.1). Hardpan Plain was the dominant broad fauna habitat within the Study Area, occupying approximately 47.37%, (1,155.08 ha) of the Study Area (Table 5.1; Figure 5.1). Following Hardpan Plain is Stony Plain (18.77%, 457.77 ha), Sand Plain (16.63%, 405.39 ha), and Mulga Woodland (13.52%, 329.65 ha) (Table 5.1; Figure 5.1). Two broad fauna habitats represented less than 5% of the Study Area each; Hillcrest/ Hillslope (2.02%, 49.29 ha) and Major Drainage Line (0.7%, 16.89 ha) (Table 5.1; Figure 5.1). The remaining 1.00% (24.22 ha) of the Study Area comprised Cleared/ Disturbed areas, which are associated with infrastructure (rail and haul road) for current operations areas for the Jimblebar Iron Ore Mine (Table 5.1; Figure 5.1). Data from on-site vertebrate fauna habitat assessments are presented in Appendix D and SRE invertebrate fauna assessments in Appendix E.

Of the six broad fauna habitats occurring within the Study Area, all have the potential to support species of conservation significance at varying capacities though the provision of primary or secondary (supporting) breeding, denning, nesting/roosting, foraging and/or dispersal habitat (Table 5.1).

Table 5.1: Summary of fauna habitats within the Study Area

Fauna Habitat Type	Area (ha)	Proportion of Study Area (%)
Hardpan Plain	1155.08	47.37%
Stony Plain	457.77	18.77%
Sand Plain	405.39	16.63%
Mulga Woodland	329.65	13.52%
Hillcrest/ Hillslope	49.29	2.02%
Cleared/ Disturbed	24.22	1.00%
Major Drainage Line	16.89	0.69%
Total	**2,438.29**	**100%**

Table 5.2: Broad fauna habitat types identified within the Study Area

Habitat	Distinguishing Habitat Characteristics	Habitat Extent	Conservation Significant Species	Representative Photo
Hardpan Plain • 1,155.08 ha • 47.37%	Hardpan Plain is characterised as lower lying plain often sparsely vegetated with open or sparsely scattered Mulga over a sparse mixed herb and small to medium shrub (predominantly *Acacia* and *Eremophila* species) understory on heavy clay substrates, often with a stony or gravelly surface. Large open areas often void of vegetation. Often subject to sheet flow following rainfall, occasionally pooling in lower lying areas; however, presence of water often temporary and persisting for only short periods following rainfall.	Hardpan Plain is the most widely distributed habitat within the Study Area, occurring throughout the area and often occurring as the intervening area between other habitats. The extent of the habitat within the Study Area forms part of a larger expanse that occurs more broadly in the vicinity of the Study Area and across the Pilbara regions.	• **Grey falcon** – primary foraging and dispersal • **Peregrine falcon** – primary foraging and dispersal • **Brush-tailed mulgara –** secondary breeding, foraging and dispersal • **Spotted ctenotus –** primary breeding, foraging and dispersal	

Habitat	Distinguishing Habitat Characteristics	Habitat Extent	Conservation Significant Species	Representative Photo
Stony Plain • 457.77 ha • 18.77%	Stony Plain habitat comprises flat to low undulating areas and low hills. Vegetation structure and density is variable, often occurring within scattered patches amount larger sparsely vegetated areas. Vegetation is often dominated by Triodia hummock grasses and/or scattered mixed small to medium shrub species on gravelly clay loam substrates.	The extent of Stony Plain habitat occurs primarily within the north-eastern and south-eastern portions of the Study Area, often in close association with Hardpan Plain and Mulga Woodland habitats. Stony Plain is one of the most common and widespread habitat types within the Pilbara region. The vegetation and substrate which make up this habitat type are characteristic features of the region.	• **Brush-tailed mulgara –** secondary breeding, foraging and dispersal • **Long-tailed dunnart** – secondary foraging and dispersal • **Western pebble-mound mouse –** secondary breeding, foraging and dispersal • **Ghost bat** – secondary foraging and dispersal • **Grey falcon** – primary foraging and dispersal • **Peregrine falcon –** primary foraging and dispersal • **Night parrot** – secondary roosting and nesting • **Spotted ctenotus –** secondary breeding, foraging and dispersal	
Sand Plain • 405.39 ha • 16.63%	Sand Plain habitat is characterised by sandy soils, often supporting Triodia hummock grassland and open Acacia shrubland vegetation. Vegetation is often dominated by Triodia hummocks of varying density and life stages, with scattered Acacia shrubs on sandy to sandy loam substrates.	Within the Study Area, Sand Plain occurs in scattered areas primarily in the west and north-eastern portions of the Study Area, often within larger areas of Hardpan Plain. The habitat extends beyond the Study Area, often occurring as relatively small and isolated patches. More broadly within the Pilbara region, the habitat can occur as large expanses or smaller isolated areas.	• **Greater bilby** – primary breeding, foraging and dispersal • **Brush-tailed mulgara –** primary breeding, foraging and dispersal • **Ghost bat** – secondary foraging and dispersal • **Spectacled hare-wallaby** – primary breeding, foraging and dispersal • **Peregrine falcon** – primary foraging and dispersal • **Grey falcon** – primary foraging and dispersal • **Night parrot** – secondary roosting and nesting • **Spotted ctenotus –** primary breeding, foraging and dispersal	

Habitat	Distinguishing Habitat Characteristics	Habitat Extent	Conservation Significant Species	Representative Photo
Mulga Woodland • 329.65 ha • 13.52%	Mulga Woodland habitat within the Study Area is variable in density, often associated with low lying drainage areas subject to occasional sheet flow following rainfall. Vegetation dominated by open mulga (*Acacia aneura*) with sparse to no understory of mixed small shrubs, tussock and hummock grasses.	Within the Study Area, a large area of Mulga Woodland bisects the Study Area in a northwest to southeast direction. It also occurs as smaller extents in the northeast of the Study Area. The occurrence of Mulga Woodland within the Study Area is often associated with Hardpan Plain, Sand Plain and/or Stony Plain habitats. Mulga Woodland within the Study Area forms part of larger occurrences of the habitat that extend well beyond the Study Area. The habitat is relatively common throughout the Pilbara bioregion, though can often be sparsely distributed and occur in isolated patches.	• **Ghost bat** – primary foraging and dispersal • **Greater bilby –** secondary breeding and foraging • **Pilbara flat-headed blind-snake** – secondary breeding, foraging and dispersal	
Hillcrest/ Hillslope • 49.29 ha • 2.02%	Hillcrest/ Hillslope habitat comprises hills and undulating stony plains of higher elevation, often supporting hard spinifex with a mantle of gravel and larger rocks. Scattered areas of minor outcropping and breakaway, particularly atop hillcrests. Often sparsely vegetated, with vegetation often dominated by hard *Triodia* hummock grasses with scattered mulga trees and other *Acacia* and/or *Grevillea* shrubs.	Hillcrest/ Hillslope habitat occurs primarily in the eastern portion of the Study Area, often within larger expanses of Hardpan Plain, Stony Plain and/or Sandy Plain habitats. Hillcrest/ Hillslope habitat is a characteristic habitat type of the Pilbara region. Its occurrence in the broader vicinity of the Study Area and throughout the region is widespread and common.	• **Northern quoll** – secondary foraging and dispersal • **Long-tailed dunnart –** primary breeding, foraging and dispersal • **Western pebble-mound mouse –** primary breeding, foraging and dispersal • **Pilbara leaf-nosed bat –** secondary foraging (Priority 3) and dispersal • **Peregrine falcon** – secondary foraging and dispersal • **Pilbara flat-headed blind-snake** – secondary breeding, foraging and dispersal	

Habitat	Distinguishing Habitat Characteristics	Habitat Extent	Conservation Significant Species	Representative Photo
Cleared/ Disturbed • 24.22 ha • 1.00%	Cleared/ Disturbed areas are characterised as currently or previously disturbed area, often void of vegetation as a result of previous clearing. Within the Study Area, Cleared/ Disturbed areas includes major tracks and larger clearings for mine operations areas. Minor tracks dissecting broad fauna habitats do not form part of this habitat.	Within the Study Area, Cleared/ Disturbed areas confined to the north-eastern portion of the Study Area, and are associated with current operations areas for the Jimblebar Iron Ore Mine.	N/A	No Photo Available
Major Drainage Line • 16.89 ha • 0.69%	Within the Study Area, Major Drainage Line habitat is variable in structure and condition. Vegetation is often dominated by Eucalyptus species over a variable understory comprising mixed small to medium shrubs and tussock grasses.	Major Drainage Line is restricted to a small area in the southwest of the Study Area, where it forms part of a continuous extent of the habitat that extends beyond the Study Area. Major Drainage Line habitat is widespread throughout the Pilbara region, though its condition is often highly variable and susceptible to degradation from cattle grazing.	• **Northern quoll** – secondary foraging and dispersal • **Ghost bat** – secondary foraging and dispersal • **Pilbara leaf-nosed bat** – primary foraging (Priority 4) and dispersal • **Peregrine falcon** – primary foraging and dispersal • **Grey falcon** – primary nesting, foraging and dispersal • **Pilbara olive python** – secondary foraging and dispersal (where proximal to primary breeding habitat)	

805000
807500
810000
812500
7412500
7410000

Legend

Study Area

Fauna Habitat Type

- Cleared/ Disturbed
- Hardpan Plain
- Hillcrest/ Hillslope
- Major Drainage Line
- Mulga Woodland
- Sand Plain
- Stony Plain

biologic Environmental Survey

N

1:25,000

0 0.2 0.4 0.8 1.2 1.6 km

BHP Western Australian Iron Ore

Jimblebar Basic Vertebrate Fauna Survey

Figure 5.1: Broad fauna habitats occurring within the Study Area

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Size A3. Created 04/08/2020

5.2 Fauna Habitat Features

5.2.1 Caves

Caves can be particularly important features within a landscape, particularly in arid zone systems, often providing stable microclimates, shelter and protection (Medellin *et al.*, 2017). No caves were recorded within the Study Area. Numerous caves occur within the broader vicinity of the Study Area; however, contemporary records of conservation significant species which may utilise these caves (ghost bat and Pilbara leaf-nosed bat) are scarce (DBCA, 2020c), suggesting caves in the vicinity of the Study Area may not be regularly utilised by these species or records represent limited sampling for these species. This is particularly applicable to ghost bat, which prior to being listed as Vulnerable under the EPBC Act in 2016, was only listed as Priority 4, and was not subjected to the same sampling intensity it now is.

5.2.2 Water Features

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), often representing 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 species of conservation significance.

No semi-permanent or permanent natural waterbodies, natural or artificial, were recorded within the Study Area during the survey. One permanent artificial waterbody was recorded approximately 55 m north of the north-western corner Study Area (Table 5.3). It is likely that temporary waterbodies occur throughout parts of the Study Area where pooling or flowing water may be present following significant rainfall events, primarily within Major Drainage Line habitat, and to a lesser extent Hardpan Plain.

Table 5.3: Water features recorded during the survey

Water Feature ID	Latitude	Longitude	Comments	Photo
WJMW-01	-23.3662	119.9839	Artificial water feature – Noddy Bore	

5.3 Vertebrate Fauna Records

A total of 76 vertebrate fauna species, comprising 14 mammal species (11 native and three introduced), 57 bird species and five reptile species were recorded from the Study Area during the current survey (Table 5.4; Appendix F). All 76 species recorded during the current survey, were previously identified in the desktop assessment (Appendix C). None of the species recorded during the current survey were of conservation significance.

Table 5.4: Species richness recorded by previous surveys and the current survey

Source	Mammals (native)	Mammals (introduced)	Birds (native)	Birds (introduced)	Reptiles	Amphibians	Total
Literature Source							
A (Biologic, 2013)	15	6	55		38	2	116
B (Biologic, 2014a)							
C (Biologic, 2016a)	9	4	27		2		42
D (Biologic, 2016b)	15	1	39		32	2	89
E (Biologic, 2018b)	16	2	25		15	4	62
F (ENV, 2007)	4	5	72		27		108
G (ENV, 2009)	7	2	57		12	1	79
H (Outback Ecology, 2009a)	11	6	46		26	2	91
I (Outback Ecology, 2009b)	15	2	80		45	4	146
J (Outback Ecology, 2009c)	10	4	26		20		60
Current Survey	**11**	**3**	**57**		**5**	**0**	**76**

5.3.1 Occurrence of Vertebrate Fauna of Conservation Significance

The desktop assessment identified 36 species of conservation significance as potentially occurring in the Study Area (Table 3.4; Figure 3.1; Figure 3.2). Of these:

- three species (brush-tailed mulgara, western pebble-mound mouse and spotted ctenotus) have been recorded within the Study Area during previous surveys, though were not recorded during the current survey;
- four species were considered Likely to occur (ghost bat, long-tailed dunnart, grey falcon and peregrine falcon);
- seven species were considered Possible to occur (Pilbara leaf-nosed bat, Pilbara olive python, greater bilby, northern quoll, spectacled-hare wallaby, fork-tailed swift and Pilbara flat-headed bind-snake);
- 22 species were considered Unlikely to occur (night parrot, black-flanked rock-wallaby, garganey, little ringed plover, curlew sandpiper, oriental plover, black-necked stork, caspian tern, gull-billed tern, princess parrot, sharp-tailed sandpiper, pectoral sandpiper, red-necked

stint, long-toed stint, black-tailed godwit, ruff, wood sandpiper, common sandpiper, common greenshank, marsh sandpiper, common redshank and glossy ibis); and

- four species were considered Highly Unlikely to occur (barn swallow, Australian painted snipe, grey wagtail and yellow wagtail).

While a number of migratory shorebirds and waterbirds were identified in the desktop assessment as potentially occurring in the Study Area, these are generally considered Unlikely or Highly Unlikely to occur in the Study Area, owing to the lack of, or suboptimal, natural water bodies likely to support the species. Due to the proximity of optimal habitat likely to support these species occurring near the Study Area, it is unlikely the suboptimal habitat within the Study Area would be utilised. Optimal habitat in the vicinity of the Study Area includes Ophthalmia Dam (~9 km west of the Study Area) where numerous migratory shorebirds and waterbirds identified in the desktop assessment have previously been recorded.

Justification for the rating of the likelihood of these species occurring in the Study Area is outlined in Section 4.6. Those species recorded in the Study Area or considered to Likely occur, or to Possibly occur, in the Study Area are discussed further in Sections 5.3.2 to 5.3.6.

Table 5.5: Likelihood of vertebrate fauna species of conservation significance occurring in the Study Area

Species	Conservation Status				Preferred Broad Habitats	Nearest Record to the Study Area, date recorded and relevant source	Potential Critical Habitat Within the Study Area						Comments	Likelihood of Occurrence	Occurrence
	EPBC Act	BC Act	DBCA	IUCN			Hardpan Plain	Sand Plain	Hillcrest/ Hillslope	Mulga Woodland	Stony Plain	Major Drainage			
MAMMALIA															
DASYURIDAE															
Brush-tailed mulgara *(Dasycercus blythi)*			P4		Prefers spinifex *Triodia* spp. grasslands on sand plains and the swales between low dunes (Pavey *et al.*, 2012; Woolley, 2006). Mature spinifex hummocks appear to be important for protection from introduced predators (Körtner *et al.*, 2007).	Within Study Area (2016, 2018) (BHP, 2020; DBCA, 2020c)	•	•			•		Recorded 22 times during previous surveys within part of the Study Area, in Sand Plain and Hardpan Plain habitats. Likely to occur as a resident throughout Study Area where suitable sandy habitat and vegetation cover is present.	Confirmed (Biologic, 2016a, 2016b, 2018b)	Resident
Northern quoll (*Dasyurus hallucatus*)	EN	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).	~28km W (2007) (Onshore & Biologic, 2009), ~33 km W (2020) (Biologic, 2020b)			•			•	May occasionally occur within the Study Area during foraging and dispersal activities, primarily in Hillcrest/ Hillslope (where suitable outcropping occurs) and Major Drainage Line habitats. No suitable denning/shelter present within Study Area; however, suitable habitat occurs in the broader vicinity. Occurrence within the habitat likely to be subject to connectivity between suitable denning/shelter habitat to habitat within the Study Area.	Possible	Infrequent visitor (foraging/dispersal)
Long-tailed dunnart *(Sminthopsis longicaudata)*			P4		Typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Gibson & McKenzie, 2012). Once considered rare but now shown to be relatively common and widespread in rocky habitats (Burbidge *et al.*, 2008).	~34 km W (1998) (BHP, 2020)			•		•		May occur as a resident in Hillcrest/Hillslope habitat of the Study Area, particularly where suitable denning sites occur in rock formations. Foraging and dispersal may occur more broadly within Stony Plain habitat, where proximal to denning sites.	Likely	Resident
HIPPOSIDERIDAE															
Pilbara leaf-nosed bat (*Rhinonicteris aurantia* (Pilbara form))	VU	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, 2016).	~24 km NW (2013) (Biologic, 2014b)			•			•	May occasionally occur within the Study Area to forage. Frequency of visitation dependent on proximity of primary roosting habitat outside of the Study Area. No suitable roosting habitat present within the Study Area.	Possible	Occasional visitor (foraging/dispersal)
MACROPODIDAE															
Spectacled hare-wallaby *(Lagorchestes conspicillatus leichardti)*			P4		Within the Pilbara the spectacled hare-wallaby is known to occur in tussock and hummock grasslands and *Acacia* shrublands (Burbidge & Johnson, 1995; Ingleby & Westoby, 1992).	~17.5 km SE (no date) (DBCA, 2020c)		•					May occur within the Study Area as a resident, primarily in Sand Plain habitat where suitable vegetation cover is present. May also forage and disperse more broadly within other habitats adjacent to Sand Plain.	Possible	Resident
Black-flanked rock-wallaby (*Petrogale lateralis* subsp. *lateralis*)	EN	EN		NT	Rocky habitats, including gorges and gullies or outcrops with sufficient shelter habitat. Often vegetated with *Acacia* thickets and open low eucalypt woodlands with an understory of grasses and low shrubs (Willers *et al.*, 2011)	~19 km NW (1975) (DBCA, 2020c)							Suitable habitat not present	Unlikely	N/A

Species	Conservation Status				Preferred Broad Habitats	Nearest Record to the Study Area, date recorded and relevant source	Potential Critical Habitat Within the Study Area						Comments	Likelihood of Occurrence	Occurrence
	EPBC Act	BC Act	DBCA	IUCN			Hardpan Plain	Sand Plain	Hillcrest/ Hillslope	Mulga Woodland	Stony Plain	Major Drainage			
MEGADERMATIDAE															
Ghost bat (*Macroderma gigas*)	VU	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).	~4 km N (2013) (BHP, 2020), ~5 km NE (1899) (DBCA, 2020c) and 9km NE (2019) (GHD, 2019b)				•	•	•	May occasionally occur within the Study Area to forage. Frequency of visitation dependent on proximity of primary roosting habitat outside of the Study Area. No suitable roosting habitat present within the Study Area	Likely	Regular visitor (foraging/dispersal)
MURIDAE															
Western pebble-mound mouse (*Pseudomys chapmani*)			P4		This species occurs 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 (Anstee, 1996; Start *et al.*, 2000).	Within Study Area (1994, 2008, 2009) (BHP, 2020; DBCA, 2020c)			•		•		Recorded three times during previous surveys within the Study Area, in Sand Plain, Hardpan Plain and Hillcrest/ Hillslope habitats. Likely to occur as a resident throughout Study Area where suitable stony habitat present, primarily within Hillcrest/ Hillslope and Stony Plain habitats.	Confirmed (BHP, 2020; DBCA, 2020c)	Resident
THYLACOMYIDAE															
Greater bilby (*Macrotis lagotis*)	VU	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).	~19 km SW (1979) (DBCA, 2020c), ~34km E (2018) (Biologic, 2018a)		•		•			May occur within Sand Plain, and to a lesser extend Mulga Woodland, habitats of the Study Area, where suitable vegetation cover present. May occur as a resident or occasional visitor to forage or during dispersal. Occurrence within the Study Area also dependent on occurrence of suitable habitat in the vicinity of the Study Area due to relatively small and isolated nature of suitable habitat extend within the Study Area alone.	Possible	Resident
AVES															
ANATIDAE															
Garganey (*Anas querquedula*)	MI	MI			Garganey is small teal. This duck is a rare visitor to Australia recorded from lakes and inland waterbodies (Johnstone & Storr, 1998).	0.5 km SE (2013) (BHP, 2020)							Suitable habitat not present	Unlikely	N/A
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). Almost exclusively aerial.	~9 km NE (2011, 2013) (BHP, 2020)							Likely to occasionally occur within the airspace above the Study Area to forage, unlikely to land or nest within Study Area.	Possible	Infrequent visitor (foraging/migration)
CHARADRIIDAE															
Little ringed plover (*Charadrius dubius)*	MI	MI			Bare or sparsely vegetated sandy and pebbly shores of shallow standing freshwater pools, lakes or slow-flowing rivers. Also found in artificial habitats including gravel pits, sewage works, industrial wastelands and rubbish tips (Geering *et al.*, 2007).	~13 km W (2014) (BHP, 2020)							Suitable habitat not present	Unlikely	N/A

Species	Conservation Status				Preferred Broad Habitats	Nearest Record to the Study Area, date recorded and relevant source	Potential Critical Habitat Within the Study Area						Comments	Likelihood of Occurrence	Occurrence
	EPBC Act	BC Act	DBCA	IUCN			Hardpan Plain	Sand Plain	Hillcrest/ Hillslope	Mulga Woodland	Stony Plain	Major Drainage			
Oriental plover (*Charadrius veredus*)	MI	MI			A 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).	~24 km SW (1981) (DBCA, 2020c) ~97 km N (2017) (DBCA, 2020a)							Suitable habitat not present.	Unlikely	N/A
CICONIIDAE															
Black-necked stork (*Ephippiorhynchus asiaticus*)				NT	Found mainly on freshwater wetlands and associated grasslands in tropics and subtropics and also on tidal flats (Menkhorst, 2017).	~24 km SW (2003) (DBCA, 2020a)							Suitable habitat not present.	Unlikely	N/A
FALCONIDAE															
Grey falcon (*Falco hypoleucos*)	VU	VU		VU	Timbered lowlands, particularly *Acacia* shrubland and along inland drainage systems. Also frequent spinifex and tussock grassland (Burbidge *et al.*, 2010; Olsen & Olsen, 1986)	~10 km NW (2013) (BHP, 2020)	•	•			•	•	Likely to occur regularly within the Study Area to forage. Frequency of occurrence to forage dependent on nesting proximity to the Study Area. Nesting may occur within Major Drainage habitat where suitable tall trees occur.	Likely	Resident (nesting)/ frequent visitor (foraging)
Peregrine falcon (*Falco peregrinus*)		OS			In arid areas, it 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).	~19km NW (2013) (Biologic, 2014b), ~25 km W (2011) (DBCA, 2020c)	•	•	•		•	•	Likely to occur regularly within the Study Area to forage. Frequency of occurrence to forage dependent on nesting location. Nesting unlikely to occur within the Study Area.	Likely	frequent visitor (foraging)
HIRUNDINIDAE															
Barn swallow (*Hirundo rustica*)	MI	MI			The barn swallow is a non-breeding summer visitor to the Pilbara, predominantly occurring in coastal areas. It occurs in a range of habitats, often favouring areas near water (Johnstone *et al.*, 2013).	~12 km W (2014) (BHP, 2020)							Suitable habitat not present. Study Area outside of species known range (coastal Pilbara).	Highly Unlikely	N/A
LARIDAE															
Caspian tern (*Sterna caspia*)	MI	MI			Mainly sheltered seas, estuaries and tidal creeks; occasionally near-coastal salt lakes (including saltwork ponds) and brackish pools in lower courses of rivers; rarely fresh water (Johnstone & Storr, 1998).	~12 km NW (2004, 2007, 2008)(DBCA, 2020a)							Suitable habitat not present.	Unlikely	N/A
Gull-billed tern (*Gelochelidon nilotica*)	MI	MI			Shallow sheltered seas close to land, estuaries, tidal creeks; and inundated samphire flats, flooded salt lakes, claypans and watercourses in the interior (Johnstone & Storr, 1998).	~11 km NW (2008) (DBCA, 2020c)							Suitable habitat not present.	Unlikely	N/A
MOTACILLIDAE															
Grey wagtail (*Motacilla cinereal*)	MI	MI			A rare vagrant to Western Australia where it has been recorded within various habitats with open waterbodies (Johnstone & Storr, 2004).	~153 km NW (2012)(DBCA, 2020a)							Suitable habitat not present.	Highly Unlikely	N/A

Species	Conservation Status				Preferred Broad Habitats	Nearest Record to the Study Area, date recorded and relevant source	Potential Critical Habitat Within the Study Area						Comments	Likelihood of Occurrence	Occurrence
	EPBC Act	BC Act	DBCA	IUCN			Hardpan Plain	Sand Plain	Hillcrest/ Hillslope	Mulga Woodland	Stony Plain	Major Drainage			
Yellow wagtail (*Motacilla flava*)	MI	MI			An uncommon but regular visitor to the Pilbara region (Johnstone *et al.*, 2013). Occupies a range of damp or wet habitats with low vegetation although favours edges of fresh water, especially sewage ponds (Johnstone & Storr, 2004).	~369 km N (1982)(DBCA, 2020a)							Suitable habitat not present. Outside of species known range (Kimberley).	Highly Unlikely	N/A
PSITTACIDAE															
Night parrot (*Pezoporus occidentalis*)	EN	CR		EN	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).	~119 km NE (1970) and ~149 km NW (2005)(DBCA, 2020a)		•			•		Although larger mature *Triodia* hummocks occur within Sand Plain and Stony Plain habitats of the Study Area, It should be noted that the occurrence of nesting habitat in proximity to primary foraging habitat (defined as low, treeless chenopod shrublands or herb lands with high abundance of annual grasses and herbs) is believed to be a key factor in the species occurrence. As no known suitable primary foraging habitat occurs within 10 km of the Study Area (furthest distance recorded for a foraging individual; Murphy *et al.*, 2017), the species occurrence is considered unlikely.	Unlikely	N/A
Princess parrot (*Polytelis alexandrae*)	VU		P4	NT	The princess parrot inhabits low open eucalypt woodlands and savannah shrublands in arid deserts, usually with *Casuarina* and *Allocasuarina* spp. Primarily breeds in Marble Gum hollows (Pavey et al., 2014).	~50 km NW (2012)(DBCA, 2020a)							Suitable habitat not present.	Unlikely	N/A
ROSTRATULIDAE															
Australian painted snipe (*Rostratula benghalensis subsp. australis*)	EN	EN		EN	Generally, occupies shallow terrestrial freshwater wetlands (i.e. temporary and permanent lakes, swamps and claypans) with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire (Johnstone & Storr, 1998).	~80 km NW (2012)(DBCA, 2020a)							Suitable habitat not present.	Highly Unlikely	N/A
SCOLOPACIDAE															
Sharp-tailed sandpiper (*Calidris acuminata*)	MI	MI			Favours flooded samphire flats and grasslands, mangrove creeks mudflats, beaches, river pools, saltwork ponds, sewage ponds and freshwater soaks (Johnstone *et al.*, 2013).	~11 km W (2001, 2009) (DBCA, 2020c), ~11 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
Curlew sandpiper (*Calidris ferruginea*)	CR/MI	CR/MI		NT	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).	~11 km W (2005) (DBCA, 2020c) , ~11 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A

Species	Conservation Status				Preferred Broad Habitats	Nearest Record to the Study Area, date recorded and relevant source	Potential Critical Habitat Within the Study Area						Comments	Likelihood of Occurrence	Occurrence
	EPBC Act	BC Act	DBCA	IUCN			Hardpan Plain	Sand Plain	Hillcrest/ Hillslope	Mulga Woodland	Stony Plain	Major Drainage			
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).	~13 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
Red-necked stint (*Calidris ruficollis*)	MI	MI			Lives in permanent or ephemeral wetlands of varying salinity, and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In Western Australia they prefer freshwater to marine environments. The species usually forages in shallow water at the edge of wetlands and roost or loaf on tidal mudflats, near low saltmarsh, and around inland swamps (Johnstone & Storr, 1998).	~11 km W (2005) (DBCA, 2020c)							Suitable habitat not present.	Unlikely	N/A
Long-toed stint (*Calidris subminuta*)	MI	MI			They prefer shallow freshwater or brackish wetlands but are also fond of muddy shorelines, growths of short grasses, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. The Long-toed Stint also frequents permanent wetlands and forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands. They roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water. It also roosts in small depressions in the mud (Johnstone & Storr, 1998).	~11 km W (2001) (DBCA, 2020c), ~13 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
Black-tailed godwit (*Limosa limosa)*	MI	MI		NT	Found mainly in coastal habitats like estuaries, tidal mudflats, shallow river margins, sewage ponds, brackish or saline inland lakes, airfields and flooded pastures (Pizzey & Knight, 2007).	~11 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
Ruff (Philomachus pugnax)	MI	MI			Mainly fresh, brackish and saline wetlands with exposed mudflats. Found near lakes, swamps, pools, lagoons, tidal rivers and floodlands. Sometimes observed in sheltered coastal areas, including harbours and estuaries (DoEE, 2019)	~13 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
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).	~11 km W (2007) (DBCA, 2020c), ~11 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
Common sandpiper (*Tringa hypoleucos*)	MI	MI			Estuaries and deltas of streams, as well as banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans (Geering *et al.*, 2007).	~11 km W (most recent 2013)(DBCA, 2020a), ~11 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A

Species	Conservation Status				Preferred Broad Habitats	Nearest Record to the Study Area, date recorded and relevant source	Potential Critical Habitat Within the Study Area						Comments	Likelihood of Occurrence	Occurrence
	EPBC Act	BC Act	DBCA	IUCN			Hardpan Plain	Sand Plain	Hillcrest/ Hillslope	Mulga Woodland	Stony Plain	Major Drainage			
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).	~11 km W (2007, 2013, 2016) (DBCA, 2020c), ~10 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
Marsh sandpiper (*Tringa stagnatilis*)	MI	MI			Lives in permanent or ephemeral wetlands of varying salinity, and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In Western Australia they prefer freshwater to marine environments. The species usually forages in shallow water at the edge of wetlands and roost or loaf on tidal mudflats, near low saltmarsh, and around inland swamps (Johnstone & Storr, 1998).	~11 km W (2005) (DBCA, 2020c) ~11 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
Common redshank (*Tringa totanus*)	MI	MI			It is found at sheltered coastal wetlands with bare open flats and banks of mud or sand. They are also found around salt lakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms. The species has been observed feeding in shallow water, on wet bare mud or sand, or on algal deposits and roosting on small elevated areas such as estuarine sandbars and muddy islets surrounded by water (Johnstone & Storr, 1998).	~32 km W (2012) (DBCA, 2020c)							Suitable habitat not present.	Unlikely	N/A
THRESKIORNITHIDAE															
Glossy ibis (*Plegadis falcinellus*)	MI	MI			Freshwater wetlands, irrigated areas, margins of dams, floodplains, brackish and saline wetlands, tidal mudflats, pastures, lawns and public gardens (Johnstone et al., 2013).	~11 km W (most recent 2013) (DBCA, 2020c) ~10 km W (2014) (BHP, 2020)							Suitable habitat not present.	Unlikely	N/A
REPTILIA															
BOIDAE															
Pilbara olive python (*Liasis olivaceus* subsp. *barroni*)	VU	VU			Associated with drainage systems, including areas with localized 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).	~4 km N (2013) (BHP, 2020)			●			●	May infrequently occur within Hillcrest/ Hillslope (particularly where suitable outcropping occurs) and Major Drainage Line habitats of the Study Area during foraging and dispersal. Unlikely to occur as a resident due to the absence of suitable rocky shelter habitat or water sources often utilised by the species.	Possible	Infrequent visitor (foraging/dispersal)

Species	Conservation Status				Preferred Broad Habitats	Nearest Record to the Study Area, date recorded and relevant source	Potential Critical Habitat Within the Study Area						Comments	Likelihood of Occurrence	Occurrence
	EPBC Act	BC Act	DBCA	IUCN			Hardpan Plain	Sand Plain	Hillcrest/ Hillslope	Mulga Woodland	Stony Plain	Major Drainage			
SCINCIDAE															
Spotted ctenotus (*Ctenotus uber* subsp. *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).	Within Study Area (2016, 2018) (BHP, 2020; DBCA, 2020c)	•	•			•		Recorded five times during previous surveys in Sand Plain, Stony Plain and Hardpan Plain habitats. Likely to occur as a resident throughout the extent of these habitats within the Study Area.	Confirmed (Biologic, 2016b, 2018b)	Resident
TYPHLOPIDAE															
Pilbara flat-headed blind-snake (*Anilios ganei*)			P1		Little is known of the species' ecology, but this species is often associated with moist soils and leaf litter within gorges and gullies (Wilson & 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 (Wilson & Swan, 2014). Also presumed to occur within other mulga and stony habitats (Chapple *et al.*, 2019).	~4 km N (2006) (DBCA, 2020c), (2007, 2013) (BHP, 2020)			•	•			May occur as a resident within Hillcrest/ Hillslope and Mulga Woodland habitats of the Study Area, particularly in areas where leaf litter accumulates, and moisture is retained in leaf litter and substrates.	Possible	Resident

5.3.2 EPBC Matters of National Environmental Significance

The sections below provide summaries on the Program Matters identified in the approved Program for BHP's Strategic Assessment (northern quoll, greater bilby, ghost bat, Pilbara Leaf-nosed Bat, and Pilbara olive python) as well as the night parrot.

5.3.2.1 Northern Quoll (*Dasyurus hallucatus*) – Endangered (EPBC/BC Act)

The northern quoll tends to inhabit rocky habitats which offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; DoE, 2016; 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).

Despite being relatively common in the northern and western Pilbara region (generally within 150 km of the coast), it is much less common in the south eastern Pilbara. No northern quoll or evidence of the species' occurrence has been recorded within the Study Area by previous surveys or during the current survey. Overall, records of the species in the vicinity of the Study Area are sparse. A 2007 record of a roadkill juvenile individual was reported from the main access bridge into Whaleback, located approximately 28 km west of the Study Area (Onshore & Biologic, 2009). Additionally, the species was recorded ~33km west of the Study Area within BHP's Western Ridge tenement (Biologic, 2020b). These records represent the south-eastern limit of the species occurrence in the Pilbara region (DBCA, 2020a).

The species is considered to possibly occur based on the presence of potential habitat (Gorge/ Gully) in areas 3.5 km north and 4.5 km east (adjacent to and coinciding with Wheelarra mine) of the Study Area (BHP, 2020). Northern quoll may occasionally occur within Hillcrest/ Hillslope habitat of the Study Area to forage or during dispersal movements, particularly in areas near suitable primary habitat outside of the Study Area. Due to the isolated nature of most Hillcrest/ Hillslope habitat within the Study Area, the species is not considered likely to utilise these habitats on a regular basis.

Due to the absence of any records of the species occurring within the Study Area and the scarcity of records in the vicinity, the species occurrence within the Study Area may also be limited to infrequent visitations by foraging and dispersing individuals. Except for Hillcrest/ Hillslope habitat, the remaining habitats mapped within the Study Area are unlikely to provide significant habitat for the species.

5.3.2.2 Greater Bilby (*Macrotis lagotis*) – Vulnerable (EPBC/BC Act)

Extant populations of the greater bilby occur in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils (Southgate, 1990). Throughout its distribution, it occupies three major vegetation types: open tussock grassland on uplands and hills, hummock grassland in plains and alluvial areas and occasionally mulga woodland/shrubland growing on ridges and rises, and (Southgate, 1990). Within the Pilbara region the species is sparsely distributed, and often associated with spinifex sandplain habitat (Dziminski & Carpenter, 2016).

No records or evidence of occurrence of greater bilby has been recorded within the Study Area by previous surveys or during the current survey. The nearest record of the species is located

approximately 19 km south west of the Study Area (DBCA, 2020c); however, based on the date of the record (1979), it is considered to be a historic record and is unlikely to be an accurate representation of the species current occurrence within the Pilbara region. The nearest, more recent record (dated 2018) is located approximately 34 km east of the Study Area (Biologic, 2018a). An inactive burrow belonging to the species was recorded within Sand Plain habitat at BHP's Caramulla tenement. The burrow was old (likely >3 years), with no scats and no indication of current occupation (Biologic, 2018a).

The Sand Plain habitat represents primary breeding, foraging and dispersal habitat for the species, particularly where suitable vegetation cover is present. The species is considered to possibly occur as a resident or occasional visitor to forage or during dispersal. Occurrence within the Study Area is also dependent on the occurrence of suitable habitat in the vicinity of the Study Area due to the relatively small and isolated nature of suitable habitat within the Study Area. Patches of Sand Plain habitat extend outside the Study Area, the nearest of which is adjacent to and extend to the south of the Study Area.

The Mulga Woodland habitat represents secondary breeding and foraging habitat for the species. Although the species is known to utilise broad mulga habitats in other parts of its distribution, this habitat is rarely utilised by the species within the Pilbara region, likely due to the high amount of alluvial material making substrates less suitable for burrowing activity compared to sand-plain habitats (Cramer *et al.*, 2017). However, the likelihood of this habitats being utilised by the species may also increase when larger areas of suitable habitat (e.g. sandplain) are present adjacent to or in the vicinity (such as the north eastern portion of the Study Area).

5.3.2.3 Ghost Bat (*Macroderma gigas*) – Vulnerable (EPBC/BC Act)

In the Pilbara region, the species roosts in deep, complex caves beneath bluffs of low rounded hills, often composed of Marra Mamba Iron Formation or banded iron formation, granite rock piles and abandoned mines (Armstrong & Anstee, 2000). They roost either individually or in colonies (Churchill, 2008) and move between a number of caves, both seasonally and as dictated by weather changes (Armstrong & Anstee, 2000). The species will often forage more broadly across habitats, often utilising drainage lines and other habitats where prey species are likely to be most abundant (Richards *et al.*, 2008; Tidemann *et al.*, 1985). Recent studies of ghost bat home range and foraging behaviour in the Pilbara region have identified Drainage Area/ Floodplain, Gorge/ Gully, Major Drainage Line and Mulga Woodland as high suitability foraging habitats for the species, followed by Stony Plain as moderate suitability (Biologic, 2020a; unpublished data). This suitability, however, is variable depending on particular characteristics of the habitat, including the abundance of foraging structures (tree perches) and density of understory vegetation present. Where these habitat are present, their suitability for ghost bat is dependent on the abundance of foraging structures and an open understory (Biologic, 2020a; unpublished data).

No ghost bat or suitable roost caves likely to be used by the species were recorded within the Study Area during the current survey; however, detectability, particularly of foraging individuals is difficult due to their foraging behaviour (i.e. infrequent and highly variable calling during foraging) and capabilities of ultrasonic recording devices (i.e. limited detection zones). The nearest records of the species occurs approximately 4 km north (scats recorded in 2013; (BHP, 2020)), 5 km northeast (record is considered

historical - WAM vouched specimen from 1899 (DBCA, 2020c)). Scats and feeding evidence have been recently recorded at various locations between 9 and 12 km east of the Study Area (GHD, 2019a, 2019b). In 2006, a foraging individual was recorded 17 km east of the Study Area (Ecologia, 2006). Ultrasonic calls of the species has also been recorded approximately 19 km northwest of the Study Area within the Orebody 24 Area (BHP, 2020) and 28 km west of the Study Area in 2012 (DBCA, 2020c) as well as on multiple occasions within the Western Ridge Area, located approximately 32 km west of the Study Area (Biologic, 2020b).

The Major Drainage Line and Mulga Woodland habitats represent primary foraging and dispersal habitat for the species. Moreover, Stony Plain represents secondary foraging and dispersal (where proximal to primary roosting and breeding habitat) for the species. Due to the absence of any potential roosting habitat within the Study Area, occurrence of ghost bat within the Study Area is likely to be individuals originating from outside the Study Area, where known caves occur (one day roost (16 km east), three potential day roosts (~9–16 km east), two potential day/night roosts (~12 km east) and two potential night roosts (~7–12 km east) (Biologic, 2019; GHD, 2019a, 2019b)).

Tidemann *et al.* (1985) suggested ghost bat foraging areas averaged 60.83 (±18.0) ha in size (range = 28.47 to 120.8 ha), with an average distance of 1.89 (±0.45) km (range = 0.45 to 2.95 km) centred on diurnal roosts. The species has, however, been recorded moving larger distances of up to 15 km (Tidemann *et al.*, 1985). Therefore, with confirmed and potential day roosts within nightly flight of the Study Area, the species' likelihood of occurrence within the Study Area is considered likely. The species occurrence within the Study Area, however, is likely to be restricted to visitation to forage and/or during dispersal movements.

5.3.2.4 Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*) – Vulnerable (EPBC/BC Act)

This species' limited ability to conserve heat and water means it requires warm (28–32 ºC) and very humid (85–100%) roost sites in caves (Armstrong, 2001; Churchill, 1991) and/or mine shafts as these enable the individuals to persist in arid climates by limiting water loss and energy expenditure (van Dyck & Strahan, 2008). Such caves are relatively uncommon in the Pilbara (Armstrong, 2001), which limits the availability of diurnal roosts for this species. The species forages within and in the vicinity of roost caves and more broadly along waterbodies with suitable fringing vegetation supporting prey species (TSSC, 2016). Pilbara leaf-nosed bats are predicted to travel up to 20 km from roost caves during nightly foraging (Cramer *et al.*, 2016); however, seasonal variation is known to occur, with foraging occurring up to 20 km in the dry season and up to 50 km during the wet season (Bullen, 2013). Long-distance movements by the species have also been recorded, with a single monitored individual recorded from two roost caves located 170 km distant approximately 12 months apart (Bullen & Reiffer, 2019), suggesting the species may forage and/or disperse over greater distances.

No Pilbara leaf-nosed bat were recorded within the Study Area during the current survey; however, the species has previously been recorded approximately 24 km northwest in 2013 (Biologic, 2014b) and 29 km northwest of the Study Area in 2013 (Figure 3.1) (DBCA, 2020c). The species' likelihood of occurrence within the Study Area is considered Possible; however, its occurrence is likely to be restricted to occasional visitation to forage and/or during dispersal movements. No suitable roosting

habitat occurs within the Study Area; however, suitable roosting habitat may occur in some caves within the broader area. The scarcity of records in the broader vicinity of the Study Area suggests the species is relatively uncommon in the area and its occurrence may be restricted to foraging events only. Within the Study Area, based on (TSSC, 2016) categories of foraging habitat for the species, limited instances where outcropping occurs within Hillcrest/ Hillslope may provide potential Priority 3 foraging habitat, while Major Drainage Line provides Priority 4 habitat and Mulga Woodland provides suitable Priority 5 foraging habitat.

5.3.2.5 Pilbara Olive Python (*Liasis olivaceus barroni*) – Vulnerable (EPBC/BC Act)

The Pilbara olive python is moderately common through the ranges of the Pilbara region and the Mt Augustus area in the Gascoyne region. The species is often associated with rocky habitats (i.e. Gorge/Gully, Breakaway/ Cliff and Hillcrest/Hillslope habitats) and drainage systems (i.e. Major Drainage Lines), particularly where occurring in proximity to permanent or semi-permanent waterbodies, 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). Pilbara olive python are primarily nocturnal and tend to shelter in small caves or under vegetation during the day, although it is occasionally active during the day during warmer summer months (Pearson, 1993).

No Pilbara olive python were recorded during the current survey; however, the nearest records are located approximately 4km north, 5km north, and 6km northwest of the Study Area from 2013 (BHP, 2020) (Figure 3.1; Figure 3.2). Although no optimal habitat likely to support the species as a resident was recorded within the Study Area, the species may occasionally occur to forage or during dispersal movements from other areas of suitable habitat outside the Study Area. The species' likelihood of occurrence is considered Possible, particularly within Major Drainage Line and limited instances of outcropping within Hillcrest/ Hillslope habitats; however, the occurrence within the Study Area is likely to be dependent on habitat outside of the Study Area and the presence of connectivity with habitats of the Study Area.

5.3.2.6 Night Parrot (*Pezoporus occidentalis*) – Endangered (EPBC/BC Act)

This highly cryptic and nocturnal parrot inhabits arid and semi-arid areas that comprise dense, low vegetation. The habitat of the night parrot often comprises *Triodia* grasslands in stony or sandy environments (Jackett *et al.*, 2017; McGilp, 1931; Murphy *et al.*, 2017; North, 1898; Whitlock, 1924; Wilson, 1937), and of samphire and chenopod shrublands, including genera such as *Atriplex*, *Bassia* and *Maireana*, on floodplains and claypans, as well as on the margins of salt lakes, creeks or other sources of water (Jackett *et al.*, 2017; McGilp, 1931; Murphy *et al.*, 2017; Wilson, 1937). The current interim guidelines for preliminary surveys of night parrot in Western Australia suggest this species requires old-growth spinifex (*Triodia* spp.) (often more than 50 years' unburnt) for roosting and nesting (DPaW, 2017).

Foraging areas include highly productive and floristically diverse alluvial habitats, stony herb fields, sparse ironstone pavements, and quaternary sand drifts and ridges (Night Parrot Recovery Team,

2017). The occurrence of nesting habitat in proximity to primary foraging habitat, defined as low, treeless chenopod shrublands or herb lands with high abundance and diversity of annual grasses and herbs, is believed to be key to the species presence (Jackett *et al.*, 2017; Murphy *et al.*, 2017). Foraging habitat is likely to be more important if it is adjacent to or within about 10 km (furthest distance recorded for a foraging individual; Murphy et al., 2017) of suitable roosting habitat (DPaW, 2017).

Records of night parrot within the Pilbara region are scarce, with the nearest contemporary record of the species located approximately 140 km northwest, from April 2005 (Davis & Metcalf, 2008; DBCA, 2020a). Three individuals were purportedly observed at Minga Well, a station bore and livestock watering point with large pools of water (Davis & Metcalf, 2008). The site is heavily degraded from cattle and lacks understory within a larger area; however, larger patches of old-growth *Triodia* grasslands occur in the vicinity along the peripherals of the Fortescue Marsh and chenopod shrublands occur throughout the marsh itself. Despite this observation, targeted surveys since have failed to record the species again.

No evidence of occurrence of night parrot was recorded within the Study Area during the current survey, including from targeted acoustic recorders deployed in areas of habitat considered possibly suitable for the species. Habitat within the Study Area was largely considered suboptimal for the species given to most areas of *Triodia* grasslands lacking large long-unburnt hummocks and the absence of any chenopod shrubland or other foraging habitat occurring. Although little is known about the species' habitat preferences and occurrence, the presence of nesting habitat in proximity to primary foraging habitat (defined as low, treeless chenopod shrublands and/or herb lands with a high abundance of annual grasses and herbs (Murphy *et al.*, 2017)) is believed to be a key factor in the species occurrence. As potential roosting or nesting habitat within the Study Area is considered suboptimal and no known suitable primary foraging habitat occurs within 10 km of the Study Area, the species occurrence is considered unlikely to occur within the Study Area, either as a resident or infrequent visitor during foraging and or dispersal/migration movements.

5.3.3 Species Confirmed in the Study Area

5.3.3.1 Brush-tailed Mulgara (Dasycercus blythi) – Priority 4 (DBCA)

The brush-tailed mulgara is often recorded from a range of sandy and stony plain habitats (Pavey *et al.*, 2012). No evidence of the species was recorded during the current survey; however, the species was recorded within the Study Area during three previous surveys in 2016 and 2018 (Biologic, 2016a, 2016b, 2018b) (Figure 3.1; Figure 3.2). Biologic (2016a) recorded the species on four occasions at four locations in Sand Plain and Hardpan Plain habitats, comprising three inactive burrows and a single individual recorded on a motion camera (Figure 3.1; Figure 3.2). Biologic (2016b) recorded the species on nine occasions from five locations, comprising five individuals captures (including one recapture), two active burrows and one direct observation of an active individual in Sand Plain and Hardpan Plain habitats (Figure 3.1; Figure 3.2). The species was recorded a further nine times from nine locations by Biologic (2018b), comprising six inactive (recently active) burrows, two active burrows and one trapped individual, with the majority of records from Sand Plain habitat (Figure 3.1; Figure 3.2). Therefore, the species is considered to occur as a resident in Sand Plain (regarded as primary breeding, foraging and

dispersal habitat), particularly where suitable vegetation cover and sandy or loamy substrates permitting burrowing are present. Additionally, Hardpan Plain and Stony Plain provide secondary breeding, foraging and dispersal habitat for the species.

5.3.3.2 Western Pebble-mound Mouse (Pseudomys chapmani) – Priority 4 (DBCA)

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).

The western pebble-mound mouse was recorded within the Study Area on one occasion in 1994 within Sand Plain habitat, on one occasion in 2008 within Hardpan Plain habitat (DBCA, 2020c), one occasion in 2008 within Stony Plain habitat (Outback Ecology, 2009c) and on one occasion in 2015 within Hillcrest/ Hillslope habitat (BHP, 2020) (Figure 3.1; Figure 3.2). This comprised two records from secondary evidence (pebble mounds). The species is considered to occur within the Study Area as a resident, whereby Stony Plain and Hillcrest/ Hillslope provide secondary breeding, foraging and dispersal habitat for the species.

5.3.3.3 Spotted Ctenotus (Ctenotus uber subsp. johnstonei) – Priority 2 (DBCA).

Habitat preferences of the spotted ctenotus are poorly known; however, previous records of the subspecies in the Pilbara region are associated with stony hillslope and plain habitats with variable vegetation cover, often dominated by open *Acacia* shrubland and *Triodia* hummock grassland (Cogger, 2014). No evidence of the spotted ctenotus was recorded during the current survey; however, the species was recorded within the Study Area during previous surveys in 2016 and 2018 (Biologic, 2016b, 2018b). A total of five individuals of the species were recorded from direct observation (trapped individuals and one opportunistic record) at three locations within Hardpan Plain habitat in 2016 (BHP, 2020; Biologic, 2016b) (Figure 3.1; Figure 3.2). The species was also recorded once from direct observation (trapped individual) within Sand Plain habitat in 2018 (BHP, 2020; Biologic, 2018b) (Figure 3.1; Figure 3.2). Hardpan Plain and Sand Plain habitats provide primary breeding, foraging and dispersal habitat for the species. It should be noted that there is currently some taxonomic uncertainty regarding the isolated Pilbara population of this subspecies, and the population may represent an undescribed taxon (P. Doughty, Western Australian Museum, *pers. comm*.).

5.3.4 Species Highly Likely to Occur in the Study Area

No species of conservation significance identified in the desktop assessment are considered Highly Likely to occur in the Study Area (Table 5.5).

5.3.5 Species Likely to Occur in the Study Area

In addition to the ghost bat discussed above (see Section 5.3.2), a further three species of conservation significance are considered Likely to occur in the Study Area.

5.3.5.1 Long-tailed Dunnart (*Sminthopsis longicaudata*) – Priority 4 (DBCA)

Despite the relatively widespread distribution of long-tailed dunnart, the species is often sparsely distributed and locally uncommon in the Pilbara region, where is often occurs in rugged rocky areas, scree slopes and stony plains and plateaus dominated by open shrubland and *Triodia* grassland vegetation (van Dyck *et al.*, 2013).

No evidence of the long-tailed dunnart was recorded within the Study Area during the current survey; however, based on the presence of potential habitat for the species, its likelihood of occurrence is considered Likely. The species has previously been recorded approximately 34 km west of the Study Area (1997), with a more contemporary record located approximately 47 km east of the Study Area (2006) (DBCA, 2020a). Within the Study Area, the species may occur as a resident, primarily within Hillcrest/ Hillslope habitat which provides primary breeding and foraging habitat. Hillcrest/ Hillslope and Stony Plain habitat provides primary and secondary foraging and dispersal habitat, respectively. The species may also move into adjacent habitats to forage and/or disperse, particularly when occurring in proximity to denning habitat.

5.3.5.2 Grey Falcon (*Falco hypoleucos*) – Vulnerable (EPBC Act/BC Act)

The grey falcon is sparely distributed, inhabiting the arid and semi-arid zones of Australia (Schoenjahn *et al.*, 2019). The species commonly nests in timbered lowlands, particularly *Acacia* shrubland and along inland drainage systems (Garnett et al., 2011), within artificial structures or remanent stick-nests of other species of bird (Schoenjahn *et al.*, 2019). It forages in open or more sparsely vegetated habitats (Garnett et al., 2011) such as spinifex and tussock grassland (Burbidge et al., 2010; Olsen & Olsen, 1986) and feeds predominantly on birds (Schoenjahn *et al.*, 2019).

No grey falcons were recorded within the Study Area during the current survey; however, the species has previously been recorded approximately 10 km northwest (2013) (BHP, 2020) (Table 5.5; Figure 3.1; Figure 3.2). Due to the large foraging range of the species, the species is considered likely to occur within the Study Area as a frequent visitor to forage, particularly within Sand Plain, Stony Plain, Hardpan Plain and Major Drainage habitats. Occurrence within the Study Area will be influenced by proximity of nesting to the Study Area. Nesting may occur within Major Drainage habitat where suitable tall trees are present.

5.3.5.3 Peregrine Falcon (*Falco peregrinus*) – Specially Protected (BC Act)

In arid areas of its distribution, the peregrine falcon is often recorded 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 & Olsen, 1989). It also appears to prefer nesting on large ledges a reasonable distance (average of 13 m) from the top of the cliff (Olsen & Olsen, 1989), possibly to avoid ground dwelling predators. Nesting may also occasionally occur in tall trees along drainage lines, including use of abandoned nests of other large bird species (Olsen & Olsen, 1989).

No peregrine falcons were recorded within the Study Area during the current survey; however, the species has previously been recorded approximately 19 km northwest (2013) and 25 km west of the

Study Area (2011) (DBCA, 2020c) (Table 5.5; Figure 3.1; Figure 3.2). The species is considered likely to occur within the Study Area as a frequent visitor to forage, particularly if nesting occurs in the vicinity of the Study Area, and/or when dispersing. No suitable nesting habitat occurs within the Study Area and nesting is unlikely to occur.

5.3.6 Species Possibly Occurring in the Study Area

In addition to the Pilbara leaf-nosed bat, Pilbara olive python, greater bilby and northern quoll discussed above (see Section 5.3.2), a further three species of conservation significance are considered Possible to occur in the Study Area.

5.3.6.1 Spectacled-hare Wallaby (*Lagorchestes conspicillatus* subsp. *leichardti*) – Priority 4 (DBCA)

The spectacled hare-wallaby has declined across most of its Pilbara distribution and is now only known from sparsely distributed and infrequent records within the region (DBCA, 2020a) and thus, the current known range of the species is poorly defined. Within the Pilbara region the spectacled hare-wallaby is known to occur in tussock and hummock grasslands and *Acacia* shrublands, particularly in areas where large mature *Triodia* hummocks occur (Burbidge & Johnson, 1995; Ingleby & Westoby, 1992).

Records of the species are scarce in the vicinity of the Study Area; however, the species has previously been recorded approximately 17.5 km southeast of the Study Area (undated record) (DBCA, 2020c). Moreover, scats belonging to the species have been recorded ~74km north of the Study Area (APM, 2010). Based on habitats present within and in the vicinity of the Study Area and the above record, the species likelihood of occurrence within the Study Area is considered Possible. The species may occur as a resident within suitable vegetated areas of Sand Plain habitat within the Study Area. Foraging and dispersal may occur more broadly within other habitats proximal to Sand Plain habitat, including Hardpan Plain, Stony Plain and Mulga Woodland, where suitable vegetation cover is also present.

5.3.6.2 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 habitats (Johnstone & Storr, 1998). The species does not breed in Australia, migrating from breeding grounds in the northern Hemisphere. During its occurrence in Australia, the species is almost exclusively aerial, feeding and possibly also roosting aerially (DoEE, 2019).

The fork-tailed swift was not recorded during the current survey and the nearest record of the species is located approximately 8.6 km northeast of the Study Area (BHP, 2020). The species is considered to possibly occur due to its wide-ranging and sporadic occurrence. The species is likely to occur as an infrequent visitor and may forage in the airspace above all habitats occurring within the Study Area, though the species is highly unlikely to land or nest.

5.3.6.3 Pilbara Flat-headed Blind-snake (Anilios ganei) – Priority 1 (DBCA)

Little is known about the Pilbara flat-headed blind-snake; however, it can be assumed that its ecology and behaviour are similar to other blind snake species (Cogger, 2014). Due to its fossorial nature, the species is rarely encountered, and little is known of the species habitat preferences. Records of the

species are often associated with moist gorges and gullies; however, the species is presumed to occur within other mulga and stony habitats (Chapple *et al.*, 2019; Wilson & Swan, 2014).

The Pilbara flat-headed blind-snake was not recorded during the current survey; however, based on the occurrence of habitats that are similar to those in which the species has previously been recorded or are considered to potentially occur, and the occurrence of a previous record of the species approximately 4 km north of the Study Area (2004, 2007, 2014) (BHP, 2020; DBCA, 2020c), its occurrence is considered Possible. The species may occur as a resident within Hillcrest/ Hillslope, Stony Plain and Mulga Woodland habitats, particularly in areas where leaf litter accumulates, and moisture is retained in leaf litter and substrates.

5.4 Potential Limitation and Constraints

The EPA (2020) outlines several potential limitations to fauna surveys. These aspects are assessed and discussed in Table 5.6 below. No major limitations or constraints were identified for the current survey.

Table 5.6: Survey limitations and constraints

Potential limitation or constraint	Limitation to current survey	Applicability to this survey
Experience of personnel	No	The field personnel involved in the survey and reporting are experienced in undertaking fauna surveys of similar nature, including for conservation significant species of interest to the survey.
Scope (faunal groups sampled and whether any constraints affect this)	No	The scope of the survey was a basic (formerly Level 1) survey with targeted survey effort focused on species of conservation significance (i.e. northern quoll, bilby, night parrot). The survey was conducted within this framework in accordance with relevant guidelines and recommendations. All sampling methods implemented were able to be undertaken as expected to sample all target fauna groups. Although the timing of the field survey predated recently revised guidance (EPA, 2020, released July 2020), not all ultrasonic recording sites confirmed with the recommended three nights of sampling (Table 4.2). The reduced sampling effort at some sites is not considered to have significantly influenced the results of the field survey and assessment of the likelihood of occurrence of conservation significant species.
Proportion of fauna identified	No	The majority of fauna recorded in the Study Area were identified at the point of capture or observation. Bat calls were identified after they were recorded by Mr. Robert Bullen, of Bat Call WA. Acoustic recordings were analysed following the survey by Nigel Jackett. No fauna recorded during the survey were incompletely identified to relevant taxonomic levels.
Sources of information (recent or historic) and availability of contextual information	No	All contextual resources required to complete the scope were available (previous surveys, database searches, environmental information, climate data). This included information from ten biological surveys previously conducted within and in the vicinity of the Study Area, comprising a reasonable amount of previous survey effort. Also available were regional biodiversity surveys describing known assemblages of vertebrate fauna occurring in the Pilbara (McKenzie *et al.*, 2009).
Proportion of the task achieved	No	A comprehensive desktop assessment and basic field survey of the Study Area was completed as scoped for the survey.

Potential limitation or constraint	Limitation to current survey	Applicability to this survey
Timing / weather / season / cycle	No	Climactic conditions during and preceding the field survey were similar to or slightly above long-term averages. Above average temperatures and below average rainfall in the months preceding the field survey may have resulted in reduced activity of some vertebrate groups during the survey.
Disturbances (e.g. fire or flood)	No	No disturbance occurred during or immediately prior to the surveys that is likely to have significantly impacted survey outcomes.
Intensity of survey	No	A comprehensive desktop assessment and basic survey (with targeted components) was identified by BHP WAIO as the requirement for this survey. The survey methods and effort were assessed as sufficient to meet this level of survey for the size of the Study Area.
Completeness of survey	No	The survey achieved enough coverage of the Study Area and associated habitats through the sampling techniques employed and habitat assessments undertaken to complete all required aspects of the survey.
Resources (e.g. degree of expertise available)	No	All relevant resources and expertise required to complete the survey were available.
Remoteness or access issues	No	The Study Area was largely accessible either by vehicle or on foot and sampling within all broad fauna habitats mapped within the Study Area could be accessed, thus the sampling techniques used during this survey were unconstrained by accessibility or remoteness.
Availability of contextual information on the region	No	Fauna assemblages of the Pilbara region are well documented, particularly for vertebrate fauna groups. All contextual resources within the vicinity of the Study Area and the broader Pilbara region required to complete the survey were available (previous surveys, database searches, environmental information, climate data etc.)

6 CONCLUSION

Six broad fauna habitat types were recorded and mapped within the Study Area, comprising, in decreasing order of extent, Hardpan Plain (47.37%, 1,155.08 ha), Stony Plain (18.77%, 457.77 ha), Sand Plain (16.63%, 405.39 ha), Mulga Woodland (13.52%, 329.65 ha), Hillcrest/ Hillslope (2.02%, 49.29 ha) and Major Drainage Line (0.69%, 16.89 ha) (Table 5.1; Figure 5.1). The remaining 1.00% (24.22 ha) of the Study Area comprised Cleared areas and are not considered to provide suitable habitat for fauna.

All broad fauna habitats occurring within the Study Area are known to, or considered likely to, provide suitable habitat for species of conservation significance. The degree and extent of usage of these habitats by species of conservation significance is variable; however, none are considered to provide critical habitat for which any MNES species of conservation significance would be reliant upon. In instances where suitable habitat for conservation significant species occurs within the Study Area, it is often within widespread habitats and generally limited to supporting habitat (such as foraging and/or dispersal only) or occurs in relatively small and isolated areas which are less likely to be accessed or utilised by the species. All six broad habitats mapped within the Study Area are broadly distributed and well represented in the vicinity of the Study Area and across the Pilbara bioregion, and therefore support fauna assemblages which are generally common and widespread.

Of the six broad fauna habitats occurring within the Study Area, all have the potential to support species of conservation significance at varying capacities, though the provision of primary and/or secondary (supporting) breeding, denning, nesting/roosting, foraging and/or dispersal habitat. Sand Plain habitat provides primary breeding, foraging and dispersal habitat for greater bilby, brush-tailed mulgara, spectacled hare-wallaby, night parrot and spotted ctenotus, in addition to foraging and dispersal habitat for ghost bat and peregrine falcon. Hillcrest/ Hillslope habitat provides breeding, foraging and dispersal habitat for long-tailed dunnart, western pebble-mound mouse and the Pilbara flat-headed blind-snake. Furthermore, suitable foraging and dispersal habitat is also provided for northern quoll, Pilbara leaf-nosed bat and peregrine falcon. Suitable breeding, foraging and dispersal habitat is provided for brush-tailed mulgara, western pebble-mound mouse, night parrot and spotted ctenotus in Stony Plain habitat, with foraging and dispersal habitat provided for long-tailed dunnart, ghost bat and peregrine falcon. Hardpan Plain habitat provides suitable breeding, foraging and dispersal habitat for brush-tailed mulgara and spotted ctenotus, and foraging/ dispersal habitat for peregrine falcon. Mulga Woodland habitat provides breeding and foraging habitat for greater bilby and the Pilbara flat-headed blind-snake and additional foraging habitat for ghost bat. Furthermore, Major Drainage Line habitat provides suitable foraging and dispersal habitat for northern quoll, ghost bat, Pilbara leaf-nosed bat, peregrine falcon and Pilbara olive python. No important habitat features (caves or water features) were recorded within the Study Area during the current survey.

A total of 76 vertebrate fauna species, comprising 14 mammal species (11 native and three introduced), 57 bird species and five reptile species were recorded in the Study Area during the current survey, representing approximately 21.4% of species identified in the desktop assessment as potentially

occurring. No conservation significant species were recorded during the current survey; however, three species have been recorded within the Study Area during previous surveys (BHP, 2020; DBCA, 2020c):

- brush-tailed mulgara (Priority 4 – DBCA) – resident;
- western pebble-mound mouse (Priority 4 – DBCA) – resident; and
- spotted ctenotus (Priority 2 – DBCA) – resident.

Based on the habitats present within the Study Area, species distributions, habitat preferences and general ecology, three species identified in the desktop assessment were considered Likely to occur within the Study Area:

- ghost bat (Vulnerable - EPBC/BC Act) – regular visitor (foraging/dispersal only);
- long-tailed dunnart (Priority 4 – DBCA) – resident;
- grey falcon (Vulnerable - EPBC/BC Act) – potential resident (nesting)/ frequent visitor (foraging/dispersal); and
- peregrine falcon (Specially Protected – BC Act) – frequent visitor (foraging/dispersal only).

Given the habitats present within the Study Area and locations of nearby records identified during the desktop assessment, the occurrence of a further seven species of conservation significance within the Study Area is considered Possible:

- Pilbara leaf-nosed bat (Vulnerable – EPBC/BC Act) – occasional visitor (foraging/dispersal only);
- greater bilby (Vulnerable – EPBC/BC Act) – resident;
- northern quoll (Endangered – EPBC/BC Act) – infrequent visitor (foraging/dispersal only);
- Pilbara olive python (Vulnerable – EPBC/BC Act) – infrequent visitor (foraging/dispersal);
- spectacled hare-wallaby (Priority 4 – DBCA) – resident;
- fork-tailed swift (Migratory – EPBC/BC Act) – infrequent visitor (foraging/migration only); and
- Pilbara flat-headed blind-snake (Priority 1 – DBCA) – resident.

The remaining 26 species were considered Unlikely or Highly Unlikely to occur within the Study Area due to the absence of suitable habitat or habitat features to support the species and/or the Study Area occurring outside their current known distribution.

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8 APPENDICES

Appendix A – Conservation listings

International Union for Conservation of Nature

Category	Definition
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CE)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases, great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Environment Protection and Biodiversity Conservation Act 1999

Category	Definition
Threatened	
Extinct (EX)	Presumed extinct i.e. there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Presumed extinct in the wild, only surviving in cultivation, captivity or as a naturalised population well outside its past range.
Critically Endangered (CR)	Taxa facing an extremely high risk of extinction in the wild in the immediate future (i.e. 50% chance of extinction in the immediate future).
Endangered (EN)	Taxa facing a very high risk of extinction in the wild in the near future i.e. 20% chance of extinction in the near future.
Vulnerable (VU)	Taxa facing a high risk of extinction in the wild in the medium-term future i.e. 10% chance of extinction in the medium-term future.
Conservation Dependent (CD)	Taxa which will become Vulnerable, Endangered or Critically Endangered if specific conservation efforts cease.
Other	
Migratory (MI)	Birds listed under international agreements relating to the protection of migratory birds i.e. Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) or Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Biodiversity Conservation Act 2016

Category	Definition
Extinct	
Extinct (EX)	Presumed extinct i.e. there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Presumed extinct in the wild i.e. species which have been adequately searched for and there is no reasonable doubt that the last wild individual has died.
Threatened	
Critically Endangered (CR)	Taxa facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa facing a high risk of extinction in the wild.
Specially Protected	
Migratory (MI)	Birds listed under international agreements relating to the protection of migratory birds i.e. Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA) or Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).
Conservation Dependent (CD)	Species dependent on ongoing conservation intervention to prevent them becoming eligible for listing as threatened.
Other specially protected fauna (OS)	Species otherwise in need of special protection to ensure their conservation.

Department of Biodiversity, Conservation and Attractions Priority codes

Category	Definition
Poorly known	
Priority 1 (P1)	Species that are known from one or a few locations which are potentially at risk. Species whose occurrences are either small, on lands not managed for conservation or otherwise threatened with habitat destruction or degradation. Species that are well known from one or more locations but are under immediate threat from threatening processes. In urgent need of further survey.
Priority 2 (P2)	Species that are known from one or a few locations, some of which are on lands managed for conservation. Species that are well known from one or more locations but are under threat from threatening processes. In urgent need of further survey. In need of further survey.
Priority 3 (P3)	Species that are well known from several locations and are not are under imminent threat. Species known from few but widespread locations with either a large population size or with large areas of suitable habitat remaining, much of which is not under imminent threat. Species that are well known from one or more locations and threatening processes exist that could affect them.
Rare, Near Threatened and other species in need of monitoring	
Priority 4 (P4)	*Rare* – Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection but could be if present circumstances change. *Near Threatened* – Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable but are not listed as Conservation Dependent. *In need of monitoring* - Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy

Appendix B – Locations of vertebrate fauna sampling sites

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VJMW-001	8/05/2020	8/05/2020	Habitat assessment	Stony Plain	-23.3881	120.0189
VJMW-001	8/05/2020	12/07/2020	Motion camera (ten)	Stony Plain	-23.3881	120.0189
VJMW-001	8/05/2020	12/05/2020	Ultrasonic recorder (two)	Stony Plain	-23.3881	120.0189
VJMW-002	8/05/2020	8/05/2020	Habitat assessment	Hillcrest/ Hillslope	-23.3870	120.0265
VJMW-003	8/05/2020	8/05/2020	Habitat assessment	Hardpan Plain	-23.3961	120.0043
VJMW-004	8/05/2020	8/05/2020	Habitat assessment	Sand Plain	-23.3967	120.0013
VJMW-004	8/05/2020	12/05/2020	Acoustic recorder	Sand Plain	-23.3967	120.0013
VJMW-005	8/05/2020	8/05/2020	Habitat assessment	Hardpan Plain	-23.3935	120.0046
VJMW-005	8/05/2020	8/05/2020	Targeted search	Hardpan Plain	-23.3935	120.0046
VJMW-006	8/05/2020	8/05/2020	Habitat assessment	Hardpan Plain	-23.3906	120.0104
VJMW-007	8/05/2020	8/05/2020	Habitat assessment	Hardpan Plain	-23.3669	119.9843
VJMW-007	8/05/2020	10/05/2020	Ultrasonic recorder	Hardpan Plain	-23.3669	119.9843
VJMW-008	8/05/2020	8/05/2020	Habitat assessment	Sand Plain	-23.3749	119.9926
VJMW-008	8/05/2020	12/07/2020	Motion camera (six)	Sand Plain	-23.3749	119.9926
VJMW-008	8/05/2020	12/05/2020	Acoustic recorder	Sand Plain	-23.3749	119.9926
VJMW-009	8/05/2020	8/05/2020	Habitat assessment	Sand Plain	-23.3793	119.9965
VJMW-009	8/05/2020	12/05/2020	Acoustic recorder	Sand Plain	-23.3793	119.9965
VJMW-010	8/05/2020	8/05/2020	Habitat assessment	Stony Plain	-23.371	120.0337
VJMW-011	8/05/2020	8/05/2020	Habitat assessment	Stony Plain	-23.3840	120.0319
VJMW-011	8/05/2020	12/05/2020	Acoustic recorder	Stony Plain	-23.3840	120.0319
VJMW-012	8/05/2020	8/05/2020	Habitat assessment	Hillcrest/ Hillslope	-23.3850	120.0308
VJMW-013	8/05/2020	8/05/2020	Habitat assessment	Hillcrest/ Hillslope	-23.3864	120.0296
VJMW-013	8/05/2020	8/05/2020	Targeted search	Hillcrest/ Hillslope	-23.3864	120.0296
VJMW-014	8/05/2020	8/05/2020	Habitat assessment	Sand Plain	-23.3823	120.0177
VJMW-015	8/05/2020	8/05/2020	Habitat assessment	Stony Plain	-23.3837	120.0166
VJMW-015	8/05/2020	8/05/2020	Targeted search	Stony Plain	-23.3837	120.0166
VJMW-016	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3910	119.9866
VJMW-017	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3935	119.9885
VJMW-017	9/05/2020	9/05/2020	Targeted search	Hardpan Plain	-23.3935	119.9885

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VJMW-018	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3869	119.9872
VJMW-019	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3827	119.9887
VJMW-019	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3827	119.9887
VJMW-020	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3746	119.9895
VJMW-020	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3746	119.9895
VJMW-021	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3800	119.9940
VJMW-021	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3800	119.9940
VJMW-022	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3910	119.9970
VJMW-023	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3924	119.9977
VJMW-024	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3925	120.0000
VJMW-024	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3925	120.0000
VJMW-025	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3903	119.9978
VJMW-026	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3813	120.0136
VJMW-026	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3813	120.0136
VJMW-027	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3766	120.0107
VJMW-028	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3757	120.0120
VJMW-029	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3745	120.0139
VJMW-030	9/05/2020	9/05/2020	Habitat assessment	Stony Plain	-23.3727	120.0164
VJMW-030	9/05/2020	9/05/2020	Targeted search	Stony Plain	-23.3727	120.0164
VJMW-031	9/05/2020	9/05/2020	Habitat assessment	Stony Plain	-23.3722	120.0175
VJMW-032	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3754	120.0183
VJMW-032	9/05/2020	9/05/2020	Targeted search	Hardpan Plain	-23.3754	120.0183
VJMW-033	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3756	120.0161
VJMW-033	9/05/2020	9/05/2020	Targeted search	Hardpan Plain	-23.3756	120.0161
VJMW-034	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3778	119.9888
VJMW-034	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3778	119.9888
VJMW-035	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3899	120.0381
VJMW-036	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3912	120.0409
VJMW-037	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3922	120.0448

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VJMW-038	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3843	120.0373
VJMW-038	10/05/2020	10/05/2020	Targeted search	Hardpan Plain	-23.3843	120.0373
VJMW-039	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3815	120.0354
VJMW-040	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3776	120.0238
VJMW-040	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3776	120.0238
VJMW-041	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3769	120.0293
VJMW-041	9/05/2020	9/05/2020	Targeted search	Sand Plain	-23.3769	120.0293
VJMW-042	9/05/2020	9/05/2020	Habitat assessment	Sand Plain	-23.3752	120.0292
VJMW-043	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3747	120.0290
VJMW-044	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3747	120.0290
VJMW-045	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3736	120.0289
VJMW-046	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3731	120.0292
VJMW-046	10/05/2020	10/05/2020	Targeted search	Stony Plain	-23.3731	120.0292
VJMW-047	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3732	120.0306
VJMW-048	10/05/2020	10/05/2020	Habitat assessment	Sand Plain	-23.3736	120.0319
VJMW-049	10/05/2020	10/05/2020	Habitat assessment	Sand Plain	-23.3739	120.0328
VJMW-050	10/05/2020	10/05/2020	Habitat assessment	Sand Plain	-23.3756	120.0396
VJMW-050	10/05/2020	10/05/2020	Targeted search	Sand Plain	-23.3756	120.0396
VJMW-051	10/05/2020	10/05/2020	Habitat assessment	Sand Plain	-23.3728	120.0425
VJMW-052	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3703	120.0407
VJMW-053	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3678	120.0408
VJMW-054	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3669	120.0421
VJMW-055	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3668	120.0394
VJMW-056	10/05/2020	10/05/2020	Habitat assessment	Sand Plain	-23.3786	119.9978
VJMW-056	10/05/2020	10/05/2020	Targeted search	Sand Plain	-23.3786	119.9978
VJMW-057	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3922	120.0364
VJMW-058	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3924	120.0374
VJMW-059	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3928	120.0390
VJMW-060	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3935	120.0365

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VJMW-061	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3939	120.0402
VJMW-062	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3976	120.0422
VJMW-063	10/05/2020	10/05/2020	Habitat assessment	Mulga Woodland	-23.3952	120.0319
VJMW-064	10/05/2020	10/05/2020	Habitat assessment	Stony Plain	-23.3941	120.0297
VJMW-065	10/05/2020	10/05/2020	Habitat assessment	Mulga Woodland	-23.3922	120.0335
VJMW-066	10/05/2020	10/05/2020	Habitat assessment	Sand Plain	-23.3884	120.0355
VJMW-067	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3845	120.0354
VJMW-068	10/05/2020	10/05/2020	Habitat assessment	Hillcrest/ Hillslope	-23.3802	120.0358
VJMW-069	10/05/2020	10/05/2020	Habitat assessment	Major Drainage Line	-23.3884	119.9838
VJMW-069	10/05/2020	12/05/2020	Ultrasonic recorder	Major Drainage Line	-23.3884	119.9838
VJMW-070	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3872	119.9838
VJMW-071	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3682	119.9852
VJMW-072	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3712	119.9868
VJMW-073	10/05/2020	10/05/2020	Habitat assessment	Mulga Woodland	-23.3718	119.9878
VJMW-074	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3975	119.9898
VJMW-075	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3946	119.9883
VJMW-076	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3926	119.9889
VJMW-077	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3898	119.9888
VJMW-078	11/05/2020	11/05/2020	Habitat assessment	Hardpan Plain	-23.3820	119.9870
VJMW-078	11/05/2020	11/05/2020	Targeted search	Hardpan Plain	-23.3820	119.9870
VJMW-079	11/05/2020	11/05/2020	Habitat assessment	Hardpan Plain	-23.3696	120.0024
VJMW-080	11/05/2020	11/05/2020	Habitat assessment	Hardpan Plain	-23.3678	120.0071
VJMW-081	11/05/2020	11/05/2020	Habitat assessment	Hardpan Plain	-23.3680	120.0100
VJMW-082	11/05/2020	11/05/2020	Habitat assessment	Hardpan Plain	-23.3703	120.0144
VJMW-082	11/05/2020	11/05/2020	Targeted search	Hardpan Plain	-23.3703	120.0144
VJMW-083	11/05/2020	11/05/2020	Habitat assessment	Hardpan Plain	-23.3716	120.0104
VJMW-084	11/05/2020	11/05/2020	Habitat assessment	Hardpan Plain	-23.3781	120.0351
VJMW-085	11/05/2020	11/05/2020	Habitat assessment	Hillcrest/ Hillslope	-23.3768	120.0352
VJMW-085	8/05/2020	8/05/2020	Targeted search	Hillcrest/ Hillslope	-23.3768	120.0352

Site	Start Date	End Date	Method	Habitat	Latitude	Longitude
VJMW-085	11/05/2020	11/05/2020	VHF Tower	Hillcrest/ Hillslope	-23.3882	120.0209
VJMW-086	11/05/2020	11/05/2020	Habitat assessment	Stony Plain	-23.3882	120.0209
VJMW-087	11/05/2020	11/05/2020	Habitat assessment	Stony Plain	-23.3736	120.035
VJMW-088	11/05/2020	11/05/2020	Habitat assessment	Mulga Woodland	-23.3691	120.0341
VJMW-089	12/05/2020	12/05/2020	Habitat assessment	Mulga Woodland	-23.3678	120.0352
VJMW-089	12/05/2020	12/05/2020	Targeted search	Mulga Woodland	-23.3678	120.0352
VJMW-090	12/05/2020	12/05/2020	Habitat assessment	Mulga Woodland	-23.3805	120.0038
VJMW-091	12/05/2020	12/05/2020	Habitat assessment	Mulga Woodland	-23.3791	120.0050
VJMW-092	12/05/2020	12/05/2020	Habitat assessment	Hardpan Plain	-23.3934	120.0182
VJMW-092	12/05/2020	12/05/2020	Targeted search	Hardpan Plain	-23.3934	120.0182
VJMW-093	12/05/2020	12/05/2020	Habitat assessment	Hardpan Plain	-23.3695	120.0284
VJMW-094	9/05/2020	9/05/2020	Habitat assessment	Hardpan Plain	-23.3679	120.0264
VJMW-095	10/05/2020	10/05/2020	Habitat assessment	Hardpan Plain	-23.3741	120.0182

Appendix C – Vertebrate fauna identified in the desktop assessment

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
		EPBC Act	BC Act	DBCA	IUCN	NatureMap	EPBC Protected Matters	Birdata	DBCA Threatened and Priority Fauna	BHP WAIO Fauna Records	A	B	C	D	E	F	G	H	I	J	Current Survey
MAMMALS																					
BOVIDAE																					
**Bos taurus*	cow					●				●	●		●		●	●		●		●	●
CAMELIDAE																					
**Camelus dromedarius*	camel					●	●			●	●		●	●		●					
CANIDAE																					
**Canis familiaris subsp. dingo*	dog						●			●	●					●	●	●	●	●	●
**Vulpes vulpes*	fox						●														
DASYURIDAE																					
Dasycercus blythi	brush-tailed mulgara			P4		●			●	●	●		●	●	●						
Dasykaluta rosamondae	little red kaluta					●				●	●			●	●			●	●	●	●
Dasyurus hallucatus	northern quoll	EN	EN		EN		●			●											
Ningaui timealeyi	Pilbara ningaui					●								●							
Planigale sp.	Undescribed Pilbara planigale									●											
Pseudantechinus roryi	Rory's pseudantechinus					●															
Pseudantechinus woolleyae	Woolley's pseudantechinus					●				●											
Sminthopsis crassicaudata	fat-tailed dunnart					●				●								●		●	
Sminthopsis longicaudata	long-tailed dunnart			P4		●				●											
Sminthopsis macroura	stripe-faced dunnart					●				●	●							●		●	
Sminthopsis ooldea	Ooldea dunnart					●				●											
Sminthopsis youngsoni	lesser hairy-footed dunnart					●				●	●			●				●	●	●	
EMBALLONURIDAE																					
Saccolaimus flaviventris	yellow-bellied sheathtail-bat					●				●	●		●	●	●				●		●
Taphozous georgianus	common sheathtail-bat					●				●			●	●	●		●		●		
Taphozous hilli	Hill's sheathtail-bat					●				●				●	●						

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
		EPBC Act	BC Act	DBCA	IUCN	NatureMap	EPBC Protected Matters	Birdata	DBCA Threatened and Priority Fauna	BHP WAIO Fauna Records	A	B	C	D	E	F	G	H	I	J	Current Survey
EQUIDAE																					
**Equus asinus*	donkey					●	●			●			●					●			
**Equus caballus*	horse						●				●					●		●			
FELIDAE																					
**Felis catus*	cat					●	●			●	●		●		●		●	●		●	●
HIPPOSIDERIDAE																					
Rhinonicteris aurantia (Pilbara form)	Pilbara leaf-nosed bat	VU	VU			●	●		●	●											
LEPORIDAE																					
**Oryctolagus cuniculus*	rabbit					●	●			●											
MACROPODIDAE																					
Lagorchestes conspicillatus subsp. *leichardti*	spectacled hare-wallaby			P3*		●			●												
Osphranter robustus subsp. *erubescens*	euro, biggada					●				●						●	●	●	●	●	●
Osphranter rufus	red kangaroo, marlu					●				●	●		●		●	●		●	●	●	●
Petrogale lateralis subsp. *lateralis*	black-flanked rock-wallaby	EN	EN		NT	●			●												
Petrogale rothschildi	Rothschild's rock-wallaby					●				●									●		
MEGADERMATIDAE																					
Macroderma gigas	ghost bat	VU	VU		VU	●	●		●	●									●		
MOLOSSIDAE																					
Austronomus australis	white-striped freetail-bat									●							●	●			●
Chaerophon jobensis subsp. *colonicus*	northern freetail-bat					●				●	●		●	●	●						
Ozimops lumsdenae	northern free-tailed bat									●	●				●				●		●
MURIDAE																					
Leporillus apicalis	Lesser Stick-nest Rat	EX	EX																	●	
**Mus musculus*	house mouse					●	●			●	●					●		●	●	●	
Notomys alexis	spinifex hopping-mouse					●				●	●		●	●	●						●

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
		EPBC Act	BC Act	DBCA	IUCN	NatureMap	EPBC Protected Matters	Birdata	DBCA Threatened and Priority Fauna	BHP WAIO Fauna Records	A	B	C	D	E	F	G	H	I	J	Current Survey
Pseudomys chapmani	western pebble-mound mouse			P4		●			●	●							●	●		●	
Pseudomys desertor	desert mouse					●				●	●			●	●						
Pseudomys hermannsburgensis	sandy inland mouse					●				●	●			●	●			●		●	
Zyzomys argurus	common rock-rat					●				●						●		●	●		
TACHYGLOSSIDAE																					
Tachyglossus aculeatus	echidna					●				●							●	●	●		
THYLACOMYIDAE																					
Macrotis lagotis	bilby, dalgyte	VU	VU		VU	●	●		●	●											
VESPERTILIONIDAE																					
Chalinolobus gouldii	Gould's wattled bat					●				●	●			●	●				●		●
Nyctophilus geoffroyi	lesser long-eared bat					●				●	●		●	●	●				●		●
Scotorepens balstoni	inland broad-nosed bat					●				●					●						
Scotorepens greyii	little broad-nosed bat					●				●	●		●	●	●		●		●		●
Vespadelus finlaysoni	Finlayson's Cave Bat					●				●	●		●	●	●	●	●		●	●	●
AVES																					
ACANTHIZIDAE																					
Acanthiza apicalis	inland thornbill					●				●						●		●	●	●	
Acanthiza chrysorrhoa	yellow-rumped thornbill					●		●		●			●			●			●		
Acanthiza robustirostris	slaty-backed thornbill					●		●		●						●	●				●
Acanthiza uropygialis	chestnut-rumped thornbill					●		●		●	●		●	●		●			●		●
Aphelocephala leucopsis	southern whiteface							●								●					●
Aphelocephala nigricincta	banded whiteface					●															
Gerygone fusca	western gerygone					●		●		●			●	●		●	●	●	●	●	●
Pyrrholaemus brunneus	redthroat					●		●		●						●					
Smicrornis brevirostris	weebill					●		●		●				●		●	●	●	●	●	

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
		EPBC Act	BC Act	DBCA	IUCN	NatureMap	EPBC Protected Matters	Birdata	DBCA Threatened and Priority Fauna	BHP WAIO Fauna Records	A	B	C	D	E	F	G	H	I	J	Current Survey
ACCIPITRIDAE																					
Accipiter cirrocephalus	collared sparrowhawk					●				●	●		●			●					
Accipiter fasciatus	brown goshawk					●		●		●	●			●		●	●		●		●
Aquila audax	wedge-tailed eagle					●		●		●	●		●			●		●	●	●	●
Circus approximans	swamp harrier					●		●													
Circus assimilis	spotted harrier					●		●		●											●
Elanus caeruleus subsp. *axillaris*	black-shouldered kite					●		●		●							●				
Haliaeetus leucogaster	white-bellied sea-eagle					●		●		●											
Haliastur sphenurus	whistling kite					●		●		●	●					●	●	●	●		●
Hamirostra isura	square-tailed kite					●		●		●											
Hamirostra melanosternon	black-breasted buzzard					●		●		●							●	●	●		
Hieraaetus morphnoides	little eagle					●		●		●						●	●	●			●
Milvus migrans	black kite					●		●		●								●			
ACROCEPHALIDAE																					
Acrocephalus australis	Australian reed-warbler					●		●		●							●		●		
AEGOTHELIDAE																					
Aegotheles cristatus	Australian owlet-nightjar					●		●		●									●		●
ALAUDIDAE																					
Mirafra javanica	Horsfield's bushlark					●		●		●						●				●	
ALCEDINIDAE																					
Dacelo leachii subsp. *leachii*	blue-winged kookaburra					●		●		●							●		●		
Todiramphus pyrrhopygius	red-backed kingfisher					●		●		●						●	●	●	●		
Todiramphus sanctus	sacred kingfisher					●		●		●	●						●		●		●
ANATIDAE																					
Anas gracilis	grey teal					●		●		●											

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
		EPBC Act	BC Act	DBCA	IUCN	NatureMap	EPBC Protected Matters	Birdata	DBCA Threatened and Priority Fauna	BHP WAIO Fauna Records	A	B	C	D	E	F	G	H	I	J	Current Survey
Anas querquedula	garganey	MI	MI							●	●										
Anas rhynchotis	Australasian shoveler					●		●													
Anas superciliosa	Pacific black duck					●		●		●											
Aythya australis	hardhead					●		●		●											
Biziura lobata	musk duck					●		●													
Chenonetta jubata	Australian wood duck					●		●		●											●
Cygnus atratus	black swan					●		●		●											
Dendrocygna arcuata	wandering whistling duck					●		●		●									●		
Dendrocygna eytoni	plumed whistling-duck					●		●		●											
Malacorhynchus membranaceus	pink-eared duck					●		●		●											
Stictonetta naevosa	freckled duck					●		●		●											
Tadorna tadornoides	Australian shell duck					●		●		●											
ANHINGIDAE																					
Anhinga novaehollandiae	Australasian darter					●		●		●							●		●		
ANSERANATIDAE																					
Anseranas semipalmata	magpie goose					●		●													
APODIDAE																					
Apus pacificus	fork-tailed swift	MI	MI				●			●											
ARDEIDAE																					
Ardea garzetta	little egret					●		●		●											
Ardea ibis	cattle egret					●	●	●													
Ardea intermedia	intermediate egret					●		●		●											
Ardea modesta	eastern great egret					●	●	●		●											
Ardea novaehollandiae	white-faced heron					●		●		●									●		●
Ardea pacifica	white-necked heron					●		●		●	●			●					●		

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
		EPBC Act	BC Act	DBCA	IUCN	NatureMap	EPBC Protected Matters	Birdata	DBCA Threatened and Priority Fauna	BHP WAIO Fauna Records	A	B	C	D	E	F	G	H	I	J	Current Survey
Nycticorax caledonicus subsp. *australasiae*	nankeen night-heron					•		•		•											
ARTAMIDAE																					
Artamus cinereus	black-faced woodswallow					•		•		•	•		•	•	•	•	•	•	•	•	•
Artamus minor	little woodswallow					•		•		•						•	•				•
Artamus personatus	masked woodswallow					•		•		•	•				•			•		•	
Artamus superciliosus	white-browed woodswallow					•		•		•											
Cracticus nigrogularis	pied butcherbird					•				•	•			•	•	•	•	•	•	•	•
Cracticus tibicen	Australian magpie					•		•		•			•	•	•	•	•	•	•	•	•
Cracticus torquatus	grey butcherbird					•		•		•	•			•		•					•
BURHINIDAE																					
Burhinus grallarius	bush stone-curlew					•		•		•	•							•			•
CACATUIDAE																					
Cacatua roseicapilla	galah					•		•		•	•			•	•	•	•		•		•
Cacatua sanguinea	little corella					•		•		•				•	•		•	•	•		•
Nymphicus hollandicus	cockatiel					•		•		•	•		•	•		•	•		•		•
CAMPEPHAGIDAE																					
Coracina maxima	ground cuckoo-shrike					•		•		•	•										
Coracina novaehollandiae subsp. *subpallida*	black-faced cuckoo-shrike					•		•		•	•		•	•	•	•	•	•	•	•	•
Lalage leucomela	Varied Triller									•											
Lalage tricolor	white-winged triller					•		•		•	•		•		•	•	•		•		•
CAPRIMULGIDAE																					
Eurostopodus argus	spotted nightjar					•		•		•	•		•	•		•					
CASUARIIDAE																					
Dromaius novaehollandiae	emu					•		•		•						•	•		•		
CHARADRIIDAE																					

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
		EPBC Act	BC Act	DBCA	IUCN	NatureMap	EPBC Protected Matters	Birdata	DBCA Threatened and Priority Fauna	BHP WAIO Fauna Records	A	B	C	D	E	F	G	H	I	J	Current Survey
Elseyornis melanops	black-fronted dotterel					●		●		●	●								●		
Charadrius dubius	little ringed plover	MI	MI							●											
Charadrius ruficapillus	red-capped plover					●		●		●											
Charadrius veredus	oriental plover	MI	MI				●		●												
Erythrogonys cinctus	red-kneed dotterel							●													
Vanellus tricolor	banded lapwing					●															
CICONIDAE																					
Ephippiorhynchus asiaticus	black-necked stork				NT	●		●			●										
CLIMACTERIDAE																					
Climacteris melanurus	black-tailed treecreeper							●													
COLUMBIDAE																					
**Columba livia*	domestic pigeon						●														
Geopelia cuneata	diamond dove					●		●		●	●					●	●		●		●
Geopelia humeralis	bar-shouldered dove					●		●						●							
Geopelia striata subsp. *placida*	peaceful dove					●		●		●			●				●		●		
Geophaps plumifera subsp. *ferruginea*	spinifex pigeon					●		●		●	●							●	●	●	
Ocyphaps lophotes	crested pigeon					●		●		●	●		●	●	●	●	●	●	●		●
Phaps chalcoptera	common bronzewing					●		●		●	●		●	●		●			●		●
CORVIDAE																					
Corvus bennetti	little crow					●				●							●				
Corvus orru subsp. *cecilae*	torresian crow					●				●	●		●	●		●	●	●	●	●	●
CUCULIDAE																					
Cacomantis pallidus	pallid cuckoo					●		●		●			●			●			●		●
Centropus phasianinus subsp. *highami*	pheasant coucal									●									●		
Chrysococcyx basalis	Horsfield's bronze-cuckoo					●		●		●	●					●			●	●	●

Genus and Species	Common Name	Conservation Status				Database Searches					Previous Surveys										
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Chrysococcyx osculans	black-eared cuckoo					●	●	●		●									●		●
DICAEIDAE																					
Dicaeum hirundinaceum	mistletoebird					●		●		●								●	●		
ESTRILDIDAE																					
Emblema pictum	painted finch					●		●		●						●	●		●		
Neochmia ruficauda subsp. *subclarescens*	star finch (western)					●		●		●							●		●		
Taeniopygia guttata subsp. *castanotis*	zebra finch					●		●		●	●		●	●	●	●	●	●	●	●	●
FALCONIDAE																					
Falco berigora	brown falcon					●		●		●	●			●	●	●	●	●	●	●	●
Falco cenchroides	nankeen kestrel					●		●		●	●				●	●	●	●	●		●
Falco hypoleucos	grey falcon	VU	VU		VU					●											
Falco longipennis	Australian hobby					●		●		●	●						●		●		●
Falco peregrinus	peregrine falcon		OS			●		●	●	●											
Falco subniger	black falcon									●											
GLAREOLIDAE																					
Stiltia isabella	Australian pratincole					●		●		●											
HIRUNDINIDAE																					
Cheramoeca leucosterna	white-backed swallow					●		●		●								●	●		
Hirundo neoxena	welcome swallow					●		●													
Hirundo rustica	barn swallow	MI	MI				●			●											
Petrochelidon ariel	fairy martin					●		●		●									●		●
Petrochelidon nigricans	tree martin					●		●		●				●			●		●		
LARIDAE																					
Larus novaehollandiae	silver gull					●		●		●											
Sterna caspia	caspian tern	MI	MI			●		●	●												

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Sterna hybrida	whiskered tern							●		●											
Gelochelidon nilotica	gull-billed tern	MI	MI			●		●	●												
Cladorhynchus leucocephalus	banded stilt					●		●													
LOCUSTELLIDAE																					
Eremiornis carteri	spinifexbird					●		●		●	●					●		●			
Megalurus cruralis	brown songlark							●		●	●				●	●					
Megalurus gramineus	little grassbird					●		●		●											
Megalurus mathewsi	rufous songlark							●		●	●		●	●		●		●	●		●
MALURIDAE																					
Amytornis striatus subsp. *whitei*	striated grasswren					●		●		●								●	●		
Malurus lamberti subsp. *assimilis*	variegated fairy-wren					●		●		●	●		●	●		●		●	●	●	●
Malurus leucopterus subsp. *leuconotus*	white-winged fairy-wren					●				●	●			●		●	●	●	●		●
Malurus splendens	splendid fairy-wren					●				●					●	●			●		●
Stipiturus ruficeps	rufous-crowned emu-wren					●		●		●											
MELIPHAGIDAE																					
Acanthagenys rufogularis	spiny-cheeked honeyeater					●		●		●	●		●	●		●	●		●	●	●
Certhionyx variegatus	pied honeyeater					●		●		●						●					
Epthianura aurifrons	orange chat					●															
Epthianura tricolor	crimson chat					●		●		●	●				●	●			●		●
Gavicalis virescens	singing honeyeater					●		●		●	●		●	●		●	●	●	●	●	●
Conopophila whitei	grey honeyeater					●				●						●			●		
Lichmera indistincta	brown honeyeater					●		●		●						●	●		●		
Manorina flavigula	yellow-throated miner					●		●		●				●	●	●	●	●	●	●	●
Melithreptus gularis subsp. *latior*	black-chinned honeyeater					●				●									●		
Ptilotula keartlandi	grey-headed honeyeater					●		●		●						●	●	●	●		

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Ptilotula penicillata	white-plumed honeyeater							●		●	●				●	●	●	●	●		●
Purnella albifrons	white-fronted honeyeater					●		●		●						●					
Sugomel niger	black honeyeater							●		●						●	●		●		
MEROPIDAE																					
Merops ornatus	rainbow bee-eater					●	●	●		●	●			●	●	●	●	●	●	●	
MONARCHIDAE																					
Grallina cyanoleuca	magpie-lark					●		●		●	●		●	●	●	●	●	●	●	●	●
MOTACILLIDAE																					
Anthus australis subsp. *australis*	Australasian pipit					●		●		●				●		●	●	●	●		
Motacilla cinerea	grey wagtail	MI	MI				●														
Motacilla flava	yellow wagtail	MI	MI				●														
OTIDIDAE																					
Ardeotis australis	Australian bustard					●		●		●	●			●				●	●		●
PACHYCEPHALIDAE																					
Colluricincla harmonica subsp. *rufiventris*	grey shrike-thrush					●		●		●						●		●	●	●	
Pachycephala rufiventris subsp. *rufiventris*	rufous whistler					●		●		●	●		●	●		●	●	●	●		●
Oreoica gutturalis	crested bellbird					●		●		●	●			●	●	●	●		●	●	●
PARDALOTIDAE																					
Pardalotus rubricatus	red-browed pardalote					●		●		●									●		
Pardalotus striatus subsp. *murchisoni*	striated pardalote					●		●		●							●		●		
PELECANIDAE																					
Pelecanus conspicillatus	Australian pelican					●		●		●											
PETROICIDAE																					
Melanodryas cucullata	hooded robin					●		●		●	●					●		●			
Petroica goodenovii	red-capped robin					●		●		●	●			●	●	●	●		●	●	●

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PHAETHONTIDAE																					
Phalacrocorax carbo	black cormorant					●		●		●											
Phalacrocorax melanoleucos	little pied cormorant					●		●		●											
Phalacrocorax sulcirostris	little black cormorant					●		●		●									●		
Phalacrocorax varius subsp. *hypoleucos*	pied cormorant					●		●		●							●				
PHASIANIDAE																					
Coturnix pectoralis	stubble quail					●				●											
Coturnix ypsilophora	brown quail					●		●									●				
PODARGIDAE																					
Podargus strigoides	tawny frogmouth					●		●		●											
PODICIPEDIDAE																					
Podiceps cristatus	great crested grebe					●		●		●											
Poliocephalus poliocephalus	hoary-headed grebe					●		●		●											
Tachybaptus novaehollandiae	Australasian grebe					●		●		●											
POMATOSTOMIDAE																					
Pomatostomus superciliosus	white-browed babbler					●		●		●					●	●					
Pomatostomus temporalis subsp. *rubeculus*	grey-crowned babbler					●		●		●	●		●	●		●	●	●	●	●	●
PSITTACIDAE																					
Melopsittacus undulatus	budgerigar					●		●		●	●		●			●	●	●	●		●
Neopsephotus bourkii	Bourke's parrot					●				●				●		●					●
Pezoporus occidentalis	night parrot	EN	CR		EN		●														
Psephotus varius	mulga parrot									●						●					
Platycercus zonarius subsp. *zonarius*	Port Lincoln parrot					●		●		●	●		●	●	●	●	●	●	●		●
Polytelis alexandrae	princess parrot	VU		P4	NT		●														

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PSOPHODIDAE																					
Psophodes occidentalis	chiming wedgebill					●		●													
Cinclosoma castaneothorax	chestnut-breasted quail-thrush					●				●	●										
PTILINORHYNCHIDAE																					
Ptilonorhynchus maculatus subsp. *guttatus*	western bowerbird					●		●		●	●			●		●	●				
RALLIDAE																					
Fulica atra	Eurasian coot					●		●		●											
Gallirallus philippensis	buff-banded rail					●		●													
Porphyrio porphyrio	purple swamphen					●		●		●											
Porzana pusilla	Baillon's crake					●		●													
Porzana tabuensis	spotless crake					●		●		●											
Tribonyx ventralis	black-tailed native-hen					●		●		●	●										
RECURVIROSTRIDAE																					
Himantopus himantopus	black-winged stilt					●		●		●											
Recurvirostra novaehollandiae	red-necked avocet					●		●													
RHIPIDURIDAE																					
Rhipidura albiscapa	grey fantail					●		●		●						●					
Rhipidura leucophrys subsp. *leucophrys*	willie wagtail					●		●		●	●		●	●	●	●	●	●	●	●	●
ROSTRATULIDAE																					
Rostratula benghalensis subsp. *australis*	Australian painted snipe	EN	EN		EN		●														
SCOLOPACIDAE																					
Calidris acuminata	sharp-tailed sandpiper	MI	MI			●	●	●	●	●											
Calidris ferruginea	curlew sandpiper	CR/ MI	CR/ MI		NT	●	●	●	●	●											
Calidris melanotos	pectoral sandpiper	MI	MI			●	●		●	●											
Calidris ruficollis	red-necked stint	MI	MI		NT	●		●	●												

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Calidris subminuta	long-toed stint	MI	MI			●		●	●	●											
Limosa limosa	black-tailed godwit	MI	MI		NT					●											
Philomachus pugnax	ruff	MI	MI							●											
Tringa glareola	wood sandpiper	MI	MI			●		●	●	●											
Tringa hypoleucos	common sandpiper	MI	MI			●	●	●	●	●											
Tringa nebularia	common greenshank	MI	MI			●		●	●	●											
Tringa stagnatilis	marsh sandpiper	MI	MI			●		●	●	●											
Tringa totanus	common redshank	MI	MI			●				●											
STRIGIDAE																					
Ninox boobook	boobook owl							●		●						●		●	●		
Ninox connivens	barking owl					●				●											
THRESKIORNITHIDAE																					
Platalea flavipes	yellow-billed spoonbill					●		●		●									●		
Platalea regia	royal spoonbill					●		●		●											
Plegadis falcinellus	glossy ibis	MI	MI			●		●	●	●											
Threskiornis molucca	Australian white ibis							●		●											
Threskiornis spinicollis	straw-necked ibis					●		●		●											
TURNICIDAE																					
Turnix velox	little button-quail					●		●		●	●				●	●					●
TYTONIDAE																					
Tyto alba	barn owl					●		●		●								●			
REPTILES																					
AGAMIDAE																					
Ctenophorus caudicinctus	ring-tailed dragon					●				●	●			●		●	●	●	●	●	
Ctenophorus isolepis subsp. *isolepis*	military dragon or crested dragon					●				●	●		●	●	●		●		●		●

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Ctenophorus nuchalis	central netted dragon					●				●	●				●	●		●	●	●	
Ctenophorus reticulatus	western netted dragon					●				●	●			●							
Diporiphora amphiboluroides	mulga dragon					●				●	●				●						
Diporiphora valens	southern pilbara tree dragon					●															
Amphibolurus longirostris	long-nosed dragon					●				●	●			●	●	●	●		●		
Moloch horridus	thorny devil					●				●											
Pogona minor subsp. *minor*	dwarf bearded dragon					●				●	●			●	●	●					
BOIDAE																					
Antaresia perthensis	pygmy python					●				●	●								●		
Antaresia stimsoni	Stimson's python					●				●							●		●		
Aspidites melanocephalus	black-headed python					●				●											
Liasis olivaceus subsp. *barroni*	Pilbara olive python	VU	VU			●	●		●	●											
CARPHODACTYLIDAE																					
Nephrurus wheeleri subsp. *cinctus*	banded knob-tailed gecko					●				●											
CHELUIDAE																					
Chelodina steindachneri	flat-shelled turtle					●			●	●									●		
DIPLODACTYLIDAE																					
Diplodactylus conspicillatus	fat-tailed gecko					●				●	●							●	●	●	
Diplodactylus mitchelli	gecko					●															
Diplodactylus pulcher	fine-faced gecko					●															
Diplodactylus savagei	southern pilbara beak-faced gecko					●				●									●		
Lucasium stenodactylum	gecko					●				●	●				●	●		●	●	●	
Lucasium wombeyi	gecko					●				●						●					
Oedura fimbria	western marbled velvet gecko					●				●						●	●		●		●
Rhynchoedura ornata	western beaked gecko					●				●	●			●					●		

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Strophurus ciliaris subsp. aberrans	Northern spiny-tailed gecko									•											
Strophurus elderi	jewelled gecko					•				•				•							
Strophurus jeanae	gecko					•					•										
Strophurus wellingtonae	gecko					•				•	•			•		•					
ELAPIDAE																					
Acanthophis wellsi	Pilbara death adder					•				•											
Brachyurophis approximans	north-western shovel-nosed snake					•				•	•				•				•		
Demansia psammophis subsp. *cupreiceps*	yellow-faced whipsnake					•				•						•			•		
Demansia rufescens	rufous whipsnake					•				•											
Furina ornata	moon snake					•										•					
Pseudechis australis	mulga snake					•				•							•	•			
Pseudonaja mengdeni	western brown snake					•				•	•		•	•				•		•	
Pseudonaja modesta	ringed brown snake					•				•	•										
Suta fasciata	Rosen's snake					•				•											
Suta gaikhorstorum	snake					•															
Suta punctata	little spotted snake					•				•	•				•						
Vermicella snelli	Pilbara bandy bandy					•				•									•		
GEKKONIDAE																					
Gehyra montium	gecko									•											
Gehyra pilbara	Pilbara dtella					•										•					
Gehyra punctata	spotted rock dtella					•				•	•			•		•	•	•	•		
Gehyra variegata	tree dtella					•				•	•			•		•	•	•	•	•	
Heteronotia binoei	Bynoe's gecko					•				•						•		•	•		
Heteronotia spelea	desert cave gecko					•				•											
PYGOPODIDAE																					

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Delma butleri	legless lizard					●				●	●			●							
Delma elegans	legless lizard					●				●											
Delma haroldi	Neck-barred delma									●											
Delma nasuta	long-nosed delma					●				●				●	●						
Delma pax	legless lizard					●				●				●		●		●	●	●	
Delma tincta	legless lizard					●												●			
Lialis burtonis	Burton's legless lizard					●				●	●			●		●		●			
Pygopus nigriceps	legless lizard					●				●									●	●	
Delma haroldi	neck-barred delma					●															
SCINCIDAE																					
Carlia munda	shaded-litter rainbow skink					●				●									●		
Carlia triacantha	desert rainbow skink					●				●	●			●			●		●	●	
Cryptoblepharus buchananii	Buchanan's snake-eyed skink					●				●				●	●						
Cryptoblepharus ustulatus	russet snake-eyed skink					●				●											
Ctenotus ariadnae	Ariadne's ctenotus					●				●	●			●							
Ctenotus duricola	skink					●				●	●							●	●	●	
Ctenotus grandis subsp. *titan*	grand ctenotus					●				●	●			●				●	●	●	
Ctenotus inornatus	skink					●				●				●		●	●	●	●	●	●
Ctenotus leonhardii	skink					●				●									●		
Ctenotus pantherinus subsp. *ocellifer*	leopard ctenotus					●				●	●			●	●		●	●	●	●	●
Ctenotus rubicundus	ruddy ctenotus					●				●											
Ctenotus rutilans	skink					●				●											
Ctenotus schomburgkii	skink					●				●											
Ctenotus serventyi	north-western sandy-loam ctenotus									●						●					
Ctenotus uber	spotted ctenotus					●				●								●	●	●	

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Ctenotus uber subsp. *johnstonei*	spotted ctenotus			P2		●			●	●	●			●	●						
Cyclodomorphus melanops subsp. *melanops*	slender blue-tongue					●				●				●					●		
Egernia cygnitos	pygmy spiny-tailed skink (western)					●				●											
Egernia depressa	pygmy spiny-tailed skink					●				●	●			●					●	●	
Egernia formosa	Goldfields crevice-skink					●				●											
Eremiascincus richardsonii	broad-banded sand swimmer					●				●				●							
Lerista bipes	Two-toed Skink					●				●						●			●		
Lerista flammicauda	Pilbara flame-tailed slider					●															
Lerista muelleri	skink					●				●						●		●	●	●	
Lerista neander	skink					●				●	●			●				●	●		
Lerista timida	dwarf three-toed slider					●				●	●			●							
Lerista zietzi	Pilbara blue-tailed slider					●				●									●		
Menetia greyii	common dwarf skink					●				●								●	●		
Menetia surda subsp. *surda*	skink					●				●					●						
Morethia ruficauda subsp. *exquisita*	fire-tailed skink					●				●						●	●		●		
Tiliqua multifasciata	central blue-tongue lizard					●				●	●			●	●			●	●	●	
TYPHLOPIDAE																					
Anilios ammodytes	blind snake									●						●			●		
Anilios ganei	Pilbara flat-headed blind-snake			P1		●			●	●									●		
Anilios grypus	blind snake									●									●		
Anilios hamatus	blind snake									●								●	●	●	
Ramphotyphlops waitii	blind snake									●											
VARANIDAE																					
Varanus acanthurus	spiny-tailed monitor					●				●	●					●		●	●		
Varanus brevicauda	short-tailed pygmy monitor					●				●	●										

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Varanus bushi	Bush's monitor					•															
Varanus caudolineatus	stripe-tailed pygmy monitor					•				•	•			•		•		•	•	•	
Varanus eremius	pygmy desert monitor					•				•						•					
Varanus giganteus	perentie					•				•	•			•							
Varanus gouldii	Gould's monitor					•				•	•				•	•		•	•		•
Varanus hamersleyensis	Southern pilbara rock goanna									•											
Varanus panoptes	yellow spotted monitor					•				•	•			•		•					
Varanus pilbarensis	Pilbara rock monitor					•				•											
Varanus tristis subsp. *tristis*	racehorse goanna					•				•				•				•	•	•	
AMPHIBIANS																					
PELODRYADIDAE																					
Cyclorana maini	sheep frog					•				•	•			•	•						
Cyclorana occidentalis	water-holding frog					•				•											
Litoria rubella	little red tree frog					•				•	•				•		•	•	•		
LIMNODYNASTIDAE																					
Neobatrachus kunapalari	kunapalari frog					•				•									•		
Notaden nichollsi	desert spadefoot					•															
Platyplectrum spenceri	centralian burrowing frog					•				•				•	•						
MYOBATRACHIDAE																					
Pseudophryne douglasi	gorge toadlet					•				•									•		
Uperoleia russelli	Russell's toadlet					•				•					•			•	•		
Uperoleia saxatilis	Pilbara toadlet					•															

Appendix D – Vertebrate fauna habitat assessments

Appendix D: Vertebrate fauna habitat assessments

Site ID	Coord.	Date	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Avail.	Outcropping/ Rock Type	Rock Size	Veg. Litter	Dominant Veg. Type	Rocky Cracks / Crevices	Burrowing Suitability	Hollows	Water present	Disturbances	Last Fire	Notes
VJMW-001	-23.3881, 120.0189	8/05/2020	Stony Plain	Basalt Outcrops	North	Moderate	Clay Loam	Evenly Spread	Major Outcropping BIF	Small Rocks (11-20cm)	Few Large Patches	Acacia Shrubland	High	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-002	-23.387, 120.0265	8/05/2020	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	North	Moderate	Clay Loam	Evenly Spread	Major Outcropping BIF	Large Rocks (21-60cm)	Few Small Patches	Acacia Shrubland	High	Nil	1	None	Mining Exploration	Old (6+ yr.)	
VJMW-003	-23.3961, 120.0043	8/05/2020	Hardpan Plain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Scarce	Tussock Grassland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-004	-23.3967, 120.0013	8/05/2020	Sand Plain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Large Patches	Spinifex Hummock Grassland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-005	-23.3935, 120.0046	8/05/2020	Hardpan Plain	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Many Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-006	-23.3906, 120.0104	8/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Scarce	Mulga Woodland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-007	-23.3669, 119.9843	8/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Evenly Spread	Mulga Woodland	Nil	Moderate	0	Permanent	Cattle Grazing	Old (6+ yr.)	Noddy Bore
VJMW-008	-23.3749, 119.9926	8/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-009	-23.3793, 119.9965	8/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Spinifex Hummock Grassland	Nil	High	0	None	Mining Exploration	Old (6+ yr.)	
VJMW-010	-23.371, 120.0337	8/05/2020	Stony Plain	Stony Plain	West	Low	Clay Loam	Evenly Spread	Negligible	Pebbles (5-10cm)	Scarce	Acacia Shrubland	Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-011	-23.384, 120.0319	8/05/2020	Stony Plain	Footslope	North	Low	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Small Patches	Spinifex Hummock Grassland	Nil	Low	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-012	-23.385, 120.0308	8/05/2020	Hillcrest/ Hillslope	Breakaway	South/ West	Cliff	Clay Loam	Scarce	Major Outcropping Conglomerate	Boulders (>61cm)	Few Small Patches	Acacia Shrubland	Very High	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-013	-23.3864, 120.0296	8/05/2020	Hillcrest/ Hillslope	Hillslope	North	Low	Clay Loam	Evenly Spread	Negligible	Pebbles (5-10cm)	Few Large Patches	Acacia Shrubland	Nil	Low	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-014	-23.3823, 120.0177	8/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Large Patches	Acacia Shrubland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-015	-23.3837, 120.0166	8/05/2020	Stony Plain	Granite Outcrops/ Domes	North	Moderate	Clay Loam	Scarce	Major Outcropping Granite	Large Rocks (21-60cm)	Scarce	Acacia Shrubland	High	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-016	-23.391, 119.9866	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Many Large Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-017	-23.3935, 119.9885	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-018	-23.3869, 119.9872	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-019	-23.3827, 119.9887	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-020	-23.3746, 119.9895	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-021	-23.38, 119.994	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-022	-23.391, 119.997	9/05/2020	Hardpan Plain	Gilgai Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Scarce	Acacia Shrubland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-023	-23.3924, 119.9977	9/05/2020	Hardpan Plain	Claypan	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Non-Discernible	Tussock Grassland	Nil	Low	0	Prone to Pooling	Cattle Grazing	Old (6+ yr.)	

Site ID	Coord.	Date	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Avail.	Outcropping/ Rock Type	Rock Size	Veg. Litter	Dominant Veg. Type	Rocky Cracks / Crevices	Burrowing Suitability	Hollows	Water present	Disturbances	Last Fire	Notes
VJMW-024	-23.3925, 120	9/05/2020	Sand Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-025	-23.3903, 119.9978	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-026	-23.3813, 120.0136	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Limited Outcropping Granite	Negligible	Evenly Spread	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-027	-23.3766, 120.0107	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-028	-23.3757, 120.012	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-029	-23.3745, 120.0139	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-030	-23.3727, 120.0164	9/05/2020	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Limited Outcropping Granite	Pebbles (5-10cm)	Evenly Spread	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-031	-23.3722, 120.0175	9/05/2020	Stony Plain	Granite Outcrops/ Domes	West	Moderate	Clay Loam	Few Small Patches	Moderate Outcropping Granite	Large Rocks (21-60cm)	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Very High	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-032	-23.3754, 120.0183	9/05/2020	Hardpan Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland	Nil	High	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-033	-23.3756, 120.0161	9/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-034	-23.3778, 119.9888	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-035	-23.3899, 120.0381	10/05/2020	Stony Plain	Hillcrest/ Upper Hillslope	North	Low	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-036	-23.3912, 120.0409	10/05/2020	Stony Plain	Hillcrest/ Upper Hillslope	North	Low	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-037	-23.3922, 120.0448	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Scarce	Acacia Shrubland	Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-038	-23.3843, 120.0373	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-039	-23.3815, 120.0354	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-040	-23.3776, 120.0238	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-041	-23.3769, 120.0293	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-042	-23.3752, 120.0292	9/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Large Patches	Acacia Shrubland, Spinifex Hummock Grassland, Scattered Eucalypts	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-043	-23.3747, 120.029	10/05/2020	Stony Plain	Hillslope	South	Low	Clay Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Spinifex Hummock Grassland, Acacia Shrubland	Low	Low	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-044	-23.3747, 120.029	10/05/2020	Stony Plain	Minor Drainage Line	South	Low	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland	Nil	Moderate	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-045	-23.3736, 120.0289	10/05/2020	Stony Plain	Granite Outcrops/ Domes	South	Steep	Clay Loam	Scarce	Major Outcropping Granite	Large Rocks (21-60cm)	Few Small Patches	Acacia Shrubland	High	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-046	-23.3731, 120.0292	10/05/2020	Stony Plain	Granite Outcrops/ Domes	South/ East	Moderate	Clay Loam	Few Large Patches	Major Outcropping Granite	Large Rocks (21-60cm)	Few Small Patches	Acacia Shrubland	High	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-047	-23.3732, 120.0306	10/05/2020	Stony Plain	Hillslope	South/ East	Low	Clay Loam	Many Large Patches	Moderate Outcropping Granite	Small Rocks (11-20cm)	Few Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Low	Nil	0	None	Non-Discernible	Old (6+ yr.)	

Site ID	Coord.	Date	Habitat Type	Landform	Aspect	Slope	Soil Type	Soil Avail.	Outcropping/ Rock Type	Rock Size	Veg. Litter	Dominant Veg. Type	Rocky Cracks / Crevices	Burrowing Suitability	Hollows	Water present	Disturbances	Last Fire	Notes
VJMW-048	-23.3736, 120.0319	10/05/2020	Sand Plain	Hillslope	South/ East	Low	Sand	Evenly Spread	Negligible	Gravel (1-4cm)	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-049	-23.3739, 120.0328	10/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-050	-23.3756, 120.0396	10/05/2020	Sand Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Moderate	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-051	-23.3728, 120.0425	10/05/2020	Sand Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-052	-23.3703, 120.0407	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland	Nil	Low	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-053	-23.3678, 120.0408	10/05/2020	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Scarce	Acacia Shrubland	Nil	Low	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-054	-23.3669, 120.0421	10/05/2020	Stony Plain	Basalt Outcrops	South/ West	Low	Clay Loam	Many Small Patches	Minor Outcropping BIF	Gravel (1-4cm)	Scarce	Acacia Shrubland	Low	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-055	-23.3668, 120.0394	10/05/2020	Stony Plain	Granite Outcrops/ Domes	North	Moderate	Clay Loam	Evenly Spread	Minor Outcropping Granite	Large Rocks (21-60cm)	Few Small Patches	Spinifex Hummock Grassland, Acacia Shrubland	Moderate	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-056	-23.3786, 119.9978	10/05/2020	Sand Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-057	-23.3922, 120.0364	10/05/2020	Hardpan Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Non-Discernible		Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-058	-23.3924, 120.0374	10/05/2020	Hardpan Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Non-Discernible	Spinifex Hummock Grassland	Nil	Low	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-059	-23.3928, 120.039	10/05/2020	Stony Plain	Granite Outcrops/ Domes	West	Moderate	Clay Loam	Evenly Spread	Major Outcropping Granite	Pebbles (5-10cm)	Few Small Patches	Spinifex Hummock Grassland, Acacia Shrubland	Moderate	Nil	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-060	-23.3935, 120.0365	10/05/2020	Hardpan Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Non-Discernible	Acacia Shrubland	Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-061	-23.3939, 120.0402	10/05/2020	Hardpan Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Non-Discernible	Acacia Shrubland	Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-062	-23.3976, 120.0422	10/05/2020	Hardpan Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Non-Discernible	Acacia Shrubland	Nil	Low	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-063	-23.3952, 120.0319	10/05/2020	Mulga Woodland	Drainage Area/ Floodplain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Mulga Woodland	Nil	Moderate	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-064	-23.3941, 120.0297	10/05/2020	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland	Nil	Moderate	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-065	-23.3922, 120.0335	10/05/2020	Mulga Woodland	Medium Drainage Line	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Mulga Woodland	Nil	Moderate	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-066	-23.3884, 120.0355	10/05/2020	Sand Plain	Footslope	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-067	-23.3845, 120.0354	10/05/2020	Hardpan Plain	Footslope	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	High	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-068	-23.3802, 120.0358	10/05/2020	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	West	Low	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Small Patches	Spinifex Hummock Grassland	Nil	Low	0	None	Mining Exploration	Old (6+ yr.)	
VJMW-069	-23.3884, 119.9838	10/05/2020	Major Drainage Line	Major Drainage Line	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Few Small Patches	Scattered Eucalypts	Nil	High	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-070	-23.3872, 119.9838	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Many Small Patches	Acacia Shrubland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-071	-23.3682, 119.9852	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	

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VJMW-072	-23.3712, 119.9868	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-073	-23.3718, 119.9878	10/05/2020	Mulga Woodland	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-074	-23.3975, 119.9898	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	Mining Exploration	Old (6+ yr.)	
VJMW-075	-23.3946, 119.9883	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Scarce	Acacia Shrubland	Nil	Low	0	None	Mining Exploration	Old (6+ yr.)	
VJMW-076	-23.3926, 119.9889	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland	Nil	Low	0	None	Mining Exploration	Old (6+ yr.)	
VJMW-077	-23.3898, 119.9888	10/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland	Nil	Low	0	None	Mining Exploration	Old (6+ yr.)	
VJMW-078	-23.3696, 120.0024	11/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-079	-23.3678, 120.0071	11/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-080	-23.368, 120.01	11/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Scarce	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-081	-23.3703, 120.0144	11/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-082	-23.3716, 120.0104	11/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-083	-23.3781, 120.0351	11/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Pebbles (5-10cm)	Few Small Patches	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-084	-23.3768, 120.0352	11/05/2020	Hardpan Plain	Stony Plain	South/ West	Low	Clay Loam	Evenly Spread	Limited Outcropping Granite	Pebbles (5-10cm)	Few Small Patches	Spinifex Hummock Grassland	Low	Nil	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-085	-23.3882, 120.0209	11/05/2020	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	South	Moderate	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Small Patches	Spinifex Hummock Grassland, Acacia Shrubland	Low	Nil	0	None	Mining Exploration	Old (6+ yr.)	
VJMW-086	-23.3736, 120.035	11/05/2020	Stony Plain	Stony Plain	South/ West	Low	Clay Loam	Evenly Spread	Negligible	Pebbles (5-10cm)	Few Small Patches	Acacia Shrubland	Nil	Nil	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-087	-23.3691, 120.0341	11/05/2020	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Gravel (1-4cm)	Few Small Patches	Acacia Shrubland	Nil	Nil	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-088	-23.3678, 120.0352	11/05/2020	Mulga Woodland	Minor Drainage Line	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland	Nil	Moderate	0	None	Road/ Access Track	Old (6+ yr.)	
VJMW-089	-23.3805, 120.0038	12/05/2020	Mulga Woodland	Medium Drainage Line	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-090	-23.3791, 120.005	12/05/2020	Mulga Woodland	Medium Drainage Line	South/ East	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-091	-23.3934, 120.0182	12/05/2020	Mulga Woodland	Medium Drainage Line	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Few Large Patches	Mulga Woodland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-092	-23.3695, 120.0284	12/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Clay Loam	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland, Spinifex Hummock Grassland	Nil	Low	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-093	-23.3679, 120.0264	12/05/2020	Hardpan Plain	Hardpan Plain	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Few Small Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	
VJMW-094	-23.3741, 120.0182	9/05/2020	Hardpan Plain	Sand Plain	Flat	Flat	Sand	Evenly Spread	Negligible	Negligible	Evenly Spread	Acacia Shrubland	Nil	High	0	None	Non-Discernible	Old (6+ yr.)	
VJMW-095	-23.382, 119.987	10/05/2020	Hardpan Plain	Minor Drainage Line	Flat	Flat	Loamy Sand	Evenly Spread	Negligible	Negligible	Few Large Patches	Acacia Shrubland	Nil	Moderate	0	None	Cattle Grazing	Old (6+ yr.)	

Appendix E – SRE invertebrate fauna habitat assessments

Site ID	Coord.	Date	Habitat Type	Drainage	Landform	Slope	Aspect	Rocky outcrop amount	Rocky outcrop type	Rock size	Vegetation type	Vegetation litter	Shade	Soil type	Soil availability	Last fire	Disturbance
SJMW-001	-23.3876, 120.0224	8/05/2020	Hillcrest/ Hillslope	Gully	Gully	Moderate	North	Major Outcropping	BIF	Small Rocks (11-20cm)	Mulga Grove	Few Small Patches	Medium 40-60%	Clay Loam	Few Small Patches	Old (6+ yr.)	Mining Exploration
SJMW-002	-23.3897, 120.0133	8/05/2020	Mulga Woodland	Creek	Medium Drainage Line	Flat	Flat	Negligible	Non-Discernible	Negligible	Mulga Woodland	Evenly Spread	Medium 40-60%	Sandy Loam	Evenly Spread	Old (6+ yr.)	Cattle Grazing
SJMW-003	-23.374, 119.9977	11/05/2020	Mulga Woodland	Creek	Medium Drainage Line	Flat	West	Negligible	Non-Discernible	Negligible	Mulga Grove	Evenly Spread	Medium 40-60%	Clay Loam	Evenly Spread	Old (6+ yr.)	Cattle Grazing
SJMW-004	-23.3716, 120.0002	11/05/2020	Mulga Woodland	Creek	Medium Drainage Line	Flat	West	Negligible	Non-Discernible	Negligible	Mulga Grove	Evenly Spread	Medium 40-60%	Clay Loam	Evenly Spread	Old (6+ yr.)	Cattle Grazing

Appendix F – Fauna recorded during the current survey

Species	Common Name	Conservation Status			
		EPBC Act	BC Act	DBCA	IUCN
MAMMALIA					
BOVIDAE					
**Bos taurus*	cow				
CANIDAE					
**Canis familiaris subsp. dingo*	dog				
DASYURIDAE					
Dasykaluta rosamondae	little red kaluta				
EMBALLONURIDAE					
Saccolaimus flaviventris	yellow-bellied sheathtail bat				
FELIDAE					
**Felis catus*	cat				
MACROPODIDAE					
Osphranter robustus subsp. *erubescens*	euro				
Osphranter rufus	red kangaroo				
MOLOSSIDAE					
Austronomus australis	white-striped freetail-bat				
Ozimops lumsdenae	northern free-tailed bat				
MURIDAE					
Notomys alexis	spinifex hopping-mouse				
VESPERTILIONIDAE					
Chalinolobus gouldii	Gould's wattled bat				
Nyctophilus geoffroyi	lesser long-eared bat				
Scotorepens greyii	little broad-nosed bat				
Vespadelus finlaysoni	Finlayson's cave bat				
AVES					
ACANTHIZIDAE					
Acanthiza robustirostris	slaty-backed thornbill				
Acanthiza uropygialis	chestnut-rumped thornbill				
Aphelocephala leucopsis	southern whiteface				
Gerygone fusca	western gerygone				
ACCIPITRIDAE					
Accipiter fasciatus	brown goshawk				
Aquila audax	wedge-tailed eagle				
Circus assimilis	spotted harrier				
Haliastur sphenurus	whistling kite				
Hieraaetus morphnoides	little eagle				
AEGOTHELIDAE					
Aegotheles cristatus	Australian owlet-nightjar				
ALCEDINIDAE					
Todiramphus sanctus	sacred kingfisher				
ANATIDAE					
Chenonetta jubata	Australian wood duck				
ARDEIDAE					
Ardea novaehollandiae	white-faced heron				
ARTAMIDAE					
Artamus cinereus	black-faced woodswallow				
Artamus minor	little woodswallow				
Cracticus nigrogularis	pied butcherbird				
Cracticus tibicen	Australian magpie				
Cracticus torquatus	grey butcherbird				
BURHINIDAE					
Burhinus grallarius	bush stone-curlew				

Species	Common Name	Conservation Status			
		EPBC Act	BC Act	DBCA	IUCN
CACATUIDAE					
Cacatua roseicapilla	galah				
Cacatua sanguinea	little corella				
Nymphicus hollandicus	cockatiel				
CAMPEPHAGIDAE					
Coracina novaehollandiae subsp. *subpallida*	black-faced cuckoo-shrike				
Lalage tricolor	white-winged triller				
COLUMBIDAE					
Geopelia cuneata	diamond dove				
Ocyphaps lophotes	crested pigeon				
Phaps chalcoptera	common bronzewing				
CORVIDAE					
Corvus orru subsp. *cecilae*	torresian crow				
CUCULIDAE					
Cacomantis pallidus	pallid cuckoo				
Chrysococcyx basalis	Horsfield's bronze-cuckoo				
Chrysococcyx osculans	black-eared cuckoo				
ESTRILDIDAE					
Taeniopygia guttata subsp. *castanotis*	zebra finch				
FALCONIDAE					
Falco berigora	brown falcon				
Falco cenchroides	nankeen kestrel				
Falco longipennis	Australian hobby				
HIRUNDINIDAE					
Petrochelidon ariel	fairy martin				
LOCUSTELLIDAE					
Megalurus mathewsi	rufous songlark				
MALURIDAE					
Malurus lamberti subsp. *assimilis*	variegated fairy-wren				
Malurus leucopterus subsp. *leuconotus*	white-winged fairy-wren				
Malurus splendens	splendid fairywren				
MELIPHAGIDAE					
Acanthagenys rufogularis	spiny-cheeked honeyeater				
Epthianura tricolor	crimson chat				
Gavicalis virescens	singing honeyeater				
Manorina flavigula	yellow-throated miner				
Ptilotula pencillata	white-plumed honeyeater				
MONARCHIDAE					
Grallina cyanoleuca	magpie-lark				
OTIDIDAE					
Ardeotis australis	Australian bustard				
PACHYCEPHALIDAE					
Pachycephala rufiventris subsp. *rufiventris*	rufous whistler				
Oreoica gutturalis	crested bellbird				
PETROICIDAE					
Melanodryas cucullata	hooded robin				
Petroica goodenovii	red-capped robin				
POMATOSTOMIDAE					
Pomatostomus temporalis subsp. *rubeculus*	grey-crowned babbler				
PSITTACIDAE					
Melopsittacus undulatus	budgerigar				
Neopsephotus bourkii	Bourke's parrot				

Species	Common Name	Conservation Status			
		EPBC Act	BC Act	DBCA	IUCN
Platycercus zonarius subsp. *zonarius*	Port Lincoln parrot				
RHIPIDURIDAE					
Rhipidura leucophrys subsp. *leucophrys*	willie wagtail				
TURNICIDAE					
Turnix velox	little button-quail				
REPTILIA					
AGAMIDAE					
Ctenophorus isolepis subsp. *isolepis*	military dragon				
DIPLODACTYLIDAE					
Oedura fimbria	western marbled velvet gecko				
SCINCIDAE					
Ctenotus inornatus	skink				
Ctenotus pantherinus subsp. *ocellifer*	leopard ctenotus				
VARANIDAE					
Varanus gouldii	Gould's monitor				