

## Appendix D **Fauna Survey Report**

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## **Woodside Power Pty Ltd**

Solar PV Power Plant

Fauna Survey

September 2021



# Executive summary

## *Introduction*

Woodside Energy Ltd (Woodside) is proposing to develop a Solar PV Power Plant, approximately 15 kilometres (km) southwest of Karratha, Western Australia (WA). This will generate electricity from a large scale solar photovoltaic farm (Solar PV Farm), complemented by energy storage (battery) infrastructure (the Proposal). The proposed works and subsequently, the survey area, were revised in 2021. The results and recommendations outlined in this report have been updated to reflect the change in the proposed works since 2021, but the survey methodology remains the same as was conducted in 2019. The results of the fauna survey will be used to support the environmental approvals required for the construction and operation of the Solar PV Farm and Solar Plant Supporting Infrastructure (SPSI).

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.4 and the assumptions and qualifications contained throughout the Report.

## *Survey effort*

Field survey consisted of seven days over two periods the 10<sup>th</sup> to 13<sup>th</sup> of June and 22<sup>nd</sup> to 24<sup>th</sup> July 2019. The survey aimed to verify the findings of a desktop assessment and preliminary likelihood of occurrence assessment. The survey area was ground truthed with remote cameras and bat detectors installed to assist in species inventory within the survey area. In total 30 camera nights over nine locations and three bat detector nights over three locations were undertaken.

## *Key results*

- Three broad fauna habitat types (excluding disturbed areas) were recorded in the survey area. These habitat types closely align with the different vegetation types and landforms within the survey area. The fauna habitat present include, Minor Drainage lines (and small areas of exposed granite), , Tussock Grasslands on Cracking Clays, Granite and Triodia on stony soils. Some disturbed areas are also present.
- The survey area is largely intact, contiguous with disturbances including, land modifications and cattle grazing
- The Reconnaissance survey identified 84 species from within the survey area, consisting of 59 birds, 13 reptiles and 12 mammals. Of these species, four were introduced and comprise Dog, Cat, Cattle and Black Rat
- No conservation significant fauna were recorded

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- Appendix C - (Species Recorded)
- Appendix D - (Likelihood of Occurrence)
- Appendix E - (Database Searches)

# 1. Introduction

## 1.1 Background

Woodside Power Pty Ltd (Woodside) is proposing to develop a Solar PV Power Plant, approximately 15 kilometres (km) southwest of Karratha, Western Australia (WA). This will generate electricity from a large scale solar photovoltaic farm (Solar PV Farm), complemented by energy storage (battery) infrastructure (the Proposal). The proposed works and subsequently, the survey area, were revised in 2021. This report describes the survey effort that pertains to the 2019 proposed works by Woodside. The results of this survey have been modified in this report, to address the relevant impacts associated with the now survey area (Solar PV Farm and SPSI).

Woodside is referring the Proposal to the WA Environmental Protection Authority (EPA) under Section 38 of the *Environmental Protection Act 1986* (EP Act), as a Proposal that has potential to have a significant impact on the environment. Woodside is also referring the Proposal to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) as a Proposal that has potential to impact matters of national environmental significance (MNES).

## 1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by Woodside to undertake a Reconnaissance fauna assessment of the survey area. The purpose of the assessment is to delineate key fauna values within the survey area and the potential impact to areas of sensitivity. The outcomes of the assessment will be used in the environmental assessment and approvals process.

## 1.3 Scope of Works

For the purposes of undertaking this desktop assessment, the survey area refers to the proposed Solar PV Farm, where a 20 km buffer has been applied for database searches. The search area is known as the study area.

The scope of works for this project is to complete a:

- Desktop assessment of the study area was completed prior to the field survey work to identify significant fauna values which may be in, or nearby the survey area. This included a likelihood of occurrence assessment
- Review of existing and relevant environmental reports
- Field survey to verify / ground truth the desktop assessment findings
- Fauna habitat assessment across the Development Envelope
- Determination of the presence and distribution of fauna species within the survey area using motion cameras
- Determination of the presence of conservation significant bat species using bat detectors
- Series of environmental constraints maps using Geographic Information Systems (GIS) mapping software
- Concise report (this document) on the findings of the fauna survey was provided

## 1.4 Limitations

This report has been prepared by GHD for Woodside and may only be used and relied on by Woodside for the purpose agreed between GHD and Woodside as set out in section 1.2 of this report.

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

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

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

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

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

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

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of access tracks, infrastructure and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

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

This report has assessed the fauna within the survey area Figure 1. Should the survey area change or be refined, further assessment may be required.

## 2. Methods

### 2.1 Desktop

The desktop assessment reviewed existing information for the survey area to determine likelihood of occurrence of conservation significant species and inform the design of the field surveys and timing of the survey.

This assessment is restricted to vertebrate terrestrial fauna within the survey area. The desktop assessment includes:

- A review of the Department of the Environment and Energy Protected Matters Search Tool (PMST) database to identify Matters of National Environmental Significance (MNES), fauna species listed under the EPBC Act potentially occurring within the study area
- A review of the DBCA *NatureMap* database for fauna species previously recorded within a 20 km buffer of the survey area. The following data sets within *NatureMap* included: Atlas of Australian birds, Birddata – Birdlife Australia, Fauna Survey returns database (new), Pilbara Biological Survey fauna, Pilbara Threatened Fauna, WA Threatened Fauna database, and WA Museum fauna databases
- A review of DBCA Threatened Fauna databases to identify conservation significant fauna species present within the survey area and surrounds that are contained in DBCA records (20 km buffer). The above database search detail are presented in Table 1
- A review of a previous and relevant fauna assessment in the area (Fauna records are generally expressed in the *NatureMap* searches, unless Level 1). Aecom 2013 Environmental Due Diligence, Maitland Industrial Estate. Unpublished report consolidates previous works on the area and this has been reviewed as part of this survey
- Aerial photography, geology/soils and hydrology information: these datasets were reviewed to provide background information on the variability of the environment and likely habitat types
- DBCA-managed conservation estates and reserves present within or near the survey area.

Details of the database searches conducted are summarised in Table 1 and the search results are presented in Appendix E. Conservation codes and legislation is presented in Appendix B.

**Table 1 Database searches undertaken for this study**

Databases	Search Focus	Search area
Department of Agriculture, Water and the Environment Protected Matters Search Tool (DAWE 2021)	MNES - Fauna	20 km buffer around line transect, coordinates -20.799064 116.682674,-20.596088 116.78361,-20.596088 116.782924,-20.596088 116.782924
Threatened and Priority Fauna Database (Department of Biodiversity, Conservation and Attractions 2019)	Listed threatened and priority flora	20 km radius around survey area shapefiles provided
<i>NatureMap</i> (Department of Biodiversity, Conservation and Attractions 2019)	Fauna diversity and fauna of conservation significance	20 km buffer around coordinates -20.596088 116.78361

## 2.2 Field survey

A Reconnaissance fauna survey was undertaken over two periods the 10<sup>th</sup> to 13<sup>th</sup> of June and 22<sup>nd</sup> to 24<sup>th</sup> July 2019. Where access permitted, the area was ground truthed by senior zoologist Glen Gaikhorst. The agreed exclusion areas were maintained, otherwise all areas within the survey area were traversed and visually assessed.

The fauna survey was undertaken with reference to Technical Guide – Terrestrial Fauna Surveys (EPA 2020). The purpose of the reconnaissance survey was to verify the accuracy of the desktop study and characterise the fauna and faunal assemblages present in the survey area.

The majority of the survey area was traversed on foot and by vehicle over the course of seven days. The purpose of the survey was to:

- Identify and describe the dominant fauna habitat types present and their condition, and
- Assess habitat connectivity, identify and record fauna species within the survey area.

An assessment of the likelihood of conservation significant fauna and their habitats occurring within the survey area was also undertaken.

### *Habitat assessment*

A fauna habitat assessment was undertaken to document the type, condition and extent of habitats within the survey area. The following information was recorded:

- Habitat structure (e.g. vegetation type, presence/absence of structural layers such as ground cover and mid storey)
- Presence/absence of refuge including: density of ground covers, fallen timber (coarse woody debris), hollow-bearing trees and stags and rocks/boulder piles, and the type and extent of each refuge
- Presence/absence of waterways including type, extent and habitat quality within waterway

- Location of the habitat within the survey area in comparison to the habitat within the surrounding landscape
- Habitat connectivity and identification of wildlife corridors within and immediately adjacent to the survey area
- Current land use and disturbance history
- Evaluation of key habitat features and types identified during the desktop assessment relevant to fauna of conservation significance
- Evaluation of the likelihood of occurrence of conservation significant fauna within the habitat (based on presence of suitable habitat)

### **Opportunistic fauna searches**

Opportunistic fauna searches were conducted across the survey area. The majority of opportunistic searches focussed on the following:

- Searching the survey area for tracks, scats, bones, diggings and feeding areas for both native and feral fauna (Triggs 2004). For each scat found, the location, date, brief habitat description and GPS coordinate was recorded
- Searching through microhabitats including turning over rocks and ground debris (e.g. leaf litter) and examining tree hollows and hollow logs for reptile and other small vertebrate fauna
- Visual and aural surveys. This accounted for many bird species potentially utilising the survey area
- A visual assessment of the water bodies to identify any fish species observed
- Recording GPS locations of any conservation significant fauna species.

### **Camera trapping**

Motion sensor cameras (Reconyx-Hyperfire) were deployed for a total of 30 camera nights (each camera between 2 and 4 nights) at nine locations within the survey area, primarily to identify additional cryptic or nocturnal species that may utilise the survey area. Cameras were positioned in areas where conservation significant species may frequent (e.g. rocky outcrops with cavities and cracking clays). For each camera location the time and date deployed and recovered, a GPS coordinate and brief habitat description was recorded. Camera locations are displayed in Figure 3.

Data from the cameras were downloaded to a computer and analysed for the presence of animals following the field survey. Glen Gaikhorst, senior zoologist, undertook the identification of fauna images captured by the cameras. Table 2 provides the camera and bat detector locations and habitat associated.

**Table 2 Remote Camera information**

Item	Longs	Lats	Environment	Habitat	Total Nights
Remote camera	116.778063	-20.610273	Rocky Hills	Boulder Pile beneath Fig tree	4
Remote camera	116.774419	-20.615333	Rocky Hills	Boulder Piles	4
Remote camera	116.743543	-20.654963	Rocky Hills	Boulder Piles	4
Remote camera	116.740900	-20.659612	Rocky Hills	Boulder Piles	4

Item	Longs	Lats	Environment	Habitat	Total Nights
Remote camera	116.730168	-20.674946	Rocky Hills	Boulder Piles	4
Remote camera	116.728945	-20.676541	Rocky Hills	Boulder Piles	4
Remote camera <sup>1</sup>	116.674933	-20.817698	Cracking Clays	On ground amongst tussock grasses	2
Remote camera <sup>1</sup>	116.689948	-20.808314	Minor Drainage line	Amongst shrubs along minor drainage line	2
Remote camera <sup>1</sup>	116.699785	-20.830550	Rocky Plain	Amongst Triodia	2

<sup>1</sup>Relevant to the survey area

### Bat survey

A Songmeter SM4BAT+ recorder (Wildlife Acoustics Inc., USA) was deployed at three locations for a total of three nights to record ultrasonic echolocation calls emitted by microchiropteran bats.

**Table 3 Bat Detector Information**

Item	Longs	Lats	Environment	Habitat	Total Nights
Bat detector	116.769890	-20.630216	Mudflats	Mangroves	1
Bat detector	116.733319	-20.669921	Rocky Hills	Boulder Piles	1
Bat detector	116.730229	-20.681949	Sandy Plain	Shrublands	1

### Call analysis

Craig Grabham, senior zoologist, completed the analysis of all data collected during the survey using the ultrasonic bat detectors. Data from SM units were downloaded and viewed using Kaleidoscope Pro (version 4.3.1, Wildlife Acoustics Inc 2016) as full-spectrum files. WAV files were also converted to Anabat sequence files (zero-crossing format) suitable for analysis in AnalookW version 4.1s (Corben 2015).

WAV files were viewed and bat calls identified by visually comparing the Kaleidoscope Viewer spectrogram and call characteristics (e.g. characteristic frequency and call shape) with reference calls and/or species call descriptions from available reference material (e.g. McKenzie and Bullen 2009; Armstrong and Coles 2007). The spectrogram displayed each call sequence (see below for call definition) with information on the number and timing of calls.

Calls were also identified using zero-crossing analysis and AnalookW by visually comparing the time-frequency graph and call characteristics (e.g. characteristic frequency (Fc) and call shape) with reference calls and/or species call descriptions from available reference material.

The call identification was also assisted by consulting distribution information for possible species (Atlas of Living Australia and DBCA *NatureMap* records) and previous GHD surveys within the region of the survey area. No reference calls were collected during the survey.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency and shape. Calls with less than three defined consecutive pulses of similar frequency and shape were not unambiguously identified to a species (see below) but were used as part of the activity count for the survey area.

Due to variability in the quality of calls, the lack of published information regarding non-search phase calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills *et al.* 1996 and Duffy *et al.* 2000) as summarised in

Table 4. Due to the absence of reference calls from the study area and the poor quality of some the recordings and known overlap in call characteristics between some species, a conservative approach was taken when analysing calls.

**Table 4 Confidence ratings applied to calls**

Identification	Description
D - Definite	Species identification not in doubt. Call sequence contains three or more consecutive pulses of similar frequency and shape. Call characteristics match those in referenced material or species reference calls.
PR - Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail (e.g. number of pulses).
SG – Species Group	Call made by one of two or more species. Call characteristics overlap making it too difficult to distinguish between species.

### **Fauna Species Identification**

Fauna species were identified in the field using available field and electronic guides (e.g. Morcombe 2014). Nomenclature follows that used by the WA Museum (as shown on *NatureMap*), as it is regarded to contain the most up-to-date species information for WA, with the exception of birds, where Christidis and Boles (2008) or bats which follows Armstrong (2011), then van Dyck *et al.* (2008) was used.

## **2.3 Limitations**

### **2.3.1 Desktop limitations**

Desktop investigations use a variety of online resources such as the WA Museum and DBCA *NatureMap* database (DBCA 2007–), and the EPBC Act PMST. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

The EPBC Act PMST is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from the DBCA searches of threatened flora and fauna provide more accurate information for the general area. However, some records of collections, sightings or trappings cannot be dated and often misrepresent the current range of threatened species.

### **2.3.2 Field survey limitations**

The EPA (2020) Technical Guidance states survey reports for environmental impact assessment in Western Australia should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 5. Based on this assessment, the present survey effort is not subject to any constraints which affect the thoroughness of the assessment and the conclusions that have been formed.

**Table 5 Field Survey Limitations**

Aspect	Constraint	Comment
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Minor	The majority of the survey area was accessed by vehicle and on foot. Information gained from the survey was extrapolated across those sections of the survey area not accessed on foot during the field survey to assist with determining the vegetation and habitat types for the entire survey area.
Mapping reliability	Nil	Data were recorded in the field using a hand-held GPS tool. Certain atmospheric factors and other sources of error can affect the accuracy of such GPS receivers. On average, the GPS units used during this field survey (Garmin GPS, Samsung Tablet units) have an accuracy to approximately $\pm 5$ m. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/season/cycle	Moderate	The survey was conducted in June and July 2019 which was relatively late in the season for assessing migratory birds. Typically migratory bird surveys are undertaken in the summer period (Dutsun et al 2009) between October to March. Due to the habitats present in the survey area migratory species may not have been identified from the survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Minor	A number of disturbances were observed that impacted the survey. These included current and historic vegetation clearing pipelines and tracks, as well as some historic grazing. No evidence of recent fire was observed.
Intensity (in retrospect, was the intensity adequate)	Nil	The terrestrial fauna was sampled in accordance with the EPA (2020) Reconnaissance assessment. The survey area was sufficiently covered by GHD zoologist during the survey.
Access restrictions	Minor	Some areas had restricted access during the survey, however these could be visually assessed from a distance to determine habitats present. The majority of the survey area was accessed by vehicle and/or on foot.
Experience Levels	Nil	The survey zoologist is suitably qualified and experienced in his field. Glen Gaikhorst is a Senior Zoologist with over 20 years' experience in undertaking ecological surveys in Western Australia.

## 3. Results

### 3.1 Desktop

#### 3.1.1 Fauna diversity

A search of *NatureMap* identified 331 terrestrial vertebrate fauna taxa previously recorded within 20 km of the survey area. This total included 194 birds, 37 mammals, 7 amphibian and 93 reptiles (Appendix E).

Of the 331 species identified 13 are considered introduced to the region, these include four Birds (Domestic Pigeon, Spotted Turtle Dove, European Sparrow and House Sparrow), eight mammals (Cat, Fox, Goat, Sheep, Dog, Rabbit, House mouse and Black Rat) and one reptile (Asian House Gecko).

A number of Short Range Endemic (SRE) invertebrates were also recorded; however, the habitat present in the survey area is not conducive to SRE environments.

Due to the close proximity to the marine environment a number of marine species were identified, these were excluded from the search. Marine species (such as Gulls and Terns) that are known to opportunistically use terrestrial areas/habitats remained in the assessment. There are some species duplications within the database search due to the inclusion of subspecies and due to recent taxonomic name changes. These species were also excluded from the numbers.

### **3.1.2 DBCA Database**

The DBCA database identified 2281 individual fauna records of conservation significant species (consisting of both terrestrial and marine). Of these records, only one new terrestrial vertebrate species was identified, that was not recorded in other searches. This species is the North-western Free-tailed Bat (*Mormopterus (Ozimops) cobourgianus*) and has been added to the Likelihood of Occurrence table presented in Appendix D.

### **3.1.3 Conservation significant fauna**

Searches of the EPBC Act PMST identified the presence/potential presence of 47 conservation significant fauna, including 41 birds, four mammals and two reptiles (Appendix E). The EPBC Act PMST indicated the potential presence of nine additional introduced fauna taxa within 20 km of the survey area. Species identified by the PMST as marine or pelagic and migratory wetland were excluded from this assessment as no marine or wetland habitat is present within the survey area.

### **3.1.4 Previous Report for the Maitland Industrial Estate**

AECOM (2013) completed a desktop assessment for the Maitland Industrial Estate referencing three previous fauna reports undertaken over the area dating back to 1994. The key finding of the summary includes:

- Three main fauna habitats (from the most recent survey) have previously been recorded in the Maitland Industrial Estate including Paddock grassland consisting of \**Cenchrus ciliaris*, *Eragrostis xerophila* and *Eriachne aristidea* tussock grassland with *Alternanthera nudiflora*, *Hybanthus auranticatus* and *Heliotropium conocarpum* mixed herbs, Creekline community of *Grevillea wickhamii* and *Acacia coriacea* tall open shrubland over *Triodia wiseana*, *Triodia pungens* hummock grassland with patches of *Chrysopogon fallax* and Hummock grassland of *Triodia wiseana* and *Triodia pungens* with \**Cenchrus ciliaris* and *Eragrostis xerophila* tussock grassland.
- Previous surveys had identified 24 birds, 3 mammals and 10 reptiles and frogs (Aecom 2013).
- The Peregrine Falcon and Grey Falcon were recorded as potential 'fly over' the site while Northern Quoll, Pilbara Olive Python, Short-tailed Mouse, Bar-tailed Godwit, Common Greenshank, Curlew Sandpiper and Pin-tailed Snipe are possible to occur. The Lined Soil Crevice Skink and Bridled Tern are known to breed in the area. Note: A number of other species were listed as possible however these species no longer have a conservation listing.

- An assessment of likelihood determined that no EPBC Act listed species were likely to be present, with the exception of 31 migratory, marine species that are known or likely to occur.

The reports referenced by AECOM (2013) were desktop-only and 10+ years old, and therefore not an appropriate representation of species that may / may not be present in the survey area.

### **3.1.5 Conservation Managed Lands**

The survey area does not contain any DBCA-managed conservation estates or reserves or any in the near vicinity.

## **3.2 Field Survey**

### **3.2.1 Fauna Habitats**

Three main fauna habitat types were recorded during the field survey, which are described in detail in Table 6 and mapped in Figure 4, and include:

- Minor Drainage lines and small exposed granite outcrops
- Tussock Grasslands on Cracking Clays
- Hummock Grassland on Rocky Plain (Triodia on stony soils)

The topography of the survey area varied from stony plains to minor drainage lines, cracking clays and granite outcrops. Minor drainage systems occur within the survey area which drain from to the coast or across plain. Flow varies in direction through the survey area however always drains to the coast. No waterbodies were present within the minor drainages at the time of the survey. Soils varied greatly over the survey area and included red-brown stony or sandy loams, cracking clays on the plain and areas of exposed rocky hills. The habitat types for the survey area are described in Table 6.

#### *Habitat connectivity*

The fauna habitats of the survey area are part of a contiguous largely intact area of remnant vegetation within leased land primarily used for industrial, cattle grazing and resource extraction. The fauna habitats of the survey area are part of a much larger area of similar habitats within the local area and greater study area. The ephemeral drainage lines within the survey area drain towards the coast and provide corridors. Overall, the habitats within the survey area are largely contiguous through the local area and mostly well connected with habitats through the study area.


#### *Disturbance*




Some of the habitats within the survey area have been impacted by past disturbances including land clearing for infrastructure, linear corridors, pastoral practices and mineral resource extraction which has been conducted within the survey area. on the survey area lies on Karratha Station and so has suffered degradation from cattle grazing. Some signs of cattle (scats) were observed throughout the survey area.

#### *Habitat value*

The survey area provides a moderate level of habitat value within the environment. This is due to the diversity of fauna the area maintains and the conservation significance of many native fauna species that are present or likely to be present in the survey area.

**Table 6 Fauna habitats recorded in the survey area**

Habitat	Image
<p><b>Minor Drainage lines and small areas of exposed granite</b></p> <p>This habitat type is limited to the linear drainage systems which flow randomly on the plains. They primarily consist of a thin, linear corridor of denser vegetation which drain into the intertidal mudflats and coastline. This habitat type is mostly dominated by <i>Acacia</i> species on the plain. Understorey includes Triodia hummock grassland and Buffel Grass (<i>Cenchrus spp.</i>) and mixed small shrub species. Litter, woody debris and logs were present along drainage line edges or where water flow created build up. No recent fire scaring was present in the survey area but historical evidence was obvious via the age of vegetation present. This habitat, particularly on the plain provides a habitat corridor from the coastal tidal zone to an open plain over the cracking clays. The tall Corymbia's present in the survey area, provide roosting and breeding opportunities for a range of fauna via tall canopy or hollows large trees provide. A number of fauna species favouring riparian vegetation were also recorded including White-plumed Honeyeater (<i>Lichenostomus penicillatus</i>), Bush Stone Curlew (<i>Burhinus grallarius</i>), Budgerigar (<i>Melopsittacus undulatus</i>), Red Kangaroo (<i>Macropus rufus</i>) and Long-snouted Water Dragon (<i>Gowidon longirostris</i>).</p> <p>The minor drainage lines also contain a habitat-feature of small, exposed granite outcrops. These are known to support a range of reptile spp, which will utilise the rock as shelter and for foraging.</p> <p><b>Habitat value for fauna species of conservation significance</b></p> <p>Patchy and typically linear in the landscape but part of a larger area of contiguous remnant vegetation extending beyond the survey area. This habitat was present within the entire survey area and provides potential hunting and foraging opportunities for the Peregrine Falcon.. On the plain, the Northern Short-tailed Mouse (<i>Leggadina lakedowniensis</i>) and Lined Crevice Skink (<i>Notoscincus butleri</i>) would utilise this habitat.</p> <p><b>High value</b></p> <p>Linear corridor of habitat utilised by Peregrine Falcon and Northern Short-tailed Mouse and Lined Crevice Skink on the plain. A fauna corridor for all other species on the plain. Contains granite outcrops for a range of reptile spp.</p>	 <p>The image column contains three photographs. The top photo shows a drainage line with a tree and rocky ground. The middle photo shows a landscape with trees and red soil. The bottom photo shows a close-up of a granite outcrop.</p>

Habitat	Image
<p><b>Hummock Grassland on Rocky Plain (Triodia on stony soils)</b>  This habitat type occurs in some portions across the survey area, but mostly in the south-east corner of the survey area. It is often associated with slight undulation where there is association to low hills. This habitat type is mostly dominated by a Triodia wiseana hummock grassland with heavy loam stony soils. The vegetation is a mosaic of shrubs however is dominated by Acacia spp. and Hakea lorea over Triodia wiseana hummock grassland. Litter, woody debris and branches were present in areas where shrubs were present. No logs or hollows were observed due to the low shrub-vegetation structure present. No recent fire scaring was present in the survey area but historical evidence was obvious via the age of vegetation present. The grasslands provide good foraging and breeding opportunities for small native ground mammals, ground dwelling birds and reptiles. Several ground dwelling birds, small skinks and dragons were observed active during the survey (Little Button-quail (<i>Turnix velox</i>), Brown Songlark (<i>Cincloramphus cruralis</i>), Spinifexbird (<i>Eremiornis carteri</i>)) and several raptor species were observed foraging over the grasslands (Black-shouldered Kite (<i>Elanus axilaris</i>), Spotted Harrier (<i>Circus assimilis</i>), Australian Kestrel (<i>Falco cenchroides</i>)).</p> <p><b>Habitat value for fauna species of conservation significance</b>  Part of a larger area of contiguous remnant vegetation extending beyond the survey area. This habitat provides potential hunting and foraging opportunities for the Peregrine Falcon. Where sand incursion and in association with drainage lines is present within this habitat, the Northern Short-tailed Mouse and Lined Crevice Skink may be present.</p> <p><b>Moderate to High value</b>  Habitat that typically supports high diversity of small vertebrate fauna and provides foraging habitat to Peregrine Falcon. The Northern Short-tailed Mouse and Lined Crevice Skink may also utilise this habitat.</p>	<p>Exposed granite along a minor drainage line</p>  
<p><b>Tussock Grasslands on Cracking Clays</b>  This habitat type dominates the survey area and intergrades with smaller areas or scattered Triodia hummock grasslands on stony soils. Overstorey was minimal, containing sometimes a mix of tussock grasses, but dominated by <i>Eragrostis xerophila</i> tussock grassland over an annual herbland.. The grasslands provide good foraging and breeding opportunities for grassland and cracking clay specialists such as small native ground mammals, ground dwelling birds and reptiles. Several ground dwelling birds were observed active during the survey (Rufous Songlark (<i>Cincloramphus mathewsi</i>), Brown Songlark (<i>Cincloramphus cruralis</i>), Horsfield's Bushlark (<i>Mirafra javanica</i>)) and several raptor species were observed foraging over the grasslands (Black-shouldered Kite, Spotted Harrier, Australian Kestrel). Old nests were recorded for songlarks and bushlarks suggesting the species breed in the area. Animal tracks, digs and occasional small burrows were recorded in this habitat type, most of which were kangaroos and other small mammals.</p>	

## Habitat

Logs, branches and debris were very sparse in this habitat type-which is an artefact of the lack of over storey. Leaf-litter and other forms of non-vascular (ground cover of dead plant material) was localised beneath small clumps of trees but was uncommon.

### **Habitat value for fauna species of conservation significance**

No conservation significant species were recorded in this habitat at the time of the survey. Typically this habitat is utilised in the wet period (December to April) when migratory species are present and grasses are flourishing. The migratory species previously recorded in this habitat are the Oriental Plover (*Charadrius veredus*), Oriental Pratincole (*Glareola maldivarum*), Bridled Tern (*Onychoprion anaethetus*) (which has been recorded breeding just to the west) and any other migratory species that may temporarily and opportunistically utilise open plains. The Northern Short-tailed Mouse and Lined Crevice Skink would utilise this habitat.

### **Moderate value**

Seasonal opportunistic use of habitat by migratory-bird species. The Northern Short-tailed Mouse and Lined Crevice Skink may also utilise this habitat.

## Image



### 3.2.2 Species Diversity

During the survey 84 species were identified from within the survey area, consisting of 59 birds, 13 reptiles and 12 mammals. Of these species, four were introduced and comprise Dog, Cat, Cattle and Black Rat. The remaining species were all native and are known from the region. The full list of species identified can be seen in Appendix C.

Three of these species were recorded on camera and include the Cat Woolley's False Antechinus (Plate 1), Black Rat and Rothchild's Rock Wallaby (Plate 2).



**Plate 1 Woolley's False Antechinus (zoomed in)**



**Plate 2 Rothchild's Rock Wallaby**

### Conservation Significant Fauna

No Conservation Significant species were recorded in the survey area.

### 3.2.3 Likelihood of Occurrence

A preliminary likelihood of occurrence assessment was undertaken pre field survey. This assessment identified a number of species that are likely to exist in the habitats within the survey area. The field survey further refined this data based on species recorded and habitats present.

Searches of the EPBC Act PMST, DBCA Threatened and Priority Fauna database and NatureMap database (Appendix E) identified the presence/potential presence of 60 conservation significant fauna species. These species populate the Likelihood of Occurrence assessment which can be found in Appendix D. Species identified by the PMST as marine or sole marine were excluded from this assessment as no sole marine habitats were present within the survey area however species identified by the PMST as migratory terrestrial/wetland were considered as part of this assessment.

This assessment found (post survey) that 6 species were identified as likely to occur within the survey area, based on species records and habitat identified and review of previous works undertaken in the region. These species can be seen in Table 7.

**Table 7 Summary of fauna species of conservation significance determined likely to occur within the survey area**

Species and status (EPBC, WC Act)	Justification for Likelihood of Occurrence
Peregrine Falcon ( <i>Falco peregrinus</i> ) OS	<b>Likely – regular visitor or resident to survey area</b> The survey area provides suitable hunting habitat. The survey area is probably part of the species broader home range, limited breeding habitat occurs within the survey area. Important breeding habitat (e.g. steep cliffs) may be found in nearby ranges and coastal cliffs outside of the survey area but within the study area. There are five records within the study area.
Northern Short-tailed Mouse ( <i>Leggadina lakedownensis</i> ) P4	<b>Likely –resident to survey area, restricted to the cracking clays and minor drainage lines</b> The survey area provides suitable habitat for the species particularly in minor drainage line associated to cracking clays on plain habitats. The species has been recorded within the study area and the species likely present. There is three historical records within 2 km of the survey area.
Lined Soil-crevice Skink ( <i>Notoscincus butleri</i> ) P4	<b>Likely – resident in/to the survey area</b> The survey area provides suitable habitat for the species particularly in minor drainage line associated to cracking clays or stony soils on plain habitats. The species has been recorded within the study area and the species likely present. There is five historical records within the study area.
Bridled Tern ( <i>Onychoprion anaethetus</i> ) Mi, IA	<b>Likely – regular visitor or resident to survey area</b> Most records for this species are on or around the off shore islands, however the species has been recorded breeding on the mainland adjacent to the Maitland Industrial Estate survey area (AECOM 2003) (exact location unknown). A small amount of habitat is present for this

Species and status (EPBC, WC Act)	Justification for Likelihood of Occurrence
	species particularly within the intertidal mudflats and minor drainage lines. However use would be irregular and opportunistic.
Oriental Pratincole ( <i>Glareola maldivarum</i> ) Mi, IA	<p><b>Likely –seasonal visitor, opportunistic use in/to the survey area</b></p> <p>This species has been recorded in the survey area and within the vicinity of the survey area previously and habitat is present for the species. This species is known to utilise habitats in the Pilbara, including mudflats, plain and minor drainage lines.</p> <p>The species is known from the area with one record from the plain along the infrastructure corridor and another record within 2 km of the survey area.</p>
Oriental Plover ( <i>Charadrius veredus</i> ) Mi, IA	<p><b>Likely –seasonal visitor, opportunistic use in/to the survey area</b></p> <p>This species has been recorded in the vicinity of the survey area previously and habitat is present for the species. This species is known to utilise habitats in the Pilbara, including mudflat and plain.</p> <p>The species is known from the area with three records from within 2 km of the survey area.</p>

Table note:

Status (see Appendix B for full explanation)

EPBC Act – Species listed as one or more of the following: MiT = migratory terrestrial species, Vu = Vulnerable, En = Endangered

BC Act - Species listed as CR = critically endangered, En = endangered, Vu = Vulnerable, IA = international migratory agreement migratory birds, OS = other specially protected fauna

DBCA – Species listed as Priority (P) 1, 2, 3 or 4

## 4. Conclusion

Six species are likely to occur in the survey area and include Peregrine Falcon (*Falco peregrinus*), Northern Short-tailed Mouse (*Leggadina lakedownensis*), Lined Soil-crevice Skink (*Notoscincus butleri*), Bridled Tern (*Onychoprion anaethetus*), Oriental Pratincole (*Glareola maldivarum*), Oriental Plover (*Charadrius veredus*).

The Peregrine Falcon is known from the region and foraging habitat is present for the species however, the habitat available is not critical to the survival of the species (not breeding habitat) and generally restricted to foraging areas of the survey area. Foraging can occur anywhere in the survey area but is sporadic and opportunistic, the works will have little impact on the species.

The Northern Short-tailed Mouse, Lined Soil-crevice Skink have been recorded in the area previously and within 2 km of the survey area. Both species prefer habitats associated to minor drainage lines on plains of either cracking clays or stony soils. Both species are patchily distributed with the Northern Short-tailed Mouse typically a responsive boom/bust species during good and bad times. Where the Lined Soil-crevice Skink is reliant on more stable suitable habitats. The minor drainage lines in the survey area would be considered critical habitat. Due to the open, exposed nature of the cracking clays plain in this region, these drainage lines provide the only available vegetative corridors from the coast to the surrounding hills in the east. Numerous large bird species were recorded along these drainages line such as the Australian Bustard, White-bellied Sea-eagle and Whistling Kite. Large mammal like the Red Kangaroo were also utilising the corridors. Numerous smaller birds, reptiles and mammals were also recorded in these areas.

The Bridled Tern, Oriental Plover and Oriental Pratincole have previously been recorded within 2 km of the survey area and habitats are present in the survey area. These species may utilise minor drainage line and cracking clay environments, but only during the wet season when there is an availability of foraging material. There is more suitable habitat immediately outside of the survey area, including the saltworks in the north and larger drainage systems in the west. More optimal habitat including mudflats, mangroves and chenopod herblands all occur outside to the northeast of the survey area. The potential impacts to these species are therefore considered minimal.

## 5. References

- Aecom 2013. Environmental Due Diligence, Maitland Industrial Estate. Unpublished report. Unpublished Report for LandCorp, Western Australia.
- Armstrong, K. N., and Coles, R. B. 2007. Echolocation call frequency differences between geographic isolates of *Rhinonictis aurantia* (Chiroptera: Hipposideridae): implications of nasal chamber size. *Journal of Mammalogy* **88**, 94-104.
- Armstrong, K N 2011. The current status of bats in Western Australia. In: 'The biology and conservation of Australasian bats.' (Eds B Law, P Eby, D Lunney and L Lumsden) pp. 257–269. (Royal Zoological Society of New South Wales: Mosman.)
- Bamford, M.J. 1988. Kakadu National Park: a preliminary survey of migratory waders October/November 1987. RAOU Report No. 60. Royal Australasian Ornithologists Union, Melbourne, Australia.
- Boles, W.E., N.W. Longmore & M.C. Thompson 1994. A recent specimen of the Night Parrot, *Geopsittacus occidentalis*. *Emu*. 94:37-40
- Christidis, L and Boles, WE 2008, *Systematics and Taxonomy of Australian Birds*, Melbourne, Australia, CSIRO Publishing.
- Collins, P., A. Boyle, C. Minton & R. Jessop 2001. The importance of inland claypans for waders in Roebuck Bay, Broome, NW Australia. *Stilt*. 38:4--8.
- Corben, C 2015. *AnaLookW for bat call analysis using ZCA; Version 4.1z*; 20 September 2015.
- Cramp, S 1985. The birds of the Western Palearctic. Vol. IV. Oxford University Press, Oxford.
- Department of the Environment (DotE) 2016. Numerous migratory bird searches in Species Profile and Threats Database, Department of the Environment, Canberra.
- Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2013. Species Profile and Threats Database (SPRAT), Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Government.
- Department of Biodiversity, Conservation and Attractions (DBCAs) 2007–. NatureMap: Mapping Western Australia's Biodiversity, retrieved March 2019, from <http://naturemap.dpaw.wa.gov.au/default.aspx/>.
- Department of Agriculture Water and the Environment (DAWE) 2021, Species Profile and Threats Database (SPRAT), retrieved March 2019, from <http://www.environment.gov.au/cgi-bin/sprat/public/>.
- Duffy, AM, Lumsden, LF, Caddle, CR, Chick, RR & Newell, GR 2000. The efficacy of Anabat ultrasonic detectors and harp traps for surveying microchiropterans in southeastern Australia, *Acta Chiropterologica* 2: 127-144.
- Dutson, G., Garnett, S and Gole, C. 2009. Australia's Important Bird Areas- Key sites for bird conservation. Bird Australia (RAOU) Conservation Statement No. 15.
- Environmental Protection Authority (EPA) 2020. Technical Guidance, Terrestrial vertebrate fauna surveys for environmental impact assessment, Environmental Protection Authority, Western Australia.
- Geering, A., L. Agnew & S. Harding, 2007, eds. Shorebirds of Australia. Page(s) 75-196. Melbourne: CSIRO Publishing.

- Higgins, PJ and Davies, SJJF (eds.) 1996. Handbook of Australian, New Zealand & Antarctic birds, Volume 3: Snipe to Pigeons, South Melbourne, Australia, Oxford University Press.
- Jarman, H, 1978. An inland record of the Whimbrel. *Australian Bird Watcher*. 7:170.
- Lloyd, RL and Lloyd, HJ 1991. An Oriental Pratincole at the Dry Creek Saltfields, South Australian Ornithologist, vol. 31, pp 74.
- Marchant, S and Higgins, PJ (eds.) 1993. Handbook of Australian, New Zealand and Antarctic Birds, Volume 2 – Raptors to Lapwings, Melbourne, Victoria, Oxford University Press.
- McKenzie, NL, and Bullen, R D 2009. The echolocation calls, habitat relationships, foraging niches and communities of Pilbara microbats. *Records of the Western Australian Museum Supplement* 78: 123–155.
- Mills, DJ, Norton, TW, Parnaby, HE, Cunningham, RB & Nix, HA 1996. Designing surveys for microchiropteran bats in complex forest landscapes – a pilot study from south-east Australia. *Forest Ecology and management* 85(1-3):149-161.
- Minton, C., & J. Whitelaw 2000. Waders roosting on mangroves. *Stilt*. 37:23-24.
- Morcombe, M 2004. Field Guide to Australian Birds, Queensland, Australia, Steve Parish Publishing Archer Field.
- Parker, S.A. 1980. Birds and conservation parks in the north-east of South Australia. *South Australian Parks and Conservation*. 3:11-18.
- Pavey, C 2006. National Recovery Plan for the Greater Bilby *Macrotis lagotis*. Northern Territory Department of Natural Resources, Environment and the Arts.
- Rogers, D. 1999b. Roost choice in the waders of Roebuck Bay: is avoiding heat stress their main consideration?. *Stilt*. 35:65.
- Rogers, D. 2001. Conservation and ecology of migratory shorebirds in Roebuck Bay, north-western Australia. Wetlands Unit, Environment Australia.
- Schodde, R. & I.J. Mason 1999. The Directory of Australian Birds: Passerines. Melbourne, Victoria: CSIRO
- Southgate, R., R. Paltridge, P. Masters & S. Carthew 2007. Bilby distribution and fire: A test of alternative models of habitat suitability in the Tanami Desert, Australia. *Ecography*. 30:759-776.
- Smith, L. E and Chafer, C. J 1987. The avifauna of Bass Point, New South Wales. *Australian Birds*. 21:1-18.
- Start, A. N. 1996. A Review of the Conservation status of the Ngadji (Western Pebble-mound Mouse) *Pseudomys chapmani*. Kitchener, 1980 (Rodentia Muridae). Department of Conservation and Land Management Science and Information Division.
- Stewart, D., A. Rogers & D.I. Rogers 2007. Species description. In: Geering, A., L. Agnew & S. Harding, eds. *Shorebirds of Australia*. Page(s) 75-196. Melbourne: CSIRO Publishing.
- Storr, GM 1980. Birds of the Kimberley Division, Western Australia, Special Publications of the Western Australian Museum, No. 11, pp 1-117, Perth, Western Australia, Western Australian Museum.
- Tutt, M. S. Mitchell, P. Brace & D. Pearson 2002. Conserving Pilbara olive pythons on the Burrup. Threatened Species Network community grants annual report, Project WA04/100. Karratha: Nickol Bay Naturalists' Club/WA CALM.

Wilson, S and Swan, G 2017. A Complete Guide to Reptiles of Australia, 5th Edition, Sydney Australia, New Holland Press

Watkins, D. 1993. A national plan for shorebird conservation in Australia. Australasian Wader Studies Group, Royal Australasian Ornithologists Union, and World Wide Fund for Nature, 1993

Van Dyck, S and Strahan, R 2008. The Mammals of Australia, third edition, Sydney, Australia, New Holland Publishers.

# Appendices

# **Appendix A** - (Figures)

*Figure 1 Survey Area Location*

*Figure 2 Biological Constraints*

*Figure 3 Survey Methods*

*Figure 4 Fauna Habitat Types*

*Figure 5 Fauna Results*

## **Appendix B** - (Relevant legislation, conservation codes and background information)

## **Appendix C - (Species Recorded)**

*Species recorded from the survey area*

Family	Genus	Species	Common Name	Status	Observed	Observed
Birds					10-13 June	22-24 July
Acanthizidae	<i>Smicrornis</i>	<i>brevirostris</i>	Weebill		8	
Acanthizidae	<i>Gerygone</i>	<i>tenebrosa</i>	Dusky Gerygone		2	
Accipitridae	<i>Aquila</i>	<i>audax</i>	Wedge-tailed Eagle		2	1
Accipitridae	<i>Circus</i>	<i>assimilis</i>	Spotted Harrier		1	1
Accipitridae	<i>Elanus</i>	<i>axillaris</i>	Black-shouldered Kite		2	1
Accipitridae	<i>Haliaeetus</i>	<i>leucogaster</i>	White-bellied Sea Eagle		4	1
Accipitridae	<i>Haliastur</i>	<i>indus</i>	Brahminy Kite		1	1
Accipitridae	<i>Haliastur</i>	<i>sphenurus</i>	Whistling Kite		3	2
Accipitridae	<i>Milvus</i>	<i>migrans</i>	Black Kite		23	5
Aegothelidae	<i>Aegotheles</i>	<i>cristatus</i>	Australian Owlet-nightjar		1	
Alaudidae	<i>Mirafra</i>	<i>javanica</i>	Horsefield's Bushlark			2
Ardeidae	<i>Egretta</i>	<i>novaeollandiae</i>	White-faced Heron		1	
Artamidae	<i>Artamus</i>	<i>cinereus</i>	Black-faced Woodswallow		8	2
Artamidae	<i>Artamus</i>	<i>leucorhynchus</i>	White-breasted Woodswallow		2	
Artamidae	<i>Artamus</i>	<i>minor</i>	Little Woodswallow		2	
Artamidae	<i>Cracticus</i>	<i>nigrogularis</i>	Pied Butcherbird		2	3
Cacatuidae	<i>Cacatua</i>	<i>sanguinea</i>	Little Corella		24	12
Cacatuidae	<i>Eolophus</i>	<i>roseicapilla</i>	Galah		60	26
Cacatuidae	<i>Nymphicus</i>	<i>hollandicus</i>	Cockatiel		8	6
Campephagidae	<i>Coracina</i>	<i>novaeollandiae</i>	Black-faced Cuckoo-Shrike		3	1
Campephagidae	<i>Lalage</i>	<i>sueurii</i>	White-winged Triller		4	
Columbidae	<i>Phaps</i>	<i>chalcoptera</i>	Common Bronzewing			1
Columbidae	<i>Geophaps</i>	<i>plumifera</i>	Spinifex Pigeon		12	7
Columbidae	<i>Geopelia</i>	<i>cuneata</i>	Diamond Dove		4	
Columbidae	<i>Geopelia</i>	<i>striata</i>	Peaceful Dove		2	
Columbidae	<i>Ocyphaps</i>	<i>lophotes</i>	Crested Pigeon		4	6
Corvidae	<i>Corvus</i>	<i>orru</i>	Torresian Crow		4	6
Cuculidae	<i>Chalcites</i>	<i>basilis</i>	Horsefield's Bronze-cuckoo			1
Cuculidae	<i>Cacomantis</i>	<i>pallidus</i>	Pallid Cuckoo		1	
Estrildidae	<i>Emblema</i>	<i>pictum</i>	Painted Finch		4	
Estrildidae	<i>Taeniopygia</i>	<i>guttata</i>	Zebra Finch		52	18

Family	Genus	Species	Common Name	Status	Observed	Observed
Falconidae	<i>Falco</i>	<i>cenchroides</i>	Nankeen Kestrel		2	5
Falconidae	<i>Falco</i>	<i>berigora</i>	Brown Falcon		2	3
Falconidae	<i>Falco</i>	<i>longipennis</i>	Hobby Falcon		1	
Halcyonidae	<i>Todiramphus</i>	<i>pyrrhopygius</i>	Red-backed Kingfisher		6	1
Hirundinidae	<i>Hirundo</i>	<i>neoxena</i>	Welcome Swallow		5	
Hirundinidae	<i>Petrochelidon</i>	<i>nigricans</i>	Tree Martin		3	6
Maluridae	<i>Malurus</i>	<i>lamberti</i>	Variiegated Fairy-wren			4
Maluridae	<i>Malurus</i>	<i>leucopterus</i>	White-winged Fairy-wren			6
Megaluridae	<i>Cincloramphus</i>	<i>cruralis</i>	Brown Songlark		5	1
Megaluridae	<i>Cincloramphus</i>	<i>mathewsi</i>	Rufous Songlark		13	5
Megaluridae	<i>Eremiornis</i>	<i>carteri</i>	Spinifexbird			2
Meliphagidae	<i>Epthianura</i>	<i>tricolor</i>	Crimson Chat		8	6
Meliphagidae	<i>Lichenostomus</i>	<i>penicillatus</i>	White-plumed Honeyeater		14	2
Meliphagidae	<i>Lichenostomus</i>	<i>virescens</i>	Singing Honeyeater		5	4
Meliphagidae	<i>Lichmera</i>	<i>indistincta</i>	Brown Honeyeater		1	
Meliphagidae	<i>Manorina</i>	<i>flavigula</i>	Yellow-throated Miner		16	4
Meropidae	<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater		4	4
Monarchidae	<i>Grallina</i>	<i>cyanoleuca</i>	Magpie-lark		4	1
Motacillidae	<i>Anthus</i>	<i>novaeeseelandiae</i>	Australasian Pipit		3	2
Otididae	<i>Ardeotis</i>	<i>australis</i>	Australian Bustard			prints
Pachycephalidae	<i>Colluricincla</i>	<i>harmonica</i>	Grey Shrike-thrush		1	
Psittacidae	<i>Barnardius</i>	<i>zonarius</i>	Port Lincoln Parrot		2	
Psittacidae	<i>Melopsittacus</i>	<i>undulatus</i>	Budgerigar		18	24
Ptilonorhynchidae	<i>Ptilonorhynchus</i>	<i>guttatus</i>	Western Bowerbird		1	
Rhipiduridae	<i>Rhipidura</i>	<i>leucophrys</i>	Willie Wagtail		4	6
Threskiornithidae	<i>Threskiornis</i>	<i>spinicollis</i>	Straw-necked Ibis		6	
Tunicidae	<i>Turnix</i>	<i>velox</i>	Little Button-quail		2	
Zosteropidae	<i>Zosterops</i>	<i>luteus</i>	Yellow White-eye		6	
<b>Reptiles</b>						
Agamidae	<i>Gowidon</i>	<i>longirostris</i>	Long-snouted Water Dragon		1	
Agamidae	<i>Ctenophorus</i>	<i>caudicinctus caudicinctus</i>	Ringtail Dragon		4	
Agamidae	<i>Ctenophorus</i>	<i>isolepis isolepis</i>	Central Military Dragon		6	
Gekkonidae	<i>Gehyra</i>	<i>punctata</i>	Spotted Dtella		3	
Gekkonidae	<i>Gehyra</i>	<i>variegata or crypta</i>	Dtella		1	3

Family	Genus	Species	Common Name	Status	Observed	Observed
Gekkonidae	<i>Gehyra</i>	<i>variegata</i>	Tree Dtella			1
Gekkonidae	<i>Heteronotia</i>	<i>binoei</i>	Bynoe's Gecko		2	5
Scincidae	<i>Ctenotus</i>	<i>pantherinus ocellifer</i>	Panther's Skink		3	1
Scincidae	<i>Ctenotus</i>	<i>saxatilis</i>	Rock Ctenotus		7	1
Scincidae	<i>Lerista</i>	<i>clara</i>	Sharp-blazed Three-toed Skink		3	
Scincidae	<i>Lerista</i>	<i>onsloviana</i>	Onslow Broad-striped Slider		4	
Scincidae	<i>Menetia</i>	<i>surda surda</i>	Surd's Dwarf Skink		1	
Varanidae	<i>Varanus</i>	<i>panoptes rubidus</i>	Yellow spotted Monitor		1	1
<b>Mammals</b>						
Bovidae	<i>Bos</i>	<i>taurus</i>	Cow	intro		scats
Canidae	<i>Canus</i>	<i>lupis domesticus</i>	Dog	intro	1	scats
Dasyuridae	<i>Pseudantechinus</i>	<i>woolleyae</i>	Woolley's False antechinus		camera	
Felidae	<i>Felis</i>	<i>catus</i>	Cat	intro	camera, 1	prints
Macropodidae	<i>Macropus</i>	<i>robustus</i>	Euro		14	2
Macropodidae	<i>Macropus</i>	<i>rufus</i>	Red Kangaroo			12
Macropodidae	<i>Petrogale</i>	<i>rothchildi</i>	Rothchilds Rock Wallaby		camera	
Molossidae	<i>Austronomus</i>	<i>australis</i>	White-striped freetail Bat		D	X
Molossidae	<i>Chaerephon</i>	<i>jobensis</i>	Northern Freetail Bat		PR	
Molossidae	<i>Mormopetrus</i>	<i>Ozimops lumsdenae</i>	Northern Free-tail Bat		PR	
Muridae	<i>Rattus</i>	<i>rattus</i>	Black Rat	intro	camera	
Tachyglossidae	<i>Tachyglossus</i>	<i>aculeatus</i>	Echidna		X	digs

Key

3, numbers recorded

intro, introduced species

camera, identified via remote camera

X, Present, identified from echolocation

Pr, Probable, probably present identified from echolocation either as this species or to species group

Mi, Migratory under EPBC Act

IA, International Agreement under BC Act

P1, 4, Priority species under DBCA

## **Appendix D** - (Likelihood of Occurrence)

## Parameters of fauna likelihood of occurrence assessment

Assessment outcome	Description
Present	Species recorded during the field survey or from recent, reliable records from within or close proximity to the survey area.
Likely	Species are <b>likely</b> to occur in the survey area where there is suitable habitat within the survey area and there are recent records of occurrence of the species in close proximity to the survey area. OR Species known distribution overlaps with the survey area and there is suitable habitat within the survey area.
Unlikely	Species assessed as <b>unlikely</b> include those species previously recorded within 5 km of the survey area however: <ul style="list-style-type: none"> <li>• There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the survey area.</li> <li>• The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.</li> </ul> OR Those species that have a known distribution overlapping with the survey area however: <ul style="list-style-type: none"> <li>• There is limited habitat in the survey area (i.e. the type, quality and quantity of the habitat is generally poor or restricted).</li> <li>• The suitable habitat within the survey area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the survey area.</li> </ul>
Highly unlikely	Species that are considered <b>highly unlikely</b> to occur in the survey area include: <ul style="list-style-type: none"> <li>• Those species that have no suitable habitat within the survey area.</li> <li>• Those species that have become locally extinct, or are not known to have ever been present in the region of the survey area.</li> </ul>

**Definitions:** Survey area = a 20 km buffer around the survey area

### Source information - desktop searches

PMST – DoEE Protected Matters Search Tool (PMST) to identify fauna listed under the EPBC Act potentially occurring within the survey area

DBCA – DBCA (2007 - ) records of threatened fauna, database search within the survey area (accessed March 2019)

NM – DBCA NatureMap (accessed March 2019)

**Table 8 Fauna likelihood of occurrence assessment**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
<b>Birds</b>								
Common Sandpiper <i>(Actitis hypoleucos)</i>	IA	Mi	X	X	X	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (Geering et al. 2007; Higgins & Davies 1996). Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area	<b>Unlikely – No estuarine areas or water-bodies are present in the survey area.</b>
Ruddy Turnstone <i>(Arenaria interpres)</i>	IA	Mi	X		X	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In north Australia it is known to occur in a wide variety of habitats, and may prefer wide mudflats. Surveys demonstrate that the species can live away from coastal areas in habitats such river beds, and on inland lakes and adjacent farmland (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – No suitable habitat exists in the survey area.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Curlew Sandpiper <i>(Calidris ferruginea)</i>	Cr	Cr	X	X	X	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – No suitable habitat exists in the survey area.</b>
Red Knot <i>(Caladris canutus)</i>	IA	EN	X	X	X	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – No suitable habitat exists in the survey area.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Greater Knot <i>(Calidris tenuirostris)</i>	Cr	CR	X	X	X	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps (Higgins & Davies 1996). Typically, the Great Knot roosts in large groups in open areas, often at the waters edge or in shallow water close to feeding grounds (Higgins & Davies 1996; Rogers 2001). It is known that in hot conditions, waders prefer to roost where a damp substrate lowers the local temperature (Rogers 1999b). A group of approximately 8610 birds have been recorded roosting at an inland claypan near Roebuck Bay in north-west Western Australia (Collins et al. 2001).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – No suitable habitat exists in the survey area</b>
Greater Sand Plover <i>(Charadrius leschenaultii)</i>	Vu	VU	X	X	X	In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. They are occasionally recorded on near-coastal saltworks and saltlakes, including marginal saltmarsh, and on brackish swamps (Stewart et al. 2007).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Lesser Sand Plover <i>(Charadrius mongolus)</i>	En	EN	X	X	X	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. In north-western Australia, the species appears to use the Port Hedland saltworks in preference to nearby beaches. The species is seldom recorded away from the coast, at margins of lakes, soaks and swamps associated with artesian bores (Marchant & Higgins 1993).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>
Bar-tailed Godwit <i>(Limosa lapponica baueri)</i> Western Alaskan Population	Vu	VU	X	X	X	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas (Marchant & Higgins 1993).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>
Bar-tailed Godwit <i>(Limosa lapponica menzbieri)</i> Northern Siberian Population	Cr	CR		X	X	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas (Marchant & Higgins 1993).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Black-tailed Godwit <i>(Limosa limosa)</i>	IA	MI	X	X	X	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>
Eastern Curlew <i>(Numenius madagascariensis)</i>	Vu	CR	X	X	X	The Eastern Curlew is a large non-breeding migratory shorebird, found commonly along the north coast of Western Australia, but rarely south of Shark Bay. The species is found along the coastline from Barrow Island and Dampier Archipelago, through the Kimberley in WA to the NT. It is found in estuaries, bays, harbours, inlets and coastal lagoons, saltworks and sewerage farms, areas (e.g. intertidal mudflats or sandflats fringed by mangroves) often with beds of seagrass and occasionally on ocean beaches, coral reefs, rock platforms and rocky islets. The Eastern Curlew forages on soft, sheltered, intertidal sand- or mudflats, often near mangroves, on saltflats, saltmarshes, rock pools, coastal reefs and ocean beaches near the tideline. The species roosts in large flocks, separate from other waders on sandy spits and islets, dry beach sand near the high-water mark, among coastal vegetation (including low saltmarsh and mangroves) and occasionally reef-flats, in the shallow water of lagoons, near-coastal wetlands and trees (Morcombe 2004).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Little Curlew <i>(Numenius minutus)</i>	IA	Mi	X		X	When resting during the heat of day, the Little Curlew congregates around pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs. The species prefers pools with bare dry mud (including mudbanks in shallow water) and they do not use pools if they are totally dry, flooded or heavily vegetated (Higgins & Davies 1996). Birds may also rest in grassy, open woodlands and on bare blacksoil plains, or on dry or recently burnt grasslands on floodplains, which may be without vegetation for hundreds of metres, and occasionally on mudflats when nearby grasslands are unburnt, or around swamps. Resting has also been recorded under partly submerged vegetation. After freshwater pools dry up, roosting may occur in the shallows of reservoirs and the sea (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area,	<b>Unlikely – opportunistic visitor/no suitable habitat for the species in the survey area</b>
Whimbrel <i>(Numenius phaeopus)</i>	IA	Mi	X	X	X	The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, un-vegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields (Higgins & Davies 1996). There are a small number of inland records from saline lakes and canegrass swamps (Jarman 1978). It has also been recorded in coastal dunes and on a football field (Smith & Chafer 1987).	This species has been recorded within 20 km of the survey area	<b>Unlikely – however use is opportunistic, limited and irregular with limited habitat present.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Osprey <i>(Pandion haliaetus)</i>	IA	Mi	X	X	X	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays. Often nests in elevated artificial structures.	This species has been recorded within 20 km of the survey area.	<b>Highly unlikely – No suitable habitat in the survey area</b>
Red-necked Phalarope <i>(Phalaropus lobatus)</i>	IA	Mi		X		During the non-breeding period the Red-necked Phalarope occurs mainly at sea. It is commonly sighted in Australia from mid-October to early-April, where it is recorded at both inland and coastal lakes/swamps, including highly saline waters and artificial wetlands notably saltworks. In WA the species has been seen on Rottneest Island, Pelican Point, the Swan River, Port Hedland Saltworks, the Eyre Bird Observatory and Hinds Lake Nature Reserve (DotE 2016).	The species has not been recorded within 20 km of the survey area.	<b>Highly unlikely – No suitable habitat present in the survey area</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Sanderling ( <i>Calidris alba</i> )	IA	Mi	X		X	In Australia, the Sanderling is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops. Less often the species occurs on more sheltered sandy shorelines of estuaries, inlets and harbours. Rarely, they are recorded in near-coastal wetlands. There are rare inland records from sandy shores of ephemeral brackish lakes and brackish river-pools. They occur on most of the coast from Eyre to Derby, and also around Wyndham. They are more often recorded on the south and southwest coasts, north to around southern Shark Bay, with more sparsely scattered records further north in Gascoyne and Pilbara Regions and the Kimberley Division (DotE 2016).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>
Red-necked Stint ( <i>Calidris ruficollis</i> )	IA	Mi	X		X	In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – opportunistic visitor/no suitable habitat for the species in the survey area</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Long-toed Stint <i>(Calidris subminuta)</i>	IA	Mi	X		X	In Australia, the Long-toed Stint occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has also been observed at open, less vegetated shores of larger lakes and ponds and is common on muddy fringes of drying ephemeral lakes and swamps. The Long-toed Stint also frequents permanent wetlands such as reservoirs and artificial lakes. They are uncommon, but not unknown, at tidal estuaries, saline lakes, saltponds and bore swamps (Higgins & Davies 1996). The Long-toed Stint forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands. They occasionally feed on open water, well away from the shore; this is more common in drying ephemeral wetlands. They roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water. It also roosts in small depressions in the mud (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area	<b>Highly unlikely – no suitable habitat for the species in the survey area</b>
Pin-tailed Snipe <i>(Gallinago stenura)</i>	IA	Mi	X		X	During non-breeding periods the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands. In WA the species was reported in the Pilbara, Port Headland, Myaree Pool, Maitland River and near Karratha. In Pilbara the distribution is believed to be bound by Pardoo (Banningarra Spring) and the lower Maitland River and Shay Gap (DotE 2016).	Recorded historically in study area	<b>Unlikely – No suitable habitat in survey area</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Night Parrot <i>(Pezoporus occidentalis)</i>	Cr	En		X		The Night Parrot inhabits arid and semi-arid inland areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of <i>Triodia</i> grasslands in stony or sandy environments and of samphire and chenopod shrublands, including genera such as <i>Atriplex</i> , <i>Bassia</i> and <i>Maireana</i> , on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (Parker, 1980). It has also been observed to enter dense <i>Muehlenbecki</i> growth when flushed from a more typical habitat (Boles et al. 1994).	Identified as potentially occurring species (PMST) based on historical (limited) records in Pilbara region.	<b>Unlikely – Some suitable habitat exists in the survey area (Triodia on stony soils), but the area is outside of the modelled distribution for the species.</b>
Australian Painted Snipe <i>(Rostratula australis)</i>	En	En		X		The Australian Painted Snipe is rarely seen as it is extremely secretive, keeping to dense vegetation of swamps, emerging only in subdued light of dawn and dusk. The preferred habitat of this species includes surrounds and shallows of wetlands that are well vegetated with dense low cover (Morcombe 2004).	Identified as potentially occurring species (PMST) in the study area but no records exist.	<b>Highly Unlikely - Unlikely – Habitat is not suitable in the survey area</b>
Gull-billed Tern <i>(Gelocheidon nilotica)</i>	IA	Mi	X		X	The Gull-billed Tern is a nomadic or migratory species in Australia. Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands, where resources are favourable (Morcombe 2004). They are only rarely found over the ocean. The Gull-billed Tern. Although essentially an inland species, outside breeding season it shows a distinct preference for saltmarshes and lagoons near the coast. Movements are not fully understood but it is common and widespread in Australia (Morcombe 2004).	Identified as potentially occurring species (PMST) in the study area	<b>Highly Unlikely – no suitable habitat in the survey area.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
White-winged Black Tern <i>(Chlidonias leucopterus)</i>	IA		X		X	In Australia, the White-Winged Tern mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. They frequent tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats. Terrestrial wetlands, including swamps, lakes, billabongs, rivers, floodplains, reservoirs, saltworks, sewage ponds and outfalls are also inhabited. Wetlands may be open, or with floating emergent or marginal vegetation. Most breeding is on vegetated, freshwater inland wetlands. The species is widespread on the southern west coast, north to Mongers Lake, and also on coasts of the Pilbara region and Kimberley Division, with occasional records farther inland, mainly along major river systems, such as the Ord. The species only rarely occurs in the Gascoyne Region of the central-western coast, and is occasionally recorded along the southern coast (DotE 2016).	Identified as potentially occurring species (PMST) in the study area	<b>Highly unlikely – No suitable habitat in the survey area</b>
Bridled Tern <i>(Onychoprion anaethetus)</i>	IA	Ma	X	X	X	Bridled Terns occupy tropical and subtropical seas, breeding on islands, including vegetated coral cays, rocky continental islands and rock stacks. They are only rarely found in inshore continental waters and along mainland coastlines, though the species is reported to breed on the mainland of far southern WA. In WA, breeding is widespread from islands off Cape Leeuwin north to Shark Bay and in Pilbara region and Kimberley Division. At sea, distribution extends from Cape Leeuwin north to Dirk Hartog Island, with isolated mainland coastal records at Point Maud and Ningaloo, and from Barrow Island to the Dampier Archipelago, and at sea off the Kimberley coast from waters west of the Dampier Peninsula to Ashmore Reef and Joseph Bonaparte Gulf (DotE 2016).	This species has been recorded within 1 km of the survey area in the saltworks and breeding recorded within the Maitland Industrial Estate. however limited habitat is present for the species in the survey area.	<b>Likely –however use is opportunistic, limited and irregular.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Roseate Tern <i>(Sterna dougallii)</i>	IA	Ma	X	X	X	The Roseate Tern occurs in coastal and marine areas in subtropical and tropical seas. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands. Birds rarely occur in inshore waters or near the mainland, usually venturing into these areas only accidentally, when nesting islands are nearby. In WA, the subspecies is regularly recorded north from Mandurah to around Eighty Mile Beach. Around the Kimberley coastline, the subspecies occurs at scattered sites, north to the Bonaparte Archipelago and possibly further. The subspecies used to be a sporadic visitor to the southwest, but occurs regularly at present. In addition, breeding colonies have been established on Lancelin Island and Second Rock (DotE 2016).	This species has been recorded within 1 km of the survey area in the saltworks.	<b>Unlikely –Habitat is not suitable in the survey area</b>
Common Tern <i>(Sterna hirundo)</i>	IA	Mi	X		X	Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores. Occasionally they are recorded in coastal and near-coastal wetlands, either saline or freshwater, including lagoons, rivers, lakes, swamps and saltworks. Sometimes they occur in mangroves or saltmarsh and, in bad weather, in coastal sand-dunes or coastal embayments. In WA, the species is rarely recorded south of approximately 30° S, with only scattered records north of there to the Kimberley Division (DotE 2016).	This species has been recorded within 1 km of the survey area in the saltworks.	<b>Unlikely –habitat in the survey area is not suitable.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Little Tern ( <i>Sternula albifrons</i> )	IA	Mi	X		X	In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches. One of its breeding populations is found across northern Australia, from about Broome to the Gulf of Carpentaria and eastern Cape York Peninsula. Non-breeding birds extend farther around the Australian coast than known breeding colonies. In WA the species regularly occurs south to approximately 20° S, with occasional records south of there (e.g. Shark Bay) (DotE 2016).	This species has been recorded within 2 km of the survey area in the saltworks.	<b>Unlikely –Habitat is not suitable in the survey area</b>
Caspian Tern ( <i>Sterna caspia</i> )	IA	Mi	X	X	X	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially, waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs (Higgins & Davis 1996). The Caspian Tern usually forages in open wetlands, including lakes and rivers. They often prefer sheltered shallow water near the margins, but can also be found in open coastal waters. In coastal inlets they may prefer to forage in tidal channels, or over submerged mudbanks (Higgins & Davis 1996).	This species has been recorded within 1 km of the survey area in the saltworks.	<b>Unlikely – the habitat in the survey area is not suitable</b>
Crested Tern ( <i>Thalasseus bergii</i> )	IA	Ma	X	X	X	A common tern to coastal regions of Australia. A large species with a large straw yellow bill, white body and black legs. The black cap and slight crest is also evident. The species preferred habitat is primarily coastal and off shore waters including beaches, bays, inlets, tidal rivers, swamps, lakes and large rivers (Higgins & Davis 1996).	This species has been recorded within 1 km of the survey area in the saltworks.	<b>Unlikely – no suitable habitat is present in the survey area.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Australian Fairy Tern <i>(Sternula nereis subsp. nereis)</i>	VU	VU	X	X	X	The habitat of the fairy tern is essentially marine, including sheltered coasts, bays, inlets, estuaries, coastal lagoons, ocean beaches but rarely out to sea or out of sight of land. They also inhabit wetlands near the coast including salt ponds and lakes. This species favours sites with sand spits and small sand islets in river mouth channels (Morcombe 2004).	This species has been recorded within 1 km of the survey area in the saltworks.	<b>Unlikely –Habitat is not suitable for this species in the survey area.</b>
Grey-tailed Tattler <i>(Tringa brevipes)</i>	P4, IA	Ma, Mi,	X	X	X	The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. It is less often on open flat sandy beaches or sandbanks, especially around accumulated seaweed or isolated clumps of dead coral. It is occasionally found around near-coastal wetlands, such as lagoons and lakes and ponds in sewage farms and saltworks. Inland records for the species are rare with sightings on river banks and the edges of rock pools (Higgins & Davies 1996).	This species has been recorded within 1 km of the survey area.	<b>Unlikely –habitat in the survey area is marginal as only small ephemeral drainage lines exist</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Marsh Sandpiper <i>(Tringa stagnatilis)</i>	IA	Mi	X	X	X	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats (Higgins & Davies 1996), although surveys in Kakadu recorded more birds around shallow freshwater lakes than in areas influenced by tide (Bamford 1988). Three of the five sites with highest recorded numbers are saltwater habitats (Hunter Estuary, NSW; Port Hedland Saltworks, Western Australia; Tullakool Evaporation Ponds, NSW) (Watkins 1993). In Western Australia they prefer freshwater to marine environments. In south-east Australia they prefer inland saline lakes and coastal saltworks. They are found infrequently around mangroves (Higgins & Davies 1996).	This species has been recorded within 1 km of the survey area.	<b>Unlikely –Habitat in the survey area is not suitable.</b>
Common Redshank <i>(Tringa totanus)</i>	IA	Mi		X		The Common Redshank is found at sheltered coastal wetlands such as bays, river estuaries, lagoons, inlets and saltmarsh (with bare open flats and banks of mud or sand). They are also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms (Higgins & Davies 1996). The Common Redshank has been observed feeding in shallow water, on wet bare mud or sand, or on algal deposits, round the edges of wetlands, near rocks or samphire (Higgins & Davies 1996). They have been recorded roosting on small elevated areas such as estuarine sandbars and muddy islets surrounded by water (Higgins & Davies 1996).	Species identified in the PMST search with potential to occur, but no records exist in the area.	<b>Unlikely –habitat present in survey area is not suitable.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Broad-billed Sandpiper  <i>(Limicola falcinellus)</i>	IA	Mi	X		X	The Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby. Occasionally they occur on reefs or rocky platforms. They have also been recorded in creeks, swamps and lakes near the coast, particularly those with bare mudflats or sand exposed by receding water. They often favour mud among, or fringed by, mangroves, particularly on the seaward side and sometimes occur in estuaries edged by saltmarsh. They are rarely recorded inland. Foraging occurs on exposed flats of soft mud or wet sand at edges of coastal and near-coastal wetlands, often around channels on mudflats or in accumulated mud in swales between shell banks. In northern Australia, they forage in soft mud near mangroves, but may remain on same muddy section, even though fresher substrate may be exposed by the receding tide. They also forage in shallow water on muddy edges of ponds. They roost on the banks of sheltered sandy, shelly or shingly beaches (Higgins & Davies 1996). They nest on the ground, frequently in the top of a tussock (Cramp 1985).	This species has been recorded within 2 km of the survey area. .	<b>Unlikely –Habitat in the survey area is not suitable.</b>
Peregrine Falcon  <i>(Falco peregrinus)</i>	OS		X		X	The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, from coastal heath to alpine. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2004).	Nearest records are 25 km north of the survey area. The	<b>Likely – regular visitor or resident to survey area, foraging habitat only</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Sharp-tailed Sandpiper  ( <i>Calidris acuminata</i> )	IA	Mi	X	X	X	In WA, scattered records occur along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division. Inland records indicate the species is widespread and scattered from Newman, east to Lake Cohen, south to Boulder and west to Meekatharra (Higgins & Davies 1996). The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation including lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They tend to occupy coastal mudflats mainly after ephemeral. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996). They have also been recorded roosting in mangroves (Minton & Whitelaw 2000).	This species has been recorded adjacent to the survey area (~ 1 km),	<b>Unlikely –Habitat is marginal for suitability in the survey area.</b>
Grey Plover  ( <i>Pluvialis squatarola</i> )	IA	Mi	X	X	X	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes (Marchant & Higgins 1993).	This species has been recorded within 1 km of the survey area.	<b>Unlikely – Habitat is marginal for suitability in the survey area.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Pacific Golden Plover <i>(Pluvialis fulva)</i>	IA	Mi	X	X	X	In Australia the Pacific Golden Plover usually inhabits coastal habitats, on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in saltworks. It is sometimes recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, but can be seen in habitats with short grass in paddocks, crops or airstrips, or ploughed or recently burnt areas. In WA, the species is seldom recorded along the southern or south-western coasts (DotE 2016).	This species has been recorded within 2 km of the survey area.	<b>Unlikely –Habitat in the survey area is not suitable.</b>
Oriental Plover <i>(Charadrius veredus)</i>	IA	Mi	X	X	X	Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland. Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps or open areas that have been recently burnt (Storr, 1980).	This species has been recorded within 2 km of the survey area, habitat is present for the species in and adjacent to the survey area.	<b>Likely –however use is opportunistic, limited and irregular.</b>
Fork-tailed Swift <i>(Apus pacificus)</i>	IA	Mi	X	X	X	In WA there are sparsely scattered records along the south coast, ranging from the Eyre Bird Observatory and west to Denmark. They are widespread in coastal and sub-coastal areas between Augusta and Port Hedland, including some on nearshore and offshore islands. This species is almost exclusively aerial, flying less than 1 m to at least 300 m above ground. This species is considered rare in the south-west region (DSEWPac 2013).	No habitat present and the species is predominantly aerial utilising terrestrial environments rarely.	<b>Unlikely – No habitat present, not known from the survey area. Use would be very opportunistic and rare.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Oriental Pratincole <i>(Glareola maldivarum)</i>	IA	Mi	X	X	X	In non-breeding grounds in Australia, the Oriental Pratincole usually inhabits open plains, floodplains or short grassland (including farmland or airstrips), often with extensive bare areas. They often occur near terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins. The species also occurs along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons (Lloyd and Lloyd, 1991).	This species has been recorded within 20 km of the survey area, habitat is present for the species in and adjacent to the survey area.	<b>Likely –however use is opportunistic, limited and irregular.</b>
Common Greenshank <i>(Tringa nebularia)</i>	IA	Mi	X	X	X	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetland and has the widest distribution of any shorebird in Australia (DSEWPac 2013).	This species has been recorded within 20 km of the survey area and some habitat is present for the species.	<b>Unlikely –No suitable wetland habitat available in the survey area</b>
Pectoral Sandpiper <i>(Calidris melanotos)</i>	IA	MI		X		In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies 1996).	No records of the species are present in the region.	<b>Unlikely – Suitable habitat is not available in the survey area.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Terek Sandpiper ( <i>Xenus cinereus</i> )	IA	Mi	X	X	X	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire ( <i>Halosarcia</i> spp.). Birds are seldom near the edge of water, however, birds may wade into the water (Marchant & Higgins 1993). Less often seen on sandy or shingle beaches, or on rock or coral reefs or platforms, Terek Sandpipers are occasionally sighted around drying sewage ponds and salt pans if surrounded by mudflats. The species is also found around brackish coastal swamps, lagoons and dune-lakes; and also on gravel or rocky edges of estuarine pools and freshwater river-pools (Marchant & Higgins 1993). Very occasionally, birds use swampy, grassy or cultivated paddocks near the coast (Marchant & Higgins 1993). Preferring to roost in or among mangroves, birds may perch in branches or roots up to 2 m from the ground, or beneath them in the shade on hot days. Occasionally, they roost in dead trees or among tangled driftwood. Elsewhere, they may roost with other waders on flat shores, on muddy spits, islets or banks, and sometimes on sandy and pebbly beaches (Marchant & Higgins 1993).	Several records are present in adjacent the survey area in the coastal habitats.	<b>Unlikely – no suitable habitat present</b>
Wood Sandpiper ( <i>Tringa glareola</i> )	IA	Mi	X		X	The Wood Sandpiper is a seasonal visitor to Australia and has its largest numbers recorded in north-west Australia (Roebuck Bay near to Broome). Off the <i>Tringa</i> group (like the Common Greenshank) the Wood Sandpiper utilises a broad range of habitat types throughout Western Australia. Typical habitat includes well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. This species does not breed in Australia (DSEWPaC 2013).	This species has been recorded within 20 km of the survey area. Numerous records occur at Karratha and Cape Lambert.	<b>Unlikely – the survey area does not contain suitable wetland habitat.</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Barn Swallow <i>(Hirundo rustica)</i>	IA	Mi	X	X	X	In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland (Schodde et al 1999).	Species has not been recorded in the survey area. Four records are present and associated to the estuary side of the saltworks	<b>Unlikely – No habitat present, not known from the survey area.</b>
Glossy Ibis <i>(Plegadis falcinellus)</i>	IA	Mi	X		X	The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat is inland and northern floodplains (Marchant & Higgins 1993).	Species has not been recorded in the immediate area.	<b>Unlikely – No habitat present, not known from the area.</b>
Grey Wagtail <i>(Motacilla cinerea)</i>	IA	Mi		X		A migratory species that regularly visits northern Australia particularly the area from Broome to Darwin (Morcombe 2004). The species prefers coastal habitat near to water where it prefers to forage. However the species has been recorded further inland feeding on plains (Morcombe 2004).	Species has not been recorded in the immediate area.	<b>Unlikely – Limited habitat present, not known from the area. Can opportunistically use survey area</b>
Yellow Wagtail <i>(Motacilla cinerea)</i>	IA	Mi		X		A migratory species that regularly visits northern Australia particularly the area from Broome to Darwin (Morcombe 2004). The species prefers coastal habitat near to water where it prefers to forage. However the species has been recorded further inland feeding on plains (Morcombe 2004).	Some habitat present and the species has not been recorded in the immediate area.	<b>Unlikely – Limited habitat present, not known from the area. Can opportunistically use and area</b>
<b>Reptiles</b>								

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Airlie Island Skink <i>(Ctenotus angusticeps)</i>	P3	VU	X	X	X	This species was formerly known from only two widely separated localities in Western Australia: Airlie Island, off the north-west coast and Roebuck Bay, just south of Broome. On Airlie Island it inhabits Acacia shrublands, coastal spinifex and tussock grasses. On the mainland, the Airlie Island Ctenotus generally inhabits samphire shrubland in the intertidal zone along mangrove (Grey Mangrove ( <i>Avicennia marina</i> ) with occasional Red Mangrove ( <i>Rhizophora stylosa</i> ) margins, however, subtle differences in vegetation/topography exist among sites where the species has been recorded. The Roebuck Bay lizards have been observed on coastal mudflats vegetated with samphire (Wilson and Swan 2017). Recent surveys determined the species' distribution between Karratha and Broome therefore showing the distribution of this species is more widespread than previously thought.	The species has been recorded 3 km west of the survey area in the samphire areas fringing the coastal mudflats.	<b>Unlikely</b> – The survey area provides no habitat for the species as it is associated with samphire and mudflats typically fringing mangroves and where crab holes are present.
Lined Soil-crevice Skink <i>(Notoscincus butleri)</i>	P4		X		X	<i>Notoscincus butleri</i> is a pale coppery-brown skink with bold black vertebral and dorsal stripes, broad black upper lateral stripes, white mid-lateral stripes and a narrow dark ventrolateral stripe. This species range is restricted to arid, rocky areas of near-coastal Pilbara region. Habitat is found in spinifex dominated areas near creek and river margins (Wilson and Swan 2017).	There are historical records near to the survey area and numerous records occur within 20 km (particularly Karratha).	<b>Likely – resident within the survey area.</b> The survey area provides extensive suitable habitat for the species (hummock and tussock grasslands near drainage lines).

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Pilbara Olive Python  <i>(Liasis olivaceus subsp. barroni)</i>	VU	VU	X	X	X	The Olive Python (Pilbara subspecies) is a dull olive-brown to pale fawn or rich-brown python with a white underside and pale finely dotted lips. This species reaches an average size of 2.5 m but can grow up to 4 m long. The Olive Python's range is restricted to the Pilbara region, north Western Australia, and the Dampier Archipelago. Habitat consists of rocky escarpments, gorges and waterholes within the Pilbara region. The preferred microhabitats for this species are under rock piles, on top of rocks, and under spinifex as well as in man-made features such as overburden heaps, railway embankments and sewerage treatment ponds. The species' breeding season occurs from June to August, with males moving long distances in search of breeding females (Wilson and Swan 2017).	s. There are records on the Burrup Peninsula (20 km from the survey area).	<b>Unlikely</b> – The minor drainage lines in the survey area are regarded as limited habitat for the species.
<b>Mammals</b>								
Northern Quoll  <i>(Dasyurus hallucatus)</i>	En	En	X	X	X	The Northern Quoll once occurred across the majority of northern Australia but its range has significantly contracted. It occurs in the Pilbara region but in disjunct populations. The Northern Quoll inhabits a range of vegetation associations but is especially abundant on dissected rocky escarpment and eucalypt woodland within 200 km of the coast. It is known to den in rock crevices and rock piles and favours rocky areas. They are predominantly nocturnal but are occasionally active during the day, particularly during the mating season and are known to have a large home range (Van Dyck and Strahan 2008).	The species is known from the region, particularly from rocky areas or along drainage lines with wooded areas.	<b>Unlikely</b> – The minor drainage lines in the survey area are regarded as limited habitat for the species.

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Northern Short-tailed Mouse <i>(Leggadina lakedownensis)</i>	P4		X		X	The Lakeland Downs Mouse occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, tropical Eucalyptus and Melaleuca woodlands and stony ranges. Most habitats, however, are seasonally inundated on red or white sandy-clay soils. They are nocturnal, largely solitary, and individuals spend the day in simple, single-chambered burrows (Van Dyck and Strahan 2008).	There are historical records near to the survey area and numerous records occur within 20 km (particularly Karratha).	<b>Likely – resident within the survey area on the plain and in minor drainage lines.</b> The survey area provides extensive suitable habitat for the species (hummock and tussock grasslands on clay plains).
Western Pebble-mound Mouse <i>(Pseudomys chapmani)</i>	P4		X		X	The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the Western Pebble-mound Mouse can be found on stony hillsides with hummocky grasslands and little or no soil. It constructs large mounds of pebbles on stony slopes which cover an area of 0.5-9.0 square metres. 'Active' mounds are characterized by volcano-like cones capped by 'craters' that mark occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck and Strahan 2008).	Numerous records occur within 20 km (particularly Burrup Peninsula, hills behind Karratha and Cape Lambert areas). The populations on Burrup and around Karratha are presumed locally extinct.	<b>Unlikely –</b> The survey area provides some suitable habitat for the species (stony soils), but the species may be extinct in the area.

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Water Rat <i>(Hydromys chrysogaster)</i>	P4		X		X	The Water Rat lives in the vicinity of permanent bodies of fresh or brackish water, from sub-alpine streams to lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. It can travel considerable distance overland and is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck and Strahan 2008).	Records occur within 20 km (particularly Burrup Peninsula)	<b>Unlikely – unlikely resident within survey area, restricted to coastal water bodies in this area</b>
Ghost Bat <i>(Macroderma gigas)</i>	VU	VU	X	X	X	The Ghost Bat occurs in a wide range of habitats, and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia, and is sensitive to disturbance (Van Dyck and Strahan 2008).	The species is known from the region, however are restricted to caves, and old mine shafts. There are none of these recorded in the survey area. Foraging may occur across the survey area opportunistically.	<b>Unlikely – unlikely a resident within survey area, may opportunistically utilise to survey area for foraging.</b>
North-western Free-tail Bat <i>(Mormopterus (Ozimops) cobourgianus)</i>	P1				X	The Little North-western Freetail Bat occurs along the Western Australian coast from Lake McLeod to Point Torment, occurring sparsely across its range. The Western Australian populations have only been recorded from mangrove stands, particularly those that include mature mangroves (Van Dyck and Strahan 2008). It roosts in crevices and sprouts of the dead upper branches of the mangrove <i>Avicennia marina</i> . The genus for this species is in the process of being renamed in a taxonomic review of molossids by Terry Reardon, which has shown the genus <i>Mormopterus</i> does not occur in Australia (Churchill 2008).	The species is known from the region, however are restricted to mangroves	<b>Unlikely – There are no mangroves in the survey area</b>

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Greater Bilby <i>(Macrotis lagotis)</i>	VU	VU		X		The Greater Bilby distribution in Western Australia is restricted to the north, including the Pilbara, Sandy and Gibson Deserts. The Greater Bilby usually spends the daytime in burrows, often built against termite mounds, spinifex hummock or shrubs (Van Dyck and Strahan 2008). Extant population of the Greater Bilby occur in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils. It occupies three major vegetation types; open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas. Laterite and rock feature substrates are an important part of Greater Bilby habitat. After dark they leave their burrows to feed and populations are known to move long distances when current habitat ranges become unsuitable. Bilbies are largely solitary, widely dispersed and found in low numbers. The current occurrence of the Greater Bilby is strongly associated with higher rainfall and temperatures, which promote areas of higher plant and food production. (Pavey 2006; Southgate et al. 2007).	The nearest record is greater than 150 km from the survey area.	<b>Unlikely</b> – The survey area does not contain any suitable habitat for this species.

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Nearest record	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
<p>Pilbara Leaf-nosed Bat</p> <p><i>(Rhinonictoris aurantia)</i></p> <p>In the NatureMap search this species was reported as the Kimberley population although should have been the Pilbara population.</p>	VU	VU	X	X	X	<p>The Pilbara Leaf-nosed Bat roosts in deep caves or mines in the wet season and forages nearby. This species occurs in the Pilbara region where its populations are scattered and localised. There are a few known populations of this species in the western Pilbara, roosting in caves formed in gorges that dissect massive siliceous sedimentary geology. It is most often observed in flight over waterholes in gorges (Van Dyck and Strahan 2008). Optimal roosts are thought to occur in caves that form between ascending rock layers, where humidity is maintained from seeping groundwater (Van Dyck and Strahan 2008). Roosts are commonly located over pools of water, or areas deep within the mine or cave structure which provides elevated temperature and humidity. Foraging habitat includes: <i>Triodia</i> hummock grasslands covering low rolling hills and shallow gullies, with <i>Eucalyptus camaldulensis</i> along the creeks; over small watercourses throughout granite boulder terrain; over pools and low shrubs in ironstone gorges; and in and around gravelly watercourses with <i>Melaleuca leucadendron</i>.</p>	<p>There are records within 20 km of the survey area.</p>	<p><b>Unlikely – No suitable roosting habitat occurs within the survey area. However, the species may forage over the survey area.</b></p>



## **Appendix E** - (Database Searches)

GHD

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[75968/https://projects.ghd.com/oc/WesternAustralia2/woodsideheppplant/Delivery/Documents/6137808\\_Rev-0\\_WoodsideHEPPFaunaSurvey.docx](https://projects.ghd.com/oc/WesternAustralia2/woodsideheppplant/Delivery/Documents/6137808_Rev-0_WoodsideHEPPFaunaSurvey.docx)

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