

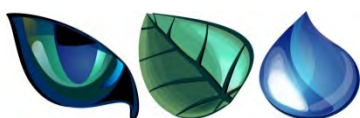


June  
2019

# PERDAMAN UREA PROJECT Pre and Post-wet Season Biological Survey Burrup Peninsula, WA



Prepared on behalf of Cardno by:



**Animal Plant Mineral Pty Ltd**

**Burrup Peninsula:**

Site F: TR 70/5461

Site C: TR 70/6697

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## Disclaimer

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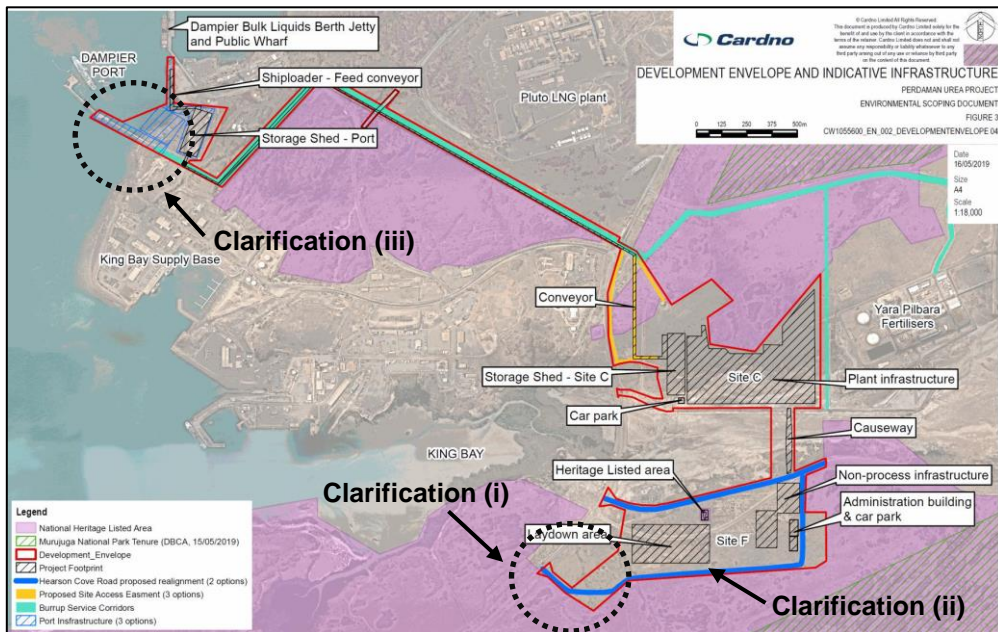
## FOREWORD

### CLARIFICATION OF PROJECT AREA

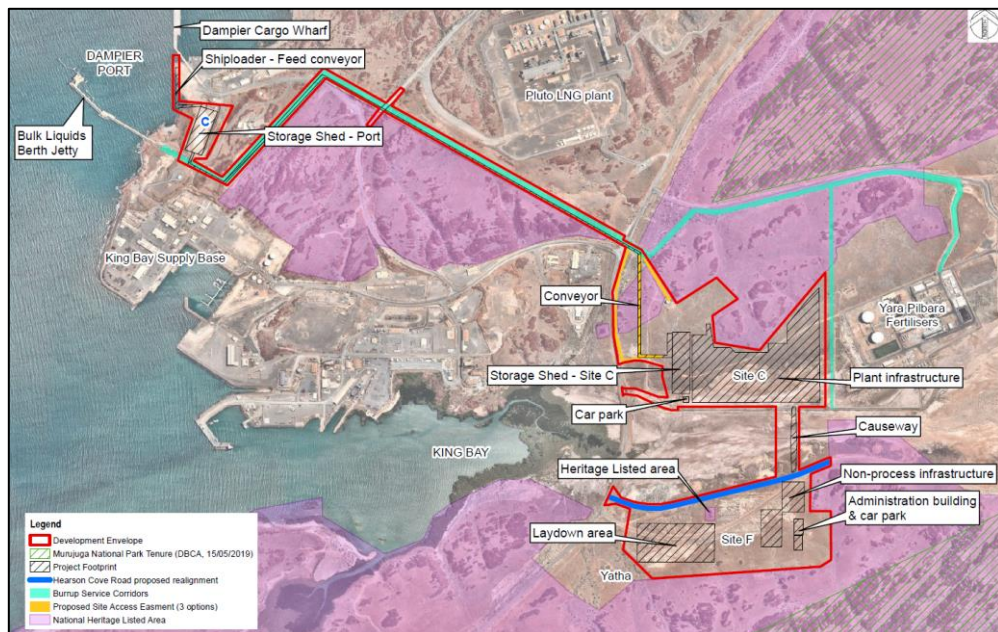
Some technical reports, including this one, were completed in the early planning and design phases of the Project. As such, some of the maps and aerial views depict the following anomalies associated with the actual Project area:

- i. The Project boundary of Site F does not have an extension from the south west corner.
- ii. The southern alignment of Hearson Cove Road is not applicable. Only the alignment on the north side of Site F will apply to the Project.
- iii. The footprint of the port area is limited to the area depicting the *Storage Shed – Port* and *Shiploader – Feed Conveyor*. It does not extend out along the Bulk Liquids Berth Jetty.

Figures A and B below provide further clarification of these discrepancies.



*Figure A: Incorrect / superseded Project Area.*



*Figure B: Correct Project Area.*



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## EXECUTIVE SUMMARY

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The Perdaman Urea Plant Project (the **Project**) is located within the Burrup Strategic Industrial Area, on the Burrup Peninsula, approximately 13 km northwest of Karratha and 1,300 km north of Perth (Figure ES 1). The Burrup Peninsula is a narrow strip of land extending approximately 22 km from the mainland and is part of the Dampier Archipelago, a group of 42 islands and islets. Large outcrops and ranges of fractured red / brown rock and spinifex-covered scree slopes dominate the landscape of the Burrup Peninsula. The land is elevated from the typically low and flat coastal plains of the West Pilbara. Numerous gorges, creeks and drainage lines cutting across the landscape provide heterogeneity in the topography and the vegetation communities it supports. The landscape is distinctive in its appearance and is restricted to the Burrup Peninsula, some nearby islands and adjacent mainland (Department of Environment and Conservation, 2013).

To inform an environmental review document for the Project, Animal Plant Mineral was engaged to undertake:

- Desktop flora, vegetation and fauna studies of the Study Area; and
- Multi-season flora, vegetation and terrestrial vertebrate fauna surveys of the Study Area.

The Project Area and Biological Study Area is shown in Figure ES 1.

The post-wet season field surveys followed the passage of Cyclone Veronica which crossed Karratha in March 2019. The Karratha Aero weather station (BOM station 00408310, 10 km to the south of the Survey Area) recorded 70 mm of rainfall associated with the passage of the cyclone. This rainfall created adequate post-wet season survey conditions.

26 rocky outcrops were identified that constitute the P1 Priority Ecological Community – Rockpiles of the Burrup Peninsula. These locations are not presently listed on the Department of Biodiversity, Conservation and Attractions database. Seven vegetation associations have been classified in this assessment to be synonymous with vegetation associations listed by M.E. Trudgen & Associates (2002) as being of conservation significance because they have less than 10 occurrences across the Burrup Peninsula and Angel, Gidley and Dolphin Islands. Two flora species of conservation significance were identified inside the Project Area. *Terminalia supranitifolia* (P3) trees occur on rockpiles in the southern extent of the Project Area which are also classified as the P1 PEC - Rockpiles of the Burrup Peninsula. *Rhynchosia bungarensis* (P4) was collected in the eastern Project Area boundary in a shallow drainage area.

Two fauna surveys were conducted at the Project Area; an initial level 1 fauna survey prior to the wet season of 2018 / 2019 and a level 2 survey conducted immediately after that wet season. A full bird census, camera trapping, spotlight surveys, and bat surveys were carried out in both surveys, while a full terrestrial fauna trapping survey was conducted in the post-wet season survey. Four broad fauna habitats are present within the Project Area; rocky outcrops, hummock grasslands on mid-slopes, drainage lines, and samphire shrublands and supra-tidal flats. A range of migratory shorebirds and waders were observed including the Red-capped Plover (*C. ruficapillus*), Grey-tailed Tattler (*T. brevipes*), and the Common Greenshank (*T. nebularia*). However, no Threatened bird species were recorded during the survey. Supra-tidal flats within the Project Area and mangrove vegetation surrounding King Bay to the west provide locally important habitat for a range of species, especially waders and shorebirds. The Project, however, will avoid direct disturbance of this habitat type. In addition, the vehicle access that crosses the supra-tidal flats will be designed with culverts to avoid alteration of surface water flows, mitigating potential indirect impacts to downstream habitats.

The Ghost Bat (*Macroderma gigas*) was recorded using acoustic bat detectors on two occasions during the post-wet season survey. It is listed as Vulnerable under both Federal and State legislation. However, no roost sites were identified during the surveys, indicating that the bats roost nearby (possibly at Murujuga National Park to

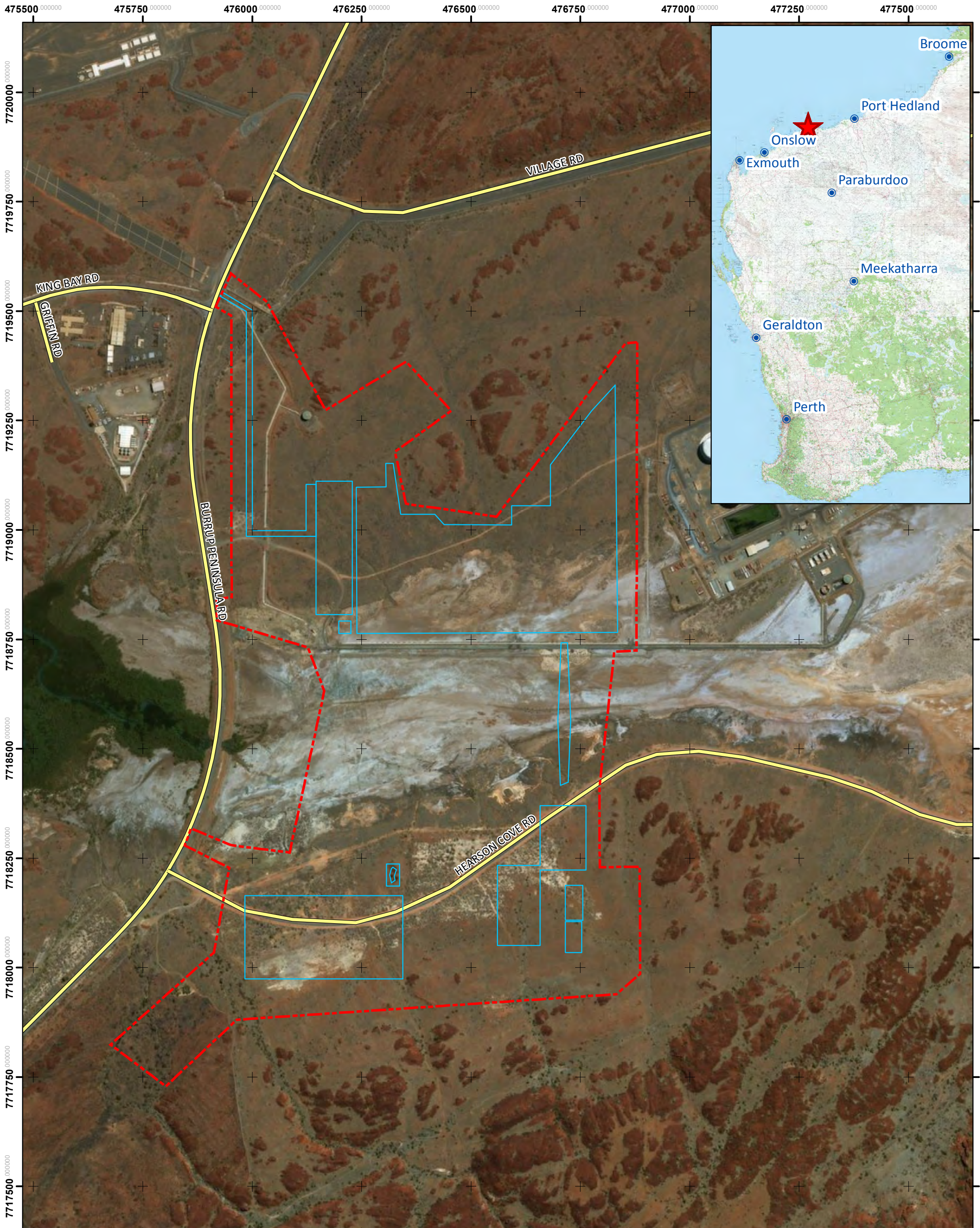


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the south), and forage over the Project Area. The drainage line in the south-west of the Project Area provides suitable foraging habitat for this species- disturbance of this area should be avoided where possible.

Rocky outcrops present at the northern and southern fringes of the Project Area were searched for the Northern Quoll (*Dasyurus hallucatus*) and the Pilbara Olive Python (*Lialis olivaceus barroni*). While neither of these species was recorded during the survey, both are highly cryptic, and may occur within the Project Area. Disturbance of rocky outcrops should therefore be minimised.





**Figure ES 1: Study Location**

**Legend**

- Study Area
- Proposed Project Footprint
- Main Roads WA



175 87.5 0 175 Meters

1 centimeter = 80 meters

Date: 12/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: [ems@animalplantmineral.com.au](mailto:ems@animalplantmineral.com.au)



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## ABBREVIATIONS

Abbreviation	Meaning
APM	Animal Plant Mineral
BAM Act	Biosecurity and Agriculture Management Act 2007
BC Act	<i>Biodiversity Conservation Act 2016</i>
BoM	Bureau of Meteorology
BSIA	Burrup Strategic Industrial Area
Cth	Commonwealth
DBCA	Department of Biodiversity Conservation and Attractions
DEC	Department of Environment and Conservation
DoEE	Department of the Environment and Energy
EPA	Environmental Protection Authority of Western Australia
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
MNES	Matter of National Environmental Significance
PEC	Priority Ecological Communities
WA	Western Australia

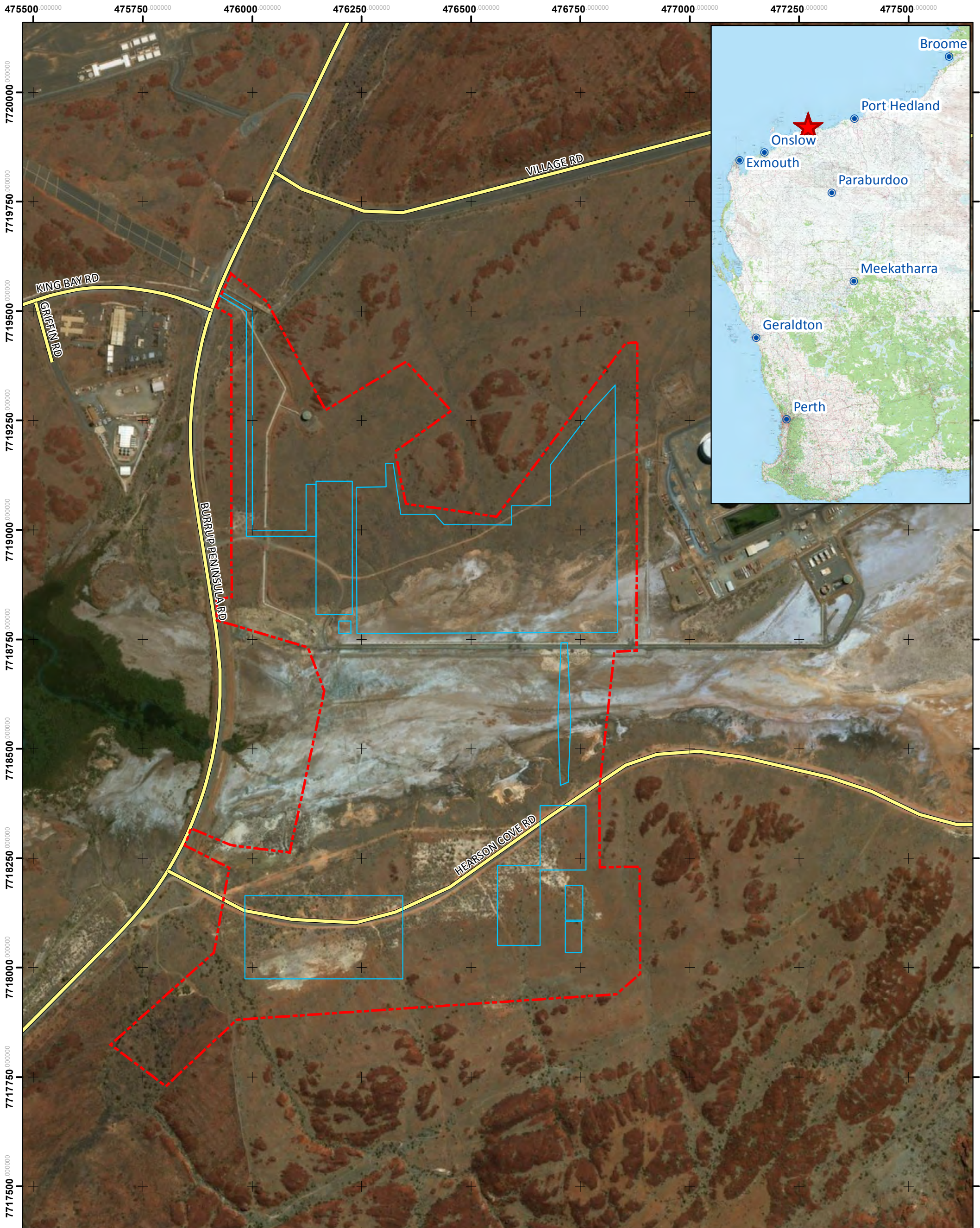
## 1 INTRODUCTION

### 1.1 PROJECT AND LOCATION

The Perdaman Urea Plant Project (the **Project**) is located within the Burrup Strategic Industrial Area (**BSIA**), on the Burrup Peninsula, approximately 13 km northwest of Karratha and 1,300 km north of Perth (Figure 1-1). The Burrup Peninsula is a narrow strip of land extending approximately 22 km from the mainland and is part of the Dampier Archipelago, a group of 42 inshore islands. Large outcrops and ranges of fractured red / brown rock and spinifex-covered scree slopes dominate the landscape of the Burrup Peninsula. The land is elevated from the typically low and flat coastal plains of the West Pilbara. Numerous gorges, creeks and drainage lines cutting across the landscape provide heterogeneity in the topography and the vegetation communities it supports. The landscape is distinctive in its appearance and is restricted to the Burrup Peninsula, some nearby islands and the adjacent mainland (Department of Environment and Conservation (**DEC**), 2013).

The Project Area is defined here as the proposed disturbance envelope, where land is to be cleared to allow the construction and operation of infrastructure. The Biological Study Area is a larger area that encompasses the Project Area. Small changes were made to the Study area between the pre- and post-wet season field surveys as the layout of the Project Area evolved to minimise impact to sensitive environmental areas. The Project Area is shown in Figure 1-1.





**Figure 1-1: Study Location**

**Legend**

- Study Area
- Proposed Project Footprint
- Main Roads WA



175 87.5 0 175 Meters

1 centimeter = 80 meters  
Date: 12/06/2019

Coordinate System: GDA 1994 MGA Zone 50  
Author: [ems@animalplantmineral.com.au](mailto:ems@animalplantmineral.com.au)



## 1.2 SCOPE OF WORK

To inform an environmental review document for the Project, Animal Plant Mineral (**APM**) was engaged to undertake:

- Desktop flora, vegetation and fauna studies of the Study Area; and
- Multi-season flora, vegetation and terrestrial vertebrate fauna surveys of the Study Area.

### 1.2.1 Flora and Vegetation

The aims of the desktop survey were to:

- Establish vegetation associations previously determined for the site and the region in order that field results can be compared for assessment;
- Identify species previously determined as present on site including Declared Rare and Priority Flora (under the provisions of the *Biodiversity Conservation Act 2016 (BC Act)* and *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*);
- Identify species previously determined as present on site regarded as being “significant” at both local and regional scales;
- Identify vegetation types previously determined as present on site regarded as being “significant” at both local and regional scales;
- Identify weed species previously determined as present on site in particular any Declared Weeds;
- Identify and describe areas previously determined as present on site that are designated as conservation areas based on flora and vegetation significance;
- Identify potentially suitable habitat for conservation significant flora known from the region; and
- Identify suitable field survey timing and methodology.

The aims of the field survey were to:

- Determine vegetation associations on the site;
- Identify species present on site including Declared Rare and Priority Flora (under the provisions of the BC Act and EPBC Act);
- Identify species present on site that are regarded as being “significant” at both local and regional scales;
- Identify vegetation types present on site that are regarded as being “significant” at both local and regional scales;
- Locate and identify, as far as possible, weed species, in particular any Declared Weeds;
- Map the vegetation and sensitive species; and
- Identify and describe areas within the Study Area that are designated as conservation areas based on flora and vegetation significance.

### 1.2.2 Terrestrial Fauna

The aims of the desktop survey were to:

- Establish the faunal assemblage previously determined for the site and the region;
- Identify species previously determined as present on site including Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act);
- Identify species previously determined as present on site regarded as being “significant” at both local and regional scales;
- Identify habitat types previously determined as present on site regarded as being “significant” at both local and regional scales; and
- Identify introduced species previously determined as present on site.

The aims of the field survey were to:

- Survey the species assemblage present at the site;
- Identify the fauna habitat values present at the site;
- Identify habitat that may be suitable for Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act);
- Assess the likelihood of occurrence of Threatened and Priority Fauna (under the provisions of the BC Act and EPBC Act);
- Assess the likelihood of occurrence of species that are regarded as being “significant” at both local and regional scales; and
- Assess the habitat suitability and likelihood of occurrence of introduced species.



## 2 BACKGROUND AND SUPPORTING INFORMATION

### 2.1 RELEVANT LEGISLATION

#### 2.1.1 Environmental Protection and Biodiversity Conservation Act 1999

Matters of National Environmental Significance (**MNES**) are protected under the EPBC Act. Under this Act, activities that may have a significant impact on MNES must be referred to the Department of the Environment and Energy (**DoEE**) for assessment. The MNES include:

- Listed threatened species and communities
- Listed migratory species
- Ramsar wetlands of international importance
- Commonwealth marine environment
- World heritage properties
- National heritage places
- Great Barrier Reef Marine Park
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Migratory birds are further protected under the following agreements:

- 1974 Japan and Australian Migratory Bird Agreement (**Commonwealth**);
- 1975 Ramsar Convention on Wetlands;
- 1983 Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention);
- 1986 China and Australian Migratory Bird Agreement (Cth);
- 2004 Agreement on the Conservation of Albatrosses and Petrels;
- 2007 Republic of Korea-Australian Migratory Bird Agreement; and
- 2006 East Asian – Australasian Flyway Partnership.

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as MNES under the EPBC Act.

#### 2.1.2 Western Australian Legislation

On 1 January 2019, the BC Act and *Biodiversity Conservation Regulations 2018* replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and their associated regulations. The BC Act and *Biodiversity Conservation Regulations 2018* provide protection for biodiversity through the Listing of native species, ecological communities, threatening processes and critical habitat, administration of the Licensing scheme and the protection and management of fauna.

The Department of Biodiversity Conservation and Attractions (**DBCA**) classifies specially protected flora and fauna into eight categories as listed in Appendix A. These categories also include potentially threatened species that do not meet survey criteria or are otherwise data deficient; such species are listed as Priority 1, 2 or 3. While species that are adequately known, are rare but not threatened, are listed as Priority 4.

The *Biosecurity and Agriculture Management Act 2007 (BAM Act)* and the *Biosecurity and Agriculture Management Regulations 2013* designate which weeds are Declared as Prohibited or requiring Control Actions in WA.

## 2.2 STANDARDS AND GUIDELINES

The following guidelines were used to define the objectives and methodology of the Biological Survey:

- *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessments* (Environmental Protection Authority of Western Australia (**EPA**), 2016a);
- *Environmental Factor Guideline: Flora and Vegetation* (EPA, 2016b);
- *Technical Guidance: Terrestrial Fauna Surveys* (EPA, 2016c)
- *Technical Guidance: Sampling methods for terrestrial vertebrate fauna* (EPA, 2016d); and
- *Environmental Factor Guideline: Terrestrial Fauna* (EPA, 2016e).
- *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE, 2017)

## 2.3 LAND USE

The BSIA is a well-established industrial estate with vacant land for strategic industry in close proximity to gas, port and other key infrastructure facilities in the Pilbara region. The BSIA is located within the City of Karratha. Under the City's Town Planning Scheme No.8, the BSIA is zoned 'Strategic Industry'.

The Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) was commissioned by the Burrup Peninsula Management Advisory Board for the purpose of allocating land for industry, conservation, heritage and recreation. This document also provides management objectives and outlines acceptable uses and development considerations. The plan was endorsed by Cabinet in 1996.

The BSIA has been created to take advantage of the region's natural gas resources and other competitive advantages. Industries currently located within the BSIA include:

- Woodside-operated North West Shelf Venture project – a joint venture between Woodside, Shell, BHP Billiton, BP, Chevron and Japan Australia LNG;
- Woodside Pluto LNG plant;
- Yara Pilbara Fertilisers plant; and
- Yara Pilbara Nitrates technical ammonium nitrates plant.

The Department of Jobs, Tourism, Science and Innovation is the lead agency for the development of the BSIA and LandCorp is the estate manager.

The Project Area is on land parcels C and F of the BSIA and will also require an 'amalgamated C and F' zone between the two lots. Parts of Site F and the 'amalgamated C and F' zone have previously been disturbed for a construction camp and are rehabilitated.

The Project Area has previously been investigated for two projects that did not go ahead.

Site C was investigated for the proposed Ammonia-Urea Plant by Dampier Nitrogen Pty Ltd (EPA, 2002). The EPA ruled that the project was capable of being managed in an environmentally acceptable manner given the proponents commitments. The commitments relevant to this study were to minimise clearing of conservation significant flora and vegetation and conservation significant fauna habitat.

Site F was investigated for the proposed Gas to Synthetic Hydrocarbons Plant by Syntroleum Sweetwater LLC (EPA, 2000). The Minister ruled that the project was capable of being managed in an environmentally acceptable manner given specific conditions and procedures were adhered to. The conditions and procedures relevant to this study required:

- 100 % replacement of any destroyed Priority flora;
- Collection of native seed of Priority and other native plant species;
- Machine hygiene for weed control;
- A rehabilitation plan including a weed management plan and topsoil management plan;
- Ongoing floristic survey to ensure 100% of the floristic diversity was understood;
- The use of clearing techniques that minimise harm to soil structure;
- Minimisation of impacts to the drainage features in the west of the Project Area;
- Field survey of 30 to 40 ha for snails in the rocky terrain to the south of the Project Area to quantify impacts on the biodiversity and abundance of molluscs;
- Further fauna survey to ensure 100% of the faunal diversity was understood; and
- Minimisation of impacts to flora and fauna during the construction and operation of the facility.

Particular consideration was given to the drainage features in the west of the Project Area.

## 2.4 CLIMATE

The Burrup Peninsula lies at the western edge of the semidesert tropical Pilbara region within Australia's arid zone. The climate is commonly described as having two seasons: warm and dry winters from May to November, and hot summers with periodic heavy rains from December to March.

The climate is monsoonal and seasonally controlled by the large high pressure cells that pass from west to east across the Australian continent. Strong easterly winds prevail in the winter due to the development and intensification of anticyclones over southern WA or South Australia. In summer prevailing winds are generally warmer and from the northwest and southwest.

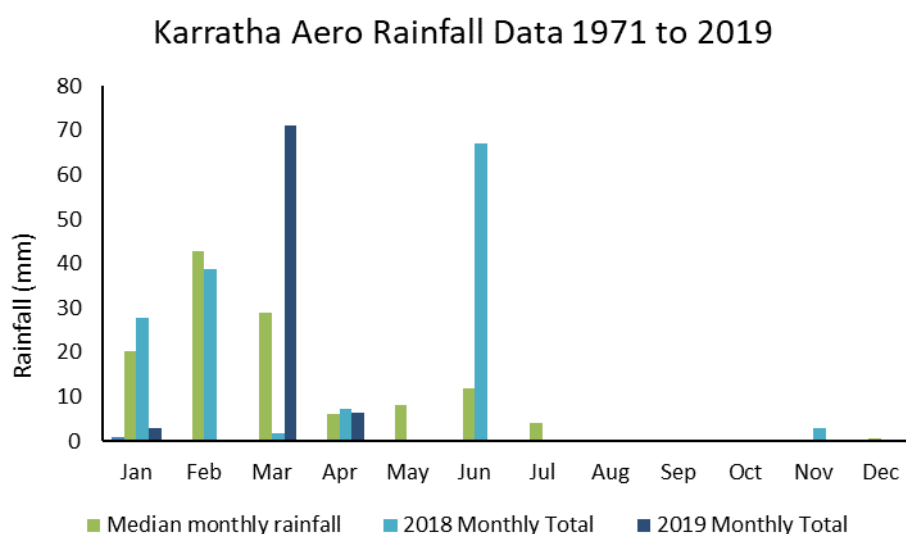
Dampier Salt weather station (12 km to the south of the site, Station 005061) opened in 1969 and Karratha Airport weather station opened in 1971 (10 km to the south of the site, Station 004083) (Bureau of Meteorology (BoM), 2019). Rainfall data is available for the duration of opening for both stations. Recent temperature data is available only from Karratha Airport for the period 1993 to 2019.

For the period 1993 to 2019 the annual mean maximum recorded temperature at Karratha Airport is 32.4°C, with an annual mean minimum recorded of 20.8°C. Monthly mean maximum temperatures recorded range from



26.3°C in July to 36.2°C in March. Monthly minimum temperatures range from 13.8°C in July to 26.8°C in January (BoM, 2019).

Annual rainfall in the region is characterised by low, highly variable and very localised rain events due to thunderstorm and tropical cyclone activity in the summer months. Average annual rainfall recorded at Karratha Airport is 285.4 mm whereas median annual rainfall is 119.4 mm (BoM, 2019). Rainfall in the region is seasonal, usually with two peaks per year. The first peak is from January to March due to tropical cyclones, tropical lows or rain-bearing depressions and tropical thunderstorms. The second peak is from May to June due to the passage of low pressure systems through the south of Western Australia (**WA**). Monthly average rainfall for the area ranges between 75.4 mm in February to 0.4 mm in October. Due to tropical cyclones, the area is prone to isolated extreme rainfall events. The highest rainfall recorded in a single month was 348.8 mm in February 2011, while all calendar months have at one stage recorded 0 mm of rainfall (BoM, 2019). Median monthly rainfall and the total monthly rainfall for 2018 and 2019 is shown in Figure 2-1.



**Figure 2-1: Median monthly rainfall and the total monthly rainfall for 2018/19 recorded at Karratha Aero (BoM Station 004083).**

Rainfall for 2018 was below average for the period January to March yet was not dissimilar to the median values for those months. Rainfall for the period June to August was 126 % higher than average, with 67.2 mm falling between the 6<sup>th</sup> and 7<sup>th</sup> of June, but no rainfall in July and August. Rainfall in January and February 2019 was below median values but the rainfall associated with a tropical cyclone led to 71 mm of rainfall recorded at Karratha aero between the 18<sup>th</sup> and 27<sup>th</sup> of March.

Wind direction at the Burrup Peninsula is predominately from the east during the winter months of April, May, June, July and August with average wind speeds ranging between 17 – 24 km/h. East to southeasterly winds are dominant in the mornings, shifting to northeasterly in the afternoon and easing in the evening in response to diurnal land temperature changes. From October through to February winds are predominantly westerly in the morning, shifting to dominant northwesterly onshore winds in the afternoon with mean wind speeds varying between 19 and 30 km/h. The months of February, March and September are transition months with less dominant wind patterns, with mean wind speeds varying between 19 and 28 km/h. Extreme wind conditions may be generated in the region by tropical cyclones, strong easterly pressure gradients, squalls and tornados. Tropical cyclones generate the most significant storm conditions in the region, wind gusts of 259 km/h at Mardie

being measured during cyclone Trixie in February 1975, and Dampier recording wind gusts of 183 km/h from cyclone Orson in 1989 (BoM, 2019).

## 2.5 BIOGEOGRAPHIC REGIONALISATION

The Interim Biogeographic Regionalisation for Australia (version 7) represents a landscape-based approach to classifying the land surface of Australia. 89 biogeographic regions and 419 sub regions have been delineated, each reflecting a unifying set of major environmental influences which shape the occurrence of flora and fauna and their interaction with the physical environment across Australia.

The Burrup Peninsula is within the Pilbara biogeographic region, within the Roebourne subregion (Department of the Environment, 2012). The '*Bioregional Summary of the 2002 Biodiversity Audit for Western Australia*' (Mckenzie *et al.* 2003) describes the Roebourne subregion, as follows:

*“Quaternary alluvial and older colluvial coastal and subcoastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of Acacia stellaticeps or A. pyrifolia and A. inaequilatera. Uplands are dominated by Triodia hummock grasslands. Ephemeral drainage lines support Eucalyptus victrix or Corymbia hamersleyana woodlands. Samphire, Sporobolus and mangal occur on marine alluvial flats and river deltas. Resistant linear ranges of basalts occur across the coastal plains, with minor exposures of granite. Islands are either Quaternary sand accumulations, or composed of basalt or limestone, or combinations of any of these three. Climate is arid (semi-desert) tropical with highly variable rainfall, falling mainly in summer. Cyclonic activity is significant, with several systems affecting the coast and hinterland annually”.*

The Burrup Peninsula lies within the Fortescue Botanical District, which is part of the biogeographical region known as the Eremaean Botanical Province (Beard, 1975).

The Burrup Peninsula, approximately 22 km long and 5 km wide, was originally an island that formed part of the Dampier Archipelago. It was joined to the mainland in the mid-1960s by a road causeway, forming the Burrup Peninsula. The Burrup Peninsula is bound by Mermaid Sound to the west and Nickol Bay to the east, and is distinguished by large areas of weather resistant rocky outcrops and scree slopes. These high scree slopes form part of an extensive high scree range which runs throughout most of the Burrup Peninsula, rises to 60 m above sea level in places, and serves as the main catchment for water during rainfall events.

Rocky outcrops exist in the northern and southern sections of the Project Area, with steeply inclined valleys occurring along fault lines forming minor drainage lines feeding into shallow drainage gullies through the mid to lower slopes of the site. These gullies then drain to the supra-tidal flats that run through the centre of the site before flowing in a westward direction to King Bay.

The topography of the Project Area is dominated by the supra-tidal flats that form an east-west trending valley at approximately 4 m Australian Height Datum from King Bay in the west to Hearson Cove in the east and divide the Burrup Peninsula into two separate units. The floor of this valley is composed of marine sediment.

The geology of the Burrup Peninsula has been previously investigated by the Geological Survey of WA and has been described by O'Brien Planning Consultants (1996). The Burrup Peninsula is composed mainly of an intrusive Proterozoic igneous rock outcrop known as the Gidley Granophyre, which is approximately 2,200 million years old. The main outcrop of Gidley Granophyre occurs in the Dampier Archipelago and the adjacent mainland, along basal unconformity of the Fortescue Group (Hickman, 1983).

The base of the intrusion consists of a differentiated coarse-grained gabbro and the main body is a fine-grained granophyre. The gabbro weathers to a dark brown and the granophyre to a lighter red-brown, and both rock

types are resistant to erosion and form aggregates of split boulder screes. Rapid weathering of dolerite dykes that are also present has resulted in the formation of deeply incised, narrow valleys, amongst the exposed granophyre bedrock, generally trending either southwest to northeast or east to west throughout the Burrup Peninsula.

The proposed Project site includes exposed granophyre bedrock, and colluvium of sand, silt and gravel in outwash fans of the supra-tidal flats that run through the middle of the Project Area and indicate a soil profile associated with a low energy marine depositional environment. The soil profile is largely comprised of sandy loams to silty sands generally brown to grey in colour. The sediments are typically organically rich and often contain a thin veneer of shelly lenses.

### 2.5.1 Land Systems

Two land systems as described by van Vreeswyk *et al.* (2004) are present at the Project Area: Granitic and Littoral. The Granitic land system is described by van Vreeswyk *et al.* (2004) as:

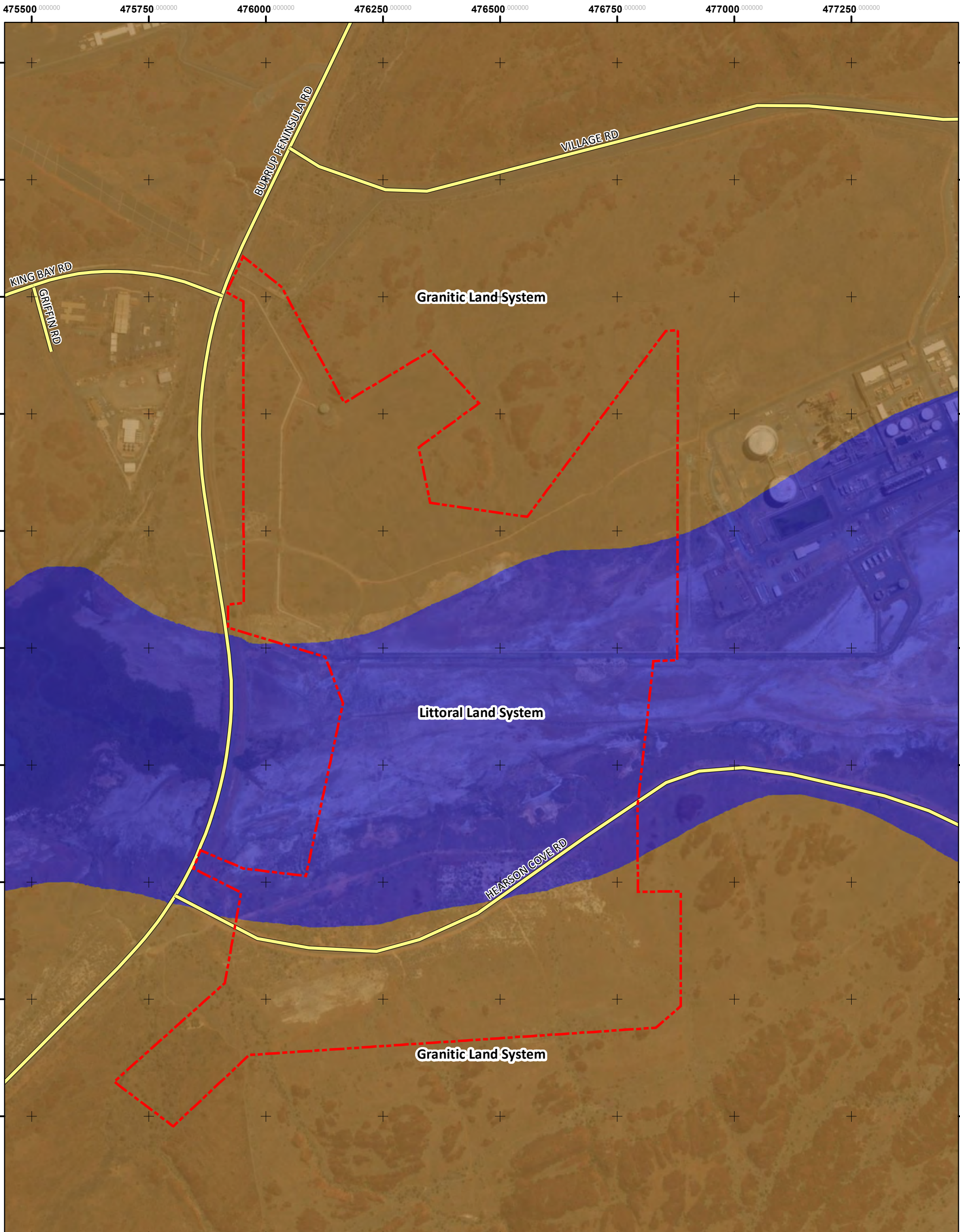
*“Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.”*

The Littoral land system is described by van Vreeswyk *et al.* (2004) as:

*“Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches.”*

Granitic and Littoral land systems make up 2.2 % and 0.9 %, respectively, of the Pilbara Rangeland surveyed by Vreeswyk *et al.* (2004). The Granitic land system is present at the northern and southern sections of the Project Area, while the Littoral land system is present across the central section (Figure 2-2).





**Figure 2-2: Land Systems of the Study Area**

**Legend**

- Study Area
- Main Roads WA
- Granitic Land System
- Littoral Land System

N  
↑

160 80 0 160 Meters

1 centimeter = 75 meters  
Date: 6/06/2019  
Coordinate System: GDA 1994 MGA Zone 50  
Author: ems@animalplantmineral.com.au

Project Area soils are of Group 423 - Red shallow sands, Soil sub-group - Red shallow sands on granite, which are described in van Vreeswyk *et al.* (2004) as:

*“These soils are uniform textured coarse sands or medium textured sands overlying weathered granite, sandstone or red-brown hardpan at shallow (25-50 cm) depth. Some soils occur over substrates such as conglomerate or quartz and are incorporated into this group. The soils are red to dark red in colour and non-calcareous with a weakly acidic to neutral soil reaction trend. The soils are mostly found within or adjacent to the parent rock resulting in gritty sands. The lower subsoil mostly overlies partially weathered granite rock and coarse fragments of quartz and granite are common throughout the profile. These soils often have a common to abundant (10>50%) stony mantle. Slightly saline soils may infrequently occur at the base of occasional large granite domes or outcrops. Domes and tors of bare rock are included in this soil group.”*

### **2.5.2 Surface Water**

No very small, small, medium or large water bodies occur in the Project Area (Department of Water and Environmental Regulation, 2018). Small ephemeral creeks drain water from the rocky outcrops in the north and south to the supra-tidal flats between King Bay and Hearson’s Cove, in the centre of the Project Area.

### **2.5.3 Wetlands and Environmentally Sensitive Areas**

The Project Area does not include and is not in close proximity to any wetlands listed as Ramsar sites (Department of Water and Environmental Regulation, 2018), nor does it occur within an Environmentally Sensitive Area. The Project Area is within an area zoned for Industrial Development on the Burrup Peninsula.

### **2.5.4 Previous Surveys**

Many Private Industry Developments have commissioned independent studies on the Burrup Peninsula. Some of these are publicly available through the EPA assessment process. Table 2-1 lists previous assessments that overlapped, or were in close proximity to, the Project Area.



**Table 2-1: Existing Flora and Fauna Surveys and Investigations within the Burrup Peninsula and Surrounds Relevant to the Project**

Report Title	Consultant	Year	Survey Type	Purpose
<b>Flora and Vegetation</b>				
Flora and Vegetation Survey of the Proposed Gas to Synthetic Hydrocarbons Plant	Astron Environmental	1999	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance.
Flora and Vegetation Survey of the Proposed Ammonia Plant	Astron Environmental	2001	Reconnaissance Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This site is adjacent to the Project Area and the survey area overlaps the project. Results of this survey are discussed in more detail in Section 4.1.3
A Flora, Vegetation and Floristic Survey of the Burrup Peninsula, some adjoining areas and part of the Dampier Archipelago, with comparisons to the floristics of areas on the adjoining mainland (Volume 2)	M. E. Trudgen & Associates	2001	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This study is the most comprehensive assessment of the regional significance of flora and vegetation. Results of this survey are discussed in more detail in Section 4.1.3
A Flora, Vegetation and Floristic Survey of the Burrup Peninsula, some adjoining areas and part of the Dampier Archipelago, with comparisons to the floristics of areas on the adjoining mainland (Volume 1)	M. E. Trudgen & Associates	2002	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This study is the most comprehensive assessment of the regional flora and vegetation. Results of this survey are discussed in more detail in Section 4.1.3
A detailed survey of the samphire vegetation in the Hearson's Cove/King Bay inlet on behalf of URS.	Astron Environmental	2002	Detailed Survey	To map vegetation present on the site and to sample flora in order to confirm or negate the presence of flora of conservation significance. This study is the most comprehensive assessment of the supratidal inlet flora and vegetation. Results of this survey are discussed in more detail in Section 4.1.3
King Bay Eastern Lease Area Industrial Estate Vegetation and Flora Report	Astron Environmental	2003	Reconnaissance Survey	To map vegetation types at a broad scale and identify any significant flora or vegetation and weed species present on site to assist relevant government bodies in achieving a low-level assessment. This study was reviewed.
Dampier Nitrogen Plant Site Wet Season Vegetation and Flora Survey Report as prepared for URS Consultants (Ref: 3909 2005-RV-01)	Astron Environmental	2005	Detailed Survey	To map the vegetation and supplement information presented in the Astron 1997 dry-season report by conducting a wet-season survey to identify all Priority and Threatened flora, weeds and Declared weeds.

Report Title	Consultant	Year	Survey Type	Purpose
Pluto LNG Development Vegetation and Flora Survey Site A	Astron Environmental	2005	Detailed Survey	To map the vegetation and compare previously mapped vegetation associations to be used in significance assessment. Identify Priority and Threatened flora, weeds and Declared weeds in order to designate areas of sensitivity and conservation. This study was reviewed.
Technical Ammonium Nitrate Production Facility. Public Environmental Review for Burrup Nitrates Pty Ltd	Environmental Resources Management Flora and Vegetation assessment by Outback Ecology (2009)	2009	Reconnaissance Survey	To provide a comprehensive desktop assessment of the area (Site D) for the Technical Ammonium Nitrate Production Facility including vegetation communities, the extent of the now Murujuga National Park, broad landscape and vegetation attributes and hydrology and drainage. This site is within the same catchment as the Project Area. Results of this survey are discussed in more detail in Section 4.1.3
Pluto LNG Development Site B North – Flora and Vegetation Assessment Survey	ENV Australia	2006	Detailed Survey	To identify all flora and vegetation associations occurring within Site B North in order to assess conservation significance. This study was reviewed.
Pluto LNG Development Proposed Gas Trunkline Option 1: Flora and Vegetation Condition Assessment	ENV Australia	2006	Targeted Survey	To search and assess presence or absence of Priority flora and undertake a vegetation condition assessment for the Pluto LNG Development Proposed Pipeline Route Terminating at Gas Trunkline Option 1 where vegetation is likely to be disturbed along the pipeline route. This study was reviewed.
Pre-Wet Season Biological Survey	APM	2018	Detailed Survey	To undertake a pre-wet season survey to assess vegetation associations of Sites C and F and the 'C and F amalgamation' zone through detailed sampling of flora to identify the types of species assemblages and vegetation communities that are present within the Project and to shape the survey efforts for the following season survey and adequately determine if significant flora or vegetation are likely to occur at the Project, given the distribution of habitats.
<b>Fauna</b>				
Fauna and Marine Biota. In: Burrup Peninsula Draft Land Use and Management Plan, Technical Appendices. Unpublished report by O'Brien Planning Consultants	H. Butler	1996		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Burrup Liquid Ammonia Plant targeted fauna survey. Unpublished report for Sinclair Knight Merz Pty Ltd	Biota Environmental Services	2001		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available

Report Title	Consultant	Year	Survey Type	Purpose
Terrestrial Fauna and Habitats. In: Methanex Australia Pty Ltd, Methanol Complex, Burrup Peninsula Western Australia, Public Environmental Review (Section 5.8)	Biota Environmental Services	2002		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Burrup Fertilisers Pty Ltd. Fauna of the Burrup Peninsula and the Proposed Ammonia Plant (Revised version). Unpublished report to Sinclair Knight Merz Pty Ltd	Astron Environmental	2001		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Natural Gas to Synthetic Oil Project Product and Feed pipelines, Vegetation, Flora and Fauna Survey. Unpublished report for Syntroleum Corporation	Astron Environmental	1999		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Terrestrial Fauna and Habitats. In: Burrup Peninsula Fertilisers Pty Ltd, Proposed 2,200 tpd Ammonia Plant, Burrup Peninsula Western Australia, Public Environmental Review (Section 5.8). August 2001. Prepared for Sinclair Knight Merz	Astron Environmental	1999		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Vegetation, Flora and Fauna Survey. In: Syntroleum, Proposed Gas to Synthetic Hydrocarbons Plant, Burrup Peninsula Western Australia, Consultative Environmental Review. November 1999. Prepared for HLA – Envirosciences Pty Ltd	Astron Environmental	2001		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Offshore Petroleum Pty Ltd	1995		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Offshore Petroleum Pty Ltd	1997		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Offshore Petroleum Pty Ltd	1998		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Annual Report on Environmental Investigations and Monitoring	Woodside Energy Pty Ltd	1999		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Pluto LNG Development Survey of Non-marine Molluscs	S.M. Slack-Smith	2005	Targeted Survey	Cited in Worley Astron 2006 – A targeted assessment of the non-marine mollusc fauna of the Burrup Peninsula to allow assessment of the probable effect of the land based components associated with the Plutos LNG Development proposed by Woodside.
Fauna assessment surveys of the Pluto LNG Development pipeline corridors	ENV Australia	2006		Cited in Worley Astron 2006 – Scope and methodology of report not known as report is no longer available
Pluto LNG Development Holden Beach Sea Turtle Habitat Use Survey	Pendoley Environmental	2006	Targeted Survey	To search for evidence of sea turtle nesting activity within the vicinity of a trunkline shore crossing location associated with the proposed Pluto LNG Development at Holden Beach

Report Title	Consultant	Year	Survey Type	Purpose
Terrestrial Fauna of the Burrup Peninsula, unpublished report prepared for BGC Contracting	Astron Environmental	2003	Desktop Survey	To provide a comprehensive desktop assessment of the King Bay Eastern Leases area and determine fauna of significance that may inhabit the lease of adjoining areas
Pluto LNG Development Desktop Fauna Report	Worley Astron	2006	Level 1 Desktop Survey	To provide a comprehensive desktop assessment of the Pluto LNG Development area and determine fauna of significance that will be required to be assessed for presence/absence in future targeted surveys.
Technical Ammonium Nitrate Production Facility. Public Environmental Review for Burrup Nitrates Pty Ltd	Environmental Resources Management	2009	Reconnaissance Survey	To provide a comprehensive desktop assessment of the area (Site D) for the Technical Ammonium Nitrate Production Facility including noise monitoring sites, noise contouring and reduction measures, the extent of the now Murujuga National Park, broad landscape and vegetation attributes and hydrology and drainage.

### 3 METHODOLOGY

#### 3.1 CONTRIBUTING AUTHORS

The planning and design of this survey was conducted by APM Principal Zoologist Dr Mitch Ladyman, Senior Botanist Dr Eleanor Hoy, and Senior Zoologist Dr Stuart Dawson. Fieldwork was carried out by E. Hoy, S. Dawson, Senior Zoologist Dr Genevieve Hayes, Environmental Scientist Sarah Flemington, Senior Ornithologist Dr Floyd Holmes, and Graduate Environmental Scientist Arlen Hogan-West.

The report was drafted by S. Flemington, E. Hoy, S. Dawson, and M Ladyman, while Environmental Scientist Tony Smith conducted GIS analysis.

#### 3.2 CONSTRAINTS

Constraints and their impacts on survey outcomes are discussed in Table 3-1.

**Table 3-1: Constraints and the impacts on survey outcomes**

Factor	Impact on survey outcomes
Access Problems	Most of the site was only accessible by foot. This was not a limiting factor, however, and all areas were adequately surveyed.
Experience levels	The personnel that executed these surveys included practitioners that are regarded as suitably qualified in their respective fields. <ul style="list-style-type: none"> <li>• Dr Eleanor Hoy – Senior Botanist (10 years experience)</li> <li>• Dr Stuart Dawson – Senior Zoologist (5 years experience)</li> <li>• Dr Genevieve Hayes - Senior Zoologist (5 years experience)</li> <li>• Sarah Flemington – Environmental Scientist (2 years experience)</li> <li>• Dr Floyd Holmes – Senior Ornithologist (5 years experience)</li> <li>• Arlen Hogan-West – Graduate Environmental Scientist (1 years experience).</li> </ul>
Scope: Flora	No constraints.
Scope: Vegetation	The survey was limited to the Study Area, excepting a small number of vegetation units in proximity to the Study Area that were included for statistical rigor of the analysis of vegetation types. Actual rather than predicted impact assessment of the proposed development may require verification of vegetation communities outside of the proposed development area.
Scope: Fauna	The scope of the fauna survey was a level 2 survey. In order to achieve the survey effort outlines in the guidelines for biodiversity surveys, trapping was conducted over 7 trap nights, and all methods of sampling were achieved within this time period. The spotlight surveys were targeted to sample the Northern Quoll and Pilbara Olive Python, two species that are cryptic and often in low densities. As a result of their cryptic nature, the absence of records does not necessarily indicate that these species are absent. In addition, the rocky outcrops where these species are likely to be present are relatively inaccessible with many rocky holes and caves for species to hide, making the probability of detection of these species limited. Two sites were placed in rocky outcrop habitat during the March/April survey, however due to the rocky nature of the substrate, no pitfall traps were used at these sites. To compensate, additional funnel traps were deployed.
Timing, weather, season, cycle	This biological report includes data gathered from field surveys conducted in November 2018 and March, April and May 2019. As such, surveys were conducted in a broad range of seasonal conditions. The 2019 wet season (Jan-March) experienced lower than average rainfall. This is likely to result in diversity and abundance of fauna and ephemeral flora being slightly lower than average years. While the survey timing did not include a period of spring tide, during which the tidal salt flats would be inundated, a cyclonic event just prior to fieldwork resulted in abundant

Factor	Impact on survey outcomes
	available water on the plains. This availability of water negates the limitation of the lack of spring tide.
Sources of information	<p>The flora of the Burrup Peninsula is well studied. The regional work by M. E. Trudgen &amp; Associates (2002) maps the current site and many flora and vegetation assessment surveys have been undertaken as part of the Environmental Impact Assessment process on development sites adjacent to the Project.</p> <p>Similarly, the fauna assemblage of the Burrup Peninsula is well studied, largely due to the number of different facilities that have been built on the peninsula in the last 30 years, and the resulting biological surveys. Many of these surveys are not freely available, however, while being referred to in more recent documents. The literature search is therefore deliberately limited to include surveys that include data directly comparable to our survey. Given the number of previous surveys and database searches, this is not considered a limitation.</p>
Completeness: Flora and vegetation	<p>The field survey recorded 86 taxa in November 2018 and an additional 42 taxa in May 2019 totalling 127 taxa (including species, subspecies and variants) from 34 Families.</p> <p>390 taxa have been recorded for the Burrup Peninsula (Astron Environmental, 2005). Astron Environmental (2005) recorded 143 taxa from 44 families for an area greater than but including Site C and the 'Site C and F amalgamation' zone. Astron (2001a) recorded 131 species in the BFPL site immediately to the east of the Study Area.</p>
Completeness: Fauna	<p>305 vertebrate fauna taxa have either been recorded or are expected to occur in the Burrup Peninsula (Worley Astron, 2006).</p> <p>The level 2 biological survey conducted in early 2019, coupled with the level survey conducted in late 2018, represents an appropriate survey effort to provide a reasonable inventory of species occupying the site. Similarly, the bird survey was conducted in accordance with guidelines. The data gathered in this survey, coupled with previous surveys on the Burrup Peninsula, and appropriate database searches, provides an adequate understanding of the faunal assemblage at the site, such that completeness is not considered a limitation.</p> <p>Trapping could not be conducted in the floodplain during the March/April survey, due to the area being waterlogged from the recent rainfall. Given the area is completely devoid of cover, this area is unlikely to support many small animals.</p>

### 3.3 DATABASE SEARCHES

Table 3-2 lists the database searches that were conducted prior to field survey. Some fauna studies have previously been undertaken in the surrounding area of the Burrup Peninsula and Dampier Archipelago. Relatively little fauna survey work, however, has been completed in the immediate proximity of or within the actual Project Area.



**Table 3-2: Database Searches Conducted Prior to Field Survey**

Database	Area Searched	Information	Administering Agency
<b>Flora and Vegetation</b>			
Australian Government Protected Matters Search Tool	Central co-ordinate within the Project Area with a 100 km buffer (Appendix C)	Matters of national significance and matters protected by EPBC Act	Department of Energy and Environment
Directory of Important Wetlands in Australia	Roebourne Biogeographic Subregion	Details of specific Ramsar and Directory Wetlands (Internationally and Nationally important wetlands, respectively)	
Threatened (Declared Rare) Flora Database		Validated populations of declared rare flora and some priority flora	Department of Biodiversity Conservation and Attractions
Western Australian Herbarium Specimen Database	270 km of coastline plus the islands within 16 km, including the entire Burrup Peninsula (Appendix D)	All records of declared Rare and Priority species from the Western Australian Herbarium collection of specimens, includes un-validated historical specimens	
Declared Rare and Priority Flora List		Declared Rare Flora and Priority Flora – provides a list of species and general distribution in an area of interest	
Priority Ecological Communities List		Priority Ecological Communities	
<b>Fauna</b>			
Australian Government Protected Matters Search Tool	Central co-ordinate within the Project Area with a 5 km buffer (Appendix C)	Matters of national significance and matters protected by <i>Environmental Protection and Biodiversity Conservation (EPBC) Act 1999</i>	Department of Energy and Environment
Atlas of Living Australia	Central co-ordinate within the Project Area with a 10 km buffer (Appendix E)	All species records that have been lodged with the database	Atlas of living Australia
NatureMap	Central co-ordinate within the Project Area with a 10 km buffer (Appendix F)	All species records that have been lodged with the database	Department of Biodiversity Conservation and Attractions (DBCA, WA)
Threatened Fauna Database	Area surrounding Project Area, including the entire Burrup Peninsula and islands within ~25 km (Appendix D)	Threatened and Priority Species listed under the <i>WC Act</i>	

### 3.4 FLORA AND VEGETATION FIELD SURVEY

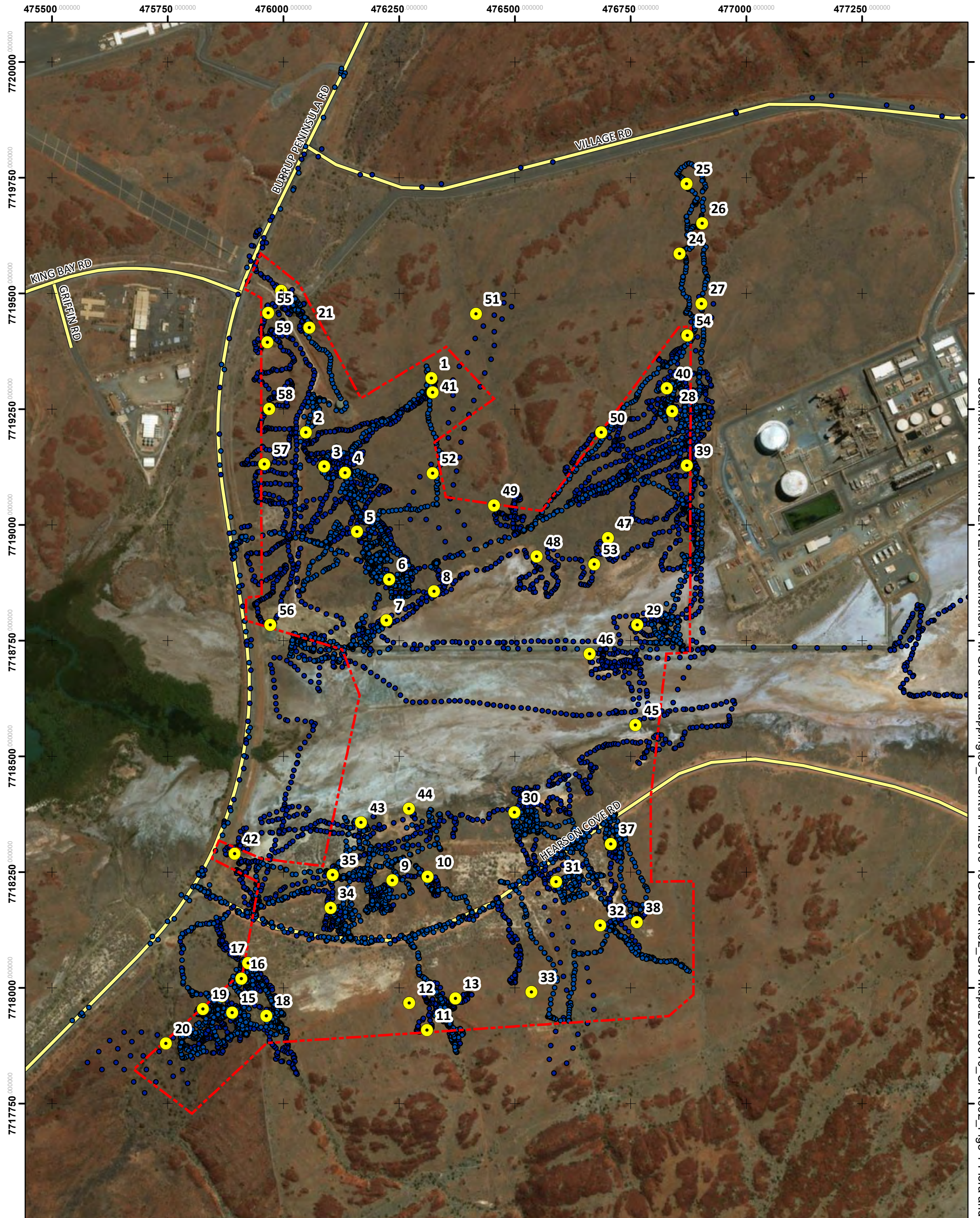
#### 3.4.1 Flora and Vegetation Survey Methodology

Vegetation classification is the process of identifying and characterising discrete vegetation units using empirical data. The aim of vegetation classification is to identify and describe the vegetation units present within a survey area, identify the local or regional significance of the identified units and provide sufficient information to enable analysis of impact significance. Two primary methods are used to classify vegetation units in WA: one is based on dominant species and vegetation structure and the other is based on analysis of floristic composition data.

A consistent approach to vegetation classification and description across surveys in similar regions is critical for the assessment of cumulative impacts at the local and regional scales. Differences in classification and analysis methods, consideration of scale, interpretation of floristic and structural vegetation information and terminology can lead to incompatibility between assessments. In identifying the appropriate methodology for the current survey, consideration was given to the methodology used in other local and regional assessments and adherence to the EPA (2016) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment*.

The fieldwork was conducted in two periods: a four-day survey was carried out by a Senior Botanist and assisting Environmental Scientist from the 19<sup>th</sup> to the 22<sup>nd</sup> of November 2018 and a 5-day survey from the 11<sup>th</sup> to 15<sup>th</sup> of May 2019 completed by a Senior Botanist. Flora surveys were undertaken in all the vegetation/soil types/landform units present in the study area, at representative locations established following the desktop assessments and initial site reconnaissance. Figure 3-1 shows the survey site locations and APM's vegetation assessment survey tracks .





**Figure 3-1: APM Multi-Season Detailed Flora Survey Sites**

**Legend**

- APM Survey Locations
  - Track Logs for Flora and Vegetation Survey
- Study Area
  - Main Roads WA

N  
↑

160 80 0 160 Meters

1 centimeter = 75 meters

Date: 10/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: [ems@animalplantmineral.com.au](mailto:ems@animalplantmineral.com.au)



Vegetation was mapped at the association scale. Survey sites were allocated to identified vegetation types to accurately describe the vegetation association. Vegetation units were identified, and boundaries delineated using a combination of aerial photography, topographical features and field data/observations. Vegetation units were allocated mapping codes with reference to previously described vegetation types in the region (see section 4.1.2) based on structure, dominant taxa and cover characteristics. Field observations on the distribution of vegetation units were made using traverses, where notes on the location, dominant species and vegetation condition were taken to help with the extrapolation of vegetation type and condition.

Survey sites represent Full Characterisation Sites (EPA, 2016) and were sampled using quadrats of 50 m x 50 m where possible. In riparian areas or where the vegetation types were of an irregular distribution, quadrat dimensions were altered but the 2,500 m<sup>2</sup> search area was retained where possible. A number of vegetation units were substantially smaller than 2,500 m<sup>2</sup>. These areas had clearly defined boundaries due to changes in vegetation composition, and the entirety of these vegetation units were sampled.

Field data at each survey site was recorded on a *pro-forma* data sheet and included the parameters detailed in Table 3-3. Details of survey sites are provided in Appendix G. A flora inventory was compiled from taxa listed in described survey sites and from opportunistic floristic collections throughout the survey area, with at least one collection made for every taxon encountered. 215 specimens were identified by an experienced botanical taxonomist in the Herbarium using published reference material. The nomenclature applied is consistent with Florabase (Western Australian Herbarium, 2019). The conservation status of all recorded flora was compared against the current lists available from DBCA (Wildlife Conservation (Rare Flora) Notice 2018 and Threatened and Priority Flora List 5 December 2018) and the EPBC Act List of Threatened Flora (DoEE, 2018a). Conservation categories are described in Appendix A.

**Table 3-3: Parameters recorded at each Survey location**

Variable	Parameters
Collection attributes	Personnel/recorder; date, quadrat dimensions and marking method, photographs of the quadrat from the northwest and south east corners, site code
Physical features	Landform, aspect, soil attributes, ground surface cover, rock type and physical attributes
Community Size	Width (m) if linear (e.g. riparian) or size (ha) if non-linear
Location	Coordinates recorded in GDA94 datum using a hand-held Global Positioning System (GPS) tool (Garmin) to accuracy approximately ± 5 m.
Vegetation condition	Vegetation condition was assessed using the condition rating scale devised by Trudgen (1988)
Disturbance	Level and nature of disturbances (e.g. weed presence, fire and time since last fire, impacts from grazing, infrastructure works).
Flora	List of dominant flora from each structural layer. List of all species within the quadrat including average height and cover

Vegetation Condition was assigned using the scale developed for the Eremaean and Northern Botanical Provinces adapted from Trudgen (1988) as recommended in EPA (2016a). Table 3-4 details the six potential categories.

**Table 3-4: EPA (2016a) Vegetation Condition Scale**

Vegetation Condition	Ermaean and Northern Botanical Provinces adapted from Trudgen (1988)
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs

### 3.4.2 Flora and Vegetation Data Analyses

Floristic composition vegetation classification methodology was applied to the full suite of species present within quadrats, to determine whether the sites fall into clusters of similar communities. The Primer 7 (Clarke and Gorley, 2015) software was used to perform the non-parametric multivariate statistical analysis. A species by site matrix was prepared using species projected cover values and square root transformation applied. The square root transformation was selected to moderate the effect of the most dominant species without giving the singleton and sporadic species excessive weight. A resemblance matrix was constructed using the Bray Curtis similarity measure on the transformed data set. A cluster analysis was performed using group averages to identify sites with similarities in species composition and cover values, and the results displayed in a dendrogram. The SIMPROF routine was used to test the hypothesis that the species and/or abundances are different at each group of sites using 999 permutations and a significance level of 5%.

The statistical methodology was selected to replicate that of Trudgen and Associates (2002).

Floristic composition vegetation classification methodology created high level groupings but did not adequately allow for comparison with previous surveys where data had not been statistically analysed by other biological survey practitioners. Structural vegetation classification was also retained to allow for comparison with previously described vegetation associations.

Structural vegetation classification uses vegetation structure and dominant species to describe differences between vegetation units. Structural vegetation classification provides information on height of strata, foliar cover and dominant species.

### 3.4.3 Priority Flora Targeted Searches

Targeted searches were conducted in all vegetation types with particular attention given around the rocky outcrops, drainage features and the fringes of the tidal inlet. Known locations of *Rhynchosia bungarensis* (P4) and *Stackhousia clementii* (P4) were searched and healthy plants identified so as to determine suitable conditions for searches of these species. Track logs of targeted searches are displayed in Figure 3-1.

Taxa with uncertain taxonomy (as identified in M.E. Trudgen & Associates, 2002) were systematically collected across the site for detailed determination at the herbarium.

## 3.5 TERRESTRIAL VERTEBRATE FAUNA

The terrestrial vertebrate fauna survey was conducted in two discrete periods, the initial, pre-wet season Level 1 survey, and the follow-up, post-wet season Level 2 survey.

The initial survey occurred between the 19<sup>th</sup> and 22<sup>nd</sup> of November 2018 and was conducted by Dr. S Dawson and Dr. F. Holmes. Fauna habitat was surveyed using nine survey points, distributed throughout the site and sampling the range of habitats present. At each survey point, a range of substrate, landform, vegetation, and structural parameters were measured. Any fauna sighted during recording at these points was recorded. Some areas adjacent to the Project Area that represented unique or significant habitat values were also surveyed. Morning and evening bird surveys were conducted, and camera traps and bat detectors were deployed in habitat appropriate for Threatened fauna. Spotlight surveys were also conducted each evening.

The post-wet season Level 2 survey was carried out between the 27<sup>th</sup> of March and the 5<sup>th</sup> of April 2019. This survey was conducted by Dr S. Dawson, Dr G. Hayes, Dr F. Holmes, S. Flemington and A. Hogan-West. This survey consisted of the deployment of six trap sites across the habitats available within the site, including cage traps, aluminium box traps, pitfall traps, funnel traps, camera traps, and acoustic bat recorders. In addition, morning and afternoon bird surveys and nocturnal spotlight surveys were conducted.

### 3.5.1 Trapping

During the post-wet season survey, conducted in March / April 2019, traps were deployed at six sites, two in each of the three major habitat types; rocky outcrop, mid-slope, and samphire. The flood plain in the centre of the site could not be sampled during trapping as it was waterlogged.

The trap effort and details of each site are shown in Table 3-5. Each trap site consisted of a single line of 5 drift fences (10 m), with one pitfall trap and a pair of funnels on each fence. Two lines of 10 aluminium box traps, one on each side, were set parallel to the line of fences, and cages were set on each end of both lines of box traps. In rocky outcrop habitat, pitfall traps were not used (as the substrate was too rocky to excavate), and an extra three pairs of funnels were deployed to compensate. Funnels and pit traps were checked twice daily, while cages and aluminium box traps were checked in the morning, closed throughout the day, then opened and re-baited in the evening. General marsupial bait (rolled oats, sardines, and peanut butter) was used.



**Table 3-5. The location and details of each trap site used in the March/April survey.**

Trap Site	Habitat	Easting	Northing	Cage	Aluminium Box	Funnel	Pit	Trap nights	Description
C01	Mid-Slope	0476587	7718117	4	20	10	5	7	Rocky substrate with scattered trees and tall shrubs over hummock grasses (25% ground cover). Creek line runs through the site.
C02	Rocky Outcrop	0476383	7717975	4	20	16	0	7	Rocky slope with scattered tall shrubs over hummock grasses (30% ground cover), near large rockpiles.
C03	Samphire	0476127	7718320	4	20	10	5	7	Flat plains with rocky sandy clay soils, Mixed low samphire shrubs (25% ground cover), fringed by hummock grassland.
C04	Samphire	0476753	7718968	4	20	10	5	7	Mix of sandy rises and clay plains. Sandy rises contain scattered tall shrubs over tussock grasses (50% ground cover), while clay plains contain low scattered shrubs (5% ground cover).
C05	Mid-Slope	0476337	7718943	4	20	10	5	7	Gentle slopes with clay soils. Scattered tall shrubs over hummock grasses, (50% ground cover).
C06	Rocky Outcrop	0476201	7719279	4	20	16	0	7	Rocky slopes with scattered tall shrubs, over hummock grasses (60% cover), near large rockpiles.
				<b>Total trap nights</b>	<b>168</b>	<b>840</b>	<b>504</b>	<b>140</b>	

### 3.5.2 Camera Trapping & Bat Acoustic Recorders

Camera traps and acoustic bat detectors were deployed in both the November 2018, and the March / April 2019 survey. All camera traps were Reconyx HC500 HyperFire™ Semi-Covert IR, while two types of bat detectors were used: AnaBat Swift Passive Bat Detectors and D500x Ultrasound Detector / Recorders. Camera trap deployment details are provided in Table 3-6.

**Table 3-6: Camera trap and bat detector survey effort across all surveys**

Type	Survey	Habitat	Locations	No. of traps	Total trap nights
Camera trap	Nov 18	Rocky Outcrop	BC001, BC002, BC006	3	12
		Mid-slope	BC003, BC004, BC008, BC009	5	16
		Mangrove (outside Study Area)	BC005	1	4
		Rocky outcrop (outside Study Area)	BC010	1	3
	<b>Total</b>				<b>35</b>
	Mar 2019	Rocky Outcrop	C02, C06	4	32
		Mid-slope	C01, C05	4	32
		Samphire	C03, C04	4	32
		Rocky outcrop (outside Study Area)	QC01, QC02, QC03	3	24
		<b>Total</b>			
Bat detector	Nov 18	Rocky Outcrop	BC001, BC006	2	8
		Mid-slope	BC004, BC009	2	8
	<b>Total</b>				<b>16</b>
	Mar 2019	Rocky Outcrop	C02, C06	2	16
		Mid-slope	C01, C05	2	8
		Samphire	C03, C04	2	8
	<b>Total</b>				<b>32</b>

### 3.5.3 Bird Surveys

Bird surveys were conducted during the November 2018 and March 2019 survey periods. Bird surveys were conducted in the morning, immediately after sunrise, and in the evening, just prior to sunset. The method involves searching 2 ha plots for 20 minutes and recording each species (and the number of individuals). Around 8-12 plots were searched each day. Plots were spread throughout all habitat types present at the site, with a focus on the floodplain and fringing habitat in order to sample migratory wader or shorebird species. All bird surveys were conducted in accordance with *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE, 2017)

### 3.5.4 Targeted Searching

Searches of rocky outcrop areas were carried out during both surveys, targeting both the Northern Quoll and the Pilbara Olive Python. This included diurnal searches largely focused on habitat assessments and recording of sign (scats and tracks). Nocturnal spotlight surveys were conducted during both surveys, searching

appropriate habitat for foraging nocturnal species. In total approximately 6 hours of spotlighting was carried out in both the pre-wet season and post-wet season surveys.

## 4 FLORA AND VEGETATION RESULTS

### 4.1 DESKTOP SURVEY

#### 4.1.1 General Site Description

The King Bay to Hearson Cove valley is the only open valley of the Burrup Peninsula which crosses east-west across the Peninsula. The Project straddles the western end of the valley with a catenary sequence from the elevated rocky hills in the north and to the south, to upper and mid slopes incised by drainage features, through hummock grasslands and plains to the floor of the valley which has a large area of saline mud flats fringed by samphire and sandy swales of tussock grasslands.

#### 4.1.2 Previous Surveys

Beard (1975) described the vegetation of the botanical province as predominantly open grassy plains or mixed grass and spinifex with shrub steppe occurring further inland on the granite plains. Beard (1975) broadly classified the vegetation of the Burrup Peninsula as *Triodia pungens* hummock grassland with very few shrubs.

Thackway and Cresswell (1995) described the vegetation as “Quaternary alluvial plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia translucens* (now *A. stellaticeps*) over *Triodia pungens* (now *T. epactia*). Samphire, *Sporobolus* and Mangal occur on marine alluvial flats”.

Blackwell and Cala (1979) looked specifically at the vegetation of the Burrup Peninsula and described a group of five basic vegetation units for the area that were further divided into 28 communities. Blackwell and Cala (1979) recognised the Burrup Peninsula as part of the Abydos Plain which forms the landscape on the mainland, but also identified it as containing a unique mixture of coastal and Eremaean species in close association with species more typical of the Northern (Kimberley) Botanical Province.

In anticipation of future development, the DEC commissioned a study of the vegetation of the Burrup Peninsula, Dolphin, Angel and Gidley Islands and Inland Ranges (M.E. Trudgen & Associates, 2002). The study identified 240 vegetation associations (each with a small area of occurrence), a rich flora for its size (383 native vascular plant species from 54 families), and a high number of geographically restricted or uncommon species (M.E. Trudgen & Associates, 2002). A significant geographic based pattern for the distribution of floristic units on the peninsula, in accordance with landscape groups (i.e. rock piles, slopes, drainage lines, etc.), was also identified (Trudgen and Griffin, 2001; M.E. Trudgen & Associates, 2002). The vegetation of the Burrup Peninsula was found to be generally in very good or excellent condition, except in areas of coastal sand (M.E. Trudgen & Associates, 2002).

Trudgen & Griffin (2001) assessed the regional significance of vegetation on the Burrup Peninsula using the (Trudgen and Associates 2002) vegetation mapping as a base. It was outside of the terms of reference to map the Samphire flats in detail and scale limitations led rock outcrops and rock pockets to be mapped as a single unit, but with descriptions of 11 rock outcrop and rock pocket vegetation units included in Volume 1. These limitations aside, the mapping and vegetation association descriptions as well as the analysis of significance for flora and vegetation associations detailed in Trudgen & Griffin (2001) and M.E. Trudgen & Associates (2002) are the most comprehensive treatments of regional flora available. The two volumes form the basis of impact assessments for developments on the Burrup Peninsula subsequent to 2001.

Many private industry developments have commissioned independent studies on the Burrup Peninsula. Studies that overlap or are adjacent to the Project are summarised below. Although the vegetation associations mapped



by Trudgen and those mapped by botanists commissioned by private industry are generally similar, some differences are evident. The reasons for the differences generally include:

- Detailed description of samphire and beach vegetation associations. These were broadly mapped by Trudgen as one unit as they were not a part of the scope for that study;
- Detailed mapping of rockpile vegetation that was previously mapped by Trudgen as one unit/association due to scale restrictions when mapping the entire Core Study Area;
- Differences in rainfall prior to the surveys and subsequent effect on the dominance of shorter-lived perennial shrub species (e.g. *Acacia coleii*, *Acacia bivenosa*); and
- More detailed survey/inspection of the site-specific survey area. The Trudgen mapping covered most of the Burrup Peninsula and to achieve mapping on that scale it was required to use aerial photo interpreted mapping in some areas.

#### **Syntrolem Sweetwater – Astron Environmental (2001a)**

The Syntrolem Sweetwater project was proposed for the southern section of the current Project Area. It was surveyed for vegetation and floristic characteristics in 1999 with a survey area extending further to the south and south west than the current Study Area. Approximately one third of the area had been previously disturbed. Six broad vegetation associations were identified and within these associations 14 vegetation assemblages were identified. *Terminalia supranitifolia* (P3) was identified during the survey. Weeds found during the survey included *\*Cenchrus ciliaris* (Buffel Grass), *\*Cenchrus setigerus* (Birdwood Grass), *\*Aerva javanica* (Kapok) and *\*Stylosanthes hamata* (Caribbean stylo). It was noted that the tall stands of *Eucalyptus victrix* and *Terminalia circumulata* (formerly *Terminalia canescens*) woodland occurring in the drainage areas and deep gullies provided important faunal habitat (moisture, shade, nesting sites etc) and add aesthetic value to the Burrup.

#### **BFPL Ammonia – Astron Environmental (2001b)**

The BFPL Ammonia processing site is immediately adjacent to the Project and a portion of the vegetation mapped by Astron Environmental (2001a) overlaps the current Project Area. Astron Environmental (2001a, 2001b) conducted two vegetation surveys to coincide with the wet summer season and the dry season. Seven broad vegetation types and 15 vegetation assemblages were found to occur within the project lease.

The vegetation assemblages considered of conservation significance based on criteria compiled from Astron Environmental (2001a, 2001b) and Trudgen *et al.* (2001), included:

- Vegetation assemblage 1a – rock pile vegetation;
- Vegetation assemblages 5a, 5b, 5c – drainage lines and broad drainage zone vegetation (especially mixed grevillea heath);
- Vegetation assemblages 6a, 6b and 6c – samphire communities;
- *Dolichandrone heterophylla* stand (rare on the Burrup) (now *Dolichandrone occidentalis*)

A total of 131 vascular species (100 dry season, 117 wet season) were recorded within the Study Area. However, as the rainfall for the wet and dry season was low, this may not represent the full total. No Declared Rare Flora was identified within the Study Area, but one Priority 3 Flora species (*Terminalia supranitifolia*, at the time of survey was classified as P1) was found. A total of 38 *Terminalia supranitifolia* individuals were located on or around the base of scree slopes and small rocky outcrops.

**Dampier Nitrogen Pty Ltd Detailed Wet Season Survey (2005) and Addendum (2009) – Astron Environmental (2005)**

Dampier Nitrogen Pty Ltd proposed a development of Site C within the King Bay / Hearson Cove Industrial Area. The area surveyed by Astron Environmental (2005) overlaps much of the northern end of the current Study Area as well as the tidal inlet and fringing vegetation in the centre of the current Project site. The Astron Environmental (2005) assessment covers a greater area than the current Project, encompassing a large area of rocky outcrop vegetation and tidal inlet that are outside of the current Project Area. Vegetation associations of the rock outcrops, samphire and tussock grass areas were described in detail. Twelve broad vegetation groups are divided into 79 associations.

The 2005 field survey recorded 143 flora taxa from 44 families. 23 *Terminalia supranitifolia* (P3) and 2 *Rhynchosia bungarensis* (P4) were identified. Two introduced species were recorded, \**Cenchrus ciliaris* (buffel grass) and \**Aerva javanica* (kapok bush). Two rockpile communities were considered to be of particular conservation significance. These occur outside of the current Project Area.

The mapping of the samphire vegetation in the Hearson Cove / King Bay Valley conducted by Astron Environmental in 2002 and included in the wet season report in 2005 is the most comprehensive assessment of the distribution of these vegetation assemblages on the Burrup Peninsula.

**Pluto LNG Development Site B North - ENV Australia (2006)**

Site B North is situated less than 500 m northwest of the Project.

One hundred and twelve taxa were collected from within the study site. One species of Priority flora, *Terminalia supranitifolia* (P3), was located at four sites within rockpiles and drainage lines. Eight special interest flora taxa were recorded (as per M. E. Trudgen & Associates, 2002). One in particular is considered of greater significance in relation to the Site B North project. *Fimbristylis* aff. *dichotoma* (M75-4) is not uncommon where it occurs. However, it is fairly restricted and a newly recognised taxon. Collection records exist at 21 locations on the Burrup Peninsula.

Two introduced species were recorded, \**Cenchrus ciliaris* (buffel grass) and \**Aerva javanica* (kapok bush).

One vegetation association mapped by M.E. Trudgen & Associates (2002) within Site B North is of conservation significance: *Triodia epactia* (Burrup form), *Cymbopogon ambiguus* hummock / tussock grassland (TeCa). The area of TeCa within Site B North represents less than 1% of the total area mapped for this association, and there is a relatively large number of occurrences on the peninsula. This association is only represented by 4% in the conservation zone, hence its significance.

**Burrup Nitrates – Outback Ecology (2009)**

The Burrup Nitrates Project is located adjacent to the BFPL ammonia project and less than 1 km to the east of the Project. Five broad vegetation types were identified during the flora survey. The five broad vegetation types identified on the Site correspond to those vegetation assemblages previously identified and mapped as occurring within the area (as per M. E. Trudgen & Associates, 2002). These vegetation types also broadly correspond with the vegetation associations mapped at the adjacent BFPL site by Astron Environmental (2001a).

Vegetation condition was described as Good to Very Good (Keighery, 1994). Three introduced species, \**Cenchrus ciliaris* (Buffel Grass), \**Aerva javanica* (Kapok bush) and \**Vachellia farnesiana* were found during the survey. It was noted that the introduced \**Cenchrus ciliaris* has increased its cover and dominance in the Coastal Flats vegetation type since the time of the M.E. Trudgen & Associates (2002) report.

No conservation significant flora species were identified within the site. While no Threatened or Priority Ecological Communities (PEC) are known on the Burrup Peninsula Based, analysis of the M.E. Trudgen & Associates (2002) mapping undertaken by ENV Australia (2006) identified that the community mapped as Sm and described as Saline Inlet and Supra-tidal Flats was considered to represent a significant vegetation association. It was noted that approximately 56% of this community's extent was represented within the proposed Burrup Peninsula Conservation Reserve.

#### 4.1.3 Conservation Significant Vegetation

No Threatened Ecological Communities listed under the EPBC Act or BC Act are known to occur on the Burrup Peninsula (DBCA 2018).

Two PECs are known from the Burrup Peninsula:

- Burrup Peninsula rock pool communities. Priority 1: Calcareous tufa deposits. Interesting aquatic snails. Threats: recreational impacts, and potential development; possibly NO<sub>x</sub> and SO<sub>x</sub> emissions, weed invasion including \**Passiflora foetida* (stinking passion flower); and
- Burrup Peninsula rock pile communities. Priority 1: Pockets of vegetation in rock piles, rock pockets and outcrops. Comprise a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Short-range endemic land snails. Threats: industrial development dust emissions. Weed invasion including \**Cenchrus ciliaris* (Buffel Grass) and \**Passiflora foetida* (stinking passion flower)

Locations of PECs listed in the DBCA databases for the Burrup Peninsula are shown in Figure 4-1. No known PECs are listed in the DBCA database as occurring in the Project area.



474000 475500 477000 478500 480000 481500

7726500 7725000 7723500 7722000 7720500 7719000 7717500 7716000



**Figure 4-1: Conservation Significant Communities Identified by Department of Biodiversity Conservation and Attractions Database Search as Occurring in the Vicinity of the Study Area**

**Legend**

**DBCA\_TecPec\_Results**

- Burrup Peninsula rock pile communities - P1
- Burrup Peninsula rock pool communities - P1

- Study Area
- Main Roads WA

N  
↑

750 375 0 750 Meters

1 centimeter = 346 meters  
Date: 6/06/2019  
Coordinate System: GDA 1994 MGA Zone 50  
Author: [ems@animalplantmineral.com.au](mailto:ems@animalplantmineral.com.au)



Trudgen & Griffin (2001) assess “rarity” (and therefore significance) of vegetation based on methodologies outlined by Abrahams *et al.* (1995), using the minimum area for protection of an ecosystem as recommended by the International Union for the Conservation of Nature, and English and Blyth (1997). Using the formulas developed in these references, Trudgen & Griffin (2001) calculates vegetation rarity as governed by area, with 2,000 ha as the lower limit for definition of a “rare” undisturbed vegetation association and 30% remaining as the threshold for “threatened” status. Given this definition, all vegetation on the Burrup is “significant”.

A map showing the frequency of vegetation types on the Burrup was produced by the Department of Mineral and Petroleum Resources (2002) utilising the results of M. E. Trudgen & Associates (2002). This map has a frequency scale ranging from 1 to 100 or more occurrences on the Burrup Peninsula. The map is a useful tool in assessing the regional significance of vegetation on any one area of the Burrup Peninsula. According to M. E. Trudgen & Associates (2002), ten or fewer occurrences of any vegetation association should be treated as significant, and more so if those occurrences are limited to the area zoned for industry.

Using Trudgen & Griffin’s (2001) significance assessment criteria, the vegetation communities identified by M. E. Trudgen & Associates (2002) from the Study Area that are considered significant are listed in Table 4-1. There are a number of statistical artefacts in the dataset that elevate map units to significance without merit. These are identified in the comments of Table 4-1. Units coloured yellow indicate there are at least ten occurrences and as such do not qualify as significant under the classification scheme. They have been included in the table here as other developments on the Burrup may have reduced the number below ten occurrences and thus need to be considered as part of the cumulative impact of development on the Peninsula.

**Table 4-1: Vegetation Communities from the Study Area that are Considered Significant using M. E. Trudgen & Associates (2002) Significance Assessment Criteria**

Association Code	Association Name	Comments
*CcTs	* <i>Cenchrus ciliaris</i> , ( <i>Triodia epactia</i> (BF)), ( <i>Triodia angusta</i> (BF))grassland/hummock grassland with <i>Tephrosia</i> aff. <i>supina</i> (MET 12, 357), <i>Rhynchosia</i> cf. <i>minima</i> herbland	*Cc is a weed. This is red by simple reason of being unique but is not considered significant vegetation. Without the *Cc it would likely be TaTsRm which is also red but together would be 2 occurrences therefore dark orange.
ItTa/AbTa	This is mapped as a combination of ItTa and AbTa.	As individually they are both light orange, this is considered to be light orange also
Sm/*Cc/D	This is mapped as a combination of Samphire, * <i>Cenchrus ciliaris</i> and Disturbed.	Sm is dark green, *Cc is a weed and D is disturbed so this vegetation is not of conservation significance.
Sm/Sv	This is mapped as a combination of Sm and Sv	Sm and Sv are medium and light green respectively so this is not considered to be of conservation significance, excepting that a discussion of the conservation significance of the tidal inlet vegetation is found below.
Sv	<i>Sporobolus virginicus</i> tussock grassland	Most of this vegetation is mapped as (Te)Sv, which indicates with or without <i>Triodia epactia</i> . It is considered here that Sv is synonymous with (Te)Sv (mapped light green) and therefore is not of conservation significance.
TaTsRm	<i>Triodia angusta</i> (BF) <i>Triodia epactia</i> grassland with <i>Tephrosia</i> aff. <i>supina</i> (MET 12,375) herbland and <i>Rhynchosia</i> cf. <i>minima</i> lianes	1 occurrence, but see note for *CcTs
AbCgTe	<i>Acacia bivenosa</i> , <i>Cassia glutinosa</i> open shrubland to shrubland over <i>Triodia epactia</i> (BF), * <i>Cenchrus ciliaris</i> grassland	Trudgen: Dark Orange 2 to 4 Occurrences
ChAbSg	<i>Corymbia hamersleyana</i> low open woodland over <i>Acacia bivenosa</i> high open shrubland over <i>Dichrostachys spicata</i> scattered shrubs over <i>Stemodia grossa</i> low shrubland to low open heath over <i>Triodia epactia</i> (Burrup form) hummock grassland	Trudgen: Dark Orange 2 to 4 Occurrences
Ev*CcTe	<i>Eucalyptus victrix</i> low open woodland to low woodland over ( <i>Pittosporum phylliraeoides</i> var. <i>phylliraeoides</i> , <i>Rhagodia eremaea</i> high shrubs to shrubs) over * <i>Cenchrus ciliaris</i> , <i>Triodia epactia</i> (BF) tussock/hummock grassland	Trudgen: Dark Orange 2 to 4 Occurrences
AbImTe	<i>Acacia bivenosa</i> high open shrubland to high shrubland over <i>Indigofera monophylla</i> (BF) scattered low shrubs to low open shrubland over <i>Triodia epactia</i> (BF) hummock grassland to closed hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences

<b>AbTa</b>	<i>Acacia bivenosa</i> high open shrubs over <i>Triodia angusta</i> (BF) hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences
<b>AbWaTe</b>	<i>Acacia bivenosa</i> high shrubland over <i>Whiteochloa airoides</i> , <i>Triodia epactia</i> (BF) tussock/hummock grassland with patches of * <i>Cenchrus ciliaris</i> grassland	Trudgen: Light Orange 4 to 9 Occurrences
<b>EvAa</b>	<i>Eucalyptus victrix</i> low woodland over <i>Acacia ampliceps</i> open heath over <i>Cyperus vaginatus</i> , <i>Eriachne tenuiculmis</i> , <i>Triodia angusta</i> (Burrup form) sedgeland and tussock/hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences
<b>ItTa</b>	<i>Indigofera trita</i> low shrubland over <i>Triodia angusta</i> (BF), ( <i>Triodia epactia</i> (BF)) hummock grassland	Trudgen: Light Orange 4 to 9 Occurrences
<b>ChImTe</b>	<i>Corymbia hamersleyana</i> scattered low trees to low open woodland over ( <i>Acacia bivenosa</i> , <i>Acacia coriaceae</i> subsp. <i>coriaceae</i> ) scattered tall shrubs over ( <i>Dichrostachys spicata</i> ) scattered shrubs over <i>Indigofera monophylla</i> (BF) low open shrubs to low shrubland over <i>Triodia epactia</i> (BF) hummock grassland	Trudgen: Yellow 10 to 24 occurrences
<b>EvDsTa</b>	<i>Eucalyptus victrix</i> scattered low trees to low open woodland over <i>Dichrostachys spicata</i> , ( <i>Acacia coriaceae</i> subsp. <i>coriaceae</i> ) tall scattered shrubs to low open shrubland over <i>Triodia angusta</i> (BF) hummock grassland	Trudgen: Yellow 10 to 24 occurrences
<b>GpCwTe</b>	<i>Grevillea pyramidalis</i> subsp. <i>pyramidalis</i> open heath over <i>Corchorus walcottii</i> scattered low shrubs to low open heath over <i>Triodia epactia</i> (BF) hummock grassland	Trudgen: Yellow 10 to 24 occurrences
<b>TcEtSe</b>	<i>Terminalia circumulata</i> low woodland over <i>Eriachne tenuiculmis</i> , <i>Triodia epactia</i> (BF) grassland/hummock grassland with <i>Sesbania cannabina</i> herbland	Trudgen: Yellow 10 to 24 occurrences

**Red** = 1 occurrence; **Dark Orange** = 2 to 4 Occurrences; **Light Orange** = 5 to 9 Occurrences; **Yellow** = 10 to 24 Occurrences.

Additionally, Astron Environmental (2005) considered two of the seven rockpile vegetation types to be very rarely occurring. These are:

- 2e DhTs Low woodland of *Dolichandrone occidentalis* (formerly *heterophylla*), *Terminalia supranitifolia* with *Brachychiton acuminatus* over very open grassland of *Triodia epactia* (Burrup form) and *Cymbopogon ambiguous*; and

- 2f ErvDhBa Low woodland of *Erythrina vespertilio* with *Dolichandrone occidentalis* and *Brachychiton acuminatus* over very open grasses of *Cymbopogon ambiguus* with *Triodia epactia* (Burrup form) over annual herbs.

Because the Study Area contains the only known occurrence of *Dolichandrone occidentalis* on the Burrup, its occurrence on the rock piles here is considered to have very high conservation value. Additionally, although *Erythrina vespertilio* does occur elsewhere on the Burrup, it is not abundant or widespread. Its occurrence with *Dolichandrone occidentalis* gives this community high conservation value. These mapped areas do not occur in the Project Area but are close to the border in the central section between the two north stretching arms.

ENV Australia (2006) mapped the *Triodia epactia* (Burrup form), *Cymbopogon ambiguus* hummock / tussock grassland (TeCa). This association is only represented by 4% in the conservation zone, hence its significance. There are more than 100 occurrences of this vegetation association on the Peninsula.

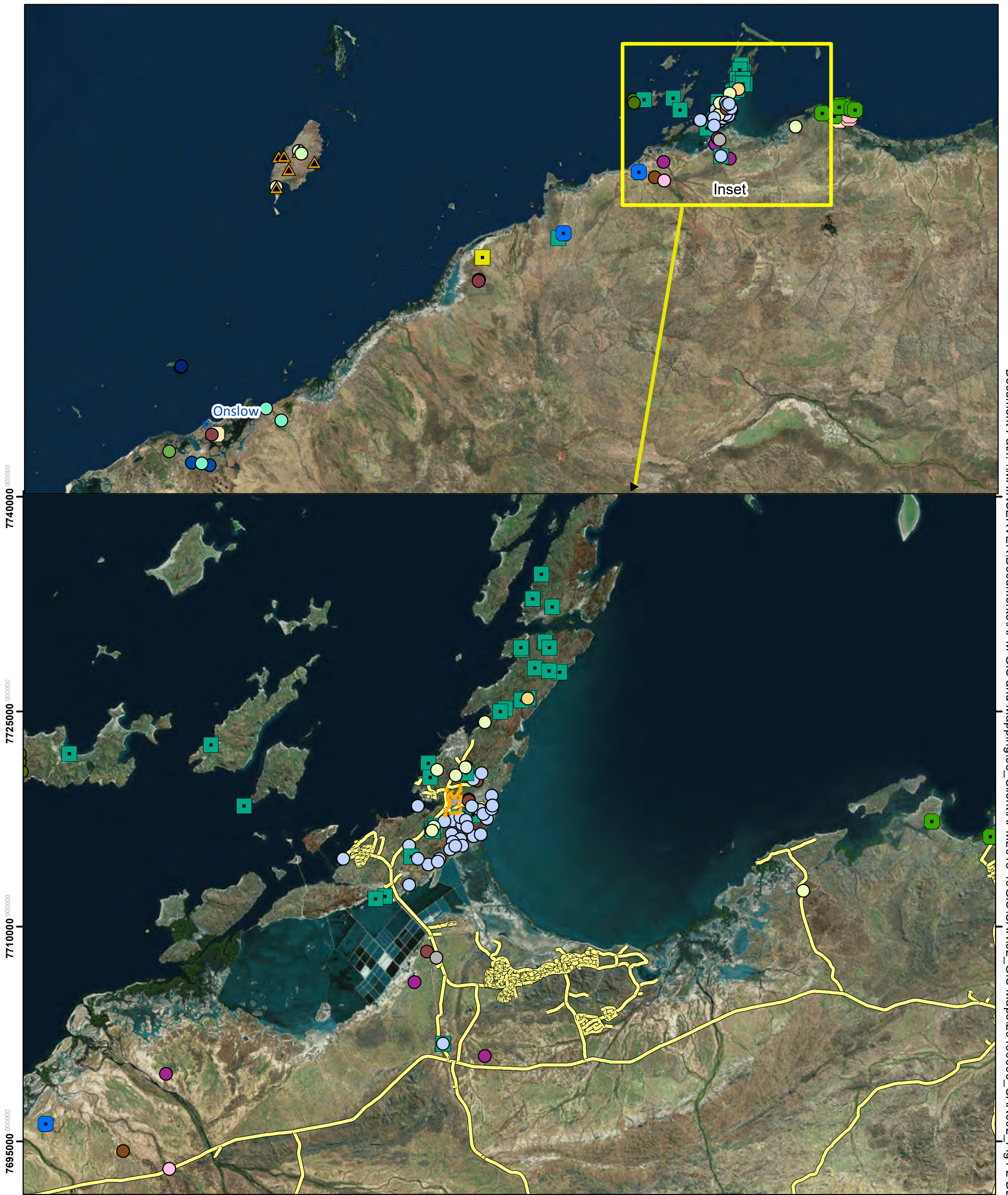
M. E. Trudgen & Associates (2002) identifies the tidal inlet between Hearson Cove and King Bay as being of conservation significance. The basic vegetation units mapped by M. E. Trudgen & Associates (2002) in the tidal inlet were designated Sm and (Te)Sv. In the assessment of occurrence Sm is represented by 50 to 99 occurrences and (Te)Sv is represented by 25 to 49 occurrences, both above the 10-occurrence threshold. Outback Ecology (2009) note also that there is approximately 56% of the Sm extent represented within the Burrup Peninsula Conservation Reserve (now the Murujuga National Park), above the 30 % threshold proposed by M. E. Trudgen & Associates (2002).

#### 4.1.3.1 Conservation Significant Flora

No plants declared rare or threatened under the EPBC Act are known from the Burrup Peninsula, or within 100 km of the Study Area. No plants declared rare under the WC Act are known from the Burrup Peninsula.

DBCAs Database Searches did not identify any known Priority flora locations within the Study Area. Priority Flora located in the Roeburn Bioregion coastal zone and Islands is shown in Figure 4-2. Table 4-2 identifies known habitat associations, distribution and flowering times of these taxa and makes an assessment of the likelihood of occurrence for each taxon given the habitats present in the Study Area. For the taxa assessed as likely to occur in the Project Area, an assessment is made about the likelihood of detection given the climatic conditions during survey. Table 4-2 identifies five taxa of conservation significance that may occur in the Project.





**Figure 4-2: Conservation Significant Flora Identified by Department of Biodiversity Conservation and Attractions Database Search as Occuring in the Vicinity of the Study Area**

**Legend**

**Conservation Significant Flora**

- |  |  |  |
|--|--|--|
| Abutilon sp. Pritzelianum (S. van Leeuwen 5095), P1      | Corchorus congener, P3   | Schoenus punctatus, P3                                 |
| Goodenia pallida, P1                                     | Eleocharis papillosa, P3                                       | Stackhousia clementii, P3                              |
| Helichrysum oligochaetum, P1                             | Eragrostis lanicaulis, P3                                      | Terminalia supranitifolia, P3                          |
| Tephrosia rosea var. Port Hedland (A.S. George 1114), P1 | Eragrostis surreyana, P3                                       | Themeda sp. Hamersley Station (M.E. Trudgen 11431), P3 |
| Cucumis sp. Barrow Island (D.W. Goodall 1264), P2        | Eremophila forrestii subsp. viridis, P3                        | Triumfetta echinata, P3                                |
| Pentalepis trichodesmoides subsp. hispida, P2            | Gomphrena cucullata, P3  | Vigna triodiophila, P3                                 |
| Atriplex lindleyi subsp. conduplicata, P3                | Gomphrena leptophylla, P3                                      | Goodenia nuda, P4                                      |
| Carpobrotus sp. Thevenard Island (M. White 050), P3      | Gymnanthera cunninghamii, P3                                   | Rhynchosia bungarensis, P4                             |
|  | Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479), P3 |  |
|  | Owenia acidula, P3   |  |

N

4.5 2.25 0 4.5 Kilometers

1 centimeter = 2,500 meters

Date: 6/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au



Table 4-2: Conservation Significant Flora identified from the Database Searches

Species	Current WA Conservation Status	Description & Habitat	Likelihood of Occurrence in Project Area and likelihood of Detection if Present
<i>Abutilon sp.</i> <i>Pritzelianum</i> (S. van Leeuwen 5095)	P1	Shrub to 1.5 m Red stony loam with <i>Acacia inaequilatera</i> , <i>Sida sp.</i> , <i>A. coriacea</i> , <i>Hibiscus leptocladus</i> .	<b>Possible.</b> Known from 1 location 40 km to the east on the mainland.
<i>Goodenia pallida</i>	P1	Balmoral Homestead. Corolla very pale purple. Plain, dry red sand. Annual grassland, Acacia steppe.	Unlikely. No suitable Habitat.
<i>Helichrysum oligochaetum</i>	P1	Erect annual, herb, to ca 0.25 m high. Fl. yellow, Aug to Nov. Red clay. Alluvial plains.	Unlikely. No suitable habitat
<i>Tephrosia rosea</i> var. <i>Port Hedland</i> (A.S. George 1114)	P1	Erect, spreading shrub 1 m Straggly open tomentose perennial. All parts densely grey/white felt, except inner petals. Deep burgundy flowers. Lower leaves becoming large. Raceme terminal 22-38 cm long. Legume 2.5-3 cm, tomentose. coastal dune sands, Open shrubland of <i>Acacia coriacea</i> subsp. <i>coriacea</i> and <i>Acacia sabulosa</i> over scattered shrubs of <i>Tephrosia rosea</i> var. <i>Port Hedland</i> over <i>Triodia epactia</i> , * <i>Cenchrus ciliaris</i> and * <i>Aerva javanica</i> . Also Small rocky hillcrest adjacent to lower-lying saline drainage areas at or just above sea level. with <i>Triodia wiseana</i> , <i>T. epactia</i> hummock grassland.	<b>Possible</b> but most locations on rocky terrain closer to the coast.
<i>Pentalepis trichodesmoides</i> subsp. <i>hispida</i>	P2	0.5 m tall x 1.5 m wide with long stems extending from the base, or just above. Phyllodes, green-yellow lanceolate, tomentose, 8 x 0.9 cm, 3 prominent veins. Flowers yellow with 5 petals. Bracts present. Banks of creeks and edges of basalt screes	Unlikely. No suitable habitat.
<i>Atriplex lindleyi</i> subsp. <i>conduplicata</i>	P3	Open straggly rotund shrub, growing up to 0.2 m tall. Sparse tussock grassland of <i>Eragrostis xerophila</i> . Crabhole plains.	Unlikely. No suitable habitat.
<i>Cucumis sp.</i> Barrow Island (D.W. Goodall 1264)	P3	Barrow Island Nature Reserve Herbaceous climber, 0.4 m high, 0.4 m wide. Very sticky creeper. Stems and leaves hirsute. Leaves mid-green, trifoliate, simple from nodes at regular intervals. One leaf and flower at each node. Perianth 0.5 cm long, 5 bright yellow petals. Flower approximately 0.5 cm diameter. Gentle calcrete slope. Red, sandy loam. <i>Triodia angusta</i> with scattered <i>Grevillea pyramidalis</i> . Species in vicinity (burn area): <i>Acacia bivenosa</i> , <i>Acanthocarpus verticillatus</i> , <i>Adriana tomentosa</i> , <i>Corchorus congener</i> , <i>Diplopeltis eriocarpa</i>	Unlikely. Restricted to Barrow Island 140 km to the west. Flowering known from June and October.
<i>Carpobrotus sp.</i> Thevenard Island (M. White 050)	P3	Thevenard Island. Prostrate succulent, glabrous plant. Leaves sessile, triangular in cross section to 10 cm in length. Sides 17mm wide. Flowers cream, solitary, 3-5 cm in diameter on thick peduncles 4-5, 2 large, leaflike, others small. Fruit turbinate. Coarse white sand on top of dune. Disturbed area.	Unlikely. No suitable Habitat. Restricted to Thevenard Island 200 km to the south-west.
<i>Corchorus congener</i>	P3	Barrow Island. Spreading plant to 75 cm diameter. Old stems grey-brown. New stems pale green and plumose. Leaves pale green, dentate, oval, 1-3 cm long x 1-1.5 cm	Unlikely. Restricted to Barrow Island 140 km to the west. Flowering known from June and October.

Species	Current WA Conservation Status	Description & Habitat	Likelihood of Occurrence in Project Area and likelihood of Detection if Present
		wide, plumose. Flowers in umbels along stems. 4 bright yellow petals, numerous bright yellow stamens.	
<i>Eleocharis papillosa</i>	P3	Broad drainage area through sandy coastal plain Red clay over granite, open clay flats. Claypans. Mosaic of <i>Tecticornia</i> (formerly <i>Halosarcia</i> ) low shrubland with mixed tussock grassland of <i>Sporobolus mitchellii</i> , <i>Eriachne benthamii</i> , <i>Eulalia aurea</i> .	Unlikely. No suitable habitat.
<i>Eragrostis lanicaulis</i>	P3	Knotty or bulbous rhizomatous, perennial, grass-like or herb, 0.45-0.5 m high. Fl. Mar to May or Aug to Oct. Red sandy clay. Flats.	Unlikely. No suitable habitat.
<i>Eragrostis surreyana</i>	P3	Tufted annual grass 1-2 cm high. Seepage/wetland areas on boulder/rocky areas. Stony soil of red-brown sandy-clay. <i>Cyperus vaginatus</i> , <i>Schoenus falcatus</i> , <i>Fimbristylis rara</i> , <i>Schoenoplectus littoralis</i> , <i>Eragrostis</i> sp. Mt Montague, sedgeland - tussock grassland with <i>Stemodia grossa</i> , <i>Pluchea rubelliflora</i> , <i>Stylidium fluminense</i> , <i>Peplidium</i> sp. E herbland.	Unlikely. No suitable habitat
<i>Eremophila forrestii</i> subsp. <i>viridis</i>	P3	Shrub, 0.8 - 1.5 m tall, Flowers pink-cream. Red sands - red/brown sandy loams of flat interdunal swales (not within dunes). Generally occurs on the flats where a hardpan develops in between inland dunes. <i>Acacia tetragonophylla</i> , <i>A. stellaticeps</i> , <i>Triodia epactia</i> .	Unlikely. No suitable habitat
<i>Gomphrena cucullata</i>	P3	Prostrate, compact herb 20 cm high x 55 cm wide. Wiry red stems, young stems slightly hairy. Revolute, linear leaves, acute 10-47 mm long x 1 mm wide. Flowers white-pink, orange stamens, corolla 4 mm long. Flower head cylindrical, 20 mm long x 7 mm wide. Floodplain, red loam, Grassland	Unlikely. No suitable habitat
<i>Gomphrena leptophylla</i>	P3	Prostrate, compact herb 20 cm high x 60 cm wide. Stem leaves acute, mucronate, revolute linear leaves 10-30 mm long x 1-2 mm wide. Flowers green, yellow stamens. Axillary corolla 5 mm long. Cylindrical flower head 20 mm long x 7 mm wide. Bracts incurved. Flowers white, Mar to Sep. Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	<b>Possible.</b> Diverse range of habitat associations.
<i>Gymnanthera cunninghamii</i>	P3	Enderby Island, Erect, multistemmed shrub to 2 m tall, Stem very pliable, bronze colour, glabrous. Leaves opposite, margins undulating, glossy, lime green above, dull beneath. Petioles 2-2.5 cm long. Milky sap. Growing in beach sand at base of dolerite hills.	Unlikely. No suitable Habitat. Records of flowering in all months.
<i>Oldenlandia</i> sp. <i>Hammersley Station</i> (A.A. Mitchell PRP 1479)	P3	Alluvial silt and clay in floodplain. Brown clay loam, Tussock Grassland of <i>Eriachne</i> sp. over Very Open Herbs.	Unlikely. No suitable habitat
<i>Owenia acidula</i>	P3	Mardie Station. Small tree to 3m, often dense stands as suckers. Leaves pseudopinnate. Known from sand dune, Shrub steppe,	<b>Possible.</b> Easily detected from vegetative growth all year.

Species	Current WA Conservation Status	Description & Habitat	Likelihood of Occurrence in Project Area and likelihood of Detection if Present
<i>Rhynchosia bungarensis</i>	P4	Burrup Peninsula. Creeper Viscid, spreading 1 m high. Steeply sloping rock pile (boulder scree) on valley side, E facing. Orange brown loam between cobbles (vegetated patch). Medium grained volcanic. Fire >10 years. <i>Terminalia circumulata</i> high open shrubland (low open woodland) over <i>Acacia coriacea</i> subsp. <i>coriacea</i> , <i>Flueggia virosa</i> subsp. <i>melanthesoides</i> high open shrubland over <i>Scaevola spinescens</i> (narrow form), <i>Rhagodia eremaea</i> scattered shrubs over <i>Triodia epactia</i>	<b>Occurs in Project Area.</b> Locally common on the Burrup Peninsula. Suitable habitat exists on the rocky outcrops and slopes. Closest DBCA record less than 300 m from the Project Area. Specimens positively detected in Project Area by APM.
<i>Schoenus punctatus</i>	P3	Tufting plant to 80 cm high. Mid green leaves and culms. Leaf base dark red. Heads fine panicles above leaves. Spikelets brown to dark brown. Growing near <i>Stylidium fluminense</i> , <i>Cyperus</i> sp. and other water dependent spp. in creekline mud.	Unlikely. No suitable habitat
<i>Stackhousia clementii</i>	P3	King Bay - Hearson Cove tidal inlet, Burrup Peninsula. Lime-green, more or less leafless plant (or scale like leaves) to 45 cm with numerous erect slender branches. Flowers in clusters, forming a cylindrical spike. Woody base. Soft, silty saline soil over limestone - with much limestone and coral rubble, on small 'island' within tidal inlet (very rarely inundated). But also with Tall shrubland of <i>Acacia bivenosa</i> over open hummock grassland of <i>Triodia epactia</i> with open tussock grassland of <i>Cenchrus ciliaris</i> , on sandy clay loam flats.	<b>Likely.</b> Located in the supratidal zone common to the Project Area. Records located 600 m to the east of the Project Area visited and healthy individuals noted. Records of flowering in all months.
<i>Terminalia supranitifolia</i>	P3	Rocky outcrops. Stunted canopy tree, very gnarled twisted trunk, intricate branches, grey in colour. Leaves glossy, silvery silky tomentum. Flowers lemon, fruits not winged. Leaves lemon-green colour.	<b>Occurs in Project Area.</b> Locally common in the central area of the Burrup Peninsula. Suitable habitat exists on the rocky outcrops. Closest DBCA record less than 300 m from the Project Area. Fertile specimen positively detected in Project Area by APM.
<i>Themeda</i> sp. <i>Hammersley Station</i> <i>(M.E. Trudgen 11431)</i>	P3	1.8m tall upright grass bases not buried in ground. Flowers Aug. Red clay. Clay pan, grass plain.	Unlikely. No suitable habitat
<i>Triumfetta echinata</i>	P3	Prostrate perennial shrub, spreading to ca 1 m diameter. sand dune with Soft spinifex.	Unlikely. No suitable habitat
<i>Vigna triodiophila</i>	P3	Burrup Peninsula. Herb. Slender vine entwined in <i>Triodia epactia</i> and rocks. Vine with thickened root - probably perennial but dying back to rootstock in dry. Flowers yellow. Rockpiles.	<b>Likely.</b> Locally common in the central area of the Burrup Peninsula. Suitable habitat exists on the rocky outcrops. Closest DBCA record is 700 m from the Project Area. Fertile material recorded in June.
<i>Goodenia nuda</i>	P4	Mardie Station Erect herb 0.3 m high x 0.2 m wide. Flowers yellow. Plain. Dry, red sand. Mesquite scrub.	Unlikely. No suitable Habitat.



M. E. Trudgen & Associates (2002) identified a number of species of conservation significance (Table 4-3). These are species identified as having high conservation value for being at the extent of their range or those for which there is a lack of scientific knowledge, or because their distribution is limited. Nine of these species are perennials, 16 are annuals, six are annual / ephemerals and five are ephemerals (one species was unknown). Some of the flora taxa of special interest listed by Trudgen has been accepted as a natural variation of a known and described taxa. *Rhynchosia* sp. Burrup (82-1C) is now known as *Rhynchosia bungarensis* (P4).

From the review of previous surveys it was noted that the Astron Environmental (2005) survey identified 23 *Terminalia supranitifolia* (P3). Most of these occur outside of the current Study Area. *Rhynchosia bungarensis* (P4) was also located in 2 areas.

**Table 4-3: Flora Taxa of Special Interest as described by M. E. Trudgen & Associates (2002)**

Characteristic of Interest	Flora Taxa
Uncommon or rare, very restricted, newly recognised taxa	<i>Stackhousia</i> sp. (BMor 153), <i>Euphorbia</i> sp. (B34-11), <i>Amaranthus</i> aff. <i>pallidiflorus</i> (D89), <i>Sida</i> aff. <i>cardiophylla</i> (B22-37), <i>Tephrosia</i> aff. <i>clementii</i> (5) B184, <i>Sida</i> aff. <i>fibulifera</i> (B181-5B), <i>Tephrosia</i> aff. <i>densa</i> (B16-22), <i>Sida</i> aff. <i>fibulifera</i> (B235-7), <i>Vigna</i> sp. Burrup (B18), <i>Sida</i> aff. <i>fibulifera</i> (D109).
Not common, very restricted, newly recognised taxa	<i>Cheilanthes</i> aff. <i>tenuifolia</i> (B18), <i>Euphorbia</i> sp. (G133), <i>Amaranthus</i> sp. (D111), <i>Triumfetta</i> cf. <i>propinqua</i> (B13-13), <i>Euphorbia</i> sp. (BPBS2), <i>Ehretia</i> ?(B23-22), <i>Euphorbia</i> sp. (D105-1)
Apparently rare, fairly geographically restricted, habitat restricted taxa	<i>Eragrostis</i> sp. Mt Montagu (M.E.Trudgen 15,246), <i>Rhynchosia</i> sp. King Bay (B181-13)
Apparently quite uncommon, but widespread taxa	<i>Cyperus blakeanus</i> , <i>Euphorbia</i> aff. <i>australis</i> type 1 (erect stems)
Locally common, moderately restricted, newly recognised taxa	<i>Paspalidium tabulatum</i> (Burrup form), <i>Themeda</i> sp. Burrup (B84)
Very uncommon, quite restricted, newly recognised taxa	<i>Tephrosia</i> aff. <i>clementii</i> (4) (M35-14), <i>Euphorbia</i> sp. (B170-4), <i>Abutilon</i> sp. Fortescue (M. Maier 28A-4), <i>Sida</i> aff. <i>fibulifera</i> (B64-13B)
Not uncommon where occurs, fairly restricted, newly recognised taxa	<i>Fimbristylis</i> aff. <i>dichotoma</i> (M75-4), <i>Tephrosia</i> aff. <i>densa</i> (B17)
Locally very common to abundant, moderately restricted, newly recognised taxa	<i>Triodia angusta</i> (Burrup form), <i>Corchorus walcottii</i> , <i>Triodia epactia</i> (Burrup form) <i>Triumfetta appendiculate</i> (Burrup form), <i>Triodia wiseana</i> (Burrup form), <i>Euphorbia tannensis</i> subsp. <i>eremophila</i> (Burrup form), <i>Rhynchosia</i> sp. Burrup (82-1C)
Species at or near their southern end of range and not common locally	<i>Abutilon indicum</i> var. <i>australiense</i>

#### 4.1.4 Introduced Flora

No Declared weeds under the BAM Act have been previously recorded in the Study Area. Under the *Environmental Weed Strategy for Western Australia* (Department of Conservation and Land Management, 1999) weeds are rated according to three criteria:

- Invasiveness: ability to invade bushland in good to excellent condition or ability to invade waterways;
- Distribution: wide current or potential distribution including consideration of known history of widespread distribution elsewhere in the world; and
- Environmental Impacts - ability to change the structure, composition and function of ecosystems. In particular an ability to form a monoculture in a vegetation community.

The rating of each weed is then given according to the following scoring system:

- High: a weed species would have to score yes for all three criteria. Rating a weed species as high would indicate prioritising this weed for control and / or research i.e. prioritising funding to it;
- Moderate: a weed species would have to score yes for two of the above criteria. Rating a weed species as moderate would indicate that control or research effort should be directed to it if funds are available, however it should be monitored (possibly a reasonably high level of monitoring);
- Mild: a weed species scoring one of the criteria. A mild rating would indicate monitoring of the weed and control where appropriate; and
- Low: a weed species would score none of the criteria. A low ranking would mean that this species would require a low level of monitoring.

Weeds species previously known from the Burrup Peninsula and their rating are:

- |   |          |
|---|----------|
| • <i>*Aerva javanica</i> - Kapok                    | High     |
| • <i>*Cenchrus ciliaris</i> - Buffel Grass          | High     |
| • <i>*Cenchrus setigerus</i> - Birdwood Grass       | High     |
| • <i>*Cenchrus enchinatus</i> - Mossman River Grass | Low      |
| • <i>*Rumex vesciarius</i> - Ruby Dock              | High     |
| • <i>*Stylosanthes hamata</i> - Caribbean stylo     | Mild     |
| • <i>*Bidens bipinnata</i> - Bipinnate Beggar-Ticks | TBA      |
| • <i>*Euphorbia hirsuta</i> - Strawberry Weed       | Moderate |
| • <i>*Passiflora foetida</i> - Wild Passionfruit    | High     |
| • <i>*Solanum nigrum</i> - Nightshade               | Moderate |
| • <i>*Chloris barbata</i> - Purple-top chloris      | Low      |
| • <i>*Pennisetum setaceum</i> - Fountain grass      | Mild     |

- \**Malvastrum americanum* – Spiked Malvastrum Moderate

Trudgen *et al.* (2001) noted weed invasion of species not well established on the Peninsula which is occurring through the movement of seed on vehicles and establishing on roadsides. Some of these are native species that are very uncommon on the Burrup Peninsula but are appearing on roadsides and may become invasive. Three species of Acacia – *A. stellaticeps*, *A. trachycarpa* and *A. ancistrocarpa* are of noted as of concern for these reasons.

## 4.2 FIELD SURVEY

### 4.2.1 Survey Conditions

The post-wet season field survey followed the passage of Cyclone Veronica which crossed Karratha in March 2019. The Karratha Aero weather station (BOM station 00408310, 10 km to the south of the Survey Area) recorded 70 mm of rainfall associated with the passage of the cyclone. This rainfall created adequate post-wet season survey conditions.

### 4.2.2 Summary of the quadrat data

Fifty-nine detailed surveys were conducted within the Study Area. The field survey recorded 127 taxa, including species, subspecies and variants, from 34 Families. Three hundred and ninety taxa have been recorded for the Burrup Peninsula (Astron Environmental, 2005). Astron Environmental (2005) recorded 143 taxa from 44 families for Site C and the 'Site C and F amalgamation' zone that overlaps the current Study Area. As the Astron Environmental (2005) survey area was much larger and contained more vegetation associations than the current Study Area, it is not expected that the same level of floristic richness will be obtained from the Study Area.

A higher rainfall, closer to a seasonal long-term average, preceding the survey may have returned a greater number of total species present on the site. Given the knowledge available from previous surveys, however, the expected difference would be less than 5%. A higher rainfall may have had greater influence over the abundance of a small suite of ephemeral and short-lived perennial species recorded at each site, which were recorded in low densities in the present survey but at higher densities in previous surveys.

### 4.2.3 Floristic composition vegetation classification

Cluster analysis returned 12 groups of sites. The results of the cluster analysis are displayed as a dendrogram in Figure 4-3. The analysis broadly groups the survey sites based on their position in the landscape, as shown in Table 4-4 and Figure 4-4.

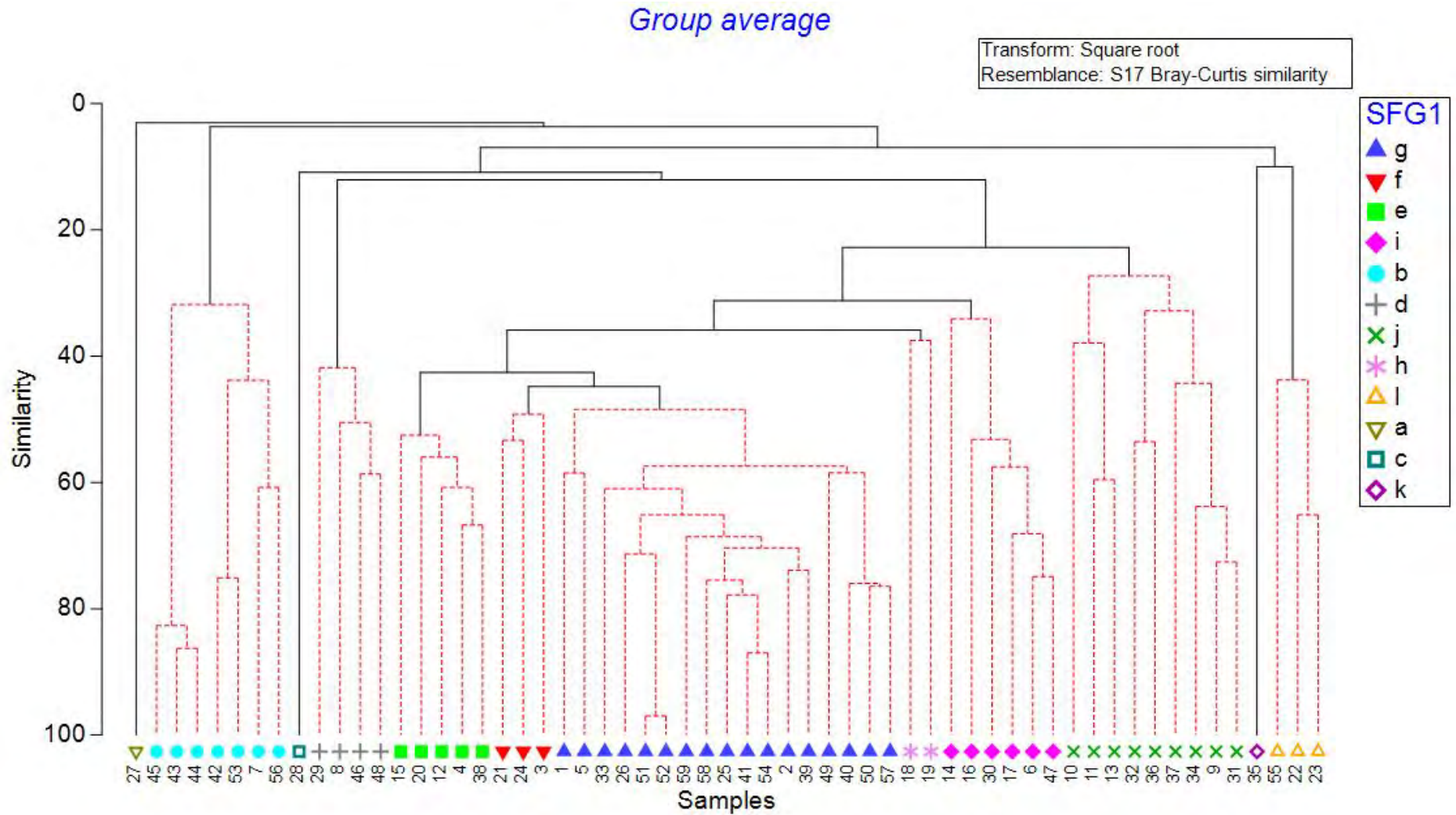


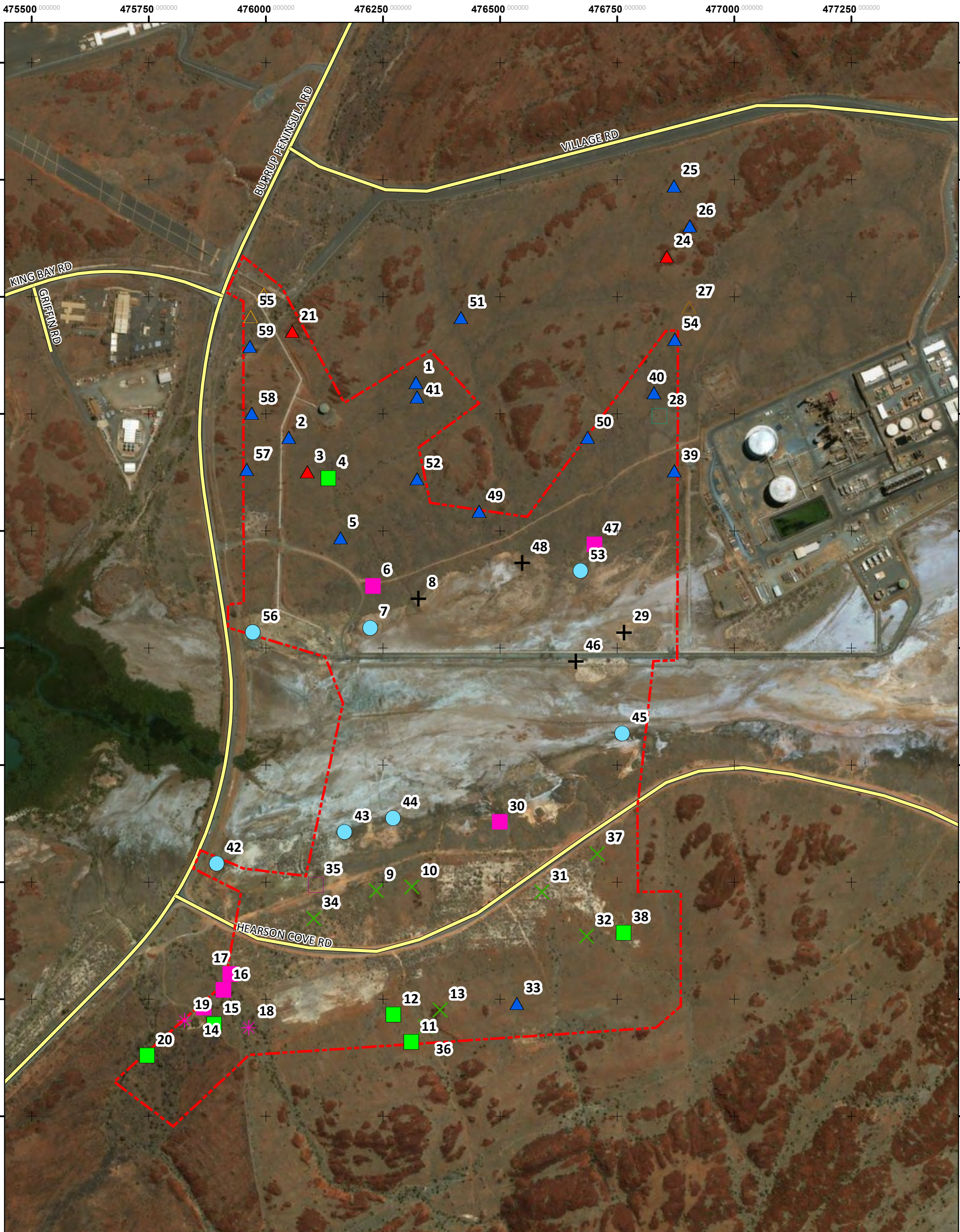
Figure 4-3: Cluster Analysis of the APM Vegetation Communities of the Study Area



**Table 4-4: Groups of sites determined from Cluster analysis and their landscape position**

CLUSTER group	Detailed Survey Sites	Landscape Position	CLUSTER group	Detailed Survey Sites	Landscape Position	
a	27	Slope	g	50	upper slope	
	7	Inlet		51	upper slope	
b	42	Sandbank		52	upper slope	
	43	Inlet		54	lower slope	
	44	Inlet		57	lower slope	
	45	Inlet		58	lower slope	
	53	Sandbank		59	mid slope	
	56	Sandbank		h	18	lower slope
c	28	Lower slope			19	lower slope
	d	8	Sandbank	i	6	lower slope
29		Sandbank	14		lower slope	
46		Sandbank	16		lower slope	
48		Sandbank	17		lower slope	
e	4	Shallow drainage	30		lower slope	
	12	Lower slope	47		lower slope	
	15	Lower slope	9		lower slope	
	20	Lower slope	10		outcrop	
	38	Mid slope	11		outcrop	
f	3	Outcrop	j		13	outcrop
	21	Outcrop		31	rehabilitation	
	24	Outcrop		32	mid slope	
g	1	drainage		34	lower slope	
	2	mid slope		36	lower slope	
	5	lower slope		37	lower slope	
	25	upper slope		k	35	Sandbank
	26	outcrop		l	22	drainage
	33	mid slope			23	drainage
	39	low rocky rise			55	drainage
	40	slope				
	41	low rocky rise				
	49	lower slope				





**Figure 4-4: Detailed Survey Sites Grouped by Cluster Analysis**

**Legend**

	a		d		g		j
	b		e		h		k
	c		f		i		l

N  
  
 160 80 0 160 Meters  
  
 1 centimeter = 75 meters  
 Date: 7/06/2019  
 Coordinate System: GDA 1994 MGA Zone 50  
 Author: ems@animalplantmineral.com.au



#### 4.2.4 Structural vegetation classification

Vegetation has been mapped using structural descriptions to the level of Association across the Study Area by M. E. Trudgen & Associates (2002), and across much of the northern and all of the central and southern sections of the Study Area by Astron Environmental (1999, 2005). As M. E. Trudgen & Associates (2002) mapped the region at the association scale, APM have prioritised retention of descriptions published in the 2002 report where they are still relevant. This is to facilitate impact assessment as many completed projects on the Burrup use the 2002 report associations which allows for calculation of cumulative impact. Astron Environmental (2005) provides a more detailed description and mapping of rocky outcrop and tidal inlet vegetation associations and has mapped the area of tidal inlet extensively beyond the current project. APM have prioritised retention of the 2005 report descriptions where relevant, to allow for calculations of local cumulative impact.

In a few situations neither the M. E. Trudgen & Associates (2002) or Astron Environmental (2005) mapping adequately described the vegetation present. Astron Environmental (2005) also noted discrepancies between the vegetation present in 2005 and that recorded by M. E. Trudgen & Associates (2002). It is considered that the vegetation of the Burrup Peninsula is highly dynamic as a consequence of the stochastic nature of the magnitude and frequency of rainfall events. The dominance of short-lived perennial species in the vegetation composition means there can be significant fluctuations in the structure and floristic composition of specific locations over time.

35 vegetation associations were mapped by APM at the Study Area. Each association and its abbreviation is listed in Table 4-5. The mapped locations of these associations within the Study Area are shown in Figure 4-5 (north section) and Figure 4-6 (south section). A species by site matrix is presented in Appendix I.

**Table 4-5: APM Vegetation Associations and Abbreviations**

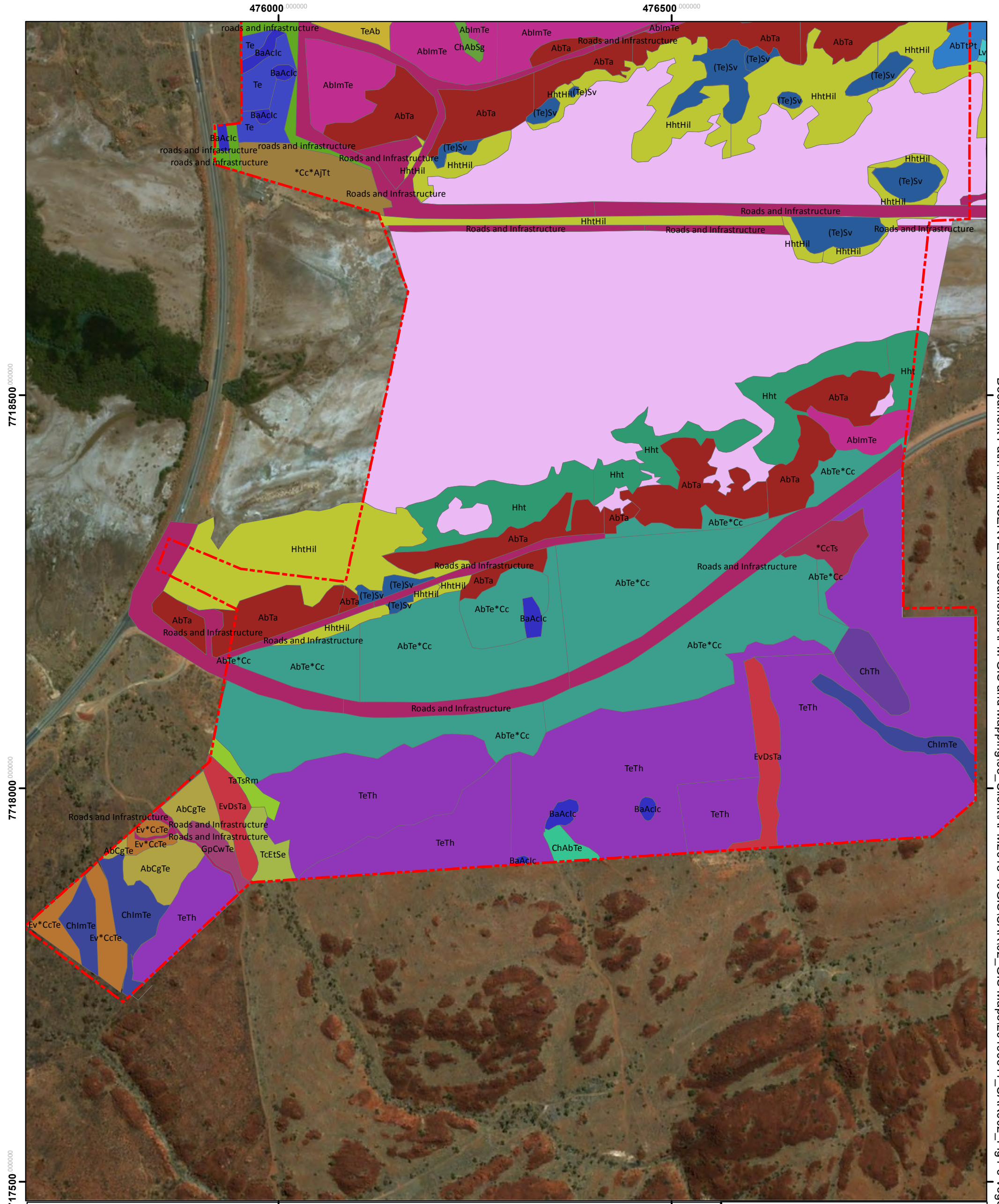
Abbreviation	APM Vegetation Community Description
(Te)Sv	Grassland of <i>Sporobolus virginicus</i> , <i>Eriachne mucronata</i> and <i>Paspalidium tabulatum</i> (30-70%) with scattered <i>Triodia epactia</i> . Evidence that <i>*Cenchrus ciliaris</i> and <i>*Aerva javanica</i> are common in wet season.
*Cc*AjTt	<i>*Cenchrus ciliaris</i> , <i>*Aerva javanica</i> with <i>Trianthema turgidifolia</i> .
*CcTs	<i>*Cenchrus ciliaris</i> , ( <i>Triodia epactia</i> (BF)), ( <i>Triodia angusta</i> (BF))grassland / hummock grassland with <i>Tephrosia supina</i> (MET 12, 357), <i>Rhynchosia cf. minima</i> herbland
AbCgTe	<i>Acacia bivenosa</i> , <i>Cassia glutinosa</i> open shrubland to shrubland over <i>Triodia epactia</i> (BF), <i>*Cenchrus ciliaris</i> grassland
AbHICwTe	High shrubland of <i>Acacia bivenosa</i> with scattered <i>Hakea lorea</i> , <i>Dolichandrone occidentalis</i> , <i>Grevillea pyramidalis</i> over hummock grassland of <i>Triodia epactia</i> (Burrup form) with occasional <i>Triodia angusta</i>
AbHITe	Tall shrubland of <i>Acacia bivenosa</i> over open shrubland of <i>Hakea lorea</i> , <i>Acacia coleii</i> over hummock grassland of <i>Triodia epactia</i> (Burrup form) over herbland.
AbImTe	<i>Acacia bivenosa</i> high open shrubland to high shrubland over <i>Indigofera monophylla</i> (BF) scattered low shrubs to low open shrubland over <i>Triodia epactia</i> (BF) hummock grassland to closed hummock grassland
AbTa	<i>Acacia bivenosa</i> high open shrubs over <i>Triodia angusta</i> (BF) hummock grassland
AbTe*Cc	Previously disturbed and rehabilitated. <i>Acacia bivenosa</i> tall shrubland (30-70%, 2.5m) over Hummock Grassland of <i>Triodia epactia</i> (30-70%) with <i>*Cenchrus ciliaris</i>
AbTtPt	High scattered (<2%) to very open shrubland (2-5%; 2m) <i>A. bivenosa</i> over low shrubland (10-30%; <1m) <i>Trianthema turgidifolia</i> over tussock grassland (10-30%) of <i>Paspalidium tabulatum</i>
AiGpTe	Tall shrubland of <i>Acacia inaequilatera</i> and <i>Grevillea pyramidalis</i> over hummock grassland of <i>Triodia epactia</i> (Burrup form) over herbland of <i>Gomphrena cunninghamii</i> , <i>Abutilon lepidum</i> , <i>Trichodesma zeylanicum</i> , <i>Trachymene oleracea</i>
BaAclc	Open low woodland of <i>Brachychiton acuminatus</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola aff spinescens</i> , <i>Ipomoea costata</i> over herbs and very open grassland of <i>Triodia epactia</i> (Burrup form) with <i>Cymbopogon ambiguus</i> and <i>Paspalidium clementii</i>

ChAbSg	<i>Corymbia hamersleyana</i> low open woodland over <i>Acacia bivenosa</i> high open shrubland over <i>Dichrostachys spicata</i> scattered shrubs over <i>Stemodia grossa</i> low shrubland to low open heath over <i>Triodia epactia</i> (Burrup form) hummock grassland
ChImTe	<i>Corymbia hamersleyana</i> scattered low trees to low open woodland over ( <i>Acacia bivenosa</i> , <i>Acacia coriacea</i> subsp. <i>coriacea</i> ) scattered tall shrubs over ( <i>Dichrostachys spicata</i> ) scattered shrubs over <i>Indigofera monophylla</i> (BF)
ChTh	<i>Corymbia hamersleyana</i> scattered low trees to low woodland over <i>Acacia bivenosa</i> , <i>Acacia colei</i> , scattered tall shrubs to low open shrubland over <i>Indigofera monophylla</i> over <i>Triodia epactia</i> , <i>Themeda</i> sp. <i>Burrup</i> hummock / tussock grassland
Ev*CcTe	<i>Eucalyptus victrix</i> low open woodland to low woodland over ( <i>Pittosporum phillyreoides</i> var. <i>phillyreoides</i> , <i>Rhagodia eremaea</i> high shrubs to shrubs) over * <i>Cenchrus ciliaris</i> , <i>Triodia epactia</i> (BF) tussock/hummock grassland
EvAa	<i>Eucalyptus victrix</i> scattered low trees to low open woodland over <i>Acacia bivenosa</i> scattered tall shrubs to high open shrubland over <i>Triodia angusta</i> (Burrup form) hummock grassland
EvAbTa	<i>Eucalyptus victrix</i> scattered low trees to low open woodland over <i>Acacia bivenosa</i> scattered tall shrubs to high open shrubland over <i>Triodia angusta</i> (Burrup form) hummock grassland
EvDsTa	<i>Eucalyptus victrix</i> scattered low trees to low open woodland over <i>Dichrostachys spicata</i> , ( <i>Acacia coriacea</i> subsp. <i>coriacea</i> ) tall scattered shrubs to low open shrubland over <i>Triodia angusta</i> (BF) hummock grassland
EvTc	<i>Eucalyptus victrix</i> and <i>Terminalia circumulata</i> over <i>Acacia coriacea</i> with <i>Cyperus vaginatus</i> , <i>Cenchrus ciliaris</i> and <i>Passiflora foetida</i>
FbBaTsAc	Open low woodland of <i>Ficus brachypoda</i> , <i>Brachychiton acuminatus</i> , <i>Terminalia supranitifolia</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola</i> aff. <i>spinescens</i> , <i>Rhagodia preissii</i> subsp. <i>obovata</i> over open <i>Cymbopogon ambiguus</i> with <i>Triodia epactia</i> (Burrup form).
FvRpAc	Shrubland of <i>Flueggea virosa</i> subsp. <i>melanthesoides</i> , <i>Rhagodia preissii</i> subsp. <i>obovata</i> , <i>Alectryon oleifolius</i> subsp. <i>oleifolius</i> , <i>Scaevola</i> aff. <i>spinescens</i> , <i>Acacia coriacea</i> over very open <i>Triodia epactia</i> (Burrup form)
GpCwTe	<i>Grevillea pyramidalis</i> subsp. <i>pyramidalis</i> open heath over <i>Corchorus walcottii</i> scattered low shrubs to low open heath over <i>Triodia epactia</i> (BF) hummock grassland
Lv	Dwarf Shrubland over Low Open Grassland On slightly elevated sandy silts or fringes of inlet
TaTsRm	<i>Triodia angusta</i> (BF) <i>Triodia epactia</i> grassland with <i>Tephrosia</i> aff. <i>supina</i> (MET 12,375) herbland and <i>Rhynchosia</i> cf. <i>minima</i> <i>lianes</i>
TcEtSe	<i>Terminalia canescens</i> low woodland over <i>Eriachne tenuiculmis</i> , <i>Triodia epactia</i> (BF) grassland / hummock grassland with <i>Sesbania cannabina</i> herbland
Te	<i>Triodia epactia</i> (BF) hummock grassland
TeAb	<i>Triodia epactia</i> (BF) hummock grassland with scattered <i>Acacia bivenosa</i> shrubs
TeAtSd	(previously disturbed) Scattered <i>Acacia trachycarpa</i> over <i>Triodia epactia</i> hummock grassland with <i>Streptaglossa decurrens</i> herbfield
TeCa	<i>Triodia epactia</i> (BF), <i>Cymbopogon ambiguus</i> hummock / tussock grassland
TeRm	<i>Triodia epactia</i> (BF) hummock grassland with <i>Rhynchosia</i> cf. <i>minima</i> <i>lianes</i>
TeTh	<i>Triodia epactia</i> (BF), <i>Themeda</i> sp. <i>Burrup</i> (B84) hummock / tussock grassland
Tht	Open (2%) to dwarf shrubland (10-20%; <0.5m) of <i>Tecticornia halocnemoides</i> subsp. <i>tenuis</i> with occasional (2%) <i>Tecticornia pruinosa</i> , <i>Tecticornia indica</i> subsp. <i>leiostachya</i> , <i>Trianthema turgidifolia</i> .
ThtTil	Dwarf open shrubland to heath (varies from 2-10% to 20-40%; <0.5m) of <i>Tecticornia halocnemoides</i> subsp. <i>tenuis</i> with <i>Tecticornia indica</i> subsp. <i>leiostachya</i>
Tw	<i>Triodia wiseana</i> hummock grasslands





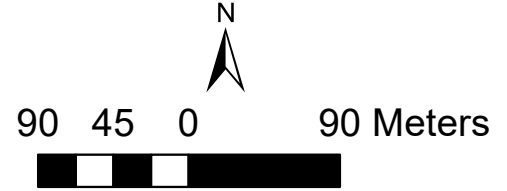




**Figure 4-6: APM (2019) Vegetation Communities of the Study Area (South)**

**Legend**

- |                      |         |          |                          |                          |              |
|----------------------|---------|----------|--------------------------|--------------------------|--------------|
| Study Area           | AbImTe  | ChImTe   | FvRpAc                   | Te                       | Veg_Mudflats |
| <b>APM 2018/2019</b> | AbTa    | ChTh     | GpCwTe                   | TeAb                     | Veg_Mudflats |
| (Te)Sv               | AbTe*Cc | Ev*CcTe  | Hht                      | TeAtSd                   |              |
| *Cc*AjTt             | AbTtPt  | EvAa     | HhtHil                   | TeCa                     |              |
| *CcTs                | AiGpTe  | EvAbTa   | Lv                       | TeRm                     |              |
| AbCgTe               | BaAcIc  | EvDsTa   | Roads and Infrastructure | TeTh                     |              |
| AbHlCwTe             | ChAbSg  | EvTc     | TaTsRm                   | Tw                       |              |
| AbHlTe               | ChAbTe  | FbBaTsAc | TcEtSe                   | roads and infrastructure |              |



1 centimeter = 45 meters  
 Date: 11/06/2019  
 Coordinate System: GDA 1994 MGA Zone 50  
 Author: ems@animalplantmineral.com.au

The vegetation associations recorded by APM for the Study Area organised by Formation Code (e.g. 10.4.2; Type 1 as appears in the original publications) and Formation Description are:

**10.4.2 *Eucalyptus victrix* scattered low trees, low open woodlands and low woodlands.** These vegetation associations occur in small shallow creek lines that are dry for much of the year. There are no rockpools associated with this vegetation type in the Study Area.

EvDsTa *Eucalyptus victrix* scattered low trees to low open woodland over *Dichrostachys spicata*, (*Acacia coriacea* subsp. *coriacea*) tall scattered shrubs to low open shrubland over *Triodia angusta* (BF) hummock grassland

Ev\*CcTe *Eucalyptus victrix* low open woodland to low woodland over (*Pittosporum phylliraeoides* var. *phylliraeoides*, *Rhagodia eremaea* high shrubs to shrubs) over \**Cenchrus ciliaris*, *Triodia epactia* (BF) tussock/hummock grassland

EvAbTa *Eucalyptus victrix* scattered low trees to low open woodland over *Acacia bivenosa* scattered tall shrubs to high open shrubland over *Triodia angusta* (Burrup form) hummock grassland

EvAa *Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus*, *Eriachne tenuiculmis*, *Triodia angusta* (Burrup form) sedgeland and tussock/hummock grassland

**10.4.5 *Corymbia hamersleyana* scattered low trees to low woodlands.**

ChImTe *Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa*, *Acacia coriacea* subsp. *coriacea*) scattered tall shrubs over (*Dichrostachys spicata*) scattered shrubs over *Indigofera monophylla* (BF)

ChTh *Corymbia hamersleyana* scattered low trees to low woodland over *Acacia bivenosa*, *Acacia colei*, scattered tall shrubs to low open shrubland over *Indigofera monophylla* over *Triodia epactia*, *Themeda* sp. Burrup hummock/tussock grassland

ChAbTe *Corymbia hamersleyana* scattered trees to low open woodland over *Acacia bivenosa* open shrubland over *Triodia epactia* (Burrup form) open to closed hummock grassland

ChAbSg *Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* (Burrup form) hummock grassland. *Stemodia grossa* was present in lower abundance due to late wet season rainfall, but a large number of juvenile plants were observed.

**10.4.7 *Terminalia circumulata* scattered low trees to low forest**

TcEtSe *Terminalia circumulata* low woodland over *Eriachne tenuiculmis*, *Triodia epactia* (BF) grassland/hummock grassland with *Sesbania cannabina* herbland. *Sesbania cannabina* was less abundant in 2018/19 than described by Trudgen and Associates 2002, likely due to seasonal conditions.

**10.4.13 *Grevillea pyramidalis* subsp. *pyramidalis* scattered shrubs to high shrublands**

GpCwTe *Grevillea pyramidalis* subsp. *pyramidalis* open heath over *Corchorus walcottii* scattered low shrubs to low open heath over *Triodia epactia* (BF) hummock grassland. *Corchorus walcottii* was not recorded in the 2018/19 survey, however that may be as a result of seasonal conditions.

**10.4.18 *Acacia bivenosa* (with various other species) scattered shrubs to high shrubland**



AbTe\*Cc *Acacia bivenosa* tall shrubland (30-70%, 2.5m) over Hummock Grassland of *Triodia epactia* (30-70%) with \**Cenchrus ciliaris*. All areas mapped as this unit are previously disturbed.

AbTa *Acacia bivenosa* high open shrubs over *Triodia angusta* (BF) hummock grassland

AbCgTe *Acacia bivenosa*, *Senna glutinosa* subsp. *glutinosa* (formerly *Cassia glutinosa*) open shrubland to shrubland over *Triodia epactia* (BF), \**Cenchrus ciliaris* grassland. *Senna glutinosa* subsp. *glutinosa* was less abundant in 2018/19 than described by Trudgen, however that is likely a consequence of seasonal conditions, and as such, the original description is retained.

AbImTe *Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* (BF) scattered low shrubs to low open shrubland over *Triodia epactia* (BF) hummock grassland to closed hummock grassland

#### 10.4.28 Hummock grasslands, hummock/tussock grasslands

TaTsRm *Triodia angusta* (BF) *Triodia epactia* grassland with *Tephrosia* aff. *supina* (MET 12,375) herbland and *Rhynchosia* cf. *minima* lianes

Te *Triodia epactia* (BF) hummock grassland. Found on plateaus and upper slopes where the soils are red brown loam with pebbles. Associated species include *Grevillea pyramidalis* subsp. *pyramidalis* and *Indigofera monophylla*.

TeAb *Triodia epactia* (BF) hummock grassland with scattered *Acacia bivenosa* shrubs

TeCa *Triodia epactia* (BF), *Cymbopogon ambiguus* hummock/Tussock grassland

TeTh *Triodia epactia* (BF), *Themeda* sp. Burrup (B84) hummock/tussock grassland. The *Themeda* collected was identified as *Themeda triandra* and was in lower abundance in 2018/19 than described by Trudgen and Associates 2002. The nomenclature is due to taxonomic revision and the abundance is likely a result of climatic conditions.

TeRm *Triodia epactia* (BF) hummock grassland with *Rhynchosia* cf. *minima* lianes

Tw *Triodia wiseana* hummock grasslands

#### 10.4.29 Tussock grasslands and tussock/hummock grasslands

(Te)Sv *Sporobolus virginicus* tussock grassland: Recorded on the edge of mud and tidal flats in soil of brown sandy loam with shell fragments. This unit varies to include *Triodia epactia* and *Eragrostis falcata* grassland.

\*CcTs \**Cenchrus ciliaris*, (*Triodia epactia* (BF)), (*Triodia angusta* (BF))grassland/hummock grassland with *Tephrosia* aff. *supina* (MET 12, 357), *Rhynchosia* cf. *minima* herbland

**Astron 2005 Type 1 Mixed open shrubland over low open shrubland of *Tephrosia* aff *supina*/*Indigofera monophylla* over hummock grassland of *Triodia epactia* (Burrup form).**

AbHICwTe High shrubland of *Acacia bivenosa* with scattered *Hakea lorea*, *Dolichandrone occidentalis*, *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* (Burrup form) with occasional *Triodia angusta*. The distribution of this vegetation community mapped in 2018/19 is significantly less than Astron 2005, with the surrounding vegetation descriptions in 2018/19 retaining those mapped by Trudgen and Associates 2002.



AiGpTe Tall shrubland of *Acacia inaequilatera* and *Grevillea pyramidalis* over hummock grassland of *Triodia epactia* (Burrup form) over herbland of *Gomphrena cunninghamii*, *Abutilon lepidum*, *Trichodesma zeylanicum*, *Trachymene oleracea*

**Astron 2005 Type 2 Low (pocket) woodland of *Terminalia supranitifolia*, *Brachychiton acuminatus*, *Ficus brachypoda* over open low shrubland of *Dichrostachys spicata*, *Ipomoea costata* over very open grassland of *Cymbopogon ambiguus*, *Triodia epactia* (Burrup form).**

BaAclc Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea*, *Scaevola aff spinescens*, *Ipomoea costata* over herbs and very open grassland of *Triodia epactia* (Burrup form) with *Cymbopogon ambiguus* and *Paspalidium clementii*

FbBaTsAc Open low woodland of *Ficus brachypoda*, *Brachychiton acuminatus*, *Terminalia supranitifolia* over mixed shrubland of *Acacia coriacea*, *Scaevola aff spinescens*, *Rhagodia preissii* subsp *obovate* over open *Cymbopogon ambiguus* with *Triodia epactia* (Burrup form). Note, no *Terminalia supranitifolia* (P3) present inside the survey boundary.

FvRpAc Shrubland of *Flueggea virosa* subsp *melanthesoides*, *Rhagodia preissii* subsp *obovata*, *Alectryon oleifolius* subsp *oleifolius*, *Scaevola aff spinescens*, *Acacia coriacea* over very open *Triodia epactia* (Burrup form)

**Astron 2005 Type 4 Shrubland of *Acacia inaequilatera*/*Hakea lorea*/*Acacia bivensoa* over low shrubland of *Indigofera monophylla*/*Triumfetta appendiculata* (Burrup form) over hummock grassland of *Triodia epactia* (Burrup form) and *Cymbopogon ambiguus* .**

AbHlTe Tall shrubland of *Acacia bivensoa* over open shrubland of *Hakea lorea*, *Acacia colei* over hummock grassland of *Triodia epactia* (Burrup form) over herbland.

**Astron 2005 Samphire Vegetation Group 2 Dwarf Shrubland over Low Open Grassland On slightly elevated sandy silts or fringes of inlet**

HhtHil Dwarf open shrubland to heath (varies from 2-10% to 20-40%; <0.5m) of *Tecticornia halocnemoides* subsp. *tenuis* with *Tecticornia indica* subsp. *leiostachya*.

Hht Open (2%) to dwarf shrubland (10-20%; <0.5m) of *Tecticornia halocnemoides* subsp. *tenuis* with occasional (2%) *Tecticornia pruinosa*, *Tecticornia indica* subsp *leiostachya*, *Trianthema turgidifolia*. Occurs along southern border of inlet, with stony mantle and is interrupted by "fingers" of *Triodia angusta* (Burrup form) grassland.

**Astron 1999 Unit 4 Drainage Lines and Gully Floors**

4a Low Woodland-Forest B (20-50%) of *Terminalia circumulata* and *E. victrix* with Low Scrub B (10-30%, 1-1.5m) and Open Grassland (10-30%).

**APM Detailed survey Vegetation Associations not adequately described by M. E. Trudgen & Associates (2002) and Astron Environmental (1999, 2005):**

\*Cc\*AjTt Tussock grassland of \**Cenchrus ciliaris*, herbland of \**Aerva javanica* and dwarf open shrubland of *Trianthema turgidifolia* on disturbed land.

Lv Dwarf open shrubland of *Lawrenca viridigrisea* (30-70%; 0.3 m)

TeAtSd (Previously disturbed) Scattered *Acacia trachycarpa* over *Triodia epactia* hummock grassland with *Streptaglossa decurrens* herbfield.

Table 4-6 lists the vegetation associations recorded by APM at the Study Area and compares them to those mapped by M. E. Trudgen & Associates (2002) and Astron Environmental (2005).

**Table 4-6: Vegetation Associations Recorded by APM at the Study Area Compared with those Mapped by Astron Environmental (2005) and M. E. Trudgen & Associates (2002).**

Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
43	(Te)Sv	(Te)Sv	1999 5a
44	(Te)Sv	Sv	1999 5a
47	(Te)Sv	Sv	1999 5a
61	(Te)Sv	(Te)Sv	HdHhtSv
64	(Te)Sv	(Te)Sv	HdHhtSv
55	(Te)Sv	(Te)Sv	HdHhtSv
105	(Te)Sv	(Te)Sv	AbTtWa
106	(Te)Sv	(Te)Sv	AbTtWa
108	(Te)Sv	(Te)Sv	HdHhtSv
109	(Te)Sv	(Te)Sv	HdHhtSv
125	(Te)Sv	(Te)Sv	AbTtWa
130	(Te)Sv	(Te)Sv	ScWa
161	*Cc*AjTt	D	not mapped
11	*CcTs	*CcTs	1999 6a
27	AbCgTe	AbCgTe	1999 3b
35	AbCgTe	AbCgTe	1999 3a
37	AbCgTe	AbCgTe	1999 3c
133	AbHICwTe	AbImTe	AbHICwTe
159	AbHICwTe	AbImTe	AbHICwTe
85	AbHITe	AbCwTe	4b. AbHITe
54	AbImTe	AbImTe	1999 3b
60	AbImTe	AbIm/TeRm	not mapped
73	AbImTe	AbImTe	1e + dolhet: AbHICwTe
77	AbImTe	AbImTe	1e + dolhet: AbHICwTe
78	AbImTe	AbImTe	1e + dolhet: AbHICwTe
80	AbImTe	AbImTe	1e + dolhet: AbHICwTe
86	AbImTe	AbImTe	1e + dolhet: AbHICwTe
87	AbImTe	AbImTe	1e + dolhet: AbHICwTe
16	AbTa	ItTa/AbTa	AbTa
18	AbTa	ItTa/AbTa	1999 3b
41	AbTa	Sm/*Cc/D	1999 5a
48	AbTa	ItTa/AbTa	AbTa
50	AbTa	ItTa	AbTa
52	AbTa	ItTa	AbTa
45	AbTa	ItTa	AbTa
51	AbTa	AbTa	not mapped
68	AbTa	AbTa	1e + dolhet: AbHICwTe
69	AbTa	AbTa	1e + dolhet: AbHICwTe
71	AbTa	AbTa	1e + dolhet: AbHICwTe
75	AbTa	AbTa	1e + dolhet: AbHICwTe
112	AbTa	AbTa	1g: AiAbTe
145	AbTa	Sv	AbTa
158	AbTa	AbTa	1999 5a
166	AbTe*Cc	D	not mapped
10	AbTe*Cc	TeTh	1999 6a
12	AbTe*Cc	D	1999 6a/6b
13	AbTe*Cc	D	1999 3a
15	AbTe*Cc	AbWaTe	1999 4b
19	AbTe*Cc	D	1999 3a
40	AbTe*Cc	D	1999 5a
42	AbTe*Cc	*Cc	1999 6b

Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
49	AbTe*Cc	D	
53	AbTe*Cc	D	
136	AbTe*Cc	D	not mapped
129	AbTa	(Te)Sv	AbAeTe
115	AiGpTe	TeRm	AiGpTe
116	AiGpTe	AbImTe	1a/1c
135	AiGpTe	TeRm	AiGpTe
162	AiGpTe	TeAb	not mapped
6	FbBaTsAc	R	1999 1a
14	FbBaTsAc	R	1999 1a
88	BaAcIc	R	not mapped
95	BaAcIc	R	not mapped
122	BaAcIc	R	2a BaAcIc
123	BaAcIc	R	not mapped
124	BaAcIc	R	not mapped
1	FbBaTsAc	R	1999 1a
5	BaAcIc	R	not mapped
156	BaAcIc	TeRm	2a BaAcIc
167	BaAcIc	R	not mapped
168	BaAcIc	R	not mapped
169	BaAcIc	R	not mapped
170	BaAcIc	R	not mapped
171	BaAcIc		not mapped
172	BaAcIc		not mapped
173	BaAcIc		not mapped
179	BaAcIc	D	not mapped
180	BaAcIc	AbImTe	not mapped
181	BaAcIc	AbImTe	not mapped
182	BaAcIc	AbImTe	not mapped
79	ChAbSg	AbImTe	not mapped
81	ChAbSg	ChAbSg	3e: ChDsSgTe
7	ChAbTe	TeTh	1999. 4c
134	ChImTe	TeTh	1999. 4c
38	ChImTe	ChImTe	1999 4b
188	ChImTe	ChImTe	1999 2a
2	ChTh	ChTh	1999 2b
31	Ev*CcTe	Ev*CcTe	1999 3b
36	Ev*CcTe	Ev*CcTe	1999 3a
187	Ev*CcTe	Ev*CcTe	1999 4b
189	Ev*CcTe	Ev*CcTe	1999 4b
97	EvAa	EvAbTa	Not mapped
100	EvAa	EvAa	Not mapped
103	EvAa	EvAa	not mapped
96	EvAbTa	EvAbTa	not mapped
98	EvAbTa	EvAbTa	not mapped
99	EvAbTa	EvAbTa	not mapped
3	EvDsTa	EvDsTa	1999. 4c
26	EvDsTa	EvDsTa	1999 4b
160	19994a	EvAbTa	not mapped
83	FbBaTsAc	R	2c FbBaTsAc
84	FbBaTsAc	R	2c FbBaTsAc
148	FbBaTsAc	R	2a BaAcIc
89	FvRpAc	R	2b FvRpAc
90	FvRpAc	R	2b FvRpAc
32	GpCwTe	GpCwTe	1999 3d
140	Tht	Sam	Hht
141	Tht	Sam	Hht



Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
142	Tht	Sam	Hht
143	Tht	Sam	Hht
144	Tht	Sam	Hht
46	ThtTil	Sv	1999 5a
62	ThtTil	Sam	HhtHil
63	ThtTil	Sam	HhtHil
65	ThtTil	Sam	HhtHil
66	ThtTil	Sam	HhtHil
107	ThtTil	Sam	BMF
110	ThtTil	Sam	HhtHil
76	ThtTil	Sam	HdHhtSv
126	ThtTil	Sam	HdHhtSv
128	ThtTil	Sam	HdHhtSv
131	ThtTil	Sam	HdHhtSv
132	ThtTil	Sam	HdHhtSv
139	ThtTil	Sam	Hht
146	ThtTil	Sm/Sv	1999 5a
147	ThtTil	Sam	1999 5a
186	ThtTil	Mud Flat	Mud Flat
138	Lv	APM new	AbAeTe
9	Roads and Infrastructure	Roads and Infrastructure	Roads and Infrastructure
17	Roads and Infrastructure	Roads and Infrastructure	Roads and Infrastructure
20	Roads and Infrastructure	Hearson Cove Road	Roads and Infrastructure
23	Roads and Infrastructure	Hearson Cove Road	Roads and Infrastructure
28	Roads and Infrastructure	Munjugura NP Road	not mapped
29	Roads and Infrastructure	Munjugura NP Camp area	not mapped
30	Roads and Infrastructure	Ev*CcTe	not mapped
39	Roads and Infrastructure	D	1999 5a
34	Roads and Infrastructure	Infrastructure	
56	Roads and Infrastructure	D	not mapped
70	Roads and Infrastructure	Road	
58	Roads and Infrastructure	Pipeline	
67	Roads and Infrastructure	Infrastructure	
72	Roads and Infrastructure	Pipeline	
74	Roads and Infrastructure	Infrastructure pipeline and road	
111	Roads and Infrastructure	Road	
113	Roads and Infrastructure	Road and infrastructure	
149	Roads and Infrastructure	road and pipeline	
150	Roads and Infrastructure	road	
151	Roads and Infrastructure	road	
152	Roads and Infrastructure	road	
153	Roads and Infrastructure	road	
155	Roads and Infrastructure	road	
174	roads and infrastructure	roads and infrastructure	not mapped
176	roads and infrastructure	AbImTe	
177	roads and infrastructure	roads and infrastructure	not mapped
178	roads and infrastructure	roads and infrastructure	not mapped
24	TaTsRm	TaTsRm	1999 3b
25	TcEtSe	TcEtSe	1999 4a
164	Te	TeAb	not mapped
165	Te	TeAb	not mapped
183	Te	AbImTe	not mapped
184	Te	AbImTe	not mapped
185	Te	AbImTe	not mapped
57	TeAb	TeAb	1c: AbTe
59	TeAb	TeAb	1b: TeCa
91	TeAb	TeAb	1c: AbTe

Polygon ID	APM 2019	Trudgen and Associates (2002)	Astron (1999, 2005)
93	TeAb	TeAb	1c: AbTe
94	TeAb	TeAb	1c: AbTe
104	TeAb	TeAb	1a GpAbTe
119	TeAb	TeAb	1b: TeCa
163	TeAb	TeAb	not mapped
101	TeAtSd	D	not mapped
102	TeAtSd	D	not mapped
82	TeCa	TeCa	1b: TeCa
121	TeCa	TeCa	1b: TeCa
120	TeRm	TeRm	1b: TeCa
127	TeRm	TeRm	TeCa
157	TeRm	TeAb	1a GpAbTe
4	TeTh	D	1999 2b
8	TeTh	TeTh	1999 2b
21	TeTh	TeTh	1999 2a
33	TeTh	TeTh	1999 2a
137	TeTh	D	not mapped
92	Tw	Tw	1b
114	TeRm	TeRm	1g: AiAeTe

#### 4.2.5 Conservation Significant Ecological Communities

26 rocky outcrops were identified in the APM survey that constitute the PEC:

- Burrup Peninsula rock pile communities. Priority 1: Pockets of vegetation in rock piles, rock pockets and outcrops. Comprise a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Short-range endemic land snails. Threats: industrial development dust emissions. Weed invasion including *\*Cenchrus ciliaris* (Buffel Grass) and *\*Passiflora foetida* (stinking passionflower)

The locations of these are displayed in Figure 4-7. Vegetation associations of conservation significance using the M. E. Trudgen & Associates (2002) classification that occur in the Study Area are listed in Table 4-7.



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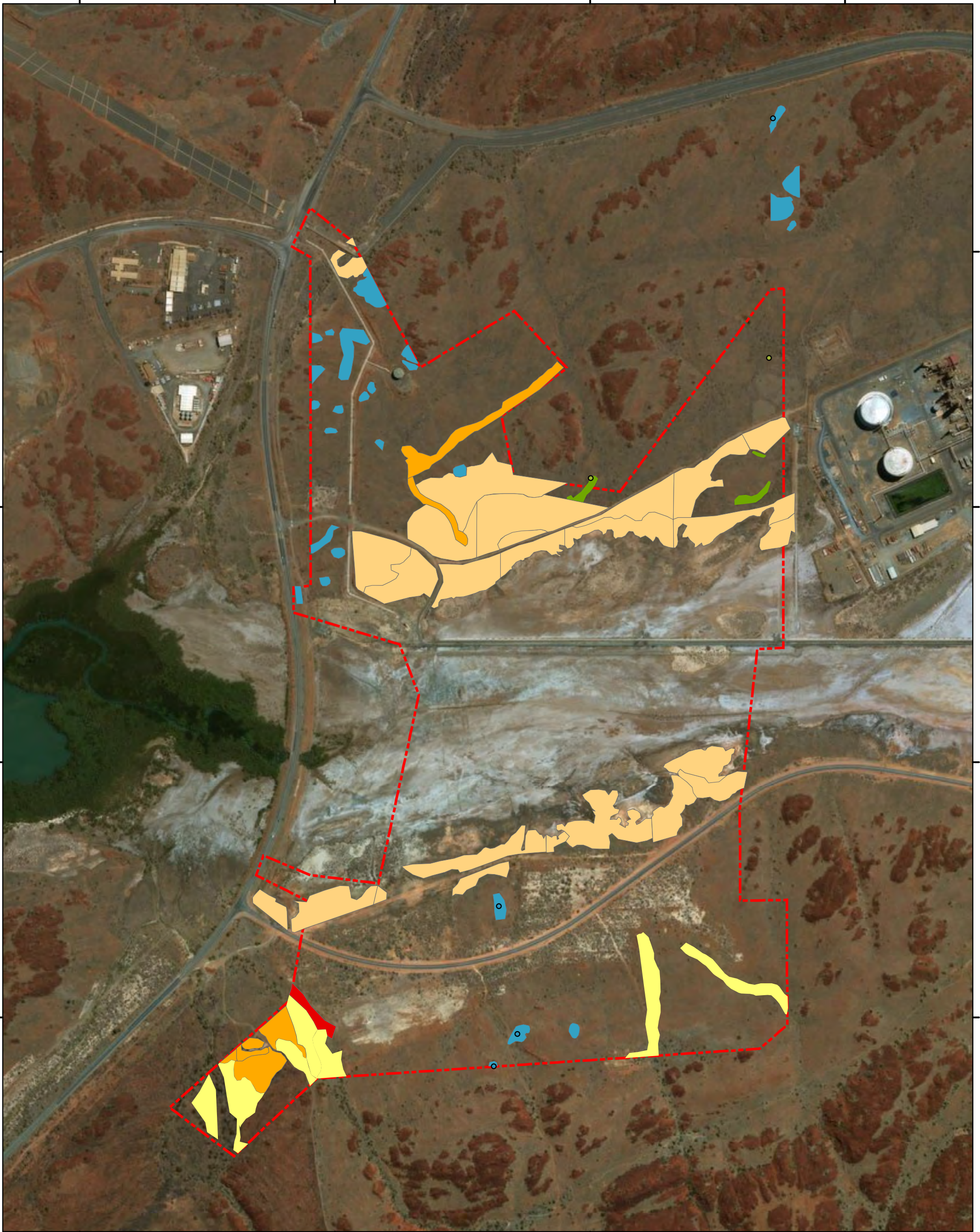
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**Figure 4-7: APM Conservation Significant Flora and Vegetation Communities of the Study Area**

**Legend**

**Priority Taxon**

- Rhynchosia bungarensis (P4)
- Terminalia supranitifolia (P3)

- Priority Ecological Community: P1 Burrup Peninsula Rock Pile Communities
- Trudgen: Dark Orange 2 to 4 occurrences
- Trudgen: Light Orange 5 to 9 occurrences
- Trudgen: Red 1 occurrence
- Trudgen: Yellow 10 to 24 occurrences
- *Locally Significant Flora*



150 75 0 150 Meters



1 centimeter = 70 meters

Date: 25/06/2019

Coordinate System: GDA 1994 MGA Zone 50

Author: ems@animalplantmineral.com.au



**Table 4-7: Vegetation Associations that Occur in the Study Area that May Have Local Conservation Significance according to the Classification System devised by M. E. Trudgen & Associates (2002)**

APM 2018 vegetation mapping code	Association Description	M. E. Trudgen & Associates (2002) Significance Rating
TaTsRm	<i>Triodia angusta</i> (BF) <i>Triodia epactia</i> grassland with <i>Tephrosia</i> aff. <i>supina</i> (MET 12,375) herbland and <i>Rhyncosia</i> cf. <i>minima</i> lianes	Red 1 occurrence
AbCgTe	<i>Acacia bivenosa</i> , <i>Cassia glutinosa</i> open shrubland to shrubland over <i>Triodia epactia</i> (BF), * <i>Cenchrus ciliaris</i> grassland	Dark Orange 2 to 4 occurrences
ChAbSg	<i>Corymbia hamersleyana</i> low open woodland over <i>Acacia bivenosa</i> high open shrubland over <i>Dichrostachys spicata</i> scattered shrubs over <i>Stemodia grossa</i> low shrubland to low open heath over <i>Triodia epactia</i> (Burrup form) hummock grassland	Dark Orange 2 to 4 occurrences
Ev*CcTe	<i>Eucalyptus victrix</i> low open woodland to low woodland over ( <i>Pittosporum phylliraeoides</i> var. <i>phylliraeoides</i> , <i>Rhagodia eremaea</i> high shrubs to shrubs) over * <i>Cenchrus ciliaris</i> , <i>Triodia epactia</i> (BF) tussock/hummock grassland	Dark Orange 2 to 4 occurrences
EvAa	<i>Eucalyptus victrix</i> low woodland over <i>Acacia ampliceps</i> open heath over <i>Cyperus vaginatus</i> , <i>Eriachne tenuiculmis</i> , <i>Triodia angusta</i> (Burrup form) sedgeland and tussock/hummock grassland	Light Orange 5 to 9 occurrences
AbImTe	<i>Acacia bivenosa</i> high open shrubland to high shrubland over <i>Indigofera monophylla</i> (BF) scattered low shrubs to low open shrubland over <i>Triodia epactia</i> (BF) hummock grassland to closed hummock grassland	Light Orange 5 to 9 occurrences
AbTa	<i>Acacia bivenosa</i> high open shrubs over <i>Triodia angusta</i> (BF) hummock grassland	Light Orange 5 to 9 occurrences
ChImTe	<i>Corymbia hamersleyana</i> scattered low trees to low open woodland over ( <i>Acacia bivenosa</i> , <i>Acacia coriaceae</i> subsp. <i>coriaceae</i> ) scattered tall shrubs over ( <i>Dichrostachys spicata</i> ) scattered shrubs over <i>Indigofera monophylla</i> (BF)	Yellow 10 to 24 occurrences
EvDsTa	<i>Eucalyptus victrix</i> scattered low trees to low open woodland over <i>Dichrostachys spicata</i> , ( <i>Acacia coriaceae</i> subsp. <i>coriaceae</i> ) tall scattered shrubs to low open shrubland over <i>Triodia angusta</i> (BF) hummock grassland	Yellow 10 to 24 occurrences
GpCwTe	<i>Grevillea pyramidalis</i> subsp. <i>pyramidalis</i> open heath over <i>Corchorus walcottii</i> scattered low shrubs to low open heath over <i>Triodia epactia</i> (BF) hummock grassland	Yellow 10 to 24 occurrences
TcEtSe	<i>Terminalia circumulata</i> low woodland over <i>Eriachne tenuiculmis</i> , <i>Triodia epactia</i> (BF) grassland/hummock grassland with <i>Sesbania cannabina</i> herbland	Yellow 10 to 24 occurrences

Additionally, the area mapped by APM as AbHICwTe contains *Dolichandrone occidentalis* (formerly *occidentalis*). Astron Environmental (2005) notes that this locality is the only known occurrence of *Dolichandrone occidentalis* on the Burrup Peninsula. The densest population areas lie to the north west of the APM mapped area and are not within the Study Area. The density of *Dolichandrone occidentalis* within the APM mapped area is scattered shrubs, whereas in the areas outside of the Study Area the species is a canopy dominant. The species also has a large distribution across the tropical regions to the east and north (Atlas of Living Australia, 2018). The Burrup Peninsula is close to the westernmost distribution of this species. The most western occurrence of the species is in the Barrow Island Class A Reserve (Atlas of Living Australia, 2018).

#### 4.2.6 Vegetation Condition

Vegetation ranges from Excellent condition to Completely Degraded. Vegetation condition is displayed in Figure 4-8. Areas classified as completely degraded contain roads and infrastructure and are maintained in a vegetation free state. One narrow area in the south western part of the Study Area has been classified as Degraded condition. This is a rehabilitated road that has not returned to a good cover or diversity of vegetation.



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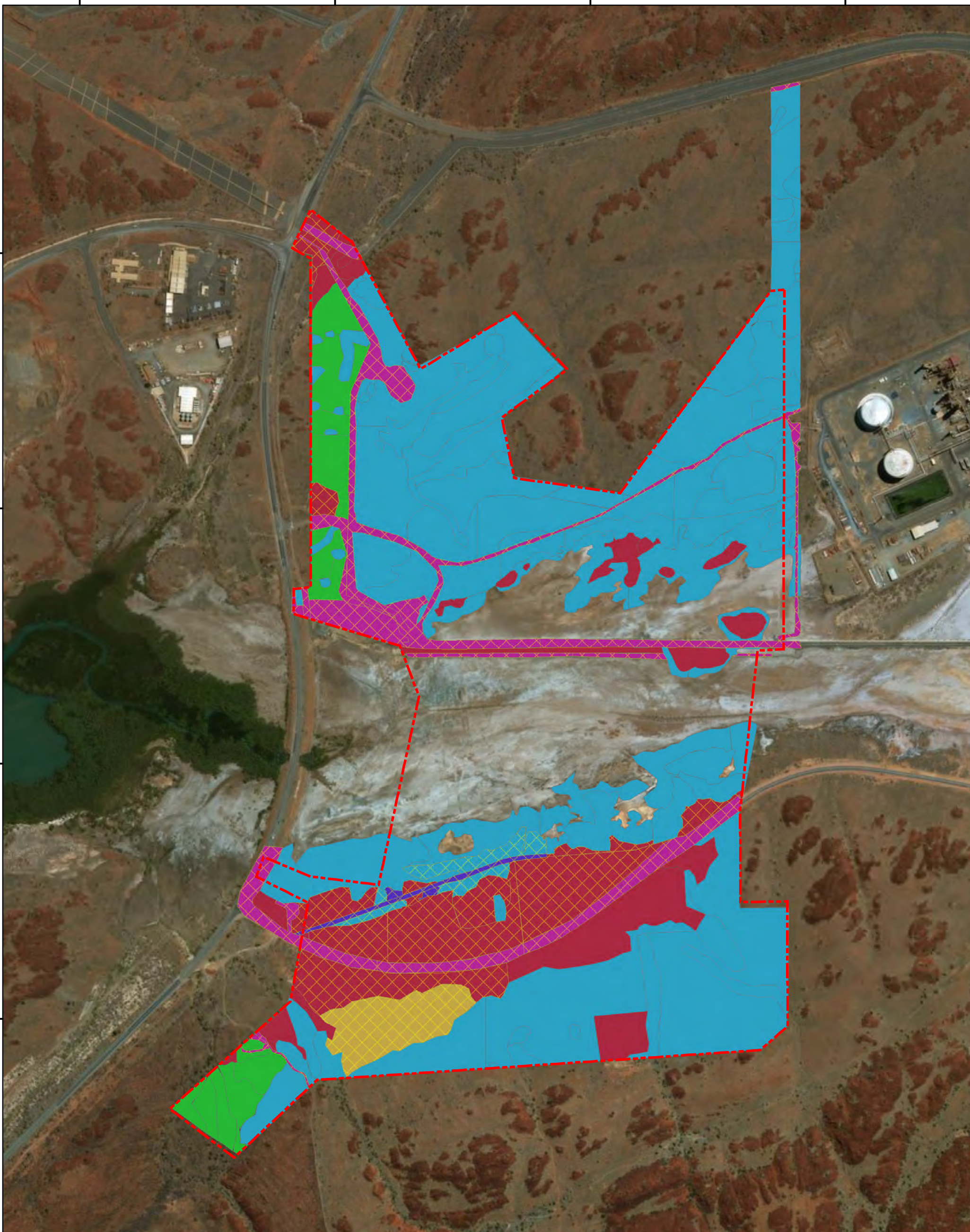


Figure 4-8: Vegetation Condition in the Study Area

**Legend**

**Vegetation Condition**

- Excellent
- Very Good
- Good

■ Poor

■ Degraded

■ Completely Degraded

**Previously disturbed**

▨ Yes



150 75 0 150 Meters

1 centimeter = 70 meters  
Date: 25/06/2019

Coordinate System: GDA 1994 MGA Zone 50  
Author: [ems@animalplantmineral.com.au](mailto:ems@animalplantmineral.com.au)



The area classified as in Poor condition in the south of the Study Area contains the vegetation association TeTh. This area is previously disturbed and rehabilitated and large shelly lens in close proximity to the surface has been exposed during the rehabilitation process which provides poor quality soil and has slowed the rehabilitation trajectory in this area. Although it has a reasonable abundance of *Triodia epactia* the cover and diversity of plants is lower than would be expected under undisturbed conditions. The time since rehabilitation indicates the area is unlikely to regain pre-disturbance structure without further intervention. There is also a presence of the aggressive weed *\*Cenchrus ciliaris*.

A number of areas have been designated in Good condition. These are distributed across the Study Area. The large areas to the south surrounding Hearson Cove Road are previously disturbed and rehabilitated and although there is also some poorer quality subsoils present at the surface, there is a reasonable diversity of species and a high abundance of plants in multiple strata. The introduced species *\*Cenchrus ciliaris* and / or *\*Aerva javanica* were found in these areas. Smaller areas designated Good condition are generally undisturbed or near to a disturbance (such as a road or pipeline corridor) and have significant infestations of the introduced species *\*Cenchrus ciliaris*, *\*Aerva javanica* and *\*Passiflora foetida*.

Areas in the vegetation fringing the tidal inlet have been classified as Good Condition in part due to the presence of *\*Cenchrus ciliaris* and *\*Aerva javanica* but also due to the lower species diversity recorded there than by Astron (2005). Astron (2005) considered changes to the surface flow conditions caused by the pipeline infrastructure to be impacting the health of the vegetation in these areas, and the lower species diversity recorded by APM confirm this.

Areas designated in Very Good condition have vehicle tracks or other infrastructure nearby that are causing some level of disturbance to the continuity of the landscape but are otherwise not disturbed. All other areas are in Excellent condition and displayed no signs of disturbance.

A large amount of dust was noted on the foliage of shrubs and trees across the entire survey area during the dry season. A large number of shrubs were noted to have died in many areas across the Study Area however it is difficult to speculate on the cause of death differing from expected senescence of short-lived perennial shrub species common on the Burrup Peninsula.

#### 4.2.7 Conservation Significant Flora

Two flora of conservation significance were located in the Study Area (Table 4-8). *Rhynchosia bungarensis* is synonymous with *Rhynchosia* sp. Burrup listed as flora of conservation significance by M. E. Trudgen & Associates (2002). Locations of the Priority flora located by APM are shown in Figure 4-7.

**Table 4-8: Flora of Conservation Significance Recorded within the Study Area**

Species	Conservation Status	Recorded in APM Quadrat(s)	Recorded in APM Targeted Search(es)	No. of Individuals Recorded
<i>Terminalia supranitifolia</i>	P3	3	OC6	4
<i>Rhynchosia bungarensis</i>	P4	40	OC29-1	2

Four *Terminalia supranitifolia* trees were recorded in the Study Area. *Terminalia supranitifolia* is typically found as a low spreading tree on rockpiles on the Burrup Peninsula. Rock pile vegetation communities, of which *Terminalia supranitifolia* is a component, have PEC status. ENV Australia (2006) recorded this species at four sites within the Pluto LNG 'Site B North' study area to the north east of the Study Area. It was found at rockpiles



and drainage lines, with one or “a few” individuals at each site. *Terminalia supranitifolia* has been discovered in scattered populations in the Chichester Ranges, leading to a reclassification from P1 to P3 in 2005.

*Rhynchosia bungarensis* (P4) was added to the Priority Flora List in 2009. It is reasonably widespread on the Burrup Peninsula although less common than *Rhynchosia minima* (M. E. Trudgen & Associates, 2002). It is frequently found along the more sheltered bases of rockpiles, along gully walls or in more dense vegetation where it is protected. The species occurs as scattered populations within the Pilbara.

Known populations of *Stackhousia clementii* (P3) to the east of the Study Area were visited in the Post Wet-Season survey and healthy individuals located. Extensive searching within suitable habitat of the Study Area did not locate the priority species.

#### 4.2.8 Introduced Flora

Four introduced species were recorded in the Study Area. No Declared weeds or weeds with control categories under the BAM Act were located in the Study Area.

The introduced species *\*Cenchrus ciliaris* (buffel grass) was scattered across the Study Area with the greatest abundances occurring in previously disturbed areas or in ephemeral creek lines under shady canopies.

*\*Aerva javanica* (kapok) occurs in highest abundances in the sandy swale areas adjacent to the tidal inlet and in disturbed areas particularly near roads. In undisturbed vegetation its presence is scattered and very low abundance.

*\*Passiflora foetida* var. *foetida* (stinking passionflower) is restricted to the riparian vegetation in the north west corner of the Study Area. Although the distribution is restricted, where it does occur it has a very aggressive infestation and is likely to cause significant decline to the quality of the vegetation in the near future if not controlled.

*\*Malvastrum americanum*, a naturalised herbaceous weed occurred as two individuals at one location.

The native species *Acacia ancistrocarpa* and *A. synchronicia* are common in the Pilbara but not common on the Burrup Peninsula. They were recorded as an opportunistic collection near Hearson Cove Road and are likely to have arrived in the area by transport of seed on vehicles (M. E. Trudgen & Associates, 2002).

## 5 TERRESTRIAL VERTEBRATE FAUNA RESULTS

### 5.1 DESKTOP SURVEY

Across the four online database searches (AoLA, NatureMap, DBCA, and the EPBC PMST), 214 terrestrial vertebrate fauna were identified as having the potential to occur, including 4 amphibians, 123 birds, 23 mammals, and 64 reptiles. The most extensive species list was the NatureMap database, with 146 species, followed by the AoLA database with 120. The DBCA Database and PMST databases both identified 42 species. An additional 35 species of marine mammals and reptiles were identified but are not further considered.

Worley Astron (2006) conducted a review of previous biological surveys carried out in the immediate vicinity and combined them in one collated database containing 305 species, including 14 non-volant mammals, 18 bats, 4 introduced mammals, 186 birds, 79 reptiles and 4 amphibians. Of these, 221 species were recorded in field surveys, providing an extensive species list, especially with additional online database searches conducted by APM for this study.

In total, 99 conservation significant species were identified across all database searches (Table 5-1). Of these, 98 were from database searches or the Worley Astron (2006) report, and one additional species was recorded during APM surveys that had not been recorded previously. For simplicity, all conservation significant fauna recorded during the APM surveys are also included in Table 5-1, but are discussed in more detail in Section 5.2.6. Refer to Appendix H for a discussion of the likelihood of occurrence of each of the identified conservation significant fauna and their habitat descriptions and requirements. Figure 5-1 shows the locations of conservation significant fauna in the vicinity of the Study Area identified by a DBCA database search.

**Table 5-1: Conservation Significant Fauna Identified in the Database Searches and/or Recorded by APM (2018, 2019) or Worley Astron (2006)**

Species	Common Name	Cons. Code			Database			Biological Surveys	
		Cth	State	NatureMap (10 km buffer)	AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km buffer)	Worley Astron 2006	APM
<b>Birds</b>									
<i>Accipiter fasciatus</i>	Brown Goshawk	M <sup>1</sup>	-					x	x
<i>Acrocephalus australis</i>	Australian Reed Warbler	M	-		x				
<i>Actitis hypoleucos</i>	Common Sandpiper	IA <sup>2</sup> , M	IA	x	x	x	x	x	
<i>Anous stolidus</i>	Common Noddy	IA, M	IA	x	x	x	x		
<i>Anthus novaeseelandiae</i>	Australasian pipit	M	-		x			x	x
<i>Apus pacificus</i>	Fork-tailed Swift	IA, M	IA			x	x	x	
<i>Ardea alba</i>	Great Egret	M	-				x	x	
<i>Ardea ibis</i>	Cattle Egret	M	-				x		
<i>Ardenna pacifica</i>	Wedge-tailed Shearwater	IA, M	IA					x	
<i>Arenaria interpres</i>	Ruddy Turnstone	IA	IA	x	x	x		x	
<i>Cacomantis pallidus</i>	Pallid Cuckoo	M	-	x	x			x	x
<i>Calidris acuminata</i>	Sharp-Tailed Sandpiper	IA, M	IA		x	x	x	x	
<i>Calidris alba</i>	Sanderling	IA, M	IA			x		x	
<i>Calidris canutus</i>	Red Knot	EN, IA, M	EN			x	x	x	
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR, IA, M	CR			x	x	x	
<i>Calidris melanotos</i>	Pectoral Sandpiper	IA, M	-				x		
<i>Calidris ruficollis</i>	Red-necked stint	IA, M	IA			x		x	x

<sup>1</sup> Listed as a Marine species under the *EPBC Act* (1999).

<sup>2</sup> Listed as a Migratory species under International Agreement under the *EPBC Act* (1999).



Species	Common Name	Cons. Code		NatureMap (10 km buffer)	Database			Biological Surveys		
		Cth	State		AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km buffer)	Worley Astron 2006	APM	
<i>Calidris subminuta</i>	Long-toed Stint	IA, M	IA						x	
<i>Calidris tenuirostris</i>	Great knot	CR, IA, M	CR						x	
<i>Calonectris leucomelas</i>	Streaked Shearwater	IA, M	IA				x			
<i>Chalcites osculans</i>	Black-eared Cuckoo	M	-				x	x		x
<i>Charadrius leschenaultii</i>	Greater Sand Plover	VU, IA	VU, IA	x		x			x	
<i>Charadrius mongolus</i>	Lesser Sand Plover	EN, IA	EN, IA			x			x	
<i>Charadrius ruficapillus</i>	Red-capped Plover	M	-	x	x				x	x
<i>Charadrius veredus</i>	Oriental plover	IA, M	IA			x	x			
<i>Chlidonias hybrida</i>	Whiskered tern	M	-						x	x
<i>Chlidonias leucopterus</i>	White-winged Black Tern	IA, M	IA						x	
<i>Chroicocephalus novaehollandiae</i>	Silver Gull	M	-	x	x				x	x
<i>Chrysococcyx basalis</i>	Horsfield's Bronze-Cuckoo	M	-		x				x	
<i>Circus approximans</i>	Swamp harrier	M	-						x	
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	M	-	x	x				x	x
<i>Egretta garzetta</i>	Little Egret	M	-		x				x	x
<i>Egretta sacra</i>	Eastern Reef Egret	M	-		x				x	
<i>Esacus Mgnirostris</i>	Beach Stone-Curlew	M	-	x	x				x	
<i>Eurostopodus argus</i>	Spotted nightjar	M	-						x	
<i>Falco cenchroides</i>	Nankeen Kestrel	M	-	x	x				x	x
<i>Falco peregrinus</i>	Peregrine Falcon	-	OS	x	x	x				
<i>Fregata ariel</i>	Lesser Frigatebird	IA, M	IA		x	x	x		x	
<i>Gelochelidon nilotica</i>	Gull-Billed Tern	IA	IA	x	x				x	
<i>Glareola Mldivarum</i>	Oriental pratincole	IA, M	IA				x			
<i>Grallina cyanoleuca</i>	Magpie-lark	M	-	x	x				x	x
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	M	-	x	x		x		x	x

Species	Common Name	Cons. Code		NatureMap (10 km buffer)	Database			Biological Surveys		
		Cth	State		AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km buffer)	Worley Astron 2006	APM	
<i>Haliastur indus</i>	Brahminy Kite	M	-	x	x			x	x	
<i>Haliastur sphenurus</i>	Whistling Kite	M	-	x	x			x	x	
<i>Himantopus himantopus</i>	Black-winged Stilt	M	-					x	x	
<i>Hirundo neoxena</i>	Welcome Swallow	M	-	x	x			x	x	
<i>Hirundo rustica</i>	Barn swallow	IA, M	IA				x			
<i>Hydroprogne caspia</i>	Caspian Tern	IA	IA		x	x		x	x	
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	IA, M	-					x		
<i>Limosa lapponica</i>	Bar-tailed Godwit	IA, M	IA				x			
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	VU, IA	VU, IA	x	x	x	x	x		
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit	CR, IA, M	CR, IA, M				x			
<i>Limosa limosa</i>	Black-tailed Godwit	IA	IA			x		x		
<i>Macronectes giganteus</i>	Southern Giant-Petrel	EN, IA, M	IA				x			
<i>Merops ornatus</i>	Rainbow Bee-eater	M	-	x	x		x		x	
<i>Motacilla cinerea</i>	Grey Wagtail	IA, M	IA				x			
<i>Motacilla flava</i>	Yellow Wagtail	IA, M	IA				x			
<i>Ninox novaeseelandiae</i>	Southern boobook	M	-					x		
<i>Numenius minutus</i>	Little Whimbrel	CR, IA, M	IA		x	x				
<i>Numenius madagascariensis</i>	Eastern Curlew	IA	CR	x	x	x	x	x		
<i>Numenius phaeopus</i>	Whimbrel	IA	IA	x	x	x		x	x	
<i>Nycticorax caledonicus</i>	Nankeen night heron	M	-					x		
<i>Oceanites oceanicus</i>	Wilson's storm-petrel	IA	IA			x				
<i>Onychoprion anaethetus</i>	Bridled Tern	IA	IA				x			
<i>Pandion cristatus</i>	Eastern Osprey	IA, M	IA	x	x	x		x	x	
<i>Pelecanus conspicillatus</i>	Australian pelican	M	-					x		
<i>Petrochelidon nigricans</i>	Tree Martin	M	-	x	x			x	x	

Species	Common Name	Cons. Code		NatureMap (10 km buffer)	Database			Biological Surveys		
		Cth	State		AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km buffer)	Worley Astron 2006	APM	
<i>Pezoporus occidentalis</i>	Night Parrot	EN	CR				x			
<i>Phalaropus lobatus</i>	Red-necked Phalarope	IA, M	-					x		
<i>Pluvialis fulva</i>	Pacific golden plover	IA, M	IA						x	
<i>Pluvialis squatarola</i>	Grey plover	IA	IA			x		x		
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet	M	-					x		
<i>Rostratula australis</i>	Australian Painted-Snipe	EN	EN				x			
<i>Sterna dougallii</i>	Roseate Tern	IA, M	IA		x	x		x		
<i>Sterna hirundo</i>	Common Tern	IA	IA			x		x		
<i>Sternula albifrons</i>	little tern	IA	IA			x				
<i>Sternula nereis nereis</i>	Australian Fairy tern	VU	VU			x	x	x		
<i>Stiltia isabella</i>	Australian pratincole	M	-					x		
<i>Sula leucogaster</i>	Brown Booby	IA	IA		x	x		x		
<i>Thalasseus bengalensis</i>	Lesser Crested Tern	M	-	x	x			x	x	
<i>Thalasseus bergii</i>	Crested Tern	IA	IA	x	x	x		x		
<i>Todiramphus sanctus</i>	Sacred Kingfisher	M	-	x	x			x		
<i>Tringa brevipes</i>	Grey-tailed Tattler	IA	IA, P4	x	x	x		x	x	
<i>Tringa glareola</i>	wood sandpiper	IA	IA			x				
<i>Tringa nebularia</i>	Common Greenshank	IA, M	IA	x	x	x	x	x	x	
<i>Tringa stagnatilis</i>	marsh sandpiper, little greenshank	IA	IA			x		x		
<i>Tringa totanus</i>	Common Redshank	IA, M	IA		x					
<i>Xenus cinereus</i>	Terek sandpiper	IA	IA			x		x		
<b>Reptile</b>										
<i>Ctenotus angusticeps</i>	Northwestern Coastal Ctenotus	VU	P3				x			
<i>Liasis olivaceus subsp. barroni</i>	Pilbara Olive Python	VU	VU	x		x	x			



Species	Common Name	Cons. Code		NatureMap (10 km buffer)	Database			Biological Surveys	
		Cth	State		AoLA (10 km buffer)	DBCA (~25 km buffer)	EPBC (5 km buffer)	Worley Astron 2006	APM
<i>Notoscincus butleri</i>	Lined-soil Crevice Skink (Dampier)	-	P4					x	
<b>Mammal</b>									
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	EN	x		x	x	x	
<i>Hydromys chrysogaster</i>	Water-rat	-	P4			x		x	
<i>Macroderma gigas</i>	Ghost Bat	VU	VU	x		x	x		x
<i>Macrotis lagotis</i>	Greater Bilby	VU	VU				x		
<i>Mormopterus cobourgianus</i>	Northern Coastal Free- tailed Bat	-	P1	x		x		x	x
<i>Petrogale lateralis</i>	Rock-wallaby	EN	-					x	
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	-	P4	x		x			
<i>Rhinonicteris aurantia</i>	Pilbara Leaf-Nosed Bat	VU	P4				x		

Database Search Area



**Figure 5-2: Conservation Significant Fauna Identified by Department of Biodiversity Conservation and Attractions Database Search as Occuring in the Vicinity of the Project Area**

Legend

- |                              |                                   |   |                                 |                                 |
|------------------------------|-----------------------------------|---|---------------------------------|---------------------------------|
| ● <all other values>         | ● <i>Caretta caretta</i>          | ● <i>Gelochelidon nilotica</i>              | ● <i>Numenius minutus</i>       | ● <i>Sterna hirundo</i>         |
| <b>NAME_SCI</b>              | ● <i>Charadrius leschenaultii</i> | ● <i>Hydromys chrysogaster</i>              | ● <i>Numenius phaeopus</i>      | ● <i>Sternula albifrons</i>     |
| ● <i>Actitis hypoleucos</i>  | ● <i>Charadrius mongolus</i>      | ● <i>Hydroprogne caspia</i>                 | ● <i>Oceanites oceanicus</i>    | ● <i>Sternula nereis nereis</i> |
| ● <i>Anous stolidus</i>      | ● <i>Charadrius veredus</i>       | ● <i>Liasis olivaceus barroni</i>           | ● <i>Onychoprion anaethetus</i> | ● <i>Sula leucogaster</i>       |
| ● <i>Apus pacificus</i>      | ● <i>Chelonia mydas</i>           | ● <i>Limosa lapponica</i>                   | ● <i>Pandion cristatus</i>      | ● <i>Thalasseus bergii</i>      |
| ● <i>Arenaria interpres</i>  | ● <i>Chlidonias leucopterus</i>   | ● <i>Limosa limosa</i>                      | ● <i>Pluvialis fulva</i>        | ● <i>Tringa brevipes</i>        |
| ● <i>Calidris acuminata</i>  | ● <i>Dasyurus hallucatus</i>      | ● <i>Macroderma gigas</i>                   | ● <i>Pluvialis squatarola</i>   | ● <i>Tringa glareola</i>        |
| ● <i>Calidris alba</i>       | ● <i>Dugong dugon</i>             | ● <i>Megaptera novaeangliae</i>             | ● <i>Pseudomys chapmani</i>     | ● <i>Tringa nebularia</i>       |
| ● <i>Calidris canutus</i>    | ● <i>Eretmochelys imbricata</i>   | ● <i>Mormopterus (Ozimops) cobourgianus</i> | ● <i>Puffinus pacificus</i>     | ● <i>Tringa stagnatilis</i>     |
| ● <i>Calidris ferruginea</i> | ● <i>Falco peregrinus</i>         | ● <i>Natator depressus</i>                  | ● <i>Stenella longirostris</i>  | ● <i>Xenus cinereus</i>         |
| ● <i>Calidris ruficollis</i> | ● <i>Fregata ariel</i>            | ● <i>Numenius madagascariensis</i>          | ● <i>Sterna dougallii</i>       |                                 |

N

0.9 0.45 0 0.9 Kilometers

1 centimeter = 493 meters  
 Date: 12/12/2018  
 Coordinate System: GDA 1994 MGA Zone 50  
 Author: [ems@animalplantmineral.com.au](mailto:ems@animalplantmineral.com.au)

Of the 99 conservation significant species that have been recorded, or have the potential to occur, 88 are birds, many of which listed as migratory or marine under the EPBC Act. A range of threatened species also have the potential to occur. The Curlew Sandpiper (*Calidris ferruginea*), Great Knot (*Calidris tenuirostris*), and Eastern Curlew (*Numenius madagascariensis*) are all listed as Critically Endangered and have been recorded in previous surveys at neighbouring sites. The Northern Quoll (*Dasyurus hallucatus*) and the Black-footed rock wallaby (*Petrogale lateralis*) are both listed as Endangered and have been recorded in previous surveys in the vicinity. The Pilbara Olive Python (*Liasis olivaceus barroni*) and Ghost Bat (*Macroderma gigas*) are listed as Vulnerable, and while records exists for both species in the database searches, they were not recorded by Worley Astron (2006).

Introduced species identified by database searches as likely or potentially occurring at the Study Area, and / or recorded by Worley Astron (2006) and APM, are listed in Table 5-2.



**Table 5-2: Introduced Fauna Identified in the Database Searches and/or Recorded by Worley Astron (2006), and APM (2018, 2019)**

Species name	Common Name	Listing		Database			Biological Surveys	
		Cth <sup>3</sup>	State <sup>4</sup>	DBCA (~25 km buffer)	NatureMap (10 km buffer)	AoLA (10 km buffer)	EPBC (5 km buffer)	Worley Astron (2006)
<b>Birds</b>								
<i>Columba livia</i>	Domestic Pigeon	Int.	s11				x	
<i>Passer domesticus</i>	House Sparrow	Int.	s12, C1				x	
<i>Passer montanus</i>	Eurasian Tree Sparrow	Int.	s12, C1				x	
<b>Mammals</b>								
<i>Canis lupis familiaris</i>	Dog	Int.	s22, C3		x			x
<i>Equus caballus</i>	Horse	Int.	s22, C3				x	
<i>Felis catus</i>	Cat	Int.	s11		x			x
<i>Mus musculus</i>	House Mouse	Int.	s11					x
<i>Oryctolagus cuniculus</i>	Rabbit	Int.	s22, C3				x	
<i>Rattus rattus</i>	Black Rat	Int.	s11					x
<i>Vulpes vulpes</i>	Red Fox	Int.	s22, C3		x			x
<b>Reptiles</b>								
<i>Hemidactylus frenatus</i>	Asian House Gecko	Int.	s22, C3		x		x	
<i>Ramphotyphlops braminus</i>	Flowerpot Snake	Int.	s22				x	

<sup>3</sup> Listed as Introduced under the *EPBC Act* (1999)

<sup>4</sup> Declared Pest Status (*BAM Act*, 2007)

## 5.2 FIELD SURVEY

### 5.2.1 Survey Conditions

The post-wet season field survey followed the passage of Cyclone Veronica which crossed Karratha in March 2019. The Karratha Aero weather station (BOM station 00408310, 10 km to the south of the Survey Area) recorded 70 mm of rainfall associated with the passage of the cyclone. This rainfall created adequate post-wet season survey conditions. The overall sampling effort was assessed by applying a Species Accumulation Curve (Appendix L).

### 5.2.2 Birds

APM recorded 63 bird species across the pre-wet and post-wet season surveys (Table 5-3). In total, 150 bird species have been recorded on the Burrup Peninsula in surveys conducted in 1994, 1998, 2002, 2005 (Worley Astron, 2006) and the two surveys by APM (NB: the total of 186 bird species noted in section 5.1 included records off the Burrup Peninsula but in similar habitat). Six of the species recorded by APM were not recorded in previous surveys or database searches including the migratory species, the Pacific Golden Plover (*Pluvialis fulva*).

While survey timing was appropriate to target migratory species, late 2018 and early 2019 was an unseasonably dry period on the Burrup Peninsula. In the week leading up the March 2019 survey, a large cyclone in the region resulted in a moderate rainfall event (71 mm total). As such, the March survey represented a time where total seasonal rainfall was below average, but the recent cyclonic rainfall in March alone was above average. In addition, the recent rainfall had resulted in areas of available surface water on the floodplain areas (often due to raised earthworks for infrastructure stopping drainage). The availability of fresh water is likely to have increased the use of the site by migratory waders and shorebirds, therefore increasing the probability of being recorded during surveys.

Seven of the species recorded during APM surveys are listed as Migratory; the Caspian Tern (*Hydroprogne caspia*), Whimbrel (*Numenius phaeopus*), Grey-tailed Tattler (*Tringa brevipes*), which is also listed as Priority 4 at the state level, Red-necked Stint (*Calidris ruficollis*), Eastern Osprey (*Pandion haliaetus*), Pacific Golden Plover (*Pluvialis fulva*), and the Common Greenshank (*Tringa nebularia*).

The avifauna records from APM surveys, and the habitat types the records were made within, are listed in Table 5-3.

**Table 5-3: APM Avifauna Survey Records and Associated Habitat Types**

Order	Family	Species	Common Name	Mid-slope	Rocky Outcrop	Samphire
<b>ANSERIFORMES</b>	Anatidae	<i>Anas gracilis</i>	Grey Teal		x	x
<b>CHARADRIIFORMES</b>	Charadriidae	<i>Charadrius ruficapillus</i>	Red-capped Plover	x	x	x
		<i>Pluvialis fulva</i>	Pacific Golden Plover			x
<b>CHARADRIIFORMES</b>	Laridae	<i>Chlidonias hybrida</i>	Whiskered Tern	x	x	x
		<i>Chroicocephalus novaehollandiae</i>	Silver Gull			x
		<i>Hydroprogne caspia</i>	Caspian Tern			x
		<i>Thalasseus bengalensis</i>	Lesser Crested Tern		x	
	Recurvirostridae	<i>Himantopus leucocephalus</i>	Pied Stilt		x	x
	Scolopacidae	<i>Calidris ruficollis</i>	Red-Necked Stint			x
		<i>Numenius phaeopus</i>	Whimbrel			x
		<i>Tringa brevipes</i>	Grey-tailed Tattler		x	x
		<i>Tringa nebularia</i>	Common Greenshank	x	x	x
<b>CICONIIFORMES</b>	Ardeidae	<i>Egretta garzetta</i>	Little Egret	x	x	x
		<i>Egretta novaehollandiae</i>	White-faced Heron			x
<b>COLUMBIFORMES</b>	Columbidae	<i>Geopelia cuneata</i>	Diamond Dove	x	x	
		<i>Geopelia placida</i>	Peaceful Dove	x		x
		<i>Geophaps plumifera</i>	Spinifex Pigeon	x	x	x
		<i>Ocyphaps lophotes</i>	Crested Pigeon	x	x	x
<b>CORACIIFORMES</b>	Alcedinidae	<i>Todiramphus pyrrhopygius</i>	Red-Backed Kingfisher	x	x	x
	Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	x		
<b>CUCULIFORMES</b>	Cuculidae	<i>Cacomantis pallidus</i>	Pallid Cuckoo	x	x	
		<i>Chalcites osculans</i>	Black-Eared Cuckoo	x	x	
<b>FALCONIFORMES</b>	Accipitridae	<i>Accipiter fasciatus</i>	Brown Goshawk	x		
		<i>Aquila audax</i>	Wedge-Tailed Eagle	x		
		<i>Circus assimilis</i>	Spotted Harrier	x		x
		<i>Elanus axillaris</i>	Black-shouldered Kite	x	x	x
		<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle		x	



Order	Family	Species	Common Name	Mid-slope	Rocky Outcrop	Samphire
		<i>Haliastur indus</i>	Brahminy Kite	x		x
		<i>Haliastur sphenurus</i>	Whistling Kite	x	x	x
		<i>Pandion haliaetus</i>	Eastern Osprey		x	
	Falconidae	<i>Falco berigora</i>	Brown Falcon	x	x	x
		<i>Falco cenchroides</i>	Nankeen Kestrel	x	x	x
		<i>Milvus migrans</i>	Black Kite		x	
<b>GALLIFORMES</b>	Phasianidae	<i>Coturnix ypsilophora</i>	Swamp Quail	x		
<b>PASSERIFORMES</b>	Acanthizidae	<i>Smicronis brevirostris</i>	Weebill	x	x	
	Alaudidae	<i>Mirafrja javanica</i>	Horsfield's Bushlark	x		
	Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow	x	x	x
		<i>Cracticus nigrogularis</i>	Pied Butcherbird	x	x	x
	Campephagidae	<i>Coracina papuensis</i>	White-bellied Cuckooshrike	x	x	x
		<i>Lalage tricolor</i>	White-Winged Triller	x	x	
	Corvidae	<i>Corvus orru</i>	Torresian Crow	x	x	x
	Estrildidae	<i>Emblema pictum</i>	Painted Finch	x	x	x
		<i>Neochmia ruficauda</i>	Star Finch	x	x	
		<i>Taeniopygia guttata</i>	Zebra Finch	x	x	x
	Hirundininae	<i>Hirundo neoxena</i>	Welcome Swallow		x	x
		<i>Petrochelidon ariel</i>	Fairy Martin	x	x	
		<i>Petrochelidon nigricans</i>	Tree Martin			x
	Locustellidae	<i>Megalurus mathewsi</i>	Rufous Songlark	x	x	x
	Maluridae	<i>Malurus leucopterus</i>	White-Winged Fairy-wren	x		
	Meliphagidae	<i>Epthianura tricolor</i>	Crimson Chat	x	x	
		<i>Gavicalis virescens</i>	Singing Honeyeater	x	x	x
		<i>Lichmera indistincta</i>	Brown Honeyeater	x	x	x
		<i>Manorina flavigula</i>	Yellow-Throated Miner	x	x	x
		<i>Ptilotula penicillata</i>	White-Plumed Honeyeater	x	x	
	Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-Lark		x	x

Order	Family	Species	Common Name	Mid-slope	Rocky Outcrop	Samphire
	Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian Pipit	x	x	x
	Pardalotidae	<i>Pardalotus rubricatus</i>	Red-Browed Pardalote	x		
		<i>Pardalotus striatus</i>	Striated Pardalote	x	x	
	Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	x	x	x
<b>PELECANIFORMES</b>	Phalacrocoracidae	<i>Phalacrocorax varius</i>	Pied Cormorant			x
<b>PSITTACIFORMES</b>	Cacatuidae	<i>Cacatua sanguinea</i>	Little Corella	x	x	x
		<i>Eolophus roseicapilla</i>	Galah	x	x	x
	Psittacidae	<i>Melopsittacus undulatus</i>	Budgerigar		x	
<b>Total</b>				<b>45</b>	<b>45</b>	<b>41</b>

### 5.2.3 Mammals

APM recorded 15 mammal species over the two surveys (Table 5-4, Table 5-5); 7 non-volant mammals and 8 bat species. The mammal assemblage at the site is typical of many areas in the Pilbara region, with Euros (*Osphranter robustus*) being the largest and most common species, while various small and medium sized mammals are also present, including the Short-Beaked Echidna (*T. aculeatus*), Delicate Mouse (*Psuedomys delicatulus*) and Desert Mouse (*P. desertor*). A range of naturalised (i.e. Dingo/dog, *Canis familiaris*) and introduced (i.e. Feral cat, *Felis catus*; Black rat, *Rattus rattus*), were also recorded.

**Table 5-4: Records of Non-volant Mammal Species across Two APM surveys**

Scientific name	Common Name	Record Type						Habitat	
		Camera	Scat	Cage	Elliot	Pit	Mid-slope	Rocky Outcrop	Samphire
<i>Osphranter robustus</i>	Euro	23					13	7	3
<i>Pseudomys delicatulus</i>	Delicate Mouse					1			1
<i>Pseudomys desertor</i>	Desert Mouse				1				1
<i>Tachyglossus aculeatus</i>	Echidna		1					1	
<i>Canis familiaris</i>	Dog/Dingo		1				1		
<i>Felis catus</i>	Cat	3	1	2			1	3	2
<i>Rattus rattus</i>	Black Rat	1						1	

**Table 5-5: Nights which Bat Species were Recorded in each Habitat**

Scientific name	Common name	Mid-slope	Rocky Outcrop	Samphire
<i>Austronomus australis</i>	White-striped Free-tailed Bat		1	1
<i>Chaerephon jobensis</i>	Greater Northern Free-tailed Bat		1	2
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat			1
<i>Macroderma gigas</i>	Ghost Bat	1	1	
<i>Mormopterus cobourgiensis</i>	Northern Coastal Free-tailed Bat	6	14	7
<i>Scotorepens greyii</i>	Little Broad-nosed Bat	8	21	8
<i>Taphozous georgianus</i>	Common Sheath-tailed Bat	13	23	8
<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat	8	18	8

In total, 21 non-volant mammals have been recorded on the Burrup Peninsula, inclusive of APM and other published report survey results (years 1994-2002) (Worley Astron, 2006). Many of these species, however, are likely to inhabit the unique and diverse rocky outcrops present throughout the region (NB: the total of 32 native mammal species noted in section 5.1 included records off the Burrup Peninsula but in similar habitat). The APM surveys targeted areas that were likely to be disturbed by the proposed construction, which are on the mid-slope and samphire areas. *Psuedomys desertor* was recorded in the 2019 APM survey, but had not been recorded in either database searches, or during the Worley Astron (2006) survey.

Targeted spot surveys were conducted, looking for the Northern Quoll (*Dasyurus hallucatus*), Rock Wallaby (*Petrogale lateralis*), and Rothschild's rock wallaby (*Petrogale rothschildi*), in the rocky outcrops within, and



immediately adjacent to, the Study Area. These species were not recorded during APM surveys, however, have been recorded in the broader area (Worley Astron, 2006). The Northern Quoll is discussed in a later section.

While Rothschild's rock wallaby (*Petrogale rothschildi*) is present on islands of the Dampier Archipelago, any mainland populations south of Withnell Bay are now rare or completely absent (Pearson & Eldridge, 2008). At sites in the northern parts of the Burrup Peninsula, rock wallaby populations are recovering in response to fox baiting operations. While foraging habitat is present in creeklines containing diverse grasses and shrubs, the absence of deep caves required by this species for diurnal shelter make it highly unlikely that this species will be present in the Study Area (Department of Parks and Wildlife, 2013). Plains of small-sized rocks may represent appropriate habitat for the Western pebble-mound mouse (*Pseudomys chapmani*), however the species has not been recorded in the Study Area. Recent work has suggested that the species is only patchily distributed in the central and southern Pilbara (Western Wildlife, 2008). The outcrops within the Study Area are small and isolated, and likely to be less important than the larger outcrops to the south, which provide greater connectivity and opportunity for secure and productive habitat.

During the APM surveys, eight bat species were recorded on acoustic bat detectors, deployed throughout the Study Area (Table 5-5). The most common species, recorded on multiple occasions across all habitat types at the site, were the Northern Coastal Free-tailed Bat (*Mormopterus cobourgianus*), Little Broad-nosed Bat (*Scotorepens greyii*), Common Sheath-tailed Bat (*Taphozous georgianus*), and Finlayson's Cave Bat (*Vespadelus finlayson's*). In addition, flying foxes (*Pteropus* sp.) have been observed in the mangroves to the west of the Study Area during the APM 2018 survey and in previous surveys (Worley Astron, 2006). The most frequent records were on detectors deployed in rocky outcrop habitats, suggesting that these areas, and the adjacent rockpiles, may provide important habitat for many bat species.

During the 2019 APM survey, Ghost Bats (*Macroderma gigas*) were detected on two nights in rocky outcrop and mid-slope habitats (Table 5-5). The Ghost Bat, in addition to the White-striped Free-tailed Bat (*Austronomus australis*), Greater Northern Free-tailed Bat (*Chaerephon jobensis*) and the Little Broad-nosed Bat (*S. greyii*) have not been recorded in database searches or previous surveys adjacent to the Study Area. This may reflect recent developments in sensitivity of technology used in modern bat detectors more than any lack of previous survey effort, or a shift in species occurrence.

#### 5.2.4 Reptiles and Amphibians

Twenty-eight species of reptiles and amphibians were recorded by APM, all of which during the post wet-season trapping survey (Table 5-6). Despite the low diversity and density of amphibians on the Burrup Peninsula (likely due to the absence of permanent fresh water), the Mains Burrowing Frog (*Cyclorana maini*) was recorded eight times, all on only 2 nights at the beginning of the survey, just after a major rainfall event.

**Table 5-6. The number of records of reptile species during the 2019 APM survey, including the type of record, and the number of records across each habitat type.**

Scientific name	Common Name	Record Type					Habitat			Total
		Camera	Opp.	Elliot	Funnel	Pit	Mid-slope	Rocky Outcrop	Samphire	
<b>Frog</b>										
<i>Cyclorana maini</i>	Main's Frog				3	5	5	3		8
<b>Gecko</b>										
<i>Gehyra punctata</i>	Spotted Dtella		1		11		1	11		12
<i>Strophorus elderi</i>	Jewelled Gecko					1	1			1
<i>Heteronotia binoei</i>	Bynoe's Gecko				5			1	4	5
<b>Skink</b>										
<i>Lerista bipes</i>	North-Western Sandslider		1		10	26	21		16	37
<i>Carlia tricantha</i>	Desert rainbow-skink				2			2		2
<i>Cryptoblepharus plagiocephalus</i>	Péron's snake-eyed skink					1	1			1
<i>Ctenotus leonhardii</i>	Leonhards Ctenotus				5	2	5	1	1	7
<i>Ctenotus rubicundus</i>	Ruddy Ctenotus			1			1			1
<i>Ctenotus saxatillis</i>	Rock Ctenotus				44	6	12	23	15	50
<i>Egernia depressa</i>	Pygmy Spiny-tailed Monitor		2		1			1	2	3
<i>Eremiascincus isolepis</i>	Northern Bar-lipped Skink				1	2			3	3
<i>Menetia surda</i>	Western Dwarf Skink				5	4	2	2	5	9
<i>Morethia ruficauda exquisita</i>	Lined Firetail Skink		1		15	1	1	14	2	17
<b>Pygopod</b>										
<i>Delma borea</i>	Rusty-topped Delma				1		1			1
<i>Delma pax</i>	Peace Delma					1	1			1
<i>Lialis burtonis</i>	Burton's Legless Lizard				1	1	1		1	2
<b>Dragon</b>										
<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon				2	3	1		4	5
<i>Ctenophorus isolepis isolepis</i>	Central Military Dragon					1	1			1
<i>Lophognathus gilbertii</i>	Gilbert's Dragon					1			1	1
<i>Pogona minor mitchelli</i>	Western Bearded Dragon				4	3	7			7
<b>Varanid</b>										
<i>Varanus acanthurus</i>	Spiny-tailed Monitor				3	1		2	2	4
<i>Varanus panoptes</i>	Yellow-spotted Monitor	1						1		1
<b>Snake</b>										
<i>Anilius amodytes</i>	Sand-diving Blind Snake				1	2		2	1	3
<i>Anilius grypus</i>	Long-beaked Blind Snake				1	1	1	1		2
<i>Antaresia perthensis</i>	Pygmy Snake		7					5	2	7
<i>Pseudechis australis</i>	Mulga Snake		1		1			2		2
<i>Pseudonaja mengdeni</i>	Western Brown Snake		1		1		2			2

The reptile assemblage on the Burrup Peninsula is generally consistent with the nearby mainland. The most common species were the North-western Sandslider (*Lerista bipes*), Rock Ctenotus (*Ctenotus saxatillis*), Spotted Dtella (*Gehyra punctata*), and Western Dwarf Skink (*Menetia surda*) (Table 5-6). Two of the species recorded by APM, the Pygmy spiny-tailed Skink (*Egernia depressa*) and Mitchell's Bearded Dragon (*Pogona minor mitchelli*), have not been recorded in previous surveys (Worley Astron, 2006) and were not present in database searches of the Study Area. Worley Astron (2006) recoded 50 reptile and two amphibian species in surveys adjacent to the Study Area.

Spotlight surveys were conducted during both APM surveys in rocky outcrop areas in an effort to record the Pilbara Olive Python (*Lialis olivaceus barroni*). However, this species was not sampled in either survey.



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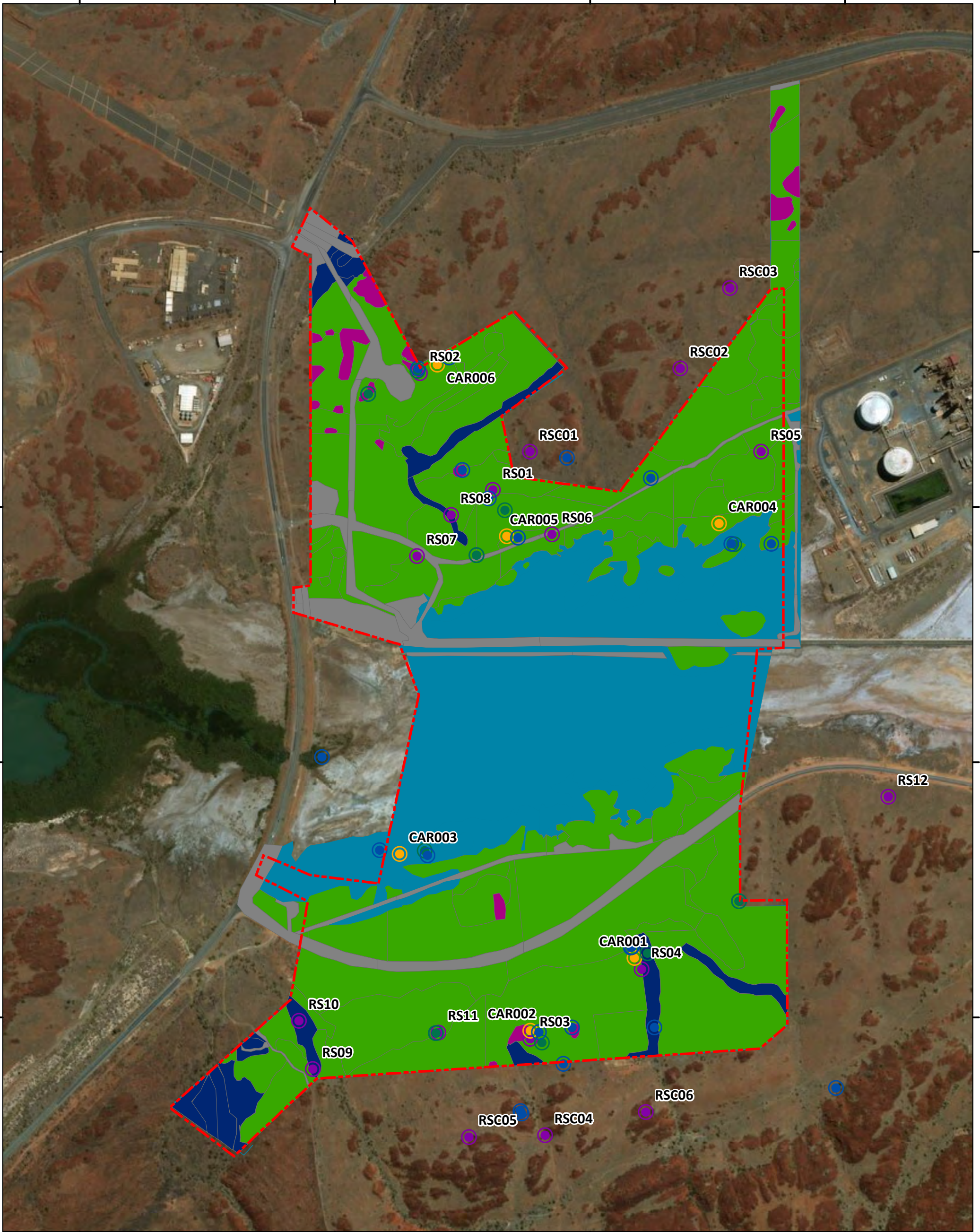
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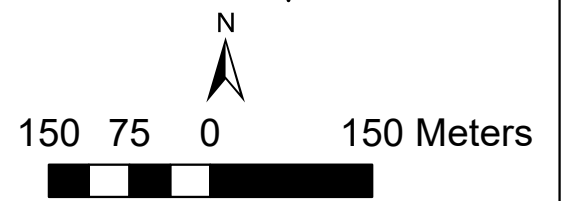
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**Figure 5-2: Fauna Habitats and Fauna Data Collection Points of the Study Area**

**Legend**

Study Area	<b>Survey Type</b>	<b>Fauna_habitat</b>
	Bat Detector	Disturbed
	Camera Trap	Drainage
	Snail survey	Hummock Grassland on Midslopes
	Trapping Grid	Rocky Outcrops
		Samphire Shrublands/Supra-tidal Flats



1 centimeter = 70 meters  
 Date: 11/06/2019  
 Coordinate System: GDA 1994 MGA Zone 50  
 Author: ems@animalplantmineral.com.au



### 5.2.5 Fauna Habitats

Four fauna habitats were present within the Study Area: rocky outcrops, Hummock Grasslands on Mid-slopes, Samphire Shrublands/Saltplains, and Drainage Lines. Habitats and fauna data collection sites are shown in Figure 5-2.

#### Rocky Outcrops



**Plate 5-1: Rocky Outcrop Habitat Trapping Sites**

Characteristic of the Burrup Peninsula, the formation of Proterozoic igneous rock outcrops (Gidley Granophyre) within the Study Area, weathered over time and resistant to extensive erosion, produce aggregates of split boulder screes. The structural complexity of these landforms provides cover for reptiles and small terrestrial mammals, while caves may provide roosts for bats. The most common rocky outcrop species in the APM surveys were the Spotted Dtella (*G. punctata*), Lined Firetail Skink (*Morethia ruficauda exquisita*), and Pygmy Python (*Antaresia perthensis*). In addition, the four most commonly recorded bat species were all most frequent in the rocky outcrop habitat; Northern Coastal Free-tailed Bat (*M. cobourgianus*), Little Broad-nosed Bat (*S. greyii*), Common Sheath-tailed Bat (*T. georgianus*), and Finlaysons's Cave Bat (*V. finlayson's*). Echidna (*T. aculeatus*) scats were also frequently recorded on rockpiles within the Study Area. This habitat type is also suitable for the Pilbara Olive Python (*Liasis olivaceus barroni*), and though not recorded during APM surveys or previous adjacent surveys (Worley Astron 2006), it is likely this species will occur in the area.

This habitat type supports many of the conservation significant species that occur on the Burrup Peninsula, and is therefore of high importance. The Study Area contains some rocky outcrop areas (Figure 5-2). This habitat type is more abundant and of higher quality, however, in the areas immediately adjacent to the Study Area. Where possible, development of the Study Area should avoid disturbance of rocky outcrops.

### Hummock Grasslands on Mid-slopes



**Plate 5-2: Hummock Grasslands on Mid-slope Trapping Sites**

The Study Area and wider Burrup Peninsula contain coastal and subcoastal plains with mixed savannah hummock and tussock grasslands, and scattered shrubs of *Acacia pyrifolia* and *Acacia inaequilatera*. The presence of hummock grasses and relatively deep soils within this habitat type provides important shelter for a range of small species such as Main's Frog (*C. maini*), Leonhard's Ctenotus (*Ctenotus leonhardii*) and the Western Bearded Dragon (*Pogona minor mitchelli*), as well as larger snake species, such as the Western Brown Snake (*Pseudonaja mengdeni*).

This habitat type will also provide foraging habitat for grazers; primarily Euros (*O. robustus*). These grasslands are also likely to support small rodents such as the Delicate Mouse (*Pseudomys delicatulus*), Sandy Inland Mouse (*P. hermannsburgensis*), and Desert Mouse (*P. desertor*) (Van Dyck & Strahan, 2008). While no rodents were recorded in the Mid-slope habitat during the 2019 APM survey, the low capture rate of small mammals in that survey suggests that these species were not present in high numbers at the time, possibly due to the dry conditions, and as a result did not occupy the full extent of potential habitat.

A range of bird species are likely to use this grassy habitat for both foraging and nesting, especially given the proximity of the grassland to the ephemeral drainage lines. These include the Star Finch (*Neochmia subclarascens*), Swamp Quail (*Coturnix ypsilophora*), Painted Finch (*Emblema pictum*), and Crimson Chat (*Epthianura tricolor*).

This habitat type is typical of the broader Pilbara region, but less common on the Burrup Peninsula, which is frequently dominated by rocky outcrops. This habitat type is well represented within the Study Area, and is likely to support fewer conservation significant species, and be less sensitive to disturbance, than other habitat types present.



### Samphire Shrubland / Supra-tidal Flats



**Plate 5-3: Samphire Shrubland / Supra-tidal Flat Trapping Sites**

The Burrup Peninsula contains marine alluvial flats and river deltas that support Samphire and mangal ecosystems (mangroves). Although these areas are relatively small in a regional context, the intertidal flats around the Burrup are locally significant (DEC, 2013). Within the Study Area, supra-tidal flats exist in the middle of the area, draining westward into King Bay, and this area is fringed by Samphire Shrubland, consisting of low shrublands on sandy soils. The reptiles recorded most frequently within this habitat type were the Ring-tailed Dragon (*Ctenophorus caudicinctus*), Northern Bar-lipped Skink (*Eremiascincus isolepis*), and Bynoe's Gecko (*Heteronotia binoei*). The Delicate Mouse (*P. delicatulus*), Desert Mouse (*P. desertor*), Greater Northern Free-tailed Bat (*Chaerephon jobensis*), and Gould's Wattled Bat (*Chalinolobus gouldii*) were all recorded within the Samphire Shrubland habitat type more frequently than other habitat types.

The supra-tidal flats area of this habitat type is subject to inundation, due to tidal surges, and also drainage from rainfall events. As such, this area supports a range of shorebirds and waders, including the Red-capped Plover (*Charadrius ruficapillus*), Grey-tailed tattler (*Tringa brevipes*), and Common Greenshank (*T. nebularia*), all of which were recorded frequently in the post wet-season survey. In turn, predatory species such as the Eastern Osprey (*Pandion haliaetus*) are likely to forage over these areas.



**Plate 5-4: Examples of Mangrove Vegetation Adjacent to the Study Area, and Supra-tidal Habitat Present within the Study Area**

Mangrove vegetation is present in association with King Bay, immediately outside the survey area to the West. These areas are likely to support a diverse range of fauna including many birds that may use the rich organic



marine sediment to forage and potentially nest, such as Brahminy Kite (*Haliastur indus*) and the Mangrove Golden Whistler (*Pachycephala melanura*). Mangrove vegetation may also support a range of mammal species, including the Rakali (*Hydromys chrysogaster*), Northern Coastal Free-tailed Bat (*O. cobourgianus*), and the Little Red Flying Fox (*Pteropus scapulatus*). The mangrove vegetation is outside the Study Area, and will not be directly disturbed by the proposed development.

The Samphire Shrubland / Supra-tidal Flats habitat type provides locally important foraging opportunities for a range of species, particularly migratory shorebirds and waders. Shallow tidal plains such as that within the Study Area are rare on the Burrup Peninsula. Where possible, development within the Study Area should avoid disturbance of this habitat type, and modification of any drainage that would alter the habitat, or the mangroves further downstream.

### Drainage Lines



**Plate 5-5: Drainage Line Habitat in the Southwest Corner of the Study Area**

Weathering of the geology of the area has formed deeply incised narrow valleys amongst the exposed bedrock. These channels trend southwest to northeast and east to west throughout the Burrup Peninsula. The drainage channel present in the Study Area in the southwest corner is quite significant as this habitat type occurs infrequently on the Burrup Peninsula.

Throughout much of arid and semi-arid Australia, ephemeral drainage lines provide important habitat diversity and resources (i.e. water) for many species. Within the Study Area, Drainage Lines are likely to provide important habitat for reptiles, such as Pygmy Pythons (*A. perthensis*) and Yellow Spotted Monitors (*Varanus panoptes*). The large trees associated with these landforms may provide hollows suitable for birds such as the Galah (*Cacatua roseicapilla*) and Little Corella (*Cacatua sanguinea*). Similarly, this habitat provides roosting, nesting,

perching and foraging habitat for the Red-browed Pardalote (*Pardalotus rubricatus*), Red-backed Kingfisher (*Todiramphus pyrrhopygius*) and Black-faced Woodswallow (*Artamus cinereus*).

Trees containing hollows are likely to provide roosting habitat for the Northern Free-tailed Bat (*Chaerephon jobensis*), the Little Broad-nosed Bat (*S. greyii*), as well as foraging habitat for the Ghost bat (*M. gigas*).

Drainage line habitat is relatively limited within the Study Area, and is likely to be of high importance due to the associated tall trees and ephemeral freshwater. Particularly, the creekline in the south-west of the Study Area is unique within the Study Area. This creek line drains from the Murujuga National Park, an area likely to contain suitable roost sites for the Ghost Bat (*M. gigas*), which forages along drainage lines. Development of the Study Area should avoid disturbance to this habitat type.

### 5.2.6 Conservation Significant Fauna

A range of conservation significant fauna have the potential to occur at the site (Table 5-1). Of these 99 species, 28 have been recorded by APM within the Study Area (Table 5-7). 26 are Migratory or Marine birds, and many share common habitat preferences. These species are discussed in more detail below.

Two conservation significant mammal species were recorded during APM surveys, both of which are bats; the Ghost Bat (*M. gigas*), and the Northern Coastal Free-tailed Bat (*M. cobourgianus*). No conservation significant reptiles or amphibians were identified during the surveys. The Northern Quoll (*D. hallucatus*) and the Pilbara Olive Python (*Liasis olivaceus barroni*) were not recorded by APM, but have the potential to occur, and are important considerations for many developments in the Pilbara region.

**Table 5-7: Conservation Significant Fauna recorded by APM, Showing the Number of Bird Individuals observed and the Number of Nights each Bat Species was Recorded**

Species	Common Name	Conservation Status		APM Biological Surveys	
		Cth	State	2018 Pre-wet Season	2019 Post-wet Season
<b>Birds</b>					
<i>Accipiter fasciatus</i>	Brown Goshawk	M	-		1
<i>Anthus novaeseelandiae</i>	Australasian pipit	M	-	1	19
<i>Cacomantis pallidus</i>	Pallid Cuckoo	M	-		7
<i>Calidris ruficollis</i>	Red-necked stint	IA, M	IA, Schedule 5	1	
<i>Chalcites osculans</i>	Black-eared Cuckoo	M	-		7
<i>Charadrius ruficapillus</i>	Red-capped Plover	M	-	18	89
<i>Chlidonias hybrida</i>	Whiskered tern	M	-		21
<i>Chroicocephalus novaehollandiae</i>	Silver Gull	M	-	2	1
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	M	-	27	15
<i>Egretta garzetta</i>	Little Egret	M	-	2	18
<i>Falco cenchroides</i>	Nankeen Kestrel	M	-	11	17
<i>Grallina cyanoleuca</i>	Magpie-lark	M	-		4
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	M	-		1
<i>Haliastur indus</i>	Brahminy Kite	M	-	4	1
<i>Haliastur sphenurus</i>	Whistling Kite	M	-	16	5
<i>Himantopus himantopus</i>	Black-winged Stilt	M	-		13
<i>Hirundo neoxena</i>	Welcome Swallow	M	-		8
<i>Hydroprogne caspia</i>	Caspian Tern	IA	IA, Schedule 5		1
<i>Merops ornatus</i>	Rainbow Bee-eater	M	-	8	
<i>Numenius phaeopus</i>	Whimbrel	IA	IA, Schedule 5		5
<i>Pandion cristatus</i>	Eastern Osprey	IA, M	IA, Schedule 5	2	
<i>Petrochelidon nigricans</i>	Tree Martin	M	-		8



Species	Common Name	Conservation Status		APM Biological Surveys	
		Cth	State	2018 Pre-wet Season	2019 Post-wet Season
<i>Pluvialis fulva</i>	Pacific golden plover	IA, M	IA, Schedule 5		1
<i>Thalasseus bengalensis</i>	Lesser Crested Tern	M	-	1	
<i>Tringa brevipes</i>	Grey-tailed Tattler	IA	IA, Schedule 5, P4		57
<i>Tringa nebularia</i>	Common Greenshank	IA, M	IA, Schedule 5		37
<b>Mammals</b>					
<i>Macroderma gigas</i>	Ghost Bat	VU	VU, Schedule 3		2
<i>Mormopterus cobourgianus</i>	Northern Coastal Free-tailed Bat	-	P1	6	21

### 5.2.6.1 Migratory and Marine Birds

Of the 26 conservation significant species observed by APM during both surveys, 23 are listed as Marine and 7 are listed as Migratory (a species can be listed as both Marine and Migratory) and are covered under international agreements. None of the species present are listed as Threatened species (under federal or state legislation). The Grey-tailed Tattler (*Tringa brevipes*) is listed as Priority 4 under the BC Act, which means it is Rare or Near Threatened, but not qualifying of listing as Threatened.

The Study Area contains a broad salt plain, draining westwards towards King Bay, with some associated Mangrove vegetation outside the Study Area. As a result, the Study Area provides an important and relatively limited area suitable for migratory waders and shorebirds. Under the guidelines outlined by DoEE (2017), the area does not qualify as Nationally Important Habitat, as there are fewer than 15 migratory species, and less than 2,000 migratory shorebirds that regularly use the area. The Burrup Road, a busy road providing access to the many processing facilities and Port, is situated immediately to the west of the supra-tidal flats. As a result, this area is already subject to noise disturbance from traffic, and the species observed during APM surveys are present despite this disturbance. While further disturbance to this area should be minimised, it is unlikely to present a significant increase to that already created by the Burrup Road.

### 5.2.6.2 Ghost Bat – *Macroderma gigas*

The Ghost Bat is the largest microchiropteran bat in Australia and the second largest in the world (Woinarski *et al.* 2014; Richards *et al.* 2008). It is the only carnivorous bat in Australia (Michael & Lindenmayer, 2018) and the sole residing member of the family Megadermatidae (False Vampires) in Australia and is endemic to the continent (Woinarski *et al.* 2014; Richards *et al.* 2008). Originally widespread across mainland Australia, the species has experienced a range contraction, and now only persists in in the Pilbara and Kimberley regions and patchily along coastal Queensland and the northern extent of the Northern Territory (Michael and Lindenmayer, 2018; BHP, 2017; Woinarski *et al.* 2008).

The suitability of roost sites is the most influential and limiting factor for the distribution of these bats (BHP, 2017). While ghost bats have exploited abandoned mine shafts and underground pits and found these types of roost sites to be favourable, this species is particularly sensitive to disturbance and is unlikely to return to a site once it has been disturbed in any way (Michael and Lindenmayer, 2018; BHP, 2017; Woinarski *et al.* 2014).

While it is daytime, they roost in deep, complex natural cave systems and rock fissures with stable temperatures of 23°–28° and a relative humidity of 50-100% (Woinarski *et al.* 2014). Approximately 1 hour after sunset the bats will emerge from their roosts and commence hunting for a period of 2 hours (BHP, 2017). The Ghost Bat uses a surface foraging strategy in which it will perch on vegetation with vantage points to either ambush passing prey on the ground or in the air, or it will glean prey from the ground whilst in flight (Woinarski *et al.* 2014). Bats change viewpoints frequently during foraging activity and may move up to 360 metres between viewpoints

(Woinarski *et al.* 2014). Ghost Bats have an average foraging area of 61 ha, with individuals typically ranging as far out as 1.9 kilometres from their day roosts (Woinarski *et al.* 2014). This species is Australia's only truly carnivorous bat, preying on frogs, birds, mice, small lizards, insects and other bats (Michael and Lindenmayer, 2018; Woinarski *et al.* 2014). Ghost Bats typically fly low to the ground, around fence height, and are prone to collisions with wire fences. Due to low fecundity, even infrequent deaths on fences can have a moderate impact on populations (Woinarski *et al.* 2014).

Upon the commencement of mating season in July, Ghost Bats will concentrate upon relatively few roost sites. The gestation period takes three months from which the offspring are born during September to November. Juveniles hunt with their mothers until they become completely independent. Colony sizes range from a few individuals to greater than 100, although large colonies are now rare. In the Pilbara, colony sizes in natural roosts are generally much smaller, often consisting of just a few animals. It is during the time of breeding and rearing young that these bats are most sensitive to disturbance.

No suitable roosting caves were located within the Study Area during APM surveys, although Ghost Bats were detected on two occasions on the south side of the Study Area in close proximity to rocky outcrops. The creekline in the southwest of the Study Area contained large trees and is in close proximity to the rocky outcrops of Murujuga National Park, where roosting habitat may be present. Given the provision of tall trees as vantage points and the proximity to potential roosting habitat, this creekline is considered important Ghost Bat habitat.

#### 5.2.6.3 Northern Coastal Free-tailed Bat - *Mormopterus cobourgianus*

The Northern Coastal Free-tailed Bat is listed as Priority 1 under the BC Act as it is a relatively little-known species. There are few published studies on this species, with most relying on general information about the Genus, or field guides. This species occurs in coastal areas of the Pilbara region in WA, and the Top End of the Northern Territory (Churchill, 2008). The Northern Coastal Free-tailed Bat is brown to grey-brown, with a paler belly that is greyish lemon. They roost in the upper dead branches of the Grey Mangrove (*Avicennia marina*), emerging in groups of up to 100 after sunset and dispersing to forage in pairs or alone (Churchill, 2008).

The Northern Coastal Free-tailed Bat generally forages in mangroves and associated monsoon forests and is known to use openings and linear clearings (such as roads or creeks) to navigate through the canopy (Churchill, 2008). Within the Study Area, this species was recorded throughout all habitats, and on many occasions. It is likely that this species may roost in the mangrove vegetation to the west of the Study Area.

#### 5.2.6.4 Northern Quoll – *Dasyurus hallucatus*

The Northern Quoll is considered Endangered under both Commonwealth and State legislation. In addition to its conservation significance, the species is considered a keystone species in the Pilbara, and one of many 'critical-weight range' mammals under threat across Australia.

Northern Quolls are nocturnal, partially arboreal and omnivorous, primarily feeding on invertebrates, small mammals and reptiles (Schmitt *et al.* 1989). Once thought to have occupied almost the entire northern third of Australia, the distribution of Northern Quolls is suspected to have declined by over 75% (Braithwaite & Griffiths, 1994). The Northern Quoll is generally found in rocky and broken country within open Eucalypt forest, however it can occupy a variety of other habitats, including rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. The Northern Quoll will usually den in hollow tree trunks (Hill & Ward, 2010) or in small caves and crevices in rocky outcrops. These areas can be found within deep drainage lines, steep hills and gorges on the island. Management of the Burrup Peninsula population of Northern Quoll is critical to maintain the mainland distribution. Researchers at DBCA have been strongly advising that predator control on the Burrup be increased in order to return the Peninsula to similar densities to that of the neighbouring islands. However, the number of stakeholders involved in such management makes progress slow. Aerial deployment of predator baits have recently been conducted across the Burrup Peninsula (Department of Parks and Wildlife, 2017).

Northern Quoll have been recorded in close proximity to the Study Area. One record in 1990 is less than 1 km from the proposed site, and another at a similar time is approximately 2.2km away. The most recent record is from the northern point of King Bay which is approximately 2.7 km from the proposed site. Despite a concerted survey effort by APM during the 2018 and 2019 surveys, including cage and Elliot trapping, camera trapping, spotlight searches, and scat searches, Northern Quolls were not recorded. Given the low density of mainland populations of this species, and its cryptic nature, the lack of detections during APM surveys may not indicate the absence of this species from the area. However, the lack of detections does indicate that this species is rare in habitats at the Study Area.

Northern Quolls on the Burrup Peninsula are likely to inhabit complex landforms of rocky outcrops, which can afford greater cover from predators than more open areas. The current survey area does not include the well-developed and extensive rocky outcrops present immediately north and south of the site.

#### 5.2.6.5 Pilbara Olive Python – *Liasis olivaceus barroni*

The Olive Python is endemic to Australia and only occurs within two distinct regions, giving rise to two distinct subspecies; *Liasis olivaceus olivaceus* which occurs from the Kimberley region to the Great Dividing Range in Queensland, and the Pilbara Olive Python (*Liasis olivaceus barroni*), largely restricted to the Hamersley Range and Dampier Archipelago of the Pilbara region. Other populations of the subspecies have also been recorded in Pannawonica, Tom Price, Millstream and also the Burrup Peninsula (Pearson, 2006).

The Pilbara Olive Python has been recorded in areas with gorges, escarpments in close proximity to water holes (Doughty *et al.* 2011). During the cooler months they will typically hide in caves, crevices and fissures away from water sources. However, in the warmer months they become active and tend to stay near rocky outcrops and water. Their preference for water holes is likely due to resulting abundance of prey, rather than a need for drinking water. This species readily swims in water holes to hunt prey. On the Burrup Peninsula, Olive Pythons have been found to prefer granophyre rock piles and occasionally are found in neighbouring spinifex grasslands.

The Breeding season commences from June through to August. The mating pair will isolate themselves in shelter for up to three weeks. The eggs are deposited around October after a gestation period of 3 months and hatch in January, after which the young disperse.

Introduced predators represent the main threats to the Pilbara Olive Python. Foxes and cats will prey upon juvenile pythons and compete with adults for prey (Carwardine *et al.* 2014). Within isolated areas, such as the Burrup Peninsula, development of mining infrastructure may also have adverse impacts on the Pilbara Olive Python. Further, mining development could alter the availability of prey and increase road deaths of this species.

Rocky outcrop areas inside and immediately adjacent to the Study Area were nocturnally searched during both APM surveys; no Pilbara Olive Pythons, however, were recorded. While the rainfall leading up to the 2019 post-wet season survey was below average, the cyclone event in the preceding week resulted in some fresh water being available. The frequency with which Pygmy Pythons (*Anterisia perthensis*) were detected during the post-wet season survey (5 individuals across 4 nights) suggested that conditions were appropriate for other python species during this survey.

This species is highly cryptic, and occupies complex rocky outcrops and fissures that make detection probability for this species low. As such, it is possible that Pilbara Olive Pythons will use the Study Area. The lack of detections during the APM survey, however, suggest it is infrequent if present. The current survey area does not include the well-developed and extensive rocky outcrops present immediately north and south of the site.



## 6 CONCLUSION

### 6.1 VEGETATION OF CONSERVATION SIGNIFICANCE IN THE STUDY AREA

Twenty-six locations in the Study Area have been classified by this assessment as the P1 Priority Ecological Community – Rockpiles of the Burrup Peninsula. These locations are not presently listed on the DBCA database.

Seven vegetation associations have been classified in this assessment to be synonymous with vegetation associations listed by M. E Trudgen & Associates (2002) as being of conservation significance because they have less than 10 occurrences across the Burrup Peninsula and Angel, Gidley and Dolphin Islands. A further 4 have been included as they were listed with 10 to 24 occurrences. Impact assessment on these vegetation types will need to consider the cumulative impact of prior developments.

The EPA (2001) noted that vegetation in the King Bay – Hearson Cove Valley has high conservation value and that part of the floristic variation appears to be uncommon elsewhere on the Peninsula (Trudgen *et al.*, 2001). The EPA (2001) stated that the King Bay – Hearson Cove valley appeared to be the only area on the Peninsula and islands where there is development of both an infrequently submerged littoral zone, an extensive area of samphires, and the littoral grass *Sporobolus virginicus*. It considered that more comparative information was required for the valley vegetation, and that subsequent development needed to incorporate the findings from such work into its planning. Astron Environmental (2005) mapped samphire vegetation in the valley, allowing a more detailed impact and cumulative impact assessment. Outback Ecology (2009) noted that the community mapped as Sm and described as Saline Inlet and Supra-tidal Flats by M. E. Trudgen & Associates (2002) had approximately 56% of this community's extent represented within the proposed Burrup Peninsula Conservation Reserve. Although not classified to the vegetation association level, M. E. Trudgen & Associates (2002) mapped 50 to 99 occurrences of Sm and 25 to 49 occurrences of the littoral grass *Sporobolus virginicus*.

The EPA (2001) noted that the valley is the only broad valley with gentle lower slopes and consequently had the best stands of a part of the range of vegetation structural / dominance units on the Burrup Peninsula (Trudgen, 2001). The Burrup Nitrates project along with other industrial developments in the valley have directly impacted vegetation assemblages considered significant and in general have fragmented the catena / topographic sequence on the northern side of the valley. However, the EPA recognises that the Burrup Peninsula Land Use Plan and Management Strategy (O'Brien Planning Consultants, 1996) set aside about 5,400 ha (62%) of the Burrup Peninsula for conservation, recreation and heritage protection, and that the valley has been set aside for industrial development. The EPA (2001) expects proponents to take reasonable measures to minimise impacts on the vegetation communities of highest importance as defined at a local and regional scale, having taken the available information on vegetation surveys into account when planning the footprint of their plants.

### 6.2 FLORA OF CONSERVATION SIGNIFICANCE IN THE STUDY AREA

Four flora of conservation significance occur inside the Study Area. Three *Terminalia supranitifolia* (P3) trees occur on rockpile vegetation in the south of the Study Area which are also classified as the P1 PEC - Rockpiles of the Burrup Peninsula. One specimen of *R. bungarensis* (P4) was collected from near the eastern boundary in a shallow drainage area. *T. supranitifolia* is found in other areas on the Burrup Peninsula, and other areas of the Pilbara, while *R. bungarensis* is widespread throughout the Burrup Peninsula. As such, development of the Study Area does not represent a significant loss of either of these species.

### 6.3 IMPACTS ON FLORA AND VEGETATION

The proposed Project Area as displayed in Figure ES-1 has been laid out to minimise the impact to conservation significant flora and vegetation whilst simultaneously considering the impact to fauna and heritage.

No Priority flora located during the field surveys will be impacted by the proposed layout. *Dolichandrone occidentalis* has been identified previously as being of local conservation significance as the distribution on the Burrup Peninsula is limited to one known area, despite it being widespread on the mainland. The Project Area intersects with small pockets of this species; however the greater part of its distribution is to the north of the Study Area and will not be impacted.

Three small rock outcrops that constitute the Priority 1 ecological community Rockpiles of the Burrup Peninsula are partially intersected by and will be impacted by the proposed layout. They contain the vegetation community BaAclc: Open low woodland of *Brachychiton acuminatus* over mixed shrubland of *Acacia coriacea*, *Scaevola spinescens*, *Ipomoea costata* over herbs and very open grassland of *Triodia epactia* with *Cymbopogon ambiguus* and *Paspalidium clementii*. The Project Area intersects with 0.031 ha of BaAclc. There are 21 Priority 1 ecological community Rockpiles of the Burrup Peninsula with the vegetation community BaAclc in the Study Area ranging in size from 0.013 ha to 0.312 ha. In total the BaAclc in the Study Area covers 1.656 ha and the impact of 0.031 ha will reduce that cover by 1.9%. The total cover of all Priority 1 ecological community Rockpiles of the Burrup Peninsula in the Study Area is 1.876 ha and the impact of 0.031 ha will reduce that cover by 1.7%. It is also noted that there are large, undisturbed areas of the Priority 1 ecological community Rockpiles of the Burrup Peninsula to the north and south of the Study Area, with a large proportion of the total area on the Burrup Peninsula occurring in Reserve areas. As such the proposed impact is not considered to have a significant effect on the overall sustainability of this vegetation type.

The Project Area intersects a number of vegetation associations identified in Trudgen and Associates (2002) as being of regional conservation significance. The area mapped as TaTsRm: *Triodia angusta*, *Triodia epactia* grassland with *Tephrosia supina* herbland and *Rhyncosia minima* lianes by Trudgen and Associates (2002) was recorded as a single occurrence and thus of high conservation significance. In this Biological Assessment, APM have retained the description given by Trudgen and Associates (2002) but note a much lower abundance of *Tephrosia supina* herbland and *Rhyncosia minima* lianes, likely due to the lower than average rainfall conditions. APM also note that this area is a very narrow (15 m wide) strip of area (both in 2002 and 2019) immediately adjacent to the disturbed and rehabilitated zones to the east. In the Cluster analysis, the site was grouped with other sites based on the presence of *Triodia angusta*, and in the present study this locality is one of the furthest occurrence of *T. angusta* from the inlet. The Project Area intersects 0.024 ha of this mapped vegetation association, or 10% of the total mapped 0.224 ha. Notably, where the Project Area intersects the vegetation association does not contain *T. angusta*, as the majority of the *T. angusta* occurs towards the centre of the mapped distribution.

The Project Area also intersects 0.405 ha (40% of the 1.015 ha in the Study Area) of the vegetation association described by Trudgen and Associates (2002) as ChAbSg *Corymbia hamersleyana* low open woodland over *Acacia bivenosa* high open shrubland over *Dichrostachys spicata* scattered shrubs over *Stemodia grossa* low shrubland to low open heath over *Triodia epactia* hummock grassland. In the current study APM have retained the description. Trudgen and Associates (2002) recorded 4 occurrences of this vegetation association, including one within the Reserved area, and identify it as regionally significant.

The Project Area also intersects three vegetation associations that were recorded by Trudgen and Associates (2002) as having 5 to 9 occurrences. 5.353 ha (65% of the 8.279 ha in the Study Area) of the vegetation association as AblmTe: *Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* scattered low shrubs to low open shrubland over *Triodia epactia* hummock grassland to closed hummock grassland; 3.143 ha (37% of the 8.486 ha in the Study Area) of the vegetation AbTa: *Acacia bivenosa* high open shrubs over *Triodia angusta* hummock grassland and 0.018 ha (8% of the 0.232 ha in the Study Area) of the vegetation association EvAa: *Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus*, *Eriachne tenuiculmis*, *Triodia angusta* sedgeland and tussock/hummock grassland.

The southwestern corner of the Study Area contains a number of vegetation associations regional conservation significance with between 2 and 10 occurrences. The area is a drainage feature and has a high diversity of flora and vegetation associations in a small area. This locality is of local conservation significance due to this localised diversity. The Project layout has been achieved so that this area will not be directly impacted by the Project.

The Project impact to the vegetation fringing the tidal inlet is restricted to the northern sector, where the vegetation is contained within the pipeline that runs from the north of the Study Area on the western side, then crosses the mudflat. Astron (2005) note that this pipeline interrupts the flow of water in the area and was at that time having a negative impact on the health of the vegetation. In this current biological survey APM recorded lower floristic and vegetative diversity in this area than Astron (2005). This is potentially a longer-term consequence of the disruption to water flows described by Astron (2005). In this current survey for the area within the Project layout, APM have retained the description of the sandy swale vegetation consistent with Trudgen and Associates (2002) who mapped over 100 occurrences of the association (Te)Sv; and retained the samphire description of Astron (2005) (updated to current nomenclature) ThtTil. Astron (2005) considered the condition of this vegetation to be impacted by the drainage issues of existing infrastructure to the extent that the proposed project at that time was unlikely to have significant further impact.

#### 6.4 IMPACTS ON FAUNA OF CONSERVATION SIGNIFICANCE

In total, APM recorded 63 bird, 7 non-volant mammal, 8 bat, 27 reptile and 1 amphibian species during two surveys. Within this assemblage, one Threatened fauna species, the Ghost Bat (*M. gigas*), one Priority 4 species, the Northern Coastal Free-tailed Bat (*M. cobourgianus*), and 26 listed bird species were recorded.

Of the migratory and marine bird species recorded within the Study Area, the most numerous species were the Red-capped Plover (*C. ruficapillus*), Grey-tailed Tattler (*T. brevipes*), and Common Greenshank (*T. nebularia*). While the supra-tidal flats in the Study Area represent a locally important habitat type for migratory shorebirds, its importance on a regional scale is low. For example, an average of 19,800 Red-necked Stints (*C. ruficollis*) seasonally feed in Roebuck Bay (DoEE, 2018) where only one was recorded during the APM surveys. As such, the Study Area is not likely to be of key importance to migratory species. In addition, the area is already subject to disturbance from the busy Burrup road, and as a result any species that currently use the areas are likely to be relatively resilient to anthropogenic disturbance. The current design of the development within the Study Area largely avoids any disturbance to the supra-tidal flats or the surrounding Samphire Shrublands. As there is infrastructure being built on both the north and south sides of the supra-tidal flats, there will be a road across the supra-tidal flats to connect the two areas. This road has been designed with culverts to avoid restricting drainage. This will negate the potential for development to impact this supra-tidal flats habitat or the mangrove vegetation outside the Study Area.

A range of other bird species were recorded, especially in the post-wet season survey in March 2019, including 11 species of raptor. However, no threatened bird species were recorded during surveys. The Grey-tailed Tattler is a Priority 4 species, meaning it is considered near-threatened under the Western Australian state legislation. The lack of threatened bird species using the Study Area indicates that the proposed development is unlikely to reduce the availability of habitat for such species.

The Ghost Bat (*M. gigas*), listed as Vulnerable under both federal and state legislation, was recorded on two evenings in the southern section of the Study Area. This species requires well developed caves for roosting, and disturbance of these caves is one of the primary drivers of this species' decline. This species often forages along creeklines, using the taller trees as vantage points from which to spot prey. The creekline in the south west of the Study Area is likely to provide important foraging habitat for the Ghost Bat, especially given its close proximity to Murujuga National Park, which is likely to provide important roosting opportunities. Where



possible, development of the Study Area should avoid disturbance of this creekline, to avoid possible impacts to this species.

The Northern Coastal Free-tailed Bat (*M. cobourgianus*), listed as Priority 4 (poorly-known) in WA, was also recorded at numerous sites, on multiple occasions, throughout the Study Area. This species is known to roost in Grey Mangroves, which are likely to be present in the vicinity of King Bay to the west of the Study Area. It is unlikely that the Project will impact this species.

During both the pre-wet season, and post-wet season surveys, camera traps were deployed in rocky outcrop areas, and nightly spotlight searches were conducted, in an effort to record the Northern Quoll (*D. hallucatus*) and Pilbara Olive Python (*L. o. barroni*). Cage and Elliot trapping conducted in rocky outcrop sites as part of the broader post-wet season survey is also suitable for the Northern Quoll. Despite this survey effort, neither species was recorded during the APM surveys. While the survey design was appropriate, both species are cryptic and often inhabit complex landscapes where detection is difficult. As a result, the lack of records should not be interpreted as an absence of either species. Given the close proximity of recent records of both species, it is possible that both may be present, albeit infrequently within the Study Area.

The development of the Study Area may present a risk to some species via habitat fragmentation, particularly the Northern Quoll. While 4,913 ha of appropriate habitat has been protected in Murujuga National Park, resulting in 44% of the Burrup Peninsula land mass available for this species being protected from further disturbance, development of the Study Area will effectively separate the northern regions of the peninsula from the southern areas and mainland. This may cause significant fragmentation of the Burrup Peninsula Northern Quoll population. Development of the Study Area may also locally exacerbate the factors that have contributed to the decline of this species. Specifically, the development will not impact denning habitat but will decrease foraging habitat by land clearing and may increase the frequency of fires and the presence of introduced predators such as feral cats (*F. catus*) and red foxes (*V. vulpes*), disease and habitat fragmentation (Hill & Ward, 2010).

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## APPENDICES



**APPENDIX A: DEPARTMENT OF BIODIVERSITY CONSERVATION AND ATTRACTIONS PROTECTED BIOTA  
CATEGORIES**



# CONSERVATION CODES

## For Western Australian Flora and Fauna

Specially protected fauna or flora<sup>1</sup> are species<sup>2</sup> which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

### **T Threatened species**

Published as Specially Protected under the *Wildlife Conservation Act 1950*, and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

**Threatened fauna** is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

**Threatened flora** is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

### **CR Critically endangered species**

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

### **EN Endangered species**

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

### **VU Vulnerable species**

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

### **EX Presumed extinct species**

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

### **IA Migratory birds protected under an international agreement**

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.

## **CD Conservation dependent fauna**

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

## **OS Other specially protected fauna**

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950*, in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

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## **P Priority species**

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

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

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

### **1 Priority 1: Poorly-known species**

Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.

### **2 Priority 2: Poorly-known species**

Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

### **3 Priority 3: Poorly-known species**

Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.

### **4 Priority 4: Rare, Near Threatened and other species in need of monitoring**

(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.

(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.

(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

<sup>1</sup> The definition of flora includes algae, fungi and lichens

<sup>2</sup> Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).



**APPENDIX B: DATABASE (2018) AND HISTORICAL SURVEY TERRESTRIAL FAUNA AND FLORA RECORDS**

Taxon	Cons_Code	Latitude	Longitude	Date
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	1	-21.68333333	115.1333333	3/08/1963
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	1	-20.66666667	117.15	/08/1982
Atriplex lindleyi subsp. conduplicata	3	-20.85055556	116.5519444	7/11/1996
Carpobrotus sp. Thevenard Island (M. White 050)	3	-21.46319444	115.0196	24/08/1990
Carpobrotus sp. Thevenard Island (M. White 050)	3	-21.46666667	115.0166667	23/06/1988
Corchorus congener	3	-20.88305556	115.3266667	21/11/1965
Corchorus congener	3	-20.76666667	115.4	/10/1980
Corchorus congener	3	-20.76666667	115.4	/10/1980
Corchorus congener	3	-20.88305556	115.3266667	29/04/1964
Corchorus congener	3	-20.76666667	115.4	4/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.80199897	115.449625	1/10/2015
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.76666667	115.4	/10/1980
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.78333333	115.3333333	5/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.88305556	115.3266667	/06/1964
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2	-20.88305556	115.3266667	26/06/1964
Eleocharis papillosa	3	-21.738935	114.979944	14/03/2011
Eragrostis lanicaulis	3	-20.62972222	117.1897222	/03/1921
Eragrostis lanicaulis	3	-20.62972222	117.1897222	/03/1921
Eragrostis surreyana	3	-20.566933	116.823335	27/06/2000
Eragrostis surreyana	3	-20.56538889	116.8237778	27/05/2009
Eragrostis surreyana	3	-20.56552778	116.824	27/05/2009
Eremophila forrestii subsp. viridis	3	-21.77557918	115.0539952	19/08/2009
Eremophila forrestii subsp. viridis	3	-21.78277778	115.1116667	28/08/1960
Gomphrena cucullata	3	-20.8619	116.58295	11/07/2004
Gomphrena leptophylla	3	-20.8619	116.58295	11/07/2004
Goodenia nuda	4	-21.10981887	115.9935363	31/07/2002
Goodenia pallida	1	-20.83333333	116.5	11/08/1970
Gymnanthera cunninghamii	3	-20.59472222	116.6113889	13/06/1962
Gymnanthera cunninghamii	3	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3	-20.605	116.4833333	13/05/1982
Gymnanthera cunninghamii	3	-20.6	116.4833333	2/09/1987
Helichrysum oligochaetum	1	-20.66	117.18	//
Helichrysum oligochaetum	1	-20.65	117.1833333	//
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	-20.74444	116.74772	21/08/2005
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	-20.80192	116.58086	21/08/2005
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	3	-20.79114	116.79464	11/09/2004
Owenia acidula	3	-21.18333333	115.9833333	//
Owenia acidula	3	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3	-21.18333333	115.9833333	19/08/1966
Owenia acidula	3	-21.18666667	115.9816667	5/03/1953
Pentalepis trichodesmoides subsp. hispida	2	-20.63333333	117.2	8/10/1992
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.69025	116.727778	30/11/2010
Rhynchosia bungarensis	4	-20.56552778	116.824	27/05/2009
Rhynchosia bungarensis	4	-20.63722222	116.788	26/05/2009
Rhynchosia bungarensis	4	-20.56552778	116.824	27/05/2009
Rhynchosia bungarensis	4	-20.57205556	116.8086111	27/05/2009
Rhynchosia bungarensis	4	-20.64794444	116.7592778	29/05/2009
Rhynchosia bungarensis	4	-20.59472222	116.6113889	14/06/1962
Rhynchosia bungarensis	4	-20.50805556	116.84	5/06/1962
Rhynchosia bungarensis	4	-20.63333333	116.6333333	9/11/1987
Rhynchosia bungarensis	4	-20.6	116.5166667	19/07/1980
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.487416	116.832863	29/05/2000
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4	-20.574043	116.805097	26/06/2000
Rhynchosia bungarensis	4	-20.61269	116.782273	22/05/2000
Rhynchosia bungarensis	4	-20.534969	116.819554	27/05/2000
Rhynchosia bungarensis	4	-20.606376	116.756965	26/05/2000
Rhynchosia bungarensis	4	-20.533712	116.819134	27/05/2000
Rhynchosia bungarensis	4	-20.615432	116.758045	26/05/2000
Rhynchosia bungarensis	4	-20.533695	116.838079	27/05/2000
Rhynchosia bungarensis	4	-20.533695	116.838079	27/05/2000
Rhynchosia bungarensis	4	-20.566045	116.82089	5/06/2000
Rhynchosia bungarensis	4	-20.549081	116.844855	25/05/2000
Rhynchosia bungarensis	4	-20.640271	116.777358	20/05/2000
Rhynchosia bungarensis	4	-20.546327	116.828242	25/05/2000
Rhynchosia bungarensis	4	-20.638945	116.786661	20/05/2000
Rhynchosia bungarensis	4	-20.665256	116.745265	3/06/2000
Rhynchosia bungarensis	4	-20.645762	116.761779	21/05/2000
Rhynchosia bungarensis	4	-20.69183	116.721464	28/05/2000
Rhynchosia bungarensis	4	-20.648958	116.759739	21/05/2000
Rhynchosia bungarensis	4	-20.566793	116.819181	5/06/2000
Rhynchosia bungarensis	4	-20.548369	116.837843	25/05/2000
Rhynchosia bungarensis	4	-20.78333333	116.7666667	21/09/1983
Rhynchosia bungarensis	4	-21.04651731	116.2398665	7/06/2017
Schoenus punctatus	3	-20.56589139	116.8235573	10/07/1999
Stackhousia clementii	3	-20.63026737	116.784159	30/04/2002
Stackhousia clementii	3	-20.72520548	116.7560462	24/02/2013
Stackhousia clementii	3	-21.68456	115.118028	30/08/2011
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.652806	117.133444	7/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.621222	117.150917	9/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.624361	117.143611	10/03/2008
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	-20.616417	117.150972	5/10/2007





Burrup Peninsula rock pile communities Priority 1  
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 Burrup Peninsula rock pool communities Priority 1  
 Burrup Peninsula rock pool communities Priority 1

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1980
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1983
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1977
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5	-20.5	1981
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5872	-20.4689	1998
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.85	-20.45	2005
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.91	-20.41	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.8494	-20.4843	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6283	-20.4564	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6343	-20.5843	0
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1983
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1983
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1984
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6343	-20.5843	1984
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.8494	-20.4843	1990
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5194	-20.6069	1990
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6343	-20.5843	1990
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.5872	-20.4689	1998
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.85	-20.45	2005
Actitis hypoleucos	Actitis	hypoleucos	common sandpiper	116.6283	-20.4564	0
Anous stolidus	Anous	stolidus	common noddy	116.7833	-20.5833	1988
Anous stolidus	Anous	stolidus	common noddy	116.6283	-20.4564	0
Anous stolidus	Anous	stolidus	common noddy	116.5381	-20.4778	1983
Anous stolidus	Anous	stolidus	common noddy	116.6254	-20.4528	1983
Anous stolidus	Anous	stolidus	common noddy	116.6283	-20.4564	0
Apus pacificus	Apus	pacificus	fork-tailed swift	116.5194	-20.6069	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1977
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1974
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5	-20.5	1966
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.58	-20.58	1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.58	-20.58	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5808	-20.4758	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5872	-20.4689	1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6583	-20.525	1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.91	-20.41	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7768	-20.5405	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6592	-20.6094	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6225	-20.4697	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5381	-20.4778	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6396	-20.4392	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5936	-20.4817	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6343	-20.5843	0
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8064	-20.4931	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8056	-20.3858	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.7768	-20.5405	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.4444	-20.6572	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6831	-20.6547	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6225	-20.4697	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5194	-20.6069	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8317	-20.3889	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.5381	-20.4778	1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.8494	-20.4843	1982
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone	116.6283	-20.4564	1990

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8494	-20.4843 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8494	-20.4843 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7768	-20.5405 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5194	-20.6069 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7768	-20.5405 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8317	-20.3889 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.4444	-20.6572 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.6393	-20.4388 1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5381	-20.4778 1983
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5194	-20.6069 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8056	-20.3858 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8064	-20.4931 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5936	-20.4817 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8317	-20.3889 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.6393	-20.4388 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5936	-20.4817 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5381	-20.4778 1984
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5936	-20.4817 1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.6343	-20.5843 1990
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.6583	-20.525 1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5808	-20.4758 1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5872	-20.4689 1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8494	-20.4843 1978
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.6225	-20.4697 1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8064	-20.4931 2014
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7768	-20.5405 0
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.6283	-20.4564 0
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8317	-20.3889 0
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8806	-20.3881 1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.8202	-20.5862 1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.6583	-20.525 1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5822	-20.4745 1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5885	-20.4676 1998
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7597	-20.6403 1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7047	-20.6662 2010
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7972	-20.6331 1999
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5013	-20.4987 1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.918	-20.4153 1980
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5847	-20.582 1980
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5847	-20.4153 1980
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5847	-20.4153 1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7513	-20.582 1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7513	-20.582 1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5847	-20.582 1981
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5847	-20.4153 1978
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5013	-20.4987 1977
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5847	-20.582 1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5847	-20.4153 1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.7513	-20.582 1979
Arenaria interpres	Arenaria	interpres	ruddy turnstone		116.5013	-20.4987 1980
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe		116.5194	-20.6069 1984
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe		116.4444	-20.6572 1990
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe		116.5194	-20.6069 1990
Calidris acuminata	Calidris	acuminata	sharp-tailed sandpipe		116.7513	-20.582 1981
Calidris alba	Calidris	alba	sanderling		116.5	-20.5 1983
Calidris alba	Calidris	alba	sanderling		116.85	-20.45 2005
Calidris alba	Calidris	alba	sanderling		116.8513	-20.4487 2005
Calidris alba	Calidris	alba	sanderling		116.8806	-20.3881 1998
Calidris alba	Calidris	alba	sanderling		116.8513	-20.4487 2005
Calidris alba	Calidris	alba	sanderling		116.5013	-20.4987 1981
Calidris canutus	Calidris	canutus	red knot, knot		116.4444	-20.6572 1990
Calidris canutus	Calidris	canutus	red knot, knot		116.5	-20.5 1980
Calidris canutus	Calidris	canutus	red knot, knot		116.8494	-20.4843 1978
Calidris canutus	Calidris	canutus	red knot, knot		116.5013	-20.4987 1980
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper		116.8494	-20.4843 1990
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper		116.5194	-20.6069 1990
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper		116.5	-20.5 1977
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper		116.5	-20.5 1966
Calidris ferruginea	Calidris	ferruginea	curlew sandpiper		116.5013	-20.4987 1977
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5936	-20.4817 1984
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.8494	-20.4843 1990
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5936	-20.4817 1990
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5	-20.5 1977
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5	-20.5 1983
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5	-20.5 1980
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5	-20.5 1981
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.85	-20.45 2005
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.8513	-20.4487 2005
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.8513	-20.4487 2005
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.7988	-20.6323 2010
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.7972	-20.6331 1999
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5013	-20.4987 1981
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5847	-20.4153 1978
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5013	-20.4987 1978
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5013	-20.4987 1977
Calidris ruficollis	Calidris	ruficollis	red-necked stint		116.5013	-20.4987 1980
Caretta caretta	Caretta	caretta	loggerhead turtle		116.917	-20.3999 2008
Caretta caretta	Caretta	caretta	loggerhead turtle		116.8317	-20.3889 1984
Caretta caretta	Caretta	caretta	loggerhead turtle		116.917	-20.3999 2008
Charadrius leschenaultii	Charadrius	leschenaultii	greater sand plover, l		116.6283	-20.4564 0

































NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Fregata ariel	Fregata	ariel	lesser frigatebird		116.5013	-20.4987 1980
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.8056	-20.3858 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.5936	-20.4817 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.8069	-20.3845 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.5949	-20.4803 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.8597	-20.4044 1984
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.8597	-20.4044 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.5936	-20.4817 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.8597	-20.4044 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.8073	-20.3847 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.7713	-20.6087 1997
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.5953	-20.4807 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.8069	-20.3845 0
Hydromys chrysogaster	Hydromys	chrysogaster	water-rat, rakali		116.5949	-20.4803 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8314	-20.3889 1987
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8314	-20.3889 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8314	-20.3889 1991
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6292	-20.4571 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6939	-20.5202 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5946	-20.4797 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5204	-20.6007 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.4449	-20.6588 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5204	-20.6007 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5204	-20.6007 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.4449	-20.6588 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8044	-20.3856 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.777	-20.5399 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.777	-20.5399 1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5	-20.5 1974
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5	-20.5 1978
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5	-20.5 1981
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5747	-20.5931 2008
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.58	-20.58 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5872	-20.4689 1998
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.63	-20.58 1901
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6583	-20.525 1999
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6667	-20.5194 2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6675	-20.5203 2002
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.85	-20.45 2005
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8519	-20.4492 2002
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8875	-20.3917 2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.91	-20.41 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8056	-20.3858 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.7768	-20.5405 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.4444	-20.6572 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5194	-20.6069 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5194	-20.6069 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6943	-20.5202 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5936	-20.4817 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8317	-20.3889 1987
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8064	-20.4931 2000
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.7768	-20.5405 1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.4444	-20.6572 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5194	-20.6069 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8317	-20.3889 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8317	-20.3889 1991
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6283	-20.4564 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6169	-20.4441 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8056	-20.3858 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.7768	-20.5405 1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8494	-20.4843 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.4444	-20.6572 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5194	-20.6069 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8317	-20.3889 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8317	-20.3889 1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5381	-20.4778 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6283	-20.4564 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.675	-20.5178 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6943	-20.5202 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6737	-20.4485 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6732	-20.4512 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5079	-20.4995 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5936	-20.4817 1984
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6149	-20.5694 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6343	-20.5843 0
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6169	-20.4441 1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.8494	-20.4843 1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5389	-20.5356 1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.7768	-20.5405 1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5381	-20.4778 1990
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.675	-20.5178 1982
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5194	-20.6069 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.4444	-20.6572 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6283	-20.4564 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.7754	-20.5404 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5194	-20.6069 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.6283	-20.4564 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.584	-20.5753 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.5194	-20.6069 1983
Hydroprogne caspia	Hydroprogne	caspia	Caspian tern		116.654	-20.5059 1983



































NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Natator depressus	Natator	depressus	flatback turtle		116.917	-20.3999 2009
Natator depressus	Natator	depressus	flatback turtle		116.917	-20.3999 2009
Natator depressus	Natator	depressus	flatback turtle		116.9336	-20.4109 2009
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.868	-20.6487 1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.868	-20.6487 1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.868	-20.6487 1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.868	-20.6487 1966
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.6283	-20.4564 1983
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.8494	-20.4843 1984
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.8494	-20.4843 1990
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.85	-20.45 2005
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.8494	-20.4843 1978
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.8513	-20.4487 2005
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.7513	-20.582 1981
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.5013	-20.4987 1978
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.5013	-20.4987 1977
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.5013	-20.4987 1978
Numenius madagascariensis	Numenius	madagascariensis	eastern curlew		116.5013	-20.4987 1977
Numenius minutus	Numenius	minutus	little curlew, little whi		116.7105	-20.6551 2010
Numenius minutus	Numenius	minutus	little curlew, little whi		116.7513	-20.582 1981
Numenius minutus	Numenius	minutus	little curlew, little whi		116.7513	-20.582 1981
Numenius minutus	Numenius	minutus	little curlew, little whi		116.7513	-20.582 1977
Numenius minutus	Numenius	minutus	little curlew, little whi		116.5013	-20.4987 1977
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.85	-20.45 2005
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6169	-20.4441 0
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5194	-20.6069 0
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6737	-20.4485 0
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6732	-20.4512 0
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8211	-20.4486 1982
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6283	-20.4564 1983
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5194	-20.6069 1983
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5194	-20.6069 1984
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5194	-20.6069 1984
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6737	-20.4485 1984
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6169	-20.4441 1984
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8064	-20.4931 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6169	-20.4441 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5194	-20.6069 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8211	-20.4486 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6283	-20.4564 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8806	-20.3881 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6737	-20.4485 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.6343	-20.5843 1990
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8513	-20.4487 2005
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8494	-20.4843 1978
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8806	-20.3881 1998
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8265	-20.4836 2015
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8215	-20.5195 2015
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8014	-20.5711 2001
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8105	-20.6059 1999
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7822	-20.6595 2004
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7597	-20.6403 1999
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7819	-20.5903 1999
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.8513	-20.4487 2005
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7988	-20.6323 2010
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7972	-20.6331 1999
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5013	-20.4987 1981
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7513	-20.582 1980
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7513	-20.582 1981
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7513	-20.582 1981
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5013	-20.4987 1978
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5013	-20.4987 1977
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.7513	-20.582 1978
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5013	-20.4987 1977
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5013	-20.4987 1979
Numenius phaeopus	Numenius	phaeopus	whimbrel		116.5013	-20.4987 1980
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.5	-20.5 1974
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.91	-20.41 0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.8494	-20.4843 0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.4444	-20.6572 0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.6343	-20.5843 1983
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.6404	-20.4913 1983
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.4444	-20.6572 1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.8064	-20.4931 1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.7408	-20.4168 1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.5528	-20.4818 1984
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.8494	-20.4843 0
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.7322	-20.5958 2008
Oceanites oceanicus	Oceanites	oceanicus	Wilson's storm-petrel		116.918	-20.4153 1979
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5	-20.5 1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5	-20.5 1981
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5	-20.5 1974
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5	-20.5 1980
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5	-20.5 1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5	-20.5 1981
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5	-20.5 1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5747	-20.5931 2008
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.58	-20.58 1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.58	-20.58 0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.58	-20.58 1977







NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE	
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.675	-20.5178	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.675	-20.5178	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5936	-20.4817	1976
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5936	-20.4817	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5936	-20.4817	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5936	-20.4817	1983
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6343	-20.5843	1976
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6343	-20.5843	1977
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6343	-20.5843	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8064	-20.4931	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6169	-20.4441	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8597	-20.4044	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.7768	-20.5405	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8494	-20.4843	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.4444	-20.6572	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6831	-20.6547	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6225	-20.4697	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.4313	-20.6537	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5194	-20.6069	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8211	-20.4486	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5389	-20.5356	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6796	-20.5419	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8317	-20.3889	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5381	-20.4778	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6283	-20.4564	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8806	-20.3881	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.675	-20.5178	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6943	-20.5202	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6393	-20.4388	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6393	-20.4388	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5936	-20.4817	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6149	-20.5694	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6343	-20.5843	1990
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6254	-20.4528	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.7768	-20.5405	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.654	-20.5059	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6796	-20.5419	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6283	-20.4564	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8317	-20.3889	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.4444	-20.6572	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8494	-20.4843	1978
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.675	-20.5178	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8317	-20.3889	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5389	-20.5356	1984
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8806	-20.3881	2000
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5936	-20.4817	2004
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8169	-20.5092	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8273	-20.5152	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8347	-20.4846	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8222	-20.4231	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8181	-20.4136	2015
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8806	-20.3881	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.4444	-20.6572	1918
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8064	-20.4931	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.7768	-20.5405	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8494	-20.4843	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.4444	-20.6572	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5479	-20.5379	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5194	-20.6069	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8317	-20.3889	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6254	-20.4528	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6283	-20.4564	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.8806	-20.3881	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.675	-20.5178	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.5936	-20.4817	0
Pandion cristatus	Pandion	cristatus	osprey, eastern ospre		116.6343	-20.5843	0
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover		116.5	-20.5	1980
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover		116.6283	-20.4564	1983
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover		116.7047	-20.6662	2010
Pluvialis fulva	Pluvialis	fulva	Pacific golden plover		116.5013	-20.4987	1980
Pluvialis squatarola	Pluvialis	squatarola	grey plover		116.5	-20.5	1983
Pluvialis squatarola	Pluvialis	squatarola	grey plover		116.8494	-20.4843	1990
Pluvialis squatarola	Pluvialis	squatarola	grey plover		116.4444	-20.6572	1990
Pluvialis squatarola	Pluvialis	squatarola	grey plover		116.4485	-20.6657	1983
Pluvialis squatarola	Pluvialis	squatarola	grey plover		116.7988	-20.6323	2010
Pluvialis squatarola	Pluvialis	squatarola	grey plover		116.5013	-20.4987	1981
Pseudomys chapmani	Pseudomys	chapmani	western pebble-mour		116.8313	-20.5787	1983
Pseudomys chapmani	Pseudomys	chapmani	western pebble-mour		116.7713	-20.6087	1994
Stenella longirostris	Stenella	longirostris	spinner dolphin		116.6633	-20.5342	2014
Sterna dougallii	Sterna	dougallii	roseate tern		116.538	-20.5352	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6737	-20.4482	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.5	-20.5	1974
Sterna dougallii	Sterna	dougallii	roseate tern		116.5	-20.5	1983
Sterna dougallii	Sterna	dougallii	roseate tern		116.58	-20.58	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.91	-20.41	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6732	-20.4512	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.5389	-20.5356	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.8597	-20.4044	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.8494	-20.4843	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6943	-20.5202	0

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE	
Sterna dougallii	Sterna	dougallii	roseate tern		116.6396	-20.4392	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6737	-20.4485	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6732	-20.4512	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.5079	-20.4995	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.5936	-20.4817	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6343	-20.5843	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.8056	-20.3858	1990
Sterna dougallii	Sterna	dougallii	roseate tern		116.5381	-20.4778	1983
Sterna dougallii	Sterna	dougallii	roseate tern		116.5079	-20.4995	1984
Sterna dougallii	Sterna	dougallii	roseate tern		116.5079	-20.4995	1984
Sterna dougallii	Sterna	dougallii	roseate tern		116.8056	-20.3858	1984
Sterna dougallii	Sterna	dougallii	roseate tern		116.6737	-20.4485	1984
Sterna dougallii	Sterna	dougallii	roseate tern		116.6393	-20.4388	1984
Sterna dougallii	Sterna	dougallii	roseate tern		116.5936	-20.4817	1984
Sterna dougallii	Sterna	dougallii	roseate tern		116.8317	-20.3889	1990
Sterna dougallii	Sterna	dougallii	roseate tern		116.5381	-20.4778	1990
Sterna dougallii	Sterna	dougallii	roseate tern		116.6393	-20.4388	1990
Sterna dougallii	Sterna	dougallii	roseate tern		116.6737	-20.4485	1990
Sterna dougallii	Sterna	dougallii	roseate tern		116.5079	-20.4995	1990
Sterna dougallii	Sterna	dougallii	roseate tern		116.5936	-20.4817	1990
Sterna dougallii	Sterna	dougallii	roseate tern		116.6943	-20.5202	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6343	-20.5843	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.5936	-20.4817	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.8494	-20.4843	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.8388	-20.416	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.538	-20.5352	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6737	-20.4482	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.5389	-20.5356	1994
Sterna dougallii	Sterna	dougallii	roseate tern		116.6732	-20.4512	1994
Sterna dougallii	Sterna	dougallii	roseate tern		116.8806	-20.3881	1998
Sterna dougallii	Sterna	dougallii	roseate tern		116.5389	-20.5356	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.6732	-20.4512	0
Sterna dougallii	Sterna	dougallii	roseate tern		116.5013	-20.4987	1981
Sterna dougallii	Sterna	dougallii	roseate tern		116.5847	-20.582	1981
Sterna dougallii	Sterna	dougallii	roseate tern		116.7513	-20.582	1981
Sterna dougallii	Sterna	dougallii	roseate tern		116.7513	-20.4153	1981
Sterna dougallii	Sterna	dougallii	roseate tern		116.7513	-20.582	1979
Sterna dougallii	Sterna	dougallii	roseate tern		116.5847	-20.4153	1979
Sterna dougallii	Sterna	dougallii	roseate tern		116.5847	-20.582	1979
Sterna dougallii	Sterna	dougallii	roseate tern		116.7513	-20.582	1979
Sterna dougallii	Sterna	dougallii	roseate tern		116.918	-20.4153	1979
Sterna hirundo	Sterna	hirundo	Common Tern		116.4444	-20.6572	1990
Sterna hirundo	Sterna	hirundo	Common Tern		116.5194	-20.6069	1990
Sterna hirundo	Sterna	hirundo	Common Tern		116.5389	-20.5356	1990
Sterna hirundo	Sterna	hirundo	Common Tern		116.8317	-20.3889	1990
Sterna hirundo	Sterna	hirundo	Common Tern		116.6343	-20.5843	1990
Sterna hirundo	Sterna	hirundo	Common Tern		116.4456	-20.6489	2000
Sterna hirundo	Sterna	hirundo	common tern		116.5758	-20.6397	2000
Sterna hirundo	Sterna	hirundo	common tern		116.4814	-20.6461	2000
Sterna hirundo	Sterna	hirundo	common tern		116.4456	-20.6489	2000
Sternula albifrons	Sternula	albifrons	little tern		116.58	-20.58	2010
Sternula albifrons	Sternula	albifrons	little tern		116.8064	-20.4931	2014
Sternula nereis nereis	Sternula	nereis	fairy tern		116.432	-20.6537	1991
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8044	-20.3856	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8044	-20.3856	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.866	-20.383	1918
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5	-20.5	1974
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8056	-20.3858	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.4313	-20.6537	1991
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8317	-20.3889	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5381	-20.4778	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.675	-20.5178	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6737	-20.4485	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6732	-20.4512	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5079	-20.4995	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6149	-20.5694	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6283	-20.4564	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.654	-20.5059	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.4444	-20.6572	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5381	-20.4778	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5929	-20.5894	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5389	-20.5356	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5079	-20.4995	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5671	-20.4849	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5671	-20.4849	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6149	-20.5694	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5936	-20.4817	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6737	-20.4485	1979
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6149	-20.5694	1984
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8064	-20.4931	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8597	-20.4044	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8494	-20.4843	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.4444	-20.6572	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5194	-20.6069	1990

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE	
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5389	-20.5356	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5381	-20.4778	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6283	-20.4564	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.675	-20.5178	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5079	-20.4995	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6343	-20.5843	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.432	-20.6537	1991
Sternula nereis nereis	Sternula	nereis	fairy tern		116.654	-20.5059	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8317	-20.3889	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8056	-20.3858	1983
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6737	-20.4485	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8597	-20.4044	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.4313	-20.6537	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5936	-20.4817	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.6149	-20.5694	1990
Sternula nereis nereis	Sternula	nereis	fairy tern		116.654	-20.5059	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8317	-20.3889	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.5936	-20.4817	2004
Sternula nereis nereis	Sternula	nereis	fairy tern		116.4444	-20.6572	1918
Sternula nereis nereis	Sternula	nereis	fairy tern		116.8056	-20.3858	0
Sternula nereis nereis	Sternula	nereis	fairy tern		116.4313	-20.6537	0
Sula leucogaster	Sula	leucogaster	brown booby		116.8056	-20.3858	0
Sula leucogaster	Sula	leucogaster	brown booby		116.6737	-20.4485	1979
Sula leucogaster	Sula	leucogaster	brown booby		116.6732	-20.4512	1979
Sula leucogaster	Sula	leucogaster	brown booby		116.7273	-20.533	1983
Sula leucogaster	Sula	leucogaster	brown booby		116.6861	-20.5284	1983
Sula leucogaster	Sula	leucogaster	brown booby		116.6641	-20.5354	1983
Sula leucogaster	Sula	leucogaster	brown booby		116.6799	-20.617	1983
Sula leucogaster	Sula	leucogaster	brown booby		116.6737	-20.4485	1979
Sula leucogaster	Sula	leucogaster	brown booby		116.6737	-20.4485	1979
Sula leucogaster	Sula	leucogaster	brown booby		116.6737	-20.4485	1980
Sula leucogaster	Sula	leucogaster	brown booby		116.8075	-20.3877	1984
Sula leucogaster	Sula	leucogaster	brown booby		116.7454	-20.4188	1984
Sula leucogaster	Sula	leucogaster	brown booby		116.6737	-20.4485	0
Sula leucogaster	Sula	leucogaster	brown booby		116.7513	-20.4153	1980
Sula leucogaster	Sula	leucogaster	brown booby		116.7513	-20.582	1980
Sula leucogaster	Sula	leucogaster	brown booby		116.7513	-20.582	1980
Sula leucogaster	Sula	leucogaster	brown booby		116.7513	-20.4153	1981
Sula leucogaster	Sula	leucogaster	brown booby		116.5847	-20.4153	1978
Sula leucogaster	Sula	leucogaster	brown booby		116.5847	-20.4153	1979
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5758	-20.6397	2000
Thalasseus bergii	Thalasseus	bergii	crested tern		116.8202	-20.5862	1999
Thalasseus bergii	Thalasseus	bergii	crested tern		116.8124	-20.5903	1999
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5822	-20.4745	1999
Thalasseus bergii	Thalasseus	bergii	crested tern		116.6675	-20.5203	2002
Thalasseus bergii	Thalasseus	bergii	crested tern		116.6675	-20.5203	2002
Thalasseus bergii	Thalasseus	bergii	crested tern		116.8347	-20.6653	2002
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7922	-20.5826	1999
Thalasseus bergii	Thalasseus	bergii	crested tern		116.8105	-20.6059	1999
Thalasseus bergii	Thalasseus	bergii	crested tern		116.8105	-20.6059	1999
Thalasseus bergii	Thalasseus	bergii	crested tern		116.8513	-20.4487	2005
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5847	-20.5833	2010
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7047	-20.6662	2010
Thalasseus bergii	Thalasseus	bergii	crested tern		116.6283	-20.4603	2011
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7983	-20.6339	2011
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7972	-20.6331	1999
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5013	-20.4987	1981
Thalasseus bergii	Thalasseus	bergii	crested tern		116.918	-20.4153	1980
Thalasseus bergii	Thalasseus	bergii	crested tern		116.8347	-20.4153	1980
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7513	-20.582	1980
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5847	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7513	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7513	-20.4153	1981
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5847	-20.4153	1981
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7513	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern		116.7513	-20.582	1981
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5847	-20.4153	1979
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5847	-20.582	1979
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5847	-20.4153	1979
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5847	-20.582	1979
Thalasseus bergii	Thalasseus	bergii	crested tern		116.5013	-20.4987	1980
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5	-20.5	1977
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5	-20.5	1966
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5	-20.5	1974
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5	-20.5	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.58	-20.58	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6583	-20.525	1999
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6667	-20.5194	2000
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8056	-20.3858	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6592	-20.6094	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6283	-20.4564	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.675	-20.5178	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6343	-20.5843	0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.7768	-20.5405	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5194	-20.6069	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5417	-20.5368	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.654	-20.5059	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8494	-20.4843	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5194	-20.6069	1983
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5194	-20.6069	1984

NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5194	-20.6069 1984
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8056	-20.3858 1984
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8056	-20.3858 1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.7768	-20.5405 1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8494	-20.4843 1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5194	-20.6069 1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.5389	-20.5356 1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8806	-20.3881 1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.675	-20.5178 1990
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6583	-20.525 1999
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6667	-20.5194 2000
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8494	-20.4843 1978
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8064	-20.4931 2014
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.654	-20.5059 0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.6283	-20.4564 0
Tringa brevipes	Tringa	brevipes	grey-tailed tattler		116.8806	-20.3881 1998
Tringa glareola	Tringa	glareola	wood sandpiper		116.5	-20.5 1977
Tringa glareola	Tringa	glareola	wood sandpiper		116.5	-20.5 1977
Tringa glareola	Tringa	glareola	wood sandpiper		116.5013	-20.4987 1977
Tringa glareola	Tringa	glareola	wood sandpiper		116.5013	-20.4987 1977
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1980
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1966
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1978
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1977
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1980
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1983
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5	-20.5 1977
Tringa nebularia	Tringa	nebularia	common greenshank,		116.58	-20.58 0
Tringa nebularia	Tringa	nebularia	common greenshank,		116.85	-20.45 2005
Tringa nebularia	Tringa	nebularia	common greenshank,		116.6225	-20.4697 0
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5194	-20.6069 1983
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5194	-20.6069 1990
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5936	-20.4817 1990
Tringa nebularia	Tringa	nebularia	common greenshank,		116.6343	-20.5843 1990
Tringa nebularia	Tringa	nebularia	common greenshank,		116.8494	-20.4843 1978
Tringa nebularia	Tringa	nebularia	common greenshank,		116.6225	-20.4697 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.8806	-20.3881 1998
Tringa nebularia	Tringa	nebularia	common greenshank,		116.8347	-20.6653 2002
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7597	-20.6403 1999
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7819	-20.5903 1999
Tringa nebularia	Tringa	nebularia	common greenshank,		116.8513	-20.4487 2005
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7047	-20.6662 2010
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5013	-20.4987 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5847	-20.582 1980
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5847	-20.4153 1980
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1980
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.4153 1980
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5847	-20.4153 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5847	-20.582 1981
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5013	-20.4987 1978
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5013	-20.4987 1977
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5013	-20.4987 1978
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1979
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5013	-20.4987 1977
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5013	-20.4987 1979
Tringa nebularia	Tringa	nebularia	common greenshank,		116.7513	-20.582 1979
Tringa nebularia	Tringa	nebularia	common greenshank,		116.5013	-20.4987 1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl		116.5	-20.5 1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl		116.5	-20.5 1977
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl		116.5	-20.5 1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl		116.5	-20.5 1966
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl		116.5013	-20.4987 1980
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl		116.5013	-20.4987 1977
Tringa stagnatilis	Tringa	stagnatilis	marsh sandpiper, littl		116.5013	-20.4987 1979
Xenus cinereus	Xenus	cinereus	Terek sandpiper		116.5	-20.5 1977
Xenus cinereus	Xenus	cinereus	Terek sandpiper		116.5	-20.5 1981
Xenus cinereus	Xenus	cinereus	Terek sandpiper		116.8268	-20.4836 2015
Xenus cinereus	Xenus	cinereus	Terek sandpiper		116.8215	-20.5195 2015
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.5381	-20.4778 1983
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.4593	-20.631 1983
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.4814	-20.6461 2000
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.5013	-20.4987 1978
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.5013	-20.4987 1977
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.7513	-20.582 1978
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.7513	-20.582 1979
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.5013	-20.4987 1977
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.7513	-20.582 1979
Chlidonias leucopterus	Chlidonias	leucopterus	white-winged black te		116.5013	-20.4987 1980
Gelochelidon nilotica	Gelochelidon	nilotica	gull-billed tern		116.8494	-20.4843 1990
Gelochelidon nilotica	Gelochelidon	nilotica	gull-billed tern		116.5194	-20.6069 1990
Gelochelidon nilotica	Gelochelidon	nilotica	gull-billed tern		116.5	-20.5 1980
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern		116.6225	-20.4697 0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern		116.6247	-20.6665 1988
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern		116.5381	-20.4778 0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern		116.6732	-20.4512 0
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern		116.5936	-20.4817 1981
Onychoprion anaethetus	Onychoprion	anaethetus	bridled tern		116.6169	-20.4441 1991







NAME_SCI	GENUS	SPECIES	NAME_COM	GDA_LONG	GDA_LAT	DATE
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5389	-20.5356 1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5381	-20.4778 1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.6283	-20.4564 1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.8806	-20.3881 1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.675	-20.5178 1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5079	-20.4995 1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.7768	-20.5405 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.654	-20.5059 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.6225	-20.4697 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.6796	-20.5419 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.6283	-20.4564 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.4444	-20.6572 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.675	-20.5178 1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5389	-20.5356 1984
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.8806	-20.3881 1990
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.6169	-20.4441 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.8056	-20.3858 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.7768	-20.5405 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.4444	-20.6572 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5479	-20.5379 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.6225	-20.4697 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5327	-20.5428 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5389	-20.5356 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.5381	-20.4778 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.6283	-20.4564 0
Puffinus pacificus	Puffinus	pacificus	wedge-tailed shearw:		116.675	-20.5178 0

**APPENDIX C: PROTECTED MATTERS SEARCH TOOL EPBC DATABASE RECORDS (100 KM & 5 KM BUFFERS)**





# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

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

Report created: 13/11/18 16:13:09

[Summary](#)

[Details](#)

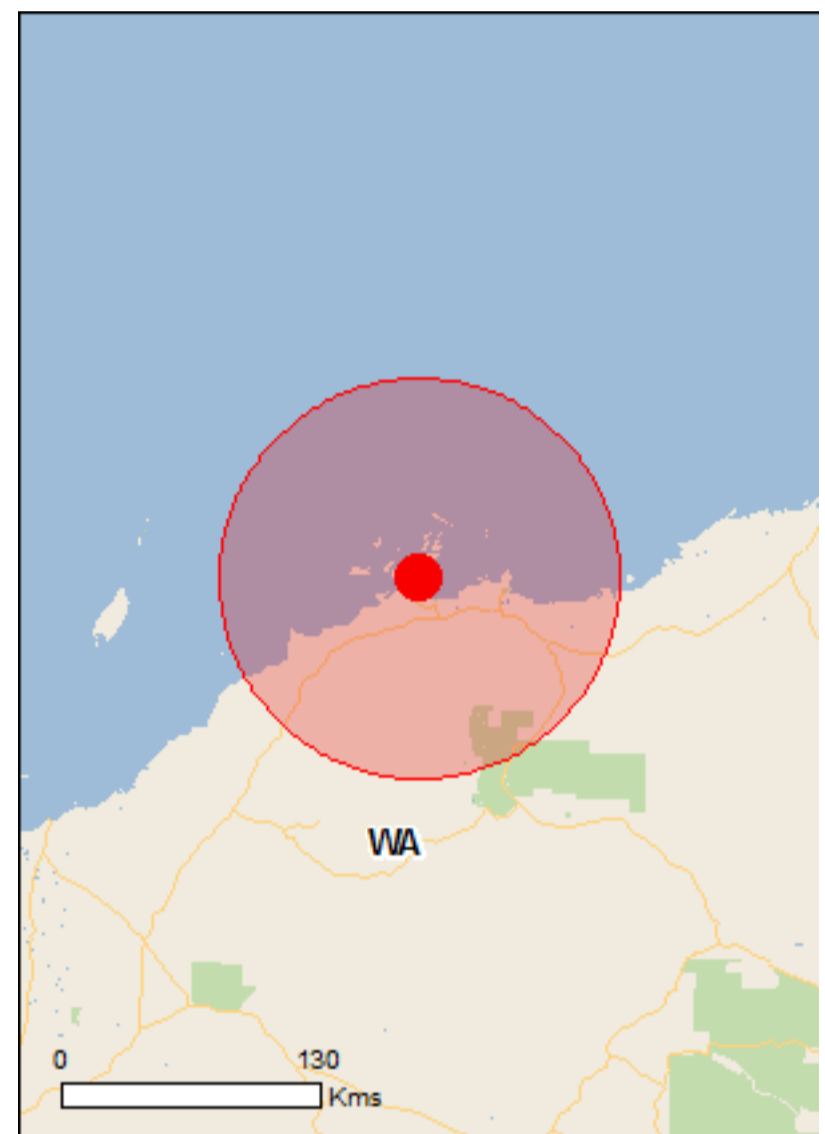
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

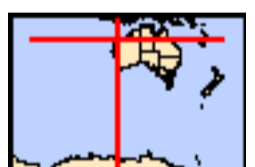
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

[Buffer: 100.0Km](#)



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	1
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	1
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	35
<a href="#">Listed Migratory Species:</a>	66

## Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	2
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	113
<a href="#">Whales and Other Cetaceans:</a>	16
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	4

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">State and Territory Reserves:</a>	9
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	19
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	1

# Details

## Matters of National Environmental Significance

National Heritage Properties		<a href="#">[ Resource Information ]</a>
Name	State	Status
<b>Indigenous</b>		
<a href="#">Dampier Archipelago (including Burrup Peninsula)</a>	WA	Listed place

## Commonwealth Marine Area [\[ Resource Information \]](#)

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside the Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area. Generally the Commonwealth Marine Area stretches from three nautical miles to two hundred nautical miles from the coast.

Name
EEZ and Territorial Sea

## Marine Regions [\[ Resource Information \]](#)

If you are planning to undertake action in an area in or close to the Commonwealth Marine Area, and a marine bioregional plan has been prepared for the Commonwealth Marine Area in that area, the marine bioregional plan may inform your decision as to whether to refer your proposed action under the EPBC Act.

Name
<a href="#">North-west</a>

## Listed Threatened Species [\[ Resource Information \]](#)

Name	Status	Type of Presence
<b>Birds</b>		
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
<a href="#">Limosa lapponica baueri</a> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Limosa lapponica menzbieri</a> Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Name	Status	Type of Presence
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Species or species habitat may occur within area
<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
<b>Mammals</b>		
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
<a href="#">Dasyurus hallucatus</a> Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Species or species habitat may occur within area
<a href="#">Macroderma gigas</a> Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Macrotis lagotis</a> Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhinonictis aurantia (Pilbara form)</a> Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat likely to occur within area
<b>Reptiles</b>		
<a href="#">Aipysurus apraefrontalis</a> Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Ctenotus angusticeps</a> Northwestern Coastal Ctenotus, Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area



Name	Status	Type of Presence
<a href="#">Lerista neviniae</a> Nevin's Slider [85296]	Endangered	Species or species habitat known to occur within area
<a href="#">Liasis olivaceus barroni</a> Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<b>Sharks</b>		
<a href="#">Carcharias taurus (west coast population)</a> Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

### Listed Migratory Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardenna pacifica</a> Wedge-tailed Shearwater [84292]		Breeding known to occur within area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat likely to occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
<a href="#">Hydroprogne caspia</a> Caspian Tern [808]		Breeding known to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Onychoprion anaethetus</a> Bridled Tern [82845]		Breeding known to occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Breeding likely to occur

Name	Threatened	Type of Presence within area
<b>Migratory Marine Species</b>		
<a href="#">Anoxypristis cuspidata</a> Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
<a href="#">Balaena glacialis australis</a> Southern Right Whale [75529]	Endangered*	Species or species habitat may occur within area
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
<a href="#">Isurus oxyrinchus</a> Shortfin Mako, Mako Shark [79073]		Species or species habitat likely to occur within area
<a href="#">Isurus paucus</a> Longfin Mako [82947]		Species or species habitat likely to occur within area
<a href="#">Manta alfredi</a> Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
<a href="#">Sousa chinensis</a> Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Species or species habitat known to occur within area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Species or species habitat known to occur

Name	Threatened	Type of Presence within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat known to occur within area
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Phalaropus lobatus</a> Red-necked Phalarope [838]		Species or species habitat known to occur within area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Species or species habitat known to occur within area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]		Species or species habitat known to occur within area
<a href="#">Thalasseus bergii</a> Crested Tern [83000]		Breeding known to occur within area
<a href="#">Tringa brevipes</a> Grey-tailed Tattler [851]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
<a href="#">Tringa totanus</a> Common Redshank, Redshank [835]		Species or species habitat known to occur within area
<a href="#">Xenus cinereus</a> Terek Sandpiper [59300]		Species or species



Name	Threatened	Type of Presence
		habitat known to occur within area

## Other Matters Protected by the EPBC Act

### Commonwealth Land [\[ Resource Information \]](#)

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

Name
Commonwealth Land - Defence - KARRATHA TRAINING DEPOT

### Listed Marine Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
<a href="#">Arenaria interpres</a> Ruddy Turnstone [872]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
<a href="#">Calidris alba</a> Sanderling [875]		Species or species habitat known to occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species

Name	Threatened	Type of Presence
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	habitat known to occur within area Species or species habitat known to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<a href="#">Calidris ruficollis</a> Red-necked Stint [860]		Species or species habitat known to occur within area
<a href="#">Calidris subminuta</a> Long-toed Stint [861]		Species or species habitat known to occur within area
<a href="#">Calidris tenuirostris</a> Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat likely to occur within area
<a href="#">Charadrius leschenaultii</a> Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Charadrius mongolus</a> Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
<a href="#">Charadrius ruficapillus</a> Red-capped Plover [881]		Species or species habitat known to occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat known to occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
<a href="#">Fregata minor</a> Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat known to occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Breeding known to occur within area
<a href="#">Heteroscelus brevipes</a> Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
<a href="#">Himantopus himantopus</a> Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Larus novaehollandiae</a> Silver Gull [810]		Breeding known to occur within area
<a href="#">Limicola falcinellus</a> Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Limosa limosa</a> Black-tailed Godwit [845]		Species or species habitat known to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Numenius phaeopus</a> Whimbrel [849]		Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Breeding known to occur within area
<a href="#">Phalaropus lobatus</a> Red-necked Phalarope [838]		Species or species habitat known to occur within area
<a href="#">Pluvialis fulva</a> Pacific Golden Plover [25545]		Species or species habitat known to occur within area
<a href="#">Pluvialis squatarola</a> Grey Plover [865]		Species or species habitat known to occur within area
<a href="#">Puffinus pacificus</a> Wedge-tailed Shearwater [1027]		Breeding known to occur within area
<a href="#">Recurvirostra novaehollandiae</a> Red-necked Avocet [871]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Sterna anaethetus</a> Bridled Tern [814]		Breeding known to occur within area
<a href="#">Sterna bergii</a> Crested Tern [816]		Breeding known to occur within area
<a href="#">Sterna caspia</a> Caspian Tern [59467]		Breeding known to occur

Name	Threatened	Type of Presence
<a href="#">Sterna dougallii</a> Roseate Tern [817]		within area  Breeding likely to occur within area
<a href="#">Sterna fuscata</a> Sooty Tern [794]		Breeding known to occur within area
<a href="#">Sterna nereis</a> Fairy Tern [796]		Breeding known to occur within area
<a href="#">Stiltia isabella</a> Australian Pratincole [818]		Species or species habitat known to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
<a href="#">Tringa stagnatilis</a> Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
<a href="#">Tringa totanus</a> Common Redshank, Redshank [835]		Species or species habitat known to occur within area
<a href="#">Xenus cinereus</a> Terek Sandpiper [59300]		Species or species habitat known to occur within area
<b>Fish</b>		
<a href="#">Acentronura larsonae</a> Helen's Pygmy Pipehorse [66186]		Species or species habitat may occur within area
<a href="#">Bulbonaricus brauni</a> Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
<a href="#">Campichthys tricarinatus</a> Three-keel Pipefish [66192]		Species or species habitat may occur within area
<a href="#">Choeroichthys brachysoma</a> Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
<a href="#">Choeroichthys latispinosus</a> Muiron Island Pipefish [66196]		Species or species habitat may occur within area
<a href="#">Choeroichthys suillus</a> Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
<a href="#">Corythoichthys flavofasciatus</a> Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
<a href="#">Cosmocampus banneri</a> Roughridge Pipefish [66206]		Species or species habitat may occur within area
<a href="#">Doryrhamphus dactyliophorus</a> Banded Pipefish, Ringed Pipefish [66210]		Species or species habitat may occur within area
<a href="#">Doryrhamphus excisus</a> Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
<a href="#">Doryrhamphus janssi</a> Cleaner Pipefish, Janss' Pipefish [66212]		Species or species

Name	Threatened	Type of Presence
<a href="#">Doryrhamphus multiannulatus</a> Many-banded Pipefish [66717]		habitat may occur within area  Species or species habitat may occur within area
<a href="#">Doryrhamphus negrosensis</a> Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
<a href="#">Festucalex scalaris</a> Ladder Pipefish [66216]		Species or species habitat may occur within area
<a href="#">Filicampus tigris</a> Tiger Pipefish [66217]		Species or species habitat may occur within area
<a href="#">Halicampus brocki</a> Brock's Pipefish [66219]		Species or species habitat may occur within area
<a href="#">Halicampus grayi</a> Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
<a href="#">Halicampus nitidus</a> Glittering Pipefish [66224]		Species or species habitat may occur within area
<a href="#">Halicampus spinirostris</a> Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
<a href="#">Haliichthys taeniophorus</a> Ribbioned Pipehorse, Ribbioned Seadragon [66226]		Species or species habitat may occur within area
<a href="#">Hippichthys penicillus</a> Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
<a href="#">Hippocampus angustus</a> Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
<a href="#">Hippocampus histrix</a> Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
<a href="#">Hippocampus kuda</a> Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
<a href="#">Hippocampus planifrons</a> Flat-face Seahorse [66238]		Species or species habitat may occur within area
<a href="#">Hippocampus spinosissimus</a> Hedgehog Seahorse [66239]		Species or species habitat may occur within area
<a href="#">Hippocampus trimaculatus</a> Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
<a href="#">Micrognathus micronotopterus</a> Tidepool Pipefish [66255]		Species or species habitat may occur within area
<a href="#">Phoxocampus belcheri</a> Black Rock Pipefish [66719]		Species or species habitat may occur within



Name	Threatened	Type of Presence area
<a href="#">Solegnathus hardwickii</a> Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
<a href="#">Solegnathus lettiensis</a> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
<a href="#">Solenostomus cyanopterus</a> Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
<a href="#">Trachyrhamphus bicoarctatus</a> Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
<a href="#">Trachyrhamphus longirostris</a> Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area
<b>Reptiles</b>		
<a href="#">Acalyptophis peronii</a> Horned Seasnake [1114]		Species or species habitat may occur within area
<a href="#">Aipysurus apraefrontalis</a> Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Aipysurus duboisii</a> Dubois' Seasnake [1116]		Species or species habitat may occur within area
<a href="#">Aipysurus eydouxii</a> Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
<a href="#">Aipysurus laevis</a> Olive Seasnake [1120]		Species or species habitat may occur within area
<a href="#">Aipysurus tenuis</a> Brown-lined Seasnake [1121]		Species or species habitat may occur within area
<a href="#">Astrotia stokesii</a> Stokes' Seasnake [1122]		Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Disteira kingii</a> Spectacled Seasnake [1123]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Disteira major</a> Olive-headed Seasnake [1124]		Species or species habitat may occur within area
<a href="#">Emydocephalus annulatus</a> Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
<a href="#">Ephalophis greyi</a> North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
<a href="#">Hydrelaps darwiniensis</a> Black-ringed Seasnake [1100]		Species or species habitat may occur within area
<a href="#">Hydrophis czeb lukovi</a> Fine-spined Seasnake [59233]		Species or species habitat may occur within area
<a href="#">Hydrophis elegans</a> Elegant Seasnake [1104]		Species or species habitat may occur within area
<a href="#">Hydrophis mcdowellii</a> null [25926]		Species or species habitat may occur within area
<a href="#">Hydrophis ornatus</a> Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<a href="#">Pelamis platurus</a> Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

## Whales and other Cetaceans

[ [Resource Information](#) ]

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within area
<a href="#">Balaenoptera borealis</a> Sei Whale [34]	Vulnerable	Species or species habitat may occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Balaenoptera physalus</a> Fin Whale [37]	Vulnerable	Species or species habitat may occur within area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Eubalaena australis</a> Southern Right Whale [40]	Endangered	Species or species habitat may occur within

Name	Status	Type of Presence area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area
<a href="#">Pseudorca crassidens</a> False Killer Whale [48]		Species or species habitat likely to occur within area
<a href="#">Sousa chinensis</a> Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
<a href="#">Stenella attenuata</a> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

## Australian Marine Parks [ Resource Information ]

Name	Label
Dampier	Habitat Protection Zone (IUCN IV)
Dampier	Multiple Use Zone (IUCN VI)
Dampier	National Park Zone (IUCN II)
Montebello	Multiple Use Zone (IUCN VI)

## Extra Information

### State and Territory Reserves [ Resource Information ]

Name	State
Millstream Chichester	WA
Murujuga	WA
Unnamed WA36907	WA
Unnamed WA36909	WA
Unnamed WA36910	WA
Unnamed WA36913	WA
Unnamed WA36915	WA
Unnamed WA38287	WA
Unnamed WA40877	WA

## Invasive Species

[ [Resource Information](#) ]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
<b>Birds</b>		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
<b>Plants</b>		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
<b>Reptiles</b>		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]		Species or species habitat known to occur within area

### Key Ecological Features (Marine)

[\[ Resource Information \]](#)

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region
<a href="#">Glomar Shoals</a>	North-west



# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-20.62919 116.77412

# Acknowledgements

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

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

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

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



# EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

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

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

Report created: 20/11/18 13:00:48

[Summary](#)

[Details](#)

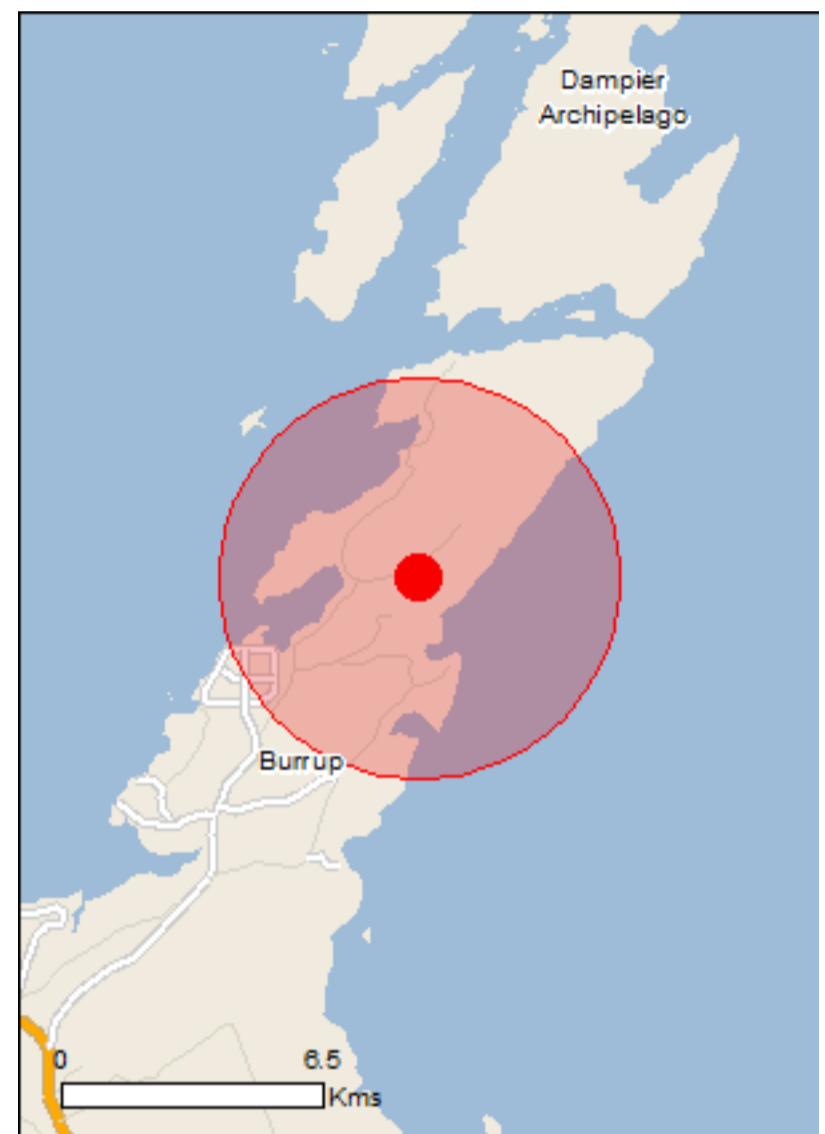
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

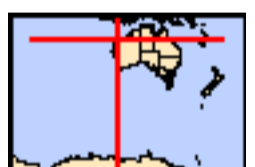
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

[Buffer: 5.0Km](#)



# Summary

## Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

<a href="#">World Heritage Properties:</a>	None
<a href="#">National Heritage Places:</a>	1
<a href="#">Wetlands of International Importance:</a>	None
<a href="#">Great Barrier Reef Marine Park:</a>	None
<a href="#">Commonwealth Marine Area:</a>	None
<a href="#">Listed Threatened Ecological Communities:</a>	None
<a href="#">Listed Threatened Species:</a>	28
<a href="#">Listed Migratory Species:</a>	39

## Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

<a href="#">Commonwealth Land:</a>	None
<a href="#">Commonwealth Heritage Places:</a>	None
<a href="#">Listed Marine Species:</a>	75
<a href="#">Whales and Other Cetaceans:</a>	12
<a href="#">Critical Habitats:</a>	None
<a href="#">Commonwealth Reserves Terrestrial:</a>	None
<a href="#">Australian Marine Parks:</a>	None

## Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

<a href="#">State and Territory Reserves:</a>	1
<a href="#">Regional Forest Agreements:</a>	None
<a href="#">Invasive Species:</a>	16
<a href="#">Nationally Important Wetlands:</a>	None
<a href="#">Key Ecological Features (Marine)</a>	None

# Details

## Matters of National Environmental Significance

National Heritage Properties		[ Resource Information ]
Name	State	Status
Indigenous		
<a href="#">Dampier Archipelago (including Burrup Peninsula)</a>	WA	Listed place

Listed Threatened Species		[ Resource Information ]
Name	Status	Type of Presence

### Birds

<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
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<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
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<a href="#">Limosa lapponica baueri</a> Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
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<a href="#">Limosa lapponica menzbieri</a> Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
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<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
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<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
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<a href="#">Pezoporus occidentalis</a> Night Parrot [59350]	Endangered	Species or species habitat may occur within area
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<a href="#">Rostratula australis</a> Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
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<a href="#">Sternula nereis nereis</a> Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area
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### Mammals

<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
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<a href="#">Dasyurus hallucatus</a> Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
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<a href="#">Macroderma gigas</a> Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur
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Name	Status	Type of Presence within area
<a href="#">Macrotis lagotis</a> Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Rhinonictoris aurantia (Pilbara form)</a> Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
<b>Reptiles</b>		
<a href="#">Aipysurus apraefrontalis</a> Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Ctenotus angusticeps</a> Northwestern Coastal Ctenotus, Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat may occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
<a href="#">Liasis olivaceus barroni</a> Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<b>Sharks</b>		
<a href="#">Carcharias taurus (west coast population)</a> Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
<b>Listed Migratory Species</b>		<b>[ Resource Information ]</b>
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
<b>Migratory Marine Birds</b>		
<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat may occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<b>Migratory Marine Species</b>		
<a href="#">Anoxypristis cuspidata</a> Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Carcharodon carcharias</a> White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
<a href="#">Manta alfredi</a> Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat known to occur within area
<a href="#">Manta birostris</a> Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat likely to occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Pristis clavata</a> Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Pristis zijsron</a> Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area
<a href="#">Rhincodon typus</a> Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
<a href="#">Sousa chinensis</a> Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
<b>Migratory Terrestrial Species</b>		
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<b>Migratory Wetlands Species</b>		
<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat may occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

## Other Matters Protected by the EPBC Act

### Listed Marine Species [\[ Resource Information \]](#)

\* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
<b>Birds</b>		

<a href="#">Actitis hypoleucos</a> Common Sandpiper [59309]		Species or species habitat known to occur within area
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<a href="#">Anous stolidus</a> Common Noddy [825]		Species or species habitat may occur within area
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<a href="#">Apus pacificus</a> Fork-tailed Swift [678]		Species or species habitat likely to occur within area
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<a href="#">Ardea alba</a> Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
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<a href="#">Ardea ibis</a> Cattle Egret [59542]		Species or species habitat may occur within area
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<a href="#">Calidris acuminata</a> Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
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<a href="#">Calidris canutus</a> Red Knot, Knot [855]	Endangered	Species or species habitat likely to occur within area
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<a href="#">Calidris ferruginea</a> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
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<a href="#">Calidris melanotos</a> Pectoral Sandpiper [858]		Species or species habitat may occur within area
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<a href="#">Calonectris leucomelas</a> Streaked Shearwater [1077]		Species or species habitat may occur within area
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Name	Threatened	Type of Presence
<a href="#">Charadrius veredus</a> Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
<a href="#">Chrysococcyx osculans</a> Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
<a href="#">Fregata ariel</a> Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
<a href="#">Glareola maldivarum</a> Oriental Pratincole [840]		Species or species habitat may occur within area
<a href="#">Haliaeetus leucogaster</a> White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
<a href="#">Hirundo rustica</a> Barn Swallow [662]		Species or species habitat may occur within area
<a href="#">Limosa lapponica</a> Bar-tailed Godwit [844]		Species or species habitat known to occur within area
<a href="#">Macronectes giganteus</a> Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
<a href="#">Merops ornatus</a> Rainbow Bee-eater [670]		Species or species habitat may occur within area
<a href="#">Motacilla cinerea</a> Grey Wagtail [642]		Species or species habitat may occur within area
<a href="#">Motacilla flava</a> Yellow Wagtail [644]		Species or species habitat may occur within area
<a href="#">Numenius madagascariensis</a> Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
<a href="#">Pandion haliaetus</a> Osprey [952]		Species or species habitat known to occur within area
<a href="#">Rostratula benghalensis (sensu lato)</a> Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
<a href="#">Sterna dougallii</a> Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
<a href="#">Tringa nebularia</a> Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
<b>Fish</b>		
<a href="#">Bulbonaricus brauni</a> Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
<a href="#">Campichthys tricarinatus</a> Three-keel Pipefish [66192]		Species or species habitat may occur within area



Name	Threatened	Type of Presence
<a href="#">Choeroichthys brachysoma</a> Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
<a href="#">Choeroichthys suillus</a> Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
<a href="#">Doryrhamphus janssi</a> Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
<a href="#">Doryrhamphus negrosensis</a> Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
<a href="#">Festucalex scalaris</a> Ladder Pipefish [66216]		Species or species habitat may occur within area
<a href="#">Filicampus tigris</a> Tiger Pipefish [66217]		Species or species habitat may occur within area
<a href="#">Halicampus brocki</a> Brock's Pipefish [66219]		Species or species habitat may occur within area
<a href="#">Halicampus grayi</a> Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
<a href="#">Halicampus nitidus</a> Glittering Pipefish [66224]		Species or species habitat may occur within area
<a href="#">Halicampus spinirostris</a> Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
<a href="#">Haliichthys taeniophorus</a> Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
<a href="#">Hippichthys penicillus</a> Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
<a href="#">Hippocampus angustus</a> Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
<a href="#">Hippocampus histrix</a> Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
<a href="#">Hippocampus kuda</a> Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
<a href="#">Hippocampus planifrons</a> Flat-face Seahorse [66238]		Species or species habitat may occur within area
<a href="#">Hippocampus trimaculatus</a> Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
<a href="#">Micrognathus micronotopterus</a> Tidepool Pipefish [66255]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Solegnathus hardwickii</a> Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
<a href="#">Solegnathus lettiensis</a> Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
<a href="#">Solenostomus cyanopterus</a> Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
<a href="#">Syngnathoides biaculeatus</a> Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
<a href="#">Trachyrhamphus bicoarctatus</a> Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
<a href="#">Trachyrhamphus longirostris</a> Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
<b>Mammals</b>		
<a href="#">Dugong dugon</a> Dugong [28]		Species or species habitat known to occur within area
<b>Reptiles</b>		
<a href="#">Acalyptophis peronii</a> Horned Seasnake [1114]		Species or species habitat may occur within area
<a href="#">Aipysurus apraefrontalis</a> Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
<a href="#">Aipysurus duboisii</a> Dubois' Seasnake [1116]		Species or species habitat may occur within area
<a href="#">Aipysurus eydouxii</a> Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
<a href="#">Aipysurus laevis</a> Olive Seasnake [1120]		Species or species habitat may occur within area
<a href="#">Aipysurus tenuis</a> Brown-lined Seasnake [1121]		Species or species habitat may occur within area
<a href="#">Astrotia stokesii</a> Stokes' Seasnake [1122]		Species or species habitat may occur within area
<a href="#">Caretta caretta</a> Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
<a href="#">Chelonia mydas</a> Green Turtle [1765]	Vulnerable	Breeding known to occur within area
<a href="#">Dermochelys coriacea</a> Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
<a href="#">Disteira kingii</a> Spectacled Seasnake [1123]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
<a href="#">Disteira major</a> Olive-headed Seasnake [1124]		Species or species habitat may occur within area
<a href="#">Emydocephalus annulatus</a> Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
<a href="#">Ephalophis greyi</a> North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
<a href="#">Eretmochelys imbricata</a> Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
<a href="#">Hydrelaps darwiniensis</a> Black-ringed Seasnake [1100]		Species or species habitat may occur within area
<a href="#">Hydrophis czeb lukovi</a> Fine-spined Seasnake [59233]		Species or species habitat may occur within area
<a href="#">Hydrophis elegans</a> Elegant Seasnake [1104]		Species or species habitat may occur within area
<a href="#">Hydrophis mcdowellii</a> null [25926]		Species or species habitat may occur within area
<a href="#">Hydrophis ornatus</a> Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
<a href="#">Natator depressus</a> Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
<a href="#">Pelamis platurus</a> Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

## Whales and other Cetaceans

[ [Resource Information](#) ]

Name	Status	Type of Presence
<b>Mammals</b>		
<a href="#">Balaenoptera acutorostrata</a> Minke Whale [33]		Species or species habitat may occur within area
<a href="#">Balaenoptera edeni</a> Bryde's Whale [35]		Species or species habitat may occur within area
<a href="#">Balaenoptera musculus</a> Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
<a href="#">Delphinus delphis</a> Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
<a href="#">Grampus griseus</a> Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
<a href="#">Megaptera novaeangliae</a> Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
<a href="#">Orcinus orca</a> Killer Whale, Orca [46]		Species or species habitat may occur within

Name	Status	Type of Presence area
<a href="#">Sousa chinensis</a> Indo-Pacific Humpback Dolphin [50]		Species or species habitat likely to occur within area
<a href="#">Stenella attenuata</a> Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
<a href="#">Tursiops aduncus</a> Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
<a href="#">Tursiops aduncus (Arafura/Timor Sea populations)</a> Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat likely to occur within area
<a href="#">Tursiops truncatus s. str.</a> Bottlenose Dolphin [68417]		Species or species habitat may occur within area

## Extra Information

State and Territory Reserves	[ Resource Information ]
Name	State
Murujuga	WA

Invasive Species	[ Resource Information ]
Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.	

Name	Status	Type of Presence
<b>Birds</b>		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
<b>Mammals</b>		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
<p>Oryctolagus cuniculus Rabbit, European Rabbit [128]</p>		Species or species habitat likely to occur within area
<p>Rattus rattus Black Rat, Ship Rat [84]</p>		Species or species habitat likely to occur within area
<p>Vulpes vulpes Red Fox, Fox [18]</p>		Species or species habitat likely to occur within area
<b>Plants</b>		
<p>Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]</p>		Species or species habitat likely to occur within area
<p>Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]</p>		Species or species habitat likely to occur within area
<p>Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]</p>		Species or species habitat likely to occur within area
<p>Prosopis spp. Mesquite, Algaroba [68407]</p>		Species or species habitat likely to occur within area
<b>Reptiles</b>		
<p>Hemidactylus frenatus Asian House Gecko [1708]</p>		Species or species habitat likely to occur within area
<p>Ramphotyphlops braminus Flowerpot Blind Snake, Brahminy Blind Snake, Cacing Besi [1258]</p>		Species or species habitat likely to occur within area



# Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

# Coordinates

-20.57361 116.815

# Acknowledgements

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

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

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

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

**APPENDIX D: DEPARTMENT OF BIODIVERSITY CONSERVATION AND ATTRACTIONS DATABASE SEARCH RESULTS FOR THREATENED AND PRIORITY FLORA, ECOLOGICAL COMMUNITIES AND FAUNA**

Taxon	Cons_Cod Locality	Latitude	Longitude	Date
Abutilon sp. Pritzellanum (S. van Leeuwen 5095)	1 1 km S of Onslow	-21.68333333	115.1333333	3/08/1963
Abutilon sp. Pritzellanum (S. van Leeuwen 5095)	1 Rear Roebourne Oval	-20.66666667	117.15	/08/1962
Atriplex lindleyi subsp. conduplicata	3 Ca 10 km WNW from Karratha Homestead, on main road reserve of Coastal Highway adjacent to circular regeneration pond Karratha Station	-20.85055556	116.5519444	7/11/1996
Carporobrotus sp. Thevenard Island (M. White 050)	3 Thevenard Island between Saladin 4 and jetty area	-21.46319444	115.0196	24/08/1990
Carporobrotus sp. Thevenard Island (M. White 050)	3 Thevenard Island. 500 m from south beach 250 m SW windsock	-21.46666667	115.0166667	23/06/1988
Corchorus congener	3 Barrow Island	-20.88305556	115.3266667	21/11/1965
Corchorus congener	3 Barrow Island	-20.76666667	115.4	/10/1980
Corchorus congener	3 Barrow Island	-20.76666667	115.4	/10/1980
Corchorus congener	3 Barrow Island	-20.88305556	115.3266667	29/04/1964
Corchorus congener	3 Between road and S84 cave on Barrow Island,	-20.76666667	115.4	4/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2 Barrow Island	-20.80198987	115.449625	1/10/2015
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2 Barrow Island	-20.76666667	115.4	/10/1980
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2 75 m E of turnoff to R33 on S side of road on Barrow Island	-20.78333333	115.3333333	5/06/1991
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2 Barrow Island, off the NW coast	-20.88305556	115.3266667	/06/1964
Cucumis sp. Barrow Island (D.W. Goodall 1264)	2 8,300 metres W of Campsite, Barrow Island	-20.88305556	115.3266667	26/06/1964
Eleocharis papillosa	3 Site: 567_BES622. 17.6 SSE of Onslow, 102 km W of Nanutarra Roadhouse and 124 km NW of Barradale Roadhouse	-21.738935	114.979944	14/03/2011
Eragrostis laticaulis	3 Near Point Sampson [Samson]	-20.62972222	117.1897222	/03/1921
Eragrostis laticaulis	3 Near Point Sampson [Samson]	-20.62972222	117.1897222	/03/1921
Eragrostis surreyana	3 Site 8233, Burrup Peninsula 5 km NE of North West Shelf Gasworks, Pilbara Bioregion	-20.566933	116.823335	27/06/2000
Eragrostis surreyana	3 Wetland above waterfall, Burrup Peninsula. (Trudgen & Associates Burrup Vegetation Survey Site B233)	-20.56538889	116.8237778	27/05/2009
Eragrostis surreyana	3 Waterhole above waterfall: Burrup Peninsula	-20.56527778	116.824	27/05/2009
Eriopholia forrestii subsp. viridis	3 Ca 30 km SW of Onslow, Pilbara	-21.77557918	115.059952	19/08/2009
Eriopholia forrestii subsp. viridis	3 10 miles S of Onslow	-21.78277778	115.116667	28/08/1960
Gomphrena cucullata	3 North West Coastal Highway, 35 km S of Karratha	-20.8619	116.58295	11/07/2004
Gomphrena leptophylla	3 North West Coastal Highway, 35 km S of Karratha	-20.8619	116.58295	11/07/2004
Goodenia nuda	4 By side of management track on Mardie Station	-21.10981887	115.995363	31/07/2002
Goodenia pallida	1 127 miles from Onslow on Roebourne road,	-20.83333333	116.5	11/08/1970
Gymnanthera cunninghamii	3 West Lewis Island, Dampier Archipelago	-20.59472222	116.6113889	13/06/1962
Gymnanthera cunninghamii	3 Enderby's Island, Dampier Archipelago	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3 Enderby's Island, Dampier Archipelago	-20.605	116.4833333	/02/1818
Gymnanthera cunninghamii	3 Enderby Island, W end, near Rocky Headland	-20.605	116.4833333	13/05/1982
Gymnanthera cunninghamii	3 Enderby Island, S side, Fortescue Botanical District	-20.6	116.4833333	2/09/1987
Helichrysum oligochaetum	1 Port Walcott	-20.65	117.18	//
Helichrysum oligochaetum	1 Port Walcott, ca 10 km N of Roebourne	-20.65	117.1833333	//
Oidienlandia sp. Hammersley Station (A.A. Mitchell PRP 1479)	3 Site: DRW14, 6.4 km S of White Peak, 8.2 km N of Mt Regal, 8.7 km SSE of Dampier, Karratha Station, Pilbara IBRA	-20.74444	116.74772	21/08/2005
Oidienlandia sp. Hammersley Station (A.A. Mitchell PRP 1479)	3 Site: DRW16, 17.1 km ENE of Yerwararron Hill, 17.5 km WNW of Mt Regal, 18.8 km SW of Dampier, Karratha Station, Pilbara IBRA	-20.80192	116.58086	21/08/2005
Oidienlandia sp. Hammersley Station (A.A. Mitchell PRP 1479)	3 Site: DR13, 5.7 km NE of Mt Regal, 13.4 km SSE of White Peak, 8.1 km SW of Karratha, Pilbara IBRA	-20.79144	116.74644	11/09/2004
Owenia acidula	3 Mardie Station	-21.18333333	115.9833333	//
Owenia acidula	3 Mardie Station	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3 Mardie Station	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3 Mardie Station	-21.18333333	115.9833333	10/12/1949
Owenia acidula	3 Mardie Station	-21.18333333	115.9833333	19/08/1966
Owenia acidula	3 Mardie	-21.18666667	115.9816667	5/03/1953
Pentalepis trichodesmoides subsp. hispida	2 45 km peg, NW Gas Pipeline	-20.63333333	117.2	8/10/1992
Rhynchosia bungarensis	4 900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4 0.77 km WSW from the intersection of Cinders Road and Dampier Road, 3.54 km SSE of Dampier and 13.41 km NW of Karratha	-20.69025	116.727778	30/11/2010
Rhynchosia bungarensis	4 Waterhole above waterfall, Burrup Peninsula	-20.65527778	116.824	27/05/2009
Rhynchosia bungarensis	4 Deep Gorge, Burrup Peninsula, N of Karratha	-20.63722222	116.788	26/05/2009
Rhynchosia bungarensis	4 Burrup Peninsula, waterhole above waterfall	-20.56552778	116.824	27/05/2009
Rhynchosia bungarensis	4 Burrup Peninsula, dry creekbed crossing near waterfall area	-20.57205556	116.8086111	27/05/2009
Rhynchosia bungarensis	4 3.75 km along Burrup Road from Karratha - Dampier Road; ca 500 m in from road on top of rockpile	-20.64794444	116.7992778	29/05/2009
Rhynchosia bungarensis	4 West Lewis Island, Dampier Archipelago	-20.59472222	116.6113889	14/06/1962
Rhynchosia bungarensis	4 Dolphin Island, Dampier Archipelago	-20.50805556	116.84	5/06/1962
Rhynchosia bungarensis	4 One Shack Bay, East Lewis Island	-20.63333333	116.6333333	9/11/1987
Rhynchosia bungarensis	4 NE end of Enderby Island, Dampier Archipelago	-20.6	116.5166667	19/07/1980
Rhynchosia bungarensis	4 900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4 Site D013, 3.85 km NNE along the coast from the southern tip of Dolphin Island, Dampier Archipelago, Pilbara Bioregion	-20.487416	116.832863	29/05/2000
Rhynchosia bungarensis	4 900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4 900 m SSW of the point near the centre of the NW of the Burrup Peninsula, Pilbara Bioregion, Site B082	-20.530114	116.835262	27/06/2000
Rhynchosia bungarensis	4 1.9 km ENE of the SW tip of Dolphin Island and 300 m from the west coast, Site D088, Dampier Archipelago, Pilbara Bioregion	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4 1.9 km ENE of the SW tip of Dolphin Island and 300 m from the west coast, Site D088, Dampier Archipelago, Pilbara Bioregion	-20.502672	116.826804	29/05/2000
Rhynchosia bungarensis	4 Site B235, 600 m E of the inner corner of Withnell Bay, Pilbara Bioregion	-20.574043	116.805097	26/06/2000
Rhynchosia bungarensis	4 2.6 km NE of the inner end of King Bay, Burrup Peninsula, Site B028, Pilbara Bioregion	-20.61269	116.782273	22/05/2000
Rhynchosia bungarensis	4 Site B076, NW part of the Burrup Peninsula, 600 m NE of the N corner of Conzinc Bay	-20.534969	116.819554	27/05/2000

Taxon	Cons_Code	Locality	Latitude	Longitude	Date
Rhynchosia bungalowensis	4	Site B064, Burrup Peninsula, Pilbara Bioregion, west coast, adjacent to Holden Beach, between Dampier Port and NW Shelf Gas Works	-20.606376	116.756965	26/05/2000
Rhynchosia bungalowensis	4	Site B074, N of Conzinc Bay and 11.2 km ESE of the NW tip of the Burrup Peninsula, Pilbara Bioregion	-20.533712	116.831314	27/05/2000
Rhynchosia bungalowensis	4	Site B002, 1.5 km almost due S of Holden Point between Dampier Port and North West Shelf Gas plant (on E side of road), Burrup Peninsula, Pilbara Bioregion	-20.615432	116.730045	26/05/2000
Rhynchosia bungalowensis	4	Site B066, 1.2 km S of the point near the centre of the end of the Burrup Peninsula, Pilbara Bioregion	-20.533695	116.838079	27/05/2000
Rhynchosia bungalowensis	4	Site B066, 1.2 km S of the point near the centre of the end of the Burrup Peninsula, Pilbara Bioregion	-20.533695	116.838079	27/05/2000
Rhynchosia bungalowensis	4	Site B193, 2.5 km ENE of the inner end of Withnell Bay, Burrup Peninsula, Pilbara Bioregion	-20.566045	116.82089	5/06/2000
Rhynchosia bungalowensis	4	Site B020, 1.74 km ENE of Mt Burrup and 180 m from the E coast of the Burrup Peninsula, Pilbara Bioregion	-20.548081	116.844855	25/05/2000
Rhynchosia bungalowensis	4	Site B003, 1.6 km SW of the inner end of King Bay, Burrup Peninsula, Pilbara Bioregion	-20.640271	116.773558	28/05/2000
Rhynchosia bungalowensis	4	Site B040, 900 m slightly W of N of Mt Burrup, Burrup Peninsula, Pilbara Bioregion	-20.546327	116.828242	25/05/2000
Rhynchosia bungalowensis	4	Site B007, 1.34 km WSW of the southern corner of Hearson Cove, Burrup Peninsula, Pilbara Bioregion	-20.638945	116.786661	20/05/2000
Rhynchosia bungalowensis	4	Pistol Range ENE of Telstra tower, Burrup Peninsula, Site B183, Pilbara Bioregion	-20.666256	116.745265	3/06/2000
Rhynchosia bungalowensis	4	Site B020, 1.74 km ENE of Mt Burrup and 180 m from the E coast of the Burrup Peninsula, Pilbara Bioregion	-20.548081	116.761779	25/05/2000
Rhynchosia bungalowensis	4	Site B001, White Hill, Pilbara Bioregion S of Dampier Road, NW corner of Dampier Salt lease on W facing exposed slope	-20.69183	116.721464	28/05/2000
Rhynchosia bungalowensis	4	1.94 km slightly W of the S of the inner end of King Bay, Site B017, Burrup Peninsula, Pilbara Bioregion	-20.648958	116.759391	21/05/2000
Rhynchosia bungalowensis	4	Site B195, 2.25 km ENE of the SE corner of Withnell Bay and 1.5 km inland from the E coast of the Burrup Peninsula, Pilbara Bioregion	-20.566793	116.819181	5/06/2000
Rhynchosia bungalowensis	4	Site B031, NE part of Burrup Peninsula, 3.7 km from NE point and 0.6 km from east coast (near Mt Burrup)	-20.548369	116.837843	25/05/2000
Rhynchosia bungalowensis	4	Near quadrant on cutting along road to Con. camp; Burrup Peninsula	-20.78333333	116.766667	21/09/1983
Rhynchosia bungalowensis	4	Cape Preston	-21.04651731	116.238865	7/06/2017
Schoenus punctatus	3	Burrup Peninsula	-20.56589139	116.823573	10/07/1999
Stackhousia clementii	3	King Bay - Hearson Cove tidal inlet, Burrup Peninsula	-20.63026737	116.784159	30/04/2002
Stackhousia clementii	3	On 7 Mile Flats, 8.4 km SE of Dampier, 9.4 km W of Karratha	-20.72520548	116.750462	24/02/2013
Stackhousia clementii	3	5.4 km S of Onslow, 35.4 km NNE of Minderoo Homestead and 79.6 km W of Yarraloola Homestead	-21.59455	115.118028	30/08/2011
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	32.1 km E-NE of Karratha town site	-20.652806	117.133444	7/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	34.9 km NE of Karratha town site	-20.621222	117.150917	9/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	34.1 km NE of Karratha town site	-20.624361	117.143611	10/03/2008
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	35 km NE of Karratha town site	-20.616417	117.150972	5/10/2007
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	W of track to Sams Creek, c. 1.5 km W of Point Samson, c. 5 km NE of Wickham	-20.6275509	117.181041	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	C. 2 km S of Anketell Point, c. 5 km NW of Wickham	-20.6430538	117.0941985	3/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	C. 2.5 km SW of Cape Lambert Port. C. 6 km N of Wickham	-20.6234288	117.1491159	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	C. 2.5 km S of Cape Lambert Port. C. 5.5 km NNE of Wickham	-20.6213672	117.1654401	3/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	Ca 2.5 km SW of Cape Lambert Port, ca 6 km N of Wickham	-20.6234288	117.1491159	4/09/2012
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	Sams Creek, Point Samson	-20.6297222	117.1897222	7/08/1984
Tephrosia rosea var. Port Hedland (A.S. George 1114)	1	Pt Samson	-20.63333333	117.2	8/10/1992
Terminalia supranitfolia	3	Base hills right hand side Dampier Island, near right hand side of Dampier Salt Ltd lease.	-20.6666667	116.7	12/1986
Terminalia supranitfolia	3	Site 1, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.67040184	116.756983	2/11/1998
Terminalia supranitfolia	3	Site 12, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64153748	116.796257	12/11/1998
Terminalia supranitfolia	3	Site 13, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.6359749	116.7917049	15/11/1998
Terminalia supranitfolia	3	King Bay - Withnell Bay Road, peninsula between Dampier and Dolphin Island.	-20.63333333	116.75	6/12/1978
Terminalia supranitfolia	3	Burrup Peninsula, Pistol Ranges, S of Hearson Cove Road	-20.63597546	116.7916969	15/11/1998
Terminalia supranitfolia	3	Burrup Peninsula, Pistol Ranges, S of Hearson Cove Road	-20.64153102	116.7962525	12/11/1998
Terminalia supranitfolia	3	Burrup Peninsula, Pistol Ranges, S of Hearson Cove Road	-20.67039265	116.7570029	2/11/1998
Terminalia supranitfolia	3	Site 11, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.6361588	116.7937555	10/11/1998
Terminalia supranitfolia	3	Site 20, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64257507	116.7732557	26/11/1998
Terminalia supranitfolia	3	Site 21, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65113121	116.7725423	26/11/1998
Terminalia supranitfolia	3	Hearson's cove beach	-20.63333333	116.8	11/03/1983
Terminalia supranitfolia	3	Hearson's cove beach	-20.63333333	116.8	11/03/1983
Terminalia supranitfolia	3	Hearson's cove beach	-20.63333333	116.8	11/03/1983
Terminalia supranitfolia	3	Burrup Peninsula	-20.78333333	116.766667	10/02/1982
Terminalia supranitfolia	3	Near Dampier	-20.6666667	116.75	21/07/2004
Terminalia supranitfolia	3	1.8 miles from Dampier on road to Hearson Cove, Nickol Bay	-20.6666667	116.7	12/1971
Terminalia supranitfolia	3	Site 18, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65430143	116.7784031	24/11/1998
Terminalia supranitfolia	3	Site 8, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.63839632	116.796453	5/11/1998
Terminalia supranitfolia	3	Site 19, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65611998	116.773226	24/11/1998
Terminalia supranitfolia	3	Site 17, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64520398	116.798082	22/11/1998
Terminalia supranitfolia	3	Site 16, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64068437	116.7785477	22/11/1998
Terminalia supranitfolia	3	Site 5, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.66687903	116.764387	28/11/1998
Terminalia supranitfolia	3	Site 2, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.66859454	116.763242	2/11/1998
Terminalia supranitfolia	3	Site 3, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.66073537	116.7717119	3/11/1998
Terminalia supranitfolia	3	Site 22, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64303766	116.7677738	28/11/1998
Terminalia supranitfolia	3	Site 4, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65870665	116.7750463	3/11/1998
Terminalia supranitfolia	3	Site 10, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.63530522	116.7993944	10/11/1998
Terminalia supranitfolia	3	Rear of beach, Hearson Cove	-20.63333333	116.8	05/1983
Terminalia supranitfolia	3	Site 7, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65249621	116.7871513	8/11/1998
Terminalia supranitfolia	3	Site 9, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.65143609	116.7871831	8/11/1998
Terminalia supranitfolia	3	Site 15, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.63373596	116.7859391	20/11/1998
Terminalia supranitfolia	3	Site 14, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64242027	116.78226	20/11/1998
Terminalia supranitfolia	3	Site 8, Burrup Peninsula, Pistol Ranges, south of Hearson's Cove Road	-20.64673249	116.783224	18/11/1998
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	3	10km W of Karratha on road to Dampier opp & Mile Railway sheds on E side of road	-20.72916667	116.762222	20/08/1992
Triumfetta echinata	3	Ca 16 km S-SW of Onslow	-21.77707459	115.0853797	1/11/2009
Triumfetta echinata	3	20 km E of Onslow	-21.63805556	115.3438889	25/10/1980
Triumfetta echinata	3	Ca 35 km NW from Peedamulla Homestead and 0.5 km back from sea, Peedamulla Station	-21.59972222	115.2938889	5/11/1996
Vigna tridophila	3	Burrup Road between MCF Road and NorthWest Shelf, opposite Pluto Site ca 500 m from Withnell Bay Road, E side Burrup - Burrup Peninsula	-20.61416667	116.772778	6/06/2011
Vigna tridophila	3	Site B024, E of Burrup road at bend before North West Shelf gas plant	-20.609139	116.782	21/05/2000
Vigna tridophila	3	1.7 km SE of the centre of King Bay, Burrup Peninsula, Pilbara Bioregion, Site B016	-20.648704	116.759173	21/05/2000
Vigna tridophila	3	Site B025, Burrup Peninsula, ca 250 m inland from the East coast of Withnell Bay	-20.58063	116.79481	22/05/2000
Vigna tridophila	3	3.75 km along Burrup Road from Karratha - Dampier Road; towards top of rockpile ca 500 m in from road	-20.64461469	116.7606137	29/05/2009
Vigna tridophila	3	8.2 km along Cleavelly track from North West Coastal Highway, N of Karratha; Pilbara Biological Survey site BRC 11	-20.68711287	117.0081136	26/05/2009
Vigna tridophila	3	Site B018, Burrup Peninsula, Pilbara Bioregion, 400 m SE of Burrup	-20.649002	116.75947	21/05/2000
Vigna tridophila	3	On Pluto Lease, adjacent to and W side of Haul Road - Pluto (Burrup Industrial Area) Burrup Peninsula	-20.61074796	116.7630429	31/03/2011



COM_NAME	STATE_CATG	COMM_CATG	S_ID_COUI	FIRST_S_ID	LAST_S_ID	BUFFER	BDY_ID
BurruP Peninsula rock pile communities	Priority 1		1	P9		200	14928
BurruP Peninsula rock pile communities	Priority 1		1	P4		200	14923
BurruP Peninsula rock pile communities	Priority 1		1	P8		200	14927
BurruP Peninsula rock pile communities	Priority 1		1	P5		200	14924
BurruP Peninsula rock pile communities	Priority 1		1	P7		200	14926
BurruP Peninsula rock pile communities	Priority 1		1	P6		200	14925
BurruP Peninsula rock pile communities	Priority 1		1	P12		200	14930
BurruP Peninsula rock pile communities	Priority 1		1	P2		200	14921
BurruP Peninsula rock pile communities	Priority 1		1	P1		200	14920
BurruP Peninsula rock pile communities	Priority 1		1	P38		200	14955
BurruP Peninsula rock pile communities	Priority 1		1	P37(first)		200	14953
BurruP Peninsula rock pile communities	Priority 1		1	P30		200	14946
BurruP Peninsula rock pile communities	Priority 1		1	P31		200	14947
BurruP Peninsula rock pile communities	Priority 1		1	P25		200	14941
BurruP Peninsula rock pile communities	Priority 1		1	P35		200	14951
BurruP Peninsula rock pile communities	Priority 1		1	P22		200	102670
BurruP Peninsula rock pile communities	Priority 1		1	P23		200	14939
BurruP Peninsula rock pile communities	Priority 1		1	P24		200	14940
BurruP Peninsula rock pile communities	Priority 1		1	P16		200	14934
BurruP Peninsula rock pile communities	Priority 1		1	P15		200	14933
BurruP Peninsula rock pile communities	Priority 1		1	P18		200	14936
BurruP Peninsula rock pile communities	Priority 1		1	P44		200	14961
BurruP Peninsula rock pile communities	Priority 1		1	P63		200	14981
BurruP Peninsula rock pile communities	Priority 1		1	P59		200	14977
BurruP Peninsula rock pile communities	Priority 1		1	P49		200	14966
BurruP Peninsula rock pile communities	Priority 1		1	P50		200	14967
BurruP Peninsula rock pile communities	Priority 1		1	P58		200	14976
BurruP Peninsula rock pile communities	Priority 1		1	P60		200	14978
BurruP Peninsula rock pile communities	Priority 1		1	P61		200	14979
BurruP Peninsula rock pile communities	Priority 1		1	P51		200	14968
BurruP Peninsula rock pile communities	Priority 1		1	P56		200	14973
BurruP Peninsula rock pile communities	Priority 1		1	P52		200	14969
BurruP Peninsula rock pile communities	Priority 1		1	P53		200	14970
BurruP Peninsula rock pile communities	Priority 1		1	P54		200	14971
BurruP Peninsula rock pile communities	Priority 1		1	P41		200	14958
BurruP Peninsula rock pile communities	Priority 1		1	P10		200	14929
BurruP Peninsula rock pile communities	Priority 1		1	P13		200	14931
BurruP Peninsula rock pile communities	Priority 1		1	P3		200	14922
BurruP Peninsula rock pile communities	Priority 1		1	P39		200	14956
BurruP Peninsula rock pile communities	Priority 1		1	P47		200	14964
BurruP Peninsula rock pile communities	Priority 1		1	P46		200	14963
BurruP Peninsula rock pile communities	Priority 1		1	P48		200	14965
BurruP Peninsula rock pile communities	Priority 1		1	P43		200	14960
BurruP Peninsula rock pile communities	Priority 1		1	P34		200	14950
BurruP Peninsula rock pile communities	Priority 1		1	P26		200	14942
BurruP Peninsula rock pile communities	Priority 1		1	P27		200	14943
BurruP Peninsula rock pile communities	Priority 1		1	P28		200	14944
BurruP Peninsula rock pile communities	Priority 1		1	P36		200	14952
BurruP Peninsula rock pile communities	Priority 1		1	P37(second)		200	14954
BurruP Peninsula rock pile communities	Priority 1		1	P32		200	14948
BurruP Peninsula rock pile communities	Priority 1		1	P33		200	14949
BurruP Peninsula rock pile communities	Priority 1		1	P29		200	14945
BurruP Peninsula rock pile communities	Priority 1		1	P21		200	14938
BurruP Peninsula rock pile communities	Priority 1		1	P20		200	14937
BurruP Peninsula rock pile communities	Priority 1		1	P14		200	14932
BurruP Peninsula rock pile communities	Priority 1		1	P17		200	14935
BurruP Peninsula rock pile communities	Priority 1		1	P62		200	14980
BurruP Peninsula rock pile communities	Priority 1		1	P42		200	14959
BurruP Peninsula rock pile communities	Priority 1		1	P45		200	14962
BurruP Peninsula rock pile communities	Priority 1		1	P40		200	14957
BurruP Peninsula rock pile communities	Priority 1		1	BRPile2		500	0
BurruP Peninsula rock pile communities	Priority 1		1	BRPile3		500	0
BurruP Peninsula rock pool communities	Priority 1		1	BRPool1		500	0
BurruP Peninsula rock pool communities	Priority 1		1	BRPool2		500	0
BurruP Peninsula rock pool communities	Priority 1		1	BRPool3		500	0





























































NAME_SCI	FAMILY	GENUS	SPECIES	NAME_COM	CLASS	CONS_CT	GDA_LONG	GDA_LAT	YEAR
Onychoprion anaethetus	Laridae	Onychoprion	anaethetus	bridled tern	BIRD	IA	116.5936	-20.4817	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5379	-20.4785	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5379	-20.4785	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6292	-20.4571	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6292	-20.4571	1990
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.8044	-20.3856	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6168	-20.4438	1991
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5327	-20.5428	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5473	-20.5379	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6251	-20.4707	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.6742	-20.5151	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.5379	-20.4785	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.4449	-20.6588	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	0
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.538	-20.5352	1983
Puffinus pacificus	Procellariidae	Puffinus	pacificus	wedge-tailed shearwater	BIRD	IA	116.777	-20.5399	0



## APPENDIX E: ATLAS OF LIVING AUSTRALIA 10 KM BUFFER DATABASE SEARCH RESULTS

- [Appendix\\_X\\_Atlas of Living Australia Database Search \(10km Search\)](#)



Species	Naturalised	Conservation Code	Endemic To Query Area
<b>Amphibian</b>			
Cyclorana maini			
Litoria rubella			
<b>Bird</b>			
Acrocephalus australis			
Acrocephalus australis			
Actitis hypoleucos			
Aegotheles cristatus			
Anhinga novaehollandiae			
Anous stolidus			
Anthus novaeseelandiae			
Apus pacificus			
Aquila audax			
Ardea modesta			
Ardenna pacifica			
Ardeotis australis			
Arenaria interpres			
Artamus minor			
Artamus cinereus			
Artamus leucorhynchus			
Burhinus grallarius			
Butorides striatus			
Cacatua sanguinea			

Cacomantis pallidus			
Calidris acuminata			
Centropus phasianinus			
Charadrius ruficapillus			
Chroicocephalus novaehollandiae			
Chrysococcyx basalis			
Cincloramphus cruralis			
Circus assimilis			
Columba livia	Y		
Coracina novaehollandiae			
Corvus bennetti			
Corvus orru			
Cracticus nigrogularis			
Egretta garzetta			
Egretta novaehollandiae			
Egretta sacra			
Elanus axillaris			
Elseyornis melanops			
Emblema pictum			
Eolophus roseicapillus			
Ephippiorhynchus asiaticus			
Epthianura tricolor			
Erythrogonys cinctus			
Esacus magnirostris			
Falco berigora			
Falco cenchroides			

Falco longipennis			
Falco peregrinus			
Fregata ariel			
Gallirallus philippensis			
Gavicalis virescens			
Gelochelidon nilotica			
Geopelia cuneata			
Geopelia humeralis			
Geopelia striata			
Geophaps plumifera			
Gerygone tenebrosa			
Glareola maldivarum			
Grallina cyanoleuca			
Haematopus fuliginosus			
Haematopus longirostris			
Haematopus ostralegus			
Haliaeetus leucogaster			
Haliastur indus			
Haliastur sphenurus			
Hieraaetus morphnoides			
Himantopus himantopus			
Hirundo neoxena			
Hydroprogne caspia			
Lalage sueurii			
Lichmera indistincta			
Limosa lapponica			

Malurus leucopterus			
Manorina flavigula			
Melopsittacus undulatus			
Merops ornatus			
Milvus migrans			
Mirafrja javanica			
Neochmia ruficauda			
Neopsephotus bourkii			
Numenius madagascariensis			
Numenius minutus			
Numenius phaeopus			
Nymphicus hollandicus			
Oceanites oceanicus			
Ocyphaps lophotes			
Pachycephala lanioides			
Pachycephala melanura			
Pachycephala rufiventris			
Pandion cristatus			
Pardalotus rubricatus			
Pardalotus striatus			
Passer domesticus	Y		
Passer montanus	Y		
Pelecanus conspicillatus			
Petrochelidon ariel			
Petrochelidon nigricans			
Phalacrocorax sulcirostris			

Phalacrocorax varius			
Phaps chalcoptera			
Podargus strigoides			
Ptilonorhynchus guttatus			
Ptilotula keartlandi			
Ptilotula penicillata			
Rhipidura leucophrys			
Rhipidura phasiana			
Smicronis brevirostris			
Sterna dougallii			
Sterna hirundo			
Sula leucogaster			
Taeniopygia guttata			
Thalasseus bengalensis			
Thalasseus bergii			
Threskiornis spinicollis			
Todiramphus chloris			
Todiramphus pyrrhopygius			
Todiramphus sanctus			
Tringa brevipes			
Tringa totanus			
Tringanebularia			
Turnix velox			
Tyto javanica			
Xenus cinereus			
Zosterops luteus			
<b>Mammal</b>			



Felis catus	Y		
Nyctophilus geoffroyi			
Osphranter robustus			
Pseudantechinus roryi			
Pseudantechinus woolleyae			
Pseudomys delicatulus			
Pseudomys hermannsburgensis			
Rattus rattus	Y		
Taphozous georgianus			
Vespadelus finlaysoni			
Vulpes vulpes	Y		
Zyomys argurus			
<b>Reptile</b>			
Acanthophis wellsei			
Anilius ammodytes			
Anilius grypus			
Antaresia perthensis			
Antaresia stimsoni			
Aspidites melanocephalus			
Carlia triacantha			
Crenadactylus horni			
Cryptoblepharus buchananii			
Cryptoblepharus ustulatus			
Ctenophorus caudicinctus			
Ctenophorus isolepis			
Ctenotus inornatus			
Ctenotus pantherinus			

Ctenotus rubicundus			
Ctenotus serventyi			
Cyclodomorphus melanops			
Delma pax			
Delma tinctoria			
Demansia rufescens			
Diplodactylus conspicillatus			
Diplodactylus galaxias			
Egernia pilbarensis			
Ephalophis greyi			
Eremiascincus isolepis			
Fordonia leucobalia			
Furina ornata			
Gehyra punctata			
Gehyra variegata			
Gowidon longirostris			
Hemidactylus frenatus	Y		
Heteronotia binoei			
Lerista bipes			
Lerista clara			
Lerista jacksoni			
Lerista muelleri			
Lialis burtonis			
Menetia greyii			
Menetia surda			
Morethia ruficauda			

Notoscincus ornatus			
Oedura fimbria			
Oedura marmorata			
Pseudechis australis			
Pseudonaja mengdeni			
Strophurus ciliaris			
Strophurus elderi			
Suta punctata			
Varanus eremius			
Varanus gouldii			

## APPENDIX F: NATUREMAP DATABASE SEARCH (10 KM BUFFER)

Species	Naturalised	Conservation Code	Endemic To Query Area
<b>Amphibian</b>			
Cyclorana australis			
Cyclorana maini			
Litoria rubella			
Notaden nichollsi			
<b>Bird</b>			
Actitis hypoleucos		IA	
Aegotheles cristatus			
Anous stolidus subsp. Pileatus		IA	
Arenaria interpres		IA	
Artamus cinereus			
Artamus leucorhynchus			
Artamus leucorhynchus subsp. leucopygialis			
Artamus minor			
Burhinus grallarius			
Butorides striata			
Cacatua sanguinea			
Cacomantis pallidus			
Centropus phasianinus			
Charadrius leschenaultii		IA	
Charadrius ruficapillus			
Chroicocephalus novaehollandiae			
Coracina novaehollandiae			

Cracticus nigrogularis			
Dromaius novaehollandiae			
Elseyornis melanops			
Emblema pictum			
Eolophus roseicapillus			
Esacus magnirostris			
Falco berigora			
Falco cenchroides			
Falco peregrinus		S	
Gelochelidon nilotica		IA	
Geopelia cuneata			
Geopelia humeralis			
Geopelia striata			
Geophaps plumifera			
Gerygone tenebrosa			
Grallina cyanoleuca			
Haematopus fuliginosus			
Haematopus longirostris			
Haliaeetus leucogaster			
Haliastur indus			
Haliastur sphenurus			
Hirundo neoxena			
Larus novaehollandiae			
Lichmera indistincta			
Limosa lapponica		IA	
Manorina flavigula			



Melopsittacus undulatus			
Merops ornatus			
Milvus migrans			
Numenius madagascariensis		T	
Numenius phaeopus		IA	
Ocyphaps lophotes			
Pandion cristatus		IA	
Pardalotus rubricatus subsp. Rubricatus			
Pardalotus striatus			
Petrochelidon ariel			
Petrochelidon nigricans			
Phalacrocorax varius			
Pitta moluccensis			
Podargus strigoides			
Podargus strigoides subsp. brachypterus			
Ptilonorhynchus guttatus			
Rhipidura leucophrys			
Taeniopygia guttata			
Thalasseus bengalensis			
Thalasseus bergii		IA	
Todiramphus pyrrhopygius			
Todiramphus sanctus			
Tringa brevipes		P4	
Tringa nebularia			
Zosterops luteus			
<b>Mammal</b>			

Canis familiaris	Y		
Dasyurus hallucatus		T	
Felis catus	Y		
Macroderma gigas			
Macropus robustus			
Macropus robustus subsp. erubescens			
Macropus rufus			
Megaptera novaeangliae		S	
Mormopterus (Ozimops) cobourgianus			
Ningauai timealeyi			
Petrogale rothschildi			
Planigale sp. nov.			
Pseudantechinus roryi			
Pseudomys chapmani			
Pseudomys delicatulus			
Pseudomys hermannsburgensis			
Pteropus alecto			
Tachyglossus aculeatus			
Vulpes vulpes			
<b>Reptile</b>			
Acanthopphis wellsei			
Acanthopphis wellsi			
Antaresia perthensis			
Antaresia stimsoni			
Antaresia stimsoni subsp. stimsoni			
Aspidites melanocephalus			

Carlia munda			
Carlia triacantha			
Chelonia mydas		T	
Crenadactylus ocellatus subsp. horni			
Cryptoblepharus buchananii			
Cryptoblepharus plagiocephalus			
Cryptoblepharus ustulatus			
Ctenophorus caudicinctus subsp. caudicinctus			
Ctenotus leonhardii			
Ctenotus pantherinus subsp. ocellifer			
Ctenotus rubicundus			
Ctenotus saxatilis			
Ctenotus serventyi			
Cyclodomorphus melanops			
Cyclodomorphus melanops subsp. melanops			
Delma pax			
Demansia psammophis			
Demansia rufescens			
Diplodactylus conspicillatus			
Diplodactylus galaxias			
Diplodactylus savagei			
Ephalophis greyae			
Eremiascincus isolepis			
Eretmochelys imbricata subsp. bissa		T	
Fordonia leucobalia			

Furina ornata			
Gehyra punctata			
Gehyra variegata			
Hemidactylus frenatus	Y		
Heteronotia binoei			
Lerista bipes			
Lerista jacksoni			
Lerista muelleri			
Lialis burtonis			
Liasis olivaceus subsp. barroni		T	
Lucasium stenodactylum			
Menetia greyii			
Menetia surda subsp. surda			
Morethia ruficauda subsp. exquisita			
Natator depressus		T	
Notoscincus ornatus subsp. ornatus			
Oedura marmorata			
Pogona minor subsp. Minor			
Pseudechis australis			
Pseudonaja mengdeni			
Pseudonaja nuchalis			
Strophurus elderi			
Suta punctata			
Varanus acanthurus			
Varanus eremius			
Varanus giganteus			

Varanus gouldii			
Varanus panoptes subsp. rubidus			
Varanus pilbarensis			
Varanus tristis subsp. tristis			

AIZOACEAE	Trianthema portulacastrum
	Trianthema turgidifolium
AMARANTHACEAE	Aerva javanica
	Amaranthus undulatus
	Gomphrena cunninghamii
	Ptilotus nobilis
APOCYNACEAE	Ptilotus obovatus
	Cynanchum floribundum
ARALIACEAE	Trachymene oleracea
	Trachymene oleracea subsp. oleracea
ASTERACEAE	Angianthus milnei
	Bidens bipinnata
	Conyza bonariensis
	Pluchea rubelliflora
	Pterocaulon sphaeranthoides
	Sonchus oleraceus
	Tridax procumbens
BORAGINACEAE	Ehretia saligna var. saligna
BRASSICACEAE	Lepidium pedicellosum
CAPPARACEAE	Capparis spinosa subsp. nummularia
CELASTRACEAE	Stackhousia clementii
CHENOPODIACEAE	Neobassia astrocarpa
	Rhagodia preissii subsp. obovata
	Tecticornia halocnemoides
	Tecticornia indica subsp. indica
CLEOMACEAE	Cleome viscosa
COMBRETACEAE	Terminalia supranitifolia





COMMELINACEAE	Commelina ensifolia
CONVOLVULACEAE	Bonamia pilbarensis
	Evolvulus alsinoides var. villosicalyx
	Ipomoea costata
CUCURBITACEAE	Cucumis variabilis
CYPERACEAE	Cyperus bifax
	Cyperus blakeanus
	Cyperus bulbosus
	Cyperus vaginatus
	Eleocharis geniculata
	Fimbristylis dichotoma
	Schoenoplectus subulatus
EUPHORBIACEAE	Euphorbia australis
	Euphorbia australis var. subtomentosa
	Euphorbia biconvexa
	Euphorbia careyi
	Euphorbia tannensis subsp. Eremophila
	Euphorbia trigonosperma
	Euphorbia vaccaria
FABACEAE	Acacia arida
	Acacia colei var. colei
	Acacia coriacea
	Acacia coriacea subsp. coriacea
	Acacia pyrifolia var. pyrifolia
	Clitoria ternatea
	Dichrostachys spicata
	Indigofera monophylla

	Leucaena leucocephala
	Rhynchosia australis
	Rhynchosia bungarensis
	Rhynchosia minima
	Stylosanthes hamata
	Swainsona pterostylis
	Tephrosia clementii
	Tephrosia sp.
	Tephrosia supina
	Vigna triodiophila
GENTIANACEAE	Centaurium erythraea
GOODENIACEAE	Goodenia lamprosperma
	Scaevola spinescens
LAMIACEAE	Clerodendrum tomentosum
	Clerodendrum tomentosum var. lanceolatum
LAURACEAE	Cassytha capillaris
LYTHRACEAE	Lawsonia inermis
MALVACEAE	Abutilon fraseri
	Brachychiton acuminatus
	Corchorus elachocarpus
	Corchorus trilocularis
	Corchorus walcottii
	Hibiscus sturtii
	Malvastrum americanum
	Sida fibulifera
	Triumfetta appendiculata
MOLLUGINACEAE	Trigastrotheca molluginea




MORACEAE	<i>Ficus aculeata</i> var. <i>indecora</i>
MYRTACEAE	<i>Corymbia opaca</i> <i>Eucalyptus victrix</i>
NYCTAGINACEAE	<i>Boerhavia coccinea</i> <i>Boerhavia gardneri</i>
OLEACEAE	<i>Jasminum didymum</i> subsp. <i>Lineare</i>
PASSIFLORACEAE	<i>Passiflora foetida</i>
PHYLLANTHACEAE	<i>Flueggea virosa</i> subsp. <i>melanthesoides</i>
PITTOSPORACEAE	<i>Pittosporum phillyreoides</i>
PLANTAGINACEAE	<i>Stemodia grossa</i>
POACEAE	<i>Aristida contorta</i> <i>Cenchrus ciliaris</i> <i>Cenchrus setaceus</i> <i>Cenchrus setiger</i> <i>Chrysopogon fallax</i> <i>Cymbopogon ambiguus</i> <i>Dactyloctenium radulans</i> <i>Digitaria ctenantha</i> <i>Enneapogon caeruleus</i> <i>Enneapogon lindleyanus</i> <i>Eriachne tenuiculmis</i> <i>Paspalidium tabulatum</i> <i>Sporobolus australasicus</i> <i>Themeda</i> sp. <i>Themeda triandra</i> <i>Triodia angusta</i> <i>Triodia epactia</i>



PROTEACEAE	Triodia wiseana Whiteochloa airoides Grevillea pyramidalis subsp. pyramidalis Hakea lorea subsp. lorea
RHIZOPHORACEAE	Ceriops australis Rhizophora stylosa
SOLANACEAE	Physalis angulata Solanum horridum Solanum lasiophyllum Solanum nigrum
VIOLACEAE	Hybanthus aurantiacus
ZYGOPHYLLACEAE	Tribulus terrestris




## APPENDIX G: SURVEY SITE DETAILS


<b>Site</b>	1	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	19/11/18 & 11/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	WSW	<b>Landform</b>	Shallow gully
<b>Seasonal Condition</b>	Dry and Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	AbHITE	<b>Surface Rock Size and Shape</b>	0.2 – 0.5L blocky angular to weathered smooth
<b>Vegetation Association</b>	Tall shrubland of <i>Acacia bivenosa</i> over open shrubland of <i>Hakea lorea</i> , <i>Acacia coleii</i> over hummock grassland of <i>Triodia epactia</i> over herbland.		
<b>Condition</b>	No Disturbances		
<b>Site</b>	2	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	19/11/18 & 11/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	Undulating mid slope
<b>Seasonal Condition</b>	Dry and Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	TeAb	<b>Surface Rock Size and Shape</b>	0.2 – 0.5L blocky angular to weathered smooth
<b>Vegetation Association</b>	<i>Triodia epactia</i> (Burrup Form) hummock grassland with scattered <i>Acacia bivenosa</i> shrubs		
<b>Condition</b>	Spinifex and shrubs. Culvert leakage caused some vegetation death		
<b>Site</b>	3	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	19/11/18 & 11/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	Flat	<b>Landform</b>	Rocky outcrop
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	90
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	N/A
<b>Vegetation Code</b>	BaAclc	<b>Surface Rock Size and Shape</b>	Blocky 0.5 m - 1 m <sup>3</sup>





<b>Vegetation Association</b>	Open low woodland of <i>Brachychiton acuminatus</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola spinescens</i> , <i>Ipomoea costata</i> over herbs and very open grassland of <i>Triodia epactia</i> with <i>Cymbopogon ambiguus</i> and <i>Paspalidium clementii</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	4	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	19/11/18 & 11/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	Shallow gully to incised channel
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	65
<b>Vegetation Code</b>	ChAbSg	<b>Surface Rock Size and Shape</b>	Large - medium
<b>Vegetation Association</b>	<i>Corymbia hamersleyana</i> low open woodland over <i>Acacia bivenosa</i> high open shrubland over <i>Dichrostachys spicata</i> scattered shrubs over <i>Stemodia grossa</i> low shrubland to low open heath over <i>Triodia epactia</i> (Burrup Form) hummock grassland		
<b>Condition</b>	Spinifex and shrubs. Culvert leakage caused some vegetation death		
<b>Site</b>	5	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	19/11/18 & 11/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	Lowers slopes / flats
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	50
<b>Vegetation Code</b>	AbImTe	<b>Surface Rock Size and Shape</b>	0.2 – 0.5L blocky angular to weathered smooth
<b>Vegetation Association</b>	<i>Acacia bivenosa</i> high open shrubland to high shrubland over <i>Indigofera monophylla</i> scattered low shrubs to low open shrubland over <i>Triodia epactia</i> hummock grassland to closed hummock grassland		




<b>Condition</b>	Large dead area in the middle, likely culvert leakage caused vegetation death		
<b>Site</b>	6	<b>Soil Type</b>	Sandy clay
<b>Date</b>	19/11/18 & 11/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	Lower slopes / flats with low boulder outcrops
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	80
<b>Vegetation Code</b>	AbTa	<b>Surface Rock Size and Shape</b>	small rocks and boulders
<b>Vegetation Association</b>	<i>Acacia bivenosa</i> high open shrubs over <i>Triodia angusta</i> (Burrup Form) hummock grassland		
<b>Condition</b>	No disturbances		
<b>Site</b>	7	<b>Soil Type</b>	Sand
<b>Date</b>	19/11/18 & 11/05/19	<b>Soil Colour</b>	Light brown
<b>Aspect</b>	S	<b>Landform</b>	Riparian salty mudflat margin
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Bluestone gravel
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	ThTil	<b>Surface Rock Size and Shape</b>	Bluestone gravel
<b>Vegetation Association</b>	Dwarf open shrubland to heath (varies 2-10% to 20-40%) of <i>Tecticornia halocnemoides</i> with <i>Tecticornia indica</i>		
<b>Condition</b>	15% weed coverage. Vehicle tracks have dissected the vegetation and road building gravel has spilled onto it		
<b>Site</b>	8	<b>Soil Type</b>	Sand
<b>Date</b>	19/11/18 and 11/05/19	<b>Soil Colour</b>	Light brown
<b>Aspect</b>	Flat	<b>Landform</b>	Riparian sand bank
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	0
<b>Vegetation Code</b>	(Te)Sv	<b>Surface Rock Size and Shape</b>	N/A

<b>Vegetation Association</b>	Grassland of <i>Sporobolous virginicus</i> , <i>Eriachne mucronata</i> and <i>Paspalidium tabulatum</i> (30-70%) with scattered <i>Triodia epactia</i> . * <i>Cenchrus ciliaris</i> and * <i>Aerva javanica</i> are common in wet season.			
<b>Condition</b>	No disturbances			
<b>Site</b>	9	<b>Soil Type</b>	Sandy clay loam	
<b>Date</b>	19/11/18 & 13/05/19	<b>Soil Colour</b>	Light brown	
<b>Aspect</b>	N	<b>Landform</b>	Lower slopes	
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Laterite and granite	
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	40% gravel, 40% rock	
<b>Vegetation Code</b>	AbTe*Cc	<b>Surface Rock Size and Shape</b>	2-20 cm	
<b>Vegetation Association</b>	Previously disturbed and rehabilitated. <i>Acacia bivenosa</i> tall shrubland (30-70%, 2.5m) over Hummock Grassland of <i>Triodia epactia</i> (30-70%) with * <i>Cenchrus ciliaris</i>			
<b>Condition</b>	Previously disturbed and rehabilitated.			
<b>Site</b>	10	<b>Soil Type</b>	Loam	
<b>Date</b>	19/11/18 & 13/05/19	<b>Soil Colour</b>	Brown	
<b>Aspect</b>	Flat	<b>Landform</b>	Rocky outcrop running north - south	
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite	
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100	
<b>Vegetation Code</b>	FbBaTsSc	<b>Surface Rock Size and Shape</b>	Blocky 0.5 m - 1m <sup>3</sup>	
<b>Vegetation Association</b>	Open low woodland of <i>Ficus brachypoda</i> , <i>Brachychiton acuminatus</i> , <i>Terminalia supranitifolia</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola spinescens</i> , <i>Rhagodia preissii</i> subsp <i>obovate</i> over open <i>Cymbopogon ambiguus</i> with <i>Triodia epactia</i>			
<b>Condition</b>	No disturbances			
<b>Site</b>	11	<b>Soil Type</b>	N/A	
<b>Date</b>	20/11/18 & 12/11/19	<b>Soil Colour</b>	N/A	



<b>Aspect</b>	Flat	<b>Landform</b>	Rocky outcrop running south-west
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100
<b>Vegetation Code</b>	FbBaTsSc	<b>Surface Rock Size and Shape</b>	Large boulders
<b>Vegetation Association</b>	Open low woodland of <i>Ficus brachypoda</i> , <i>Brachychiton acuminatus</i> , <i>Terminalia supranitifolia</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola spinescens</i> , <i>Rhagodia preissii</i> subsp <i>obovate</i> over open <i>Cymbopogon ambiguus</i> with <i>Triodia epactia</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	12	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Lower slopes
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	TeTh	<b>Surface Rock Size and Shape</b>	Blocky – rounded, 0.2 m -0.5 m <sup>3</sup>
<b>Vegetation Association</b>	<i>Triodia epactia</i> , <i>Themeda triandra</i> hummock/tussock grassland		
<b>Condition</b>	Garden waste pile in track edge		
<b>Site</b>	13	<b>Soil Type</b>	N/A
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	N/A
<b>Aspect</b>	Flat	<b>Landform</b>	Rocky outcrop in south-west
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100
<b>Vegetation Code</b>	FbBaTsSc	<b>Surface Rock Size and Shape</b>	Blocky – rounded, 0.2 m -0.5 m <sup>3</sup>
<b>Vegetation Association</b>	Open low woodland of <i>Ficus brachypoda</i> , <i>Brachychiton acuminatus</i> , <i>Terminalia supranitifolia</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola spinescens</i> , <i>Rhagodia preissii</i> subsp <i>obovate</i> over open <i>Cymbopogon ambiguus</i> with <i>Triodia epactia</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	14	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Mid slopes/flats near drainage
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	< 2 years	<b>Rock Cover</b>	70









<b>Vegetation Code</b>	AbCgTe	<b>Surface Rock Size and Shape</b>	Small rocks
<b>Vegetation Association</b>	<i>Acacia bivenosa</i> , <i>Cassia glutinosa</i> open shrubland to shrubland over <i>Triodia epactia</i> (Burrup Form), * <i>Cenchrus ciliaris</i> grassland		
<b>Condition</b>	Acacia regrowth post fire		
<b>Site</b>	15	<b>Soil Type</b>	Sandy loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Lower slopes/plains at bottom of rocky hills
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	70
<b>Vegetation Code</b>	GpCwTe	<b>Surface Rock Size and Shape</b>	0.2 - 0.5L blocky angular to weathered smooth
<b>Vegetation Association</b>	<i>Grevillea pyramidalis</i> subsp. <i>pyramidalis</i> open heath over <i>Corchorus walcottii</i> scattered low shrubs to low open heath over <i>Triodia epactia</i> (Burrup Form) hummock grassland		
<b>Condition</b>	No disturbance. Adjacent to camp area		
<b>Site</b>	16	<b>Soil Type</b>	Sandy loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Lower slopes/plains at bottom of rocky hills
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	70
<b>Vegetation Code</b>	EvDsTa	<b>Surface Rock Size and Shape</b>	0.2 - 0.5L blocky angular to weathered smooth



<b>Vegetation Association</b>	<i>Eucalyptus victrix</i> scattered low trees to low open woodland over <i>Dichrostachys spicata</i> , ( <i>Acacia coriaceae</i> subsp. <i>coriaceae</i> ) tall scattered shrubs to low open shrubland over <i>Triodia angusta</i> hummock grassland		
<b>Condition</b>	Small amount of *Cc		
<b>Site</b>	17	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Lower slopes
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	60
<b>Vegetation Code</b>	TaTsRm	<b>Surface Rock Size and Shape</b>	Mostly rounded. 0.2 - 2L
<b>Vegetation Association</b>	<i>Triodia angusta</i> , <i>Triodia epactia</i> grassland with <i>Tephrosia supina</i> herbland and <i>Rhyncosia minima</i> lianes		
<b>Condition</b>	Immediately adjacent to disturbed ripped rehab area		
<b>Site</b>	18	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Lower slopes
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	40
<b>Vegetation Code</b>	TcEtSe	<b>Surface Rock Size and Shape</b>	Mostly rounded. 0.2 - 2L
<b>Vegetation Association</b>	<i>Terminalia canescens</i> low woodland over <i>Eriachne tenuiculmis</i> , <i>Triodia epactia</i> grassland/hummock grassland with <i>Sesbania cannabina</i> herbland		
<b>Condition</b>	Shrubs and trees coated in thick dust		
<b>Site</b>	19	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown






<b>Aspect</b>	N	<b>Landform</b>	Lower slopes/transition to flats
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	0
<b>Vegetation Code</b>	Ev*CcTe	<b>Surface Rock Size and Shape</b>	N/A
<b>Vegetation Association</b>	<i>Eucalyptus victrix</i> over <i>Pittosporum phylliraeoides</i> var. <i>phylliraeoides</i> / <i>Rhagodia eremaea</i> over * <i>Cenchrus ciliaris</i> / <i>Triodia epactia</i>		
<b>Condition</b>	Some clearing of understory and ground cover.		
<b>Site</b>	20	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	20/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Lower slopes - plain
<b>Seasonal Condition</b>	Dry and wet Season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	< 2 years	<b>Rock Cover</b>	60
<b>Vegetation Code</b>	ChImTe	<b>Surface Rock Size and Shape</b>	Rounded 0.2 - 0.5L
<b>Vegetation Association</b>	<i>Corymbia hamersleyana</i> scattered low trees to low open woodland over ( <i>Acacia bivenosa</i> , <i>Acacia coriaceae</i> subsp. <i>coriaceae</i> ) scattered tall shrubs over ( <i>Dichrostachys spicata</i> ) scattered shrubs over <i>Indigofera monophylla</i>		
<b>Condition</b>	One large Ch. Mostly small coppiced. Limited Te regrowth		
<b>Site</b>	21	<b>Soil Type</b>	Clay loam
<b>Date</b>	20/11/18 & 13/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	W	<b>Landform</b>	Rocky outcrop, slope
<b>Seasonal Condition</b>	Dry and wet Season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100
<b>Vegetation Code</b>	BaAclc	<b>Surface Rock Size and Shape</b>	Blocky rectangular 0.2 - 2 m <sup>3</sup>



<b>Vegetation Association</b>	Open low woodland of <i>Brachychiton acuminatus</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola spinescens</i> , <i>Ipomoea costata</i> over herbs and very open grassland of <i>Triodia epactia</i> with <i>Cymbopogon ambiguus</i> and <i>Paspalidium clementii</i>		
<b>Condition</b>	N/A		
<b>Site</b>	22	<b>Soil Type</b>	Loam
<b>Date</b>	20/11/18 & 13/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	Flat	<b>Landform</b>	Island inside creek bend. Accumulated silt
<b>Seasonal Condition</b>	Dry and wet Season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	0
<b>Vegetation Code</b>	EvAa	<b>Surface Rock Size and Shape</b>	N/A
<b>Vegetation Association</b>	<i>Eucalyptus victrix</i> low woodland over <i>Acacia ampliceps</i> open heath over <i>Cyperus vaginatus</i> , <i>Eriachne tenuiculmis</i> , <i>Triodia angusta</i> (Burrup form) sedgeland and tussock/hummock grassland		
<b>Condition</b>	Extensive passion vine weed cover. Heavy animal traffic flow		
<b>Site</b>	23	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	20/11/18 & 13/05/19	<b>Soil Colour</b>	Light brown
<b>Aspect</b>	W / NW	<b>Landform</b>	Incised creek channel
<b>Seasonal Condition</b>	Dry and wet Season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	15
<b>Vegetation Code</b>	EvAbTa	<b>Surface Rock Size and Shape</b>	Small rocks
<b>Vegetation Association</b>	<i>Eucalyptus victrix</i> over <i>Acacia bivenosa</i> over <i>Triodia angusta</i> (Burrup Form)		
<b>Condition</b>	passion vine weed cover. Heavy animal traffic flow		
<b>Site</b>	24	<b>Soil Type</b>	Loam
<b>Date</b>	20/11/2018	<b>Soil Colour</b>	Brown
<b>Aspect</b>	NE	<b>Landform</b>	Rocky outcrop

<b>Seasonal Condition</b>	Dry Season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100
<b>Vegetation Code</b>	BaAclc	<b>Surface Rock Size and Shape</b>	Large blocky rock, infill areas with soil, 0.25 - 2 m <sup>3</sup> , infill 0.5 - 2L
<b>Vegetation Association</b>	<i>Brachychiton acuminatus</i> over <i>Acacia coriacea</i> / <i>Scaevola spinescens</i> / <i>Ipomoea costata</i> over herbs / <i>Triodia epactia</i> / <i>Cymbopogon ambiguus</i> / <i>Paspalidium clementii</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	25	<b>Soil Type</b>	Clay loam
<b>Date</b>	21/11/2018	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S / W	<b>Landform</b>	Upper slopes over a crest
<b>Seasonal Condition</b>	Dry Season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	95
<b>Vegetation Code</b>	TeRm	<b>Surface Rock Size and Shape</b>	Block 2-250L
<b>Vegetation Association</b>	<i>Triodia epactia</i> hummock grassland with <i>Rhynchosia minima</i> lianes		
<b>Condition</b>	Noise and light from processing plant		
<b>Site</b>	26	<b>Soil Type</b>	N/A
<b>Date</b>	21/11/2018	<b>Soil Colour</b>	N/A
<b>Aspect</b>	W	<b>Landform</b>	Rocky outcrop
<b>Seasonal Condition</b>	Dry season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100
<b>Vegetation Code</b>	BaAclc	<b>Surface Rock Size and Shape</b>	Blocky 2L - 1.5m <sup>3</sup>
<b>Vegetation Association</b>	Open low woodland of <i>Brachychiton acuminatus</i> over mixed shrubland of <i>Acacia coriacea</i> , <i>Scaevola spinescens</i> , <i>Ipomoea costata</i> over herbs and very open grassland of <i>Triodia epactia</i> with <i>Cymbopogon ambiguus</i> and <i>Paspalidium clementii</i>		




<b>Condition</b>	No disturbances		
<b>Site</b>	27	<b>Soil Type</b>	Clay loam
<b>Date</b>	21/11/2018	<b>Soil Colour</b>	Brown
<b>Aspect</b>	E	<b>Landform</b>	Eastern lower slope below small rocky outcrop
<b>Seasonal Condition</b>	Dry season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100
<b>Vegetation Code</b>	TeCa	<b>Surface Rock Size and Shape</b>	Blocky 2L - 50L
<b>Vegetation Association</b>	<i>Triodia epactia</i> , <i>Cymbopogon ambiguus</i> hummock/tussock grassland		
<b>Condition</b>	No disturbances		
<b>Site</b>	28	<b>Soil Type</b>	Clay loam
<b>Date</b>	21/11/18 & 13/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	Lower slopes/plains
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	85
<b>Vegetation Code</b>	Tw	<b>Surface Rock Size and Shape</b>	Blocky 0.1 - 0.25L
<b>Vegetation Association</b>	<i>Triodia wiseana</i> hummock grasslands		
<b>Condition</b>	N/A		
<b>Site</b>	29	<b>Soil Type</b>	Sand - loamy sand
<b>Date</b>	21/11/18 & 13/05/19	<b>Soil Colour</b>	Pale Brown
<b>Aspect</b>	Flat	<b>Landform</b>	Sandbank 1m deep above mudflats
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	0
<b>Vegetation Code</b>	(Te)Sv	<b>Surface Rock Size and Shape</b>	N/A







<b>Vegetation Association</b>	Grassland of <i>Sporobolous virginicus</i> , <i>Eriachne mucronata</i> and <i>Paspalidium tabulatum</i> (30-70%) with scattered <i>Triodia epactia</i> . Evidence that <i>*Cenchrus ciliaris</i> and <i>*Aerva javanica</i> are common in wet season.		
<b>Condition</b>	Kapok cover high in wet season		
<b>Site</b>	30	<b>Soil Type</b>	Clay loam
<b>Date</b>	21/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	lower plains drop into samphire. Lateritic cliffs in front of mudflats
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	AbTa	<b>Surface Rock Size and Shape</b>	Blocky 50 - 100 mL
<b>Vegetation Association</b>	<i>Acacia bivenosa</i> high open shrubs over <i>Triodia angusta</i> hummock grassland		
<b>Condition</b>	Clearing and rehab to south adjacent to vegetation. Vegetation in poor condition, coated in dust		
<b>Site</b>	31	<b>Soil Type</b>	Sandy, shell rich
<b>Date</b>	21/11/18 & 12/05/19	<b>Soil Colour</b>	Pale brown/grey
<b>Aspect</b>	Flat	<b>Landform</b>	Lower slopes/ plain rehab
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	0
<b>Vegetation Code</b>	AbTe*Cc	<b>Surface Rock Size and Shape</b>	Many shells and old coral
<b>Vegetation Association</b>	Previously disturbed and rehabilitated. <i>Acacia bivenosa</i> tall shrubland (30-70%, 2.5m) over Hummock Grassland of <i>Triodia epactia</i> (30-70%) with <i>*Cenchrus ciliaris</i>		
<b>Condition</b>	Rehabilitated area. Dense weed cover. Dust coating on shrubs.		


<b>Site</b>	32	<b>Soil Type</b>	Clay loam
<b>Date</b>	21/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Mid slopes
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	ChImTe	<b>Surface Rock Size and Shape</b>	Mostly rounded 0.25 - 0.5L
<b>Vegetation Association</b>	<i>Corymbia hamersleyana</i> scattered low trees to low open woodland over ( <i>Acacia bivenosa</i> , <i>Acacia coriaceae</i> subsp. <i>coriaceae</i> ) scattered tall shrubs over ( <i>Dichrostachys spicata</i> ) scattered shrubs over <i>Indigofera monophylla</i>		
<b>Condition</b>	Weeds present		
<b>Site</b>	33	<b>Soil Type</b>	Sandy clay loam
<b>Date</b>	21/11/18 & 15/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Mid slopes
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	85
<b>Vegetation Code</b>	TeTh	<b>Surface Rock Size and Shape</b>	00.25 - 25L
<b>Vegetation Association</b>	<i>Triodia epactia</i> , <i>Themeda triandra</i> hummock/tussock grassland		
<b>Condition</b>	Rehabilitated		
<b>Site</b>	34	<b>Soil Type</b>	Clay loam / sand
<b>Date</b>	21/11/18 & 13/05/19	<b>Soil Colour</b>	Brown / white
<b>Aspect</b>	N	<b>Landform</b>	Flats between lower slopes and mudflats
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite and calcareous
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	20
<b>Vegetation Code</b>	AbTe*Cc	<b>Surface Rock Size and Shape</b>	0.25 - 25L





<b>Vegetation Association</b>	Previously disturbed and rehabilitated. <i>Acacia bivenosa</i> tall shrubland (30-70%, 2.5m) over Hummock Grassland of <i>Triodia epactia</i> (30-70%) with * <i>Cenchrus ciliaris</i>		
<b>Condition</b>	Rehabilitated. *Cc. Some shrubs covered in dust		
<b>Site</b>	35	<b>Soil Type</b>	Clay loam - cracking clays
<b>Date</b>	22/11/18 & 13/05/19	<b>Soil Colour</b>	Pinkish
<b>Aspect</b>	Mounds and Channels	<b>Landform</b>	Road building bunds and drainage channels
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	0
<b>Vegetation Code</b>	(Te)Sv	<b>Surface Rock Size and Shape</b>	N/A
<b>Vegetation Association</b>	Grassland of <i>Sporobolous virginicus</i> , <i>Eriachne mucronata</i> and <i>Paspalidium tabulatum</i> (30-70%) with scattered <i>Triodia epactia</i> . Evidence that * <i>Cenchrus ciliaris</i> and * <i>Aerva javanica</i> are common in wet season.		
<b>Condition</b>	Disturbed. Spontaneous regeneration		
<b>Site</b>	36	<b>Soil Type</b>	Loam
<b>Date</b>	22/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Gully, approximately 25 m in the mid-slopes
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	85
<b>Vegetation Code</b>	ChAbTe	<b>Surface Rock Size and Shape</b>	Mostly rounded 0.025 - 0.5L
<b>Vegetation Association</b>	<i>Corymbia hamersleyana</i> scattered trees to low open woodland over <i>Acacia bivenosa</i> open shrubland over <i>Triodia epactia</i> open to closed hummock grassland		
<b>Condition</b>	Vehicle tracks through centre		
<b>Site</b>	37	<b>Soil Type</b>	Clay loam




<b>Date</b>	22/11/18 & 12/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	N	<b>Landform</b>	Lower slope
<b>Seasonal Condition</b>	Dry and wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	40
<b>Vegetation Code</b>	*CcTs	<b>Surface Rock Size and Shape</b>	0.2 - 2L
<b>Vegetation Association</b>	<i>*Cenchrus ciliaris</i> , ( <i>Triodia epactia</i> ), ( <i>Triodia angusta</i> ) grassland/hummock grassland with <i>Tephrosia supina</i> , <i>Rhyncosia minima</i> herbland		
<b>Condition</b>	Previously disturbed. Weeds present		
<b>Site</b>	38	<b>Soil Type</b>	Loamy sand - sandy loam
<b>Date</b>	22/11/18 & 12/05/19	<b>Soil Colour</b>	Brown - pale grey
<b>Aspect</b>	N	<b>Landform</b>	Mid slope
<b>Seasonal Condition</b>	Dry and wet Season	<b>Rock Type</b>	Granite and calcareous
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	20
<b>Vegetation Code</b>	ChTh	<b>Surface Rock Size and Shape</b>	0.02 - 0.05L
<b>Vegetation Association</b>	<i>Corymbia hamersleyana</i> scattered low trees to low woodland over <i>Acacia bivenosa</i> , <i>Acacia coleii</i> , scattered tall shrubs to low open shrubland over <i>Indigofera monophylla</i> over <i>Triodia epactia</i> , <i>Themeda triandra</i> hummock/tussock grassland		
<b>Condition</b>	dead Acacia shrubs likely caused from thick dust coating		
<b>Site</b>	39	<b>Soil Type</b>	Clay loam
<b>Date</b>	22/11/18 & 13/05/19	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	Lower slope, undulating large rocks
<b>Seasonal Condition</b>	Dry and wet Season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	100
<b>Vegetation Code</b>	AbHICwTe	<b>Surface Rock Size and Shape</b>	0.25 - 1m <sup>3</sup>




<b>Vegetation Association</b>	High shrubland of <i>Acacia bivenosa</i> with scattered <i>Hakea lorea</i> , <i>Dolichandrone heterophylla</i> , <i>Grevillea pyramidalis</i> over hummock grassland of <i>Triodia epactia</i> with occasional <i>Triodia angusta</i>			
<b>Condition</b>	N/A			
<b>Site</b>	40	<b>Soil Type</b>	Clay loam	
<b>Date</b>	22/11/18 & 15/05/19	<b>Soil Colour</b>	Brown	
<b>Aspect</b>	S	<b>Landform</b>	Lower slope, shallow drainage line	
<b>Seasonal Condition</b>	Dry and Wet Season	<b>Rock Type</b>	Granite	
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	80	
<b>Vegetation Code</b>	AiGpTe	<b>Surface Rock Size and Shape</b>	0.2 - 1L	
<b>Vegetation Association</b>	Tall shrubland of <i>Acacia inaequilatera</i> and <i>Grevillea pyramidalis</i> over hummock grassland of <i>Triodia epactia</i> (Burrup Form) over herbland of <i>Gomphrena cunninghamii</i> , <i>Abutilon lepidum</i> , <i>Trichodesma zeylanicum</i> , <i>Trachymene oleracea</i>			
<b>Condition</b>	No disturbances			

<b>Site</b>	41	<b>Soil Type</b>	Clay loam	
<b>Date</b>	14/05/2019	<b>Soil Colour</b>	Brown	
<b>Aspect</b>	south	<b>Landform</b>	Low rocky rise	
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite	
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90	
<b>Vegetation Code</b>	TeRm	<b>Surface Rock Size and Shape</b>	blocky 2L to 50L	
<b>Vegetation Association</b>	<i>Triodia epactia</i> hummock grassland with <i>Rhynchosia minima</i> lianes			
<b>Condition</b>	No Disturbances			





<b>Site</b>	42	<b>Soil Type</b>	Sand/shells
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	White
<b>Aspect</b>	north	<b>Landform</b>	Sandbank
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No signs of fire	<b>Rock Cover</b>	-
<b>Vegetation Code</b>	ThTil	<b>Surface Rock Size and Shape</b>	-
<b>Vegetation Association</b>	Dwarf open shrubland to heath (varies 2-10% to 20-40%) of <i>Tecticornia halocnemoides</i> with <i>Tecticornia indica</i>		
<b>Condition</b>	Buffel grass on the margins, evidence of land clearing for road building and some evidence of ripping		
<b>Site</b>	43	<b>Soil Type</b>	Sand
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	White
<b>Aspect</b>	north	<b>Landform</b>	Mudflat margins
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	70
<b>Vegetation Code</b>	Tht	<b>Surface Rock Size and Shape</b>	Blocky 0.1 – 0.25 L
<b>Vegetation Association</b>	Dwarf scattered (<2%) to open (2-10% <0.5m) shrubland of <i>Tecticornia halocnemoides</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	54	<b>Soil Type</b>	Sand
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	White
<b>Aspect</b>	north	<b>Landform</b>	Mudflat margins
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	70
<b>Vegetation Code</b>	Tht	<b>Surface Rock Size and Shape</b>	Blocky 0.1 – 0.25 L




<b>Vegetation Association</b>	Dwarf scattered (<2%) to open (2-10% <0.5m) shrubland of <i>Tecticornia halocnemoides</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	45	<b>Soil Type</b>	Sand
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	White
<b>Aspect</b>	north	<b>Landform</b>	Mudflat margins
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	75
<b>Vegetation Code</b>	Tht	<b>Surface Rock Size and Shape</b>	Blocky 0.1 – 0.25 L
<b>Vegetation Association</b>	Dwarf scattered (<2%) to open (2-10% <0.5m) shrubland of <i>Tecticornia halocnemoides</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	46	<b>Soil Type</b>	Sand/shell
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	White
<b>Aspect</b>	-	<b>Landform</b>	sandbank
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	No rock
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	-
<b>Vegetation Code</b>	(Te)Sv	<b>Surface Rock Size and Shape</b>	-
<b>Vegetation Association</b>	Grassland of <i>Sporobolous virginicus</i> , <i>Eriachne mucronata</i> and <i>Paspalidium tabulatum</i> (30-70%) with scattered <i>Triodia epactia</i> . Evidence that <i>*Cenchrus ciliaris</i> and <i>*Aerva javanica</i> are common in wet season.		
<b>Condition</b>	Weeds Buffel grass and Kapok. Infrastructure pipelines cut through this		
<b>Site</b>	47	<b>Soil Type</b>	Loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	brown


<b>Aspect</b>	S	<b>Landform</b>	Lower slopes/flats
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	60
<b>Vegetation Code</b>	AbTa	<b>Surface Rock Size and Shape</b>	Rounded 0.2 to 5 L
<b>Vegetation Association</b>	<i>Acacia bivenosa</i> high open shrubs over <i>Triodia angusta</i> hummock grassland		
<b>Condition</b>	A few scattered Kapok		
<b>Site</b>	48	<b>Soil Type</b>	Sand
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	White
<b>Aspect</b>	Flat	<b>Landform</b>	sand bank
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	0
<b>Vegetation Code</b>	(Te)Sv	<b>Surface Rock Size and Shape</b>	N/A
<b>Vegetation Association</b>	Grassland of <i>Sporobolous virginicus</i> , <i>Eriachne mucronata</i> and <i>Paspalidium tabulatum</i> (30-70%) with scattered <i>Triodia epactia</i> . Evidence that <i>*Cenchrus ciliaris</i> and <i>*Aerva javanica</i> are common in wet season.		
<b>Condition</b>	Kapok and Buffel grass common		
<b>Site</b>	49	<b>Soil Type</b>	clay loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	brown
<b>Aspect</b>	S	<b>Landform</b>	Lower slopes
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	50
<b>Vegetation Code</b>	AbHICwTe	<b>Surface Rock Size and Shape</b>	Blocky 2 L to 50 L
<b>Vegetation Association</b>	High shrubland of <i>Acacia bivenosa</i> with scattered <i>Hakea lorea</i> , <i>Scaevola spinescens</i> , <i>Grevillea pyramidalis</i> over open dwarf shrubland of <i>Corchorus walcottii</i> over hummock grassland of <i>Triodia epactia</i> with occasional <i>Triodia angusta</i> . There are small groves of		



	<i>Dolichandrone heterophylla</i> within this association.		
<b>Condition</b>	A few scattered Kapok		
<b>Site</b>	50	<b>Soil Type</b>	Loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Brown
<b>Aspect</b>	s	<b>Landform</b>	Upper slopes
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	60
<b>Vegetation Code</b>	AiGpTe	<b>Surface Rock Size and Shape</b>	Blocky 0.2 to 10 L
<b>Vegetation Association</b>	Tall shrubland of <i>Acacia inaequilatera</i> and <i>Grevillea pyramidalis</i> over hummock grassland of <i>Triodia epactia</i> over herbland of <i>Gomphrena cunninghamii</i> , <i>Abutilon lepidum</i> , <i>Trichodesma zeylanicum</i> , <i>Trachymene oleracea</i>		
<b>Condition</b>	No disturbances		
<b>Site</b>	51	<b>Soil Type</b>	Loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Brown
<b>Aspect</b>	E	<b>Landform</b>	Below low outcrop
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	TeCa	<b>Surface Rock Size and Shape</b>	0.2 to 2 L
<b>Vegetation Association</b>	<i>Triodia epactia</i> , <i>Cymbopogon ambiguus</i> hummock/Tussock grassland		
<b>Condition</b>	No disturbances		
<b>Site</b>	52	<b>Soil Type</b>	Loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Brown
<b>Aspect</b>	E	<b>Landform</b>	Below low outcrop
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	90
<b>Vegetation Code</b>	TeCa	<b>Surface Rock Size and Shape</b>	0.2 to 2 L
<b>Vegetation Association</b>	<i>Triodia epactia</i> , <i>Cymbopogon ambiguus</i> hummock/Tussock grassland		
<b>Condition</b>	No disturbances		
<b>Site</b>	53	<b>Soil Type</b>	Sand/shells
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	white
<b>Aspect</b>	Flat	<b>Landform</b>	Sandbank
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	No rocks
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	-

<b>Vegetation Code</b>	ThTil	<b>Surface Rock Size and Shape</b>	-
<b>Vegetation Association</b>	Dwarf open shrubland to heath (varies 2-10% to 20-40%) of <i>Tecticornia halocnemoides</i> with <i>Tecticornia indica</i>		
<b>Condition</b>	Some Kapok and Buffel grass on the landward margin		
<b>Site</b>	54	<b>Soil Type</b>	loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	lower slopes
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	70
<b>Vegetation Code</b>	TeRm	<b>Surface Rock Size and Shape</b>	0.2 to 2 L
<b>Vegetation Association</b>	<i>Triodia epactia</i> hummock grassland with <i>Rhynchosia minima</i> lianes		
<b>Condition</b>	No disturbances		
<b>Site</b>	55	<b>Soil Type</b>	Sandy
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Light Brown
<b>Aspect</b>	west	<b>Landform</b>	Drainage
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	80
<b>Vegetation Code</b>	1999 4a	<b>Surface Rock Size and Shape</b>	0.2 - 0.2L weathered smooth
<b>Vegetation Association</b>	Low Woodland-Forest B (20-50%) of <i>Terminalia circumulata</i> and <i>Eucalyptus victrix</i> with Low Scrub B (10-30%, 1-1.5m) and Open Grassland (10-30%)		
<b>Condition</b>	No disturbance but drainage feature impeded by infrastructure to the east and west.		
<b>Site</b>	56	<b>Soil Type</b>	Sand
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	white
<b>Aspect</b>	S	<b>Landform</b>	Sandbank
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	20
<b>Vegetation Code</b>	*Cc*AjTt	<b>Surface Rock Size and Shape</b>	gravel

<b>Vegetation Association</b>	Disturbed not rehabilitated area of <i>*Cenchrus ciliaris</i> <i>*Aerva javanica</i> and <i>Trianthema turgidifolia</i>		
<b>Condition</b>	Completely degraded, spontaneous growth of Kapok, Buffel grass and <i>T. turgidifolia</i> following disturbance for infrastructure.		
<b>Site</b>	57	<b>Soil Type</b>	clay loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Brown
<b>Aspect</b>	S	<b>Landform</b>	Lower slopes
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	70
<b>Vegetation Code</b>	AiGpTe	<b>Surface Rock Size and Shape</b>	2 – 50 L
<b>Vegetation Association</b>	Tall shrubland of <i>Acacia inaequilatera</i> and <i>Grevillea pyramidalis</i> over hummock grassland of <i>Triodia epactia</i> over herbland of <i>Gomphrena cunninghamii</i> , <i>Abutilon lepidum</i> , <i>Trichodesma zeylanicum</i> , <i>Trachymene oleracea</i>		
<b>Condition</b>	Between gas pipeline and road and cleared area, otherwise no disturb.		
<b>Site</b>	58	<b>Soil Type</b>	loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Red/brown
<b>Aspect</b>	S	<b>Landform</b>	Lower slopes
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	70
<b>Vegetation Code</b>	Te	<b>Surface Rock Size and Shape</b>	2-50 L
<b>Vegetation Association</b>	<i>Triodia epactia</i> hummock grassland. Associated species include <i>Grevillea pyramidalis</i> subsp. <i>pyramidalis</i> and <i>Indigofera monophyla</i> .		
<b>Condition</b>	Between gas pipeline and road, otherwise no disturb.		
<b>Site</b>	59	<b>Soil Type</b>	Clay loam
<b>Date</b>	15/05/2019	<b>Soil Colour</b>	Brown

<b>Aspect</b>	west	<b>Landform</b>	Mid slopes
<b>Seasonal Condition</b>	Wet season	<b>Rock Type</b>	Granite
<b>Fire Age</b>	No evidence	<b>Rock Cover</b>	65
<b>Vegetation Code</b>	TeAb	<b>Surface Rock Size and Shape</b>	0.2 – 10L
<b>Vegetation Association</b>	<i>Triodia epactia</i> hummock grassland with scattered <i>Acacia bivenosa</i> shrubs		
<b>Condition</b>	Between gas pipeline and road, otherwise no disturb.		

**APPENDIX H: CONSERVATION SIGNIFICANT FAUNA (TERRESTRIAL) RECORDED WITHIN DATABASE SEARCHES AND DURING FIELD SURVEY(S)**

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<b>Birds</b>							
<i>Accipiter fasciatus</i>	Brown Goshawk	M <sup>1</sup>	-	Hunts over forest and woodland, dry scrub and farmland. Feeds on small birds and ground-dwelling rodents and mammals, catching them in flight or on the ground. This species is common and sedentary.	Recorded	Yes	This species has been recorded historically recorded within the Burrup Peninsula (Worley Astron, 2006). Suitable foraging and nesting habitat exists in the Project Area for this species, though was not recorded during the pre-wet season survey. Recorded in Worley Astron (2006).
<i>Acrocephalus australis</i>	Australian Reed-Warbler	M	-	A common migrant. This species inhabits dense reedbeds alongside water but can utilise tall crops and bamboo thickets as well.	Low	No	No suitable habitat exists in the Project Area. The species has been recorded in near-coastal wetland areas in scattered locations within Dampier and the Burrup Peninsula.
<i>Actitis hypoleucos</i>	Common Sandpiper	M, IA <sup>2</sup>	IA	Though typically associated with estuaries, mangroves and creeks, this species is known to occupy small river pools, areas of inundation and flooding, particularly as water recedes. It is also commonly observed on artificial water bodies, such as sewage ponds. Across its distribution it is widespread in small numbers.	Low	Yes	This species has been recorded in the Dampier region on the Roly Rock islet and other islets in the archipelago (DBCA, 2018). Records indicate the species prefers the mangroves and intertidal pools present on many of the islands in the archipelago. Recorded in Worley Astron, 2006.

<sup>1</sup> Listed as a Marine species under the *EPBC Act* (1999).

<sup>2</sup> Listed as a Migratory species under International Agreement under the *EPBC Act* (1999).



Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Anous stolidus</i>	Common Noddy	M, IA	IA	Resides and breeds within coastal waters near island colonies during migration.	Low	No	This species has been recorded at Withnell Bay, west of Project Area (DBCA, 2018). Only one bird was recorded. The species can form large colonies on some islands utilising seaweed and other plant material to build a nest on the ground or dense coastal shrubbery. This species is a short-term visitor between May and October, and potential breeding habitat is not expected to be impacted by the Project.
<i>Anthus novaeseelandiae</i>	Australasian Pipit	M	-	Inhabits grasslands, forest clearings, grassy woodlands, semi-open scrub, beaches and hind-dunes and grassy roadsides. Nests in depressions sheltered by rock or clumps of vegetation.	Recorded	Yes	This species was recorded during the pre-wet season survey. This species can be considered locally nomadic and common, and breeds between August and December. Given its widespread distribution, and broad availability of suitable and undisturbed habitat in the greater Pilbara, the Project is not expected to impact populations of this species.
<i>Apus pacificus</i>	Fork-tailed Swift	M, IA	IA	This species flies over inland plains but also occasionally foothills or coastal areas, such as beaches and islands and well out to sea. They occur over dry or open habitats comprising of riparian woodland, low scrub, heathland or saltmarsh, also grasslands and sandplains with spinifex (Morcombe, 2011).	Low	Yes	This species has been historically recorded in the Dampier region on Enderby Island (DBCA, 2018). There are scattered records along the coast from south-west Pilbara to the north and east Kimberley. This species is almost exclusively aerial and has a wide range of suitable habitats for foraging. The species nests on island cliff faces and would not be reliant on any habitat within the Project Area. Recorded in Worley Astron 2006.
<i>Ardea alba</i>	Great Egret	M	-	Inhabits floodwaters, rivers, shallows of wetlands and intertidal mudflats.	Low	Yes	Common and widespread in any suitable permanent or temporary habitat. Recorded in Worley Astron 2006.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Ardea ibis</i>	Cattle Egret	M		Often congregates in flocks amongst cattle. It frequents moist pastures with tall grass, open and shallow wetlands and mudflats. Species is common across northern Australia.	Moderate	Yes	This species was identified in the EPBC PMST. The species may use the temporarily flooded mudflats present in the Project Area during the wet season. The species has not been recorded during any surveys in the area before.
<i>Ardenna pacifica</i>	Wedge-tailed Shearwater	M, IA	IA	Frequents pelagic oceans, feeding across the surface, especially where deep water meets inshore water.	Low	No	This species has been recorded on Quartermaine Island off Rosemary in the Dampier Archipelago (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). This species would not be likely to use any habitat in the Project Area, especially as breeding and foraging is undertaken on offshore islands.
<i>Arenaria interpres</i>	Ruddy Turnstone	M, IA	IA	Resides on ocean coasts with exposed rock, stony or shell beaches, but also mudflats and sometimes inland on shallow pools.	Moderate	Yes	This species has been recorded on Roly Rock, a small, distant island off the coast of Dampier, King Bay and Cowrie Cove on the Burrup Peninsula (DBCA, 2018). This species is common. Given their preference for foraging on exposed reefs and under beach stones and seaweed, this species is more likely to be reliant on coastal areas, which will not be directly impacted by the Project.
<i>Cacomantis pallidus</i>	Pallid Cuckoo	M	-	Forages on ground and foliage, feeding on large insects, even hairy caterpillars. Inhabits open areas, avoiding dense closed vegetation. Lays egg in other bird open cup nests, pushing out other bird's eggs/chicks.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM during the post-wet season survey. Suitable foraging and breeding habitat is present within the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M, IA	IA	Scarce to moderately common. Widespread in coastal and interior wetlands. Mudflats in tidal zones, salt marshes or in fresh/saline/brackish inland water bodies.	Low	Yes	This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). The Project Area may provide some foraging habitat however, the species is widespread and has broad habitat requirements – it would not rely on the habitats present in the Project Area for the short time it is available during the wet season.
<i>Calidris alba</i>	Sanderling	M, IA	IA	Open, sandy beaches washed by ocean swells.	Low	No	This species has been recorded on Roly Rock, a small, distant island off the coast of Dampier (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). It is a regular migrant, and often seen in large flocks on favoured beaches, however it is rarely recorded using inland wetlands, saltponds and samphire flats. This species is unlikely to occur.
<i>Calidris canutus</i>	Red Knot	EN, M, IA	EN, IA	In close proximity to coastal waters such as mudflats and sandflats in estuaries. Also known to occur in salt ponds and salt lakes near the coast.	Moderate	Yes	This species has been recorded in the Dampier region (DBCA, 2018) and less recently on the Burrup Peninsula (Worley Astron, 2006). The species is known to follow tide edges when foraging, and can be seen with many other shore birds, such as the Red-necked Stint, which was recorded on site, within the samphire habitat. Given the proximity to Hearson's Cove, and the presence of open flats within the Project Area, this species may use the area for both foraging and roosting. This species was not recorded on either of APM's surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR, M, IA	CR, IA	Known to occupy drying near-coastal freshwater lakes and swamps. Predominantly occurring in the shallows of estuaries and attracted to near-coastal water bodies, such as salt ponds, salt lakes, sewage ponds, beaches and freshwater swamps and lakes.	Moderate	Yes	This species has been recorded in the Dampier region (DBCA, 2018) and historically on the Burrup (Worley Astron, 2006). This species may use the Project Area during the wet season, though records suggest that the species prefers undisturbed islands and islets.
<i>Calidris melanotos</i>	Pectoral Sandpiper	M, IA	IA	Utilises fresh and saline coastal wetlands, and also inland permanent or temporary wetlands. Prefers mudflats with fringing vegetation or swamps with heavy overgrowth of vegetation.	Low	Yes	Regular but uncommon in Australia, and generally occurs in the southeast. Though the habitat for this species is suitable in the Project Area, the mudflats are very open and there are no true dense swampy areas. This species preferred habitat is not present.
<i>Calidris ruficollis</i>	Red-necked Stint	M, IA	IA	Inhabits a diverse range of habitats, both tidal and inland, mudflats, salt marshes, beaches, salt fields, temporary floodwaters. Is a very common migrant in areas that are most favoured and scattered elsewhere.	Recorded	Yes	This species was recorded during the pre-wet season survey. This species is not likely to use the Project Area exclusively, especially given the nearest major and favoured feeding area is Roebuck Bay, 600 km north of the Burrup Peninsula.
<i>Calidris subminuta</i>	Long-toed Stint	M, IA	IA	Appears in pairs, singularly or in flocks within favoured sites. Uses shallow fresh water, brackish swamps, lakes with muddy edges. Prefers low vegetation rather than open mudflats. Scarcely seen.	Low	No	This species has been historically recorded on the Burrup (Worley Astron, 2006). It is unlikely that this species would use the open mudflats present in the Project Area.
<i>Calidris tenuirostris</i>	Great Knot	CR, M, IA	CR, IA	Often seen in large flocks of hundreds to thousands of birds. Forages over inter-tidal flats. Will reside in sheltered coastal mudflats of estuaries, lagoons and mangrove swamps. Sometimes uses salt lakes but rarely inland waters.	Low	No	This species has been historically recorded on the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of APM's surveys. The samphire/mudflat habitat is likely too open for this species, and it does not that contain the mangrove swamps it prefers.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Calonectris leucomelas</i>	Streaked Shearwater	M, IA	IA	Frequents pelagic oceans, shelf waters and edges and follows fishing boats. Very rarely inhabits inshore areas.	Low	No	This species was identified as a migrant within the area according to the EPBC PMST. It is not likely to utilise any habitats present in the Project Area.
<i>Chalcites osculans</i>	Black-eared Cuckoo	M	-	Inhabit dry habitats such as open woodland, mulga and mallee, sparse and open arid areas with spinifex, grassland or salt marsh and lines of vegetation along watercourses. Present across most of northern Australia.	Recorded	Yes	A solitary and inconspicuous species. This species breeds in the south east after rain in rain semi-arid regions. This species is a transitory visitor to site. Recorded in Worley Astron 2006 and APM
<i>Charadrius leschenaultii</i>	Greater Sand Plover	VU, M, IA	VU, IA	Resides in large mixed-species flocks on coastal, intertidal mudflats and sandbanks of sheltered bays. Less common on coastal salt marshes and brackish or freshwater wetlands.	Moderate	Yes	This species has been recorded northeast of Rosemary Island on an islet called Lady Nora within the Dampier archipelago and Hearson's Cove. This species is a regular migrant between August and May and is most common in northern Australia. The species is not expected to be reliant on the Project Area habitats given it prefers sheltered bays and intertidal mudflats.
<i>Charadrius mongolus</i>	Lesser Sand Plover	EN, M, IA	EN, IA	Inhabits intertidal sandflats and mudflats, beaches and sandbars and reef flats.	Low	Yes	This species has been historically recorded on Dolphin Island in the Dampier region. This species sometimes overwinters in northern Australia. It is abundant in Queensland, and uncommon elsewhere in Australia. This species is not expected to rely on habitats present in the Project Area, especially as this species does not breed in Australia.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Charadrius ruficapillus</i>	Red-capped Plover	M	-	Inhabits coastal, sheltered estuaries, salt marsh lagoons, and inland areas consisting of salty edges of waterways, brackish pools and claypans. Highest numbers can occur on inland salt lakes.	Recorded	Yes	This species was recorded during the pre-wet and post-wet season surveys. It is one of the most common shorebirds, and it breeds within northern Australia between September and December, where they create nests on beach or beside claypans or salt lakes. This species is not dependent on specific habitat types and is not expected to be impacted locally or regionally by the Project development. No nests were recorded.
<i>Charadrius veredus</i>	Oriental Plover	M, IA	IA	This species prefers samphire vegetation and other sparse grassy flats.	Low	Yes	This species has been recorded in the Dampier region on Enderby Island (DBCA, 2018). Suitable habitat is present in the Project Area, however, it was not recorded on either of the APM surveys.
<i>Chlidonias hybrida</i>	Whiskered Tern	M	-	An inland species that uses inland freshwater or permanent/temporary floodwater, claypans, sometimes estuaries or marine habitat. Occurs in flocks usually when foraging.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM during the post-wet season survey. The presence of this species is dependent on rainfall and flooding of wetlands. The species could utilise the samphire vegetation present in the Project Area for breeding. No evidence of breeding (presence of nests) was identified by APM.



Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Chlidonias leucopterus</i>	White-winged Black Tern	M, IA	IA	Inhabits marine and freshwater coastal wetlands, including inundated floodplains and estuaries. A regular migrant to Australia, common in the Top End. They congregate in large flocks in preferred sites and at staging sites before northern migration (Alva Beach Queensland and Perron Island Northern Territory). Elsewhere they roost and forage in small flocks or can be seen in twos, threes or singularly (DoEE, 2018).	Moderate	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during the pre-wet season survey. This species could utilise the marshy habitat present within the samphire vegetation and claypans. If present, the species would only likely be in small numbers as the area is not a "staging site".
<i>Chroicocephalus novaehollandiae</i>	Silver Gull	M	-	Very common and widespread bird. Inhabits diverse habitat-types including beaches, temporary floodwaters, inland rivers etc.	Recorded	Yes	This species was recorded by APM during both surveys. The species is not limited to one habitat type and will not be impacted by the Project development.
<i>Chrysococcyx basalis</i>	Horsfield's Bronze-Cuckoo	M	-	A common bird across all of Australia. Its most commonly frequented habitat types include open forest, woodland and roadside trees.	Low	Yes	This species has been historically recorded on the Burrup (Worley Astron, 2006). Some suitable habitat exists in the Project Area, where the creek lines contain mature <i>Eucalyptus victrix</i> .
<i>Circus approximans</i>	Swamp Harrier	M		Forages over reed beds, open water of swamps and lakes, mangroves, salt marshes and temporary floodwaters. Builds nest within swamp or lake within dense reeds or other wetland plant material.	Low	Yes	This species has been recorded historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded in the Project Area surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	M	-	Inhabits exceptionally diverse habitats from semi-desert scrub to tall, wet forests of the southeast and Tasmania. It is found almost throughout the entirety of Australia.	Recorded	Yes	This species was recorded during both APM surveys. Given the lack of many overstorey trees in the Project Area, aside from scattered Eucalypts, this species is not likely to rely on the area for breeding, though it is possible. The wide diversity of its habitats mean that the species is not limited to select few habitats, especially habitat present in the Project Area, which is widespread elsewhere.
<i>Egretta garzetta</i>	Little Egret	M	-	Inhabits fresh and marine wetlands. Forages in the shallows of swamps, floodplain pools, mudflats and mangrove channels.	Recorded	Yes	This species was recorded by APM during both surveys. It is a common species in northern Australia.
<i>Egretta sacra</i>	Eastern Reef Egret	M	-	Inhabits estuarine mudflats and inshore reefs. Nests in colonies on islands within mangroves or on ground or ledges among shrubs and rocks.	Low	No	This bird has been recorded in the area before according to Worley Astron, in 1994 (Butler) and by CALM in an unpublished report. This species may use the habitat present adjacent the Project Area for feeding (mangrove and King Bay estuary), though if present would be more likely to utilise shorelines containing mangroves.
<i>Esacus magnirostris</i>	Beach Stone-curlew	M	-	Confined to marine tidal zone containing mudflats, mangroves, sandy stony and rocky shores.	Low	No	This species was recorded in 1994 (Worley Astron, 2006). This species is known to be shy and wary and avoids disturbed areas. If it were to occur, it would likely be in the islands that are largely undisturbed and contain mangrove swamps, north of Burrup and far off the coast of Dampier.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Eurostopodus argus</i>	Spotted Nightjar	M	-	Inhabits open, dry country with stony ground and litter of yellow/ochre coloured leaves. Open habitats such as spinifex, mallee, eucalypt, acacia and mulga. Species favours stony ridges.	Moderate	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of APM's surveys. The presence of rocky outcrops and open spinifex grasslands and scattered eucalypts make the Project Area quite suitable for this species.
<i>Falco cenchroides</i>	Nankeen Kestrel	M	-	Inhabits open habitats, woodlands, grasslands, sparse scrub, heath, farms, roadsides and coastal dunes. Common on the mainland.	Recorded	Yes	This species was recorded by APM during both surveys. The species breeds in the north between August and January. This species could use the area given the combination of large open areas for foraging, and tall Eucalyptus trees for nesting.
<i>Falco peregrinus</i>	Peregrine Falcon	-	OS	Very diverse habitat ranging from arid scrub, coastal heath and rainforest. Often hunts over offshore islands and estuaries.	Moderate	Yes	This species has been recorded at Burrup in 2006 and Hearson's Cove (DBCA, 2018). The Project Area could provide foraging habitat, though it would not provide adequate nesting habitat given the lack of undisturbed, tall cliff faces with sheltered ledges.
<i>Fregata ariel</i>	Lesser Frigatebird	M, IA	IA	Flies over shelf waters, open sea, close inshore and inland over continental coasts and perches on trees.	Low	Yes	This species has been recorded in the Dampier region on Cohen island (DBCA, 2018). This species is predominantly aerial and marine. It breeds between May and December and colonies are often found on islands. If it were present in the Project Area, it would be transitory, flying over the area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Gelochelidon nilotica</i>	Gull-Billed Tern	M, IA	IA	Occurs over inland and rarely over ocean. Nests on inland waters both fresh and saline. Uses water on mudflats, claypans, salt pans, salt marsh and areas of shallow flooding. Prefers lagoons and salt marshes near the coast when not breeding, and when breeding uses small islands.	low	Yes	This species has been recorded on Dolphin Island on the Dampier Archipelago (DBCA, 2018). This species may use the Project Area for foraging, though it is unlikely given its preferred habitat is coastal and intertidal areas.
<i>Glareola maldivarum</i>	Oriental Pratincole	M, IA	IA	Inhabits mudflats, beaches and shallow water areas such as margins of wetlands and lakes where large clouds of insects group.	Low	Yes	Dispersive and nomadic, the species ranges widely to locate the most productive sites. Is a temporary visitor to northern Australia. The species is known to rest on flat areas of ground which can be roads, airfields, paddocks and mudflats. Suitable habitat is widespread for this species.
<i>Grallina cyanoleuca</i>	Magpie-lark	M	-	Has diverse range of suitable habitats from coastal to semi-desert where water and trees occur. This species is well adapted to live in man-made environments, particularly where there is permanent water.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM in 2019. The species is a very common vagrant.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	OM	-	Perches on high cliffs overlooking coastal and inland waters. Inhabits islands, reefs, bays, estuaries, mangroves, lagoons and floodplains along major rivers.	Recorded	Yes	This species may hunt over the Project Area and surrounds, especially given the proximity of coastline surrounding the area, but would likely focus more on the offshore islands that contain extensive mangroves and pools. APM did record this species on the western side of the Project Area, flying over Burrup Road and the adjacent rocky outcrops.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Haliastur indus</i>	Brahminy Kite	M	-	Along shorelines, shallows, mangroves and mudflats. Prefers coasts with islands, mangroves, estuaries, mud-flats, harbours and coastal towns.	Recorded	Yes	This species was recorded during the pre-wet and post-wet season surveys. This species is known to scavenge for carrion along the shoreline and shallows and is also an opportunist hunting for fish, and reptiles and insects on land. The species likes to build its nests where mangroves meet the sea. The Project Area is not expected to provide ideal breeding habitat, though the species would use the area to forage. Extensive opportunities for feeding are present outside the Project Area.
<i>Haliastur sphenurus</i>	Whistling Kite	M	-	Often flies over wetlands, but also arid regions, open woodland and scrub.	Recorded	Yes	Is primarily a scavenger, locating carrion and roadkill. This species breeds in tall trees within a woodland, near or standing in water, creek or dam. The Project Area is likely to provide some suitable breeding and foraging habitat, given the presence of some tall Eucalypt woodlands in gullies, and the addition of roads and paths within and nearby the site, that the species could feed within. No nests were located.
<i>Himantopus himantopus</i>	Australian Pied Stilt	M	-	Inhabits shallow wetlands, interior claypans and salt lakes. Widespread and common. Breeds after substantial rain. The species builds a small platform nest of plant material within shallows of islet or beach.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM during the post-wet season survey. No nests were located in the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Hirundo neoxena</i>	Welcome Swallow	M	-	Typically occupy open habitats of woodland, grassland, wetland and farmland. Has adapted well to developed areas, and often utilises artificial habitats such as buildings and bridges that can offer sheltered sites for building mud nest. Nests can be made in mine shafts and under culverts as well. When not available, they use underside of cliffs and inside of large tree hollows.	Recorded	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006) and more recently by APM in 2019. This species could utilise the Project Area given the availability of nesting spots and foraging areas. It is a common vagrant species.
<i>Hirundo nigricans</i>	Tree Martin	M	-	Occupies open woodland and farmland containing trees not far from water. Uses small hollows in upper limbs of tall trees. Nomadic or migratory over most of its range and is common.	Recorded	Yes	This species has been recorded in 1994, 1995 and 2001 (Worley Astron, 2006), and more recently by APM during the post-wet season survey. The species would only use the area during the wet season when the gullies and channels within the Eucalyptus woodland are full of water.
<i>Hirundo rustica</i>	Barn Swallow	M, IA	IA	Visits northern Australia from September to March, in close proximity to towns and wetlands including salt ponds and swamps.	Moderate	Yes	This species may utilise artificial water bodies at the Project Area and natural areas containing the mudflats and clay pans.
<i>Hydroprogne caspia</i>	Caspian Tern	M, IA	IA	The species flies over the surf line and inshore waters. The species prefers sheltered estuaries, inlets, bays, harbours, lagoons with muddy or sandy shores. Will also utilise fresh and saltwater lakes and large rivers.	Recorded	Yes	This species has been recorded on Keast Island in the Dampier Archipelago (DBCA, 2018) and more recently by APM during the post-wet season survey. The species would be more inclined to use the undisturbed islets and islands off the archipelago and the individual recorded by APM was likely only an opportunistic visitor.



Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Hypotaenidia philippensis</i>	Buff-banded Rail	M	-	Feeds at dawn before full sunlight and at dusk, on exposed mudflats and open marshy ground. Resides within damp and dense vegetation around swamps, lakes and tidal mudflats. Dense vegetation is required for nesting, though can be far away from water, but usually not.	Low	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of the APM surveys. This species could use the samphire vegetation and possibly the more-swampy areas after rain throughout the Project Area, however the vegetation is likely too sparse to provide adequate nesting habitat.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	M, IA	IA	Prefers sheltered coastal estuaries and soft inter-tidal mudflats, coastal creeks, swamps and sewage ponds and only occasionally reefs. Often seen with Red-necked Stints or Curlew Sandpipers. A migrant to Australia, during non-breeding season. They mostly occur on the Pilbara and Kimberley coasts between Onslow and Broome (DoEE, 2018).	Moderate	Yes	The largest population of these birds is seen at the Port Hedland Saltworks (around 6000 birds). Suitable habitat for this species does occur adjacent the Project Area, though is not expected to be impacted.
<i>Limosa lapponica baueri</i>	Bar-tailed Godwit	VU, M, IA	VU	This species forages over coastal dunes. Has been observed amongst sand and mud flats in estuarine and beach areas, as well as near-coastal salt ponds and salt lakes.	Moderate	Yes	This species has been recorded in the Dampier region on Dolphin Island and Hearson's Cove (DBCA, 2018). This species may forage over the salt ponds and mud flats present in the Project Area.
<i>Limosa lapponica menzbieri</i>	Northern Siberian Bar-tailed Godwit	CR, M, IA	CR	This species forages over coastal dunes. Has been observed amongst sand and mud flats in estuarine and beach areas, as well as near-coastal salt ponds and salt lakes.	Low	Yes	This species is present in the north and south of Western Australia. This species may forage over the salt ponds and mud flats present in the Project Area.
<i>Limosa limosa</i>	Black-tailed Godwit	M, IA	IA	Inhabits coastal areas such as sheltered bays, islets containing large inland lakes, tidal mudflats and sandbars.	Low	Yes	This species has been recorded in the Dampier region (DBCA, 2018), however it is most abundant on the east coast of Darwin.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Macronectes giganteus</i>	Southern Giant-Petrel	EN, MM <sup>3</sup>	MM	Occupies marine habitats, over open seas and inshore waters. It favours the edges of the continental shelf. Gathers in areas of carrion and sewage for foraging.	Low	No	This species is far more common in the southern parts of Australia. This species would be a transitory visitor flying over site, if present at all.
<i>Merops ornatus</i>	Rainbow Bee-eater	M	-	Common and widespread, this species likes open woodland, open forest, semi-arid scrub, grassland, clearings in heavier forest and farmland. The emphasis is on open areas, as the species pursues insects in the air.	Recorded	Yes	This species was recorded during the pre-wet season survey. The species breeds before and after the Wet season. It digs long and narrow tunnels in soft, loamy soil of flat ground or banks that extends to a wide chamber where it nests. The species is likely to use the area for foraging and breeding within the mangrove, clay pans/salt lakes and creeklines. However, beach and dune systems adjacent and outside the Project Area could also provide suitable foraging and breeding habitat and the mangrove habitat is outside the development area.
<i>Motacilla cinerea</i>	Grey Wagtail	M, IA	IA	If seen in Australia, will inhabit fresh streams, mown grass, ploughed land or sewage ponds.	Low	No	This species rarely reaches Australia during its winter migration south of the equator.
<i>Motacilla flava</i>	Yellow Wagtail	M, IA	IA	Visitor between May and September in Australia, but uncommon in the northern Pilbara. Inhabits fresh streams, mown grass, ploughed land or sewage ponds.	Low	No	Uncommon and vagrant visitor to northwest Australia.
<i>Ninox novaeseelandiae</i>	Southern Boobook	M	-	Inhabits anywhere containing open eucalypt forest and woodland. Preys on insects and arthropods, small birds and rodents (and similar sized mammals). Roosts in dense foliage during the day. Requires either tree hollows or old babbler nests or hollowed out cliff for nesting.	Low	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during the pre-wet season survey. The vegetation is likely too sparse for this species to roost, though areas suitable for foraging are present.

<sup>3</sup> Listed as a Marine Migratory (of Australia only and not under International Agreement) under the *EPBC Act 1999*.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Numenius madagascariensis</i>	Eastern Curlew	CR, M, IA	CR, IA	Predominately found in estuarine systems, saltmarshes, tidal mudflats and mangroves. Can be found in brackish or freshwater lakes.	Moderate	Yes	This species has been recorded at Nickol Bay (east coast of Burrup) (DBCA, 2018). This species is a common migrant to the north, northeast and southeast of Australia.
<i>Numenius minutus</i>	Little Curlew	M, IA	IA	This bird flocks in large numbers across extensive swamps and billabongs of the coastal black-soil plains of northern Australia. Inhabits dry grassland of clay and black soil plains, river floodplains, woodlands with a grassy understorey. Forages on recently burnt grassland or open woodland. These birds also like artificial habitat such as grassed fields and lawns, airfields/ aerodromes and pasture.	Low	Yes	This species has been recorded at the Hampton Oval sports complex in Dampier (DBCA, 2018). This species is abundant along the northern coastlines of Australia. As it is commonly recorded on open cleared fields in developed areas, it is unlikely this species would rely on the Project Area habitats.
<i>Numenius phaeopus</i>	Whimbrel	M, IA	IA	Inhabits mudflats of estuaries, lagoons containing mangroves. Less often in sandy beaches, reefs and salt lakes.	Recorded	Yes	This species has been recorded on Dolphin Island in Dampier, King Bay and Cowrie Cove within the Burrup Peninsula (DBCA, 2018) and more recently by APM during the post-wet season survey. This species would be an opportunist during the wet season and not likely to rely on suitable habitat in the Project Area.
<i>Nycticorax caledonicus</i>	Nankeen Night Heron	M	-	Secluded wetlands; flooded grassland, damp fields, mangroves, tidal channels. Prefers sites that contain some dense tree cover for protection when roosting.	Low	Yes	This species has been recorded historically recorded within the Burrup Peninsula (Worley Astron, 2006). The species breeds in the late Wet season (Feb- Apr). The Project Area does not contain the mangroves, and much dense vegetation that the species likes for protection.
<i>Oceanites oceanicus</i>	Wilson's Storm Petrel	M, IA	IA	Inhabits deep pelagic seas, shelf slopes and shallower shelf and inshore waters. Records are usually from edge of continental shelf.	Low	No	This species is widespread and abundant. It has been historically recorded on the Burrup (Worley Astron, 2006). It is not expected to use habitats present in the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Onychoprion aneathetus</i>	Bridled Tern	M, IA	IA	Inhabits areas often far from land, forages on open seas and frequents islands and reefs to breed, sometimes inshore waters.	Low	No	This species has been recorded on Quartermaine Island in the Dampier Archipelago (DBCA, 2018). This species would be unlikely to use any waters present in the Project Area.
<i>Pandion cristatus</i>	Eastern Osprey	M, IA	IA	Inhabits coastal waters and estuaries, islets and exposed reefs. The species follows major rivers inland and even to large pools and gorges in arid regions. More common across northern coasts along rocky shorelines, islands and reefs.	Recorded	Yes	This species has been recorded on Roly Rock islet in Dampier (DBCA, 2018) and more recently by APM during the post-wet season survey. The species would be a transitory visitor, foraging or flying over site and would be more inclined to forage over the vast undisturbed rocky islets and islands across the Dampier archipelago, north and northwest of the Burrup.
<i>Pelecanus conspicillatus</i>	Australian Pelican	M	-	Wide distribution and much available habitat; any large or small area of water from sheltered coastal bays and estuaries to temporary pools in the desert.	Moderate	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of the APM surveys.
<i>Pezoporus occidentalis</i>	Night Parrot	EN	CR	Thought to be associated with spinifex or samphire bushes on the margins of salt lakes. It nests in the dense clumps of spinifex.	Low	Yes	This species is exceptionally rare and in low numbers. This species is known to inhabit inland very arid areas.
<i>Phalaropus lobatus</i>	Red-necked Phalarope	M, IA	IA	Frequents seas that are rich in plankton but does occasionally blow inshore to shelter from gales on coastal wetlands. It infrequently comes to land. Feeds on sea surface. The species has been observed on brackish, saline or fresh water pools and muddy margins. The species is considered a rare vagrant and is present at sea during the nonbreeding season.	Low	Yes	The species is a seasonal or occasional visitor of the Burrup Peninsula (Worley Astron, 2006). It was not recorded on either of the APM surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Pluvialis fulva</i>	Pacific Golden Plover	M, IA	IA	Occupies coastal habitats in small flocks or large flocks within estuaries, intertidal mudflats, salt marshes, reefs and offshore islands. The species disperses around suitable habitat areas on the coast.	Recorded	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018) and more recently by APM during the post-wet season survey. The species would be more inclined to inhabit the islands on the west side of Dampier and Burrup, where suitable habitat is vastly available, and especially where it is quieter, as the species is quite shy and wary. Only one individual was recorded by APM.
<i>Pluvialis squatarola</i>	Grey Plover	M, IA	IA	Inhabits coastal areas, marine shores of estuaries or lagoons, on broad open mudflats, sandbars, beaches, rock platforms, reef flats of rocky coasts. Also forages slightly inland near coast and on the margins of salt lakes or swamps.	Low	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018). Sometimes seen with Golden Plovers. This species is shy and tends to stay out far on shallows or flats. This species would likely inhabit the offshore islands and islets away from human development and where suitable habitat is abundant.
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet	M		Uses salt and freshwater wetlands. Large numbers reside on shallow salt lakes, especially as salinity rises during evaporation. They inhabit claypans and temporary flood waters. Breed after good rain.	Moderate	Yes	This species has been historically recorded within Burrup (Worley Astron, 2006). It was not recorded during either of APM's surveys.
<i>Rostratula australis</i>	Australian Painted-snipe	EN	EN	Resides within the dense vegetation of swamps, emerging during light of dawn and dusk. It prefers the surrounds of shallow wetlands that are well vegetated with dense low cover, typically swamps and flooded areas containing sedges and grasses. Breeds in inland southeast Australia amongst low samphire bushes.	Low	Yes	This species is very secretive and often not seen and therefore it is not well known. It is uncommon generally. Though the Project Area does contain large mudflat and clay pans with samphire, the majority of breeding records are from freshwater wetlands. It is not likely the area would provide preferred habitat, or that the species occurs in the area at all.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Sterna dougallii</i>	Roseate Tern	M, IA	IA	Inhabits marine, coastal and often coral reefs, foraging over reefs, lagoons and surrounds. Usually avoids mainland shoreline but may use shallow water just offshore (100 m).	Low	No	This species has been recorded on Goodwyn island in the Dampier archipelago (DBCA, 201). This species would be unlikely to use the habitats within the Project Area, possibly only the shoreline within Hearsons cove.
<i>Sterna hirundo</i>	Common Tern	M, IA	IA	Inhabits marine environments, well offshore, sometimes coastal waters, bays, estuaries and ocean beaches. A moderately common species ( <i>longipennis</i> race) in the north.	Low	No	This species has been recorded on Eaglehawk Island on the Dampier archipelago (DBCA, 2018). This species would be more inclined to use offshore islets and islands of the archipelago.
<i>Sternula albifrons</i>	Little Tern	M, IA	IA	Resides within shallow coastal waters such as estuaries, lagoons and channels around rivers and harbours. Often congregates within favoured islets.	Low	Yes	This species has been recorded on Enderby island on the Dampier archipelago (DBCA, 2018). May use harbours adjacent of Burrup, on the west side and river channels during the Wet season present in the Project Area.
<i>Sternula nereis nereis</i>	Australian Fairy Tern	VU	VU	Habitat includes sheltered coasts, bays, inlets, estuaries, coastal lagoons, ocean beaches and also inland salt ponds and lakes and wetlands near the coast. However, it favours sand spits of islets in river-mouth channels, where they can forage on the seaward side of reefs and islands.	Low	Yes	This species has been recorded on Egret Island on the Dampier archipelago (DBCA, 2018). This species would be more inclined to use the sheltered and undisturbed bays within the islands and islets of the archipelago.
<i>Stiltia isabella</i>	Australian Pratincole	M	-	Forages for insects and small prey within sparse wooded plains and grasslands, claypans and stony ground. Does not venture far from water. Breeds after rain and within stony ground.	Low	Yes	This species has been historically recorded within the Burrup Peninsula (Worley Astron, 2006). It was not recorded during either of APM's surveys. Suitable foraging and breeding habitat exist for this species, though its occurrence is unpredictable.



Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Sula leucogaster</i>	Brown Booby	M, IA	-	Inhabits marine environs where it travels low over waves to forage in deep waters but also inshore shallows.	Low	No	This species has been recorded on Cohen Island on the Dampier Archipelago (DBCA, 2018). This species would use the offshore islands of the archipelago where foraging opportunity is high.
<i>Thalasseus bengalensis</i>	Lesser Crested Tern	M	-	Inhabits sandy beaches, coral cays, exposed reefs, islands and mudflats, estuaries and creek channels. Breeds in the northeast and northwest on offshore islands. Known to breed on Adele and Bedout islands.	Recorded	Yes	This species was recorded by APM during pre-wet season survey. The species is utilising mudflats and creeks present in the Project Area for foraging, though given the known breeding habitat is islands and rocky shorelines, the species may be more inclined to use undisturbed rocky islets present across the archipelago. APM recorded just one individual during dry conditions.
<i>Thalasseus bergii</i>	Crested Tern	M, IA	IA	This species is a common tern, especially of bays, harbours, boats and jetties. Inhabits beaches, offshore islands, deeper pelagic seas, inshore estuaries and only occasionally on salt ponds and saline lakes near the coast.	Moderate	Yes	This species has been recorded on the Dampier Archipelago and Hearson's Cove (DBCA, 2018). This species may utilise the Project Area for foraging over the salt clay pans during the wet season.
<i>Todiramphus sanctus</i>	Sacred Kingfisher	M	-	Occupies semi-arid scrubland, open forest, woodland and mangroves. Hunts on dry land for small reptiles and large insects. Sometimes uses wetlands.	Moderate	Yes	This species has been recorded in 1994, 1998 and 2004 (Worley Astron, 2006). Suitable habitat exists for this species though it has a wide known range.
<i>Tringa brevipes</i>	Grey-tailed Tattler	M, IA	IA	Coastal habitats including inter-tidal pools, shallows, soft surfaces of mudflats and sand beaches, but also rocky ledges and reefs.	Recorded	Yes	This species has been recorded on Roly Rock islet in the Dampier archipelago (DBCA, 2018) and more recently by APM during the post-wet season survey. This species utilises the mudflats present in the Project Area for foraging. Suitable habitat is vast outside of the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Tringa glareola</i>	Wood Sandpiper	M, IA	IA	Resides within shallows of wooded lakes or swamps with trees where it forages among fallen trees and vegetation, only occasionally frequents mangroves and brackish waters.	Low	Yes	This species has been recorded on Roly Rock islet in the Dampier archipelago (DBCA, 2018). This species is an uncommon migrant. May possibly utilise the Eucalypt woodlands during the wet season when the channels have filled with water.
<i>Tringa nebularia</i>	Common Greenshank	M, IA	IA	This species requires open swamps, and therefore may only use smaller water bodies opportunistically. However, records have been made in dams and sewage ponds. Typically associated with saltmarshes, estuaries and shallow waters such as clay pans and mudflats, it prefers wet and flooded mud and clay, rather than sandy ground.	Recorded	Yes	This species has been recorded on Roly Rock islet within Dampier and King Bay (DBCA, 2018) and more recently by APM during the post-wet season survey. This species diverse habitat usage means that it is likely to not be reliant on habitats present in the Project Area.
<i>Tringa stagnatilis</i>	Marsh Sandpiper	M, IA	IA	Inhabits coastal and inland wetlands, beaches, mangrove mudflats, shallows of swamps, temporary flood waters and salt ponds.	Low	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018). While this species is more common in the far northern parts of Australia, suitable marshy habitat is present in the Dampier region and the Project Area.
<i>Tringa totanus</i>	Common Redshank	M, IA	IA	Frequents coastal wetlands inclusive of estuaries and lagoons that contain sandbars, mudflats and saltlakes. Uncommon visitor but is known to be a regular summer visitor in some sites around the coast.	Low	Yes	One occurrence of this species has been recorded within AoLA records, from 1994, on the expansive intertidal flats of Nickol Bay.
<i>Xenus cinereus</i>	Terek Sandpiper	M, IA	IA	Resides in coastal mudflats, sheltered estuaries, lagoons and sandbars, reefs, coastal swamps and salt fields.	Low	Yes	This species has been recorded on Roly Rock islet within Dampier (DBCA, 2018). Common in the northern coasts of Australia and is concentrated (among other areas) in the area between Eighty Mile Beach and Broome.
<b>Mammals</b>							

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	EN	Inhabits rocky outcrops and mezzoformations in areas with Eucalyptus woodlands.	Moderate	Yes	This species has been previously recorded on Dolphin Island in the Dampier region and on the Burrup Peninsula in various locations, including a sighting at the port area of King Bay warehouse.
<i>Hydromys chrysogaster</i>	Water-rat, Rakali	-	P4	Occurs in habitats with fresh, brackish or marine water. They require a permanent water source all year round. In the Pilbara, the species occurs along the coastline and offshore islands where they forage for a diverse range of aquatic and terrestrial creatures.	Low	No	This species has been recorded on the Burrup Peninsula (DBCA, 2018). If the species were present in the area, it would be most inclined to use the coastline of bays, most likely further north into Dolphin and Legendre Islands, and other islands further offshore in the archipelago where it is undisturbed and more vegetated than rocky.
<i>Macroderma gigas</i>	Ghost Bat	VU	VU	Inhabits arid spinifex hillsides, open savannah woodland, tall open forest etc. They roost in sandstone or limestone caves or under boulder piles and abandoned mines. They prefer to roost deep in the cave system and in a relatively open space in the cavity. This has to do with humidity and temperature in the microclimate that caves produce. Females roost with young preferentially in the large open cavity far from the cave entrance.	Recorded	Yes	This species has been recorded on the Burrup Peninsula about 4 km northeast of the Project Area (DBCA, 2018) and more recently by APM during the post-wet season survey. This species was once distributed over the entire north of Australia but is now restricted to pockets within tropical areas. This is partly due to the introduction of the Cane Toad, but also loss and disturbance of roost sites and loss of foraging habitat through inappropriate management and dramatic land-use change (DENR, 2016).
<i>Macrotis lagotis</i>	Greater Bilby	VU	VU	The former range of the Greater Bilby has declined dramatically, and the remaining populations of the Bilby reside within three main habitats; the open tussock grassland on uplands and hills, mulga woodland on ridges and rises and hummock grassland in plains and alluvial areas (DoE, 2016).	Low	Yes	The species is highly unlikely to occur in the Project Area due to the lack of appropriate burrowing substrate, and the presence of foxes.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Ozimops cobourgius</i>	Northern Coastal Free-tailed Bat	-	P1	Uses mangroves to roost, particularly crevices in dead upper branches of <i>Avicennia marina</i> . They are restricted to mangrove forests adjacent monsoon forest along large waterways and vine thickets. They like unobstructed corridors in the form of roads or creeklines when foraging for flying insects.	Recorded	Yes	This species has been recorded in the Burrup Peninsula and the Cowrie Cove (a bay just north of Hearson's Cove) in the mangrove habitat. Suitable habitat exists adjacent the Project Area but also is extensive elsewhere (mangroves) along the Burrup and its islands. This bat was recorded during both APM seasonal surveys, across multiple sites, indicating the Project Area is of suitable foraging habitat.
<i>Petrogale lateralis lateralis</i>	Black-footed Rock-Wallaby	EN	EN	This species was historically widespread, though is now only patchily distributed in protected parts of WA including Barrow Island and Cape Range National Park in the Pilbara (DPaW, 2013). The species no longer occurs within the Burrup and Dampier Peninsulas. This rock-wallaby shelters in deep rocky caves, cliffs, screes and rockpiles. They emerge at dusk to feed on grasses and shrubs not far from their shelter site, if food is available.	Low	Yes	The Black-footed Rock-wallaby ( <i>Petrogale lateralis lateralis</i> ) was recorded on the Burrup Peninsula in 1994 (Worley Astron, 2006; see Appendix B for a list of fauna), however it is not expected to currently occur on the Burrup Peninsula.
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	-	P4	This species builds relatively high (up to 10 cm and more) mounds out of tiny pebbles found on the ground. They create intricate chambers underground at least 60 cm deep where they escape the heat of the day. They do continue to use their durable mound systems throughout generations (Anstee <i>et al.</i> 1997). The mouse forages in dry creek beds and mounds are usually created amongst hummock grassland of sandy and pebbly soils.	Low	Yes	This species has been historically recorded in the Burrup Peninsula within the Murajuga National Park (DBCA, 2018). The species has declined in its range, particularly along the Pilbara coasts, likely due to predation by foxes, though populations are still present in the Pilbara and Sandy Desert. The Project Area lies within the former extent of occurrence for the species, though suitable habitat is present within the Project Area.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Rhinonictes aurantia</i>	Pilbara Leaf-Nosed Bat	VU	VU	Inhabits tall open forest, open savannah woodland and spinifex-covered hills etc. Their roost cave requirements are very specific, requiring about 100% humidity and a very high temperature.	Low	Yes	This species may use the rocky outcrops that contain woodland creek lines running through, that may support cave systems deep enough to offer suitable microclimate conditions in both the dry and wet-seasons, though these caves are quite uncommon. The bat would be more likely to use the area for foraging, and potentially use shallower caves provided by the outcrops as a temporary refuge in the wet-season as they can forage several kilometres from their day-time roost sites. The species is predated quite heavily by Ghost Bats.
<i>Ctenopus angusticeps</i>	Northwestern Coastal Ctenopus	VU	P3	Inhabits salt marsh communities in samphire shrubland. Records exist in samphire sites close to tidal creeks. Strongly associated with <i>Tectornia halocnemoides</i> subsp. <i>tenuis</i> and <i>Suaeda arbusculoides</i> occurring on clayey soils and mixed herb and grass cover of <i>Sporobolus virginicus</i> and <i>Muellerolimon salicorniaceum</i> . The species appears to utilise crabholes for shelter and protection.	Low	Yes	Suitable habitat does exist for this species within the Project Area, though it is not known from the Burrup region. Biologic (2013) recorded the species 7 km East of Karratha at Lulu Creek in 2012. The species is threatened by Buffel Grass ( <i>Cenchrus ciliaris</i> ) which is present within the Project Area.
<b>Reptiles</b>							
<i>Liasis olivaceus barroni</i>	Olive Python	VU	VU	Occurs in a range of habitats from savannah woodlands to monsoonal forests. Typically, in areas of rocky hills, outcrops and ranges.	High	Yes	This species has been historically recorded on Dolphin Island in the Dampier region and in King Bay, Hearson's Cove and in many locations around the Karratha Gas Plant and Pluto LNG facility, particularly where artificial water sources occur (open water pit) It is often recorded around the built environment and highly disturbed areas. APM did not record the species on either of the surveys.

Species	Common Name	Cons. Code		Habitat	Likelihood of Occurrence	Habitat Requirements	Comments
		Cth	WA				
<i>Notoscincus butleri</i>	Lined-soil Crevice Skink (Dampier)	-	P4	Inhabits stony areas dominated by spinifex ground cover. Was originally only known from the Dampier Archipelago region of WA, but records from early 2000 have since increased the known range of the species.	Moderate	Yes	Historical record of the species within the Burrup Peninsula made by Biota in 2001 (Worley Astron, 2006) and other records exist on West Intercourse Island and several on the mainland extending into Millstream Chichester National Park, Pannawonica and west of Mount Sheila. It is possible this species may occur in the Project Area, given its preferred habitat however, targeted trapping and search effort would be required to eliminate uncertainty of the presence of this species.



## APPENDIX I: SPECIES BY SITE MATRIX





Appendix I: APM Multi-Season Flora Species by Site Matrix

Family	species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39			
	<i>Tephrosia supina</i>										0.1																												0.1				
GOODENIACEAE	<i>Goodenia microptera</i>														0.1															0.1													
	<i>Goodenia lamprosperma</i>																																										
	<i>Scaevola cunninghamii</i>																												0.1														
	<i>Scaevola spinescens</i>				1									0.1	0.1						0.1			1	0.1				0.1	0.1													
LAMIACEAE	<i>lanceolatum</i>	0.1			0.1	0.1				0.1	1	0.1	15		0.1	0.1				0.1																							
LAURACEAE	<i>Cassytha filiformis</i>	0.1				0.1	0.1									1							1						0.1	0.1	0.1												
MALVACEAE	<i>*Malvastrum americanum</i>																					0.1																					
	<i>Abutilon fraseri</i>																																										
	<i>Abutilon lepidum</i>	0.1	0.1		0.1	0.1						0.1	0.1																														
	<i>Brachychiton acuminatus</i>			5								20	20		1.0	0.1				0.1		1			1																0.1		
	<i>Corchorus incanus subsp. incanus</i>	0.1																																									
	<i>Corchorus incanus subsp. incanus</i>									0.1			0.1		1.0	2		0.1	0.1		1									0.1	0.1	0.1	0.1	0.1	0.1		1	0.1	0.1				
	<i>Corchorus walcottii</i>																																										
	<i>Gossypium australe</i>															0.1						0.1																				0.1	
	<i>Hibiscus sturtii var. campochlamys</i>					0.1	0.1					0.1	0.1		0.1																										0.1	0.1	
	<i>Lawrenca viridigrisea</i>																																										
	<i>Melhania oblongifolia</i>																				0.3																						
	<i>Sida fibulifera</i>																														0.1										0.1		
	<i>Triumfetta appendiculata</i>												0.1		0.1	0.1	1		0.1	0.1		0.1				0.1			0.1	0.1	0.1	0.1					10		0.1				
	<i>Waltheria indica</i>													0.1		0.1		0.1																									
MENISPERMACEAE	<i>Tinospora smilacina</i>			1	0.1							0.1													0.1		0.1																
	<i>Tinospora smilacina</i>			1								1.0																														0.1	
MOLUGINACEAE	<i>Trigastrotheca molluginea</i>																																										
MORACEAE	<i>Ficus brachypoda</i>																						1.0					1															
MYRTACEAE	<i>Corymbia hamersleyana</i>				25							5		0.1	1.0							25									0.1	50					25		25				
	<i>Eucalyptus victrix</i>															10		1.0	60				80	50																			
NYCTAGINACEAE	<i>Boerhavia gardneri</i>	0.1		0.1	0.1							0.1			0.1																											0.1	
OLEACEAE	<i>Jasminum didymum subsp. lineare</i>	0.1												1							1.0	1.0						0.1						0.1				0.1					
PASSIFLORACEAE	<i>*Passiflora foetida var. foetida</i>																							80	1.0																		
PHYLLANTHACEAE	<i>Flueggea virosa subsp. melanthesoides</i>													2						0.1															0.1			0.1					
	<i>Notoleptopus decaisnei</i>										0.1																					0.1								0.1			
	<i>Phyllanthus maderaspatensis</i>																																										
PITTOSPORACEAE	<i>Pittosporum phillyreoides</i>														0.1	0.1					5	0.1												1					0.1				













Appendix I: APM Multi-season flora survey Species Accumulation Curve

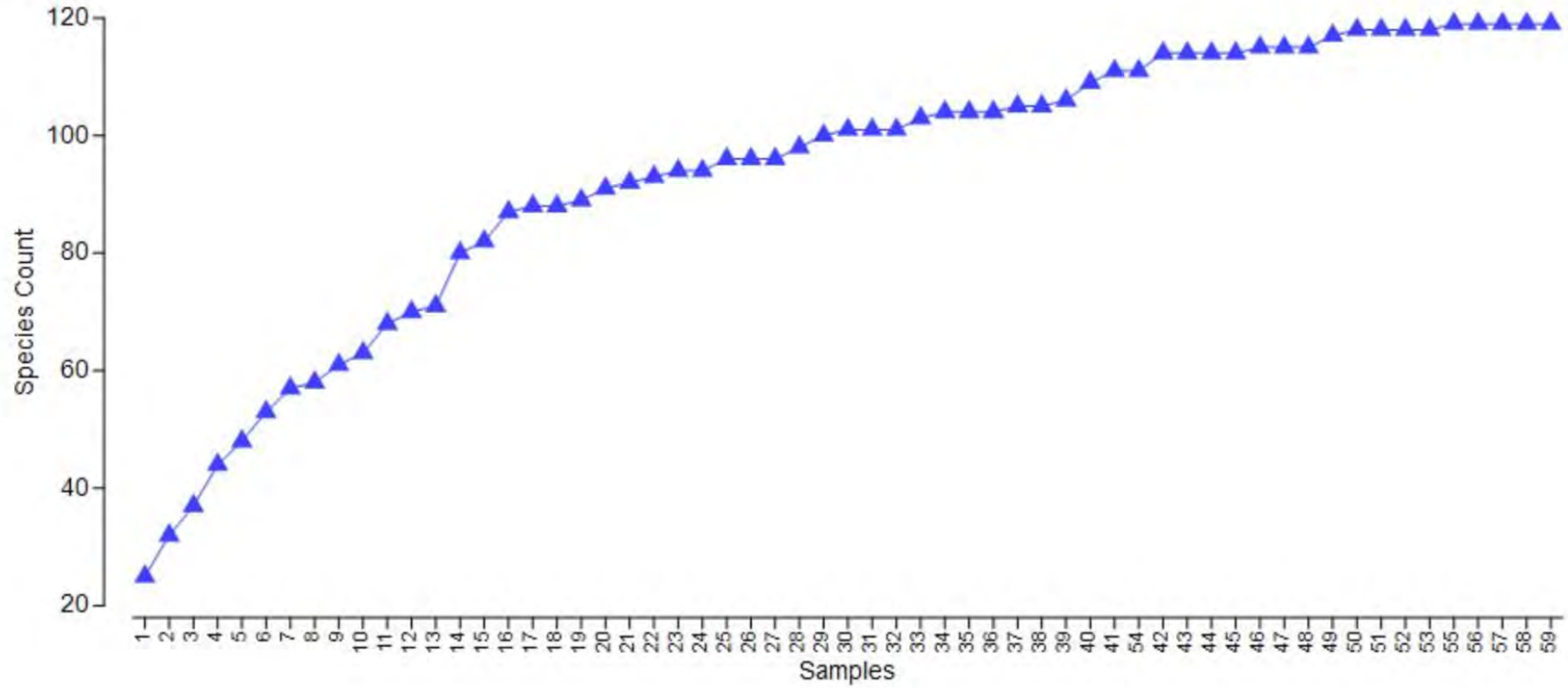


Figure I-1: Species Accumulation Curve for the multi-season flora survey. Species Count is the number of species recorded at each Detailed Survey Site (X axis: Samples) that had not been previously recorded in the APM Detailed Surveys. The species by site matrix used to derive the Species Accumulation Curve contained the full list of species recorded at each Detailed Survey Site over the multiple survey seasons.

**APPENDIX J: BAT CALL IDENTIFICATION FROM THE BURRUP PENINSULA (SPECIALISED ZOOLOGICAL) (2018-2019)**



## Bat call identification from the Burrup Peninsula, WA

Type: Acoustic analysis

Prepared for: Animal Plant Mineral Pty Ltd

Date: 6 May 2019

Job No.: SZ474-489

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This report should be included as an appendix in any larger submission to Government, and cited as:

Specialised Zoological (2019). Bat call identification from the Burrup Peninsula, WA. Acoustic analysis. Unpublished report by Specialised Zoological for Animal Plant Mineral Pty Ltd, 6 May 2019, Job number SZ474-489.



## Summary

Bat identifications from acoustic recordings are provided from the Burrup Peninsula, near Dampier in the Pilbara region of Western Australia. The identification of bat species from full spectrum WAV-format recordings of their echolocation calls was based on measurements of characteristic frequency, observation of pulse shape, and the pattern of harmonics. Eight species of bat were identified unambiguously as being present (**Tables 1–3**). Attribution of call types to species was straightforward for this dataset. The presence of the Ghost Bat *Macroderma gigas* (Megadermatidae) was detected based on one echolocation call sequence (at 19:29 on 2019-03-30; unit 536887) and one social call (at 05:20 on 2019-04-02; unit 498038). Representative echolocation calls for each identified species are illustrated (**Figure 1**), as recommended by the Australasian Bat Society (ABS 2006). Further details are available should verification be required.

## Methods

Data were recorded in full spectrum WAV format with Titley Scientific AnaBat Swift and Pettersson Elektronik D500X bat detectors (sampling rate 500 kHz, set to turn on automatically at sunset and off at sunrise).

A multi-step acoustic analysis procedure developed to process large full spectrum echolocation recording datasets from insectivorous bats (Armstrong and Aplin 2014; Armstrong et al. 2016) was applied to the recordings made on the survey. Firstly, the WAV files were scanned for bat echolocation calls using several parameter sets in the software SCAN'R version 1.8.3 (Binary Acoustic Technology), which also provides measurements (in "SCAN'R output") from each putative bat pulse. The output was then used to determine if putative bat pulses measured in SCAN'R could be identified to species. This was done using a custom [R] language script that performed three tasks: 1. undertook a Discriminant Function Analysis on training data from representative calls from the Pilbara region; 2. from the measurements of each putative bat pulse from SCAN'R, calculated values for the first two Discriminant Functions that could separate the echolocation call types derived from the analysis of training data, and plotted these resulting coordinates over confidence regions for the defined call types; and 3. facilitated an inspection in a spectrogram of multiple examples of each call type for each recording night by opening the original WAV files containing pulses of interest in Adobe Audition CS6 version 5.0.2. The [R] language script also included a separate process that repeated the above steps using training data that included signals from Pilbara cave roosting bat species to assist with the detection of echolocation calls of the Ghost Bat *Macroderma gigas*. Species were identified based on information in McKenzie

and Bullen (2009) and the author's own reference calls; and nomenclature follows Jackson and Groves (2015).

## **Limitations**

The identifications presented in this report have been made within the following context:

1. The identifications made herein were based on the ultrasonic acoustic data recorded and provided by a 'third party' (the client named on the front of this report).
2. The scope of this report extended to providing information on the identification of bat species in bulk ultrasonic recordings. Further comment on these species and the possible impacts of a planned project on bat species were not part of the scope.
3. In the case of the present report, the recording equipment was set up and supplied by Specialised Zoological. The equipment was operated by the third party during the survey.
4. Other than the general locality of the study area, Specialised Zoological has not been provided with detailed information of the survey area, has not made a site visit to observe the habitats available for bats, nor have we visited the specific project areas on a previous occasion.
5. Specialised Zoological has had no input into the overall design of this bat survey, including its timing, recording site placement, nor degree of recording site replication.
6. While Specialised Zoological has made identifications to the best of our ability given the available materials, and reserves the right to re-examine the data and revise any identification following a query, it is the client's and / or proponent's responsibility to provide supporting evidence for any identification, which might require follow-up trapping effort or non-invasive methods such as video recordings. Specialised Zoological bears no liability for any follow-up work that may be required to support an identification based initially on the analysis of acoustic recordings undertaken and reported on here.
7. There are a variety of factors that affect the 'detectability' of each bat species, given the frequency, power and shape characteristics of their calls. Further information on the analysis and the various factors that can impinge on the reliability of identifications can be provided upon request.
8. The analysis of ultrasonic recordings is one of several methods that can be used to survey for bats, and comprehensive surveys typically employ more than one method. If an identification in the present report is ambiguous or in question, a trapping programme would help to resolve the presence of the possibilities in the project area.

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**Table 1.** Species identified in the present survey from all sites combined.

<b>MEGADERMATIDAE</b>	
Ghost Bat	<i>Macroderma gigas</i>
<b>EMBALLONURIDAE</b>	
Common Sheath-tailed Bat	<i>Taphozous georgianus</i>
<b>VESPERTILIONIDAE</b>	
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>
Little Broad-nosed Bat	<i>Scotorepens greyii</i>
Finlayson's Cave Bat	<i>Vespadelus finlaysoni</i>
<b>MOLOSSIDAE</b>	
White-striped Free-tailed Bat	<i>Austronomus (=Tadarida) australis</i>
Greater Northern Free-tailed Bat	<i>Chaerephon jobensis</i>
Northern Coastal Free-tailed Bat	<i>Ozimops (=Mormopterus) cobourgianus</i>

**Table 2.** Species identifications, with the degree of confidence indicated by a code—survey in November 2018. Date and serial/unit number correlates with site; see **Table 1** for full species names.

	<i>C. jobensis</i>	<i>O. cobourgiensis</i>	<i>S. greyii</i>	<i>T. georgianus</i>	<i>V. finlaysoni</i>
<b>D500X 1009</b>					
19/11/2018	—	—	—	◆	—
<b>D500X 1011</b>					
19/11/2018	—	—	—	◆	—
20/11/2018	—	◆	—	◆	—
21/11/2018	—	—	—	◆	—
22/11/2018	—	—	—	◆	—
<b>AnaBat Swift 450057</b>					
19/11/2018	—	◆	◆	◆	◆
20/11/2018	◆	◆	—	◆	—
21/11/2018	—	—	—	◆	—
22/11/2018	—	—	—	◆	—
<b>AnaBat Swift 450083</b>					
19/11/2018	—	◆	◆	◆	◆
20/11/2018	—	◆	◆	◆	—
21/11/2018	—	◆	◆	◆	—
22/11/2018	—	—	◆	◆	—

**Definition of confidence level codes:**

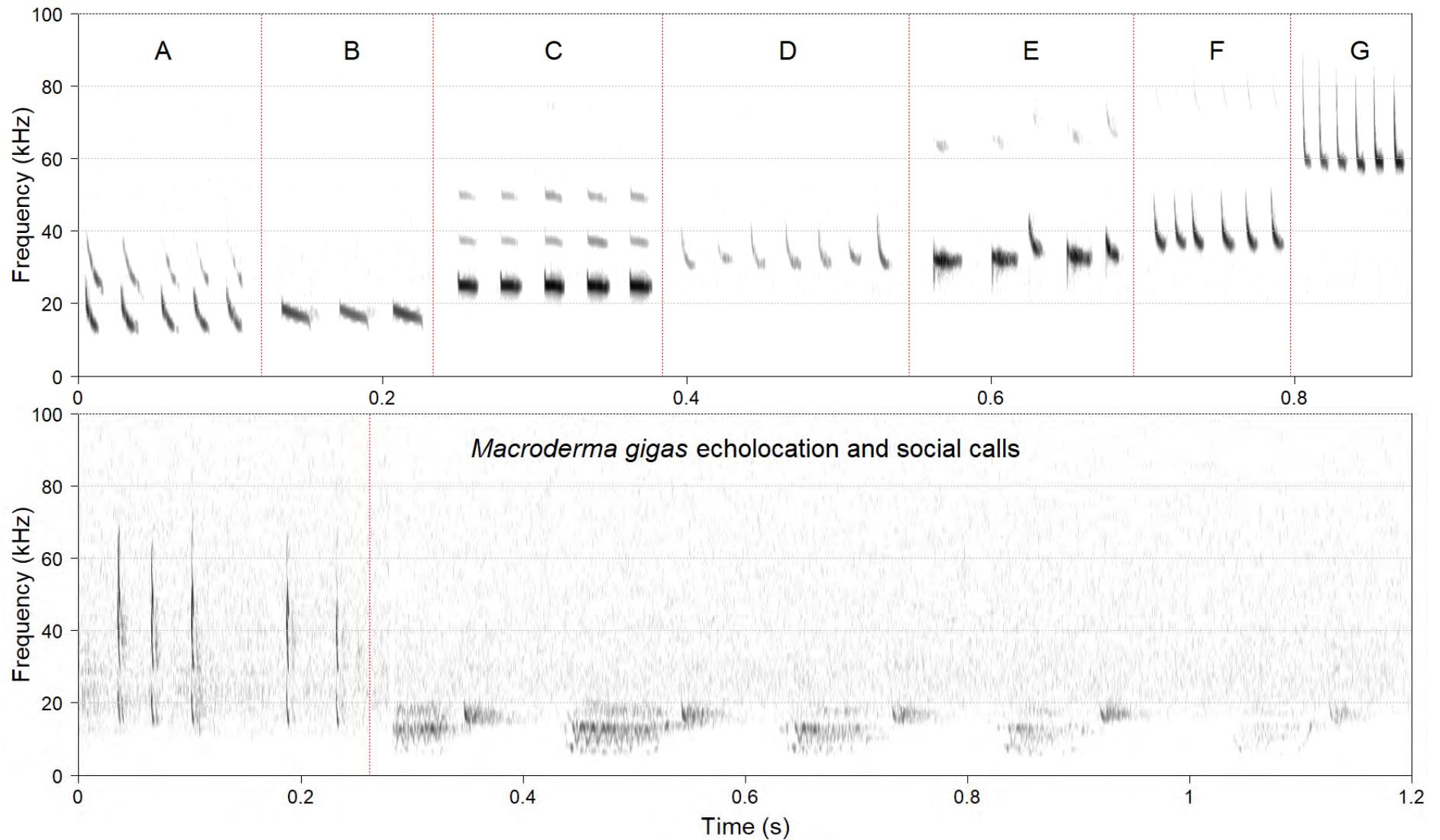
— Not detected.

◆ Unambiguous identification of the species at the site based on measured call characteristics and comparison with available reference material. Greater confidence in this ID would come only after capture and supported by morphological measurements or a DNA sequence.

**NC Needs Confirmation.** Either call quality was poor, or the species cannot be distinguished reliably from another that makes similar calls. Alternative identifications are indicated in the *Comments on identifications* section of this report. If this is a species of conservation significance, further survey work might be required to confirm the record.

**Table 3.** Species identifications, with the degree of confidence indicated by a code—survey in April 2019. Date and serial/unit number correlates with site; see Table 1 for full species names and Table 2 for an explanation of confidence level codes.

	<i>A. australis</i>	<i>C. gouldii</i>	<i>C. jobensis</i>	<i>M. gigas</i>	<i>O. cobourgiensis</i>	<i>S. greyii</i>	<i>T. georgianus</i>	<i>V. finlaysoni</i>
<b>AnaBat Swift 497962</b>								
30/03/2019	—	—	—	—	◆	◆	◆	◆
31/03/2019	—	◆	—	—	◆	◆	◆	◆
1/04/2019	—	—	◆	—	◆	◆	◆	◆
2/04/2019	◆	—	—	—	◆	◆	◆	◆
3/04/2019	—	—	—	—	—	◆	◆	◆
4/04/2019	—	—	—	—	◆	◆	◆	◆
5/04/2019	—	—	◆	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	◆	◆	◆	◆
<b>AnaBat Swift 498038</b>								
30/03/2019	—	—	—	—	◆	◆	◆	◆
31/03/2019	—	—	—	—	—	◆	◆	◆
1/04/2019	—	—	—	◆	◆	◆	◆	◆
2/04/2019	—	—	—	—	—	◆	◆	◆
3/04/2019	—	—	—	—	◆	◆	◆	◆
4/04/2019	—	—	—	—	—	◆	◆	◆
5/04/2019	—	—	—	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	◆	◆	◆	◆
<b>AnaBat Swift 536846</b>								
30/03/2019	—	—	—	—	◆	◆	◆	◆
31/03/2019	◆	—	—	—	—	◆	—	◆
1/04/2019	—	—	—	—	—	◆	◆	◆
2/04/2019	—	—	—	—	—	◆	◆	◆
3/04/2019	—	—	—	—	◆	◆	◆	◆
4/04/2019	—	—	—	—	—	◆	◆	◆
5/04/2019	—	—	—	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	◆	◆	◆	◆
<b>AnaBat Swift 536887</b>								
30/03/2019	—	—	—	◆	◆	◆	◆	◆
31/03/2019	—	—	—	—	—	◆	◆	◆
1/04/2019	—	—	—	—	◆	◆	◆	◆
2/04/2019	—	—	—	—	◆	◆	◆	◆
3/04/2019	—	—	—	—	◆	◆	◆	◆
4/04/2019	—	—	—	—	—	◆	◆	◆
5/04/2019	—	—	—	—	◆	◆	◆	◆
6/04/2019	—	—	—	—	—	◆	◆	◆



**Figure 1.** Representative call sequence portions of the species identified (Top: **A:** *Austronomus australis*; **B:** *Chaerephon jobensis*; **C:** *Taphozous georgianus*; **D:** *Chalinolobus gouldii*; **E:** *Ozimops cobourgianus*; **F:** *Scotorepens greyii*; **G:** *Vespadelus finlaysoni*; time between pulses has been compressed).



**APPENDIX K: BIRD CENSUS (APM, 2018-2019) RESULTS**



Rufous Songlark		11	13	4	2	1	3	15	14	63
Silver Gull		2				1				3
Singing Honeyeater	43	57	40	30	27	17	13	29	28	284
Spinifex Pigeon	12	24	12	11	6	6		1	22	94
Spotted Harrier	1		1							2
Star Finch	8									8
Striated Pardalote					1	2	1	1		5
Torresian Crow	11	12	6	4		1	11	1		46
Tree Martin					8					8
Wedge-tailed Eagle				1						1
Weebill		6								6
Welcome Swallow					3		2		3	8
Whimbrel					2	1			2	5
Whiskered Tern					10	5	5	1		21
Whistling Kite	5	8	1	2		1	2	1	1	21
White-bellied Sea-eagle									1	1
White-faced Heron								1		1
White-plumed Honeyeater		15	27	9		19	10	12	9	101
White-winged Fairywren					4					4
White-winged Triller	4	10	7	1	5	3	3	9		42
Willie Wagtail	5	2	1	7	3	4	5	5	7	39
Yellow Throated Miner	26	35	20	8	26	10	10	20	35	190
Zebra Finch	15	164	71	58	82	14	13	21	29	467
<b>Grand Total</b>	<b>243</b>	<b>543</b>	<b>540</b>	<b>368</b>	<b>377</b>	<b>180</b>	<b>160</b>	<b>212</b>	<b>260</b>	<b>2883</b>

## **APPENDIX L: Species Accumulation Curve Memorandum**

**TO: CARDNO****DATE:****FROM:****Att: Daniel Hunter**

12 March 2020

**Dr Eleanor Hoy****Manager Environmental Approvals****Biological Sciences Manager**

Project: Perdaman Project, Burrup Peninsula, Western Australia.



Email: Daniel.Hunter@cardno.com.au

**Animal Plant Mineral Pty Ltd****Ph:** 08 6461 0739**Phone (08):** 6296 5155**Email:** eleanor@animalplantmineral.com.au**RE: Species Accumulation Curve Memo for the Perdaman Project, Burrup Peninsula**

Dear Daniel

A species accumulation curve (SAC) can be used to assess the effectiveness of sampling methods. This method of estimating species richness illustrates the accumulation of new species and plateaus when no new species are added to the assemblage. In other words, as the curve reaches an asymptote, it suggests that the majority of trappable species in the local assemblage have been sampled. More sampling effort is required to capture rare/cryptic species, and an accumulation curve can be used to interpret whether this is required (EPA, 2016).

## 1 METHODS

### *Data*

The Perdaman Urea Plant Project (the **Project**) is located within the Burrup Strategic Industrial Area, on the Burrup Peninsula, approximately 13 km northwest of Karratha and 1,300 km north of Perth. To inform an Environmental Review, Animal Plant Mineral Pty Ltd (**APM**) was engaged to undertake: i) a Level 1 Biological Survey in the pre-wet season (19 – 22 November 2018); and ii) a Level 2 Biological Survey in the post-wet season (27 March – 5 April 2019).

Overall sampling effort was assessed using SACs. These analyses assume a standard sampling effort; therefore, avifauna consensus data from both surveys, and herpetofauna (reptiles and amphibians) and mammal fauna trapping data from the post-wet season survey were analysed. Given the restriction of the data, a subset of the fauna sampled were not represented in the estimates/curves (e.g. larger species captured on camera traps, or opportunistic recordings). Furthermore, as only four species of mammals were trapped, an SAC could not be estimated for the mammal fauna.

### *Analysis*

A range of mean species richness estimates were generated using the software *EstimateS* (version 9; Colwell, 2013a). These include the Abundance Coverage-based Estimator of species richness (**ACE**); Incidence Coverage-based Estimator of species richness (**ICE**); classic forms of '**Chao1**' and '**Chao2**' estimators of species richness; first- (**Jack 1**) and second- (**Jack 2**) order jackknife estimators of species richness (incidence-based); **Bootstrap** estimator of species richness; and Michaelis-Menten estimator of species richness computed once for analytical rarefaction curve (**MMM**Mean). The methods/equations for estimating these values are reported in the *EstimateS* User Guide (Colwell, 2013b). Estimates were generated as sample-based incidence data, randomised across 100 permutations without replacement. The values represent theoretical maxima for the number of species present

within the sampled area. The ACE, ICE, Chao1, Chao2, and Jack1 methods estimate total species richness, including species not present in any sample (Colwell, 2013b). The Chao1 and 2 estimates are considered lower bounds of species richness and are more accurate with increased reference sample size (as with all estimators of species richness). While the MMMean method has previously been the most common method to estimate asymptotic species richness (and is, therefore, included in Table 1), it is considered by the developers of *EstimateS* as outdated as the data points are non-independent and serially correlated (Colwell, 2013b).

The observed species richness curve (**Sobs**, also known as Mao Tau) was calculated using the number of species in *t* pooled samples, given the reference sample. This curve along with a selection of the species richness methods (ACE, Chao1, and Jack1) were then plotted to create the SACs for the two fauna groups.

## 2 RESULTS AND DISCUSSION

The results of the mean species richness estimates are reported in Table 1, while the SACs for the avifauna and herpetofauna are illustrated in Figure 1 and Figure 2, respectively.

**Table 1. Mean species richness estimates for the avifauna and herpetofauna survey data.**

Species Richness	Avifauna	Herpetofauna
ACE	70.83	37.76
ICE	78.97	35.75
Chao-1	69.19	42.57
Chao-2	84.92	36.93
Jack-1	78.88	34.75
Jack-2	88.9	39.67
Bootstrap	69.61	29.92
MMMean	71.35	34.53
<b>Observed</b>	<b>63</b>	<b>26</b>

For the avifauna, the theoretical maximum number of species ranged from 69 to 89 species, compared to the 63 species observed (Table 1). This suggests that between 71 % and 91 % of avifauna were sampled, with an average of 14 species still unsampled (Figure 1).

For the herpetofauna, the theoretical maximum number of species ranged from 30 to 43 species, compared to the 26 species observed (Table 1). This suggests that between 61 % and 87 % of herpetofauna were sampled (Figure 2).

Additional species of both avi- and herpeto-fauna were recorded opportunistically or through other (non-systematic) capture methods, e.g. camera traps or spotlighting. These will likely help to provide a fuller representation of the true species richness at the Project area.



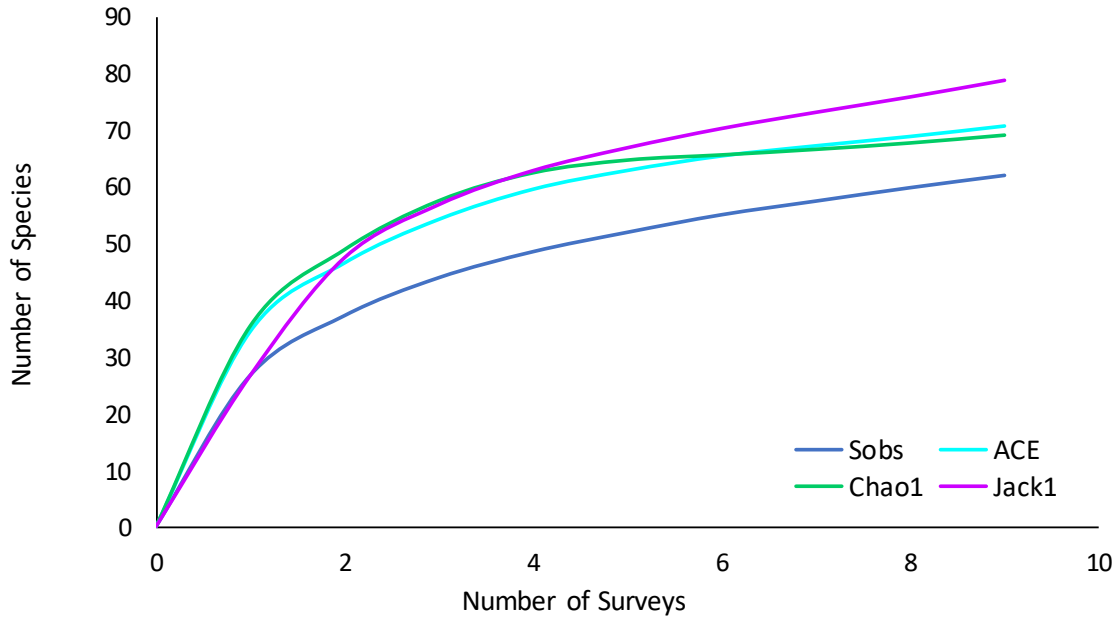


Figure 1. Species accumulation curve for avifauna.

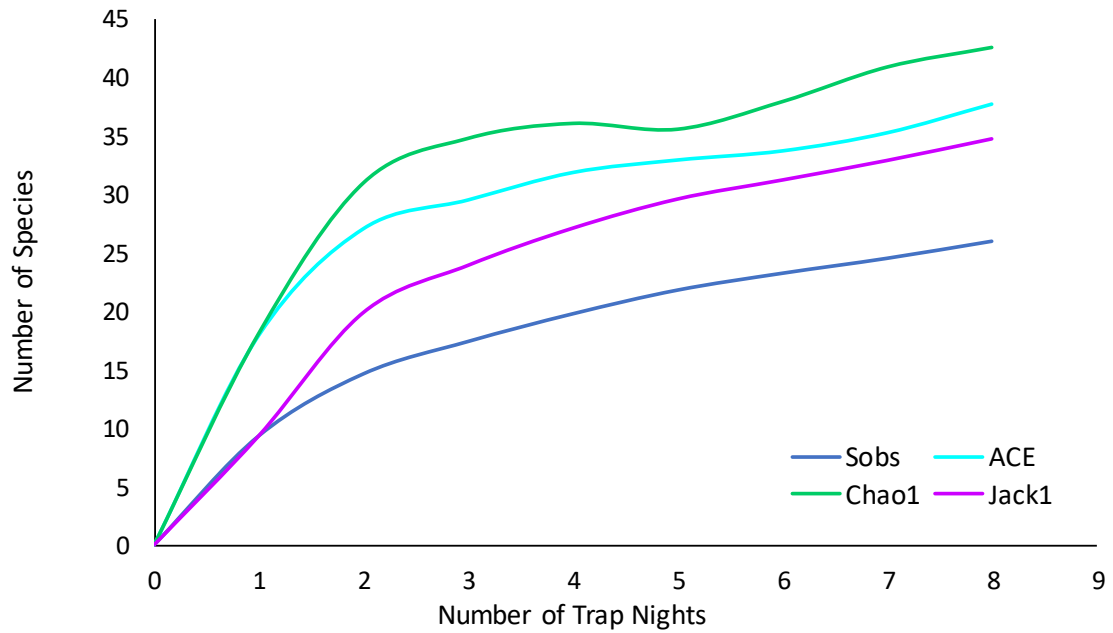


Figure 2. Species accumulation curve for herpetofauna.

3 REFERENCES

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