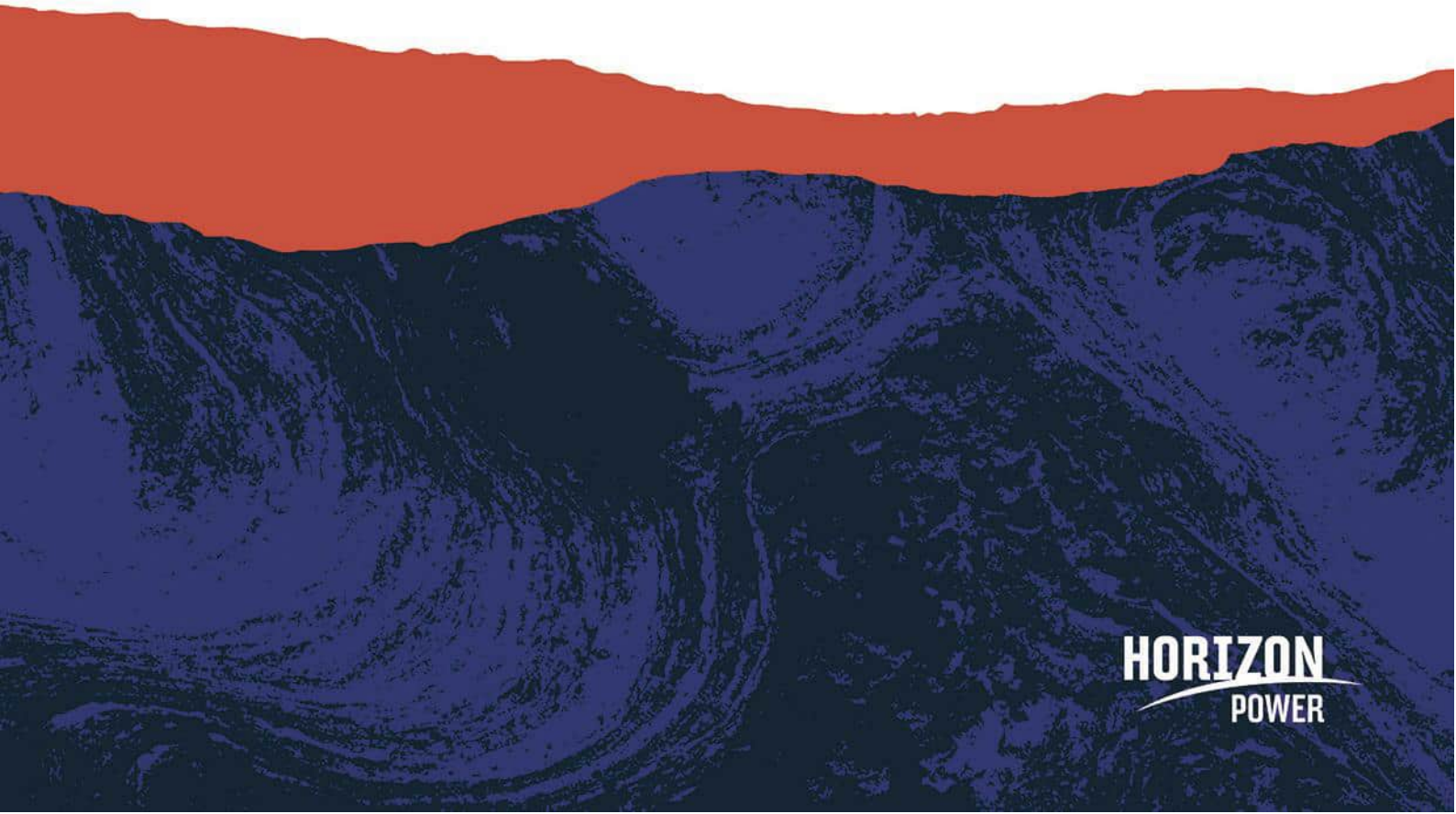
Burrup Common User Transmission Infrastructure – Preliminary Documentation

EPBC Number: 2022/09407

05 February 2024



Cover Page

EPBC Number	2022/09407
Project Name	Burrup Common User Transmission Infrastructure
Proponent	Horizon Power
ACN or ABN	ABN 57 955 011 697
The Proposed Action	Horizon Power is proposing to construct the Burrup Common User Transmission Infrastructure project ('the Proposed Action').
Location of the Action	The Proposed Action is located in Murujuga, Western Australia, approximately 1.5 km east of the Dampier township.

Document Version Control

Revision	Date	Description	Author	Checked	Reviewed	Approved	Signature
0	15/12/2023	Final for Issue	HR	DF	LB	DK	
1	05/02/2024	Update following DCCEEW Comments	DF	LB	LB	RL	

Executive Summary

Background

The Burrup Common User Transmission Infrastructure project (the 'Proposed Action') involves the expansion of the North-West Interconnected System (NWIS) via construction of an approximately 7 km long 132 kilovolt (kV) overhead transmission line, between the Dampier substation and the Burrup Strategic Industrial Area (SIA) with the Pilbara region. This transmission line will be owned by Horizon Power and provide common user transmission infrastructure to tenants on the Burrup Peninsula.

Horizon Power referred the Proposed Action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in November 2022 (EPBC 2023/09407). On 3 April 2023, a delegate of the Minister for the Environment decided that the Proposed Action is a controlled action under section 75 and 87 of the EPBC Act due to potential impacts to the following Matters of Environmental Significance (MNES); National Heritage Place; Threatened Species; and Migratory Species, and that it will be assessed by Preliminary Documentation.

This Preliminary Documentation (PD) has been prepared to address Department of Climate Change, Energy, The Environment and Water (DCCEEW) request for further information to support the assessment of a controlled action by preliminary documentation.

Description of the action

The 'Proposed Action' is located on Murujuga (Burrup Peninsula) in WA, approximately 1.5 km east of the Dampier township. The Proposed Action Development Envelope (DE) has a total extent of 85.54 ha, which represents the boundary within which all development will be contained. The Proposed Action includes:

- approximately 7 km long 132 kV overhead transmission line;
- approximately 40 poles and cleared pole access pads (40 m x 20 m), and associated pole stays along the transmission line route;
- cleared, unsealed access track along the transmission line route required for maintenance during operations;
- Burrup substation (inclusive of 33 kV and 132 kV switchgear, large scale battery, transformers, fencing and ancillary equipment);
- Dampier substation expansion (inclusive of 132 kV switchgear, fencing and ancillary equipment); and
- associated electrical infrastructure.

The detailed design for the Proposed Action has not yet been finalised, but to ensure the Proposed Action avoids impacts to significant environmental and heritage values identified within the DE, an 'avoidance area' covering 5.47 ha has been developed within the DE. The finalised design will avoid these areas to minimise impacts to environmental and Aboriginal cultural heritage values as much as possible. Horizon Power has committed to clearing no more than 14.40 ha of vegetation ('Maximum clearing extent'). It should be noted that the 14.40 ha clearing extent represents the **maximum area of clearing** required to construct and install the Proposed Action (including up to 11.50 ha of permanent disturbance and up to 2.90 ha of temporary disturbance as a worse case), and where opportunities are available, clearing will be minimised.

Description of protected matters relevant to the action

Matters of National Environmental Significance (MNES) listed under the EPBC Act that have the potential to be in the DE and/or immediate surrounds were identified by DCCEEW as including the following:

- Northern Quoll (*Dasyurus hallucatus*);
- Pilbara Olive Python (*Liasis olivaceus barroni*);
- Ghost Bat (*Macroderma gigas*);
- Grey Falcon (*Falco hypoleucos*);

- Curlew Sandpiper (*Calidris ferruginea*);
- Eastern Curlew (*Numenius madagascariensis*);
- Greater Sand Plover (*Charadrius leschenaultii*);
- Lesser Sand Plover (*Charadrius mongolus*);
- Red Knot (*Calidris canutus*);
- Northern Siberian Bar-Tailed Godwit (*Limosa lapponica menzbieri*);
- Australian Fairy Tern (*Sternula nereis nereis*);
- Whimbrel (*Numenius phaeopus*);
- Oriental Plover (*Charadrius veredus*);
- Wood Sandpiper (*Tringa glareola*);
- Oriental Pratincole (*Glareola maldivarum*);
- Common Sandpiper (*Actitis hypoleucos*);
- Common Greenshank (*Tringa nebularia*);
- Gull-billed Tern (*Gelochelidon nilotica*);
- Caspian Tern (*Hydroprogne caspia*);
- Crested Tern (*Thalasseus bergii*);
- Bridled Tern (*Onychoprion anaethetus*); and

- National Heritage Place:
  - Dampier Archipelago (including the Burrup Peninsula).

Assessment of impacts

Threatened and Migratory fauna

Clearing for construction of the transmission line will directly impact the following Threatened and Migratory fauna habitat:

- No more than 14.4 ha of critical habitat comprising:
  - Up to 14.4 ha of Rocky Hills with exposed boulder piles, which is denning/shelter and feeding habitat for the Northern Quoll, and also considered important supporting habitat for the Pilbara Olive Python (shelter and feeding habitat); and
  - Up to 1.5 ha of Mudflat with tidal inundation, Mangroves and supportive scattered Samphire, which is foraging habitat for the Australian Fairy Tern.
- Up to 14.4 ha from 74.45 ha of potential Ghost Bat and Grey Falcon foraging and flyaway habitat.
- Up to 1.5 ha of 5.84 ha of Curlew Sandpiper, Great Sand Plover, Lesser Sand Plover, Northern Siberian Bar-tailed Godwit, Oriental Pratincole, Common Greenshank, Gull-billed Tern, Caspian Tern, Greater Crested Tern and Bridled Tern foraging habitat.
- Up to 1.5 ha of 5.84 ha of Eastern Curlew, Red Knot, Whimbrel, Oriental Plover and Common Sandpiper foraging and roosting habitat.

Given the detailed design for the Proposed Action is ongoing, the exact amount of this habitat to be removed is not currently known, therefore as a worst case it has been assumed the Proposed Action has potential to impact up to 14.4 ha of a particular habitat (which is the maximum clearing extent in the DE), or the total amount of a particular habitat within the DE, if this is less than 14.4 ha. The actual amount to be cleared of each habitat type will be significantly less than 14.4 ha given the Proposed Action will cover multiple habitat types.

Other aspects of the Proposed Action that have the potential to result in impacts to Threatened fauna include:

- Habitat fragmentation and population isolation
- Increased risk of feral animals and weeds
- Direct mortality
- Increased dust
- Vehicle strike
- Increased light and noise pollution
- Increased risk of fire
- Habitat contamination by Acid Sulfate Soils
- Risk of Collision
- Anthropogenic disturbance

Significant residual impacts

The Proposed Action will result in the following significant residual impacts:

- Clearing up to 14.4 ha of habitat critical to the survival of the Northern Quoll, and classed as important habitat for the Pilbara Olive Python; and
- Clearing up to 1.5 ha of foraging habitat critical to the survival of the Australian Fairy Tern.

The Proposed Action is not expected to result in significant residual impacts to any other Threatened fauna.

Avoidance and mitigation

Mitigation and management of the potential direct and indirect impacts on MNES associated with the Proposed Action will be implemented in accordance with standard construction industry environmental practices, as well as relevant Horizon Power standards and procedures.

In order to comply with relevant environmental legislation and manage the impacts to the local environment, Horizon Power has defined objective, outcomes and management-based provisions to ensure that impacts to the noted MNES are avoided and minimised as far as practicable during implementation of the Proposed Action. These management actions are provided in the Environmental Management Plan in Appendix B, which includes measures to:

- Prevent unauthorised clearing of EPBC Act listed threatened and/or migratory fauna habitat and prevent habitat fragmentation.
- Prevent indirect impacts on fauna habitats.
- Minimise the clearing of intertidal adapted vegetation located within the tidal inlet between Hearson Cove and King Bay
- Prevent introduction or spread of declared weeds, WONS or serious environmental weed species into surrounding native vegetation
- Minimise injury, mortality or indirect impacts to EPBC Act listed threatened and/or migratory species.

Horizon Power has also committed to the rehabilitation of pre-existing native vegetation in temporarily cleared areas (anticipated to be approximately 2.9 ha) using locally native species. Degraded areas will be utilised as a preference and revegetation will be to the equivalent vegetation quality prior to disturbance.

Offsets

Horizon Power proposes to use the Pilbara Environmental Offsets Fund to counterbalance the Proposed Action's significant residual impacts. Horizon Power expects to pay a rate per hectare of impact to habitat critical to the survival of the Northern Quoll and Australian Fairy Tern. Based on the DCCEEW residual impact offset rate, contribution to the fund will be made for the following significant residual impacts:

- Clearing no more than 14.4 ha of critical habitat comprising:

- up to 14.4 ha of potential Northern Quoll denning/shelter and feeding habitat critical to the survival of the Northern Quoll; and
- up to 1.5 ha of potential Australia Fairy Tern foraging habitat critical to the survival of the Australian Fairy Tern.

This equates to an offset contribution of $47,606.

Economic and social matters

In line with Horizon Power's Aboriginal Cultural Heritage Management policy, Horizon Power will avoid impacting on Aboriginal Cultural Heritage whenever possible. Numerous heritage surveys have already been carried out which have informed the design of the Proposed Action, and final project design and construction will utilise the data gathered from these surveys to avoid heritage. Accordingly, no negative social or economic impacts are anticipated with regard to Aboriginal cultural heritage.

Other economic benefits will be realised during construction, through local contractor depots and the majority of the workforce proposed to be from the local area.

The Burrup Common User Transmission Infrastructure project will facilitate the connection of the Woodside solar facility at Maitland Industrial Estate to users on the Burrup Peninsula. By facilitating renewable energy transmission to industrial customers, the Proposed Action will enable the associated carbon reduction savings and is aligned with the Western Australian Climate Change Policy 2050 targets for decarbonisation.

Contents

Acronyms and abbreviations

Acronym	Description
CoA	Commonwealth of Australia
cm	centimetre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy the Environment and Water
DE	Development Envelope
DEC	Department of Environment and Conservation
DEE	Department of Environment and Energy
DEWHA	Department of Environment, Water, Heritage and the Arts
DoW	Department of Water
DPIRD	Department of Primary Industries and Regional Development
DSWEPaC	Department of Sustainability, Environment, Water, Population and Communities
DWER	Department of Water, Environment and Regulation
EEAF	East Asian-Australian Flyaway
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act* 1999
ESAs	Environmentally Sensitive Areas
g	grams
GTE	Government Trading Enterprise
ha	Hectare
IBRA	Interim Biogeographic Regionalisation of Australia
km	Kilometre
kV	Kilovolt
LGA	Local Government Authority
m	Metre
MAC	Murujuga Aboriginal Corporation

Acronym	Description
mm	Milometre
MNES	Matters of National Significance
NWIS	North-West Interconnected System
PD	Preliminary Documentation
PEC	Priority Ecological Community
PNCA	Pilbara Networks Access Code
SIA	Strategic Industrial Area
T/A	Trading as
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
WA	Western Australia
WoNS	Weeds of National Significance

1 Introduction

1.1 Background

Regional Power Corporation, trading as (T/A) Horizon Power, is a Western Australian (WA) Government Trading Enterprise (GTE) and the state's regional and remote energy provider. Horizon Power operates under the *Electricity Corporations Act 2005* and is governed by a Board of Directors accountable to the Minister for Energy.

The Burrup Common User Transmission Infrastructure project (the 'Proposed Action') involves the expansion of the North-West Interconnected System (NWIS) via construction of an approximately 7 km long 132 kilovolt (kV) overhead transmission line, between the Dampier substation and the Burrup Strategic Industrial Area (SIA) with the Pilbara region. This transmission line will be owned by Horizon Power and provide common user transmission infrastructure to tenants within the Burrup SIA and broader Burrup Peninsula.

Horizon Power referred the Proposed Action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in November 2022 (EPBC 2023/09407). On 3 April 2023, a delegate for the Minister for the Environment determined that the Proposed Action is a controlled action under section 75 and 87 of the EPBC Act due to potential impacts to the following Matters of Environmental Significance (MNES): National Heritage Place; Threatened Species; and Migratory Species, and that it will be assessed by Preliminary Documentation.

1.2 Scope and Purpose

This Preliminary Documentation (PD) has been prepared to address the Department of Climate Change, Energy, The Environment and Water (DCCEEW) request for further information to support the assessment of a controlled action by preliminary documentation.

1.3 Description of the Action

The 'Proposed Action' is located on Murujuga (referred to as Burrup Peninsula here after) in WA, approximately 1.5 km east of the Dampier township. The North-West Interconnected System (NWIS) is located within the Pilbara region and comprises a number of interconnected electricity networks with different owners. The three largest participants in the NWIS are Horizon Power (Government Trading Entity, GTE), Alinta Energy and Rio Tinto (which are privately owned). The Pilbara Networks Access Code (PNAC) is the key instrument that governs access to lightly regulate the NWIS.

Horizon Power is proposing to expand the NWIS electricity network, by constructing an approximately 7 kilometre (km) long 132 kilovolt (kV) overhead transmission line between the Dampier substation and the Burrup Strategic Industrial Area (SIA) (the Proposed Action). The Burrup SIA is not currently connected via transmission infrastructure to the NWIS.

The Proposed Action will provide common user transmission infrastructure, owned and operated by Horizon Power. As a result, the Proposed Action will also provide opportunities for tenants on the Burrup to access the higher efficiency generation portfolio, including proposed renewable energy resources available on the NWIS. The Proposed Action is considered the first step to providing enabling infrastructure to the Burrup SIA to support the transition towards State and Federal Government greenhouse gas emission reduction targets. One of the primary aims and benefits of the Proposed Action is to reduce carbon emissions in the NWIS through connection to the renewable energy sources that will be in operation.

Burrup Peninsula and its surrounds supports extensive Aboriginal cultural heritage sites, with the wider Dampier Archipelago region known to have one of Australia's greatest collections of rock art (petroglyphs) (DEC, 2013). Horizon Power has worked with the Murujuga Aboriginal Corporation (MAC) extensively in relation to the Proposed Action, undertaking detailed Aboriginal cultural heritage site avoidance surveys. It should be noted that these surveys will not be made publicly available due to cultural sensitivity reasons and are considered to be confidential as requested by the Traditional Owners. These surveys have assisted Horizon Power to progress the transmission route design to avoid impacts to Aboriginal cultural heritage sites. Horizon Power is committed to avoiding direct impact to known Aboriginal cultural heritage, and will have Aboriginal heritage monitors on site during ground disturbing activities.

The Proposed Action Development Envelope (DE) has a total extent of 85.54 ha, which represents the boundary within which all development will be contained (**Figure 1-1**). The detailed design for the Proposed Action has not yet been finalised, but to ensure the detailed design for the Proposed Action avoids impacts to significant environmental and heritage values identified within the DE, an 'avoidance area' covering 5.47 ha has been developed within the DE (**Figure 1-1**). The finalised detailed design will avoid these areas to minimise impacts to environmental and Aboriginal cultural heritage values as much as possible. Horizon Power has committed to clearing no more than 14.40 ha of vegetation ('Maximum clearing extent'). It should be noted that the 14.40 ha clearing extent represents the maximum area of clearing required to construct and install the Proposed Action (including 11.50 ha of permanent disturbance and 2.90 ha of temporary disturbance), and where opportunities are available, clearing will be minimised.

Construction of the Proposed Action will include the following permanent and temporary elements, all within the DE:

– Permanent elements
  - approximately 7 km long 132 kV overhead transmission line;
  - approximately 40 poles and cleared pole access pads (40 m x 20 m), and associated pole stays along the transmission line route. The poles will be constructed on top of concrete pile foundations and secured down by ragbolts;
  - cleared, unsealed access track along the transmission line route required for maintenance during operations;
  - Burrup substation (inclusive of 33 kV and 132 kV switchgear, large scale battery, transformers, fencing, lighting and ancillary equipment);

- Dampier substation expansion (inclusive of 132 kV switchgear, fencing, lighting and ancillary equipment); and
- associated electrical infrastructure.

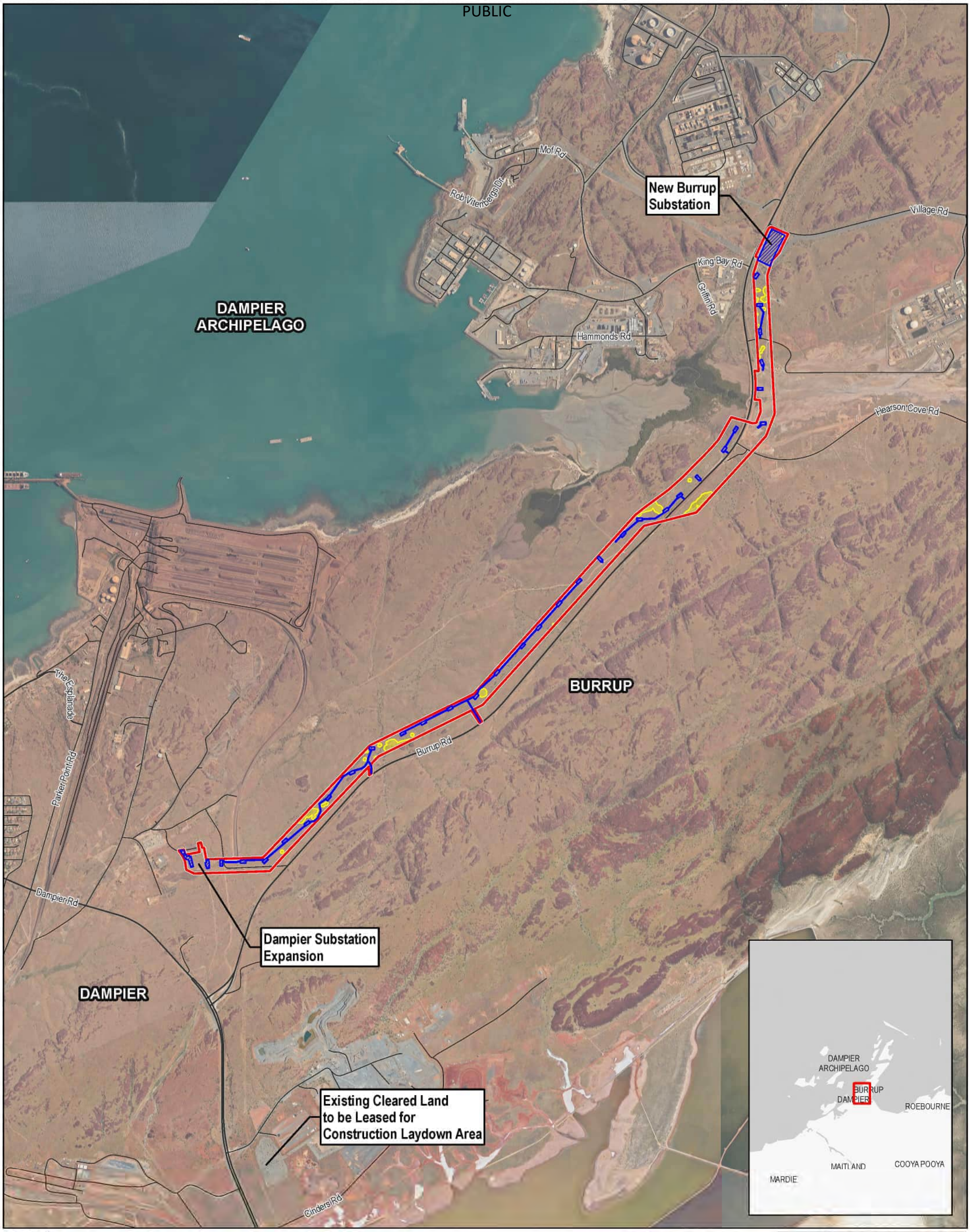
– Temporary elements:
  - additional areas required to construct the transmission line;
  - cleared access track (4 m wide) for the purpose of stringing the transmission line; and
  - 50 m x 40 m winch sites as required.

The poles will be constructed with suspended insulators and the conductors will be spaced approximately 230 cm apart, with an approximately 100 cm distance from crossarm to energised parts (as shown in Photos 1 and 2) which complies with the low risk category in the recommendations developed by BirdLife International to inform the drafting of *International conventions on the protection of birds from collision with power lines* (BirdLife International, 2007).

Photo 1 – Example Transmission Poles

Photo 2 – Example Transmission Poles

The main points of access to the Proposed Action during the construction and operational stages will be via Burrup Road and existing cleared access tracks located within the DE. During construction, an additional two tracks will be cleared to allow access to the southern portion of the DE as detailed in **Section 1.3.1.1**. Further, an unsealed access track will be constructed along the transmission line route (except for within the tidal inlet where no access track is proposed to reduce the required amount of clearing). This access track will be maintained throughout the operational stage to ensure maintenance checks and activities such as weed management can be maintained. Horizon Power will utilise, where possible, existing cleared access tracks to reduce the amount of clearing required.



Legend

- Major Road
- Minor Road
- Development Envelope
- Indicative Impact Area
- Avoidance Areas

0 125 250 500
Metres

N

Scale: 1:25,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; Landgate - Roads, WA Now accessed August 2023
Map Produced: 12/11/2023.
Project Number: IS472900
Rev C

Jacobs
JACOBS: Mia Yellagonga Tower 2, Level 5, 5 Spring Street, (GPO Box H615) | Perth WA 6000 | Australia
Tel: +61 8 9469 4400 Fax: +61 8 9469 4488

Figure 1-1 Proposed Action - Development envelope and Maximum Clearing Extent

1.3.1 Construction and Operational Stages of the Proposed Action

1.3.1.1 Construction

The Proposed Action will require the clearing of up to 14.40 ha of vegetation within the DE (including permanent clearing of 11.50 ha and temporary clearing of 2.90 ha). Permanent construction elements include clearing an approximate 7 km track for installation and maintenance of the transmission line, avoiding the specified 'avoidance areas' as required. Ground disturbance will be undertaken to install the poles required to support the transmission line. An unsealed access track will be established and pole access pads constructed as required. Formation of the transmission line will occur via the stringing of transmission line cables using either ground machinery or helicopters to avoid the specified 'avoidance areas' (as required). Construction of the Burrup substation, Dampier substation expansion and associated electrical infrastructure will require the clearing of vegetation, excavation of soils and the use of plant and machinery.

Temporary clearing of vegetation and associated ground disturbance will occur via graders and bulldozers when constructing the Proposed Action temporary elements, as well as driving over vegetation for activities such as stringing and winching the poles. Access tracks will be established as necessary, but will avoid the 'avoidance areas'.

Construction of the temporary and permanent elements identified above will impact on the environment through the actions of clearing of vegetation, ground disturbance and soil excavation. Heavy machinery such as graders and bulldozers will be used for ground disturbing activities. Helicopters may be used (as required) for the stringing of transmission line cables, where constraints result in restricted access. Additional clearing may be required for unanticipated supporting activities; however this would be accounted for in the total maximum area of clearance proposed, ensuring the total clearing is no greater than 14.40 ha.

Construction of the permanent and temporary elements required for the Proposed Action also have the potential to generate noise and dust emissions. Dust and noise emissions produced during construction of the Proposed Action will be managed via standard management measures as detailed in the Environmental Management Plan (EMP) (**Appendix B**). As detailed in the EMP, temporary construction areas will be rehabilitated at the completion of each construction phase. The Proposed Action will not require a commissioning phase. The operational elements of the Proposed Action will be permanent infrastructure of the NWIS. Should the infrastructure associated with the Proposed Action be no longer required, the infrastructure will be decommissioned and removed as far as reasonably practical.

During construction and operation, access to the existing Dampier substation and the southern portion of the DE will be via an existing cleared access track, which intersects Burrup Road at 116.7363654˚E, -20.6627847˚S (decimal degrees). An additional two access tracks will be constructed to allow construction and operational machinery and plant to access the southern portion of the DE whilst avoiding the identified 'avoidance areas' (**Figure 1-1**). These tracks intersect Burrup Road at 116.7422759˚E, -20.6568737˚S and 116.7500076˚E, -20.6534470˚S (decimal degrees). The central portion of the DE will be accessed via an existing cleared access track which intersects Burrup Road at 116.7602744˚E, -20.6424547˚S (decimal degrees). The northern portion of the DE (just south of King Bay) will be accessed via the existing Burrup Road. Within the tidal inlet, the existing Burrup Road and cleared access tracks will be utilised where possible to reduce the required amount of clearing within this area. The northern extent of the DE will be accessed via existing cleared tracks located along Burrup Road (116.7688198˚E, -20.6283257˚S, 116.7689487˚E, -20.6231713˚S).

Clearing for construction laydown areas will not be required as suitable areas of existing cleared land are available for use.

Cyclone warnings will be monitored by the Contractor during construction and if a cyclone warning is issued, a site audit and clean-up will be undertaken prior to the cyclone. This will include filling in any holes, as well as stabilisation or dispersal of piles of dirt and removal of rubbish.

1.3.1.2 Operations and Maintenance

Upon completion of construction, the Project will be incorporated into the NWIS operations. Regular maintenance will be undertaken by Horizon Power including maintaining clearance of power lines and access tracks.

Operational traffic associated with the Proposed Action is anticipated to be minimal, contained to the required maintenance vehicles. Noise associated with operations will be similar levels to those currently experienced in the area with the existing transmission line and road infrastructure.

1.3.1.3 Decommissioning

No specific decommissioning activities have been considered for the Proposed Action as the project is common user infrastructure, rather than a supply for a specific customer, and therefore anticipated to be long term infrastructure which would be maintained indefinitely. When assets are required to be decommissioned this is undertaken via a decommissioning plan on a case by case basis, however the life of the Proposed Action is in excess of 50 years and therefore a decommissioning plan has not been developed at this stage.

1.3.2 Anticipated Timing

Detailed design of the project is subject to the first customer signing up, and award of contracts, as well as ongoing discussions with traditional owners. Detailed design is estimated to be completed by mid Q2 2025.

Construction of the Proposed Action is planned to commence in Q3 2025, and run for a period of approximately 18 months.

Upon completion of construction the Proposed Action will be incorporated into the NWIS operations. The completed transmission line will be subject to normal routine, recurrent and periodic maintenance during operation.

1.3.3 Rehabilitation Activities

Vegetation clearing for the purpose of construction accesses and other temporary purposes will be rehabilitated using locally native species, which will be selected to reflect the surrounding vegetation and be characteristic of significant fauna habitat.

Further information on rehabilitation activities is provided in **Section 0**.

2 Description of the Environment and Matters of National Environmental Significance

2.1 Description of Protected Matters within the DE

This PD describes the following MNES listed under the EPBC Act that are, or have the potential to be, in the DE and surrounds:

Listed Threatened species

- Northern Quoll (*Dasyurus hallucatus*) (Endangered);
- Pilbara Olive Python (*Liasis olivaceus barroni*) (Vulnerable);
- Ghost Bat (*Macroderma gigas*) (Vulnerable); and
- Grey Falcon (*Falco hypoleucos*) (Vulnerable).

Listed Threatened Shorebird species

- Curlew Sandpiper (*Calidris ferruginea*) (Critically Endangered);
- Eastern Curlew (*Numenius madagascariensis*) (Critically Endangered);
- Great Knot (*Calidris tenuirostris*) (Critically Endangered);
- Greater Sand Plover (*Charadrius leschenaultii*) (Vulnerable);
- Lesser Sand Plover (*Charadrius mongolus*) (Critically Endangered);
- Red Knot (*Calidris canutus*) (Endangered);
- Northern Siberian Bar-Tailed Godwit (*Limosa lapponica menzbieri*) (Critically Endangered); and
- Australian Fairy Tern (*Sternula nereis nereis*) (Vulnerable).

Listed Migratory Shorebird and Seabird species

- Whimbrel (*Numenius phaeopus*) (Migratory);
- Oriental Plover (*Charadrius veredus*) (Migratory);
- Wood Sandpiper (*Tringa glareola*) (Migratory);
- Oriental Pratincole (*Glareola maldivarum*) (Migratory);
- Common Sandpiper (*Actitis hypoleucos*) (Migratory);
- Common Greenshank (*Tringa nebularia*) (Migratory);
- Gull-billed Tern (*Gelochelidon nilotica*) (Migratory);
- Caspian Tern (*Hydroprogne caspia*) (Migratory);
- Crested Tern (*Thalasseus bergii*) (Migratory); and
- Bridled Tern (*Onychoprion anaethetus*) (Migratory).

National heritage place

- Dampier Archipelago (including the Burrup Peninsula).

2.2 Technical Reports

Studies and surveys used to inform the impact assessment of the Proposed Action are listed within **Table 2-1.**, including an assessment of any survey limitations. Further detail on each survey is provided in **Table 11-1** in Chapter 11. All surveys were undertaken according to relevant guidelines and included a desktop assessment, that informed the methodologies needed (as per each species recovery plans and/or conservation advice) for the field assessment component. Further detail on the guidelines utilised and assessment process of the surveys is provided in **Section 2.3.8.1**.

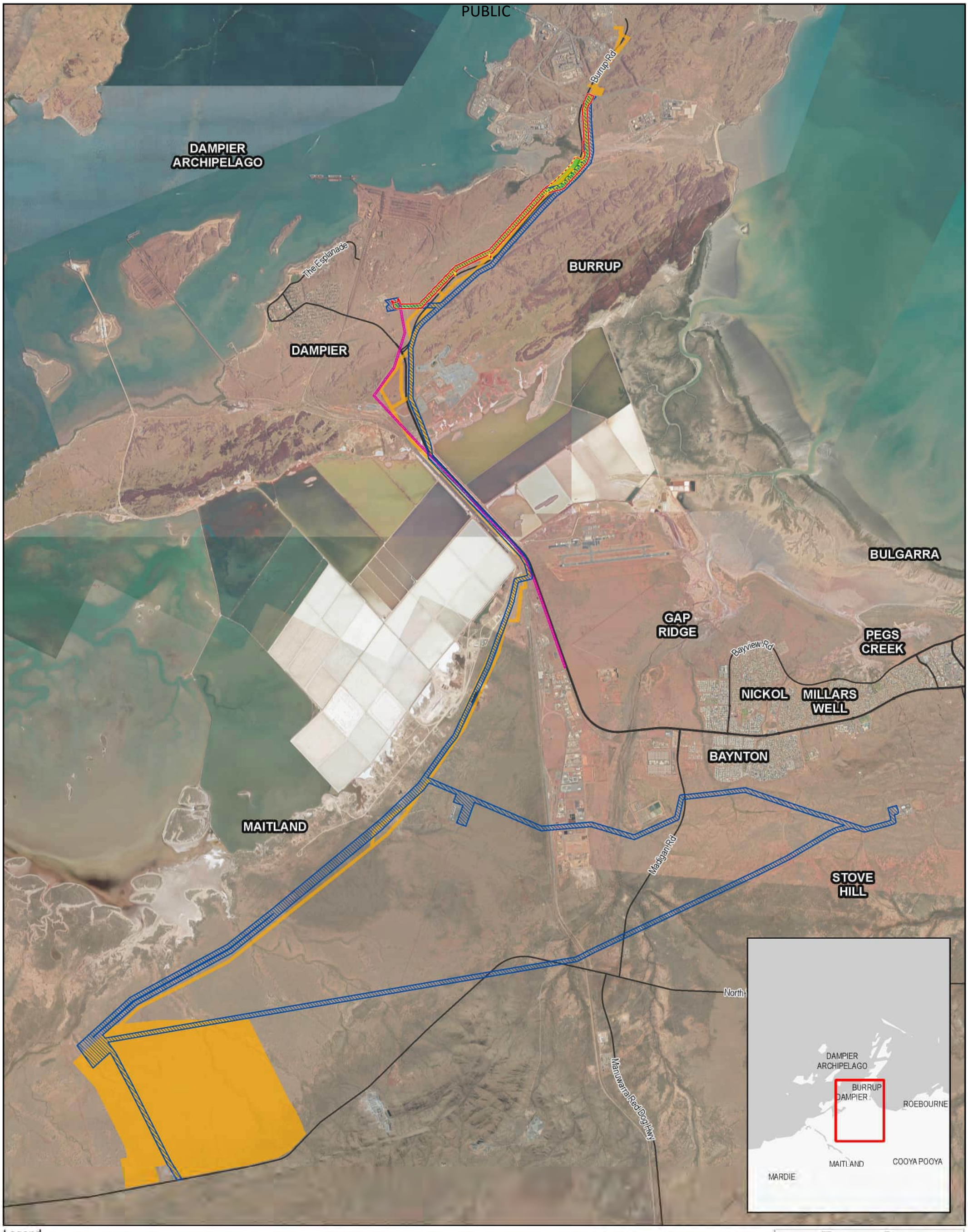
Regarding the timing of the fauna surveys, GHD undertook two fauna surveys of the area, one in 2020 (GHD, 2020b) that included majority of the DE and one in 2022 (GHD, 2022) that included the additional areas remaining. These surveys were undertaken in June to August, which is the appropriate time of year for the

majority of the migratory bird species considered relevant to this assessment. There are some exceptions which generally arrive from September including Curlew Sandpiper, Lesser Sand Plover, Oriental Plover, and the Oriental Pratincole (which generally arrives in November). Therefore, to ensure a conservative approach, and based on existing records, all these species have been assumed to be 'likely to occur' in the DE. Given the general timings of the surveys, the existing data in the area (provided in **Appendix C** and on **Figure 10-1**), and the fact they were undertaken in line with EPA's *Technical Guide on Terrestrial Fauna Surveys* (EPA, 2016a), they are considered to be sufficient to inform the assessment of the Proposed Action and no further baseline survey work is considered necessary.

Appendix A contains the biological survey reports used to inform this document and the study area for the below surveys are detailed on **Figure 2-1**.

Table 2-1. Studies and surveys relevant to the Proposed Action

Survey / Report name	Extent of survey area	Survey date	Methodology	Survey limitations
VLA, 2019. Desktop Assessment Report – Flora and Vegetation Surveys.	Total: 1489.9 ha DE: 39.70 ha	10 to 14 June 2019 and 23 and 23 July, 2019	Reconnaissance flora and vegetation surveys	No significant limitations were identified. See Tabl1 11-1.
GHD, 2019. 124-KRT-DMP 132kV Line Upgrade Project – Flora and Fauna Survey.	Total: 39.36 ha DE: 0.50 ha	5 June 2019 (Northern Section) and 22 and 23 July 2019 (Southern Section).	Vegetation, flora and fauna survey	No significant limitations were identified. See Tabl1 11-1.
GHD, 2020a. Burrup Expansion Project – Flora and Vegetation Survey.	Total: 805.87 ha DE: 71.20 ha	23 to 28 April 2020	Vegetation and flora survey	No significant limitations were identified. See Tabl1 11-1.
GHD, 2020b. Hybrid Renewable Power Plant – Fauna Survey.	Total: 1,367.38 ha DE: 39.70 ha	10th to 13th June and 22nd to 24th July 2019	Vertebrate fauna survey	No significant limitations were identified. See Tabl1 11-1.
GHD, 2022. Burrup Additional Areas – Reconnaissance/Basic Survey	Total: 46.80 DE:14.51 ha	3 and 4 August, 2022	Reconnaissance and basic flora and fauna surveys	No significant limitations were identified. See Tabl1 11-1.



Legend

- Major Road
- Minor Road
- Development Envelope
- Flora and fauna survey (GHD, 2019)
- Vegetation and flora survey (VLA, 2019)
- Vegetation and flora survey (GHD, 2020a)
- Vertebrae fauna survey (GHD, 2020b)
- Reconnaissance and basic flora and fauna survey (GHD, 2022)

0 0.75 1.5 3
Kilometres

N

Scale: 1:75,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; GHD - Biological Survey Area; Landgate - Roads, WA Now accessed April 2023
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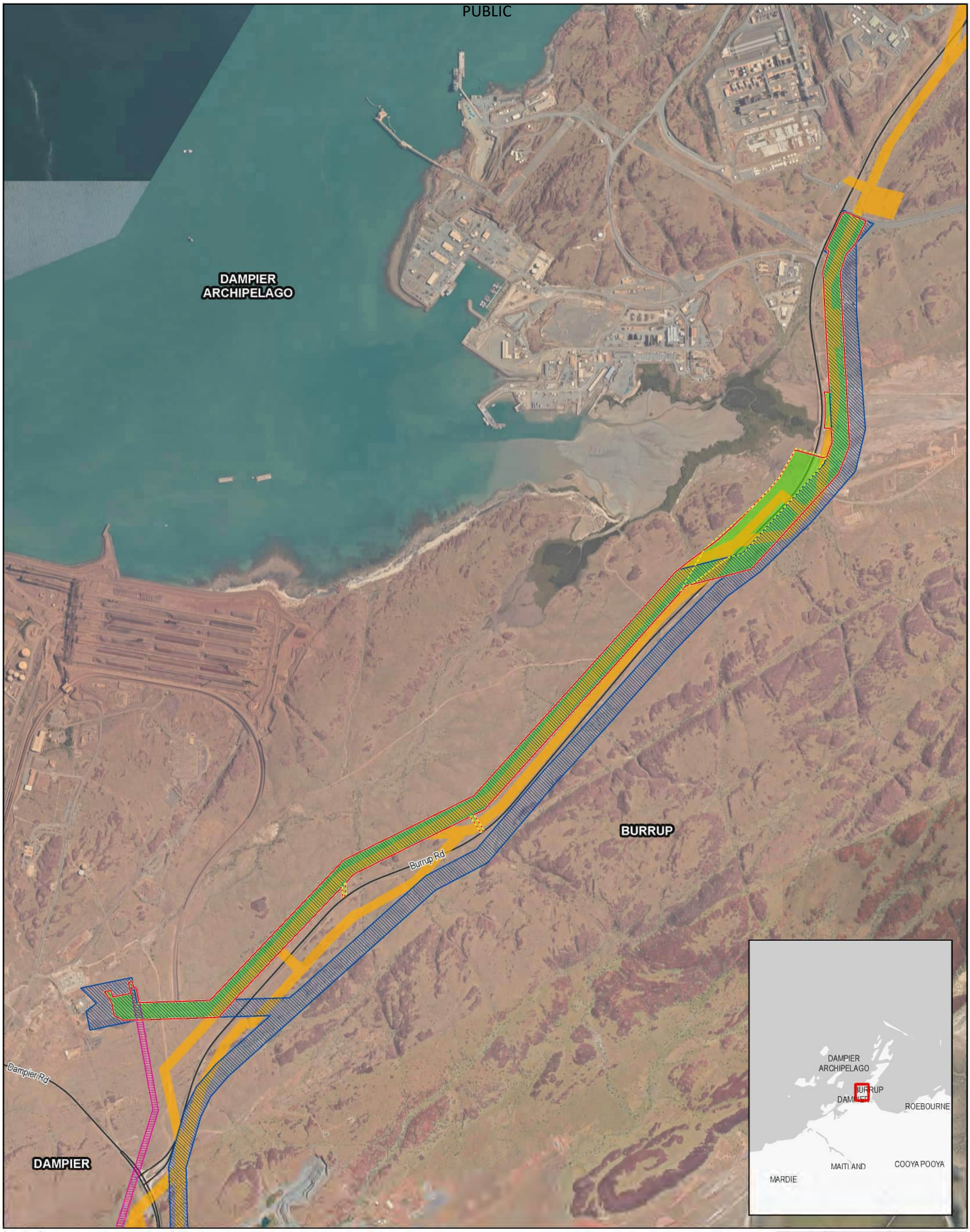
Figure 2-1 Biological Survey Extent (GHD,2020a, 2020b, 2022)



Legend

- Major Road
- Minor Road
- Development Envelope
- Flora and fauna survey (GHD, 2019)
- Vegetation and flora survey (VLA, 2019)
- Vegetation and flora survey (GHD, 2020a)
- Vertebrae fauna survey (GHD, 2020b)
- Reconnaissance and basic flora and fauna survey (GHD, 2022)

0 0.25 0.5 1
Kilometres

N

Scale: 1:20,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; GHD - Biological Survey Area; Landgate - Roads, WA Now accessed April 2023
Map Produced: 12/7/2023.
Project Number: IS472900
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Figure 2-1 Biological Survey Extent (GHD,2020a, 2020b, 2022)

2.3 Existing Environment

2.3.1 Climate

The Burrup Peninsula is characterized by a semi-arid climate with elevated temperatures throughout the year and scarce rainfall, mostly occurring in the late summer months influenced by tropical cyclones and monsoons. Climate statistics from the last 30 years (1993 to 2023) recorded at the Bureau of Meteorology (2023) weather station at Karratha Aero (Station number 004083) indicates a mean maximum temperature range from 36.2°C (March) to 26.5°C (June/July) and mean minimum temperature between 26.9°C (January) and 13.9°C (July).

Regarding mean rainfall, over the last 50 years, the area has an average annual rainfall of 290.5 mm, with the highest rainfall typically in February (76.4 mm) lowest in October (0.4 mm) (see **Figure 2-2**).

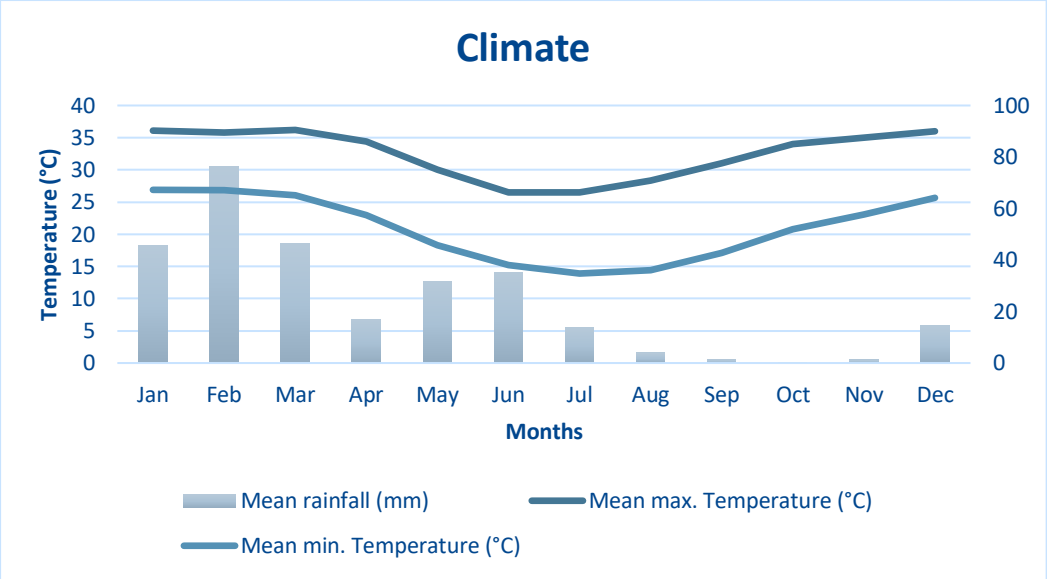


Figure 2-2. Climate - Karratha Aero (Station number 004083) (Bureau, 2023)

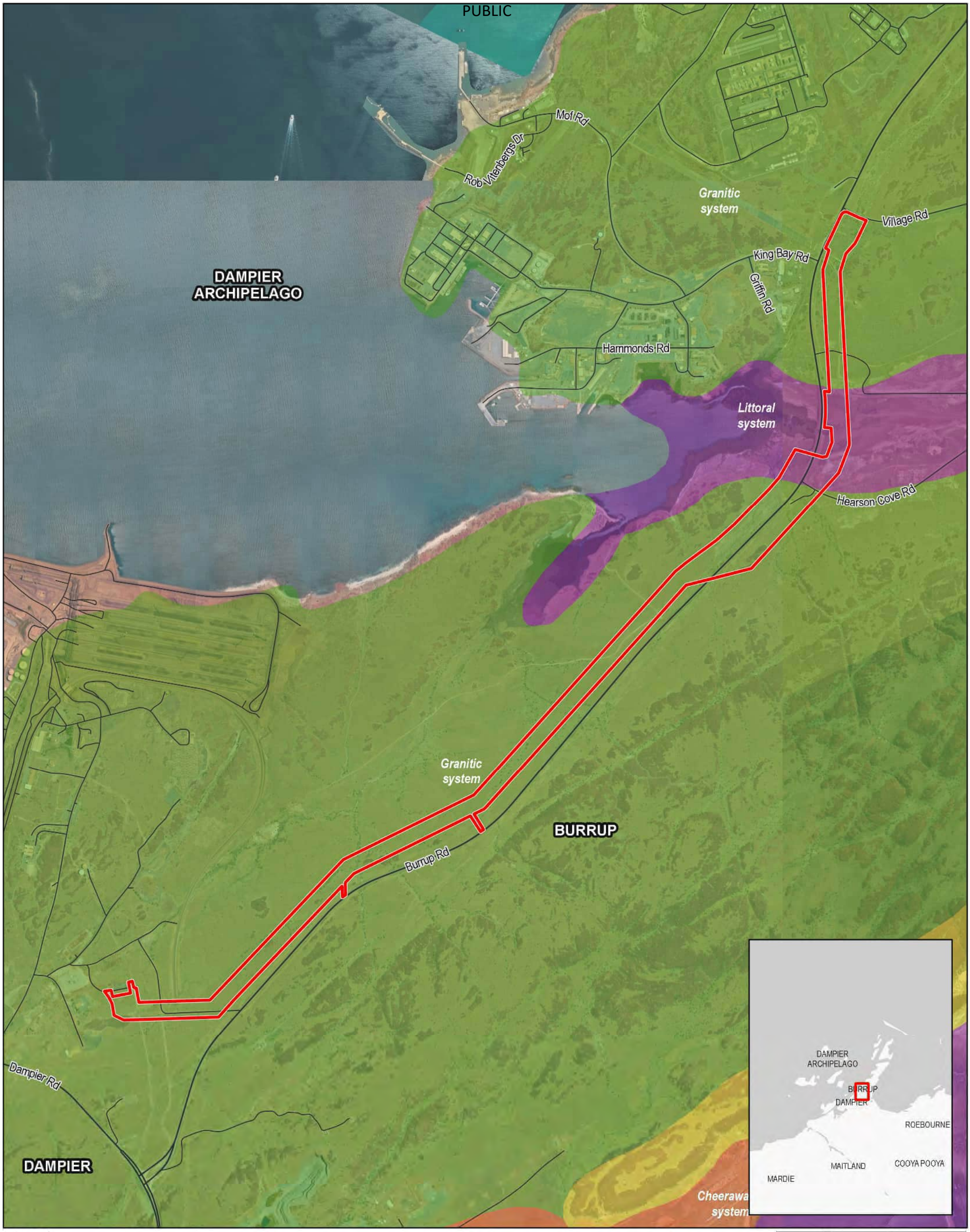
2.3.2 Geology, Landforms and soils

The Burrup Peninsula has Archean and gneissic granite geological substrate, along with intrusive outcrops of Proteozoic gabbro and granophyric rhyodacite. Over time, due to erosion the rhyodacite formations eroded. This formation is known for their strength. The subsequent intrusion of doleritic dykes, followed by geological processes, contributed to the creation of elongated, narrow valleys that cut through the land surface of the Burrup Peninsula. This landscape is marked by distinctive piles of boulders and rocky outcrops with visible joints (Lantze, 2003).

The DE for the proposed action overlaps two Land Systems (DPIRD, 2022) (**Figure 2-3**):

– Granitic Land System: 'Rugged granitic hills supporting shrubby hard and soft spinifex grasslands'.
– Littoral land system: 'Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests'.

The granitic land system is composed of stony soils (soil type code 203), red shallow sands (423), red loamy earth (544) and shallow riverbed soils (705) which have diverse permeability characteristics (DPIRD, 2004 and 2013). The area within the DE has a major association with sandy loam on rocky slopes with frequent basalt outcropping (VT06) and rocky sandy loam on minor drainage lines (VT03). The area within the Littoral Land System has tidal soils (104) characterized by very slow permeability (DPIRD, 2004 and 2013) and vegetation associated with tidal flats (VT04) (GHD, 2020a).



Legend

- Major Road
- Minor Road
- Development Envelope
- Cheerawarra System
- Granitic System
- Littoral System
- Rocklea System

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)
Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; DPIRD - Land Systems; Landgate - Roads, WA Now accessed April 2023
Map Produced: 10/13/2023.
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Figure 2-3 Land Systems within the DE (DPIRD, 2022)

2.3.2.1 Acid Sulfate Soils and Contaminated Sites

Acid sulfate soil (ASS) is a name given to soils or sediments containing iron sulfides. When exposed by drainage, lowering of water-tables or excavation, ASS can oxidate the sulfides creating acid discharge or runoff and consequently trigger a range of flow-on effects. The Acid Sulfate Soil Risk Map of the Pilbara Coastline (DWER) shows that there are (**Figure 2-4**):

– 11.6 ha of 'High to Moderate Risk' occurring within 3 m of natural soil surface that could be disturbed by most land development activities.
– 9.9 ha of 'Moderate to low risk' occurring within 3 m of natural soil surface that could be Disturbed by most land development activities (activities disturbing soils at depths greater than 3 m carry a high to moderate risk of disturbing ASS).

According to DWER (2023), there are no known contaminated sites within the DE. The closest confirmed site is 1.5 km east from the northern portion of the DE.

PUBLIC

DAMPIER ARCHIPELAGO

Mof Rd

Rob Vitenbergs Dr

Village Rd

King Bay Rd

Griffin Rd

Hammonds Rd

Hearson Cove Rd

BURRUP

Burrup Rd

Dampier Rd

DAMPIER

Legend

- Major Road
- Minor Road
- Development Envelope

Contaminated Sites

- Contaminated - remediation required

Acid Sulfate Soil Classification

- High to moderate risk of ASS occurring within 3m of natural soil surface
- Moderate to low risk of ASS occurring within 3m of natural soil surface

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - DE; DWER - Acid Sulfate, Contaminated Sites; Landgate - Roads, WA Now accessed April 2023
Map Produced: 10/2/2023.
Project Number: IS472900
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Figure 2-4 Acid Sulfate Soil Risk Map and Contaminated Sites - Development Envelope

2.3.3 Groundwater

The Pilbara region relies on the groundwater as the main water resource which is recharged by water infiltrating though streambeds during large rainfall events. The hydrogeology of the Pilbara is influenced by the geology of the region and the drainage, the DE is located within the North-Pilbara Granite-Greenstone Terrane Hydrogeological province and the Pilbara-Fractured aquifer. The Granit-Greenstone Terrane Hydrogeological Province has shallow soils, relatively high drainage density and groundwater resources limited to alluvial aquifers and fracture zones in greenstones (CSIRO, 2015). Additionally, fractured rock aquifers are characterised by irregular and unpredictable water availability, recharge, and storage (DoW, 2013) with recharge rainfall dependent and through leakage from overlying sediments and from surface flows directly to areas of secondary porosity (DoW,2009).

According to the Water Information Reporting (DWER, 2023), there is only one registered groundwater bore (Site Ref. 70970061) within the Burrup Peninsula, however there is no publicly available data.

The water supplies are part of the West Pilbara Water Supply Scheme. The Millstream wellfield is used as a source of water, along with Harding Dam, to supply water to Karratha, Dampier, Roebourne, Wickham, Point Sampson, Cape Lambert, and the Burrup Peninsula (CSIRO, 2015; DoW, 2010).

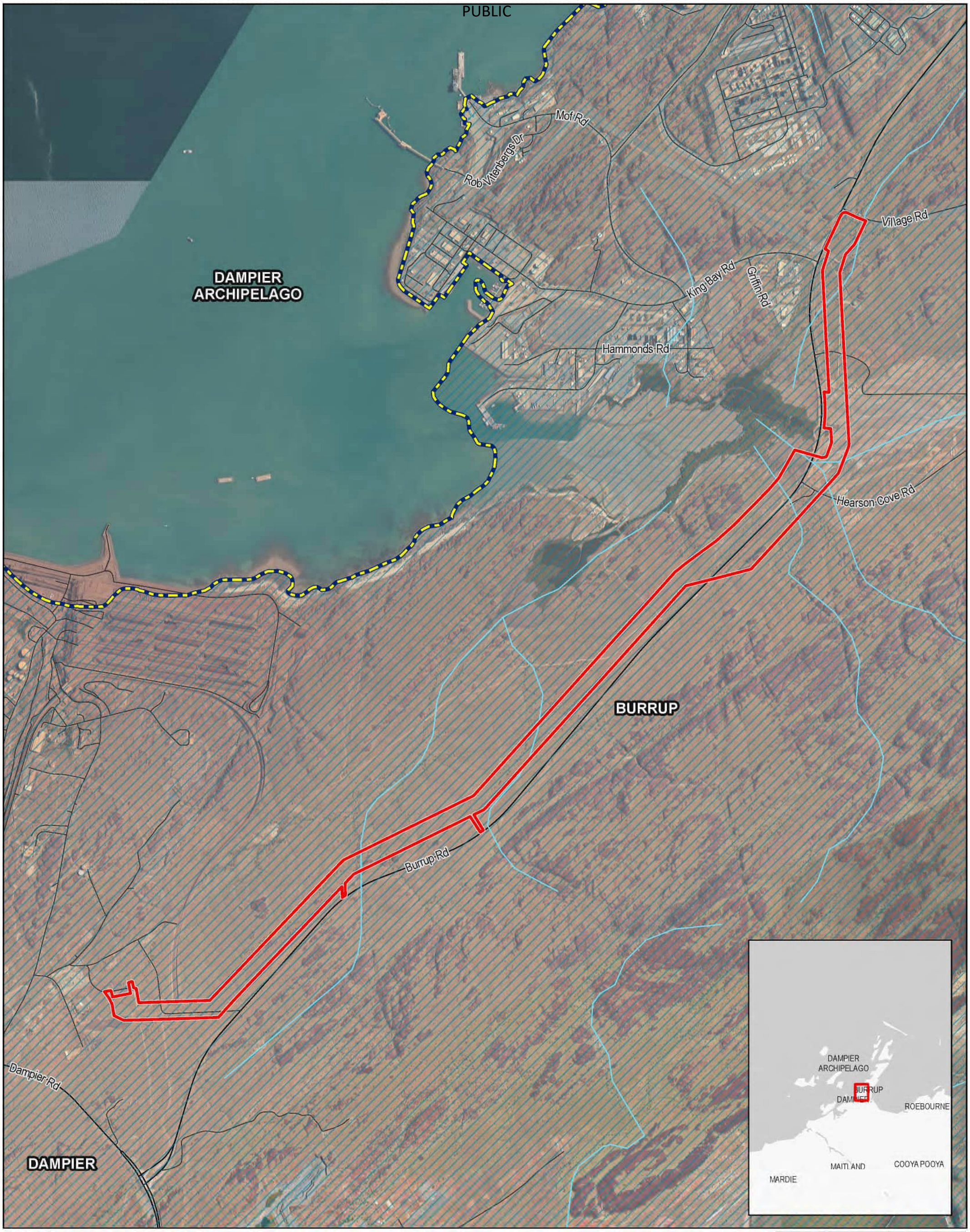
2.3.4 Surface Water

The Proposed Action is located within the proclaimed Pilbara Surface Water Area and Port Hedland Coast River basin. The Pilbara's surface water supplies rely upon inputs during the wet season, often in response to large cyclonic rainfall events. In the different catchments, a rain event of between 8 and 30 mm is necessary to generate streamflow (CSIRO, 2015).

Usually, potential evaporation exceeds annual rainfall by 6 to 14 times, but during cyclonic events and tropical depressions, the rate of rainfall exceeds infiltration rate by 5 to 6 times, resulting in runoff and generating flows in the ephemeral waterways of the area (CSIRO, 2015).

The DE and surroundings are located within or adjacent to 'minor' non-perennial drainage lines (**Figure 2-5**). The Proposed Action is near the tidal inlet between Hearson Cove and King Bay which is characterised by saline flats that experience tidal inundation.

The DE does not overlap public drinking water source areas. The closest area is the Roebourne Water Reserve, approximately 44km to the south east of the Proposed Action.



Legend

- Major Road
- Minor Road
- Creeks and River Drainage
- Development Envelope
- Pilbara-Fractured Aquifer
- Pilbara Surface Water Area
- Port Hedland Coast River Basin

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation

Projection: GDA2020 MGA Zone 50

Sources: Jacobs - DE; DWER - Acid Sulfate, Contaminated Sites; Landgate - Roads, WA Now accessed April 2023

Map Produced: 12/11/2023.

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Figure 2-5 Groundwater and Surface Water within and in the vicinity of the DE

2.3.5 Existing Land Use

Land use in the wider Pilbara region includes mining and petroleum operations, pastoralism, tourism and recreation, and conservation. The Burrup Peninsula is a combination of National Park, proposed Industrial Estate areas, Dampier Town Lands, Salt Fields and current Industrial Leases. The primary land use of the DE is Strategic Industry. The remainder of the land within the DE is zoned as District Roads as per the local planning scheme (**Figure 2-6**).

There are no DBCA managed lands within the DE, however the Murujuga National Park is located within close proximity, approximately 100 m north and 180 m east of the DE, which is owned by the Murujuga Aboriginal Corporation (MAC) and jointly managed by MAC and DBCA. The closest Crown Land of Interest is 22 km south of the southern portion of the DE (DBCA, 2023b).

The Murujuga National Park hosts the largest concentration of ancient rock art in the world and has an area of 5,134 hectares (ha). Primary geographical features and ecosystems found within the park consist of sea cliffs, mudflats, sandy and rock shores, narrow valleys, rocky outcrops and hills, and mangroves. The prevailing vegetation in the region is composed mainly of 'hummock' grasslands (*Triodia pungens*), accompanied by a restricted occurrence of 'vegetation communities' (Murujuga, 2023).

No Environmentally Sensitive Areas (ESAs) intersect the DE (DWER, 2021).

The section of the intertidal area which lies within the proposed DE is traversed by an existing distribution power line and Burrup Road, which is a two-lane sealed road atop a crushed rock causeway with a large central culvert to permit tidal movements of water underneath the road infrastructure. On the southern side the intertidal flat is bordered by Hearson Cove Rd and along the northern side there is small network of unsealed roads and two industrial facilities. As such, the intertidal area already exhibits a notable degree of disturbance, vegetation clearing and pre-existing infrastructure as shown in Photos 3 and 4.

Photo 3 – An area close to the tidal inlet showing pre-existing and ongoing clearing

Photo 4 – An area close to the tidal inlet showing pre-existing and ongoing clearing

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Mof Rd

Rob Vitenbergs Dr

Murujuga National Park

Village Rd

King Bay Rd

Griffin Rd

Hammonds Rd

Hearson Cove Rd

BURRUP

Burrup Rd

Murujuga National Park

Dampier Rd

DAMPIER

DAMPIER ARCHIPELAGO

BURRUP

DAMPIER

ROEBOURNE

MAITLAND

COOYA POOYA

MARDIE

Legend

- Major Road
- Minor Road
- Development Envelope
- Murujuga National Park

Land Tenure

- Easements
- Other Interests
- Crown Lease
- Crown Reserve
- Public Road
- Unallocated Crown Land; Closed Road
- Crown Allotment (Type 2)
- Lot on Survey (Type 1)

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation

Projection: GDA2020 MGA Zone 50

Sources: Jacobs - DE; DWER - Acid Sulfate, Contaminated Sites; Landgate - Roads, WA Now accessed April 2023

Map Produced: 10/13/2023.

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Figure 2-6 Existing Land Use in the Vicinity within and in the Vicinity of the DE

2.3.6 Aboriginal Cultural Heritage

The Burrup Peninsula and its surrounds supports extensive Aboriginal cultural heritage sites, with the Dampier Archipelago (including Burrup Peninsula) listed on the National Heritage List. The Dampier Archipelago was listed as a National Heritage Place on 3 July 2007, and has been nominated for World Heritage listing, placed on Australia's World Heritage Tentative List in February 2020. The Dampier Archipelago is recognised for its unique natural and Aboriginal cultural heritage. The Archipelago formed 6 - 8,000 years ago and comprises a system of islands, rocky reefs, coral reefs, shoals, channels and straits covering approximately 400 km. The underlying rocks are amongst the oldest on earth, formed in the Archaean period more than 2,400 million years ago (DCCEEW, 2022).

Home to Indigenous Australians for tens of thousands of years, the Dampier Archipelago contains a diverse array of Aboriginal cultural heritage including dreaming sites, ceremonial sites, rock engravings and other archaeological sites. It is of exceptional heritage interest for its diverse array of rock engravings (potentially numbering in the millions) and stone arrangements, and the importance of these within the Aboriginal traditions of Ngarda-Ngarli people. The rock art of the Dampier Archipelago illustrates the evolution of societies, cultures and the environment over time (DCCEEW, 2022).

The marine environment of the Dampier Archipelago is characterised by intertidal mud and sand flats associated with fringing mangals in bays and lagoons, a large tidal range, highly turbid water and the occurrence of fringing coral reefs around some of the islands (DCCEEW, 2022). The DE overlaps a portion of the National Heritage site Dampier Archipelago, which includes the Burrup Peninsula and consists of 42 islands, islets, and rocky formations.

Murujuga Aboriginal Corporation (MAC) was formed in 2006 as part of the Burrup and Maitland Industrial Estates Agreement (BMIEA) with the WA Government. MAC holds freehold title to the Murujuga National Park. There are 31 known places of Aboriginal cultural heritage significance which intersect the DE (CBG 2020, Scarp 2022).

The Project avoids all known heritage sites identified by the heritage surveys within the DE. The impacts to the Dampier Archipelago and how these will be avoided and mitigated are discussed in the Cultural Heritage Management Plan (CHMP) (Confidential document - provided separately to the Preliminary Documentation). Through consultation with MAC, it was determined that the preferential route for the Proposed Action would predominantly be on the north-western side of the existing road.

2.3.7 Vegetation and Flora

Regional Biogeography

The DE is located within the Pilbara bioregion and Roebourne subregion (PIL 4) as described by the Interim Biogeographic Regionalisation of Australia (IBRA). The Pilbara bioregion is characterized by mulga low woodlands or sappy gum over bunch and hummock grasses (DCCEEW, 2008). The Roebourne subregion comprises quaternary alluvial and older colluvial coastal and sub-coastal plains, with ephemeral drainage lines supporting Eucalyptus woodlands and with extensive dwarf shrubs steppe dominated by *Acacia translucens* and *Triodia pungens* on alluvial plains and, along the marine flats, there are typical Samphire (*Tecticornia*), Sporobolus grass and mangrove swamp (WA Museum, 2010).

Pre-European Vegetation

The Pre-European vegetation mapping of Western Australia dataset maps the vegetation presumed to have existed prior to European settlement. The Proposed Action lies on the Abydos Plain (Roebourne) vegetation association characterized by Hummock grassland of *Triodia spp* (**Table 2-2.**).

Table 2-2. Pre-European vegetation within the Development Envelop

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Proportion remaining (%)	Proportion of current extent in all DBCA managed land (proportion of current extent) (%)
Abydos Plain – Roebourne (117)	WA	919,517.05	886,005.79	96.36	14.79
	IBRA Region: Pilbara	82,705.78	78,096.64	94.43	22.54
	IBRA Subregion: Roebourne	50,962.94	46,901.57	92.03	37.53
	Local Government authority (LGA): City of Karratha	41,173.74	31,921.58	77.53	58.03

Field Survey assessment

An overview of the vegetation types (GHD, 2022; and GHD, 2020a) within the DE is provided in **Table 2-3.** and shown in **Figure 2-7**. Vegetation condition in the DE ranged from 'Excellent' to 'Cleared' as shown in **Table 2-3.** and **Figure 2-8**.

Table 2-3. Vegetation Type within the Development Envelope

Vegetation Type	Vegetation Type Description	Extent of Vegetation type within the DE (ha)	Proportion within DE (%)
AbCc	*Acacia bivenosa* tall open to shrubland over **Cenchrus ciliaris* tussock grassland, sometimes closed tussock grassland, with patchy *Triodia angusta.*	0.02	0.02
AbImTe	*Acacia bivenosa, Acacia pyrifolia subsp morrisonii, Grevillea pyramidalis* open shrubland over *Indigofera monophylla, Corchorus walcottii* open low shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* tussock grassland.	0.02	0.02
EvAbTa	*Eucalyptus victrix* open to scattered low woodland with scattered *Corymbia hamersleyana* over *Acacia bivenosa tall* open shrubland over *Adriana tomentosa / Indigofera monophylla* open low shrubland over *Triodia angusta / T. epactia* open to hummock grassland.	0.015	0.02

Vegetation Type	Vegetation Type Description	Extent of Vegetation type within the DE (ha)	Proportion within DE (%)
GpCc	*Grevillea pyramidalis* (regenetrating) scattered to open tall shrubland over **Cenchrus ciliaris* tussock and *Triodia epactia* hummock grassland	0.02	0.02
GpTeBaTs	*Grevillea pyramidalis* scattered to open tall shrubland, sometimes with scattered *Hakea lorea subsp lorea, Ipomoea costata, Acacia inaequilatera* over *Triodia epactia* hummock grassland, sometimes patchy *T. angusta*. There can be open low *Indigofera monophylla* shrubland.	0.361	0.42
TslcTe	*Grevillea pyramidalis* scattered to open tall shrubland, sometimes with scattered *Hakea lorea subsp lorea, Ipomoea costata, Acacia inaequilatera* over *Triodia epactia* hummock grassland, sometimes patchy *T. angusta*. There can be open low *Indigofera monophylla* shrubland.	0.001	0.00
Tspp	*Tecticornia halocnemoides subsp tenuis, T. pruinosa, T. indica* subsp *leiostachya*, with *Muellerolimon salicorniaceum* open low shrubland with patchy *Avicennia marina* trees.	0.06	0.07
VT01	*Brachychiton acuminatus* scattered low trees over Grevillea pyramidalis subsp. pyramidalis, *Terminalia supranitifolia* (P3) and *Flueggea virosa subsp. melanthesoides* scattered shrubs over *Triodia epactia* open hummock grassland over *Cymbopogon ambiguus* and* **Cenchrus ciliaris* open tussock grassland and *Tinospora smilacina* and *Ipomoea costata* open vineland on rock piles.	1.74	2.03
VT02	*Corymbia hamersleyiana* open woodland over *Acacia bivenosa*, Grevillea pyramidalis subsp. Pyramidalis and *Hakea lorea subsp*. Lorea scattered shrubs over *Triodia epactia* open hummock grassland with **Cenchrus ciliaris* scattered grass over over *Hybanthus aurantiacus*, *Cleome viscosa* and *Trichodesma zeylanicum var. zeyl*anicum open forbland on brown sandy loam on elevated rocky plain.	2.42	2.83
VT03	*Eucalyptus victrix* open woodland over *Terminalia circumalata* low open woodland over *Triodia wiseana* open hummock grassland with **Cenchrus ciliaris* and *Eriachne benthamii* scattered tussock grasslands over *Hybanthus aurantiacus*, *Indigofera trita* and *Gossypium austral* scattered herbs on rocky sandy loam on minor drainage lines.	6.52	7.62
VT04	*Tecticornia indica subsp. Leiostachya* and *Tecticornia pterygosperma* low chenopod shrubland with scattered *Avicennia marina* on saline flats with tidal inundation.	4.62	5.40

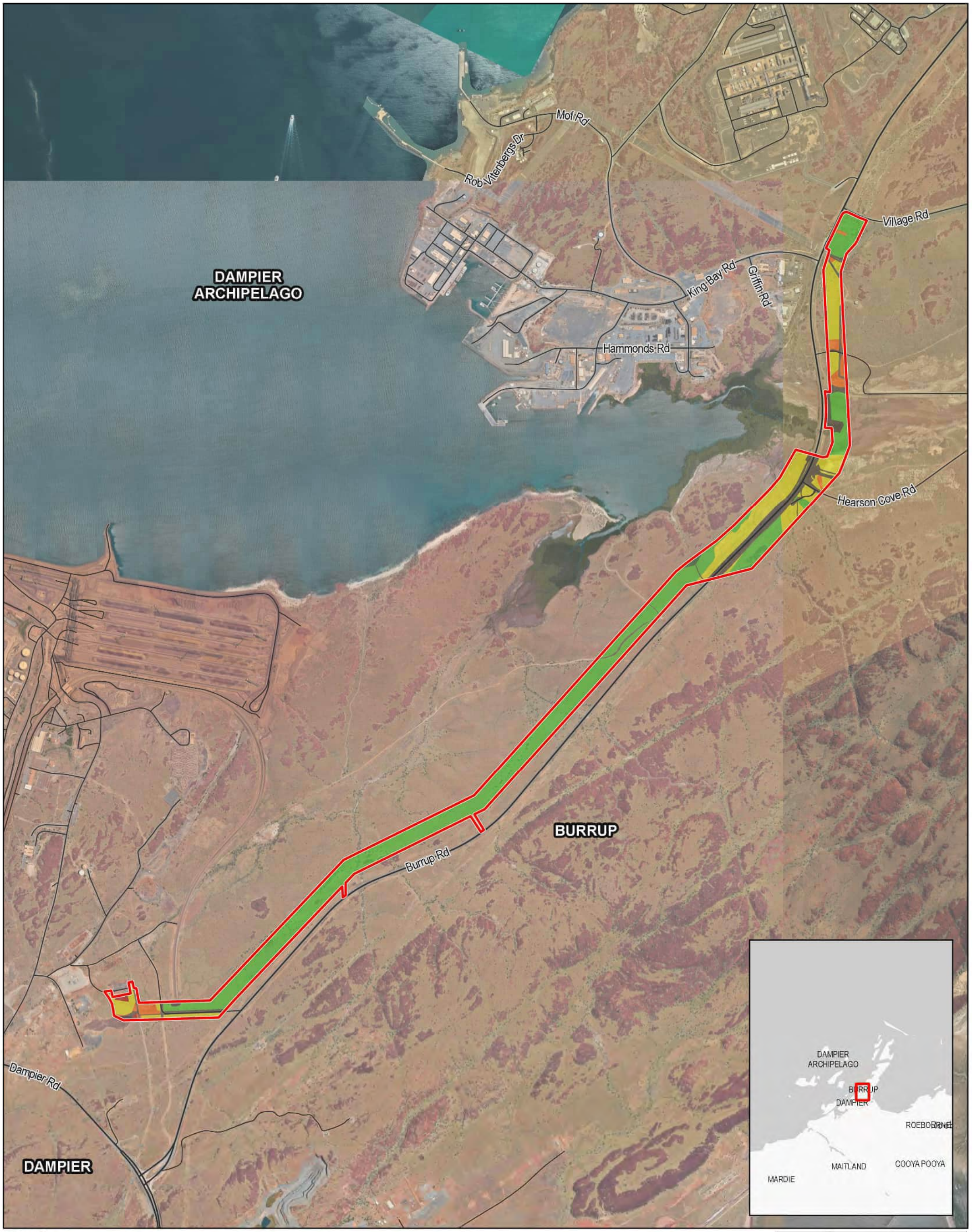
Vegetation Type	Vegetation Type Description	Extent of Vegetation type within the DE (ha)	Proportion within DE (%)
VT05	*Cenchrus ciliaris open grassland over *Trianthema turgidifolia* and *Neobassia astrocarpa* open chenopod shrubland on disturbed edges of saline flats.	2.07	2.42
VT06	*Grevillea pyramidalis subsp. Pyramidalis* and **Vachellia farnesiana* scattered shrubs over *Ipomoea costata*, Indigofera monophylla and *Scaevola spinescens* open shrubland over *Triodia epactia* open hummock grassland over *Cleome viscosa*, *Rhynchosia minima* and *Hybanthus aurantiacus* scattered herbs on red/brown sandy loam on rocky slopes with frequent basalt outcropping.	57.12	66.78
Cleared	Previously cleared areas.	10.56	12.35
Total		**85.54**	**100**

Table 2-4 Vegetation condition within the Development Envelope

Vegetation condition	Extent in DE (ha)	Proportion within DE (%)
Excellent	0.37	0.43
Very Good	51.93	60.7
Good	19.17	22.41
Poor	3.19	3.73
Degraded	0.02	0.02
Completely Degraded	0.31	0.36
Cleared	10.56	12.35
Total	**85.54**	**100**

Significant ecological communities (Threatened and Priority Ecological Communities) are addressed in **Section 2.3.7.1**. Other significant vegetation recorded in the DE is associated with the drainage lines that intersect the DE. Minor drainage lines which dissect the plain and rocky slopes are lined by *Corymbia hamersleyana* and *Eucalyptus victrix* (GHD, 2020a). Within the DE, VT03 and EvAbTa are considered to represent riparian vegetation. There is 6.54 ha of riparian vegetation within the DE.

In addition, three vegetation types (Tspp, VT04 and VT05) growing in association with the tidal inlet between Hearson Cove and King Bay may have some significance due to their limited distribution and impacts from threatening processes such as clearing and development. There is 6.75 ha of intertidal adapted vegetation within the DE. Ongoing clearing in the tidal inlet by third parties has reduced the expected hectares of disturbance in this area, as detailed in Section 2.3.5.



Legend

- Major Road
- Minor Road
- Development Envelope

Vegetation Condition

- Excellent
- Very Good
- Good
- Poor
- Degraded
- Cleared

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; GHD - Vegetation; Landgate - Roads, WA Now accessed April 2023
Map Produced: 10/13/2023.
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Figure 2-7 Vegetation Condition within the DE

Legend

- Major Road
- Minor Road
- Development Envelope

Vegetation Type

- AbCc
- AbImTe
- EvAbTa
- GpCc
- GpTeBaTs
- TsIcTe
- Tspp
- VT01
- VT02
- VT03
- VT04
- VT05
- VT06
- Cleared

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; GHD - Vegetation; Landgate - Roads, WA Now accessed April 2023
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Figure 2-8 Vegetation Types within the DE

2.3.7.1 Threatened Ecological Communities and Threatened Flora

A search of the Protected Matters Search Tool and other databases did not identify any Threatened Ecological Communities (TECs) listed under the EPBC Act as occurring within the DE, which were confirmed by the surveys (GHD 2020a, 2022). However, the Priority Ecological Community (PEC) 'Burrup Peninsula rock pile communities (Priority 1)' (State listed PEC) was recorded within the DE as Vegetation Type 01 (VT01), GpTeBaTs and TsIcTe, with a total mapped extent of 2.1 ha within the DE. This PEC is included in the 'avoidance areas' that will be avoided during clearing and construction works (identified on **Figure 1-1**). PECs are listed by the WA Department of Biodiversity, Conservation and Attractions (DBCA) as they are identified as near threatened or for which there is insufficient information to this these communities as TECs.

The Burrup Peninsula rock pile communities PEC is characterised by pockets of vegetation in rock piles and outcrops. The rock pile communities vary from open tussock grass assemblages with small herbs and grasses on otherwise bare calcrete, through to hummock sub-shrub communities, to dense shrub/tree communities. The PEC is restricted to Burrup Peninsula and some Dampier Archipelago islands. The 'Burrup Peninsula rock piles community' PEC comprises a mixture of Pilbara and Kimberley fire sensitive species (GHD, 2020a).

The Burrup Peninsula rock piles communities is listed as Priority 1 by the DBCA. Key threats to this PEC include clearing, altered fire regimes, emissions and weed invasion (DBCA, 2022).

2.3.7.2 Introduced and Invasive Flora Species

According to the surveys (GHD 2020a, 2022), one introduced flora taxa was recorded within the DE: Stinking passionflower (*Passiflora foetida*). This species was recorded near to a patch of PEC located in the northern area of the DE (**Figure 2-9**). This species is not listed as a Weed of National Significance (WoNS) or Declared Plant.

Legend

- Invasive Flora: *Passiflora foetida*
- Major Road
- Minor Road
- Development Envelope
- Burrup Peninsula Rock Pile Communities (P1)
- No-Go Zones

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - DE; GHD - PEC, No Go Zones, Invasive Flora; Landgate - Roads, WA Now accessed April 2023
Map Produced: 10/2/2023.
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Rev A

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Figure 2-9 Priority Ecological Community (PEC) and Invasive Flora Species

2.3.8 Fauna

2.3.8.1 Overview

DBCA database records were reviewed to assess the recorded occurrences of the relevant listed fauna within the wider region, identified in DCCEEW's request for information. The historic records are displayed on **Figure 2-10** and details of the records are provided in **Appendix C**.

The following surveys of the DE focused on fauna:

- 124-KRT-DMP 132kV Line Upgrade Project – Flora and Fauna Survey (GHD, 2019)
- Hybrid Renewable Power Plant – Fauna Survey (GHD, 2020b); and
- Burrup Additional Areas Reconnaissance/Basic Survey (GHD, 2022).

The desktop studies were undertaken to identify features of significance known from the study area. This involved the collation of previous biological surveys overlapping the study area and the outputs of various database searches. The results of the desktop study were used as the basis for compiling lists of fauna species of significance potentially occurring in the survey area. In reviewing previous surveys carried out nearby, the potential presence of habitat types associated with significant species were identified and used to tailor the design and timing of the field survey.

Basic and targeted fauna surveys of the survey area were undertaken to verify the accuracy of the desktop study, broadly characterise the fauna assemblage and collect data on species of significance. This involved describing and mapping fauna habitats and selective low-intensity sampling.

The scope and approach of the fauna surveys was consistent with the following policies and guidelines:

- Environmental Factor Guideline – Terrestrial Fauna (EPA, 2016a);
- Technical Guidance – Terrestrial Fauna Surveys for Environmental Impact Assessment (EPA, 2020);
- Survey Guidelines for Australia's Threatened Birds (DEWHA, 2010); and
- Survey Guidelines for Australia's Threatened Mammals (DSEWPaC, 2011).

GHD undertook two fauna surveys of the area, one in 2020 (GHD, 2020b) that included majority of the DE and one in 2022 (GHD, 2022) that included the additional areas remaining.

Survey limitations were assessed (**Section 2.2.1**), and no significant limitations were identified. Given the above, the surveys undertaken are considered adequate for the purpose of this impact assessment, including with respect to survey extent, effort, and timing.

The desktop assessment (GHD, 2020b) identified a total of 331 vertebrate fauna species with the potential to occur in the survey area. It is noted that there are several bird species which may occur within the DE and/or immediate surrounds due to their migratory natures.

Thirty-one of the species in the potential assemblage are listed as conservation significant. A further 60 avifauna species are listed as 'Migratory' under the EPBC Act. The consolidated potential species list is provided in the GHD (2020b) report (**Appendix A**).

During the GHD (2020b) field survey, a total of 97 native vertebrate fauna species were recorded within the survey area. Four EPBC Act listed fauna species were recorded in the survey area:

- Whimbrel (*Numenius phaeopus*) (Migratory);
- Gull-billed Tern (*Gelochelidon nilotica*) (Migratory);
- Caspian Tern (*Hydroprogne caspia*) (Migratory); and
- Crested Tern (*Thalasseus bergii*) (Migratory).

Five fauna habitat types (excluding cleared and disturbed areas) were identified within the DE (GHD, 2020b and GHD, 2022). Most of the fauna species of significance recorded from the survey area, or likely to occur, would be associated with the mudflat with tidal inundation, mangroves and supportive scattered samphire, or the rocky hills with exposed boulder piles habitats.

Figure 2-11 shows each of the fauna habitat types mapped by GHD (2020b and 2022). **Table 2-5** describes each of the fauna habitats. With **Table 2-6** outlining the quality of the fauna habitats, ranging from Poor to Excellent condition.

Overall, the habitats present contain a diversity of fauna, and provide habitat for significant fauna species (mainly Migratory birds) that are present or likely to be present within the DE.

DAMPIER ARCHIPELAGO
BURRUP
GAP RIDGE
CLEAVERVILLE
DAMPIER
BULGARRA
NICKOL
MOUNT ANKETELL
MULATAGA
KARRATHA INDUSTRIAL ESTATE
STOVE HILL
MAITLAND
North West Coastal Hwy
Karratha Station Rd
MARDIE

DAMPIER ARCHIPELAGO
BURRUP
DAMPIER
ROEBOURNE
MAITLAND
COOYA POOYA
MARDIE

Legend

- Major Road
- Development Envelope

Significant Fauna

- Bridled Tern *(Onychoprion Anaethetus)*
- Caspian Tern *(Hydroprogne Caspia)*
- Common Greenshank *(Tringa Nebularia)*
- Common Sandpiper *(Actitis Hypoleucos)*
- Crested Tern *(Thalasseus Bergii)*
- Curlew Sandpiper *(Calidris Ferruginea)*
- Eastern Curlew *(Numenius Madagascariensis)*
- Ghost Bat *(Macroderma Gigas)*
- Great Knot *(Calidris Tenuirostris)*
- Greater Sand Plover, Large Sand Plover *(Charadrius Leschenaultii)*
- Gull-Billed Tern *(Gelochelidon Nilotica)*
- Lesser Sand Plover *(Charadrius Mongolus)*
- Northern Quoll *(Dasyurus Hallucatus)*
- Oriental Plover *(Charadrius Veredus)*
- Oriental Pratincole *(Glareola Maldivarum)*
- Pilbara Olive Python *(Liasis Olivaceus Barroni)*
- Red Knot *(Calidris Canutus)*
- Whimbrel *(Numenius Phaeopus)*
- Wood Sandpiper *(Tringa Glareola)*

0 2.5 5 10
Kilometres

N

Scale: 1:170,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation

Projection: GDA2020 MGA Zone 50

Sources: Jacobs - DE; DWER - Acid Sulfate, Contaminated Sites; Landgate - Roads, WA Now accessed April 2023

Map Produced: 12/7/2023.

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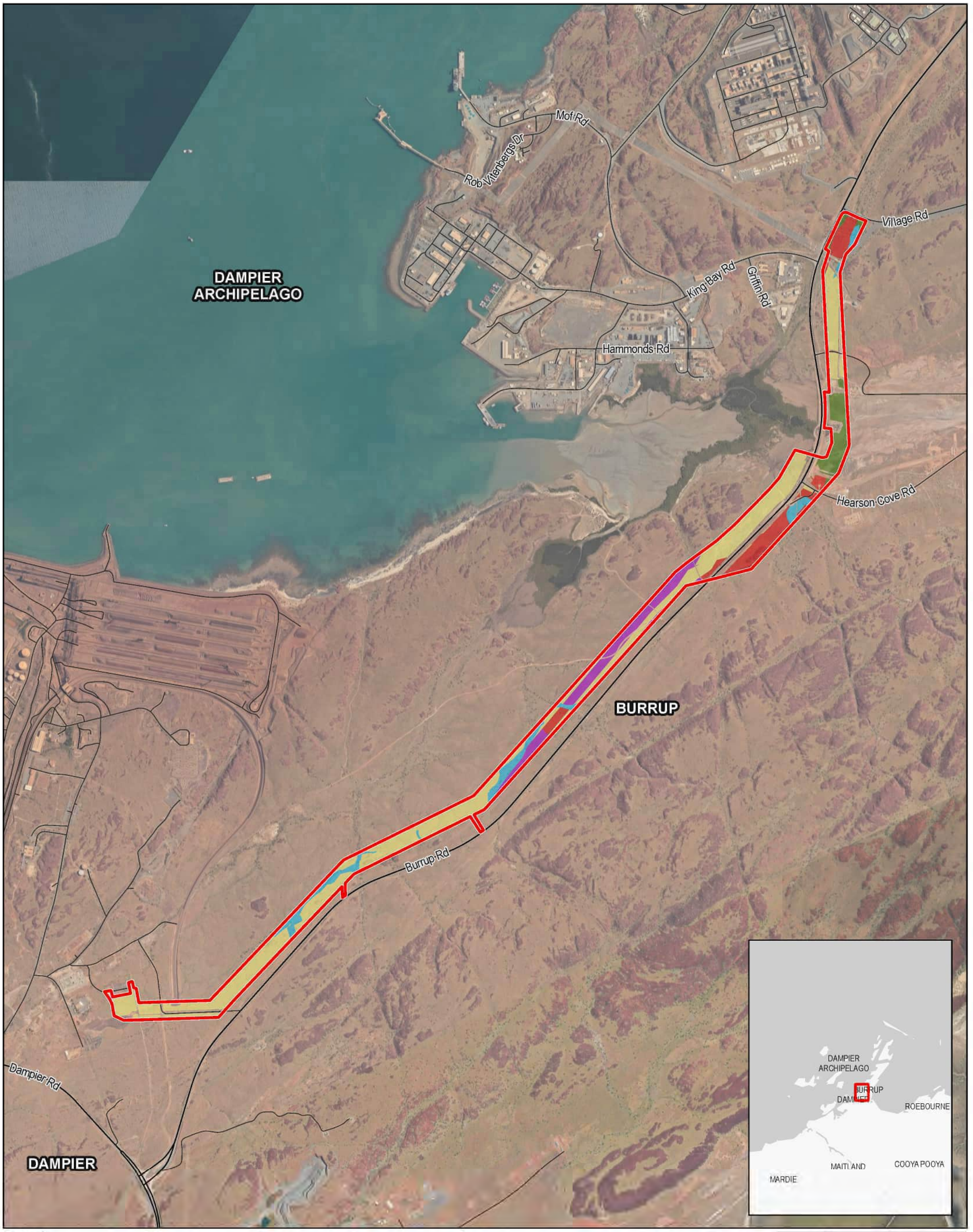
Figure 2-10 Regional Occurrences of Significant Fauna within 20 km of the Development Envelope



Legend

- Major Road
- Minor Road
- Development Envelope

Fauna Habitat

- Hummock Grassland on Rocky Plain
- Low Rocky Hills
- Minor Drainage Lines
- Mudflat with Tidal inundation, Mangroves and Supportive Scattered Samphire
- Rocky Hills with Exposed Boulder Piles

0 125 250 500
Metres

N

Scale: 1:20,000 (A3 Print)

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Figure 2-11 Fauna Habitat Types within the DE

Table 2-5 Fauna habitats in the Development Envelope and MNES fauna associations (GHD, 2020b)

Habitat	Description	EPBC Act Listed Fauna Association with Habitat	Extent of Habitat within the DE (ha)	Proportion within the DE (%)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Vegetation is minimal excluding where the mudflats fringe mangroves and samphire. Within this habitat vegetation was mainly sparse and scattered, with small areas of clustered low samphire shrublands. Areas were inundated with water during high tides that retract to several small pools and minor drainage lines during the low tide.	Foraging habitat for the following species: – Ghost Bat; – Grey Falcon; – Curlew Sandpiper; – Eastern Curlew; – Greater Sand Plover; – Northern Siberian Bar-tailed Godwit; – Australian Fairy Tern; – Oriental Pratincole; – Common Greenshank; – Gull-billed Tern; – Caspian Tern; – Greater Crested Tern; and – Bridled Tern. Foraging and roosting habitat for the following species: – Lesser Sand Plover; – Red Knot; – Whimbrel; – Oriental Plover; and – Common Sandpiper.	5.84	6.83
Rocky Hills with exposed boulder piles	Dominated by a Triodia hummock grassland however does support tussock grasses and scattered Acacia shrubs. However, the boulder rock piles are typically devoid of ground cover. The crests of hills contain extensive rock outcropping or boulder piles and support scattered *Ficus platypoda* and *Brachychiton* sp.	Core habitat (denning/shelter and feeding) for the following species: – Northern Quoll; and – Pilbara Olive Python. Foraging habitat for the Grey Falcon.	42.09	49.21
Minor Drainage lines	Primarily consist of thin, linear corridors of denser vegetation which drain into the intertidal mudflats and coastline. This habitat is mostly dominated by Eucalypt Woodland and Acacia species, with the understory including Triodia hummock grassland and Buffel Grass (*Cenchrus* spp.) and mixed small shrub species.	Linear corridor habitat for the following species: – Northern Quoll; and – Pilbara Olive Python. Foraging habitat for the following species: – Grey Falcon; and – Ghost Bat.	6.51	7.61
Hummock Grassland	Habitat is dominated by Triodia hummock grassland, however does support tussock grasses and	Foraging and disbursal habitat for the following species:	10.89	12.73

Habitat	Description	EPBC Act Listed Fauna Association with Habitat	Extent of Habitat within the DE (ha)	Proportion within the DE (%)
on Low Rocky Hills	scattered Acacia shrubs. The crests of the low hills contain rocky substrates but lack boulder piles in the surrounding taller hills.	– Northern Quoll; and – Pilbara Olive Python. Foraging habitat for the following species: – Grey Falcon; and – Ghost Bat.		
Hummock Grassland on Rocky Plain	Often associated with slight undulation where there is an association to low hills or rocky substrates. Mostly dominated by Triodia hummock grassland with heavy loam stony soils. Vegetation is a mosaic of shrubs however dominated by Acacia, Hakea and Grevillia over hummock grasses.	Foraging habitat for the following species: – Grey Falcon; and – Ghost Bat.	9.12	10.66

Table 2-6 Quality of Fauna Habitats within the Development Envelope (GHD, 2020b)

Habitat	Habitat Quality
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Good
Rocky Hills with exposed boulder piles	Good
Minor Drainage lines	Good
Hummock Grassland on Low Rocky Hills	Good
Hummock Grassland on Rocky Plain	Good

2.3.8.2 EPBC Act Listed Fauna Occurrence Likelihood Assessment

Based on the survey findings, previous records from the study area, and an assessment of habitat within the survey area, 20 EPBC Act listed threatened species were recorded, are considered likely to occur in or near or may occur in the DE. These species are:

Known to occur:

- Whimbrel (*Numenius phaeopus*) (Migratory);
- Gull-billed Tern (*Gelochelidon nilotica*) (Migratory);
- Caspian Tern (*Hydroprogne caspia*) (Migratory); and
- Crested Tern (*Thalasseus bergii*) (Migratory).

Likely to occur:

- Northern Quoll (*Dasyurus hallucatus*) (Endangered);
- Pilbara Olive Python (*Liasis olivaceus barroni*) (Vulnerable);
- Curlew Sandpiper (*Calidris ferruginea*) (Critically Endangered);
- Eastern Curlew (*Numenius madagascariensis*) (Critically Endangered);
- Greater Sand Plover (*Charadrius leschenaultii*) (Vulnerable);
- Lesser Sand Plover (*Charadrius mongolus*) (Critically Endangered);

– Red Knot (*Calidris canutus*) (Endangered);
– Oriental Plover (*Charadrius veredus*) (Migratory);
– Oriental Pratincole (*Glareola maldivarum*) (Migratory);
– Common Sandpiper (*Actitis hypoleucos*) (Migratory); and
– Common Greenshank (*Tringa nebularia*) (Migratory).

May occur:

– Ghost Bat (*Macroderma gigas*) (Vulnerable);
– Australian Fairy Tern (*Sternula nereis nereis*) (Vulnerable);
– Grey Falcon (*Falco hypoleucos*) (Vulnernable);
– Bridled Tern (*Onychoprion anaethetus*) (Migratory);
– Great Knot (*Calidris tenuirostris*) (Critically Endangered); and
– Northern Siberian Bar-Tailed Godwit (*Limosa lapponica menzbieri*) (Critically Endangered).

Unlikely to occur:

– Wood Sandpiper (*Tringa glareola*) (Migratory).

The criteria used to assess the likelihood of each EPBC Act listed threatened species is outlined in **Table 2-7.** below, with the justifications of each assessment explained in **Table 2-8**.

Table 2-7. Criteria used to assess likelihood of species occurrence within survey area

Likelihood	Criteria
Known to occur	– The species has been recorded in the survey area
Likely to occur	– There are existing records of the species in close proximity to the survey area (within 10 km); and • the species is strongly linked to a specific habitat, which is present in the survey area; or • the species has more general habitat preferences, and suitable habitat is present.
May occur	– There are existing records of the species from the study area, however • the species is strongly linked to a specific habitat, of which only a small amount is present in the survey area; or • the species has more general habitat preferences, but only some suitable habitat is present in the survey area – There is suitable habitat in the survey area, but the species is recorded infrequently in the locality.
Unlikely to occur	– The species is linked to a specific habitat, which is absent from the survey area; or – Suitable habitat is present in the survey area, however there are no existing records of the species from the study area despite reasonable previous sampling effort in suitable habitat; or – There is some suitable habitat in the survey area, however the species is very infrequently recorded in the study area or the only records are historical (>40 years ago).

Table 2-8. Assessment of species presence within the Development Envelope

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
Northern Quoll (*Dasyurus hallucatus*)	Endangered	Species or species habitat known to occur within area.	**Likely to occur:** The preferred habitat for this species is rocky hills with exposed boulder piles and minor drainage lines near boulder piles (Woinarski, 2005; Hill and Ward, 2010; TSSC, 2005).

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
			The Northern Quoll is known to occur within the Burrup Peninsula in low numbers (Hill and Ward, 2010). Studies in lowland savannah indicated that female Northern Quolls occupied home ranges averaging 35 ha with intra-sexually exclusive denning areas (Oakwood, 2002). Radio tracking results suggested the home ranges of male Northern Quolls were similar to female home ranges before the mating season, but expanded during the mating season to >100 ha to overlap extensively with several female home ranges and numerous other male home ranges (Oakwood, 2002). One long range movement has been recorded of a male moving 2.5 km in a day in July on the Mitchell Plateau, Western Australia (Schmitt et al. 1989). However, Braithwaite and Griffiths (1994) suggested that Northern Quolls have a much smaller home range in rocky country, such as that recorded within the DE. Based on a home range of 35 ha for breeding females and non-breeding males, and up to 100ha for breeding males, it can be assumed the area is in the home range of one female and one non-breeding male. In breeding season, it is assumed this could increase to approximately 3 males in the area of the DE. The most recent record of this species within the Burrup Peninsula is from 2022, with the DBCA record in close proximity to the DE (< 100 m). Additionally, indigenous rangers present during a survey for the Proposed Action (GHD, 2020b) indicated remote camera records of Northern Quoll from the Burrup. No detailed information of the locations of these camera traps was provided. Further, during this survey a large area of suitable habitat was recorded within the DE that links to suitable habitat beyond the DE (GHD, 2020b). Due to the known distribution of this species and the presence of suitable habitat, the species is considered likely to occur within the DE.
Pilbara Olive Python (*Liasis olivaceus barroni*)	Vulnerable	Species or species habitat known to occur within area.	**Likely to occur:** The Pilbara Olive Python prefers escarpments, gorges, rocky outcrops and water holes in the ranges of the Pilbara region (Pearson, 1993). An important population of this species is known to occur within the Burrup Peninsula (Pearson, 2006). Further, there is a record of the species near the DE from 2015 (<100 m). Additionally, a study for the Proposed Action found suitable habitat for the species (GHD, 2020b). Given the proximity of the Proposed Action to the Burrup Peninsula area and the presence of suitable habitat, it is considered likely that the Pilbara Olive Python is in or near the DE.
Ghost Bat (*Macroderma gigas*)	Vulnerable	Species or species habitat likely to occur within area.	**May occur:** The Ghost Bat occurs across a wide range of habitat types and prefers undisturbed caves, deep fissures or disused mine shafts (Woinarski et al., 2014). The species' current range is discontinuous, with geographically distinct colonies occurring within the Pilbara region (McKenzie and Bullen, 2009).

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
			This species is known to occur within the region, however, has restricted habitats such as caves. These habitat types were not recorded in the fauna survey undertaken for the Proposed Action (GHD, 2020b). Despite the lack of suitable roosting habitat within the area, the area may be used for foraging or dispersal by the species. Therefore, it is considered that this species may occur within the DE.
Grey Falcon (*Falco hypoleucos*)	Vulnerable	Species or species habitat likely to occur within area.	**May occur:** The Grey Falcon occurs in arid and semi-arid areas throughout Australia. Grey Falcons typically nest in the tallest trees along watercourses, particular river red gums, though they have also been observed to nest in communication towers (Marchant and Higgins, 1993). This species is known to occur in timbered lowland plains, tussock grasslands and open woodlands, and has been observed hunting in treeless areas (Garnett et al., 2011). The Grey Falcon was not recorded in the fauna survey undertaken for the project (GHD, 2020b). However, it is possible that the Grey Falcon may use areas within or near the DE for hunting; and therefore, it is considered the species may occur within the DE.
Curlew Sandpiper (*Calidris ferruginea*)	Critically Endangered	Species or species habitat known to occur within area.	**Likely to occur:** Curlew Sandpipers occur throughout coastal regions in Australia and are also occasionally located inland. In Western Australia, they are widespread within coastal and sub-coastal plains from Cape Arid to the south-west of the Kimberly. In Australia, this species mainly occupies intertidal mudflats in sheltered coastal areas and can also be found around ephemeral and permanent lakes, dams and waterholes and bore drains (Higgins and Davies, 1996). This species has been recorded within 3 km of the DE in 2017, with suitable habitat found for the species (GHD, 2020b). Therefore, it is considered the species will likely occur within the DE.
Eastern Curlew (*Numenius madagascariensis*)	Critically Endangered	Species or species habitat known to occur within area	**Likely to occur:** The Eastern Curlew has a predominately coastal distribution, with a continuous population known to occur within the Dampier Archipelago. This species prefers habitats of estuaries, bays, harbours, inlets and coastal lagoons, saltwork and sewage farms, areas with beds of seagrass and occasionally ocean beaches, coral reefs, rock platforms and rocky inlets (Marchant and Higgins, 1993). This species is known to occur within the Dampier Archipelago region, with a record of the species within 6 km of the DE from 2017. Further, suitable habitat was found within the DE (GHD, 2020b). Therefore, it is considered the species is likely to occur within the DE.
Greater Sand Plover (*Charadrius leschenaultii*)	Vulnerable	Species or species habitat known to occur within area	**Likely to occur:** The Greater Sand Plover breeds in the northern hemisphere and undertakes annual migrations to and from the southern hemisphere feeding grounds for the austral summer. This species' distribution in

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
			Australia during the non-breeding season is widespread, with majority of the species found in northern Australia (Bamford, 2008). This species mainly occupies coastal areas, inhabiting littoral and estuarine habitats. They often inhabit sheltered sandy or muddy beaches, large intertidal mudflats, sandbanks, salt marshes, coral reefs and rocky islands (Marchant and Higgins, 1993). The Greater Sand Plover has been known to occur within the region, with a record of the species <100 m of the DE from 1999 and more recent records within 6 km of the DE from 2017. Further, suitable habitat was found within the DE (GHD, 2020b). Therefore, it is considered the species likely occurs within the DE.
Great Knot (*Calidris tenuirostris*)	Critically Endangered	Species or species habitat known to occur within area	**May occur:** The Great Knot breeds in the northern hemisphere and undertakes biannual migrations along the East Asian-Australasian Flyway, EAAF. With majority of the population wintering in Australia (approx. >90%) (Bamford *et al*., 2008). The species is found around the entirety of the Australian coast, with a few scattered records inland. The species has its greatest numbers in northern Western Australia and the North Territory. It is common on the coastal sites in the Pilbara and Kimberly, from the Dampier Archipelago to the Northern Territory border. In Australia, the species favours sheltered coastal habitats with large intertidal mudflats or sandflats. The Great Knot has a known distribution within the Dampier Archipelago. With the closest record from 2017, 20 km away from the DE. Further suitable habitat was found within the DE (GHD, 2020b). Therefore, it is considered the species may occur within the DE.
Lesser Sand Plover (*Charadrius mongolus*)	Critically Endangered	Species or species habitat known to occur within area	**Likely to occur:** The Lesser Sand Plover breeds in the northern hemisphere, where it takes annual migrations to and from the southern hemisphere feeding grounds for the austral summer. This species distribution in Australia is widespread and it has been recorded in all states (Bamford, 2008). This species mainly occupies coastal areas, preferring sandy beaches, mudflats or coastal bays and estuaries, sand-flats and dunes near the coast (del Hoyo et al., 1996). The Lesser Sand Plover is known to occur within the region, with records of the species within 6 km of the DE in 2007 and 2010. Further, suitable habitat was found for the species within the DE (GHD, 2020b). Therefore, it is considered the species likely occurs within the DE.
Red Knot (*Calidris canutus*)	Endangered	Species or species habitat known to occur within area	**Likely to occur:** The Red Knot breeds in the northern hemisphere and undertakes migrations along the East Asian-Australian Flyaway (EAAF) to spend the boreal winter in Australia. The majority of this species spends its non-breeding winter period in Australia (Bamford et al., 2008).

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
			The Red Knot occupies all the main suitable habitats around the coast of Australia with scattered records of the species from the Kimberly region to Ningaloo in the north-west (Barrett et al., 2003). The Red Knot has a predominately coastal distribution, with a continuous population known to occur within the Dampier Archipelago. With the closest record from 2012 only 6 km away from the DE. Further, suitable habitat was found within the DE (GHD, 2020b). Therefore, it is considered the species likely occurs within the DE.
Northern Siberian Bar-Tailed Godwit (*Limosa lapponica menzbieri*)	Critically Endangered	Species or species habitat may occur within area	**May occur:** The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. In Western Australia it is spread across the coast, from Eyre to Derby. This species prefers habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays (Higgins and Davies, 1996). During the non-breeding season, this species is mainly found in the north and north-west of Western Australia (Bamford et al, 2008). The mudflat with tidal inundation, mangrove, and supportive scattered samphire habitat was found within the DE, a suitable foraging and roosting habitat for the species. Therefore, it is considered the species may occur within the DE.
Australian Fairy Tern (*Sternula nereis nereis*)	Vulnerable	Breeding known to occur within area.	**May occur:** The Australian Fairy Tern's distribution occurs along the coasts of New South Wales, Victoria, Tasmania, South Australia and Western Australia. Fairy Terns occupy a range of habits including offshore, estuarine or lacustrine (lake) islands, wetlands, beaches and spits (Higgins and Davies, 1996). The DE contains suitable habitat for this species, further there has been recent record of this species to occur within the Dampier Archipelago area (Dunlop, 2018). Therefore, it is considered the species may occur within the DE.
Whimbrel (*Numenius phaeopus*)	Migratory	Species or species habitat known to occur within area.	**Known to occur:** The Whimbrel prefers intertidal mudflats of sheltered coastal areas. This species is also found in harbours, lagoons, estuaries, and river deltas, often those with mangroves but also in unvegetated mudflats (Higgins and Davies, 1996). The species was recorded within the DE in the mudflat with tidal inundation, mangrove, and supportive scattered samphire habitat area during a recent survey (GHD, 2020b). Therefore, this species is known to occur within the DE.
Oriental Plover (*Charadrius veredus*)	Migratory	Species or species habitat known to occur within area.	**Likely to occur:** Oriental Plovers spend their non-breeding season in northern Australia within coastal habitats such as estuarine mudflats and sandbanks, or sandy or rocky ocean beaches or nearby reefs, or near-coastal grasslands; before migrating further inland (Storr, 1980).

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
			The species is known to occur within the region, with three records ranging from 2008 to 2016 within the Dampier Saltworks (approx. 6 km from the DE). Further, suitable habitat was found (GHD, 2020b) for the species within the DE and therefore it is considered the species may opportunistically inhabitant the DE.
Wood Sandpiper (*Tringa glareola*)	Migratory	Species or species habitat may occur within area.	**Unlikely to occur:** The Wood Sandpiper has its largest population recorded in north-west Australia, with nationally important areas for the species located in Western Australia including, Parry Floodplain, Camballin, Lake Argyle, Shark Bay, Vasse-Wonnerup estuary, Lake McLarty and Kogolup Lakes (Watkins, 1993). This species typically prefers well-vegetated, shallow, freshwater wetlands (such as swamps, billabongs, lakes, pools and waterholes). The Wood Sandpiper inhabits emergent, aquatic plants or grass, that is dominated by taller fringing vegetation, especially *Melaleuca* sp. and River Red Gums (Higgins and Davies, 1996). This species has previously been recorded within 6 km of the DE; however no suitable habitat was found within the DE. Therefore, it is considered the species is unlikely to occur within the DE.
Oriental Pratincole (*Glareola maldivarum*)	Migratory	Species or species habitat known to occur within area.	**Likely to occur:** Within Australia, the Oriental Pratincole is distributed widely throughout the northern areas, especially along the Pilbara Region in Western Australia (Barrett et al., 2003). In the non-breeding season the species occupies the following habitats in Australia; open plains, floodplains or short grasslands, often with extensive bare areas. The are often found near terrestrial wetlands, such as billabongs, lakes and artificial wetlands. The species also habits areas along the coast, including beaches, mudflats and islands (Jaensch, 2004). This species is known to occur within the Pilbara region and has previously been recorded in the area (9 km from the DE). Further, a survey for the Proposed Action found suitable mudflat with tidal inundation, mangroves and supportive scattered samphire habitat present (GHD, 2020b); therefore, it is considered likely for this species to be present within the DE.
Common Sandpiper (*Actitis hypoleucos*)	Migratory	Species or species habitat known to occur within area.	**Likely to occur:** The Common Sandpiper occupies areas along coastlines of Australia and also inland areas. The population in Australia is mainly found in the northern and western parts of Australia (Higgins and Davies, 1996). This species prefers habits within coastal wetlands and some inland wetlands and is mostly found within muddy margins or rocky shores. Further, this species is often located near mangroves (Higgins and Davies, 1996). This species has previously been recorded within the area, with a record less than 100 m from the DE from 1999 and more recent records approximately 6 km from the DE from 2007. Further, a survey for the Proposed Action found suitable mudflat with tidal

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
			inundation, mangroves and supportive scattered samphire habitat present (GHD, 2020b); therefore, it is considered likely for this species to be present within the DE.
Common Greenshank (*Tringa nebularia*)	Migratory	Species or species habitat known to occur within area.	**Likely to occur:** The Common Greenshank occurs around most of the coast in Western Australia, from Cape Arid in the south to Carnarvon in the north-west (Higgins and Davies, 1996). This species occupies a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. In sheltered habitats, it is found in areas with large mudflats, saltmarshes, mangroves or seagrass. The species has previously been recorded within 100 m of the DE in 1999, with more recent records approximately 2 km from the DE. Further, a survey for the Proposed Action found suitable mudflat with tidal inundation, mangroves and supportive scattered samphire habitat (GHD, 2020b); therefore, it is considered likely for this species to be present within the DE.
Gull-billed Tern (*Gelochelidon nilotica*)	Migratory	PMST data not available, including distribution map.	**Known to occur:** The Gull-billed Tern is a migratory species in Australia, often inhabituating freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, artificial wetlands and grasslands (Morcombe, 2004). This species was recorded within the mudflat with tidal inundation, mangrove and supportive scattered samphire habitat area during a recent survey (GHD, 2020b); and is therefore known to occur within the DE.
Caspian Tern (*Hydroprogne caspia*)	Migratory	Breeding known to occur within area.	**Known to occur:** In Western Australia, the Caspian Tern is widespread in coastal regions, from the Great Australian Bight to the Dampier Peninsula. This species occupies sheltered coastal embankments and those with sandy or muddy margins are preferred. They also are found on near-coastal and inland terrestrial wetlands, especially lakes, waterholes, reservoirs, rivers and creeks (Higgins and Davies, 1996). The species has previously been recorded within the area, with two records within 4 km of the DE from 1999 and 2000. Further, the species was recorded within the mudflat with tidal inundation, mangrove and supportive scattered samphire habitat area during the survey for the Proposed Action (GHD, 2020b). Therefore, this species is known to occur within the DE.
Greater Crested Tern (*Thalasseus bergii*)	Migratory	Breeding known to occur within area.	**Known to occur:** The Crested Tern is common to coastal regions of Australia, with the species' preferred habitat being coastal and offshore waters including beaches, bays, inlets, tidal rivers, swamps and lakes (Higgins and Davies, 1996). This species was recorded within the mudflat with tidal inundation, mangrove and supportive scattered samphire habitat area during a

Common Name / Species Name	EPBC Act Listing	PMST Advice	Assessment (likelihood of occurrence within the DE) & Justification
			recent survey (GHD, 2020b); and is therefore known to occur within the DE.
Bridled Tern (*Onychoprion anaethetus*)	Migratory	Species or species habitat may occur within area.	**May occur:** In Western Australia, the Bridled Tern is known to breed from the islands off Cape Leeuwin north to Shark Bay and in the Pilbara regions (including the Dampier Archipelago) and Kimberly. This species occupies tropical and subtropical seas, breeding on islands and rarely in inshore continental waters along mainland coastlines (Higgins and Davies, 1996). The species is known to occur within the Dampier Archipelago region on offshore islands (within 10 km from the DE). Further, suitable habitats for the species were recorded during a survey for the Proposed Action (GHD, 2020b); therefore, it is considered the species may occur within the DE.

The following section details the species profiles for all Threatened species, migratory species and shorebirds considered as known to occur, likely to occur and may occur within the DE.

2.3.8.3 EPBC Act Listed Threatened Fauna

2.3.8.3.1 Northern Quoll (*Dasyurus hallucatus*)

Species background information

The Northern Quoll is listed as Endangered under the EPBC Act (TSSC, 2005). The Northern Quoll is the smallest of the four Australia quoll species. It is a small omnivorous marsupial with white spots against a reddish-brown coat, a long tail and a pointy snout. The species is predominantly nocturnal and solitary. The Northern Quoll can weigh up to 1.2 kg, with males being larger than females (TSSC, 2005).

Abundance & Distribution

The Northern Quoll occurs in Queensland, the Northern Territory and Western Australia. The Northern Quoll at the time of European settlement was distributed widely across northern Australia. However, the species has declined to a small number of geographic regions across northern Australia. While there are no overall assessments of the Northern Quoll population size available, the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' identifies several important populations for this species, including the populations in the Pilbara region of WA where there Proposed Action is located (Hill and Ward, 2010). This population is potentially present within the DE is therefore regarded as an important population.

Populations of the species have been declining since the mid-1980s with the exact cause unknown (TSSC, 2005). However, the recovery plan outlines the greatest threat to the species being the spread of cane toads (Hill and Ward, 2010).

The species within the Pilbara is mostly confined to ironstone formations, some river systems and the Burrup Peninsula and adjacent offshore islands. Females maintain territory ranges of approximately 35 ha with males estimated to range over 150 ha (TSSC, 2005).

Habitat preferences

Northern Quolls do not have highly specific habitat requirements and occur in a variety of habitats across their range (Hill and Ward, 2010). The species opportunistically forages and can alter their diets based on the season and availability (Oakwood, 2000). They are most abundant in rocky terrain, which has been shown to support higher population densities and longer-lived individuals; as rocky areas retain water and have a variety of

microhabitats, supporting a higher floristic diversity and productivity and thus greater food resources (Burnett, 1997).

The species utilises a range of micro-habitats for foraging and denning, such as gorges, breakaways and hills, and also occurs near creek and drainage lines, where adjacent plains and vegetated areas provide habitat for foraging and dispersal of young. The dens of the species are often made in rock crevices, tree holes or occasionally termite mounds (van Dyck and Strahan, 2008).

Threats

According the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' (Hill and Ward, 2010). The key threats to northern quolls are cane toads, due to lethal toxic ingestion; predation by feral animals, inappropriate fire regimes, habitat degradation and destruction, weeds, disease, hunting and population isolation.

Known populations in the vicinity of the DE and broader region

The Northern Quoll is known to occur within the Burrup Peninsula in low numbers (Hill and Ward, 2010). The most recent record of this species within the Burrup Peninsula is from 2022, with the DBCA record in close proximity to the DE (< 100 m). Additionally, indigenous rangers present during the recent fauna survey (GHD, 2020b) indicated there are remote camera records of the species from the Burrup. Further, during this recent survey a large area of suitable rocky hill habitat was recorded within the DE that links to suitable habitat beyond the DE. These DBCA records do not specify whether the individual species were recorded in known breeding sites or roosting/denning habitat, however, a review of satellite imagery shows that majority of these records are situated in rocky areas and are likely to provide these habitat values. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Given the extent of suitable habitat present including the rocky hills with exposed boulder piles, the minor drainage lines and the hummock grassland on low rocky hills; and the locations of previous recorded sightings, it is considered highly probable that an important population of Northern Quoll exists within the DE. Camera trapping was undertaken to target cryptic species such as the Northern Quoll during the studies for the Proposed Action (GHD, 2019 and GHD, 2020b) with no Northern Quoll individuals recorded. Therefore, the population likely present within the DE is likely to be very low density.

Species habitat extent

The Proposed Action will result in the loss of up to 14.4 ha from the 59.5 ha of potential Northern Quoll denning/shelter, foraging and dispersal habitat within the DE, which is all considered to be habitat critical to the survival of this species. Suitable supporting habitat and habitat critical to the survival of the Northern Quoll is detailed in **Table 2-9**.

Table 2-9. Extent of suitable Northern Quoll habitat within the Development Envelope

Habitat Type	Habitat Importance	Extent in DE (ha)
Habitat critical to the survival of the Northern Quoll		
Rocky Hill with exposed boulder piles	Denning/shelter and feeding habitat	42.09
Minor drainage lines	Linear corridor habitat	6.51
Hummock grassland on low rocky hills	Foraging and dispersal habitat	10.89
Total		**59.5**

Species habitat quality and importance

The Northern Quoll habitat present in the DE represents denning/shelter, feeding, foraging and dispersal habitat for the species. Of the suitable habitats present, the rocky hills with exposed boulder piles habitat is suitable for denning/shelter and feeding.

Habitat critical to the survival of the Northern Quoll is defined as habitat within the modelled distribution of the species which provides shelter for breeding, refuge from fire and/or predation and potential poisoning from Cane Toads (DoE, 2016). Habitat critical to the survival of the species usually occurs in the form of (DoE, 2016; Hill and Ward, 2010):

– rocky habitats such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines;
– structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs; and
– offshore islands where the northern quoll is known to exist.

The following habitat types are rocky habitats within the DE, and considered to represent habitat critical to the survival of the Northern Quoll (GHD, 2020b):

– Rocky hills with exposed boulder piles.

Further, dispersal and foraging habitat associated with or connecting populations is considered 'important for the long-term survival of the northern quoll' (DoE, 2016). There is 17.4 ha of this habitat within the DE.

The vegetation types recorded in the GHD surveys were given a quality classification. As the vegetation types assessed in the GHD surveys overlap with the fauna habitats, the vegetation condition within each fauna habitat has been used to infer the quality of the habitats suitable for the Northern Quoll. However, it should be noted there are limitation in using the vegetation condition to assess the quality of fauna habitats as discussed further below.

The rocky hills with exposed boulder piles habitat had a vegetation quality ranging from 'Very Good' to 'Poor' condition, with majority of which classified as 'Very Good' and only a small amount classified as 'Poor.' This fauna habitat can therefore be classed as a 'Good' condition within the DE. From this information it can be inferred that the foraging value of this habitat is in a 'Good' condition. When determining the quality of the rocky hills habitat in terms of providing shelter, however, this cannot be inferred as the fauna habitat quality to the species would be dependent on factors other than vegetation.

The minor drainage lines vegetation quality ranged from 'Very Good' to 'Good' condition. Therefore, this linear corridor habitat is considered to be of a 'Good' condition overall.

The hummock grasslands on low rocky hills ranged from 'Excellent' to 'Poor' condition, with majority of habitat being in 'Very Good' to 'Good' condition. This fauna habitat is therefore considered to be in a 'Good' condition. The hummock grasslands would be used as foraging and dispersal habitat by the species.

2.3.8.3.2 Pilbara Olive Python (*Liasis olivaceous barroni*)

Species background information

The Pilbara Olive Python is listed as Vulnerable under the EPBC Act (TSSC, 2008). It is a subspecies of the Olive Python (TSSC, 2008). The species is a dull olive-brown to pale fawn or rich brown colour averages 2.5 m in length (TSSC, 2008). The species has a white/cream belly and differs from *Liasis olivaceus* in mid-body and ventral scale counts.

They are adept at swimming and hunt in waterholes or along tracks. Their diet consists of wallabies, euros, fruit bats, ducks, corellas, spinifex pigeons and coucals (Pearson, 2006).

Abundance & Distribution

The Pilbara Olive Python is a distinct subspecies of the Olive Python found only from ranges within the Pilbara region, north-western Australia, such as the Hamersley Range and Islands of the Dampier Archipelago. Twenty-one important populations are known to occur in four distinct areas, including a population within the Burrup Peninsula (DSEWPaC, 2012a). Given the Proposed Action is within the Burrup Peninsula, it is considered likely that Pilbara Olive Python individuals located in or near to the DE are part of an important population.

It is difficult to estimate the population size of the Pilbara Olive Python due to its cryptic nature and lack of reliable trapping or census techniques (TSSC, 2008). Though there is a report that states the subspecies

population is sizable in pockets, with some remote populations restricted from threatening processes (Pearson, 2006).

Habitat preferences

The Pilbara Olive Python prefers escarpments, gorges, rocky outcrops and water holes in the ranges of the Pilbara region (Pearson, 1993; Wilson and Swan, 2003). The snake finds shelter in caves, under boulders, in water and trees overhanging water (Bush and Maryan, 2011). Radio-telemetry has shown that individuals are usually in close proximity to water and rock outcrops that attract suitable sized prey species (TSSC, 2008).

Threats

According to the Conservation Advice of Pilbara Olive Python (DEWHA, 2008), the main threats to the species include predation by feral animals (cats and fox), predation of food sources and habitat loss.

Known populations in the vicinity of the DE and broader region

An important population of this species is known to occur within the Burrup Peninsula (Pearson, 2006). Further, there is a DBCA record of the species near the DE in 2015 (<100 m). Additionally, a study of the proposed DE found rocky hills with exposed boulder piles, as well as minor drainage lines and hummock grassland on low rocky hills habitat (GHD, 2020b), which are regarded as suitable habitat for the species. Given the proximity of the proposed action to the Burrup Peninsula area and the presence of suitable habitat, it is considered likely that the Pilbara Olive Python is in or near the DE.

A review of satellite imagery was undertaken of the broader region surrounding the DE, with many of the DBCA records of the species found within industrial areas, with individuals likely utilising this area as dispersal habitat. Other records were found between 2 to 7 km from the DE within rocky areas, which would likely serve as shelter and feeding habitat. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The GHD (2020b) survey identified 59.5 ha of suitable habitat for the Pilbara Olive Python within the DE. The Proposed Action will result in the loss of up to 14.4 ha of this 59.5 ha. This habitat is listed in **Table 2-10** below.

Table 2-10. Extent of suitable Pilbara Olive Python habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)
Supporting habitat		
Rocky Hill with exposed boulder piles	Shelter and feeding habitat	42.09
Minor drainage lines	Linear corridor and feeding habitat	6.51
Hummock grassland on low rocky hills	Foraging and dispersal habitat	10.89
Total		**59.5**

Species habitat quality and importance

The Pilbara Olive Python's conservation advice does not list critical habitat for the species (DEWHA, 2008), however, it does state that the species spends the cooler months hiding in caves and rocky crevices and therefore the rocky hills with exposed boulder piles shall be considered as important to the species as it provides shelter and feeding habitat. Further, the supporting habitats of minor drainage lines and hummock grasslands on low rocky hills provide linear corridor habitat and foraging and dispersal habitat respectively near the important habitat recorded. However, given these habitats are common and widespread in the region it is unlikely that the species is restricted to these habitats within the DE. Additionally, Pilbara Olive Python individuals have large home ranges (between 88 ha and 449 ha) (Tutt et al., 2004); therefore, they are unlikely to be dependent on the habitat to be cleared.

As discussed, the quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. However, the vegetation types assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Pilbara Olive Python can be discussed.

The rocky hills with exposed boulder piles habitat had a vegetation quality ranging from 'Very Good' to 'Poor' condition, with majority of which classified as 'Very Good' and only a small amount classified as 'Poor.' This fauna habitat can therefore be inferred as being in a 'Good' condition within the DE. With this information providing some limited context in terms of the foraging value of the habitat, however, this does not provide context in terms of the shelter quality within this habitat.

The minor drainage lines ranged from 'Very Good' to 'Good' condition. This fauna habitat within the DE is therefore considered to be of a 'Good' quality. This habitat would be used as linear corridor habitat for the species and any permanent/semi-permanent pools would be focal point for prey.

The hummock grasslands on low rocky hills ranged from 'Excellent' to 'Poor' condition, with the majority of habitat being in 'Very Good' to 'Good' condition. The hummock grasslands can be considered to be in a 'Good' condition and would be used for hunting/foraging, in those parts of the habitat type that are in proximity to the rocky areas, and as dispersal habitat by the species.

2.3.8.3.3 Ghost Bat (*Macroderma gigas*)

Species background information

The Ghost Bat is listed as Vulnerable under the EPBC Act (TSSC, 2016b). The Ghost Bat is the largest bat of sub-order Microchiroptera in Australia, with a head and body length of 10 to 13 cm and a forearm length of 10 to 11 cm. The species is Australia's only carnivorous bat and is primarily insectivorous though has been recorded preying on other bat species (Richards et al., 2008). The bat's fur is light to dark grey and it has long ears, large eyes, a simple nose-leaf and no tail (van Dyck and Strahan, 2008). The species uses several roosts per night and often returns to the same daytime roost. Survival of this species is critically dependent on finding natural roost sites (Hall et al., 1997).

Abundance & Distribution

Ghost Bats are restricted to the tropical north of Australia (Churchill, 2008). Populations display genetic variation as they are geographically isolated from each other, with Pilbara populations also being isolated from those in the Kimberley and NT (Armstrong and Wilmer, 2004). As such, the Pilbara population is considered to be an important population as it is necessary for maintaining genetic diversity. Therefore, Ghost Bat individuals likely present for foraging within the DE are considered to be a part of an important population.

The estimated population size in Australia is fewer than 10,000 mature individuals with estimates continuing to decline (Woinarski et al., 2014). Of the existing population, it is estimated that 1,300 to 2,000 Ghost Bat individuals are within the Pilbara (TSSC, 2016b).

Habitat Preferences

Within the Pilbara the species is known to forage in productive habitat including drainage lines and along riparian corridors, on alluvial plains and supporting mulga woodland and tussock grasslands, sparse woodlands along ridge lines, as well as cave entrances (Cramer et al., 2022). Foraging areas tend to be located less than 5 km from diurnal roost sites (TSSC, 2016b), though larger distances have been recorded. With a study recording nightly flight path distances in excess of 40 km (Bullen et al., 2023).

Roost sites for the species include deep natural caves, rock crevices and disused mines (TSSC, 2016b). Ghost Bats are known to require a number of suitable caves throughout their home ranges, due to both temporal and seasonal factors. The presence of day roosts and/or maternity roosts in an area is the most important indicator of suitable habitat for Ghost Bats, and these caves are generally the primary focus of conservation and/or monitoring (TSSC, 2016b).

Further, it has been found that the occurrence of pools of water is a critical component of the foraging habitat to the Ghost Bat (Armstrong, 2001).

Data is not available on the maximum distance that Ghost Bats will fly from its day roost cave before it needs to drink water; however, based on a foraging range of 10 km from a roost, the species is likely to require at least one drinking water source within this range. Water sources closer to the roost may be more critical than water sources further away.

Threats

According to the Conservation Advice for the Ghost Bat (TSSC, 2016b). The key threats to Ghost Bats are habitat loss (particularly destruction of or disturbance to roost sites and nearby areas), disturbance (human visitation) to breeding sites, modification of foraging habitat, collision with fences, collapse or reworking of old mine sites, contamination by mining at roost sites, disease, poisoning by cane toads and competition for prey with feral animals.

Known populations in the vicinity of the DE and broader region

This species is known within the region; however, this species has restricted habitats such as caves. This habitat type was not recorded in the fauna survey undertaken for the Proposed Action (GHD, 2020b). Further, the nearest record of the species is from 2006 and is approx. 4.5 km from the DE. However, the species may still use the DE as foraging habitat.

The DBCA records of the broader region were limited to 2 records, with one 4.5 km from the DE as discussed and the other 14 km away from the DE. Both records outline the Ghost Bats were caught/trapped during survey efforts, so it's likely the individuals were foraging within the area. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 14.4 ha from the 32.36 of potential Ghost Bat foraging habitat in the DE. **Table 2-11** identifies the suitable habitat for the Ghost Bat that is present within the DE.

Table 2-11. Extent of suitable Ghost Bat habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)
Supporting habitat		
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84
Minor drainage lines	Foraging habitat	6.51
Hummock Grassland on Low Rocky hills	Foraging habitat	10.89
Hummock grassland on rocky plain	Foraging habitat	9.12
Total		**32.36**

Species habitat quality and importance

There is up to 32.36 ha of supportive foraging habitat present within the DE for the Ghost Bat, with up to 14.4 ha of this to be cleared as a worst case. Given these supportive habitats are widely represented in the region and not in close proximity to any suitable roost caves, it is unlikely that Ghost Bats would be restricted to or reliant on these habitats.

As discussed, the quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. The vegetation types assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Ghost Bat can be discussed. However, it should be noted these are not an accurate representation of the fauna habitat themselves only the vegetation within the fauna habitats.

The mudflats with tidal inundation, mangroves and supportive scattered samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. This fauna habitat being classified as a

'Good' quality overall within the DE doesn't provide context into the quality of the waterbody the Ghost Bat would utilise for foraging.

The minor drainage lines ranged from 'Very Good' to 'Good' condition. This foraging Ghost Bat habitat can therefore be considered as being in a 'Good' condition.

The hummock grasslands on low rocky hills ranged from 'Excellent' to 'Poor' condition, with majority of habitat being in 'Very Good' to 'Good' condition. This foraging Ghost Bat habitat within the DE can therefore be considered as being in a 'Good' condition.

2.3.8.3.4 Grey Falcon (*Falco hypoleucos*)

Species background information

The Grey Falcon is listed as Vulnerable under the EPBC Act (TSSC, 2020). It is the rarest of the falcon species found in Australia and consists of a single population (TSSC, 2020). It is a medium sized, pale falcon with a heavy thick chest and long wings with dark tips (TSSC, 2020). It primarily preys on birds, reptiles and mammals (NSW Government, 2017).

Abundance and distribution

The Grey Falcon is sparsely distributed across arid and semi-arid inland Australia where rainfall is less than 500 mm annually, including the Murray-Darling Basin, Eyre Basin, central Australia and WA (Marchant and Higgins, 1993). It is commonly located on wooded plains and along major river courses (Johnstone et al., 2013).

The estimated number of mature individuals is less than 1,000 (BirdLife International, 2023b; Garnett et al., 2011; Schoenjahn, 2018). Important populations or important sites are not listed within the conservation advice for this species, however due to there only being a single population of this species, the individuals potentially utilising the DE shall be regarded as part of an important population.

Habitat preferences

Grey Falcons typically nest in the tallest trees along watercourses, particularly river red gums (*Eucalyptus camaldulensis*), though they have also been known to nest in communications towers (Marchant and Higgins, 1993). It is known to frequent timbered lowland plains, particularly Acacia shrublands that are crossed by tree-lined watercourses, tussock grassland and open woodland, and has been observed hunting in treeless areas (Garnett et al., 2011; Schoenjahn, 2018).

Breeding commonly occurs in tall trees such a river red gums, or on man-made structures, from June to November (TSSC, 2020).

Threats

According to the Conservation Advice for Grey Falcon (TTSC, 2020) the key threats for the species are: predation by cats; increased temperatures in arid and semi-arid Australia; Demographic and genetic stochastic events (small population size); habitat loss and fragmentation (Grazing by exotic herbivores and nest shortage), disturbance (birdwatchers and photographers), direct mortality (collision with traffic and collision with fences and powerlines) and harvesting (egg collecting and falconry).

Known populations in the vicinity of the DE and broader region

The Grey Falcon was not recorded in the fauna survey undertaken for the Proposed Action (GHD, 2020b). Further, no recent records of the species within the DE or surrounds (within 20 km) have been recorded. However, it is possible that the Grey Falcon may use areas within or surrounding the DE for hunting; and is therefore considered that the species may occur within the DE and broader region.

Species habitat extent

The Proposed Action will result in the loss of up to 14.4 ha from the 74.45 ha of potential Grey Falcon foraging habitat in the DE, as a worst case. **Table 2-12** identifies the suitable habitat for the Grey Falcon that is present within the DE.

Table 2-12. Extent of suitable Grey Falcon habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)
Supporting habitat		
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84
Rocky hills with exposed boulder piles	Foraging habitat	42.09
Minor drainage lines	Foraging habitat	6.51
Hummock Grassland on Low Rocky hills	Foraging habitat	10.89
Hummock grassland on rocky plain	Foraging habitat	9.12
Total		**74.45**

Species habitat quality and importance

The conservation advice for the Grey Falcon does not identify habitat critical to the survival of the species. The habitat present within the DE found is supportive habitat only which provides foraging/hunting habitat for the species. No potential breeding habitat was identified within the DE. Up to 14.4 ha of the 74.45 ha foraging habitat within the DE expected to be cleared as worst case. Given this, the absence of any recent records of the species, and noting that the species occurs widely in similar habits which are extensive in the region; the Grey Falcon is unlikely to be restricted or limited to the habitat in the DE.

The quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. The vegetation conditions assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Grey Falcon can be discussed.

The fauna habitats had the following vegetation conditions:

- The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition.
- The rocky hills with exposed boulder piles habitat had a vegetation quality ranging from 'Very Good' to 'Poor' condition, with majority of which classified as 'Very Good' and only a small amount classified as 'Poor.'
- The minor drainage lines ranged from 'Very Good' to 'Good' condition.
- The hummock grasslands on low rocky hills ranged from 'Excellent' to 'Poor' condition, with majority of habitat being in 'Very Good' to 'Good' condition.
- The hummock grasslands on rocky plains ranged from 'Very Good' to 'Poor' condition, with majority of habitat being in 'Good' condition.

The vegetation condition for each is considered as being in 'Good' condition, therefore each Grey Falcon foraging habitat can be considered to be of 'Good' quality.

2.3.8.4 Shorebird Species

2.3.8.4.1 Curlew Sandpiper (*Calidris ferruginea*)

Species background information

The Curlew Sandpiper is listed as Critically Endangered under the EPBC Act (DoE, 2015a). The Curlew Sandpiper is a small, slim sandpiper typically 18 to 23 cm long and weighing 57 g, with a wingspan of 38 to 41 cm. The legs, neck and bill of this species are long. The bill is black, and sometimes has a brown or green tinge at the base. The head is small and round, and the iris is dark brown. The legs and feet are black or black-grey. The sexes are similar, but females have a slightly larger and longer bill and a slightly paler underbelly when in breeding plumage (Higgins and Davies, 1996).

Abundance and Distribution

Within Australia, Curlew Sandpipers occupy coastal areas and are also quite widespread inland, though in smaller numbers, with records occurring in all states during the non-breeding season. The species arrives in coastal south-western Australia as early as August, with small numbers also passing through Eyre, south-eastern Western Australia in August-November. The Curlew Sandpiper generally leaves Australia by March, except for the majority of juveniles which stay in non-breeding areas during breeding season. In Western Australia, they occur from Cape Arid to south-west Kimberley Division, but are mostly found between Carnarvon and the Dampier Archipelago. They occur in large numbers, in thousands to tens of thousands, at Port Hedland Saltworks, 80 Mile Beach, Roebuck Bay and Lake Macleod (Higgins and Davies, 1996). As the species is listed as Critically Endangered, any populations are considered important. Therefore, the likely population within the DE is considered an important population.

The global population is estimated at 1,850,000 individuals, of which approximately 180,000 are observed in the East Asian – Australasian Flyway (Bamford et al., 2008), however, these numbers are old data. In Australia, 115,000 individuals were estimated to visit during the non-breeding period (Bamford et al., 2008), but numbers have since declined (Garnett et al., 2011).

Habitat Preferences

Curlew Sandpipers mainly occupy intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and are also found around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They have also been recorded inland, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. The species can be found in both fresh and brackish waters, and are also sometimes recorded around floodwaters (Higgins and Davies, 1996).

Curlew Sandpipers forage on mudflats and shallow waters nearby. The species forages on the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. They also occasionally forage on wet mats of algae or waterweed, or on banks of beachcast seagrass or seaweed (Higgins and Davies, 1996).

Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarshes (Higgins & Davies, 1996).

Curlew Sandpipers do not breed in Australia. The breeding range of the species is restricted to the Arctic or Northern Siberia (Higgins and Davies, 1996).

Threats

According to the Conservation Advice for Curlew Sandpiper (DoE, 2015a), the main threats for the species are human disturbance, habitat loss and degradation from pollution, changes to the water regime and invasive plants and habitat alteration, especially in the non-breeding grounds of Australia.

Known populations in the vicinity of the DE and broader region

The species has been recorded in 2017 within 3 km of the DE. Further, suitable habitat of mudflats with tidal inundation, Mangroves and supportive scattered habitat was found for the species near the survey area (GHD, 2020b). Therefore, it is expected that an important population is likely to occur within the DE; accessing the 7,76 ha of the mudflat habitat for foraging.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with majority of individuals recorded within the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the Curlew Sandpiper. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Curlew Sandpiper foraging habitat as a worst case, however is likely to be less, with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has available mudflat habitat outside of the DE, between Kings Bay to the west and Hearson Cove to the east, of approximately 220 ha. The species suitable habitats found within the DE and the wider area are outlined below in **Table 2-13**.

Table 2-13. Extent of suitable Curlew Sandpiper habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Supporting habitat			
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Curlew Sandpiper may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this 5.84 ha of habitat within the DE is considered supportive habitat. Further, given this habitat type is found widely within the region with records of the species within the Burrup Peninsula approximately 3 km or greater from the DE, it is not expected that this important population of Curlew Sandpiper's would be restricted to or reliant on the habitat within the DE.

The quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. The vegetation type assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Curlew Sandpiper can be discussed.

The mudflats with tidal inundation, mangroves and supportive scattered samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, the fauna habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and therefore has limitations.

2.3.8.4.2 Eastern Curlew (*Numenius madagascariensis*)

Species background information

The Eastern Curlew is listed as Critically Endangered under the EPBC Act (DoE, 2015b). The Eastern Curlew is the largest of the migratory shorebirds in the world. The species is very large, with a long, heavy decurved bill. The species has a dark brown rump and underwing. Whole underparts are washed brownish, palest from rear to belly to undertail (Marchant and Higgins, 1993). The species is approximately 60 to 66 cm in length, with a wingspan of 110 cm and weighs between 565 to 1,150 g.

The Eastern Curlew is carnivorous, predominately feeding on crustaceans, small molluscs and some insects. This species is known to be very wary and will take flight at the first sign of danger, long before other shorebirds become nervous (Marchant and Higgins, 1996). The Eastern Curlew is both diurnal and nocturnal, with feeding and roosting cycles dependent on the tides.

Abundance and Distribution

This species breeds in the Northern Hemisphere, from Japan and China northwards to the arctic regions of Siberia and Alaska, and regularly spends its non-breeding season in Australia (Minton & Watkins, 1993). The Eastern Curlew arrives in Australia in August. The total population of the Eastern Curlew was estimated by Watkins in 1993 as 21,000, however; a more recent study has increased this to 38,000 with 28,000 of these being in Australia (Bamford et al., 2008). The distribution within Australia is widespread, with a large concentration (over 1,000 individuals) located in Roebuck Bay in north-west Western Australia (Bamford et al.,

2008). Further, this species has a continuous population known to occur within the Dampier Archipelago. As the species is listed as Critically Endangered, any populations are regarded as important and therefore the potential population within the DE is considered an important population.

Habitat Preferences

The species inhabits coastal beaches and sandy or muddy estuaries, occasionally inland near large wetlands. With the species often found foraging on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons (Birdlife Australia, 2023). The species forages on soft sheltered intertidal sandflats or mudflats, often near mangroves, on sandflats and in saltmarshes, rockpools, coral reefers and ocean beaches near tideline (Marchant and Higgins, 1996).

During high tide this species may gather in large flocks to roost (Marchant and Higgins, 1996). The species roosts during high tide periods on sandy spits, sandbars and islets and among coastal vegetation including saltmarshes or mangroves. At Roebuck Bay in Western Australia, the species have been recorded flying from foraging areas on the tidal flats to 5 km inland on a flooded supratidal claypan (Collins et al., 2001).

The Eastern Curlew does not breed in Australia. This species breeds in the northern hemisphere on swampy moors and boggy marshes. With the nest being a shallow depression lined with grass (Birdlife Australia, 2023).

Threats

According to the Conservation Advice for Eastern Curlew (DoE, 2015b), the main threats for the species are human disturbance, habitat loss and degradation from pollution, changes to the water regime and invasive plants.

Known populations in the vicinity of the DE and broader region

This species is known to occur within the Dampier Archipelago region, with a record of the species within 6 km of the DE from 2017. Further, suitable habitat of mudflat with tidal inundation, mangroves and supportive samphire habitat found within the DE. Therefore, this important population of Eastern Curlews is likely to occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging and roosting habitat for the Eastern Curlew. Further records were found within Nickol Bay (approx. 10 km from the DE), with this area also likely used as foraging and roosting habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Eastern Curlew foraging and roosting habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-14**.

Table 2-14. Extent of suitable Eastern Curlew habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging and roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Eastern Curlew may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging and roosting. With 5.84 of this habitat present within the DE, however, it should be noted that up to 1.5 ha is proposed to be cleared. Therefore, given this habitat type is found widely within the region and the small portion of this expected to be cleared, it is not expected that this important population of Eastern Curlew's would be restricted or reliant on this habitat within the DE.

The quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. The vegetation types assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Eastern Curlew can be discussed.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, the foraging and roosting habitat within the DE is considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.4.3 Greater Sand Plover (*Charadrius leschenaultia*)

Species background information

The Greater Sand Plover is listed as Vulnerable under the EPBC Act (TSSC, 2016c). The Greater Sand Plover is a medium sized brown and white plover, with sexes separating when in breeding plumage but inseparable when in non-breeding plumage (Marchant and Higgins, 1996; Stewart et al., 2007). When in Australia, the species is generally in non-breeding plumage and can be difficult to distinguish from the similar Lesser Sand Plover

The Greater Sand Plover occurs in flocks sometimes containing up to several hundred birds during non-breeding season, often with other shorebirds including the Lesser Sand Plover (Marchant and Higgins, 1996; Stewart et al., 2007).

Abundance & Distribution

The population size is very large with approximately 100,000 to 225,000 individuals estimated (Birdlife International, 2023c). In Australia, the Greater Sand Plover occupies coastal areas in all states, with the greatest numbers occurring in northern Australia, especially the northwest (Marchant and Higgins, 1996). The species is one of the first migratory waders to return to north-western Australia, usually arriving in late July (Minton et al., 20-5). In northern Australia, the species is especially common between Northwest Cape and Roebuck Bay in Western Australia (Barrett et al., 2003). Two internationally important sites for the species occur in Western Australia in Roebuck Bay and Eighty Mile Beach (approx. 500 km east of the DE). Important populations are not defined within the species conservation advice, and therefore the important sites will be used as a proxy to important populations. Given the important sites are not near the DE, the population within the area is not considered to be an important population.

Habitat Preferences

When in the non-breeding grounds of Australiasia, the Greater Sand Plover is almost entirely coastal, inhabiting littoral and estuarine habitats. The Greater Sand Plover mainly occupies sheltered sandy or muddy beaches with large intertidal mudflats or sandbanks, as well as estuarine lagoons (Stewart et al., 2007). This species is also recorded near coastal saltworks and saltlakes, including marginal saltmarsh and on brackish swamps (C.D.T Minton, 2002).

The Greater Sand Plover is mostly observed feeding from the surface of wet sand or mud on open intertidal flats of sheltered embayments, lagoons or estuaries (Marchant and Higgins, 1996), more often on firm sandy flats than on soft, muddy ones (Rogers, 1999).

This species mostly roosts on sand-splits and banks on beaches or in tidal lagoons, and occasionally on rocky points (Bamford, 1988) or in areas in close proximity to saltmarshes (Gosper and Holmes, 2002) or claypans (Collins et al., 2001). Further, this species is often observed roosting further up the beach than other wader species, sometimes well above the high-tide mark (C.D.T Minton, 2002).

Threats

According to the Conservation Advice for Greater Sand Plover (TSSC, 2016c), the main threats for the species are habitat loss and habitat degradation, climate change associated with changes in sea level, pollution/contamination, human disturbance, introduced species, direct mortality and disease.

Known populations in the vicinity of the DE and broader region

The Greater Sand Plover has been known to occur within the region, with a record of the species <100 m of the DE from 1999 and a couple of records within 6 km of the DE from 2017. Further, during a survey for the Proposed Action (GHD, 2020b) suitable habitat was found within the DE. While a population of the species is likely to occur within the DE it is not considered to be an important population for the species.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the species. Further records were found within the surrounding coastal areas, with these areas also likely to be used as foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Greater Sand Plover foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-15**.

Table 2-15. Extent of suitable Greater Sand Plover habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Supporting habitat			
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Greater Sand Plover utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this small portion of habitat within the DE is considered supportive habitat. Further, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

The quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. The vegetation types assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Greater Sand Plover can be discussed.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, the foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.4.4 Great Knot (*Calidris tenuirostris*)

Species background information

The Great Knot is listed as Critically Endangered under the EPBC Act (TSSC, 2016). The species is a medium sized shorebird growing to a length of 26 to 28 cm with a wingspan of approximately 58 cm. The Great Knot is the largest of all the calidrid species. The females of this species are slightly larger than the males. It has a straight, slender bill that is black with a tip that is green. The eye is brown and legs and feet are dark greenish-grey. This species has distinctive breeding, non-breeding and juvenile plumages (Higgins and Davies, 1996).

When in Australia, the Great Knot is often confused with the similar species the Red Knot (*Calidris canutus*). However, it is slightly larger with a thicker bill and less prominent eyebrow, with larger spots on the underparts and has longer wings.

The Great Knot is a monogamous species (Battley et al., 2004).

Abundance & Distribution

The Great Knot breeds in the northern hemisphere where it takes biannual migrations along the East Asian-Australasian Flyaway, EAAF. Majority of the species winters in Australia, with a study estimated approximately 90% of the population (Bamford et al., 2008). The species has been recorded around the entirety of the Australia coast, with some scattered records inland. The Great Knot has its largest numbers recorded in northern Western Australia and the Northern Territory. With the species known to occupy the Pilbara and Kimberly, from the Dampier Archipelago to the Northern Territory border.

The global population is estimated at 292,000 to 295,000 individuals in 2007 (Birdlife International, 2023). With large numbers arriving in north-west Australia in late August to early September (Lane, 1987). This species is Critically Endangered, therefore all populations are considered important and the population potentially utilising habitat within the DE shall be regarded as an important population.

Habitat Preferences

Within Australia, the Great Knot favours sheltered coastal habitats with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. The species is also occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds, saltworks, swamps near coastal areas, salt lakes and no-tidal lagoons (Higgins and Davies, 1996). The Great Knot feeds on invertebrates by pecking either on or below the surface of moist mud or sand.

This species prefers to roost in large groups in open areas, often at the water's edge or in shallow water close to feeding grounds (Higgins and Davies, 1996).

The Great Knot does not breed in Australia. The species breeds in north-east Siberia and the far north-east of Russia (Higgins and Davies, 1996).

Threats

Migratory shorebirds, such as the Great Knot are highly sensitive to certain development activities due to their high site fidelity, tendency to aggregate, high energy demands and need for habitat networks containing both roosting and foraging sites (DoE, 2015).

The main threats to this species include habitat loss and habitat degradation (e.g. through land reclamation, industrial use, changes to the water regime, invasive plants, water quality deterioration and environmental pollution), diseases and direct mortality (e.g. through hunting and climate change impacts) (Moores 2006; Rogers et al. 2006; Garnett et al. 2011; Curran et al. 2014).

Known populations in the vicinity of the DE and broader region

The Great Knot is known to occur within the Dampier Archipelago, with a record of the species approximately 20 km from the DE in 2017. Further, during a study for the Proposed Action (GHD, 2020b) suitable habitat was found within the DE. Given the lack of recent close records of the species to the DE, it is considered that an important population may occur within the DE, however it is likely to be an occasional visitor and not rely upon the habitats of the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Great Knot foraging habitat as a worst case, however, it is likely to be less with an indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area outlined below in **Table 2-16**.

Table 2-16. Extent of suitable Great Knot habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Great Knot may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this small portion of habitat within the DE is considered supportive habitat. Further, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

The quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. The vegetation types assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Greater Sand Plover can be discussed.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, the foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.4.5 Lesser Sand Plover (*Charadrius mongolus*)

Species background information

The Lesser Sand Plover is listed as Endangered under the EPBC Act (TSSC, 2016d). The Lesser Sand Plover is a small to medium-sized grey-brown and white plover which has a dark eye stripe and reaches 18 to 21 cm in length and 56 to 71 g in weight. The sexes differ in breeding season when in breeding plumage but are inseparable when in non-breeding plumage (Marchant and Higgins, 1996).

During the non-breeding season, the Lesser Sand Plover occurs in small parties or larger flocks up to several hundred birds, though it is sometimes observed feeding individually (Marchant and Higgins, 1996). They are often observed with other wader species when feeding and roosting, particularly the Greater Sand Plover (Marchant and Higgins, 1996; Swan, 2005).

Abundance & Distribution

In Australia, the Lesser Sand Plover has a large range and has been recorded within coastal regions in all states. The following sites are internationally important sites in Western Australia: Eighty Mile Beach, Roebuck Bay

(approx. 600 km east from DE), Port Hedland Saltworks (approx. 200 km east from DE) and Broome (approx. 650 km east from DE). The species arrives in north-west Australia from late August, with numbers declining by 50% by November (Watkins, 1993). The conservation advice for the Lesser Sand Plover does not list the important populations of the species, and therefore the important sites will be used as a proxy to important populations. Given the important sites are not in close proximity to the DE, the population within the area is not considered to be an important one.

The current population size is unknown; however, the population is believed to be very large and not estimated to be declining (Birdlife International, 2023e).

Habitat Preferences

In the non-breeding grounds of Australia, the Lesser Sand Plover mostly occupies coastal littoral and estuarine environments. It habits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries and occasionally sandy beaches, coral reefs, rock platforms and rocky outcrops. It can also sometimes be found on short saltmarshes or along mangroves (Marchant and Higgins, 1996).

The species mostly feeds on extensive, freshly exposed areas of intertidal sandflats and mudflats in estuaries or beaches (Johnstone and Storr, 1998; McGill and Keast, 1945).

The species roost near foraging sites; on beaches, banks or slits (McGill and Keast, 1945; Pegler, 1983).

Threats

According to the Conservation Advice for Lesser Sand Plover (TSSC, 2016d), the main threats for the species are habitat loss and habitat degradation, climate change associated with changes in sea level, pollution/contamination, human disturbance, introduced species, direct mortality and disease.

Known populations in the vicinity of the DE and broader region

The Lesser Sand Plover is known to occur within the region and may opportunistically occur within the mudflats. Further, records show the species recorded in 2007 and 2010 approx. 6 km from the DE. While a population of the species is likely to occur within the DE it is not considered to be an important population for the species.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging and roosting habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging and roosting habitat. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Lesser Sand Plover foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area outlined below in

Table 2-17.

Table 2-17. Extent of suitable Lesser Sand Plover habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging and roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Lesser Sand Plover may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging and roosting. However, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

As discussed, the quality of the fauna habitats was not assessed in the GHD surveys, with only the vegetation types given a quality classification. The vegetation types assessed overlap with the fauna habitats and therefore the vegetation condition within each fauna habitat for the Greater Sand Plover can be discussed.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging and roosting habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.4.6 Red Knot (*Calidris canutus*)

Species background information

The Red Knot is listed as Vulnerable under the EPBC Act (TSSC, 2016e). The Red Knot is a small to medium sized bird; 23 to 25 cm in length, with a wingspan of 45 to 54 cm and a body mass of 120 g. The species is a short-necked, long bodied wader with a short straight bill, long wings extending beyond the tail and short legs. In all plumages the species has a clear narrow white wing bar and off-white patch on the rump and uppertail-coverts. It is obscured by narrow dark barring and appears pale grey at a distance (Higgins & Davies, 1996).

Abundance & Distribution

The Red Knot breeds at a range of locations across the Arctic. The species then migrates to non-breeding areas that extend to the southernmost parts of America, Africa, Europe and Australasia (del Hoyo et al., 1996). The species arrives in north-west Australia from late August, where it rapidly declines by 50% by November (Watkind, 1993).

The Red Knot is found in all suitable habitats around the coast of Australia (Barrett et al., 2002; Minton, C.D.T., 2002, pers. comm.; Watkins, 1993). Large numbers are regularly recorded in north-west Australia, with 80 Mile Beach and Roebuck Bay being particular strongholds. This species is occasionally recorded inland in all regions. In Western Australia, there are scattered records in the south, and it is occasionally seen around Peron Peninsula and Carnarvon. It is widespread on the coast from Ningaloo and Barrow Island to the south-west Kimberley Division (Higgins and Davies, 1996). The conservation advice for the species does not identify any important populations or important sites for the species, therefore it is assumed that the populations that migrate to Australia are not important populations.

The Red Knot is not listed as globally threatened (del Hoyo et al., 1996); however, some populations (including those in Australia) are probably in serious decline (Minton, C.D.T. 2002, per. comm.).

Habitat Preferences

Within Australasia, the Red Knot largely inhabits intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. The species is occasionally observed on terrestrial saline

wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps (Higgins & Davies, 1996).

The Red Knot mostly forages in the soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. At high tide they may feed at nearby lakes, sewage ponds and floodwaters (Higgins & Davies, 1996).

The Red Knot roosts on sandy beaches, spits and islets, and mudflats; also in shallow saline ponds of saltworks. The species has been observed roosting on an inland claypan near Roebuck Bay, north-west Western Australia (Collins et al., 2001). They also like to roost in open areas close to feeding grounds (Rogers, 2001).

Threats

According to the Conservation Advice for the Red Knot (TSSC, 2016e), the main threats for the species are habitat loss and habitat degradation, climate change associated with changes in sea level, pollution/contamination, human disturbance, direct mortality, and disease (Avian influenza).

Known populations in the vicinity of the DE and broader region

The Red Knot has a predominately coastal distribution, with a continuous population known to occur within the Dampier Archipelago. The closest record from 2012 is 6 km from the DE. Further, suitable habitat was found within the DE (GHD, 2020b). While a population of the species is likely to occur within the DE it is not considered to be an important population for the species.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Red Knot foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area outlined below in **Table 2-18**.

Table 2-18. Extent of suitable Red Knot habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging and roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Red Knot may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging and roosting. However, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging and roosting habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.4.7 Northern Siberian Bar-Tailed Godwit (*Limosa lapponica menzbieri*)

Species background information

The Northern Siberian Bar-tailed Godwit is listed as Critically Endangered under the EPBC Act (TSSC, 2016a). The Northern Siberian Bar-tailed Godwit is a large bird with a length of around 37 to 39 cm, a wingspan of 62 to 75 cm and a weight between 250 to 450 g. The species has a long neck with a very long upturned bill which has a dark tip and pinkish base. Non-breeding plumages have a uniform upper pattern, with a dark back and upper rump. This species is distinguishable from other godwits by the dark barring pattern on the lower white rump, upper-tail and lining of the underwing. The females are larger with longer bills and a duller breeding plumage (Higgins and Davies, 1996).

Abundance & Distribution

The Northern Siberian Bar-tailed Godwit has an extremely large global range. The species breeds in northern Siberia, Russia between the Khatanga River and the delta of the Kolyma River (Higgins and Davies, 1996). The species overwinters mostly in north-western Australia and Southeast Asia.

The Northern Siberian Bar-tailed Godwit has been recorded in the coastal areas of all Australia states. In Western Australia, it is widespread around the coast, from Eyre to Derby (Higgins and Davies, 1996). During the non-breeding season, this species is found predominately in the north and north-west of Western Australia (Bamford et al., 2008). As the species is Critically Endangered, all populations are regarded as important populations.

Habitat Preferences

During non-breeding season in Australia, the species mainly occupies coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It has also been recorded in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats (Higgins and Davies, 1996).

The species forages in groups outside of breeding season (del Hoyo et al., 1996), occasionally aggregating into huge flocks of several hundreds or thousands at favoured sites (BirdLife International, 2023f). The species forages near the edge of water or in shallow water, predominately in tidal estuaries and harbours. This species prefers exposed sandy or soft mud substrates on intertidal flats, banks and beaches (TSSC, 2016a).

The species roosts on sandy beaches, sandbars, spits and also near coastal saltmarshes (Higgins and Davies, 1996).

Threats

According to the Conservation Advice for Norther Siberian Bar-tailed Godwit (TSSC, 2016a), the main threats for the species are habitat loss and habitat degradation, climate change associated with changes in sea level, pollution/contamination, human disturbance, direct mortality and disease (avian influenza).

Known populations in the vicinity of the DE and broader region

Suitable habitat has been found within the DE, with a record of the species from 1999 less than 50 m from the DE and more recent records (2017) approximately 20 km from the DE. Therefore, this species may occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Northern Siberian Bar-tailed Godwit foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-19**.

Table 2-19. Extent of suitable Northern Siberian Bar-tailed Godwit habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Northern Siberian Bar-tailed Godwit may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this small portion of habitat within the DE is considered supportive habitat. Further, given this habitat type is found widely within the region, it is not expected that this important population would be restricted or reliant on this habitat within the DE.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.4.8 Australian Fairy Tern (*Sternula nereis nereis*)

Species background information

The Australian Fairy Tern is listed as Vulnerable under the EPBC Act. The Australian Fairy Tern is a small grey and white bird with long, narrow wings and a bright orange bill which is often black at the base of the upper bill. This species has a bulky body with a round-bellied appearance, a large forehead and yellow to orange-yellow legs. The space between the eye and bill is white with a black patch in front of the eye. This species has a black crown, nape and pearly-grey upperparts which blend into the whitish rump and tail (Simpson and Day, 2004). The species is approximately 22 to 27 cm in length, 70 g in weight and has a wingspan of 44 to 53 cm (Higgins and Davies, 1996).

This species is gregarious, as with all other terns, gathering together at roost sites both during and outside of breeding season (Dunlop, 2018).

Abundance & Distribution

Australian Fairy Terns occur along the southern Australia coast and from south of the Dampier Archipelago in Western Australia to Botany Bay in New South Wales. The Great Australia Bright forms a gap in distribution between the western and eastern subpopulations (Higgins and Davies, 1996), and there are now substantial gaps amongst breeding colonies in eastern Australia, particularly along the Victorian coastline (Garnett et al., 2011). Within Western Australia, studies have found there are two subpopulations (Dunlop, 2018). With one population located along the Pilbara and upper Gascoyne coasts from Exmouth Gulf to the Dampier Archipelago. As the EPBC documents do not list any important populations nor sites, this population shall not be considered to be an important one.

The population size of the Australia Fairy Tern ranges from 6,800 to 8,100 mature individuals (Greenwell et al., 2021), with the largest population of approximately 5,000 to 6,000 individuals located in Western Australia (DAWE, 2020).

Habitat Preferences

Fairy Terns utilise a variety of habitats including offshore, estuarine or lake islands, wetlands, beaches and spits (TSSC, 2011). The species forages on near-shore waters. Fairy terns nest above the high water mark on sites where the substrate is sandy and the vegetation low and sparse. Nests typically consist of a shallow scrape in the sand which is often lined with small shells and vegetation.

Threats

According to the National Recovery Plan for the Australian Fairy Tern (DAWE,2020) the main threats for the species are habitat degradation and loss of breeding habitat, disturbance, invasive species (foxes, cats, rats and dogs), native wildlife (i.e., Raptors), climate variability and change, water management and increased salinity, pollution and hybridization.

Known populations in the vicinity of the DE and broader region

The DE contains suitable habitat for this species, further there has been recent record of this species to occur within the Dampier Archipelago area, on the offshore islands (within approx. 20 km). Therefore, it is considered the species may occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas including on the offshore islands. This broader area is therefore likely to provide foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Australian Fairy Tern foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area outlined below in **Table 2-20**.

Table 2-20. Extent of suitable Australian Fairy Tern habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Australian Fairy Tern's Recovery Plan states that the species habitat varies across its range, therefore it is not possible to generate one detailed description of habitat critical to its survival (DBCA, 2020). As a guide it lists habitats critical to the survival of Australia Fairy Terns as:

- suitable habitat where the species is known or likely to breed or forage as shown in the indicative distribution map; or
- any suitable habitat outside the above area that may be periodically occupied by non-breeding Australian Fairy Terns.

This habitat is centred on beaches and offshore islands (for nesting) and near-shore waters (for foraging). The Recovery Plan specifies that locations where the species frequently visits should be given the highest protection, as they are expected to yield productive habitats with high resource availability. Therefore, conservation measures should target these productive habitats. Further, sympathetic management buffer areas adjoining nesting and foraging habitats is also important.

The Australian Fairy Tern may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging and therefore this habitat should be considered critical to the survival of the species. There is 5.84 ha of this habitat found within the DE, with up to 1.5 ha expected to be cleared (maximum clearing extent).

However, given the small portion of this habitat in context of the region, it is not expected that this species would be restricted or reliant on this habitat within the DE.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5 Migratory Shorebird and Seabird Species

2.3.8.5.1 Whimbrel (*Numenius phaeopus*)

Species background information

The Whimbrel is listed as a Migratory species under the EPBC Act under the conventions Bonn, CAMBA, JAMBA and ROKAMBA. The species is a medium sized curlew approximately 40 to 45 cm in length and 350 g in weight (Higgins and Davies, 1996). The Whimbrel is a dark brown colour on the upper half of its body with varyingly pale spotted fringes. The underside of the species is mainly white with dark coarse brown streaks (Higgins and Davies, 1996).

Abundance & Distribution

The Whimbrel regularly migrates to Australia, occupying a primarily coastal distribution. There are also widespread records of Whimbrels inland in all regions, however; it is more common in the north. The species occupies areas from Carnarvon to the north-east Kimberly diversion in Western Australia. Important sites for the species include Roebuck Bay (approx. 900 km from the DE). Breeding season occurs in the Northern Hemisphere summer, with laying occurring from May to mid-June (del Hoyo et al., 1996). Within Australia, Whimbrels move south through Roebuck Bay, Western Australia, from August and September. With the species departing from Australia from February onwards (Higgins and Davies, 1996).

The global population of the Whimbrel was estimated between 1,000,000 and 2,132,000 individuals (Delany and Scott, 2002). The Whimbrel is not globally threatened; however, numbers have declined in Australia from 1986 to 1991 (Higgins and Davies, 1996).

Habitat Preferences

The Whimbrel occurs on the intertidal mudflats and sheltered coasts. It also is observed in harbours, lagoons, estuaries and river deltas (often those with mangroves), and further in open, unvegetated mudflats. It is sometimes observed on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. The species also uses salt flats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields (Higgins and Davies, 1996).

This species generally forages on intertidal mudflats within the muddy banks of estuaries and in coastal lagoons. They occasionally forage on sandy beaches or among rocks. The species has sometimes been sighted feeding on exposed coral or rocky reefs and rock platforms.

The Whimbrel regularly roosts in mangroves and other structures around mudflats and in estuaries flooded at high tide. They have also been noted to roost on the ground (occasionally under mangroves or in shallow water), on muddy, sandy or rocky beaches; rocky islets and coral cays (Higgins & Davies, 1996).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

The species was recorded within the mudflat with tidal inundation, mangrove, and supportive scattered samphire habitat area during the GHD (2020b) survey. Therefore, this species is considered known to occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging and roosting habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging and roosting habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Whimbrel foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-21**.

Table 2-21. Extent of suitable Whimbrel habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging and roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Whimbrel utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for both roosting and foraging. However, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

Within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

As mentioned, the abundance of this species has declined with population counts within Australia from 1986 to 1981 suggesting a decline (Higgins and Davies, 1996). However, a recent study found the population of the Whimbrel within the important site, Roebuck Bay (approx. 900 km from the DE) to have an increase in population size over the past decades, with this site also within the furthest extent of the species range (Kuang et al., 2020). Given the habitat within the DE is approximately 900 km away from this site, this habitat is not considered important for the Whimbrel.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging and roosting habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.2 Oriental Plover (*Charadrius veredus*)

Species background information

The Oriental Plover is listed as Migratory under the EPBC Act, under the conventions Bonn, CAMBA, JAMBA and ROKAMBA. The Oriental Plover is a medium sized plover approximately 21 to 25 cm in length and 95 g in weight. The sexes differ in breeding plumage but will be inseparable when in non-breeding plumage (Higgins and Davies, 1996).

Abundance & Distribution

The Oriental Plover occurs in Australia during non-breeding season, where the species inhabits both coastal and inland areas, mostly in northern Australia. With majority of records from the north-western coast, between Exmouth and Derby in Western Australia. The species starts to leave breeding grounds in July, with the entire population thought to winter in Australia (Bishop, 2006).

The species has the following internationally important sites in Western Australia; Eighty Mile Beach (approx. 500 km from DE), Port Hedland Saltworks (approx. 300 km from DE), Roebuck Bay (approx. 900 km from DE) and Dampier Saltworks (approx. 6 km). The Oriental Plover individuals potentially utilising habitat within the DE are in close proximity to an internationally important site for the species and are therefore considered an 'ecologically significant proportion' of the population.

In November 1982, over 21,000 individuals were recorded between Broome and Port Hedland (Marchant and Higgins, 1993).

Habitat Preferences

After arriving in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland (Bigg, 1981; Bransbury, 1985; Crawford, 1972; Serventy & Whittell, 1976; Storr, 1980).

Oriental Plovers often forage among short grasses or on hardy stone bare ground (McCrie, 1984) and also on mudflats or among seaweed on beaches (Bigg, 1981).

Oriental Plovers often roost on soft wet mud or in shallow waters of beaches and tidal mudflats (Bransbury, 1985; Cox, 1988; McCrie, 1984; Serventy & Whittell, 1976) and also often in dry, open habitats such as saltmarsh or paddocks (McCrie, 1984 and Park, 1983).

This species does not breed in Australia. Outside of Australia, Oriental Plovers often breed in arid, elevated areas (Wiersma, 1996).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

The species is known to occur within the region, with three records ranging from 2008 to 2016 within the Dampier Saltworks (approx. 6 km from the DE). Further, suitable habitat was found (GHD, 2020b) for the species within the DE and therefore it is considered the species is likely to opportunistically inhabitant the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging and roosting habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Oriental Plover foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area outlined below in **Table 2-22**.

Table 2-22. Extent of suitable Oriental Plover habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging and roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Oriental Plover utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for both roosting and foraging. No critical habitats for the species have been documented, however the conservation plan for migratory shorebirds list that some habitats may be more valuable than others, such as those used for both feeding and roosting (DoE, 2015c). However, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

Within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

The abundance for the Oriental Plover within the DE is unknown, however has previously being recorded at Eighty Mile Beach (approx. 500 km from the DE) between 1981 to 2003, with the population increasing over the decades (Minton et al,. 2013). Further, the habitat within the DE is not within the limit of the species range. However, the potential Oriental Plover individuals utilising the habitat within the DE are considered to be an 'ecologically significant proportion' of the population and therefore this habitat is considered important.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging and roosting habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.3 Wood Sandpiper (*Tringa glareola*)

Species background information

The Wood Sandpiper is listed as Migratory under the EPBC Act, under the conventions Bonn, CAMBA, JAMBA and ROKAMBA. The Wood Sandpiper is a small thin wader species that is 19 to 23 cm in length, with a wingspan of 56 to 57 cm and weight of approximately 55 g. This species has a short straight bill and long legs. The species is a dark grey-brown or plain brown colour on its upper body and paler and white on its lower body, with a greyish wash on the breast (Higgins and Davies, 1996).

This species is observed singly, in pairs, or small flocks and even occasionally in flocks of hundreds where they associate freely with other waders and often feed in scattered groups (Higgins and Davies, 1996).

Abundance & Distribution

The Wood Sandpiper has its largest numbers recorded in the north-west of Australia, with all areas of national importance recorded in Western Australia (Watkins, 1993); including, Parry Floodplain (approx. 1,600 km from DE), Camballin (approx. 1000 km from DE), Lake Argyle (approx. 700 km from DE), Shark Bay (approx. 900 km from DE), Vasse-Wonnerup estuary (approx. 1,500 km from DE), Lake McLarty (approx. 1,500 km from DE) and Kogolup Lakes (approx. 1,500 km from DE). The Wood Sandpiper individuals potentially utilising the site are not in close proximity to any internationally or nationally important sites and are therefore not regarded as an 'ecologically significant proportion' of the population.

The Wood Sandpiper arrives in Australia and New Guinea from August, with most Australia records from August to April (Hindwood and McGill, 1953).

An estimated 130,000 Wood Sandpipers occupy the East Asian-Australasian Flyway (Hansen et al. 2016), with the global population estimated at 3,005,000 to 4,320,000 (Bamford et al., 2008).

Habitat Preferences

The Wood Sandpiper prefers well-vegetated, shallow, freshwater wetlands; such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums and often with fallen timber. They also inhabit inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. This species uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains (Higgins and Davies, 1996). In Western Australia, within wetlands, birds often occur within a few metres of one another and are concentrated at a few sites in a wetland (Higgins and Davies, 1996).

This species forages on moist and dry mud at the edges of wetlands, either along shores, among open scattered aquatic vegetation, or in clear shallow water (Higgins and Davies, 1996).

The Wood Sandpiper has been recorded roosting on low, grassy hillock in flooded meadows. It has also been recorded in low trees and on fences (Higgins and Davies, 1996).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

The Wood Sandpiper has its largest population recorded in north-west Australia, with nationally important areas for the species located in Western Australia (Watkins, 1993). Three records ranging from 2013 to 2016 were identified in the Dampier Saltworks approximately 6 km from the DE. However, no suitable habitats were found within the DE, therefore this species is considered unlikely to occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken of the 3 individuals recorded within the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide dispersal habitat only for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

This species does not have suitable habitats within the DE of the Proposed Action.

Species habitat quality and importance

Within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

As this species has no suitable habitat within the DE, it can be assumed that no important habitat nor an 'ecologically significant proportion' of the population will be impacted by the Proposed Action.

2.3.8.5.4 Oriental Pratincole (*Glareola maldivarum*)

Species background information

The Oriental Pratincole is listed as Migratory under the EPBC Act, under the conventions CAMBA, JAMBA and ROKAMBA. The Oriental Pratincole is a medium sized, tern-like shorebird with long, pointed wings and a forked tail. The sexes are similar, with only seasonal variation and the juveniles are separable. The species is generally social, occurring in small to large flocks; in northern Australia the species sometimes comprises of thousands of birds (Higgins and Davies, 1996).

Abundance & Distribution

Within Australia, the Oriental Pratincole is widespread within the northern areas, especially along the coasts of the Pilbara and Kimberly in Western Australia (Higgins and Davies, 1996). The species arrives in Australia in late October and early November (Storr, 1980), with the species leaving Australia until mid-March or the first week of April (Collins, 1995). The following sites are internationally important sites for the species in Western Australia; Eighty Mile Beach (approx. 500 km from DE) and Roebuck Plains (approx. 800 km from DE). Further, the following sites are nationally important sites in Western Australia; Port Hedland Saltworks (approx. 300 km from DE), Taylors Lagoon (approx. 800 km from DE), Lake Argyle (approx. 1,600 km from DE) and Parry River floodplain (approx. 700 km from DE). The Oriental Pratincole individuals potentially utilising the site are not in close proximity to any internationally or nationally important sites and are therefore not regarded as an 'ecologically significant proportion' of the population.

The total population is estimated to be approximately 2.88 million birds (Stewart et al., 2007).

Habitat Preferences

In the non-breeding grounds of Australia, the Oriental Pratincole occupies open plains, floodplains or short grassland, often with extensive bare areas. The species is often located near terrestrial wetlands and artificial wetlands, especially around the margins (Jaensch, 2004). This species is also found along the coast, on beaches, mudflats and islands and around coastal lagoons (Garstone, 1978).

The Oriental Pratincole usually roosts near water at the edges of terrestrial wetlands (Jaensch, 2004). The species prefers to roost in bare areas such as claypans or areas with low vegetation, such as saltmarshes or airfields (Waugh, 1988).

The species does not breed in Australia. Outside of Australia, the species breeds in colonies on open grassland plains or stubble fields, or at the edges of wetlands (Crossland, 2003).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

Within Australia, the Oriental Pratincole is distributed widely throughout the northern areas, especially along the Pilbara Region in Western Australia (Barrett et al., 2003).

This species has previously been recorded in the area (multiple records approximately 9 km south of the DE) and a recent survey found suitable mudflat with tidal inundation, mangroves and supportive scattered samphire habitat present (GHD, 2020b).

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded inland of the surrounding coastal areas. This broader area is therefore likely to provide foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Oriental Pratincole foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area outlined below in **Table 2-23**.

Table 2-23. Extent of suitable Oriental Pratincole habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Oriental Pratincole utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this small portion of habitat within the DE is considered supportive habitat. Further, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

Within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1*' important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

The population trend of the Oriental Pratincole is overall decreasing (BirdLife International, 2023i), however, no records of population trends near the habitat within the DE could be found. Further, the habitat within the DE is not within the limit of the species range. Therefore, the habitat within the DE is not considered important habitat.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.5 Common Sandpiper (*Actitis hypoleucos*)

Species background information

The Common Sandpiper is listed as Migratory under the EPBC Act, under the conventions Bonn, CAMBA, JAMBA and ROKAMBA. The Common Sandpiper is approximately 19 to 21 cm in length with a wingspan of 32 to 35 cm. The breeding plumage of the species is dark brown above, with a greenish to feathers of cap, hindneck and mantle. Feathers are white underneath. The species has a prominent white eye ring and dark eye stripe from bill to the rear of the ear coverts. White patches amongst the darker feathers on the sides of the breast area and a long tail that extends behind the wings, short legs and a medium length bill (Higgins and Davies, 1996). The species is often present in small groups, often avoiding areas with congregations of more social waders. However, the species forms flocks up to 200 individuals prior to migration movements (Hayman et al., 1986).

Abundance & Distribution

The Common Sandpiper is found along all coastlines of Australia and in many areas inland. The Australian population is concentrated in northern and Western Australia (Blakers et al., 1984; Higgins and Davies, 1996). The species has the following areas of national importance in Western Australia; Nuytsland Nature Reserve (approx. 2,000 km from DE) and Roebuck Bay (approx. 900 km from DE). The Common Sandpiper individuals potentially utilising the habitat within the DE are not in close proximity to any nationally important sites and are therefore not considered to be an 'ecologically significant proportion' of the population. The Common Sandpiper winters in Australia, arriving in Western Australia from July onwards (Higgins and Davies, 1996).

The estimated population total of this species is 2,455,000 to 4,030,000 individuals (Delany and Scott, 2002, cited in Bamford et al., 2008), with individuals within Australia during non-breeding season estimated to be approximately 3,000 (Geering et al., 2007).

Habitat Preferences

The Common Sandpiper utilises a wide range of coastal wetlands and some inland wetlands, and is mostly recorded around muddy margins or rocky shores. The species has been recorded in estuaries and deltas of streams, as well as upstream on banks, lakes, pools, billabongs, dams and claypans and occasionally piers and jetties. This species is frequently associated with mangroves, and is sometimes found in areas of mud littered with rocks or snags (Geering et al., 2007; Higgins and Davies, 1996).

This species mostly forages in shallow water on bare soft mud at the edges of wetlands; often where obstacles project from the substrate, e.g. rocks or mangrove roots. The species sometimes venture into grassy areas adjoining wetlands (Higgins and Davies, 1996).

Roost sites are usually on rocks or in roots or branches of vegetation, particularly mangrove roots. The species has been observed to perch on posts, jetties, moored boats and other artificial structures (Higgins and Davies, 1996).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

This species has previously been recorded within the area, with a record less than 100 m from the DE from 1999 and more recent records approximately 2 km from the DE from 2007. Further, a surveys undertaken for the Proposed Action found suitable habitat present in the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat (GHD, 2020b).

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging and roosting habitat for the

species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging and roosting habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Common Sandpiper foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-24**.

Table 2-24. Extent of suitable Common Sandpiper habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging and roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Common Sandpiper utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for both roosting and foraging. No critical habitats for the species have been documented, however the conservation plan for migratory shorebirds list that some habitats may be more valuable than others, such as those used for both feeding and roosting (DoE, 2015c). However, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

Further, within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or

habitat that is of critical importance to the species at particular life-cycle stages; and/or

habitat utilised by a migratory species which is at the limit of the species range; and/or

habitat within an area where the species is declining.

The Common Sandpiper population is overall decreasing (Birdlife International, 2023j), with a study at Woodman Point (approx. 1,500 km from DE) finding the limited individuals seen decreased over the years (Singor, 2021). However, records of the species population trends within or in close proximity to the DE could not be found. Further, the habitat within the DE is not at the limit of the species range. Therefore, the habitat within the DE is not considered important habitat for the Common Sandpiper.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging and roosting habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.6 Common Greenshank (*Tringa nebularia*)

Species background information

The Common Greenshank is listed as Migratory under the EPBC Act, under the conventions Bonn, CAMBA, JAMBA and ROKAMBA. The Common Greenshank is approximately 30 to 35 cm in length, with a wingspan of 55–65 cm and weight up to 190 g for both males and females. The bill of this species is long and slightly

upturned and the legs are long and yellowish-green. In flight, all plumages show a dark upper wing and contrasting white rump extending in a white wedge up the back, whitish tail and tips of toes projecting slightly beyond the tip of the tail. The sexes are very similar (Higgins and Davies, 1996).

The species has been recorded singly or in small to large flocks (sometimes hundreds) in a variety of coastal and inland wetlands (Higgins and Davies, 1996).

Abundance & Distribution

The Common Greenshank does not breed in Australia. During the non-breeding season the species occupies all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins and Davies, 1996). In Western Australia, the Common Greenshank occurs around most of the coasts (Higgins and Davies, 1996). The species arrives in Australia from August (Lane, 1987).

The species has the following international important sites in Western Australia (Watkins, 1993); Eighty Mile Beach (approx. 600 km from DE), Wilson Inlet (approx. 2,000 km from DE) and Roebuck Bay (approx. 900 km from DE). The Common Greenshank individuals potentially utilising the habitat within the DE are not in close proximity to any nationally important sites and are therefore not considered to be an 'ecologically significant proportion' of the population.

The global population is estimated to be 440,000 to 1,500,000 (BirdLife International, 2023g). The species is not globally threatened and is considered secure due to its extensive breeding range (del Hoyo et al., 1996). The East Asian-Australasian Flyway population of this species is thought to be approximately 110,000 individuals (Hansen et al., 2016), of which 18,000 to 19,000 spend their non-breeding season in Australia (Bamford et al., 2008; Clemens et al., 2008).

Habitat Preferences

The Common Greenshank occupies a wide range of inland wetlands and sheltered coastal habitats. The species occurs in sheltered coastal habitats, typically with large mudflats and saltmarshes, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons. This species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are usually mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees (Higgins and Davies, 1996).

The Common Greenshank has been recorded foraging within the edges of wetlands, in soft mud on mudflats, in channels, or in shallows around the edges of water often among pneumatophores of mangroves or other sparse, emergent or fringing vegetation, such as sedges or saltmarsh. Further, the species will occasionally feed on exposed seagrass beds (Higgins and Davies, 1996).

The Common Greenshank roosts within wetlands, in shallow pools and puddles, or slightly elevated rocks, sandbanks or small muddy islets. Occasionally the species will perch and roost on stakes (Higgins and Davies, 1996).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

The species has previously been recorded within 100 m of the DE in 1999, with more recent records approximately 2 km for the DE. Further, the study for the Proposed Action found suitable habitat for the species in the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat (GHD, 2020b).

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas and the Dampier Saltworks. The Dampier Saltworks is a large

network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Common Greenshank foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-25**.

Table 2-25. Extent of suitable Common Greenshank habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Common Greenshank utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this small portion of habitat within the DE is considered supporting habitat. Further, given this habitat type is found widely within the region, it is not expected that this population would be restricted or reliant on this habitat within the DE.

Further, within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

The Common Greenshank population is overall stable (BirdLife International, 2023f), with no records of the population trend of the species within or in close proximity to the DE. As mentioned, the Common Greenshank is distributed along most coasts around Australia; therefore, the habitat within the DE is not considered at the limit of the species range. Therefore, the habitat within the DE is not considered important habitat for the Common Greenshank.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging and roosting habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.7 Gull-billed Tern (*Gelochelidon nilotica*)

Species background information

The Gull-billed Tern is listed as Migratory under the EPBC Act, under the convention CAMBA. The Gull-billed Tern is a medium sized tern species with a thick black bill. In breeding plumage, the species is pale with a black cap. Non-breeding plumage includes a dark cheek patch. This species is approximately 33 to 42 cm in length, 150 to 292 g in weight, with a wingspan of approximately 76 to 91 cm (Higgins and Davies, 1996). This species

does not plunge-dive for fish like other tern species, instead they perform a distinctive aerial swoop to catch prey.

Abundance & Distribution

The Gull-billed Tern is widely distributed, mainly as winter or breeding visitors in Europe, Asia, northwest African, Australia and in America. This species breeds in the warmer parts around the globe in southern Europe, temperate and eastern Asia and eastern South America. There is limited literature on the distribution and abundance of the Gull-billed Tern within Australia likely due to the taxonomic split of *Gelochelidon nilotica* and *Gelochelidon macrotarsa* in 2014 (del Hoyo and Collar, 2014). However, a distribution map on BirdLife International (2023k) illustrates the species occupies many coastal regions across Australia, with the species occurring from Coral Bay to Kununurra in Western Australia during the non-breeding season.

No internationally nor nationally important sites are listed for this species and therefore the individuals potentially utilising the habitat within the DE cannot be considered an 'ecologically significant proportion' of the population.

Habitat Preferences

The Gull-billed Tern is a migratory species in Australia, often habituating freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, artificial wetlands and grasslands (Morcombe, 2004).

The Gull-billed Tern does not breed in Australia, the species breeds mainly on coastal plains, including barrier beaches and dunes, salt marshes, salt pans and also artificial islands in river, freshwater lagoons and hypersaline lakes (Gochfeld et al., 2006).

The species nests along coastlines, either on sandy or saltmarsh islands, in a ground scrape. The species will also forage over flooded fields inland from the coast.

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

The species has previously been recorded within the area, with two records within 4 km of the DE from 1999 and 2000. The species was recorded within the mudflat with tidal inundation, mangrove and supportive scattered samphire habitat area during the survey for the Proposed Action (GHD, 2020b). Therefore, this species is known to occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with a single record found within the Dampier Saltworks and multiple within the surrounding coastal areas. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Gull-billed Tern foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-26**.

Table 2-26. Extent of suitable Gull-billed Tern habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Supporting habitat			
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Gull-billed Tern utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this small portion of habitat within the DE is considered supportive only. Further, given this habitat type is found widely within the region, it is not expected that the species would be restricted or reliant on this habitat within the DE.

Further, within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

As mentioned, there is limited information on the Gull-billed Tern and therefore its distribution, including the limit of the species range and population trend could not be determined. Therefore, the habitat within the DE is not considered important habitat.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.8 Caspian Tern (*Hydroprogne caspia*)

Species background information

The Caspian Tern is listed as Migratory under the EPBC Act, under the convention JAMBA. The Caspian Tern is the largest tern in Australia with long, slender backswept wings and a slightly forked tail. The bill of this species is red with a dusky tip. Both sexes are similar, with a body length of approximately 53 to 60 cm long and an average weight of 680 g (Higgins and Davies, 1996). The species has a white body, with a black and white streaked crown from bill to nape and a short shaggy crest. The mantle and upperwings are grey and the flight feathers are darker. When in breeding plumage, the crown is black. Immature birds are similar to non-breeding adults (Higgins and Davies, 1996).

This species is mainly gregarious when breeding, though single nesting does occur. Outside of breeding, the Caspian Tern occurs mostly in small groups or singly. Occasionally larger groups of 30 or more are observed, often near rich fishing areas or at nightly roost sites. The species may also aggregate into flocks during migration (Higgins and Davies, 1996).

Abundance & Distribution

In Australia, the Caspian Tern has a widespread range and occupies both coastal and inland habitat (Higgins and Davies, 1996). Within Western Australia, the Caspian Tern is distributed through coastal regions from the Great Australian Bight to the Dampier Peninsula (Higgins and Davies, 1996). Breeding within Australia occurs from the Recherche Archipelago to Dirk Hartog Island and Faure Island in Shark Bay, in the Pilbara region from

around Point Cloates to North Turtle Island, and more rarely, in the Kimberley (Chatto, 2001; Higgins and Davies, 1996). Within Australia, the species is a resident and present throughout the year at sites where breeding occurs year-round (Higgins and Davies, 1996).

The total global population is estimated to be 240,000 to 420,000 birds (Birdlife International, 2023h). The Caspian Tern individuals utilising the habitat within the DE are not within or in close proximity to important sites for the species, and therefore cannot be considered an 'ecologically significant proportion' of the species.

Habitat Preferences

The Caspian Tern occupies sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas), with sandy or muddy margins preferred. They are also observed on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. Further, the species also occupies artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species favours sheltered areas, particularly near islands (Higgins and Davies, 1996).

The Caspian Tern generally forages in open wetlands, including lakes and rivers. The species prefers sheltered shallow water near the margins, but can also be found in open coastal waters. In coastal inlets they prefer to forage in tidal channels, or over submerged mudbanks (Higgins and Davies, 1996).

The Caspian Tern breeds in a variety of habitats including low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky islets or banks. Nests are either open, or among low or sparse vegetation. They sometimes nest near bushes or other shelter such as large sticks, driftwood and piles of beach cast seagrass.

Roosting mostly occurs on bare exposed sand or shell spits, banks or shores of coasts, lakes, estuaries, coastal lagoons and inlets. Occasionally they nest among beachcast debris above the high-water mark or at artificial sites, including islands in reservoirs, or on dredge-spoil (Higgins and Davies, 1996).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

This species was recorded within the mudflat with tidal inundation, mangrove and supportive scattered samphire habitat area during a survey for the Proposed Action (GHD, 2020b) and is therefore known to occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas (including on nearby offshore islands) and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide foraging habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as foraging habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Caspian Tern foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-27**.

Table 2-27. Extent of suitable Caspian Tern habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Supporting habitat			
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Caspian Tern utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for foraging only and therefore this small portion of habitat within the DE is considered supporting habitat. Further, given this habitat type is found widely within the region, it is not expected that the species would be restricted or reliant on this habitat within the DE.

Further, within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

The population trend overall for this species is increasing (BirdLife International, 2023h), however limited information is available on the population trend of the species within or in close proximity to the habitat within the DE. The distribution of this species is widespread, with the habitat within the DE not at the limit of the species range; therefore, the habitat within the DE is not considered important habitat.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.9 Greater Crested Tern (*Thalasseus bergii*)

Species background information

The Greater Crested Tern is listed as Migratory under the EPBC Act, under the convention JAMBA. The Greater Crested Tern is a large tern approximately 5.4 to 6.5 cm in length, with a yellow bill, black legs and a glossy black crest. The adults of both sexes are identical in appearance. This species has grey upperparts, white underparts, a yellow bill, and a shaggy black crest that recedes in winter.

This species breeds in colonies, often with other seabird species. The species is monogamous and the pair bond is maintained throughout the year and sometimes in consecutive breeding seasons (Higgins and Davies, 1996).

Abundance & Distribution

The Greater Crested Tern breeds in south-west and eastern Africa, the Arabian Peninsula, tropical Indian Ocean islands through to the Oriental region and Australia. The species occupies majority of habitats within Australia except for arid areas. In Western Australia the species is mainly found along the coasts of north-western Australia (Rogers et al., 2005).

The Greater Crested Tern has a very large range, with a large population size (<10,000 individuals) and a stable population trend (BirdLife International, 2023a). Important sites for the species could not be found, therefore

the population utilising the habitat within the DE is not considered an 'ecologically significant proportion' of the population.

Habitat Preferences

The Greater Crested Tern occurs in tropical and warm temperate coastal regions from South Africa around the Indian Ocean to the Pacific and Australia (de Hoyo et al., 1996).

This species feeds mostly at sea and can forage up to 10 km from land in their breeding season (Cooper, 2006).

The nests of this species are located on low lying sandy, rocky or coral islands, sometimes amongst stunted shrubs, regularly without any shelter (Snow and Perrin, 1998). This species will roost or rest on open shores and even on boats, pilings, harbour buildings and raised salt mounds in lagoons (Cooper, 2006).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

This species was recorded within the mudflat with tidal inundation, mangrove and supportive scattered samphire habitat during the survey for the Proposed Action (GHD, 2020b) and is therefore known to occur within the DE.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with individuals recorded within the surrounding coastal areas (including on nearby offshore islands) and the Dampier Saltworks. The Dampier Saltworks is a large network of inundated salt evaporation and intake ponds surrounded by tidal creeks and mudflats (Birdlife International, 2023l). This broader area is therefore likely to provide roosting habitat for the species. Further records were found within the surrounding coastal areas, including Nickol Bay, with these areas also likely to be used as roosting habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha potential Greater Crested Tern roosting habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-28**.

Table 2-28. Extent of suitable Greater Crested Tern habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Supporting habitat			
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Greater Crested Tern utilises the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for roosting only and therefore this small portion of habitat within the DE is considered supportive only. Further, given this habitat type is found widely within the region, it is not expected that this species would be restricted or reliant on this habitat within the DE.

Further, within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

The Greater Crested Tern has a stable population trend (BirdLife International, 2023a), however there is limited information on the species population trend within or in close proximity to the DE. Further, limited literature on the species distribution was found. Therefore, the habitat within the DE is not considered important habitat for this species.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

2.3.8.5.10 Bridled Tern (*Onychoprion anaethetus*)

Species background information

The Bridled Tern is listed as Migratory under the EPBC Act, under the conventions CAMBA and JAMBA. The Bridled Tern is a medium-sized tern species, with a total length of 30 to 32 cm and a mean adult weight of 110 to 180 g (Higgins and Davies, 1996). The species has a grey-black bill (about the same length as the head), long slender wings and a long, deeply forked tail. Sexes do not differ in plumage or size (Higgins and Davies, 1996).

Bridled Terns are mostly gregarious, breeding in small to large colonies (of several hundred to thousands of birds), but are more often seen in loose, small to moderately large flocks (typically up to 25 birds in Western Australia) or individually when foraging and during non-breeding periods (Higgins and Davies, 1996).

Abundance & Distribution

Within Australia, Bridled Terns are widespread, breeding on offshore islands in western, northern and north-eastern Australia, extending from Cape Leeuwin in the south-west, around northern Australia to north-eastern and mid-eastern Queensland. In Western Australia, breeding is widespread from islands off Cape Leeuwin north to Shark Bay and in the Pilbara region and Kimberley Division. At sea, distribution extends from Cape Leeuwin north to Dirk Hartog Island, with isolated mainland coastal records at Point Maud and Ningaloo, and from Barrow Island to the Dampier Archipelago, and at sea off the Kimberley coast from waters west of the Dampier Peninsula to Ashmore Reef and Joseph Bonaparte Gulf (Barrett et al., 2003; Blakers et al., 1984; Higgins and Davies, 1996; Johnstone & Storr, 1998). In Western Australia, Bridled Terns have been recorded off the coast of the Kimberly Division from late September and off the coast of the Pilbara region from late October (Dunlop and Johnstone, 1994).

Important sites were not listed for this species and therefore the individuals potentially utilising the DE are not considered an 'ecologically significant proportion' of the population.

The total population in Western Australia is estimated to be at least 30,000 to 40,000 pairs and increasing (Dunlop & Johnstone, 1994).

Habitat Preferences

Bridled Terns inhabit tropical and subtropical seas, breeding on islands, including vegetated coral cays, rocky continental islands and rock stacks (Chatto, 2001; Higgins and Davies, 1996).

Bridled Terns breed on islands, with nests found in rocky areas or on coral, concealed in crevices or caves up to 1.5 m deep, under rocks, among talus or coral rubble, on ledges of cliffs, or on the ground beneath low shrubs, roots of Pandanus, vines or among grasses. Occasionally the species nests occur on shingle or sandy beaches

or, rarely, in the open, on pigface (a plant) or on rock (Chatto, 2001; Higgins and Davies, 1996; Serventy et al., 1971).

The Bridled Tern roosts ashore when breeding. At breeding colonies, birds roost or loaf on branches of shrubs or low trees (such as Pisonia, Argusia), on rocks, less often on the ground among vegetation or rubble or on the shoreline. However, at the start of the breeding season and when the chicks are older (about 40 days old), birds roost or loaf in groups during the day on sandbanks or beaches and the like, distant from final breeding sites. They also roost on artificial structures, including posts and buoys (Chatto, 2001; Higgins and Davies, 1996; Serventy et al., 1971).

Threats

The Wildlife Conservation Plan for Migratory Shorebirds (DoE, 2015d) specifies the main threats for the species as habitat loss, habitat modification, anthropogenic disturbance, climate variability and change, harvesting of shorebirds prey, fisheries by-catch and hunting.

Known populations in the vicinity of the DE and broader region

Suitable habitat for the species was recorded during the survey for the Proposed Action for the species (GHD, 2020b), with the closest record offshore 10 km from the DE. As the species is known to breed on offshore islands (Chatto, 2001; Higgins and Davies, 1996), use of this habitat is likely to be for roosting only.

A review of satellite imagery of the DBCA records within 20 km of the DE was undertaken, with the two records found offshore. This broader area is therefore likely used as dispersal habitat for the species. Individual DBCA records within the broader region are displayed in **Figure 2-10** and further detail of each is provided in **Appendix C**: Regional Records of Significant Fauna.

Species habitat extent

The Proposed Action will result in the loss of up to 1.5 ha of potential Bridled Tern foraging habitat as a worst case, however is likely to be less with indicative clearing associated with the current design of approximately 0.47 ha. Additionally, the species has mudflat habitat outside of the DE between Kings Bay (<3 km) and Hearson Cove (<5 km) of approximately 220 ha. The species suitable habitats found within the DE and wider area are outlined below in **Table 2-29**.

Table 2-29. Extent of suitable Bridled Tern habitat within the development envelope

Habitat Type	Habitat Importance	Extent in DE (ha)	Approximate extent of habitat type in wider area between King Bay and Hearson Cove (ha)
Supporting habitat			
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Roosting habitat	5.84	**220.00**
Total		**5.84**	**220.00**

Species habitat quality and importance

The Bridled Tern may use the mudflat with tidal inundation, mangroves and supportive scattered samphire habitat for roosting and therefore this small portion of habitat within the DE is considered supporting habitat. Given this habitat type is found widely within the region, it is not expected that this species would be restricted or reliant on this habitat within the DE.

Further, within the '*Matters of National Environmental Significance – Significant Impact Guidelines 1.1'* important habitat for migratory species is listed as:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
- habitat that is of critical importance to the species at particular life-cycle stages; and/or
- habitat utilised by a migratory species which is at the limit of the species range; and/or

– habitat within an area where the species is declining.

As mentioned, the population within Western Australia has been recorded as increasing in the past (Dunlop and Johnstone, 1994); however, limited records exist for the population trend of this species within or in close proximity to the DE. The distribution of this species is widespread, with the habitat within the DE not at the limit of the species range. Therefore, the habitat within the DE is not considered to be important habitat.

The mudflats with tidal inundation, Mangroves and supportive scattered Samphire habitat ranged from 'Very Good' to 'Poor', majority of which being classified as 'Good' condition. Therefore, this foraging habitat within the DE can be considered to be of a 'Good' quality. However, this vegetation condition rating cannot be used to infer the quality of the waterbody present within the mudflat and has limitations.

3 Impact Assessment

This section assesses the potential direct and indirect impacts on protected matters that are likely to be present within the DE and surrounds.

Each protected matter is assessed consistent with the *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* which identifies 'significant impact criteria' to assist in determining whether the potential impacts of a Proposed Action are likely to be significant (DoE, 2013). Conservation advice, recovery plans, and other relevant guidance have been applied as relevant to specific protected matters.

The following aspects associated with the Proposed Action have the potential to result in impacts to MNES.

Vegetation clearance and loss of habitat

Clearing for construction of the transmission line will impact on the following fauna habitat:

– No more than 14.4 ha total clearing, including:
  - Up to 14.4 ha of potential Northern Quoll foraging, dispersal, denning/shelter and feeding habitat within the DE, which is considered habitat critical to the survival of the species.
  - Up to 14.4 ha of potential Pilbara Olive Python denning/shelter, feeding, foraging and dispersal habitat within the DE, which is regarded as important to the species.
  - Up to 14.4 ha of potential Ghost Bat and Grey Falcon foraging and flyaway habitat.
  - Up to 1.5 ha of Australian Fairy Tern potential foraging habitat. This habitat is critical to the survival of the Australian Fairy Tern.
  - Up to 1.5 ha of potential foraging habitat for the Curlew Sandpiper, Great Sand Plover, Lesser Sand Plover, Northern Siberian Bar-tailed Godwit, Oriental Pratincole, Common Greenshank, Gull-billed Tern, and Caspian Tern.
  - Up to 1.5 ha of roosting habitat for the Bridled Tern and Greater Crested Tern.
  - Up to 1.5 ha of Eastern Curlew, Red Knot, Whimbrel, Oriental Plover and Common Sandpiper foraging and/or roosting habitat.

The Proposed Action's detailed design will minimise habitat impacts where possible, including those for construction activities through:

– avoidance of fauna habitat where possible through the use of previously cleared areas or otherwise degraded areas that provided lower value fauna habitat than less disturbed areas;
– rehabilitation of temporary construction areas at the completion of each construction phase; and
– utilising existing tracks located within the DE as far as possible to reduce the required amount of clearing.

Habitat fragmentation

Clearing and the construction of the transmission line can result in the fragmentation of small pockets of suitable fauna habitat. The transmission line is not anticipated to act as a barrier to the movement of terrestrial fauna. Although the Project covers a linear area, given the limited extent of clearing proposed, in particular the width of clearing, and the nature of the overhead transmission line, it is not anticipated that the construction or operation of the Proposed Action would result in the loss or reduction of an ecological linkage as the habitats are generally well represented locally and the infrastructure is unlikely to prevent the movement of fauna from either side.

Increased risk of feral animals and weeds

There is the potential for a range of feral animals and weed species to be introduced and/or attracted to the area as a result of construction and operational activities, such as the clearing activities, increased construction traffic movements and waste. The presence of introduced predators may be exacerbated by the Proposed Action as a result of the creation of new pathways for pest animals and potential attraction of animals to waste, however the risk of feral animals being attracted to the area is considered to be low as this would be limited to waste and food scraps discarded by the construction workforce. Given there is no longer term

infrastructure (such as accommodation or water storage) that would attract fauna, and the existing disturbance tracks in the area, the impacts are likely to be negligible.

Direct mortality

Injury or mortality of fauna individuals may potentially occur as a result of the Proposed Action due to interaction with the construction activities or operational infrastructure. Construction activities with an associated risk of direct mortality of fauna individuals include the clearing of vegetation and soil excavation.

Increased dust

Vegetation damage from increased dust deposition during construction can potentially result in degradation of fauna habitat leading to loss or fragmentation of foraging areas. This potential reduction in vegetation cover can restrict the movement of fauna individuals within their established foraging and breeding habitat.

Increased risk of vehicle strike

Injury or mortality of fauna individuals is possible resulting from vehicle strike during construction of the Proposed Action, or during routine inspection and maintenance activities during operations.

Increased light and noise pollution

Permanent lighting associated with the Proposed Action will be minimal and only associated with the new Burrup substation (and existing Dampier substation) which will have outdoor yard lighting for safety, as per standard substation arrangements. Planned operational maintenance is anticipated to occur in the day and therefore the lighting would only be used in operational situations for faults etc. Temporary mobile lighting will be installed during construction on a limited basis. Fauna may be attracted to areas where prey such as insects are attracted to the light emissions. Light emissions may also cause other behaviour responses such as changing the timing of fauna individuals' activities, or avoidance of the area.

Increased noise will also occur temporarily as a result of construction activities, specifically the movement of vehicles and machinery, excavation of pole locations, raising of poles into place and the use of winches or helicopters for stringing of the transmission line. Noise is an environmental stressor and can potentially affect fauna in a number of ways including avoidance of noisy habitats or reduction in foraging success due to masking (i.e. interference with the perception of sounds of interest).

Increased risk of fire

Accidental fire, during construction or operation of the Proposed Action, can result in injury or mortality of fauna individuals. Additionally, fire can temporarily reduce the amount of fauna habitat available, increase habitat fragmentation and open up areas to weed invasion.

Accidental fires may result from hot works (sparks may escape the immediate work area and ignite the surrounding vegetation) or actions such as parking light vehicles over grassy areas where hot exhausts may ignite the grasses.

Habitat contamination by Acid Sulfate Soils

There is an increased potential of habitat contamination by acid sulfate soils within the DE from the Proposed Action. Acid sulfate soils have the potential to cause serious negative impacts to waterways and estuaries. However, due to the 'High to Moderate' and 'Moderate to Low' levels recorded within the DE, control measures will be in place to mitigate the impact, this is outlined within the Environmental Management Plan (**Appendix B**). Given the mitigation measures that will be in place during construction (ensuring acid sulfate soils containing spoils don't generate acidic runoff), there is a high level of confidence that impacts to flora and fauna will be negligible.

Risk of collision with the transmission line

It is possible that fauna individuals (such as birds) may collide with the transmission line. Collision with the transmission line has the potential to result in injury or mortality of fauna individuals. This is further detailed in Section 3.2.

Anthropogenic disturbance

Anthropogenic disturbances are addressed in the above potential impacts. No other anthropogenic disturbances have been identified for the Proposed Action.

3.1 Threatened Terrestrial Species

3.1.1 Northern Quoll (*Dasyurus hallucatus*) - Endangered

Potential direct impacts that may occur to the Northern Quoll as a result of the Proposed Action are:

- Vegetation clearance and loss of habitat
- Direct mortality
- Increased risk of vehicle strike
- Increased light and noise pollution
- Increased risk of fire resulting in habitat loss

Potential indirect impacts that may occur to the Northern Quoll as a result of the Proposed Action are:

- Habitat fragmentation
- Increased risk of feral animals and weeds
- Increased dust
- Habitat contamination by acid sulfate soils

3.1.1.1 Direct impacts

Vegetation clearance and loss of habitat

Up to 14.4 ha would be required to be cleared as a worst case, from the 59.5 ha of potential Northern Quoll foraging, feeding, dispersal, and denning/shelter habitat within the DE. This 59.5 ha includes 42.09 ha of rocky hills with exposed boulder piles habitat, which is considered to be critical to the survival of the Northern Quoll according to the species 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill and Ward, 2010). The remaining 17.4 ha is made up of minor drainage lines and hummock grassland on low rocky hills, which is also considered to be habitat critical to the survival of the Northern Quoll given the dispersal habitat present.

The referral guideline for the Northern Quoll (DoE, 2016) also identifies foraging or dispersal habitat, that is any land comprising predominately native vegetation in the immediate area (i.e. within 1 km) of shelter habitat, as habitat critical to the survival of the species. Given this, Northern Quoll dispersal habitat within 1 km of the rocky hills with exposed boulder piles habitat is identified as critical to the survival of the Northern Quoll.

There is 17.4 ha of dispersal habitat identified as critical to the survival of the species within the DE.

A total of 59.5 ha of habitat critical to the survival of the species is therefore present within the DE, with up to 14.4 ha may be cleared for the Proposed Action.

The field survey (GHD, 2020b) identified three habitat types that the Northern Quoll may utilise. A breakdown of these habitat types within the DE is provided in **Table 3-1**. It should be noted that the Proposed Action is linear infrastructure which means the habitat loss will not be concentrated in one particular area and the width of clearing will be narrow when compared to other types of actions.

Table 3-1. Extent of Northern Quoll habitat clearing for the Proposed Action

Habitat Type	Habitat Importance	Extent present within DE (ha)
Rocky hills with exposed boulder piles	Critical to the survival of the species – denning/shelter and feeding habitat	42.09
Minor drainage lines	Critical to the survival of the species – Linear corridor and dispersal habitat	6.51

Habitat Type	Habitat Importance	Extent present within DE (ha)
Hummock grassland on low rocky hills	Critical to the survival of the species – Foraging and dispersal habitat	10.89

The clearing of critical habitat for the Northern Quoll is identified in the species 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' as a key threat (Hill and Ward, 2010). The clearing of this critical habitat is likely to have a significant residual impact on the local Northern Quoll population within the area.

However, it should be noted that the loss is a very small proportion of the available denning, foraging and dispersal habitat for Northern Quoll in the immediate vicinity of the DE. As discussed, the Proposed Action will result in the loss of up to 14.4 ha from the above 59.5 ha of Northern Quoll habitat within the DE. However, the maximum clearing extent is very small compared to the recorded habitat within the Pilbara region (approx. 8.5 million hectares).

The referral guideline for the Northern Quoll outlines mitigation measures that need to be undertaken when clearing critical habitat for the species. Horizon Power plan on avoiding clearing of the rocky hills with exposed boulder piles critical habitat where possible, however, it is still likely that a small portion of critical habitat will need to be cleared and therefore mitigation measures will be implemented to reduce/offset this loss of habitat. These measures are outlined within the Environmental Management Plan (**Appendix B**). With the mitigation measures in place and the small amount expected to be cleared, it is not anticipated that clearing associated with the Proposed Action will result in a significant decline in the Northern Quoll species.

Direct mortality

The construction activities associated with the Proposed Action have the potential to injure Northern Quoll individuals or result in direct mortality. The construction activities with the potential to cause injury or mortality include clearing of vegetation and soil excavation.

The Proposed Action is expected to function similarly to the existing transmission line in the area and will have limited interaction with the Northern Quoll species. Therefore, the operation of the Proposed Action is not expected to cause a significant residual impact to the species.

However, the risk of direct mortality is expected to increase during construction, especially construction near denning habitat during mating season (between June to August). This risk will be mitigated by through pre-clearance surveys that will be undertaken in Northern Quoll denning habitat to confirm no Northern Quoll individuals are present in the clearing area. Mitigation and management measures are described in (**Section 4**) and in the Environmental Management Plan (**Appendix B**).

It should be noted that camera trapping was undertaken to target cryptic species such as the Northern Quoll during the studies for the Proposed Action (GHD, 2019 and GHD, 2020b) with no Northern Quoll individuals recorded. Therefore, the population present within the DE is likely to be very low density. Further, a study of Northern Quoll movements within Kakadu National Park found that females occupied home ranges averaging 35 ha, with males having a similar home range, except during breeding season where it expanded to >100 ha (Oakwood, 2002). Therefore, based on a percentage of home range that is within the DE for female, male (non-breeding) and male (breeding), it can be assumed the area is in the home range of one female and one non-breeding male. In breeding season, it is assumed this could increase to approximately 3 males in the area of the DE.

Given the proposed mitigation measures, the very low density of Northern Quolls anticipated to be in the area and the large home ranges of the species impacts are expected to be minimal. Temporary avoidance behaviour is likely to occur in the small population of Northern Quoll individuals which will reduce the risk of direct mortality and injury occurring.

Increased risk of vehicle strike

Vehicles associated with construction and operation the Proposed Action may result in injury or mortality to Northern Quoll individuals. Although the number of vehicles accessing tracks during the construction phase is

expected to increase from the existing scenario, vehicle movement during operation is expected to be very minimal, with only periodic maintenance vehicles expected.

It is noted that low construction traffic is expected at night which significantly reduces the likelihood of a vehicle strike occurring, as Northern Quolls are primarily nocturnal. Given the low traffic volume, night-time vehicle movements restricted where possible and minimised to the number necessary for construction to progress and the low density of Northern Quolls in the area, impacts to the Northern Quoll as a result of vehicle strike are not expected to be significant.

Increased light and noise pollution

Permanent lighting associated with the Proposed Action will be minimal and only associated with the new Burrup substation (and existing Dampier substation) which will have outdoor yard lighting as per standard substation arrangements. Planned operational maintenance is anticipated to occur in the day and therefore the lighting would only be used in operational situations for faults etc. Temporary lighting will be installed during the construction phase as required on a limited basis. This temporary lighting will not remain in one place for an extended period and will be moved along the DE throughout construction.

Lighting has the ability to impact Northern Quoll individuals, with artificial lighting potentially resulting in behavioural responses from the species. These behavioural responses include individuals temporary avoiding illuminated areas for foraging and/or changes to the species targeted prey (insects). This will change the foraging behaviour of the species as insects are known to aggregate to illuminated areas.

Standard working hours are expected to operate between 6:00 and 18:00, with only a small amount of this time overlapping with the nocturnal nature of this species. Therefore, any potential impacts are anticipated to be minimal, with impacts only in effect for a short period of time (if temporary lighting is required around sundown). Further, due to the temporary and localised nature of the light emissions, these impacts are not expected to be significant, particularly when considering the low density of Northern Quolls within the DE.

The Proposed Action will increase noise in the immediate working area during the construction phase, however the operational noise emissions are anticipated to be minimal. During operation the level of noise is not expected to increase above the current noise level generated by the existing transmission line and road infrastructure in the area.

Noise is a known environmental stressor to many fauna species including the Northern Quoll. Noise can result in avoidance of noisy areas, increased rates of predation (e.g. by feral animals) and/or reduction in foraging success. There is a lack of research into the impact of noise on native fauna in the Pilbara in general, and on the Northern Quoll in particular. However, noise is not discussed as a threat to the species within the Northern Quoll's recovery plan. Given this, the low number of Northern Quolls expected within the DE, and the temporary nature of the increased noise level; this impact is not anticipated to be significant.

Increased risk of fire

There is an increased risk of a fire occurring as a result of the Proposed Action. Inappropriate fire regimes are listed as a key threat to Northern Quoll individuals in the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*).' The negative impact of fire is mostly via the changes it causes to habitat structure and floristics (McKenzie et al., 2007). It should be noted that the Proposed Action is unlikely to result in changes to the fire regime in the local area. Any fires caused as a result of construction or operation of the Proposed Action would be uncommon and accidental in nature.

The greatest threat caused by fire is the increased predation of quolls by dingoes, cats and raptors after fire has removed vegetative cover (Oakwood, 2004). This is especially accurate for areas where rocky outcrops are absent, as the species then relies on habitats such as tree hollows and/or fallen logs for cover. As the DE contains rocky outcrops, the risk of increased predation following fire will be reduced.

There is a record of a wildfire occurring within and surrounding the DE in 2015, burning a total of 94ovae-h. 87 ha. Demonstrating there is potential for a fire to occur within the DE and spread to the surrounding area. The cause of this fire was recorded as deliberate however and was not due to any construction or operation activities. As any fires resulting from activities associated with the Proposed Action will be accidental and

infrequent, and appropriate fire controls will be in place, the risk of fire as a result of the Proposed Action is expected to be minimal and is not expected to result in a significant decline of the species.

3.1.1.2 Indirect impacts

Habitat fragmentation

Habitat degradation and population isolation are identified in the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' as key threats to the species (Hill and Ward, 2010).

The maximum clearing extent (14.4 ha) will result in clearing of sections of the rocky hills with exposed boulder piles, hummock grasslands on rocky plain and minor drainage lines habitats. However, the maximum clearing extent is very small compared to the recorded habitat within the Pilbara region (95ovae-h. 8.5 million hectares). Further, there are breaks in this linear clearing along the DE with individual Northern Quoll species able to access adjacent habitat in these breaks therefore is not anticipated to fragment the habitat.

There is no research into whether Northern Quoll individuals in the region would cross the clearing associated with the existing transmission line, however, a study of a Newman population found that the species would cross roads if they intersected high quality habitat (Henderson, 2015). Therefore, due to the breaks in the maximum clearing extent, the narrow width of clearing required and the possibility that the species can cross the transmission line infrastructure, it is not expected that this fragmentation will result in the isolation of habitat. Given this, the fragmentation is not expected to result in a decline in Northern Quoll populations or significantly impact the recovery of the species.

Increased risk of feral animals and weeds

Feral species

Predation by introduced species (such as cats, foxes, dogs) is identified as a major threat in the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' (Hill and Ward 2010). Feral predators will not only prey on Northern Quolls, but on species that are target prey for the Northern Quoll, limiting the available food sources (Hill and Ward 2010).

Feral predators are widespread throughout the Pilbara and recorded in the DE (GHD, 2020b). Given the proposed mitigation measures (refer to Environmental Management Plan) and the existing disturbance (such as the existing transmission line and road infrastructure) in the region, it considered unlikely that the Proposed Action will result in an increase in feral predators such that Northern Quoll populations are likely to decline.

Weeds

Weeds are listed as a key threatening process to the Northern Quoll according to the species 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill and Ward, 2010).

As weed species are known to colonise disturbed areas, such as cleared areas as a result of the Proposed Action, it is expected an increase in weeds could occur. Any increase of weeds as a result of the Proposed Action is not predicted to be significant however, due to the planned mitigation measures (refer to the Environmental Management Plan) such as biosecurity measures. It is also noted that weeds of particular concern for the Northern Quoll such as Gamba Grass and Mission Grass (due to their large biomass and rigidity potentially inhibiting movement and foraging) are not found within the DE and therefore not expected to be spread by construction activities. Given this, impacts to Northern Quolls as a result of the exacerbated presence of weed species due to the Proposed Action are not expected to occur.

Increased dust

Vegetation damage from increased dust deposition can potentially result in degradation of fauna habitat leading to the loss or fragmentation of foraging areas, including foraging areas for the Northern Quoll. This potential reduction in vegetation cover can restrict the movement of Northern Quoll individuals within their established foraging and breeding habitat. The increased dust generation associated with construction of the Proposed Action is expected to be localised to the working areas and will be controlled at source as far as possible through implementation of damping down during prolonged dry spells. As such, dust deposition as a result of the Proposed Action is expected to be minimal.

It is therefore considered unlikely that the Proposed Action will result in habitat degradation via dust deposition. Given this, it is expected that impacts to the Northern Quoll as a result of increased dust will be negligible.

Habitat contamination by Acid Sulfate Soils

As the Proposed Action will involve excavation, anticipated to be approximately nine cubic meters (m^3) per transmission line pole, there is potential to mobilise the contaminants associated with the areas at risk of acid sulfate soils (ASS). Therefore, there is an increased potential for habitat contamination by ASS within the DE as a result of the Proposed Action. However, due to the 'High to Moderate' and 'Moderate to Low' levels recorded within the DE and surrounding area, control measures will be in place to mitigate any potential impact, as outlined within the Environmental Management Actions provided in the EMP (**Appendix B**). The Proposed Action has been designed to avoid areas of high ASS risk as far as possible.

Given the mitigation measures that will be in place during construction (ensuring ASS containing spoil does not generate acidic runoff), it is anticipated that impacts to Northern Quoll as a result of ASS will be negligible. Further, given the high-risk areas within the DE are associated with the mudflats, ASS contamination is unlikely to be an issue for the denning habitat recorded in the DE.

3.1.1.3 Assessment against MNES Significant Impact Guidelines

An assessment of the potential impacts of the Proposed Action on the Northern Quoll against the MNES significant impact criteria is provided in **Table 3-2**. This assessment uses the significant impact criteria for Endangered species (DoE, 2013).

Table 3-2. Assessment of the significant impact – Northern Quoll

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Quoll species
'lead to a long-term decrease in the size of a population''	*Not Significant* As discussed in **Section 3.1.1.1** (Direct impacts), the implementation of the Proposed Action will involve the clearance of up to 14.4 ha of habitat critical for the survival of the species (maximum clearing extent). Given the relatively small amount of critical habitat, important foraging and dispersal habitat and other suitable Northern Quoll habitat to be cleared compared to the regionally available suitable habitat (in the region of 8.5 million ha, and anticipated to be over 4,000 ha on the Burrup Peninsula), it is not predicted that this clearing will result in a decline in population of Northern Quolls or interfere with the species recovery. If present in the DE, they are considered to be very low density based on studies of the Northern Quoll home ranges. Females have a home range of approximately 35 ha (Oakwood, 2002) which is similar to non-breeding males, however the home range of breeding males increases up to three times to approximately 100 ha. Therefore, based on a percentage of home range that is within the DE for female, male (non-breeding) and male (breeding), it can be assumed the area is in the home range of one female and one non-breeding male. In breeding season, it is assumed the density would increase as there could be up to 3 males in the area of the DE. Other direct impacts, such as vehicle strikes and increased risk of feral animals, may occur as a result of the interaction with the construction phase. However, these impacts will be mitigated by the Environmental Management Actions (**Appendix B**), therefore, it is not expected to cause a significant impact on the population. Indirect impacts are expected to be limited and temporary behaviour alterations (avoidance and dispersal) may occur transitionally in a small number of individuals.
'reduce the area of occupancy of the species'	*Not Significant* As described in **Section 3.1.1.1**, the Proposed Action will result in the clearing of up to 14.4 ha of potential Northern Quoll habitat, including habitat critical to the survival of the species. This clearing represents a very small percentage of the estimated 8.5 million ha of similar suitable Northern Quoll habitat present in the Pilbara region. The DE is anticipated to represent approximately 0.4% of the habitat available on the

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Quoll species
	Burrup Peninsula and the proposed clearing is not expected to significantly reduce the area of occupancy on the peninsula. As described in **Section 2.3.8.3.1**, the population of Northern Quoll in the area is anticipated to be low density, with the species known to have a large home range (averaging at 35 ha for females, with males expanding during breeding season to >100 ha); therefore it is anticipated a low number of Northern Quolls present within the DE, with a density of one male and one female in the non-breeding season, and three males in the breeding season (between June to August). Given this, the relatively small amount of potential Northern Quoll habitat to be cleared (compared to the regionally available habitat), it is not considered likely that the area of occupancy of the Northern Quoll will be reduced. In addition, the Proposed Action will not result in removal of the likely denning habitat (i.e. the boulder piles).
'fragment an existing population into two or more populations'	*Not Significant* The Proposed Action will result in the clearing of small areas and will not fully segregate the habitat, with individuals able to move around the cleared areas. Further, given the species can cross these areas, the remaining surrounding habitat will still be available. It is not anticipated that any additional fencing will be required other than small areas around the new Burrup substation and potentially minor expansion of the existing fencing around the Dampier substation. The area is surrounded by highway infrastructure (Burrup Road and Village Road, see **Figure 1-1**) and existing clearing associated with historic access roads. The project is not expected to increase existing fragmentation of habitat due to the small clearing associated with each pole pad and narrow width of maintenance tracks (nominally 4m or less). The Proposed Action will not result in fragmentation of an existing population.
'adversely affect habitat critical to the survival of a species'	*Significant* The 'National Recovery Plan for the Northern Quoll' (Hill & Ward, 2010) recognises the Rocky areas as a habitat critical for the survival of the species. The Proposed Action will be clearing up to 14.4 ha of this critical habitat as a worst case (although likely to be substantially lower than this). The current indicative disturbance footprint would require the clearing of approximately 4.6 ha of the rocky habitat; however this is subject to change and therefore the worst case of 14.4 ha has been used, which is the total clearing within the DE. It is unlikely that the full 14.4 ha would comprise of rocky habitat type. The loss of up to 14.4 ha of habitat critical to the survival of the Northern Quoll could have a significant impact on local Northern Quoll populations. FMG (2018) identified 8,224 ha of potential Northern Quoll denning habitat in the region of which 299.3 ha (3.63%) was planned to be removed for the Solomon and Eliana mines and associated rail line, and 4 ha removed as part of the Munawara Red Dog Highway project. Based on this, the Proposed Action will result in the removal of a further 0.18% as a worst case of the total denning habitat in the region as mapped by FMG (2018). This means that over 96% of the suitable denning habitat mapped by FMG (2018) would remain. Given this, the loss of 14.4 ha is unlikely to be significant given the availability of locally available denning habitat and suitable habitat for the species more broadly in the Pilbara (estimated 8.5 million ha of suitable habitat is present in the Pilbara region). However, as this habitat is recorded as critical habitat, the impacts have been reported as 'significant' on a worse-case basis.
'disrupt the breeding cycle of a population'	*Not Significant* As described above, the Proposed Action may potentially impact up to 14.4 ha of habitat critical to the survival of the Northern Quoll. Given the low numbers of Northern Quoll anticipated to be in the DE (anticipated density of on female and up to three males during breeding season) and the availability of suitable habitat for the species more broadly in the Pilbara, the Proposed Action is unlikely to disrupt the breeding cycle of a population. In addition, the Proposed Action will not result in removal of the likely denning habitat (i.e. the boulder piles). Further, Northern Quolls breed in June to August once each year. As discussed in **Section 3.1.1.1** mitigation measures will be implemented, such as undertaking pre-clearance surveys prior to commencing any construction activities. In addition, although the rocky hills with exposed boulder piles habitat type is recorded in the DE,

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Quoll species
	on the ground this covers a much broader area of features and the actual denning features within the DE (e.g. caves, gorges and rockpiles) are limited. Taking this into consideration with the extremely low density anticipated in the area, construction of the Proposed Action is not expected to disrupt the breeding cycle of Northern Quoll. Other direct impacts, such as vehicle strikes during construction and increased risk of predation by feral animals may occur, however any potential injury or mortality is expected to be limited to a small number of individuals. Indirect impacts related to the construction phase, such as an increase in noise, light and dust are expected to be transitory, short term and minimal, and therefore are not predicted to disrupt the breeding cycle.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not Significant* As mentioned above, the proposed action will be clearing up to 14.4 ha of the habitat critical for the survival of the species ('Rocky Hills with exposed boulder piles'). Given the relatively small amount of habitat to be cleared compared to the regionally available suitable habitat (estimated to be 8.5 million ha), it is not predicted that this clearing will result in a decline in population of Northern Quolls or interfere with the species recovery, particularly given the likely low-density population utilising the DE anticipated to be up to three males and one female during breeding season, and less in non-breeding season. The key potential impact that could result in the decline of the species is removal of specific denning habitat. although the rocky hills with exposed boulder piles habitat type is recorded in the DE, on the ground this covers a much broader area of features and the actual denning features within the DE (e.g. caves, gorges and rockpiles) are limited. The preferred food types of the Northern Quoll is typically insects, birds, frogs and lizards. These species commonly congregate around specific areas including creeks, rock outcrops, wet areas and pools, which are much more abundant in the wider area than within the DE, and therefore areas outside the DE would be more prospective for these food items and in turn the Northern Quoll. It is also noted that quolls are most active at night when no construction works are anticipated. Given the small, narrow areas of clearing proposed, Norther Quolls if present would still be able move through the area when they are active at night and therefore no permanent barrier to movement would be created. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Northern Quoll species is likely to decline.
'result in invasive species that are harmful to a critically endangered or endangered species becoming established in the98ovae-ered or critically endangered species' habitat '	*Not Significant* The Cane Toad is recognised as one of the main threats to Northern Quoll (Hill & Ward, 2010). Additionally, feral animals such as cats, foxes and dogs pose a potential threat to the species due to an increase of predation and/or increase of prey on food sources. Cane Toads are not present in the Pilbara region (Hill & Ward, 2010). The Field Survey recorded four introduced animals: Dog, Cat, Cattle and Black Rat (GHD, 2020b). As discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* No specific diseases have been identified as a threat to the Northern Quoll in the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' (Hill & Ward, 2010). There is no credible impact pathway associated with the Proposed Action that could result in the introduction of a disease that may cause a decline in the Northern Quoll population.
'interfere with the recovery of the species'	*Not significant* The Proposed Action will not increase or exacerbate the threats of Northern Quoll Species (Section 2.3.8.3.1) in a significant manner that can affect the recovery of the species. Mitigations action will be undertaken to minimise and avoid increase in feral

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Quoll species
	predations, fire, introduction of weeds and disease. The habitat loss, compared to the regional area, is not anticipated to be significant.

3.1.2 Pilbara Olive Python (*Liasis olivaceus barroni*) – Vulnerable

Potential direct impacts that may occur to the Pilbara Olive Python as a result of the Proposed Action are:

- vegetation clearance and loss of habitat
- direct mortality
- increased risk of vehicle strike
- increased light and noise pollution
- increased risk of fire

Potential indirect impacts that may occur to the Pilbara Olive Python as a result of the Proposed Action are:

- habitat fragmentation
- increased risk of feral animals and weeds
- increased dust
- habitat contamination by Acid Sulfate Soils

3.1.2.1 Direct impacts

Vegetation clearance and loss of habitat

The Conservation Advice for the Pilbara Olive Python identifies destruction of habitat as a threat to the species (TSSC, 2008). Of the 59.5 ha of potential Pilbara Olive Python shelter and feeding, foraging and dispersal habitat within the DE, up to 14.4 ha will be cleared as a result of the Proposed Action. A breakdown of these habitat types within the DE is provided in **Table 3-3**.

Table 3-3. Extent of Pilbara Olive Python habitat clearing for the Proposed Action

Habitat type	Habitat importance	Extent present within DE (ha)
Rocky hills with exposed boulder piles	Shelter and feeding habitat	42.09
Minor drainage lines	Linear corridor and feeding habitat	6.51
Hummock grassland on low rocky hills	Foraging and dispersal habitat	10.89

The GHD (2020b and 2022) surveys did not record any evidence of the Pilbara Olive Python. However, there is suitable habitat for the species in the DE and surrounding areas and the species has been recorded in close proximity to the area previously. This suggests that the species is likely to utilise the area.

However, similar habitat utilised by the species is found extensively throughout the region (GHD, 2020b). Further, Pilbara Olive Pythons have large home ranges (between 88 ha to 449 ha) so are considered unlikely to be dependent on the habitat to be cleared (Tutt et al., 2004). Given this lack of dependence on the habitat to be cleared, the relatively small amount of Pilbara Olive Python habitat to be cleared compared to the regionally available habitat, and the fact that the Proposed Action is linear infrastructure which means the habitat loss will not be concentrated in one particular area, it is not predicted that this clearing will result in a significant impact to the Pilbara Olive Python.

Direct mortality

Injury or mortality of Pilbara Olive Python individuals may potentially occur as a result of the Proposed Action due to interaction with the construction activities. The construction activities with the potential to cause injury or mortality include the clearing of vegetation and soil excavation.

While it is expected that Pilbara Olive Pythons will display avoidance behaviour and move away from the construction area as a result of vibration from construction equipment, there remains the possibility that a small number of individuals may suffer injury or mortality through direct interaction with the construction works area. The impacts to the species from the Proposed Action are expected to be minimal given the sensitive nature of the species to vibration and avoidance behaviours likely to be applied.

Increased risk of vehicle strike

The conservation advice for the Pilbara Olive Python identifies roadkill as a main threat to the species (TSSC, 2008).

Construction and operational activities will involve vehicles accessing existing and new tracks, which increases the chance of Pilbara Olive Python mortality through collision. Vehicle strikes are likely to occur as the Pilbara Olive Python moves across tracks and roads. While there is a lack of road mortality literature specific to the Pilbara Olive Python, it is suspected that they may be particularly vulnerable to vehicle strikes as tracks and roads are often preferred basking spots for snakes.

Given this, it is considered that intermittent incidences of mortality from collision with vehicles may occur. However, the low expected traffic volume, particularly associated with the temporary construction phase and low frequency routine maintenance, means that impacts will be limited to a small number of individual and is unlikely to significantly affect the population size of the Pilbara Olive Python.

Noise and vibration

Noise and vibrations caused by the construction equipment may lead to behavioural (avoidance) impacts to Pilbara Olive Pythons. These impacts are expected to be temporary and limited to a small number of individuals. Due to the linear nature of the Proposed Action, construction works will be phased along the transmission corridor, which will mean this impact is expected to be short lived with individuals recolonising the area once construction activities cease. Therefore, there is anticipated that potential impacts to the Pilbara Olive Python as a result of noise and vibration will not be significant.

Increased risk of fire

There is an increased risk of a fire occurring as a result of the Proposed Action. Fire can result in injury or mortality of fauna individuals including Pilbara Olive Python. Further, fire can damage and burn vegetation communities, decreasing habitat and increasing habitat fragmentation; opening up areas to the impacts of weeds and feral animal invasion. It should be noted that the Proposed Action is unlikely to result in changes to the fire regime in the local area. Any fires caused as a result of construction or operation of the Proposed Action would be uncommon and accidental in nature.

A fire was recorded within and surrounding the DE in 2015, burning a total of 100ovae-h. 87 ha. This demonstrates the region has the potential for fires to occur and spread to the surrounding area. However, it should be noted this fire was caused by deliberate action and not due to any construction or operation activities. As any fires resulting from activities associated with the Proposed Action will be accidental and infrequent, and appropriate fire controls will be in place, the risk of fire as a result of the Proposed Action is expected to be minimal and is not expected to result in a significant decline of the species.

3.1.2.2 Indirect impacts

Habitat fragmentation

Clearing has the potential to fragment Pilbara Olive Python habitat. However, as Pilbara Olive Python individuals can cross cleared habitats, these habitats will still be available for use as refuge and foraging habitat. As this fragmentation will not result in the isolation of habitat or Pilbara Olive Python populations, it is not expected to result in a significant impact to the species.

Increased risk of feral animals and weeds

The conservation advice for the Pilbara Olive Python identifies predation by feral cats and foxes and predation of food sources by foxes as a main threat to the species (TSSC, 2008).

Feral predators may play a role in the decline of the Pilbara Olive Python through predation, particularly of juveniles, as well as predation of the Pilbara Olive Python's food sources (such as Quolls and Rock-wallabies; (Ellis 2013; Pearson 2013a; TSSC 2008; DAWE, 2021d)). However, the loss of prey is likely to be of particular concern to the Pilbara Olive Python in coastal areas, where the fox is more prevalent (TSSC 2008).

Feral predators are widespread throughout the Pilbara and have been recorded in the DE (GHD, 2020b). Given the proposed mitigation measures, including ensuring no feeding of native and/or feral animals and no pets allowed on site (refer to **Section 4** and the Environmental Management Plan in **Appendix B**), and the existing disturbance in the region such as the road infrastructure, it considered unlikely that the Proposed Action will result in an increase in feral predators such that Pilbara Olive Python population is likely to decline.

Increased dust

Vegetation damage from increased dust deposition can potentially result in degradation of the Pilbara Olive Python habitat leading to the loss or fragmentation of foraging areas. The increased dust generation associated with construction of the Proposed Action is expected to be localised to the working areas and will be controlled at source as far as possible through implementation of damping down during prolonged dry spells. As such, dust depositions as a result of the Proposed Action are expected to be minimal. In addition, the potential for increased dust is expected to have a minimal impact on Pilbara Olive Python given the species can cross large ranges to find suitable habitat, therefore the impacts are anticipated to be negligible.

Habitat contamination by Acid Sulfate Soils

As the Proposed Action will involve excavation, anticipated to be approximately 9 m^3 per transmission line pole, there is potential to mobilise the contaminants associated with the areas at risk of acid sulfate soils (ASS). Therefore, there is an increased potential of habitat contamination by ASS within the DE as a result of the Proposed Action. However, due to the 'High to Moderate' and 'Moderate to Low' levels recorded within the DE and surrounding area, control measures will be in place to mitigate any potential impact, as outlined within the Environmental Management Actions detailed in the EMP (**Appendix B**). The Proposed Action has been designed to avoid areas of high ASS risk as far as possible.

Given the mitigation measures that will be in place during construction (ensuring ASS containing spoils don't generate acidic runoff), it is anticipated that impacts to Pilbara Olive Pythons as a result of ASS will be negligible.

3.1.2.3 Assessment against MNES Significant Impact Guidelines

An assessment of the potential impacts of the Proposed Action on the Pilbara Olive Python against the MNES significant impact criteria is provided in **Table 3-4**. This assessment uses the significant impact criteria for Vulnerable species (DoE 2013).

Table 3-4. Assessment of significant impact – Pilbara Olive Python

Significant Impact Criteria (DOE, 2013)	Assessment for Pilbara Olive Python species
'lead to a long-term decrease in the size of an important population''	*Not Significant* The Pilbara Olive Python present in the Burrup Peninsula is one of the four populations of this species, therefore, is classified as an 'important population' (DCCEEW,2023c). The Proposed Action will involve the clearance of up to 14.4 ha of Pilbara Olive Python habitat, which may include up to 14.4 ha of 'Rocky Hill with exposed boulder piles'; up to 6.51 ha of 'Minor Drainage'; or up to 10.89 ha of 'Hummock Grassland on Low Rocky Hills'. The species is considered unlikely to be dependent on the habitat to be cleared, as the Pilbara Olive Python has a home range of 88 to 450 ha (DCCEEW, 2023) and the proposed clearing would be a small fraction of the home range of a single individual. Therefore, it is not anticipated that this clearing will result in a significant impact on Pilbara Olive Pythons. Direct impacts such as vehicle strikes and interaction with construction activities are expected to be limited to potential injury or mortality to a small number of individuals. The increase in vehicle movements in the area as a result of construction traffic and

Significant Impact Criteria (DOE, 2013)	Assessment for Pilbara Olive Python species
	plant would be short term for the duration of construction (102ovae-h. 18 months) and therefore not expected to result in long-term decrease in the population of the species. Potential for vehicle strike during construction would be minimized through measures set out in Chapter 4, including speed limits restrictions between 40-80km/hr, and induction material associated with the presence of the species. Given the limited amount of traffic anticipated in the operational phase, associated with occasional routine maintenance, any potential increase in risk of vehicle strike is considered to be negligible. Indirect impacts (e.g, noise, vibration and fire), described in **Section 3.1.2.2**, are expected to be transitory and behavioural alterations (avoidance and dispersal) is anticipated to occur in a small number of individuals during the construction phase. Therefore, it is not anticipated that the Proposed Action will result in a long-term decrease in this important population.
'reduce the area of occupancy of the important population'	*Not Significant* As described above, the Proposed Action is expected to clear up to 14.4 ha of supporting habitat for Pilbara Olive Python Species. The species is considered unlikely to be dependent on the habitat to be cleared since the Pilbara Olive Python has a home range of 88 to 450 ha (DCCEEW, 2023), it is not predicted that this clearing will result in a reduction in the area of occupancy of the Burrup Peninsula population of Pilbara Olive Pythons. The infrastructure is linear in nature and will not prevent occupancy of this species.
'fragment an existing important population into two or more populations'	*Not Significant* The proposed action has a linear design adjacent to Burrup Road. The populations of Pilbara Olive Python within the DE or adjacent areas will be able to cross the Proposed Action access tracks, as they currently do with Burrup Road. The pole installations and overhead line do not represent a barrier that could fragment the existing population. It is not anticipated that any additional fencing will be required other than small areas around the new Burrup substation and minor relocation of fencing around the Dampier substation, however given this area is surrounded by highway infrastructure (Burrup Road and Village Road, see **Figure 1-1**) and existing clearing associated with historic access roads, additional fencing is not anticipated to result in fragmentation of the habitat. The fencing associated with the Dampier substation will be similar to existing. The Proposed Action will not result in the fragmentation of the Burrup Peninsula population of Pilbara Olive Pythons.
'adversely affect habitat critical to the survival of a species'	*Not significant* The Proposed Action is expected to clear up to 14.4 ha of potential Pilbara Olive Python supporting habitat. Pilbara Olive Pythons have large home ranges (between 88 ha to 449 ha) so are considered unlikely to be dependent on the habitat to be cleared (Tutt et al., 2004). No habitat critical to the survival of the species was recorded in the DE and therefore the Proposed Action is not anticipated to adversely affect habitat critical to the survival of a species.
'disrupt the breeding cycle of an important population'	*Not Significant* The loss of up to 14.4 ha of supporting habitat (shelter and foraging habitat) is not considered to be a significant impact as the species is not likely to depend on the habitat to be cleared. Given the relatively small amount of Pilbara Olive Python habitat to be cleared compared to the individuals home range, and the fact no breeding habitat was identified in the DE, the proposed clearing is unlikely to disrupt the breeding cycle of an important population of Pilbara Olive Python. As described in **Section 3.1.2.1** and **Section 3.1.2.2**, impacts to Pilbara Olive Pythons are expected to be limited to potential injury or mortality to a small number of individuals; and temporary behavioural (avoidance) behaviour in a small number of individuals. This is not predicted to disrupt the breeding cycle of the species.
'modify, destroy, remove, isolate or decrease the availability	*Not Significant* As mentioned above, the loss of up to 14.4 ha of supporting habitat for the species is not expected to result in the decline of the Pilbara Olive Python given the relatively

Significant Impact Criteria (DOE, 2013)	Assessment for Pilbara Olive Python species
or quality of habitat to the extent that the species is likely to decline'	small amount of the habitat to be cleared compared to the regionally available habitat. As such, the species is not likely to depend on the habitat proposed to be cleared. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Pilbara Olive Python species is likely to decline.
'result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable, species' habitat'	*Not Significant* The Conservation Advice of Pilbara Olive Python (DEWHA, 2008), recognises predation by feral animals (Cats and foxes) and predation of food sources as the main threat to the species. GHD (2020b) recorded four introduced animals (Dog, Cat, Cattle and Black Rat) and one invasive flora (*Passiflora foetida*). With implementation of the proposed management and mitigation measures (**Section 4**), the likelihood of the introduction and establishment of an invasive species as a result of the Proposed Action is considered to be remote and therefore any resultant impacts will be negligible. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* Conservation Advice for Pilbara Olive Python (DEWHA, 2008) does not identify any diseases that could be a threat to Pilbara Olive Pythons. There is no credible impact pathway that could result in the introduction of a disease that may cause a decline in the Pilbara Olive Python population.
'interfere substantially with the recovery of the species'	*Not Significant* Conservation advice for the Pilbara Olive Python (TSSC, 2008) outlines the priority actions and threats for the recovery of this species relevant to the Proposed Action. The Proposed Action is not expected to alter water regimes or introduce or increase feral animals within the area. Therefore, it is not expected to interfere substantially within the recovery of the species.

3.1.3 Ghost Bat (*Macroderma gigas*) – Vulnerable

Potential direct impacts that may occur to the Ghost Bat as a result of the Proposed Action are:

- vegetation clearance and loss of habitat;
- direct mortality/vehicle strike; and
- risk of collision with the transmission line.

Potential indirect impacts that may occur to the Ghost Bat as a result of the Proposed Action are:

- increased light and noise pollution.

3.1.3.1 Direct impacts

Vegetation clearance and loss of habitat

Habitat loss and degradation, including modification of foraging habitat such as that identified in the DE, is identified as a threat to species in the conservation advice for the Ghost Bat (TSSC, 2016b).

No suitable roosting habitats were recorded within the DE during the GHD (2020b) survey. However, up to 14.4 ha of potential Ghost Bat foraging and flyaway habitat will be cleared as a result of the Proposed Action. A breakdown of these habitat types within the DE is provided in **Table 3-5**.

Table 3-5. Extent of Ghost Bat Habitat Clearing for the Proposed Action

Habitat Type	Habitat Importance	Extent in DE (ha)
Supporting habitat		
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84
Minor drainage lines		6.51
Hummock Grassland on Low Rocky hills		10.89
Hummock grassland on rocky plain		9.12
Total		**32.36**

Ghost Bats have a foraging range of 5 km from its roost, which means that Ghosts bats are not dependent on the foraging habitats within the DE and are expected to utilise other foraging resources near roost sites outside of the DE.

Foraging habitat for Ghost Bat is very broad and the species is likely to utilise all vegetated areas with the exception of dense high shrublands or forests, resulting in the majority of the areas within the region being suitable. Given the relatively small amount of Ghost Bat foraging habitat to be cleared compared to the overall similar habitat in the Pilbara region, and the expectation that Ghost Bats will utilise other available foraging habitat, it is anticipated that the clearing required for the Proposed Action will not result in impacts to Ghost Bat foraging.

Direct mortality

Injury or mortality of Ghost Bat individuals may potentially occur as a result of interaction with the construction activities including construction equipment and clearing. Given the potential for Ghost Bats to forage within the DE and surrounding areas, there is the potential for Ghost Bats to interact with construction activities as they forage. However, as the Ghost Bat is predominantly nocturnal, the likelihood of injury or mortality occurring as a result of interaction with construction equipment is low given the clearing will be undertaken during the daytime with no night works planned. In the event that such impacts do occur, they would be limited to a small number of individuals expected to be accessing the area and would not be significant.

Vehicle strike

There is a lack of studies into the roadkill rates for the Ghost Bat, however, the species is known to forage close to the ground (Churchill, 2008) which makes it vulnerable to collision with cars. Ghosts Bats are known to be attracted to light sources (DAWE, 2021) and therefore it can be considered they will be attracted to headlights (Armstrong, 2013). As such small increase in vehicles during construction of the Proposed Action has the potential to increase the risk of vehicle collisions.

While it is considered likely that intermittent incidences of mortality from collision with vehicles may occur, with potential limited vehicle movements from site at sundown, and planned works only proposed during daylight hours, no vehicles associated with the Proposed Action will be travelling at night when the species would be foraging. As such, impacts will be negligible and will not significantly affect the population size of the Ghost Bat.

Direct collision with the proposed action

While direct collisions with powerlines isn't listed as a threat within the Ghost Bats conservation advice (TSSC, 2016b), collision with fences (especially those with barbed wire) is a key threat to the species. Ghost Bats are known to forage at about fence height and substantial numbers are known to be killed when colliding with fencing wire (Armstrong and Anstee, 2000 and McKenzie and Bullen, 2009). Studies have shown a single fence near a colony can effectively remove all these individuals given enough time and has been observed in the

Pilbara (Armstrong and Anstee, 2000). The height of the transmission line will be substantially higher than a typical fence and therefore would likely be above the foraging height of ghost bats.

However, even if mortality or injury could be caused by direct collision with powerlines, there are very low numbers of Ghost Bats anticipated to be in within the DE (if at all) due to no suitable roosting caves known to be in close proximity, and therefore the Proposed Action is not expected to cause a significant decline in the population of Ghost Bats.

3.1.3.2 Indirect impacts

Increased light and noise pollution

Permanent lighting associated with the Proposed Action will be minimal and only associated with the new Burrup substation (and existing Dampier substation) which will have outdoor yard lighting as per standard substation arrangements. Planned operational maintenance is anticipated to occur in the day and therefore the lighting would only be used in operational situations for faults etc. Temporary mobile lighting will be installed during construction on a limited basis, potentially required during winter months; with works proposed to take place between 6:00 and 18:00. Temporary lighting is not likely to remain in one place for long periods of time and will be moved along the construction area as dictated by the construction schedule.

Ghost Bats may be attracted to light sources due to the concentration of insects in well-lit areas. Given the temporary and localised nature of the light emissions and resultant minor behaviour impact, and the low numbers of the species predicted, these impacts are not anticipated to be significant.

Impacts to Ghost Bats from noise may occur but would be limited to disturbance of foraging bats resulting in them foraging elsewhere. Given the large amount of suitable foraging habitat available in the area and no night works planned, any impacts to foraging bats from noise will be negligible.

3.1.3.3 Assessment against MNES Significant Impact Guidelines

An assessment of the potential impacts of the Proposed Action on the Ghost Bat against the MNES significant impact criteria is provided in **Table 3-6**. This assessment uses the significant impact criteria for Vulnerable species (DoE, 2013).

Table 3-6. Assessment of significant impact – Ghost Bat

Significant Impact Criteria (DOE, 2013)	Assessment for Ghost Bat species
'lead to a long-term decrease in the size of an important population''	*Not significant* Ghost Bat of the Pilbara population is a distinct genetic population and, therefore, classified as an 'Important Population' (Section 2.3.8.3.3). As described in Section 3.1.3.1, the Proposed Action will involve clearing of Supporting habitat (foraging habitat) for this species. Given the detailed design for the Proposed Action is ongoing, the exact amount of this habitat to be removed has not been confirmed, therefore as a worst case it has been assumed the Proposed Action has potential to impact up to 14.4 ha of this habitat within the DE (maximum clearing extent). The GHD (2020b) survey did not record any individuals within the DE. DBCA (2023a) recorded one individual in 2006 on the Burrup Peninsula outside of the DE. Records of the species within the Pilbara region show that large colonies are currently found in the Chinchester sub-region and small colonies are found in the Hamersley subregion (TSSC, 2016c). Additionally, satellite tracking of the species shows that they cover an average range of 8km to 17km (Bullen, Reiffer and Trainer, 2023). Therefore, any individuals that may utilise the foraging and roosting habitat within the DE are likely to be occasional visitors and not rely on the area for their survival. It is not expected that habitat clearing in the DE will result in the long-term decrease in the important population of Ghost Bats that utilise the area. There is a potential collision risk associated with the transmission line, however given the low numbers of the species anticipated to be using the area, and the fact their foraging would typically occur below the height of the transmission line, the risk is considered to be low and not likely to cause a noticeable decrease in the size of the

Significant Impact Criteria (DOE, 2013)	Assessment for Ghost Bat species
	Ghost Bat population. In addition, given vehicles associated with the Proposed Development are not expected to be travelling at night when the Ghost Bat would be foraging, potential vehicle strike is not anticipated to result in a significant impact to the population. It is not anticipated that any additional fencing will be required other than small areas around the new Burrup substation, however given this area is surrounded by highway infrastructure (Burrup Road and Village Road, see **Figure 1-1**) and existing clearing associated with historic access roads, and the fact there are minimal records in the area, additional fencing is not anticipated to result in impacts to the Ghost Bat species. The fencing associated with the Dampier substation will be similar to existing. As described in **Section 3.1.3.2**, indirect impacts on Ghost Bat may occur as a result of lighting and noise and vibration emissions. These potential impacts are anticipated to be transient, mainly during the construction phase, and minimal. In case of injury or mortality, it is expected to be restricted to a small number of individuals and, therefore, there is not anticipated to be a long-term decrease in the size of the population.
'reduce the area of occupancy of the important population'	*Not Significant* As described above, the Proposed Action will involve clearing of up to 14.4 ha of Supporting habitat (foraging) for this species. Due to the current distribution of the species, the small number of records within the Burrup Peninsula, and the lack of suitable roosting habitat within the DE, it is not expected to reduce the area of occupancy of this important population.
'fragment an existing important population	*Not Significant* Although the Ghost Bat population in the Pilbara region is considered an 'important population,' the low number of records on the Burrup Peninsula and their distribution preference in the Chichester and Hamersley sub-regions, combined with their ability to travel 8 to 17 kilometres, suggest that the individuals likely traversing the project area use it as a supporting habitat and do not rely on the DE. Therefore, it is not expected that the potential impacts of the proposed action will result in fragmentation of an existing population. In addition, given the transmission line would be positioned at a height greater than the typical Ghost Bat foraging height, the transmission line will not represent a barrier to movement of the Ghost Bat.
'adversely affect habitat critical to the survival of a species'	*Not Significant* The Proposed Action will involve the clearance of up to 14.4 ha of Supporting habitat (foraging) for this species. No habitat identified as critical to the survival of the species (i.e. caves and other suitable roost sites) will be impacted as a result of the Proposed Action.
'disrupt the breeding cycle of an important population'	*Not Significant* As described above, it is considered that an important population of Ghost Bat is present in the Pilbara area, although there is a small number of records within the Burrup Peninsula. The conservation advice for the Ghost Bat identifies disturbance of breeding sites as a threat to the species (TSSC, 2016b). the DE is not located in close proximity to any Ghost Bat breeding habitat, such as caves and other roost sites. Therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of the Pilbara population.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not Significant* As described in **Section 3.1.3.1**, the clearing of up to 14.4 ha of supporting habitat for Ghost Bat is not expected to be significant. This species is not dependent on the habitat to be cleared, due to their high mobility and distribution preferences within the Chichester and Hamersley sub-regions. It is not anticipated that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Ghost Bat species is likely to decline.
'result in invasive species that are harmful	*Not Significant*

Significant Impact Criteria (DOE, 2013)	Assessment for Ghost Bat species
to a vulnerable species becoming established in the vulnerable, species' habitat'	The conservation advice for the Ghost Bat identifies competition with introduced predators (foxes and feral cats) as a threat to the species. Poisoning by cane toads is also considered to be a threat (TSSC, 2016b), however they are not known from the Pilbara region. GHD (2020b) recorded four introduced animals (Dog, Cat, Cattle and Black Rat) within or in close proximity to the DE. As discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low, consequently, it is not expected to result in an increase of invasive species or feral animals that are harmful to the species.
'introduce disease that may cause the species to decline'	*Not Significant* No known disease is identified as a threat to the WA population of Ghost Bat (TSSC, 2016b). There is no credible impact pathway that could result in the introduction of a disease that may cause a decline in the Ghost Bat population.
'interfere substantially with the recovery of the species'	*Not Significant* According to the threats identified in the Ghost Bat Conservation Plan (**Section 2.3.8.3.3**), the Proposed Action will not significantly interfere with the recovery of the species. Mitigation actions will be implemented to avoid the introduction of feral animals and collisions with the transmission line. As mentioned above, Habitat disturbances within the DE will not significantly interfere with the species, as the population in question does not specifically rely on these areas. The Proposed Action is therefore not anticipated to interfere with the recovery of the species.

3.1.4 Grey Falcon (*Falco hypoleucos*) -Vulnerable

Potential direct impacts that may occur to the Grey Falcon as a result of the Proposed Action are:

- Vegetation clearance and loss of habitat;
- Direct mortality;
- Increased risk of vehicle strike; and
- Risk of collision with the transmission line.

Potential indirect impacts that may occur to the Grey Falcon as a result of the Proposed Action are:

- Habitat fragmentation; and
- Increased risk of feral animals.

3.1.4.1 Direct impacts

Vegetation clearance and loss of habitat

Loss of suitable nesting trees and artificial structures is identified as a threat to the Grey Falcon (TSSC, 2020). No suitable nesting trees were recorded during the studies for the Proposed Action (GHD, 2020b and GHD, 2022). The Grey Falcon may occur within the DE, utilising the area for hunting. There is 74.45 ha of suitable foraging habitat recorded within the DE, and up to 14.4 ha of this may be cleared as a result of the Proposed Action in a worst-case scenario. There are no recent records of the species in close proximity to the DE, so the likelihood of Grey Falcon being in the area is considered to be low.

The transmission poles may potentially provide additional artificial habitat for the Grey Falcon (Schoenjahn, 2018), particularly for roosting or perching. Given this, and noting that the species occurs widely in similar habitats which are extensive in the region, the Grey Falcon is unlikely to be restricted or limited to the habitat in the DE. Therefore, it is expected that the clearing required for the Proposed Action is unlikely to significantly affect the population size of the Grey Falcon. A breakdown of these habitat types within the DE is provided in **Table 3-7**.

Table 3-7. Extent of Grey Falcon Habitat Clearing for the Proposed Action

Habitat Type	Habitat Importance	Extent in DE (ha)
Supporting habitat		
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat	5.84
Rocky hills with exposed boulder piles		42.09
Minor drainage lines		6.51
Hummock Grassland on Low Rocky hills		10.89
Hummock grassland on rocky plain		9.12
Total		**74.45**

Increased risk of vehicle strike

Collision with traffic is identified as a threat the species in the conservation advice for the Grey Falcon (TSSC, 2020). With Schoenjahn (2018) documenting six cases of Grey Falcon being found injured or dead along roads between 2007 and 2017. During the construction of the Proposed Action, it is expected traffic levels will increase in the immediate surrounding area and on access tracks, and therefore the risk of the species colliding with vehicles will increase. Operational traffic is anticipated to be negligible and will not increase the overall traffic volumes in the area.

While it is considered likely that intermittent incidences of mortality from collision with vehicles may occur, the low expected traffic volume during both construction and operation means that impacts will be limited and are unlikely to significantly affect the population size of the Grey Falcon.

Risk of collision

Collision with fences and/or powerlines has been identified as a threat for the species in the conservation advice for the Grey Falcon (TSSC, 2020). Grey Falcons have been reported receiving life-threatening injuries from colliding with fences, and there is likely to be similar impacts associated with powerlines (Schoenjahn, 2011).

The Proposed Action may therefore result in intermittent incidences of mortality from collision with the transmission line. However, given there is an existing powerline in the area and linear road infrastructure adjacent to the Proposed Action, and the extensive amount of similar habitat in the region, additional collision impacts associated with the Proposed Action are considered to be limited and unlikely to significantly affect the population size of the Grey Falcon. There are no recent records of the species in close proximity to the DE so the likelihood of Grey Falcon being in the area is considered to be low. Therefore, the actual incidence of collision is likely to be extremely rare as the species has not been recorded in the area.

3.1.4.2 Indirect impacts

Habitat fragmentation

Clearing sections for the Proposed Action is not anticipated to fragment the Grey Falcon habitat found within the DE. This habitat is supporting habitat only, with similar habitats found throughout the region. Further, Grey Falcon individuals are able to easily access adjacent habitats and the Proposed Action should not provide a physical barrier to their movement. Previous literature has identified Grey Falcon utilising transmission lines for perching etc (Schoenjahn, 2018). As this fragmentation will not result in the isolation of habitat or Grey Falcon individuals, it is not anticipated to result in a significant impact to the species.

Increased risk of feral animals

Feral predators are widespread throughout the Pilbara and recorded in the DE (GHD, 2020b). The Proposed Action will result in increased disturbed areas which is known to increase the feral animals within an area. The conservation advice for the Grey Falcon identifies predation by feral cats as a main threat to the species (TSSC,

2020). Schoenjahn (2018) found Grey Falcon individuals sometimes roost in bare open grounds and found Grey Falcons in the gut contents of cats. Grey Falcon chicks are also threatened by cat predation on accessible nests. However, due to the lack of suitable Grey Falcon nesting areas found within the DE (GHD, 2020b and GHD 2022), this risk is negligible and not expected to impact the species.

3.1.4.3 Assessment against MNES Significant Impact Guidelines

An assessment of the potential impacts of the Proposed Action on the Grey Falcon against the MNES significant impact criteria is provided in **Table 3-8**. This assessment uses the significant impact criteria for Vulnerable species (DoE 2013).

Table 3-8. Assessment of significant impact – Grey Falcon

Significant Impact Criteria (DOE, 2013)	Assessment for Grey Falcon species
'lead to a long-term decrease in the size of an important population''	*Not Significant* An important population of this species is not considered to exist within the DE. Grey Falcons occur in arid and semi-arid Australia, mainly found where annual rainfall is less than 500 m (Marchant and Higgins, 1993; Schoenjahn, 2018). There is no evidence of a distinct or key source population within the Burrup Peninsula. The Proposed Action will involve the clearance of up to 14.4 ha of foraging habitat for this species, which may include up to 6.51 ha of 'Minor Drainage', up to 10.89 ha of 'Hummock Grassland on Low Rocky Hills', up to 1.5 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire', or up to 14.4 ha of 'Rocky Hills with exposed boulder piles'. The GHD (2020b) survey did not record any individuals within the area. Similarly, other surveys (GHD, 2020c; VLA, 2019; Cardno, 2019) and the DBCA (2023) do not have any record of the species. Therefore, it is probable that Grey Falcon overfly the area and use the foraging habitat opportunistically, and a resident population is unlikely. There are no recent records of the species in close proximity to the DE so the likelihood of Grey Falcon being in the area is considered to be low. Therefore, the actual incidence of collision is likely to be extremely rare as the species has not been recorded in the area. Impact on this species as a result of vegetation clearance and loss of habitat, increased risk of vehicle strike, risk of collision, habitat fragmentation and increased risk of feral animals and weeds are expected to be negligible, and unlikely to lead to decrease in the species population.
'reduce the area of occupancy of the important population'	*Not Significant* As mentioned above, an important population of this species does not exist in the DE. The habitats present in the DE do not represent significant habitats for the species. Grey falcons are highly mobile, and the use of these habitats in the DE is likely to be opportunistic. Therefore, it is not likely that the level of vegetation clearing required for the Proposed Action would reduce the occupancy of the species.
'fragment an existing important population into two or more populations	*Not Significant* The Proposed Action does not represent a physical geographic barrier to Grey Falcon and the species will be able to cross the transmission line infrastructure, potentially utilising the infrastructure as artificial habitat. Therefore, it is not considered that the Proposed Action will result in the fragmentation of a population of this species.
'adversely affect habitat critical to the survival of a species'	*Not Significant* There is no habitat considered critical to the survival of this species within or near the DE. In the worst-case scenario, up to 14.4 hectares of supporting fauna habitat will be cleared for the Proposed Action. However, as mentioned above, this habitat does not represent critical habitat. Therefore, the Proposed Action will not adversely affect habitat critical to the survival of a species.
'disrupt the breeding cycle of an important population'	*Not Significant* No suitable nesting trees were recorded during the studies for the Proposed Action (GHD, 2020b and GHD, 2022). Should it occur in the area, the Grey Falcon may use the habits of the DE for hunting. Given the lack of records of the species within the region

Significant Impact Criteria (DOE, 2013)	Assessment for Grey Falcon species
	and the absence of breeding habitat, it is not expected that the DE contains habitat utilised for the species reproduction. The Proposed Action is unlikely to disrupt the breeding cycle of the individuals that may occur within the DE and surrounds.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* As mentioned above, the habitats present in the DE do not represent significant habitats for the species. Grey Falcons are highly mobile, and the use of these habitats is likely opportunistic. There are no recent records of the species in close proximity to the DE so the likelihood of Grey Falcon being in the area is considered to be low. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Grey Falcon species is likely to decline.
'result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable, species' habitat'	*Not Significant* Invasive species (particularly feral cats) and, consequently, an increase in predation is considered to be one of the threats to the Grey Falcon (TSSC, 2020). With the implementation of the proposed management and mitigation measures (**Section 4**), the likelihood of the introduction and establishment of an invasive species as a result of the Proposed Action is considered to be remote and therefore any resultant impacts will be negligible. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* Conservation advice for the Grey Falcon (TSSC, 2020) does not identify disease as a threat to Grey Falcons. There is no credible impact pathway that could result in the introduction of a disease that may cause a decline in the Grey Falcon population.
'interfere substantially with the recovery of the species'	*Not Significant* Conservation advice for the Grey Falcon (TSSC, 2020) outlines the priority actions for the recovery of this species relevant to the Proposed Action. The Proposed Action is not expected to impact breeding trees or introduce feral animals into the area. Regarding the species' threats, the lack of species records in the area, along with the fact that individuals overfly and forage opportunistically, and the limited potential for collisions with the transmission line, it is not predicted that the Proposed Action will substantially interfere with the recovery of the species.

3.2 Threatened and migratory bird species

A total of seven Threatened and migratory bird species have been assessed as 'known to occur', 'likely to occur' or 'may occur' in the DE (**Section 0**). This assessment was carried out by correlating the species profiles with the potential impacts of the Proposed Action. The identified species are:

Likely to occur

- Curlew Sandpiper (*Calidris ferruginea*) (Critically Endangered, Migratory): Species Profile **Section 2.3.8.4.1**
- Eastern Curlew (*Numenius madagascariensis*) (Endangered, Migratory): Species Profile **Section 2.3.8.4.2**
- Greater Sand Plover (*Charadrius leschenaultia*) (Vulnerable, Migratory): Species Profile **Section 2.3.8.4.3**
- Lesser Sand Plover (*Charadrius mongolus*) (Endangered, Migratory): Species Profile **Section 2.3.8.4.5**
- Red Knot (*Calidris canutus*) (Endangered, Migratory): Species Profile **Section 2.3.8.4.6**

May occur

- Great Knot (*Calidris tenuirostris*) (Endangered, Migratory): Species Profile **Section 2.3.8.4.4**
- Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*) (Critically Endangered, Migratory): Species Profile **Section 2.3.8.4.7**

– Australian Fairy Tern (*Sternula nereis nereis*) (Vulnerable): Species Profile **Section 2.3.8.4.8**

All seven species are anticipated to forage in the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' and all, except for Australian Fairy Tern, are migratory shorebirds species, therefore they share similar threats and behaviour. The potential direct and indirect impacts related to the Proposed Action that could affect these species are described below, followed by the Assessment against MNES Significant Impact.

3.2.1 Direct Impacts

Potential direct impacts that may occur to Threatened and Migratory bird species as a result of the Proposed Action are:

– Vegetation clearance and loss of habitat.
– Increased risk of vehicle strike.
– Risk of collision with the transmission line.

Vegetation clearance and loss of habitat

Loss of habitat, including loss of foraging and roosting habitat, is considered to be a key threat to these species. For migratory shorebirds, the loss of those habitats can affect their ability to build up energy for migration and breeding. Migratory species are also susceptible to changes to food sources and foraging environments due to their specialized feeding techniques.

Habitat loss is also a specific threat to the Australian Fairy Tern (DAWE, 2020). The DE overlaps the Biologically Important area for the breeding of this species, however, there is no breeding habitat within the DE. Australian Fairy Tern breeding colonies are usually located on coral shingle on coastal islands, on sandy islands and on beaches inside estuaries and open beaches (DAWE, 2020). Fairy Terns nest above the high-water mark on sites where the substrate is sandy and the vegetation low and sparse (TSSC, 2011).

The 'Mudflat with tidal 111ovae-holln, Mangroves and supportive scattered Samphire' habitat within the DE is a foraging habitat for these species. The implementation of the Proposed Action will clear up to 1.5 ha of this fauna habitat as a worst case, however the actual disturbance is likely to be lower than this.

The extent of this habitat type within the DE is detailed in **Table 3-9**.

Table 3-9. Extent of Threatened and Migratory habitat within the DE

Habitat Type	Habitat Importance	Extent present within DE (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat; and foraging and roosting habitat (Eastern Curlew, Lesser Sand Plover and Red Knot)	5.84

The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging, and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that the above listed Threatened and migratory shorebirds rely on the foraging habitat within the DE.

Increased risk of vehicle strike

Vehicle strike is a potential direct impact to bird species as they travel through areas adjacent to live traffic. As part of the construction phase, an increased number of vehicles will be accessing the DE and associated access tracks to facilitate construction and material deliveries, etc. Therefore, vehicles will be operating within, and in close proximity to, the foraging habitat recorded in the DE, thereby increasing the risk of vehicle strikes. Horizon Power will implement measures to avoid and minimise vehicle strikes against these species (see **Section 3** for further detail).

In addition, once the Proposed Action is operational, the associated traffic numbers are anticipated to be negligible compared to existing levels, as only those associated with periodic maintenance will be accessing the area. As such, it is expected that the increased traffic will not significantly affect these bird populations.

Risk of collision with the transmission line

The Preliminary Documentation requirements for the Proposed Action requested further information related to the specific risk of fatality to the listed threatened shorebird and migratory bird species due to collisions with transmission line, particularly at night. An Avian Collision Impact Assessment has been undertaken to evaluate the potential risk of collision associated with these species and is reported in **Appendix D**. This Avian Collision Impact Assessment has been peer reviewed by Dr. Allan Burbidge (Principal Research Scientist, Science and Conservation Division, DBCA). The relevant Threatened and Migratory species were assessed according to their: a) likelihood of collision with power lines and; b) the likely consequence of any collision. These assessments were made in accordance with the risk matrix in Table 3-10.

Table 3-10. Impact risk matrix, [adapted from Lumsden et al, (2019)]

		Consequence of collisions			
		Insignificant	**Minor**	**Moderate**	**Significant**
Likelihood of collisions	**Very rare**	Minimal concern	Minimal concern	Minimal concern	Mild concern
	Rare	Minimal concern	Minimal concern	Mild concern	Concern
	Possible	Minimal concern	Mild concern	Concern	Extreme concern
	Probable	Mild concern	Concern	Extreme concern	Extreme concern

As discussed, the Threatened and migratory bird habitat within the DE is associated with the area of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' situated between King Bay and Hearson Cove. This habitat type constitutes migratory shorebird foraging and roosting habitat and the DE traverses approximately 420 m of this habitat type. It should be noted that ongoing clearing and construction works in the tidal inlet by third parties has already reduced the expected hectares of disturbance in this area. Current photos of the area are shown in Photos 5 and 6. In addition, this area of Australia is situated within the East Asian – Australian (EAA) Flyway, a geographic region supporting populations of migratory shorebirds throughout their annual cycle. Where transmission lines or poles associated with the Proposed Action traverse this habitat or flyway, it is considered to be a potential collision zone for these bird species.

Photo 5 - An area close to tidal inlet showing pre-existing and ongoing clearing

Photo 6 - Current construction and clearing works commenced at the tidal inlet area associated with the Perdaman Urea project and road upgrade (Photo taken 9th October 2023)

The assessment provided in **Appendix D** concludes that the level of concern for the listed Threatened and migratory birds is considered to range from 'Minimal' to 'Mild'. Despite varying in levels of absolute threat and overall rarity, these species share the characteristic of having low reporting rates in the DE and surrounding area, with the exception of the Greater Sand Plover and Lesser Sand Plover (which are each recorded regularly, albeit in low numbers at Hearson Cove). The following species are considered to be of 'Minimal' concern in relation to collision risk: Greater Sand Plover; Lesser Sand Plover; and Australian Fairy Tern.

The following species are considered to be of 'Mild' concern in relation to collision risk: Curlew Sandpiper; Eastern Curlew; Great Knot; Red Knot; Northern Siberian Bar-tailed Godwit. For the majority of the species, the level of concern is a result of the taxon's overall rarity or scarcity in the landscapes and habitat types present in the DE, combined with a lack of any evidence that these species have a taxonomic vulnerability to collisions with static linear infrastructure (this is a result of a combination of morphological and behavioural characteristics).

Further information on each species listed as 'Minimal' to 'Mild' in relation to collision risk is presented in **Section 3.2.3** and **Appendix D**.

The risk of fatality due to shorebirds colliding with the Proposed Action at night is considered to be low. While often flying at night during migration, shorebirds are primarily diurnal species; most active during daylight hours, and typically resting or engaging in less active behaviours at night. As a result, the combination of shorebirds' natural behaviour patterns (Kruger & Garthe, 2001), the lack of attraction to transmission lines, and their ability to navigate safely during the night greatly minimises the risk of fatal collisions with these structures. Design features, such as line markers, and careful positioning of infrastructure are important factors in ensuring the well-being of shorebirds and have been taken into consideration in the development of the proposed mitigation measures (**Section 4**).

Based on the assessment provided, and with implementation of the proposed mitigation, it is concluded that the Proposed Action will not result in significant impacts to Threatened and migratory birds as a result of collision with the transmission line infrastructure.

3.2.2 Indirect Impacts

Habitat fragmentation

The 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE intersects the available foraging habitat between King Bay and Hearson Cove. This area is adjacent to Burrup Road, which has already been historically cleared and currently fragments the vegetation of the tidal mudflat. As part of the Proposed Action, the current design includes the placement of up to two poles within this area, in addition to the overhead transmission line. The construction/placement of these poles and stringing of the transmission line is unlikely to require vegetation clearing across the entire width of the tidal mudflat. Further, it is noted that a large amount of the tidal mudflat area adjacent to the road is already cleared. Access to the pole locations for construction and ongoing maintenance will primarily be via Burrup Road and no new access track across with width of the mudflat is proposed. Connectivity between the underlying habitats will therefore be maintained. Additionally, Threatened and Migratory birds are able to cross over the transmission line, and therefore this is not expected to result in a significant impact to the species.

There is an existing distribution line and causeway across the intertidal area, therefore no pre-construction monitoring is able to be undertaken to determine a pre-disturbance level of use and behaviour by roosting and foraging shorebirds. The King Bay and Hearson Cove area is extensively impacted by existing infrastructure. By adhering as far as possible to areas of existing disturbance, it is considered the Proposed Action minimises further disturbance to the integrity of the intertidal area as habitat for shorebirds, allowing foraging and roosting in keeping with their current patterns without significant disruption.

In response to the query raised by DCCEEW in the Preliminary Documentation requirements for the Proposed Action, the proposed transmission line across the intertidal area is not likely to act as a barrier between potential roosting and/or foraging sites for shorebirds. Consideration will be given to the design of the transmission line and energised components to minimise their potential impact on the natural habitat and the behavioural patterns of shorebirds. The chosen alignment closely follows an existing distribution line easement and causeway and allows for shorebirds to continue accessing potential roosting and foraging locations along the intertidal zone. It is further noted that extensive clearing has been undertaken on the eastern side of the existing Burrup Road, and extensive vegetation remains on the western side. Therefore, it is assumed this habitat would be utilised in preference to the more disturbed area where the Proposed Action will be constructed.

Increase risk of weeds introduction

Introduction of weeds is a potential threat to foraging habitat of Threatened and Migratory Shorebirds species (DAWE ,2020). The Proposed Action has the potential to introduce and spread weeds through construction activities such as clearing and movement of light vehicles and personnel. According to the surveys undertaken for the Proposed Action (GHD 2020, 2022), one introduced flora taxa was recorded within the DE, Stinking passionflower (*Passiflora foetida*). This species was recorded in the northern area of the DE (**Figure 2-9**).

The implementation of weed hygiene measures (**Section 4.2**) will reduce the risk of introducing and spreading weeds as a result of the Proposed Action. Therefore, it is not expected to result in the introduction or spread of weeds that could cause significant indirect impacts.

Increase risk of feral animals

Introduced animals, such as Pigs (*Sus* sp.), Cane Toads (*Rhinella marina*), Cats (*Felis catus*) and Foxes (*Vulpes vulpes*) are listed as one of the threats for Threatened and Migratory Birds due to increase of predation. The Proposed Action has the potential, especially during the construction phase, to attract animals due to availability of water and possible food scraps from personnel. GHD (2020b) recorded four introduced animals: Dog, Cat, Cattle and Black Rat. As there are numerous existing cleared tracks and access pathways within and in close proximity to the DE, no new pathways are anticipated to be created which could lead to increases in feral animals accessing the DE. In addition, standard mitigation measures will be implemented to minimise possible introduction or increase of feral animals within the DE (**Section 4**). Consequently, the Proposed Action is not expected to increase or introduce feral animals within the DE, and as such, significant impacts are not anticipated.

Increased light emissions

Birds, in general, are known to be attracted or disoriented by artificial lights, which could result in blindness, disorientation due to interference with the magnetic compass used during migration, a delay in migration, a reduction in fuel stores, and an increased chance of collision. Artificial lights can also influence the predation of birds (DSEWPC, 2011), making them more susceptible to predation in illuminated roosting areas. Consequently, this can lead to higher energy costs for migratory individuals seeking darker roosting areas or a reduction in the use of foraging habitats due to the increased distance from the roosting sites (DEE,2020).

Permanent lighting associated with the Proposed Action will be minimal and only associated with the new Burrup substation (and existing Dampier substation) which will have outdoor yard lighting as per standard substation arrangements. Planned operational maintenance is anticipated to occur in the day and therefore the lighting would only be used in operational situations for faults etc. There is no permanent lighting proposed in the main area of the existing mudflats habitat. Temporary mobile lighting will be installed during construction on a limited basis. Temporary lighting will not remain in one place for long periods of time and will be moved along the construction area, as dictated by the construction schedule. It is expected that any increase of light emissions would cease at the end of the working day and generally considered to be no later than 7 pm, therefore, a significant impact associated with this activity in not anticipated.

Increased noise emissions

Shorebirds are known to adapt to, or even avoid, areas with consistent human activity, often altering their foraging and roosting behaviours to minimise disruptions (Peters & Otis, 2007). Noise emissions are not well-documented as a potential threat to these species, however increased noise can lead to avoidance or dispersal behaviour for birds. The Proposed Action will increase noise emissions during the construction phase. During construction, sudden loud noises may occur and can lead to the disturbance of nearby shorebirds and avoidance or abandonment of noisy areas. Disturbance in the intertidal area may have some effects on shorebirds and the way that they use the habitat. The species listed are considered likely to utilise components of this area for roosting and foraging.

However, due to the transitory characteristics of the construction activities, and the limited operational noise anticipated, the Proposed Action is not expected to significantly affect their behaviour permanently. Low levels of noise emissions from the operational phase may occur; however, chronic low levels of noise are not

expected to impact the Threatened and Migratory bird species or the feeding activities of Australian Fairy Tern.

Although some of the construction activities may cause elevated levels of noise, noise emissions are anticipated to be short-term and transient in nature. In addition, given this context and that the Proposed Action will closely abut existing noise emitters, such as traffic travelling along Burrup Road, industrial developments in the Burrup SIA and the ongoing construction work in the area (see **Photo 3-2** above), the likelihood of further disturbance to shorebirds is considered to be relatively low. The Proposed Action will occur on the eastern side of Burrup Road, avoiding areas of mangrove habitat on the western side. The pre-existing disturbance is likely to have already modified shorebird habitat use in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level.

As such, it is not anticipated that Proposed Action would result in significant disturbance impacts associated with increased noise emissions.

Altered hydrological regimes

Altered water regimes are considered to be one of the indirect threats to these species. Changes to flows can lead to permanent drying out of areas and changes to the timing, frequency, and duration of floods, consequently affecting food availability, the lifecycle of plants and animals and impacting foraging and/or breeding habitat for these species.

There are only minor drainages within the DE in addition to the tidal inlet, which is culverted under the Burrup Road. The placement of poles as part of the Proposed Action has the potential to act as a partial barrier on the tidal movements through the culvert running under Burrup Road. The detailed design will avoid placing infrastructure in the vicinity of the culvert area such as the installation of poles, and therefore the risk of acting as a barrier to the current hydrological flow is considered to be negligible. In addition, sections of new hard standing will be minimal and discrete areas rather than continuous, predominantly associated with the new and expanded substations. As such, it is not anticipated that the Proposed Action will significantly impact hydrological regimes.

Habitat contamination by Acid Sulfate Soils

Acid Sulfate Soils are found in coastal areas (particularly tidal mud flats) and inland freshwater or saline areas (GSA, 2016). There is an increased potential of habitat contamination by acid sulfate soils within the DE due to the 'High to Moderate' and 'Moderate to Low' risk areas that occur within the area (**Section 2.3.2.1**). Activities during the construction phase, such as excavations, can disturb or exposed these soils and consequently release acidic drainage. This habitat contamination can lead to increased mortality of fish and crustaceans and can affect plants through indirect acid exposure, smothering of aquatic plants by iron precipitates and toxicity by aluminium and other metal(oid)is (GSA, 2007). This could in turn effect the foraging and/or breeding habitat for these Threatened and Migratory bird species.

Therefore, control measures will be put in place to mitigate the potential impact, as outlined within the Environmental Management Actions (**Section 4**). Management of ASS is commonly encountered and effectively managed on construction projects in WA and there are a range of standard management practices that can be implemented. Given the mitigation measures that will be implemented during construction, ASS is not expected to result in significant habitat contamination as a result of the Proposed Action.

3.2.3 Assessment against MNES Significant Impact Guidelines

An assessment of the potential impacts of the Proposed Action on Threatened and Migratory Birds Species against the MNES significant impact criteria is provided separately below for:

- Curlew Sandpiper (*Calidris ferruginea*) (Critically Endangered, Migratory): **Table 3-11**
- Eastern Curlew (*Numenius madagascariensis*) (Endangered, Migratory): **Table 3-12**
- Greater Sand Plover (*Charadrius leschenaultia*) (Vulnerable, Migratory): **Table 3-13**
- Great Knot (*Calidris tenuirostris*) (Endangered, Migratory): **Table 3-14**

- Lesser Sand Plover (*Charadrius mongolus*) (Endangered, Migratory): **Table 3-15**
- Red Knot (*Calidris canutus*) (Endangered, Migratory): **Table 3-16**
- Northern Siberian Bar-tailed Godwit (*Limosa lapponica menzbieri*) (Critically Endangered, Migratory): **Table 3-17**
- Australian Fairy Tern (*Sternula nereis nereis*) (Vulnerable): **Table 3-18**

3.2.3.1 Curlew Sandpiper (Calidris ferruginea) – (Critically Endangered, Migratory)

Table 3-11. Assessment of significant impact – Curlew Sandpiper (Calidris ferruginea)

Significant Impact Criteria (DOE, 2013)	Assessment for Curlew Sandpiper species
'lead to a long-term decrease in the size of a population'	*Not Significant* The Proposed Action is not expected to cause a long-term decrease in the population size of the Curlew Sandpiper. This species is migratory and highly mobile; therefore, the impact on this species, due to a loss of supporting habitat (foraging) of up to 1.5 hectares, does not represent a significant threat. The risk of collision and vehicle strikes is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. There are very few recent records of this Critically Endangered species within 5 km of the Proposed Action. While the species, or its habitat, is modelled to occur, the most recent observations are two records from 2017 within 3 km of the DE, which appear in the eBird Basic Dataset (EBD) (Cornell Lab of Ornithology, 2023). The species' overall rarity and global population decline are the main factors leading to its assessment as being of Mild concern with regard to collision risk. It prefers coastal habitats including brackish lagoons, estuaries, tidal mud and sand flats, and rocky shores. The species exhibits an overall population trend of a decrease of 53% over three generations and has seen rapid decline in Australian reporting rates over the last decade. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its high Arctic breeding grounds. (Clemens *et al*., 2021a). Significant impacts as a result of collision with the transmission line are considered unlikely. Therefore, the Proposed Action is not anticipated to significantly reduce the population size of this species.
'reduce the area of occupancy of the species'	*Not Significant* The Curlew Sandpiper forages on the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat. The implementation of the Proposed Action will involve clearing of up to 1.5 ha of this fauna habitat. The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for these species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that the species rely on the foraging habitat within the DE.

Significant Impact Criteria (DOE, 2013)	Assessment for Curlew Sandpiper species
'Fragment an existing population into two or more populations'	*Not Significant* The Curlew Sandpiper is a highly mobile species and does not rely exclusively on the foraging area within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Curlew Sandpiper to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption. As such, it is not anticipated that the Proposed Action will result in the fragmentation of a population of this species.
'adversely affect habitat critical to the survival of a species'	*Not Significant* There is no habitat critical to the survival of the species or a Biologically Important Area related to this species in or in close proximity to the DE. The implementation of the Proposed Action will involve clearing up to 1.5 ha of supporting foraging habitat under a worst-case scenario, however the actual clearing extent is likely to be substantially less than this. Therefore, the Proposed Action is not anticipated to significantly affect habitat critical to the survival of the species.
'disrupt the breeding cycle of a population'	*Not Significant* The Curlew Sandpiper species does not breed in Australia. The breeding sites are restricted to the Russian Artic from Chosha Bay east to Kolyuchiskaya Bay (DoE, 2015a). The impact of up to 1.5 ha does not represent a significant impact to feeding habitat during non-breeding season. Increase of light emissions and noise will be appropriately mitigated (**Section 4**) and are not expected to cause a significant impact due to the short-term nature, likely behaviour alterations and alternative food resource availability for this species. Therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not Significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE, however is likely to be substantially lower than this. The species does not rely exclusively on the habitat area within the DE. Records of DBCA data (2023) shows their presence in Cowrie Cove, Hearson Cove, Dolphin Islands, Back Beach, and another similar habitat within or surrounding the Dampier Archipelago. Therefore, the Proposed Action is not expected to impact intertidal mudflats to extent that the species is likely to decline. As mentioned in **Section 3.2.2**, altered water regimes is one of the possible threats and potential impact for this species, therefore, the Proposed Action will

Significant Impact Criteria (DOE, 2013)	Assessment for Curlew Sandpiper species
	avoid installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts. Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination. The pre-existing disturbance in the area is likely to have already modified shorebird habitat and behaviours in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not anticipated that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Curlew Sandpiper species is likely to decline.
'result in invasive species that are harmful to a critically endangered or endangered species becoming established in the119ovae-119ered or critically endangered species' habitat '	*Not Significant* The Conservation Advice for the Curlew Sandpiper does not cite a specific invasive species that could be potentially harmful to the species (DoE,2015a). However, it is recognised that invasive flora and fauna can alter their foraging habitat and increase predation. Standard mitigation measures (outlined in **Section 4**) will be implemented to mitigate the likelihood of the introduction and establishment of an invasive species, therefore, the introduction of an invasive species as a result of the Proposed Action is considered to be remote. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* The Conservation Advice for the Curlew Sandpiper does not cite potential disease as a threat for the species (DoE, 2015a). It is considered that there is no credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere with the recovery of the species'	*Not Significant* There is no Recovery Plan in place for this species. The Conservation Advice (DoE, 2015a) establishes Conservations Objectives and Actions. The Proposed Action will not reduce the size of an increasing population and does not represent a key roosting and feeding site. As mentioned above, the Proposed Action is not expected to increase introduced species. Habitat loss and direct mortality are not anticipated to be significant and, therefore, will not interfere with the recovery of the species.

3.2.3.2 *Eastern Curlew (Numenius madagascariensis) – Endangered, Migratory*

Table 3-12 Assessment of significant impact – Eastern Curlew (Numenius madascariensis)

Significant Impact Criteria (DOE, 2013)	Assessment for Eastern Curlew
'lead to a long-term decrease in the size of a population''	*Not Significant* The proposed action is not expected to cause a long-term decrease in the population size of the Eastern Curlew. This species is migratory and highly mobile; therefore, the impact on this species due to a loss of supporting habitat (foraging and roosting) in the DE and potential habitat fragmentation does not represent a significant threat. The risk of collision and vehicle strikes is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. This Endangered species has few recent records within 5 km of the Proposed Action. A total of eight records have been documented since 2017. It is a very strongly coastal species preferring estuaries, mud flats, mangroves, saltmarsh, and intertidal flats. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its high Arctic breeding grounds. (Lilleyman *et al*., 2021). Despite this, it is assessed as being of Mild concern with regard to risk of collision with the Proposed Action infrastructure, largely due to its relatively recent population decline and, being a larger shorebird, possessing morphological traits in common with other species known for susceptibility to power line collision (Bevanger, 1998). Given the proposed mitigation, such as line markers and positioning of infrastructure (e.g. poles), significant impacts as a result of collision with the transmission line are considered unlikely. Therefore, the Proposed Action is not anticipated to significantly reduce the population size of this species.
'reduce the area of occupancy of the species'	Not Significant The Eastern Curlew forages on the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat. The implementation of the Proposed Action will involve clearing up to 5.84 ha of this fauna habitat, however likely to be substantially less than this. The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for these species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that migratory shorebirds rely on the foraging habitat within the DE.
'fragment an existing population into two or more populations'	*Not significant* The Eastern Curlew is a highly mobile species and does not rely exclusively on the foraging area within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Eastern Curlew to continue accessing preferred roosting and foraging locations

Significant Impact Criteria (DOE, 2013)	Assessment for Eastern Curlew
	along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption. As such, it is not anticipated that the Proposed Action will result in the fragmentation of a population of this species.
'adversely affect habitat critical to the survival of a species'	*Not significant* As mentioned on the Species Profile (**Section 2.3.8.4.2**), the preferred habitat of this species is coastal beaches and sandy or muddy estuaries. Although the DE overlaps partially a small area of Intertidal mudflats, it does not represent a habitat critical for the survival of this species in the area. Additionally, there is no habitat critical to the survival or a Biologically Important Area related to this species in or in close proximity to the DE. Therefore, the Proposed Action is not anticipated to significantly affect habitat critical to the survival of the species.
'disrupt the breeding cycle of a population'	*Not significant* The Eastern Curlew does not breed in Australia. The potential increase in light emissions, noise, altered water regimes, and habitat contamination by ASS are considered to be short-term in nature and minimal, and will be appropriately mitigated (**Section 4**). Therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE, however is likely to be substantially lower than this. The species does not rely exclusively on the habitat area within the DE. Records of the DBCA data (2023) shows their presence in Cowrie Cove, Hearson Cove, Dolphin Islands, Back Beach, and other similar habitat within or surrounding the Dampier Archipelago. Therefore, the Proposed Action is not expected to impact intertidal mudflats to extent that the species is likely to decline. Altered water regimes is one of the possible threats and potential impact for this species, therefore, the Proposed Action will avoid installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts. Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination. The pre-existing disturbance in the area is likely to have already modified shorebird habitat and behaviours in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Eastern Curlew species is likely to decline.

Significant Impact Criteria (DOE, 2013)	Assessment for Eastern Curlew
'result in invasive species that are harmful to a critically endangered or endangered species becoming established in the122ovae-ered or critically endangered species' habitat '	*Not Significant* The Conservation Advice for the Eastern Curlew does not cite a specific invasive species that could be potentially harmful to the species (DoE,2015b). However, it is recognised that invasive flora and fauna can alter their foraging habitat and increase predation. Standard mitigation measures (outlined in **Section 4**) will be implemented to mitigate the likelihood of the introduction and establishment of an invasive species, therefore, the introduction of an invasive species as a result of the Proposed Action is considered to be remote. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* The Conservation Advice for the Eastern Curlew does not cite potential disease as a threat for the species (DoE, 2015b). It is considered that there is no credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere with the recovery of the species'	*Not Significant* There is no Recovery Plan in place for this species. The Conservation Advice (DoE, 2015b) establishes the Primary Conservation Objectives. The Proposed Action will not reduce the size of an increasing population and does not represent a key roosting and feeding site. As mentioned above, the Proposed Action is not expected to increase introduced species. Habitat loss and direct mortality are not expected to be significant and, therefore, will not interfere with the recovery of the species.

3.2.3.3 Greater Sand Plover (Charadrius leschenaultia) – Vulnerable, Migratory

Table 3-13 Assessment of significant impact – Greater Sand Plover

Significant Impact Criteria (DOE, 2013)	Assessment for Greater Sand Plover species
'lead to a long-term decrease in the size of an important population'	*Not Significant* The proposed action is not expected to cause a long-term decrease in the population size of the Greater Sand Plover. This species is migratory and highly mobile; therefore, the impact on this species, due to a loss of supporting habitat (foraging) within the DE and potential habitat fragmentation, does not represent a significant threat. The risk of collision and vehicle strikes is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. This species prefers sheltered sandy, shelly, and muddy coastal areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its east Asian breeding grounds (Rogers *et al.*,, 2021). This species is assessed as being of 'Minimal' concern due to the size of global populations globally being stable and populations in north-western Australia

Significant Impact Criteria (DOE, 2013)	Assessment for Greater Sand Plover species
	have been increasing since 2008 (Rogers, Scroggie, & Hassell, 2020). In addition, as a smaller shorebird it may also be less exposed to the risk of power line collision than larger and longer-winged species (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998). In addition, an important population is not considered to be present in the DE. Therefore, the Proposed Action is not anticipated to significantly reduce the population size of an important population of this species.
'reduce the area of occupancy of the important population'	*Not Significant* The Greater Sand Plover forages on the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat. The implementation of the Proposed Action will involve clearing of up to 5.84 ha of this fauna habitat. However, an important population has not been recorded within the DE. Therefore, the Proposed Action is not anticipated to reduce the area of occupancy of an important population.
'fragment an existing important population	*Not significant* An important population of this species is not considered to exist in the DE. The Greater Sand Plover is a highly mobile species and does not rely exclusively on the foraging area recorded within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Greater Sand Plover to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption. As such, it is not anticipated that the Proposed Action will result in the fragmentation of a population of this species.
'adversely affect habitat critical to the survival of a species'	*Not Significant* As mentioned in the Species Profile (**Section 2.3.8.4.3**), there is no habitat critical to the survival or a Biologically Important Area related to this species in or in close proximity to the DE. The preferred habitat of this species is sheltered coasts with large intertidal mudflats or sandflats. Although the DE overlaps partially a small area of Intertidal mudflats, it does not represent a habitat critical for the survival of this species in the area. Therefore, the Proposed Action is not anticipated to significantly affect habitat critical to the survival of the species.
'disrupt the breeding cycle of an important population'	*Not significant* The Greater Sand Plover does not breed in Australia. The potential increase in light emissions, noise, altered water regimes, and habitat contamination by ASS will be appropriately mitigated (**Section 4**).

Significant Impact Criteria (DOE, 2013)	Assessment for Greater Sand Plover species
	In addition, an important population of this species is not considered to exist in the DE. Therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of an important population of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE, however is likely to be much less than this. The species does not rely exclusively on the habitat area within the DE. Records of the DBCA data (2023) shows their presence in Back Beach, Cowrie Cove, Whittell Bay and other similar habitat within or surrounding the Dampier Archipelago. Therefore, the Proposed Action is not expected to impact intertidal mudflats to the extent that the species is likely to decline. As mentioned in **Section 3.2.2**, altered water regimes is one of the possible threats and potential impact for this species, therefore, the Proposed Action will avoid installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts. Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination. The pre-existing disturbance in the area is likely to have already modified shorebird habitat and behaviours in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Greater Sand Plover species is likely to decline.
'result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable, species' habitat'	*Not Significant* Invasive species, such as *Spartina alterniflora* and domestic pets, is considered to be one of the threats for Greater Sand Plover (TSSC, 2016c). With the implementation of the proposed management and mitigation measures (**Section 4**) the likelihood of the introduction and establishment of an invasive species as a result of the Proposed Action is considered to be remote. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* Greater Sand plover is susceptible to Avian Influenza; however, this disease has not been detected in Australia since 1992 (TSSC, 2016c). Therefore, there is no credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere substantially with the recovery of the species'	*Not Significant* The Conservation Advice for Greater Sand Plover outlines the threats (**Section 2.3.8.4.3**) and conservation actions for the species. As mentioned above, the Proposed Action is not expected to increase introduced species, disease, or

Significant Impact Criteria (DOE, 2013)	Assessment for Greater Sand Plover species
	weeds. Habitat loss and direct mortality are not anticipated to be significant and, therefore, will not interfere with the recovery of the species.

3.2.3.4 Great Knot (Calidris tenuirostris) – Endangered, Migratory

Table 3-14 Assessment of Significant Impacts – Great Knot

Significant Impact Criteria (DOE, 2013)	Assessment for Great Knot
'lead to a long-term decrease in the size of a population''	*Not Significant* The Proposed Action is not expected to cause a long-term decrease in the population size of the Great Knot. This species is migratory and highly mobile; therefore, the impact on this species, due to a loss of supporting habitat (foraging and roosting) within the DE and potential habitat fragmentation, does not represent a significant threat. The risk of collision and vehicle strikes is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. Within Australia, the Great Knot favours sheltered coastal habitats with large intertidal mudflats or sandflats. The Great Knot is known to occur within the Dampier Archipelago, and this Endangered species is regularly observed in small numbers at Hearson Cove (some 2.9 km to the east of the DE). At that location flocks as large as 15 individuals have been recorded in the majority of each of the last ten years. These regular records of small flocks of birds, in relative proximity to the Proposed Action result in it being assessed as being of Mild concern with regard to collision risk with the Proposed Action. The species is entirely coastal within its non-breeding range. It forages on wet muddy substrates including intertidal mud and sand in sheltered areas. No major threats are documented for the species within Australia probably due to it occupying remote and sparsely populated parts of the coastline. As such, collision with power lines is not documented as a threat to the species in Australia, nor along its migratory route through the East Asian-Australian Flyway or its subarctic breeding grounds (Clemens *et al.*, 2021b). Therefore, the Proposed Action is not anticipated to significantly reduce the population size of this species.
'reduce the area of occupancy of the species'	*Not Significant* The Great Knot forages on the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat. The implementation of the Proposed Action will involve clearing of up to 5.84 ha of this fauna habitat. The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for those species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that migratory shorebirds rely on the foraging habitat within the DE.

Significant Impact Criteria (DOE, 2013)	Assessment for Great Knot
'fragment an existing population into two or more populations'	*Not significant* Great Knot is a highly mobile species and does not rely exclusively on the foraging area within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Great Knot to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption. As such, it is not anticipated that the Proposed Action will result in the fragmentation of a population of this species.
'adversely affect habitat critical to the survival of a species'	*Not Significant* There is no habitat critical to the survival of the species, or a Biologically Important Area related to this species in or in close proximity to the DE. As mentioned on the Species Profile (**Section 2.3.8.4.4**), the preferred foraging habitat of this species is sheltered coastal habitats with large intertidal mudflats or sandflats. Although the DE overlaps partially a small area of Intertidal mudflats, it does not represent a habitat critical for the survival of this species in the area. Therefore, the Proposed Action is not anticipated to significantly affect habitat critical to the survival of the species.
'disrupt the breeding cycle of a population'	*Not Significant* The Great Knot does not breed in Australia. The species breeds in north-east Siberia and the far north-east of Russia (Higgins and Davies, 1996). The potential increase in light emissions, noise, altered water regimes, and habitat contamination by ASS will be appropriately mitigated (**Section 4**), and therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE. The species is not considered to rely exclusively on the habitat area within the DE. Records of the DBCA (2023) shows their presence in Dampier Archipelago approximately 20km form the DE. Therefore, the Proposed Action is not expected to impact intertidal mudflats to extent that the species is likely to decline. As mentioned in Section 3.2.2, altered water regimes is one of the possible threats and potential impact for this species, therefore, the Proposed Action will avoid the installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts. Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination.

Significant Impact Criteria (DOE, 2013)	Assessment for Great Knot
	The pre-existing disturbance in the area is likely to have already modified shorebird habitat and behaviours in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Great Knot species is likely to decline.
'result in invasive species that are harmful to a critically endangered or endangered species becoming established in the127ovae-ered or critically endangered species' habitat '	*Not Significant* The Conservation Advice for the Great Knot does not cite a specific invasive species that can be potentially harmful to the species (TSSC, 2016f). However, it is recognised that invasive flora and fauna can alter their foraging habitat and increase predation. Standard mitigation measures (outlined in **Section 4**) will be implemented to mitigate the likelihood of the introduction and establishment of an invasive species, therefore, the introduction of an invasive species as a result of the Proposed Action is considered to be remote. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* Disease is listed as a threat to the species in the conservation advice (TSSC, 2016f). The viral disease testing of Charadriiformes from coastal northwest Australia did not detect any evidence of avian influenza virus excretion in the great knot or any other species from testing carried out since 1992. However, from serologic testing, there was evidence of a very low level of past exposure to the virus (Curran *et al.* 2014). There is not considered to be a credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere with the recovery of the species'	*Not Significant* The Conservation Advice for Great Knot outlines the threats (**Section 2.3.8.4.4**) and conservation actions for the species. As mentioned above, the Proposed Action is not expected to increase introduced species, disease, or weeds. Habitat loss and direct mortality are not expected to be significant and, therefore, will not interfere with the recovery of the species.

3.2.3.5 Lesser Sand Plover (Charadrius mongolus) – Endangered, Migratory

Table 3-15 Assessment of significant impact – Lesser Sand Plover

Significant Impact Criteria (DOE, 2013)	Assessment for Lesser Sand Plover
'lead to a long-term decrease in the size of a population''	*Not Significant* The proposed action is not expected to cause a long-term decrease in the population size of the Lesser Sand Plover. This species is migratory and highly mobile; therefore, the impact on this species, due to a loss of supporting habitat (foraging) within the DE and potential habitat fragmentation, does not represent

Significant Impact Criteria (DOE, 2013)	Assessment for Lesser Sand Plover
	a significant threat. The risk of collision and vehicle strikes is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. The species prefers sheltered sandy, shelly, and muddy coastal areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its east Asian breeding grounds. The Lesser Sand Plover is assessed as being of 'Minimal' concern with regard to collision with the Proposed Action due to its absence from reports of shorebird mortality resulting from power line collision. It is a smaller shorebird making it less morphologically exposed to collision risk and, while the species is regularly recorded at Hearson Cove and nearby areas, these observations are generally of small flocks or individual birds and their foraging and roosting activities are typically confined to sandy beaches and mudflats. Therefore, the Proposed Action is not anticipated to significantly reduce the population size of this species.
'reduce the area of occupancy of the species'	*Not Significant* The Lesser Sand Plover forages on 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat. The implementation of the Proposed Action will involve clearing of up to 5.84 ha of this fauna habitat. The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for those species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that migratory shorebirds rely on the foraging habitat within the DE.
'fragment an existing population into two or more populations'	*Not significant* Lesser Sand Plover species is highly mobile species and does not rely exclusively on the foraging area within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Lesser Sand Plover to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption.
'adversely affect habitat critical to the survival of a species'	*Not Significant* There is no habitat critical to the survival of the species or a Biologically Important Area associated with this species in or in close proximity to the DE. As mentioned on the Species Profile (**Section 2.3.8.4.5**), the preferred foraging habitat of this species is large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries. Although the DE overlaps partially a small area of Intertidal mudflats, it does not represent a habitat critical for the survival of this species in the area.

Significant Impact Criteria (DOE, 2013)	Assessment for Lesser Sand Plover
	Therefore, the Proposed Action is not anticipated to significantly affect habitat critical to the survival of the species.
'disrupt the breeding cycle of a population'	*Not Significant* The Lesser Sand Plover does not breed in Australia. The potential increase in light emissions, noise, altered water regimes, and potential habitat contamination by ASS will be appropriately mitigated (**Section 4**), and therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE, however is likely to be substantially less than this. The species does not rely exclusively on the habitat area within the DE. Records of the DBCA (2023) shows their presence in Hearson Cove and Back Beach. Therefore, the Proposed Action is not expected to impact intertidal mudflats to the extent that the species is likely to decline. As mentioned in **Section 3.2.2**, altered water regimes is one of the possible threats and potential impact for this species, therefore, the Proposed Action will avoid the installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts. Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination. The pre-existing disturbance in the area is likely to have already modified shorebird habitat and behaviours in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Lesser Sand Plover species is likely to decline.
' result in invasive species that are harmful to a critically endangered or endangered species becoming established in the129ovae-ered or critically endangered species' habitat '	*Not Significant* Invasive species, such as *Spartina alterniflora* and domestic pets, is one of the threats for Lesser Sand Plover (TSSC,2016e). Standard mitigation measures (outlined in **Section 4**) will be implemented to mitigate the likelihood of the introduction and establishment of an invasive species, therefore, the introduction of an invasive species as a result of the Proposed Action is considered to be remote. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* Lesser Sand plover is susceptible to Avian Influenza; however, this disease is not detected in Australia since 1992 (TSSC, 2016e). Therefor it is considered there is

Significant Impact Criteria (DOE, 2013)	Assessment for Lesser Sand Plover
	no credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere with the recovery of the species'	*Not Significant* The Conservation Advice for Lesser Sand plover outlines the threats (**Section 2.3.8.4.5**) and conservation actions for the species. As mentioned above, the Proposed Action is not expected to increase introduced species, disease, or weeds. Habitat loss and direct mortality are not anticipated to be significant and, therefore, will not interfere with the recovery of the species.

3.2.3.6 Red Knot (Calidris canutus) – Endangered, Migratory

Table 3-16 Assessment of Significant Impacts – Red Knot

Significant Impact Criteria (DOE, 2013)	Assessment for Red Knot
'lead to a long-term decrease in the size of a population''	*Not Significant* The Proposed Action is not expected to cause a long-term decrease in the population size of the Red Knot. The Red Knot forages on wet muddy substrates including intertidal mud and sand in sheltered areas. Habitat loss is documented as a low level threat within Australia. This species is migratory and highly mobile; therefore, the impact on this species, due to a loss of supporting habitat (foraging and roosting) within the DE and potential habitat fragmentation, does not represent a significant threat. The risk of collision and vehicle strike is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. This Endangered species is entirely coastal within its non-breeding range. A single individual was documented at Hearson Cove in October of 2022. Other than this, there are very few records of the species within 20 km of the Proposed Action in recent decades. This scarcity and the presence of suitable habitat in proximity to the Proposed Action result in it being assessed as of Mild concern with regard to risk of collision with the transmission line. Collision with power lines is not documented as a threat to the species in Australia, nor along its migratory route through the East Asian-Australian Flyway or its high Arctic breeding grounds (Clemens *et al*., 2021c). Therefore, the Proposed Action is not anticipated to significantly reduce the population size of this species.
'reduce the area of occupancy of the species'	*Not Significant* The Red Knot forages on the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat. The implementation of the Proposed Action will involve clearing of up to 5.84 ha of this fauna habitat. The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for those species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat

Significant Impact Criteria (DOE, 2013)	Assessment for Red Knot
	adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that migratory shorebirds rely on the foraging habitat within the DE.
'fragment an existing population into two or more populations'	*Not significant* The Red Knot is a highly mobile species and does not rely exclusively on the foraging area within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Red Knot to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption. As such, it is not anticipated that the Proposed Action will result in the fragmentation of a population of this species.
'adversely affect habitat critical to the survival of a species'	*Not Significant* There is no habitat critical to the survival of the species or a Biologically Important Area related to this species in or in close proximity to the DE. As mentioned on the Species Profile (**Section 2.3.8.4.6**), the preferred foraging habitat of this species is soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. Although the DE overlaps partially a small area of Intertidal mudflats, it does not represent a habitat critical for the survival of this species in the area. Therefore, the Proposed Action is not anticipated to significantly affect habitat critical to the survival of the species.
'disrupt the breeding cycle of a population'	*Not Significant* The Red Knot does not breed in Australia. The potential increase in light emissions, noise, altered water regimes, and habitat contamination by ASS will be appropriately mitigated (**Section 4**), and therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE. The species is not considered to rely exclusively on the habitat area within the DE. Records of the DBCA (2023) shows their presence in Dolphin Island and Back Beach. Therefore, the Proposed Action is not expected to impact intertidal mudflats to extent that the species is likely to decline. As mentioned in Section 3.2.2, altered water regimes is one of the possible threats and potential impact for this species, therefore, the Proposed Action will avoid the installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts.

Significant Impact Criteria (DOE, 2013)	Assessment for Red Knot
	Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination. The pre-existing disturbance in the area is likely to have already modified shorebird habitat use in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Red Knot species is likely to decline.
'result in invasive species that are harmful to a critically endangered or endangered species becoming established in the132ovae-ered or critically endangered species' habitat '	*Not Significant* The Conservation Advice for the Red Knot does not cite a specific invasive species that can be potentially harmful to the species (TSSC, 2016f). However, it is recognised that invasive flora and fauna can alter their foraging habitat and increase predation. Standard mitigation measures (outlined in **Section 4**) will be implemented to mitigate the likelihood of the introduction and establishment of an invasive species, therefore, the introduction of an invasive species as a result of the Proposed Action is considered to be remote. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* Red Knot is susceptible to Avian Influenza; however, this disease has not been detected in Australia since 1992 (TSSC, 2016). There is not considered to be a credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere with the recovery of the species'	*Not Significant* The Conservation Advice for Red Knot outlines the threats (**Section 2.3.8.4.6**) and conservation actions for the species. As mentioned above, the Proposed Action is not expected to increase introduced species, disease, or weeds. Habitat loss and direct mortality are not expected to be significant and, therefore, will not interfere with the recovery of the species.

3.2.3.7 Northern Siberian Bar-Tailed Godwit (Limosa lapponica menzbieri) – Critically Endangered

Table 3-17 Assessment of Significant Impact – Northern Siberian Bar-Tailed Godwit

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Siberian Bar-Tailed Godwit
'lead to a long-term decrease in the size of a population''	*Not Significant* The proposed action is not expected to cause a long-term decrease in the population size of the Northern Siberian Bar-Tailed Godwit. This species is

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Siberian Bar-Tailed Godwit
	migratory and highly mobile; therefore, the impact on this species, due to a loss of supporting habitat (foraging) within the DE of up to 5.84 hectares or potential habitat fragmentation, does not represent a significant threat. The risk of collision and vehicle strikes is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. The total abundance of this taxon was estimated to have declined by 57% between 1995 and 2012. In the non-breeding season, the species is found in muddy coastal areas, estuaries, inlets, and intertidal areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its breeding grounds in the arctic tundra (Clemens, Rogers, Melville, Carey, & Garnett, Anadyr Bar-tailed Godwit Limosa lapponica anaddyrensis, Alaskan Bar-tailed Godwit L. l. baueri, and Yakutian Bar-tailed Godwit L. l. menzbieri, 2021d). The risk of collision with the Proposed Action has been assessed as being of Mild concern due to the species' overall rarity and possible morphological vulnerability to power line collision (Bevanger, 1998). There is a record of three individuals at Hearson Cove in 2021 and at Nickol Bay some 14 km to the southeast of the Proposed Action, and the species is recorded more regularly with flocks as large as 100 birds recorded in 2011 and 115 birds in 2021 at that location. Given the proposed mitigation, such as line markers and positioning of infrastructure (e.g. poles), significant impacts as a result of collision with the transmission line are considered unlikely. Therefore, the Proposed Action is not anticipated to significantly reduce the population size of this species.
'reduce the area of occupancy of the species'	*Not Significant* The Northern Siberian Bar-Tailed Godwit forages on the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat. The implementation of the Proposed Action will involve clearing up to 5.84 ha of this fauna habitat, although likely to be substantially less. The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for those species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that migratory shorebirds rely on the foraging habitat within the DE.
'Fragment an existing important population into two or more populations'	*Not significant* Northern Siberian Bar-Tailed Godwit are highly mobile species and does not rely exclusively on the foraging area within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Northern Siberian Bar-Tailed Godwit to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption.

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Siberian Bar-Tailed Godwit
	As such, it is not anticipated that the Proposed Action will result in the fragmentation of a population of this species.
'adversely affect habitat critical to the survival of a species'	*Not Significant* There is no habitat critical to the survival of the species or a Biologically Important Area related to this species in or in close proximity to the DE. As mentioned on the Species Profile (**Section 2.3.8.4.7**), the preferred habitat of this species is coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. Although the DE overlaps partially a small area of Intertidal mudflats, it does not represent a habitat critical for the survival of this species. Therefore, the Proposed Action is not anticipated to significantly affect habitat critical to the survival of the species.
'disrupt the breeding cycle of a population'	*Not significant* The Northern Siberian Bar-Tailed Godwit does not breed in Australia. The potential increase in light emissions, noise, altered water regimes, and habitat contamination by ASS will be appropriately mitigated (**Section 4**), and therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE, however is likely to be substantially lower than this. The species does not rely exclusively on the habitat area within the DE. Records of the DBCA data (2023) shows their presence in Back Beach, Cowrie Cove, Whittel Bay and other similar habitat within or surrounding the Dampier Archipelago. Therefore, the Proposed Action is not anticipated to impact intertidal mudflats to the extent that the species is likely to decline. As mentioned in **Section 3.2.2**, altered water regimes is one of the possible threats and potential impact for this species, therefore, the Proposed Action will avoid the installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts. Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination. The pre-existing disturbance in the area is likely to have already modified shorebird habitat and behaviours in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Northern Siberian Bar-Tailed Godwit species is likely to decline.
'result in invasive species that are harmful	*Not Significant*

Significant Impact Criteria (DOE, 2013)	Assessment for Northern Siberian Bar-Tailed Godwit
to a critically endangered or endangered species becoming established in the135ovae-ered or critically endangered species' habitat '	The Conservation Advice for the Northern Siberian Bar-Tailed Godwit does not cite a specific invasive species that can be potentially harmful to the species (TSSC,2016a). However, it is recognised that invasive flora and fauna can alter their foraging habitat and increase predation. Standard mitigation measures (outlined in **Section 4**) will be implemented to mitigate the likelihood of the introduction and establishment of an invasive species, therefore, the introduction of an invasive species as a result of the Proposed Action is considered to be remote. In addition, as discussed at the beginning of **Chapter 3**, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* The Northern Siberian Bar-Tailed Godwit is susceptible to Avian Influenza; however, this disease has not been detected in Australia since 1992 (TSSC, 2016a). There is not credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere with the recovery of the species'	*Not Significant* The Conservation Advice for Northern Siberian Bar-Tailed Godwit outlines the threats (**Section 2.3.8.4.7**) and conservation actions for the species. As mentioned above, the Proposed Action is not expected to increase introduced species, disease, or weeds. Habitat loss and direct mortality are not anticipated to be significant and, therefore, will not interfere with the recovery of the species.

3.2.3.8 Australian Fairy Tern (Sternula nereis nereis) – Vulnerable

Table 3-18 Assessment of Significant Impact – Australian Fairy Tern

Significant Impact Criteria (DOE, 2013)	Assessment for Australian Fairy Tern
'lead to a long-term decrease in the size of an important population''	*Not Significant* The Proposed Action is not expected to cause a long-term decrease in the population size of the Australian Fairy Tern. This species is migratory and highly mobile; therefore, the impact on this species, due to a loss of supporting habitat (foraging) within the DE and potential habitat fragmentation, does not represent a significant threat as it would not be dependent on the area cleared for survival. The risk of collision and vehicle strikes is expected to be minimal due to the low traffic numbers anticipated and will be mitigated through management actions, therefore any loss of individuals will likely be isolated cases. The Australian Fairy Tern is a near shore marine species which nests in exclusively coastal colonies on sandy islands, rocky archipelagos, and estuarine beaches. There is no breeding habitat for this species present within the DE. Collision with power lines is not documented as a threat to the species anywhere in its Australian distribution (Greenwell, et al., 2021). This species has few recent records in the DE and surrounding area and therefore is assessed as being of

Significant Impact Criteria (DOE, 2013)	Assessment for Australian Fairy Tern
	'Minimal' concern with regard to risk of collision with the Proposed Action. Given the low reporting rates in the DE, impacts associated with collision with the proposed transmission line are not anticipated to be significant. In addition, an important population of this species is not considered to exist in the DE. Therefore, the Proposed Action is not anticipated to significantly reduce the population size of this species.
'reduce the area of occupancy of the important population'	*Not Significant* The Australian Fairy Tern Recovery Plan (DAWE,2020) recognises habitat degradation and loss of breeding habitat as one of the main threats to the species. The DE overlaps the Biologically Important Area for the breeding of this species, however, there is no breeding habitat within the DE. Australian Fairy Tern breeding colonies are usually located on coral shingle on coastal islands, on sandy islands and on beaches inside estuaries and open beaches (DAWE,2020). The 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat within the DE is a foraging habitat for the species. The implementation of the Proposed Action will involve clearing of up to 5.84 ha of this fauna habitat, although likely to be much less than this. The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for these species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that Australian Fairy Tern rely on the foraging habitat within the DE. An important population of this species is not considered to exist in the DE.
'fragment an existing important population	*Not significant* The Australian Fairy Tern is a highly mobile species and does not rely exclusively on the foraging area within the DE. The Proposed Action is not anticipated to represent a geographic barrier and the species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway and allows for Australian Fairy Tern to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption. In addition, an important population of this species is not considered to exist in the DE. As such, it is not anticipated that the Proposed Action will result in the fragmentation of an existing important population of this species.
'adversely affect habitat critical to the survival of a species'	*Significant* As mentioned on the Species Profile (**Section 2.3.8.4.8**), Australian Fairy Tern utilise a variety of habitats including offshore, estuarine or lake islands, wetlands, beaches and spits. The implementation of the Proposed Action will involve clearing of up to 5.84 ha of this fauna habitat. This habitat type is considered critical to the survival of the species. The DE overlaps the Biologically

Significant Impact Criteria (DOE, 2013)	Assessment for Australian Fairy Tern
	Important Area for the breeding of this species, however, there is no breeding habitat within the DE. The DE is partially located within the Littoral Land system which is associated with suitable habitat for foraging for these species and is widespread in the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that the species rely on the foraging habitat within the DE. The loss of up to 5.84 ha is unlikely to be significant given the availability of surrounding suitable habitat for the species as discussed. However, as this habitat is recorded as critical habitat, the impacts have been reported as 'significant' on a worse-case basis.
'disrupt the breeding cycle of an important population'	*Not significant* The DE overlaps the Biologically Important Area for the breeding of this species, however, there is no breeding habitat within the DE. The potential increase in light emissions, noise and habitat contamination by ASS will be appropriately mitigated (**Section 4**). In addition, an important population of this species is not considered to exist in the DE. Therefore, the Proposed Action is not anticipated to disrupt the breeding cycle of this species.
'modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'	*Not significant* There is the potential to impact up to 5.84 ha of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE, however is likely to be substantially lower than this. The species does not rely exclusively to the area within the DE. Records of the DBCA data (2023) shows their presence in islands of Dampier Archipelagos such as Dolphin island, West Lewis Island. Therefore the Proposed Action is not expected to impact intertidal mudflats to the extent that the species is likely to decline. Altered water regimes is one of the potential impacts for this species, therefore, the Proposed Action will avoid installation of poles or other infrastructure in close proximity to the tidal culvert in order to minimise potential impacts. Regarding potential habitat contamination by Acid Sulfate Soils, control measures will be in place to mitigate this impact, and it is not expected to result in significant foraging habitat degradation or contamination. The pre-existing disturbance in the area is likely to have already modified shorebird habitat and behaviours in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Given this, it is not predicted that the Proposed Action will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Australian Fairy Tern species is likely to decline.
'result in invasive species that are harmful	*Not Significant*

Significant Impact Criteria (DOE, 2013)	Assessment for Australian Fairy Tern
to a vulnerable species becoming established in the vulnerable, species' habitat'	Introduced animals such as foxes (*Vulpes vulpes*), dogs (*Canis familiaris*), cats (*Felis catus*), Black Rats (*Rattus rattus*), Silver Gulls (*Larus 138ovae-hollandiae*), Pacific Gulls (*Larus pacificus*), harriers (*Circus* spp.) or ravens (*Corvus* spp.) can potentially increase predation of eggs of the Australian Fairy Tern (DSEWPC, 2011). As there are numerous existing cleared tracks and access pathways within and in close proximity to the DE, no new pathways are anticipated to be created which could lead to increases in feral animals accessing the DE. In addition, standard mitigation measures will be implemented to minimise possible introduction or increase of feral animals within the DE (**Section 4**). Consequently, the Proposed Action is not expected to increase or introduce feral animals within the DE, and as such, significant impacts are not anticipated. In addition, as discussed at the beginning of Chapter 3, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.
'introduce disease that may cause the species to decline'	*Not Significant* The National Recovery Plan for the Australian Fairy Tern (DAWE, 2020) does not identify any specific disease that may be a threat this species. Additionally, there is not credible pathway that could result in the Proposed Action introducing a disease that may cause the species to decline.
'interfere substantially with the recovery of the species'	*Not Significant* The National Recovery Plan for the Australian Fairy Tern (DAWE, 2020) highlight the threats and conservation objectives for the species. The Proposed Action is not anticipated to increase invasive species, native wildlife, pollution or alter the water regimes in the area. The habitat loss, as discussed above, will not be significant for the species. Therefore, it is not anticipated that the Proposed Action would interfere significantly with the recovery of the species.

3.2.4 Migratory Shorebirds and Seabirds Species

A total of 10 Migratory Shorebirds and seabirds species have been assessed as '*known to occur, 'likely to occur'* or *'may occur'* in the Project Area*:*

Known to occur

- Whimbrel (*Numenius phaeopus*) – **Section 2.3.8.5.1**
- Gull-billed Tern (Gelochelidon nilotica) – **Section 2.3.8.5.7**
- Caspian Tern (*Hydroprogne caspia*) – **Section 2.3.8.5.8**
- Greater Crested Tern (*Thalasseus bergii*) – **Section 2.3.8.5.9**

Likely to occur

- Common Greenshank (*Tringa nebularia*) – **Section 2.3.8.5.6**
- Common Sandpiper (*Actis hypoleucos*) – **Section 2.3.8.5.5**
- Oriental Pratincole (*Glareola maldivarum*) – **Section 2.3.8.5.4**
- Oriental Plover (*Charadrius veredus*) – **Section 2.3.8.5.2**

May occur

– Bridled Tern (*Onychoprion anaethetus*) – **Section 2.3.8.5.10**

Unlikely to occur

– Wood Sandpiper (*Tringa glareola*) – **Section 2.3.8.5.3**

Seven other species of Migratory Shorebirds are also listed as Threatened species and have been assessed in **Section 3.2**. These species have also been considered in the assessed against the MNES Significant Impact Guidelines for Migratory Species in **Section 3.2.4.3**.

3.2.4.1 Direct impacts

Potential direct impacts that may occur to Migratory Shorebirds and seabirds as a result of the Proposed Action are:

– vegetation clearance and loss of habitat;
– increased risk of vehicle strike; and
– risk of collision with the transmission line.

Vegetation clearance and loss of habitat

The migratory species that are known to occur, likely to occur or may occur within the DE are likely to utilise the 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' habitat for foraging. Some species may also roost in this habitat. The implementation of the Proposed Action will include clearing of up to 1.5 ha of this fauna habitat, although likely to be lower than this (less than 1 ha).

The DE is partially located within the Littoral Land System which is associated with suitable habitat for foraging for those species and is widespread throughout the region. In addition, there is a further approximately 220 ha of mudflat habitat adjacent to the DE between King Bay and Hearson Cove, and similar habitat along the coastal areas and islands of the Burrup. Consequently, it is unlikely that migratory shorebirds rely on the foraging habitat within the DE.

Table 3-19 Extent of Migratory Shorebirds and Seabirds species habitat clearing for the Proposed Action

Habitat Type	Habitat Importance	Extent present within DE (ha)
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire	Foraging habitat (all species); Foraging and roosting habitat (Whimbrel, Oriental Plover and Common Sandpiper)	5.84

Increased risk of vehicle strike

The Wildlife Conservation Plan for Migratory Species (DoE, 2015d) does not specifically list collision with vehicles as a threat, however it is considered as a potential direct impact of the Proposed Action due to increased traffic in the area during the construction phase. Vehicle strike could occur as Migratory bird species travel through areas adjacent to live traffic. During the construction period, vehicles will be operating within and in close proximity to Migratory shorebirds foraging habitat recorded in the DE, thereby increasing the risk of vehicle strike. Horizon Power will implement measures to avoid and minimise vehicle strikes against these species (**Section 3** for further detail). The primary access to the construction areas associated with the tidal mudflat will be Burrup Road. Construction activities will result in a small increase in the number of vehicles that travel along this road per day.

Once the Proposed Action is operational, the associated traffic numbers are anticipated to be negligible compared to existing levels as only those associated with maintenance will be accessing the area. As such, it is expected that the increased traffic will not significantly affect these bird populations.

Risk of collision with the transmission line

The presence of the transmission line could potentially result in fatalities of migratory shorebirds and seabirds due to collision with the infrastructure. An Avian Collision Impact Assessment has been undertaken to evaluate the potential risk of collision associated with these species and is reported in **Appendix D**. The relevant Threatened and Migratory species were assessed according to their: a) likelihood of collision with power lines and; b) the likely consequence of any collision. These assessments were made in accordance with the risk matrix in **Table 3-10** in **Section 3.2.1**.

As discussed, the Migratory shorebirds and seabirds habitat within the DE is associated with the area of 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' situated between King Bay and Hearson Cove. This habitat type constitutes migratory shorebird foraging and roosting habitat and the DE traverses approximately 420 m of this habitat type. In addition, this area of Australia is situated within the East Asian – Australian (EAA) Flyway, a geographic region supporting populations of migratory shorebirds throughout their annual cycle. Where transmission lines or poles associated with the Proposed Action traverse this habitat or flyway, it is considered to be a potential collision zone for these bird species.

The assessment provided in **Appendix D** concludes that the level of concern for the Migratory Shorebirds and seabirds species is considered to range from 'Minimal' to 'Mild'. Despite varying in levels of absolute threat and overall rarity, these species share the characteristic of having low reporting rates in the DE and surrounding area. The following species are considered to be of 'Minimal' concern in relation to collision risk: Oriental Plover; Wood Sandpiper; Oriental Pratincole; Common Greenshank; and Bridled Tern.

The following species are considered to be of 'Mild' concern in relation to collision risk: Whimbrel; Gull-billed Tern; Caspian Tern; and Greater Crested Tern. For the majority of the species, the level of concern is a result of the taxon's overall rarity or scarcity in the landscapes and habitat types present in the DE, combined with a lack of any evidence that these species have a taxonomic vulnerability to collisions with static linear infrastructure (this is a result of a combination of morphological and behavioural characteristics). Further information on each species listed as 'Minimal' to 'Mild' in relation to collision risk is presented in **Section 3.2.3** and **Appendix D**.

The risk of fatality to shorebirds from collision with the Proposed Action at night is considered to be low. While often flying at night during migration, shorebirds are primarily diurnal species; most active during daylight hours, and typically resting or engaging in less active behaviours at night. As a result, the combination of shorebirds' natural behaviour patterns (Kruger & Garthe, 2001), the lack of attraction to transmission lines, and their ability to navigate safely during the night greatly minimises the risk of fatal collisions with these structures. Design features, such as line markers, and positioning of infrastructure (e.g. poles) are important factors in ensuring the well-being of shorebirds and have been taken into consideration in the development of the proposed mitigation measures (**Section 4**).

Based on the assessment provided, and with implementation of the proposed mitigation, it is concluded that the Proposed Action will not result in significant impacts to Threatened and migratory bird as a result of collision with the transmission line infrastructure.

3.2.4.2 Indirect impacts

Potential indirect impacts that may occur to Migratory shorebirds and seabirds as a result of the Proposed Action is:

- Habitat fragmentation;
- Increased risk of introduction of weeds;
- Increased risk of feral animals;
- Increased light emissions;
- Increased noise emissions;
- Altered hydrological regimes; and
- Habitat contamination by Acid Sulfate Soils.

Habitat fragmentation

The 'Mudflat with tidal inundation, Mangroves and supportive scattered Samphire' within the DE intersects the available foraging habitat between Kings Bay and Hearson Cove. This area is adjacent to the Burrup Road which has already been historically cleared and currently fragments the vegetation of the tidal mudflat. As part of the Proposed Action, the current design includes the placement of up to two poles within this area in addition to the overhead transmission line. The construction/placement of these poles and stringing of the transmission line is unlikely to require clearing across the entire width of the tidal mudflat. Access to the pole locations for construction and ongoing maintenance will primarily be via Burrup Road and no new access track across with width of the mudflat will be required. Connectivity between the underlying habitats will therefore be maintained. Additionally, Migratory shorebirds and seabirds are able to cross over the transmission line, and therefore this is not expected to result in a significant impact to the species.

There is an existing distribution line and causeway across the intertidal area however no pre-construction monitoring is available to determine the changes these disturbances may have already caused in the patterns of use and behaviour by roosting and foraging shorebirds. By adhering as far as possible to areas of existing disturbance, it is considered the Proposed Action will minimise further disturbance to the integrity of the intertidal area as habitat for shorebirds, allowing foraging and roosting in keeping with their current patterns without significant disruption.

As such, in response to the query raised by DCCEEW in the Preliminary Documentation requirements for the Proposed Action, the proposed transmission line across the intertidal area is not likely to act as a barrier between potential roosting and/or foraging sites for shorebirds. Consideration has been given to the placement and design of the transmission line and energised components to minimise its impact on the natural habitat and the behavioural patterns of shorebirds. The chosen alignment closely follows an existing distribution line easement (that already has an extensive amount of habitat cleared) and allows for shorebirds to continue accessing preferred roosting and foraging locations along the intertidal zone.

Increase risk of weeds introduction

Introduction of weeds is a potential threat to foraging habitat of Migratory shorebirds species. The Proposed Action has the potential to introduce and spread weeds through construction activities such as clearing and movement of light vehicles and personnel. According to the surveys undertaken for the Proposed Action (GHD 2020, 2022), one introduced flora taxa was recorded within the DE, Stinking passionflower (*Passiflora foetida*). This species was recorded in the northern area of the DE (**Figure 2-9**).

The implementation of weed hygiene measures (**Section 4.2**) will reduce the risk of introducing and spreading weeds as a result of the Proposed Action. Therefore, it is not expected to result in the introduction or spread of weeds that could cause significant indirect impacts.

Increase risk of feral animals

Introduced animals such as Pigs (*Sus* sp.), cane toads (*Rhinella marina*), Cats (*Felis catus*) and Foxes (Vulpes vulpes) can potentially increase predation of Migratory Shorebirds (DoE, 2015). Additionally, Rodents (*Rattus* spp.) Dogs (*Canis familiaris*), Goats (*Capra hircus*) and Cattle (*Bos* spp.) are also recognise as a potential threat to seabirds (CoA, 2020). GHD (2020b) recorded four introduced animals: Dog, Cat, Cattle and Black Rat. As there are numerous existing cleared tracks and access pathways within and in close proximity to the DE, no new pathways are anticipated to be created which could lead to increases in feral animals accessing the DE. In addition, standard mitigation measures will be implemented to minimise possible introduction or increase of feral animals within the DE (**Section 4**). Consequently, the Proposed Action is not expected to increase or introduce feral animals within the DE, and as such, significant impacts are not anticipated.

Increased light emissions

Birds, in general, are known to be attracted and disoriented by artificial lights, which could result in blindness, disorientation due to interference with the magnetic compass used during migration, a reduction in fuel stores, a delay in migration, and an increased chance of collision. Artificial lights can also influence the

predation of migratory shorebirds, making them more susceptible to predation in illuminated roosting areas. Consequently, this can lead to higher energy costs for individuals seeking darker roosting areas or a reduction in the use of foraging habitats due to the increased distance from the roosting sites. On the other hand, species with nocturnal foraging habits benefit positively from artificial lighting (DEE,2020).

Permanent lighting associated with the Proposed Action will be minimal and only associated with the new Burrup substation (and existing Dampier substation) which will have outdoor yard lighting as per standard substation arrangements. Planned operational maintenance is anticipated to occur in the day and therefore the lighting would only be used in operational situations for faults etc. There is no permanent lighting proposed in the main area of the existing mudflats habitat., Temporary mobile lighting will be installed during construction on a limited basis. Temporary lighting will not remain in one place for long periods of time and will be moved along the construction area as dictated by the construction schedule. It is expected that any increase of light emissions would cease at the end of the working day generally considered to be no later than 7PM, therefore it is not expected that Increased light emission will significantly affect Migratory shorebirds behaviour, due to the low intensity and transitivity of light emissions.

Increased noise emissions

Shorebirds are known to adapt to, or even avoid, areas with consistent human activity, often altering their foraging and roosting behaviours to minimise disruptions (Peters & Otis, 2007). Noise emissions are not well-documented as a potential threat to migratory shorebirds and seabird species, however anthropogenic disturbance can compromise their capacity to build sufficient energy reserves to undertake migration (DoE, 2015). The Proposed Action will increase noise emissions during the construction phase. During construction, sudden loud noises (e.g., blasting if required and drilling activities) may occur and can lead to the disturbance of nearby shorebirds and avoidance or abandonment of noisy areas. Disturbance in the intertidal area may have some effects on Shorebirds and seabirds and the way that they use the habitat. The species listed are considered likely to utilise components of this area for roosting and foraging.

Nevertheless, due to the transitory characteristics of these activities, and the limited operational noise anticipated, the Proposed Action is not expected to significantly affect their behaviour permanently. Low levels of noise emissions from the operational phase may occur; however, chronic low levels of noise are not expected to impact Migratory Shorebirds and Seabird species to the extent they would experience changes in their behaviour and foraging patterns.

Although some of the construction activities may cause elevated levels of noise, , noise emissions are anticipated to be short-term and transient in nature. In addition, given this context and that the Proposed Action will closely abut existing noise emitters, such as traffic travelling along Burrup Road, industrial developments in the Burrup SIA and the ongoing construction work in the area (see Photo 3, **Section 3.2.2**), the likelihood of further disturbance to shorebirds is considered to be relatively low. The Proposed Action will occur on the eastern side of Burrup Road, avoiding areas of mangrove habitat on the western side. The pre-existing disturbance is likely to have already modified shorebird habitat use in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level.

As such, it is not anticipated that Proposed Action would result in significant disturbance impacts associated with increased noise emissions.

Altered hydrological regimes

The Wildlife Conservation Plan for migratory shorebirds (2015) recognizes the altered hydrological regimes as one of the direct and indirect threats to Migratory Shorebirds' habitat. Changes to flows can lead to permanent drying out of areas and changes to the timing, frequency, and duration of floods, consequently affecting food availability, the lifecycle of plants and animals and impacting foraging and/or breeding habitat for these species.

There are only minor drainages within the DE in addition to the tidal inlet which is culverted under the Burrup Road. The placement of poles as part of the Proposed Action has the potential to act as a partial barrier on the tidal movements through the culvert under Burrup Road. The detailed design will avoid placing infrastructure

in the vicinity of the culvert area such as the installation of poles, and therefore the risk of acting as a barrier to the current hydrological flow is considered to be negligible. In addition, sections of new hard standing will be minimal and discrete areas rather than continuous, predominantly associated with the new and expanded substations. As such, it is not anticipated that the Proposed Action will significantly impact hydrological regimes.

Habitat contamination by Acid Sulfate Soils

Acid Sulfate Soils are found in coastal (particularly tidal mud flats) and inland freshwater or saline areas (GSA, 2016). There is an increased potential of habitat contamination by acid sulfate soils within the DE due to the 'High to Moderate' and 'Moderate to Low' that may occur within the area (**Section 2.3.2.1**). This habitat contamination can lead to increase mortality of fish and crustaceans and can affect plants through indirect acid exposure, smothering of aquatic plants by iron precipitates and toxicity by aluminium and other metal(oid)is (E PA – GSA, 2007). This could in turn effect the foraging and/or breeding habitat for these Migratory Shorebirds and seabirds.

Therefore, control measures will be put in place to mitigate the potential impact, as outlined within the Environmental Management Actions (**Section 4**). Management of ASS is commonly encountered and effectively managed on construction projects in WA and there are a range of standard management practices that can be implemented. Given the mitigation measures that will be implemented during construction, ASS is not expected to result in significant habitat contamination as a result of the Proposed Action.

3.2.4.3 Assessment against MNES Significant Impact Guidelines

Table 3-20 Assessment Significant Impact – Migratory Shorebirds and Seabirds

Significant Impact Criteria (DOE, 2013)	Assessment for Migratory Species
'substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species'	*Not Significant* The Project Area is not an important habitat (Nationally or internationally) for these species. The Proposed Action is not anticipated to represent a geographic barrier and the Migratory shorebird and seabird species will be able to cross the transmission line infrastructure. The DE and current alignment design closely follows an existing distribution line easement and causeway, and allows for Migratory shorebirds and seabirds to continue accessing preferred roosting and foraging locations along the intertidal zone, therefore allowing foraging and roosting in keeping with their current patterns without significant disruption. As mentioned in **Section 3.2.4.2**, the Proposed Action will avoid installation of poles or other infrastructure in close proximity to the tidal culvert and will have a negligible impact on hydrological cycles. Given this, it is not anticipated that the Proposed Action will substantially modify, destroy or isolate an area of important habitat for a migratory species.
'result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or'	*Not Significant* It is recognised that invasive flora and fauna can alter foraging habitat for Migratory shorebirds and seabirds and increase predation. Standard mitigation measures (outlined in **Section 4**) will be implemented to mitigate the likelihood of the introduction and establishment of an invasive species. In addition, as discussed at the beginning of **Chapter 3**, the risk of feral animals being attracted to the area as a result of the Proposed Action is considered to be low.

Significant Impact Criteria (DOE, 2013)	Assessment for Migratory Species
'Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species'	*Not Significant* Those migratory species listed in **Section 3.2.4** which occur within the DE have been recorded at generally low rates and densities within the DE and immediate surrounds. It is therefore unlikely that the DE supports an ecologically significant proportion of the population of any of these migratory species. Further, the migratory species listed will use the DE for foraging and roosting habitat only; with no breeding habitat within the DE. Impacts to these species are expected to be slight or negligible behavioural impacts restricted to a small number of individuals likely to be present within the DE. Any avoidance or dispersal behaviour is anticipated to be short term and primarily associated with the construction phase, given the limited operational noise or light emissions predicted. The pre-existing disturbance in the area is likely to have already modified shorebird habitat use in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level. Therefore, the Proposed Action is not expected to disrupt the breeding, feeding, migration or resting behaviour of these Migratory shorebird and seabird species and is therefore unlikely to result in disruption to their lifecycle.

3.3 Cumulative Impacts

Cumulative impacts to the environment result from multiple activities whose direct impacts have the potential to combine with other activities, which can result in significant environmental and social effects. As discussed previously, the Proposed Action is located in close proximity to other developments in the area that are being progressed by third parties. The following developments, situated in close proximity to the Proposed Action, have been considered within this cumulative impact assessment:

- The Perdaman Urea Project and associated clearing for road expansion being undertaken by Main Roads (located within the Burrup SIA).
- The Woodside Solar Facility (located within the Maitland SIA).

Horizon Power is also aware of a number of projects that are currently in the design and/or planning phase, and that are located in proximity to the Proposed Action. However, as these projects have not yet been approved or submitted for approval, they are considered to be speculative and conceptual in nature and as such they have not been considered within the cumulative impact assessment.

In line with the DCCEEW information request (Ref 3.1), this cumulative impact assessment has considered the potential for cumulative impacts to terrestrial Threatened Species as a result of the Proposed Action and the above listed nearby developments, as detailed in **Table 3-21**. Cumulative impacts to Threatened shorebird and migratory bird species are also assessed.

As a result of implementation of the above projects, in combination with the Proposed Action, cumulative impacts would take place with regard to combined removal of habitat associated with the following species:

- Northern Quoll
- Pilbara Olive Python
- Ghost Bat
- Bridled Tern

– Oriental Pratincole
– Oriental Plover

Given the relatively limited amount of clearing to be undertaken as part of the Proposed Action; the significant amount of habitat available for these species in the wider region (as reported throughout **Chapter 3**); and the minimal potential impacts predicted to result from the Proposed Action on the above species, it is not anticipated that the Proposed Action would add to the cumulate impact, locally or regionally, such that the combined impact would result in significant cumulative impacts over and above those predicted for the above projects. Through implementation of the mitigation measures outlined in the EMP (provided in **Appendix B**), and the proposed rehabilitation efforts post construction, potential impacts will be minimised. The above projects also include measures to reduce or offset potential impacts and rehabilitation proposals, further reducing the potential for significant cumulative impacts to occur.

Table 3-21: Cumulative Impacts to MNES from other Relevant Proposals

MNES Relevant to the Proposed Action	Relevant Proposals			
	Burrup Transmission Line (Horizon Power)	**Perdaman Urea Project (Perdaman Chemical and Fertilisers Pty)**	**Woodside Solar Facility (Woodside Energy Ltd)**	**Cumulative Impact**
Terrestrial Threatened Species	Clearing of 14.40 ha of fauna habitat in varying condition, providing potential habitat for the following listed species: – Northern Quoll – Pilbara Olive Python – Ghost Bat – Grey Falcon	Clearing of 49.33 ha of Pilbara Olive Python and Northern Quoll habitat. Clearing of 2.7 ha of ghost bat habitat.	Loss of up to 0.1 ha of Pilbara Olive Python habitat.	Combined removal of up to 63.83 ha of Pilbara Olive Python and Northern Quoll habitat. Combined removal of up to 17.1 ha of ghost bat habitat.
Threatened shorebird and migratory bird species	Clearing of 1.5 ha of fauna habitat in varying condition, providing potential habitat for the following listed species: – Curlew Sandpiper – Eastern Curlew – Greater Sand Plover – Lesser Sand Plover – Red Knot – Northern Siberian Bar-Tailed Godwit – Australian Fairy Tern – Whimbrel – Oriental Plover – Wood Sandpiper – Oriental Pratincole – Common Sandpiper – Common Greenshank – Gull-billed Tern	Clearing of 11.97 ha of EPBC Act listed Migratory / marine bird habitat.	Impacting up to 771.5 ha of habitat associated with: – Bridled Tern – Oriental Pratincole – Oriental Plover	Combined removal of up to 784.97 ha of habitat associated with EPBC Act listed Migratory / marine birds, specifically: – Bridled Tern – Oriental Pratincole – Oriental Plover

MNES Relevant to the Proposed Action	Relevant Proposals			
	Burrup Transmission Line (Horizon Power)	Perdaman Urea Project (Perdaman Chemical and Fertilisers Pty)	Woodside Solar Facility (Woodside Energy Ltd)	Cumulative Impact
	– Caspian Tern – Crested Tern – Bridled Tern			

4 Avoidance and Mitigation Measures

4.1 Overview

Mitigation and management of the potential direct and indirect impacts on MNES associated with the Proposed Action will be implemented in accordance with standard construction industry environmental practices, as well as relevant Horizon Power standards and procedures.

An overview of the mitigation and management measures proposed is provided in the following sections. This includes identification of each impact/risk, a description of each measure proposed, the location and timing for each measure, monitoring and reporting requirements, and performance and completion criteria. Measures have been developed to be consistent with the layout as contained within the DCCEEW Environmental Management Plan Guidelines (2014).

4.2 Management Objectives

The following management targets for EPBC Act listed threatened fauna have been identified[1]:

1. Prevent unauthorised clearing of EPBC Act listed threatened fauna habitat including clearing no more than:
    a) 14.4 ha of Northern Quoll foraging, dispersal and denning habitat which is considered critical to the survival of the Northern Quoll species;
    b) 14.4 ha of Pilbara Olive Python foraging habitat;
    c) 14.4 ha of Ghost Bat roosting, foraging, flyway and drinking habitat;
    d) 14.4 ha of Grey Falcon nesting, foraging and drinking habitat;
    e) 1.5 ha of Curlew Sandpiper roosting and foraging habitat;
    f) 1.5 ha of Eastern Curlew roosting and foraging habitat;
    g) 1.5 ha of Greater Sand Plover roosting and foraging habitat;
    h) 1.5 ha of Great Knot roosting and foraging habitat;
    i) 1.5 ha of Lesser Sand Plover roosting and foraging habitat;
    j) 1.5 ha of Red Knot roosting and foraging habitat;
    k) 1.5 ha of Northern Siberian Bar-Tailed Godwit roosting and foraging habitat; and
    l) 1.5 ha of Australian Fairy Tern roosting and foraging habitat, which is considered critical habitat to the Australian Fairy Tern.
2. Prevent unauthorised clearing of EPBC Act listed Migratory Shorebird and Seabird habitat including clearing no more than:
    a) 1.5 ha of Whimbrel roosting and foraging habitat;
    b) 1.5 ha of Oriental Plover roosting and foraging habitat;
    c) 1.5 ha of Oriental Pratincole foraging habitat;
    d) 1.5 ha of Common Sandpiper roosting and foraging habitat;
    e) 1.5 ha of Common Greenshank foraging habitat;

[1] Note that the exact amount of each habitat to be removed will not be known until the detailed design is finalised. Therefore, as a worst-case scenario it has been assumed that the Proposed Action has the potential to impact up to 14.4 ha of habitat. Horizon Power have committed to clearing no more than 1.5 ha of the habitat associated with the tidal inlet area.

f) 1.5 ha of Gull-billed Tern foraging habitat;

g) 1.5 ha of Caspian Tern foraging habitat;

h) 1.5 ha of Crested Tern foraging habitat; and

i) 1.5 ha of Bridled Tern foraging habitat.

3. Minimize the risk of injury or mortality to EPBC Act listed threatened and/or migratory species during construction of the Proposed Action.

4. Prevent indirect impacts on fauna habitats due to Acid Sulfate Soils and alteration of fire regime.

5. Minimize the risk of injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.

6. Minimize the risk of indirect impacts to threatened and/or migratory fauna species due to an increase in noise, light and dust emissions.

7. Minimise disturbance, injury or mortality to EPBC listed threatened and/or migratory species during operation and reduce risk of collision impacts as far as possible.

8. No introduction or spread of Declared weeds, WONS or serious environmental weed species into surrounding native vegetation adjacent to the DE during and attributable to construction.

4.3 Environmental Management Actions

In order to comply with relevant environmental legislation and manage the impacts to the local environment, Horizon Power has defined objective, outcomes and management-based provisions to ensure that impacts to the noted MNES are avoided and minimised as far as practicable during implementation of the Proposed Action. These management actions are provided in the Environmental Management Plan in **Appendix B**.

4.4 Environmental Monitoring

Key monitoring measures have been established to assess the potential effects of the Proposed Action on MNES and their habitats, both during and after construction. This monitoring encompasses the evaluation of both immediate and secondary consequences resulting from the Proposed Action. Qualified individuals with expertise in the specified methodology will conduct the monitoring activities. The outlined monitoring plan for the Proposed Action can be found in **Appendix B**.

4.5 Revegetation/Rehabilitation

Horizon Power will rehabilitate pre-existing native vegetation in temporarily cleared areas (anticipated to be approximately 2.9 ha) to the same condition prior to Horizon Power clearing. Already disturbed locations will be utilised as a preference.

Horizon Power will retain the cleared vegetative material and topsoil removed by clearing and stockpiling in an appropriate area that has already been cleared. Drainage will be constructed around topsoil stockpiles.

At an optimal time within 12 months following completion of temporary clearing, the cleared areas not required for permanent infrastructure will be revegetated. This will include ripping the ground on the contour to remove soil compaction and laying the previously stored vegetative material and topsoil on the cleared areas.

Within 24 months of laying the vegetative material and topsoil on the cleared areas, Horizon Power will engage an environmental specialist to determine the species composition, structure and density of the revegetated and rehabilitated areas. The environmental specialist will also make a determination as to whether the composition, structure and density will result in a similar species composition, structure and density to that of the pre-clearing vegetation types recorded in that area, without further revegetation.

If it is determined that the works undertaken will not rehabilitate the area in line with baseline conditions, revegetation of the area by deliberately planting and/or direct seeding native species will be undertaken to

ensure that rehabilitation efforts will result in a similar species composition, structure, and density of native vegetation to pre-clearing vegetation types in that area.

5 Proposed Offsets Strategy

5.1 Background

The Australian Government's EPBC Act Environmental Offset Policy (DSEWPaC, 2012a) define offsets as "*measures that compensate for the residual adverse impacts of an action on the environment*". The policy states that "*offsets provide environmental benefits to counterbalance the impacts that remain after avoidance and mitigation measures. These remaining, unavoidable impacts are termed 'residual impacts'. For assessments under the EPBC Act, offsets are only required if residual impacts are significant*".

Horizon Power proposes to offset significant residual impacts resulting from the Proposed Action via the Pilbara Environmental Offsets Fund.

5.2 Significant Residual Impacts

The significant residual impacts of the Proposed Action, taking into account the mitigation outlined in Appendix B (EMP), are:

- Clearing of no more than 14.4 ha of critical habitat, including:
  - up to 14.4 ha of potential Northern Quoll denning/shelter and feeding habitat critical to the survival of the Northern Quoll, and also considered important supporting habitat for the Pilbara Olive Python; and
  - up to 1.5 ha of potential Australia Fairy Tern foraging habitat critical to the survival of the Australian Fairy Tern.

5.3 Pilbara Conservation Strategy and Pilbara Environmental Offsets Fund

The WA Government has released the Pilbara Conservation Strategy which outlines a landscape-scale approach to biodiversity conservation across the Pilbara region and provides strategic direction for conservation actions that may be funded from a variety of sources including through offsets to counterbalance the residual impacts of infrastructure projects (DPAW, 2017). The top four outcomes that will be delivered through the Pilbara Conservation Strategy are (DPAW, 2017):

1. Landscape-scale conservation through improved management of key threats;
2. Improved condition of threatened and other important species and communities;
3. Evidence-based conservation management; and
4. Conservation through partnerships.

Of these outcomes, "*Improved condition of threatened and other important species and communities*" is of particular relevance to the Proposed Action and the predicted significant residual impacts resulting from clearing of up to 14.4 ha of habitat critical to the survival of the Northern Quoll and Australian Fairy Tern. The Pilbara Conservation Strategy specifically notes the Northern Quoll as one of the species that is the focus of this objective (DPAW, 2017).

The Pilbara Conservation Strategy also outlines a number of priority areas that will be the focus of the project, to be implemented to meet the objectives of the Strategy. One of these priorities is referred to as "Karijini restoration" which includes actions that will help restore the central Hamersley Range and enhance biodiversity and ecosystem resilience in this area. This will provide key habitat for Northern Quoll species. These actions include the following (DPAW, 2017):

- eradicating or controlling feral herbivores;
- controlling feral cats;
- removing priority weeds from high value assets;
- managing fire through prescribed burning;
- undertaking research to address key knowledge gaps; and
- establishing a wildlife sanctuary within Karijini National Park.

With regard to the Australian Fairy Tern, the objectives of the species' recovery plan (DAWE, 2020) align with the objectives of the Pilbara Conservation Strategy with regard to landscape-scale conservation, and conservation through partnerships. One such landscape scale conservation scheme being undertaken as part of the Pilbara Conservation Strategy is to protect and improve the exceptional terrestrial biodiversity of the Pilbara through collaborative action on a landscape scale to manage fire and to address the threats posed by feral animals and weeds. According to the National Recovery Plan for the Australian Fairy Tern (DAWE,2020), invasive species (foxes, cats, rats and dogs) are one of the main threats for the Australian Fairy Tern. Therefore, the Australian Fairy Tern is anticipated to benefit from the management of feral animals being undertaken under this scheme throughout the region.

In July 2016, the WA Government approved the establishment of the Pilbara Strategic Conservation Initiative, now known as the Pilbara Environmental Offsets Fund (the 'fund'), to maximise the value of environmental offsets from projects in the Pilbara (DPAW, 2017). The fund facilitates the coordinated delivery of environmental offset projects within the Pilbara bioregion of WA. The fund was established to invest in strategic conservation projects in the Pilbara bioregion to improve vegetation and species habitat impacted by development. The fund combines money from individual offset payments required under the WA EP Act and the EPBC Act into a special purpose account. This enables the delivery of larger and more strategic landscape-scale projects than would not occur if individual offset projects were delivered independently, leading to better biodiversity conservation outcomes (DWER, 2019). Projects funded by the fund address the priorities of the Pilbara Conservation Strategy described above (DPAW, 2017).

On 19 November 2020, a Memorandum of Understanding (MOU) was established between the WA and Commonwealth governments to enable the fund to receive money required as a condition under Part 9 or 10 of the EPBC Act. Under the MOU, the Commonwealth Minister for the Environment, or their delegate, will consider the use of the fund to achieve and offset on a case-by-case basis. In each case, they will consider whether the fund has the appropriate mechanisms in place to ensure the successful delivery of the offset in accordance with the conditions of approval, the EPBC Environmental Offsets Policy and commitments in the MOU (DAWE, 2020).

Horizon Power proposes to use the fund to counterbalance the Proposed Action's significant residual impacts. **Table 5-1** outlines how the use of fund is consistent with the Principles of the EPBC Act Environmental Offsets Policy.

Table 5-1. Principles of EPBC Act Environmental Offsets Policy

Principle	How Addressed by Proposed Offset Strategy
Suitable offsets must deliver an overall conservation outcome that improves or maintains the viability of the protected matter.	Provision of funding to the fund as part of the proposed offset strategy will be used in priority areas such as the "Karijini restoration" which includes actions that will help restore the central Hamersley Range and enhance biodiversity and ecosystem resilience. The Hamersley ranges supports the Northern Quoll and as such, enhancing its biodiversity and ecosystem resilience will result in an outcome that improves the viability of the Northern Quoll populations. Similar actions related to the Australian Fairy Tern habitat will also be implemented through contribution to protecting and enhancing migratory bird habitat, and the management of feral animals being undertaken on a landscape scale. The MOU between the WA and Commonwealth in relation to the fund means that all monies paid into the fund as a result of an EPBC Act condition of approval will be spent for the benefit of the relevant protected matter.
Suitable offsets must be built around direct offsets but may include other compensatory measures.	The fund provides funding that is pooled with other offsets and used to implement direct offsets that address the priorities of the Pilbara Conservation Strategy.
Suitable offsets must be in proportion to the level of statutory	The offset rates paid to the fund are established by DWER and are 'based on the level of biodiversity protection in the region, and cumulative impacts to environmental values, including high quality vegetation and the conservation of significant-species habitat (DWER 2019)'. These rates include base rates for good to excellent quality vegetation and 'higher rates' for specialised environmental values such as specialised

Principle	How Addressed by Proposed Offset Strategy
protection that applies to the protected matter.	fauna habitat. It is anticipated that the higher rate will apply given the intention to offset clearing of habitat critical to the survival of the Northern Quoll and Australian Fairy Tern, and habitat that is likely of high importance to the Pilbara Olive Python. As such, it is considered that the proposed offsets are proportionate to the level of statutory protection that applies to the protected matters.
Suitable offsets must be of a size and scale proportionate to the residual impacts on the protected matter.	As discussed in **Section 5.2**, the residual impacts of the Proposed Action are expected to be limited to the loss of habitat critical to the survival of the Northern Quoll and Australian Fairy Tern, with no significant impacts occurring to the species itself. Given that the offsets rates paid to the fund are calculated on a per hectare basis, it is considered that this mechanism provides offsets that are proportionate in size and scale to the residual impacts on the protected matters.
Suitable offsets must effectively account for and manage the risks of the offset not succeeding.	The funds approach of combining money from offsets under the EP Act and EPBC Act to deliver larger and more strategic landscape-scale projects than would occur if individual offset projects were delivered independently, effectively manages the risk of offsets not succeeding when compared to smaller individual offset projects implemented by Proponents. The benefit of contributing to strategic landscape-scale projects also includes the opportunity to achieve net ecological gain due to a coordinated approach and the ability to achieve positive biodiversity outcomes on a large scale outside of the project's disturbance footprint.
Suitable offsets must be additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs.	The proposed offsets are additional to what is already required, determined by law or planning regulations, or agreed to under other schemes or programs.
Suitable offsets must be efficient, effective, timely, transparent, scientifically robust and reasonable.	The fund has an Implementation Plan which outlines the criteria that are used to select projects that are supported through the fund. These criteria include (DWER, 2019): "Be designed to align with the offset principles of the WA and Australian governments and the implementation principles in Chapter 2 (of the Implementation Plan) so that the outcomes of projects: – tangibly and measurably improve environmental matters; – are value for money and have a high chance of success; – are strategic and have landscape-scale outcomes where achievable; – are long term and enduring (ideally outcomes will endure for at least 20 years); – are additional to activities that are already required as a condition of approval or lease or a legislative requirement.
Suitable offsets must have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The fund has a Governance Framework which establishes transparent decision-making processes, clarity of roles and responsibilities, and guidance for project delivery. The funds Implementation Plan which sets the funds strategic focus for a five-year period. The Implementation Plan defines the process to plan, implement, monitor, evaluate and improve delivery of projects and the fund over time (DWER, 2019).

5.4 Implementation

Implementation of the proposed offset approach will be in accordance with the MOU between the WA and Commonwealth Governments. It is envisaged that the conditions of any approval of the Proposed Action under the EPBC Act will specify the requirement for Horizon Power to contribute to the fund. An Impact Reconciliation Procedure (IRP) has been prepared and is provided in Appendix E.

Impact Reconciliation Reports (IRR) will then be submitted biennially (from the time of approval of the Proposed Action). The IRR will advise DCCEEW on the amount of clearing that has been undertaken within each year of the biennial reporting period. This clearing is then used to define the amount to be contributed to

the fund for areas cleared during the reporting period. The contribution will be based on a $/ha basis using the rate that DCCEEW uses to offset residual significant impacts on MNES , specifically $3,306 per hectare for habitat critical to the survival of a species (2022/2023 rates).

5.5 Offsets Fund Contribution

Table 5-2 provides a summary of the proposed offset contribution based on the assessed significant residual impacts and DCCEEW residual impact offset rates. This is based on estimated clearing, and it is noted that the financial contribution will be based on actual clearing, and this can only be calculated after clearing has been conducted.

Table 5-2. Significant residual impacts requiring an offset

MNES Habitat	Clearing	Contribution	MNES Habitat
Habitat Critical to the survival of the Northern Quoll and Australian Fairy Tern; and important supporting habitat for the Pilbara Olive Python.	No more than 14.4 ha of critical habitat comprising: – Up to 14.4 ha of Rocky Hills with exposed boulder piles, which is denning/shelter and feeding habitat for the Northern Quoll, and also considered important supporting habitat for the Pilbara Olive Python (shelter and feeding habitat); and – Up to 1.5 ha of Mudflat with tidal inundation, Mangroves and supportive scattered Samphire, which is foraging habitat for the Australian Fairy Tern.	$3,306/ha	$3,306/ha for 14.4 ha = $47,606.40
Total			**$47,606.40**

It is noted that 10% of this payment will be required to be paid upfront in line with the DCCEEW requirements. The final payment will be reconciled with the amount actually cleared on site as part of the Proposed Action.

6 Economic and Social Matters

6.1 Carbon abatement

The Burrup Common User Transmission Infrastructure project will facilitate the connection of the Woodside solar facility at Maitland Industrial Estate to users on the Burrup Peninsula.

This Proposed Action is aligned with the Western Australian Climate Change Policy 2050 targets for decarbonisation. Based on the decarbonisation estimates detailed in the Woodside Solar Facility Environmental Referral Supporting Document (Woodside, 2021), the Burrup Common User Transmission Infrastructure can transmit up to 50MW and therefore will abate approximately 50 ktCO2-e per annum.

6.2 Financial Investment

The project is expected to cost approximately $166 million and finance is being sought from the Clean Energy Finance Corporation. The initial connection customer will be Woodside Energy, with connection feasibility studies currently being undertaken for Perdaman Industries, and a 3MW connection expected for the Water Corporation. Yara Australia and Engie Australia have also made connection enquiries to obtain potential emissions reductions.

6.3 Stakeholder Consultation

The key stakeholders consulted for the Proposal are provided in **Table 6-1**.

Table 6-1 Key project stakeholders

Stakeholder	Date	Type of consultation	Stakeholder comments/issue/topic raised	Stakeholder response
Murujuga Aboriginal Corporation (MAC)	August 2020 - present	In person meetings Emails Sharing of concept design information Aboriginal Heritage surveys	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Several face-to-face meetings with the CEO as well as email correspondence and supply of concept design drawings to inform them of the Proposal details.	Participation in archaeological and ethnographical Aboriginal Heritage reports including recommendations for Horizon Power on how to progress works.
Ngarluma Aboriginal Corporation (NAC)	August 2020 - present	In person meetings MS Teams meetings Emails Sharing of concept design information Aboriginal Heritage surveys	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Several face-to-face meetings with the CEO as well as email correspondence and supply of concept design drawings to inform them of the Proposal details.	Participation in archaeological and ethnographical Aboriginal Heritage reports including recommendations for Horizon Power on how to progress works.
JTSI	November 2020 - present	In person meetings MS Teams meetings Emails Sharing of concept design information	Introduction, updates, and strategy discussions related to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Focused discussions on preferred routes, land tenure and land access items. Focused discussions on sizing of the transmission infrastructure and prospective proponents.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA.
Rio Tinto (covers Hamersley Iron)	March 2021 - present	Emails Sharing of concept design information Notice of Entry letter General letter Pilbara Advisory Committee meetings	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Discussed overall project, geotechnical investigations, and Native Vegetation Clearing Permit (NVCP). Focused discussions on 220 kV line crossings and rail crossing requirements. Issued notice of entry letter for geotechnical investigations.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA subject to no negative impacts being transposed to the NWIS. Sharing of technical requirements for line crossings.

Stakeholder	Date	Type of consultation	Stakeholder comments/issue/topic raised	Stakeholder response
			Focused discussions on all technical and regulatory impacts of the Proposal through structured Pilbara Advisory Committee meetings.	
Yara	April 2021 - present	General Letter Meetings MS Teams meetings Email	Introduction and updates related to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA.
Woodside	May 2021 - present	Emails Sharing of concept design information Notice of Entry letter General letter Pilbara Advisory Committee meetings Technical modelling	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Progressing of NWIS connection studies.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA and Maitland SIA for connection of their Pluto LNG facility and proposed solar farm facility at to the NWIS. Progressing of NWIS connection application process under the low case option.
Development WA	March 2022 - present	MS Teams meetings Emails Sharing of concept design information Notice of Entry letter General letter Online workshop	Introduction, updates, and strategy discussions related to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Focus discussions on optimising line routes to avoid impact to Aboriginal Heritage sites and coordinate with existing and proposed plans for developments. Focus discussions on land tenure and land access items. Participation in the Burrup to Maitland multi-user corridor assessment study being performed by GHD for Development WA.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA subject to infrastructure considering future developments.
Department of Premier and Cabinet (DPC)	February 2022	MS Teams meetings	Introduction, updates, and strategy discussions related to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Focused discussions on Maitland land tenure and access items.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA.

Stakeholder	Date	Type of consultation	Stakeholder comments/issue/topic raised	Stakeholder response
Department of Land and Heritage	March 2022 - present	Meetings Email Notice of Entry letter	Focused discussions on land tenure and land access items for the proposed common user infrastructure transmission from Burrup to Maitland.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA subject to minimising disturbance, working with existing infrastructure operators and ensuring all safety considerations are met.
Main Roads WA	January 2022 - present	Meetings MS Teams meetings Emails Sharing of concept design information	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options. Focus discussions on road crossings and coordination in Hearson Cove Road realignment.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA subject to 20m high load route being achieved and coordination with Hearson' Cove Road realignment being achieved.
Pilbara ISO	May 2022 - present	Meetings MS Teams meetings Emails Sharing of concept design information Workshops	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland. Focus discussions on technical matters.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA subject to no negative impacts being transposed to the NWIS.
Epic Energy and BHP Minerals	August 2022	Notice of Entry letter	Notifying access required to progress investigation works.	None.
Karratha City	October 2022 - present	Meetings Sharing of concept design information	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options.	General in principle support for common user transmission infrastructure to support renewables development on the NWIS.
Water Corporation	October 2022 - present	Meetings MS Teams meetings Emails Sharing of concept design information	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA subject to safety considerations on adjacent water pipelines being properly considered and addressed.
Australia Gas Infrastructure Group	October 2022 - present	Meetings Emails	Introduction and updates to the proposed common user infrastructure transmission from Burrup to Maitland, including overviews of high, low and medium case transmission options.	General in principle support for common user transmission infrastructure being provided to the Burrup SIA subject to safety considerations on adjacent gas pipelines being properly considered and addressed.

Stakeholder	Date	Type of consultation	Stakeholder comments/issue/topic raised	Stakeholder response
		Sharing of concept design information		
DWER	October 2022 - present	MS Teams meeting	Pre-Referral Meeting Dampier to Burrup 132 kV Line.	Supportive of Horizon Power approach to submitting referral.
Community	Nov 2022	West Pilbara Community Information Session	Update on proposed common user transmission infrastructure from Maitland to Burrup and renewables on the NWIS.	General in principle support of increasing renewables on the NWIS.

6.4 Aboriginal Cultural Heritage Consultation

Horizon Power is Western Australia's regional and remote energy provider, operating across the state including Karratha, the Burrup, Roebourne and surrounding communities. With assets requiring continual maintenance and upgrading, Horizon Power already has a positive, existing and ongoing relationship with Murujuga Aboriginal Corporation (MAC). MAC, represents five traditional Aboriginal language groups (comprising the Ngarluma, Yaburara, Mardudhunera, Yindjibarndi, and Wong-Goo-Tt-Oo) and the Board of Directors as well as the Circle of Elders are comprised of people from these language groups.

Horizon Power undertakes many small – medium scale projects which require regular and ongoing liaison with these groups when Heritage surveys and Heritage Monitors are required.

Horizon Power has met with MAC on eleven occasions to discuss the Proposed Action and its potential environmental and heritage impacts, between August 2020 to September 2023. Consultation is ongoing and expected to continue into the future, as MAC are a key stakeholder for work in the region.

6.5 Social and Economic Impacts and Benefits

6.5.1 Aboriginal Cultural Heritage and Traditional Owners

In line with Horizon Power's Aboriginal Cultural Heritage Management policy, Horizon Power will avoid impacting on Aboriginal Cultural Heritage whenever possible. Numerous heritage surveys have already been carried out, and final project design and construction will utilise the data gathered from these surveys to avoid heritage. Accordingly, there will be no negative social or economic impacts on Aboriginal cultural heritage.,

Possible social and economic benefits are being explored with traditional owners and are confidential in nature.

6.5.2 Workforce

The Project is expected to require a total workforce of 50-100 people during construction. The construction contractor has a local depot in Karratha and the majority of the workforce are expected to be from the local area, with some supplementation with fly-in fly-out workers as required. The operation of the infrastructure will be managed from the existing Horizon Power Karratha depot.

6.5.3 Tourism and Recreation

The Proposed Action will provide electrical connection for users on the Burrup Peninsula. MAC are currently considering the development of a cultural tourism hub on the Burrup Peninsula, which would be potentially fed by the Proposed Action. Further, Horizon Power is discussing the potential to incorporate local Aboriginal artwork into the sides of the substation buildings that are visible to visitors to the region. MAC has also requested that the transmission poles are painted red to blend into the surrounding landscape of the Burrup Peninsula.

Significant impacts (either positive or negative) to tourism and recreation are not expected given the Proposed Action will not impact tourism access or have significant impacts to local landscape amenity.

7 Ecologically Sustainable Development

Section 3A of the EPBC Act defines the principles of ecologically sustainable development. **Table 7-1** outlines how each of the five principles has been applied to the Proposed Action.

Table 7-1. EPBC Act Principles of Ecologically Sustainable Development

NO.	Principle	Consideration of Principle in the Proposed Action
a)	Decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations	Horizon operates under an Environmental Management System (EMS) aligned with ISO14001. Horizon Power's commitment to maintaining a high level of environmental performance is exemplified through its Corporate Environmental Policy (June 2022). The policy provides a framework for Horizon Power to consider the environmental values of the service areas in which it operates while also meeting its regulatory obligations when undertaking works. Horizon Power operates on four guiding principles which are key enablers for economic, environmental, social and operational sustainability: – Community involvement - actively listening, seeking community counsel and involvement, and co-creating where appropriate, for energy solutions that provide the best outcomes for our communities. – Cleaner, greener - Improving our shared environment. Every decision with an environmental implication should, at a minimum, do no harm. We take this further by taking active steps to improve the land, natural and built environments, and enhance the liveability of our regional communities. – Aboriginal and Torres Strait Islander commitment - Positive impact on Aboriginal and Torres Strait Islander customers, suppliers, employees and communities. – Regions first - Preference towards local people, goods and services. We will seek local content, local participation and suppliers for our commercial endeavours. Horizon Power delivers its commitment to environmental leadership through delivery of the Proposed Action and other projects by: Prioritising environmental risk assessment and actively seeking environmental impact mitigation strategies early in the planning phase to ensure informed project and operational decision making and continual improvement of our environmental performance. Developing and supporting our people and contractors with the necessary systems, processes, expertise and training to deliver on our environmental commitment. Acknowledging the scientific consensus on anthropogenic climate change, the crucial need for a transition to a net-zero carbon society, and the adaptation required to address emerging and potential climate impacts. – Decarbonisation of our systems by enhancing our technical solutions, products, and infrastructure while ensuring no unacceptable impacts to the environment. – Driving change in supply and procurement practices with a focus on suppliers of generation and energy storage systems providing an assessment of the full life cycle costs (cradle to cradle) of their technology.
b)	If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation	A wide range of comprehensive desktop and field studies have been undertaken within the DE to assess the impact of the Proposed Action. Studies undertaken include: – Protected matter searches – Flora and vegetation surveys (**Appendix A**); and – Terrestrial fauna surveys (**Appendix A**). Potential impacts are described within this document including potential impacts to matters protected by the EPBC Act.

NO.	Principle	Consideration of Principle in the Proposed Action
		Information gathered during the studies has been used to inform the Proposed Action and has reduced any uncertainty surrounding prediction of impacts for the assessment. Horizon Power has ensured that the Proposed Actions design (where possible) avoids serious or irreversible damage to the environment. Mitigation and management measures have been proposed to ensure impacts are environmentally acceptable. This includes the development of an Environmental Management Plan (**Appendix B**).
c)	The principle of intergenerational equity. That the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Proposed Action will ensure the health, diversity and productivity of the environment is maintained through retaining as much habitat as possible and by taking into account the minimisation of environmental impacts where practicable during design and construction of the transmission line. One of the primary aims and benefits of the Proposed Action is to reduce carbon emissions in the NWIS through connection to the renewable energy sources.
d)	The conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making.	Horizon Power will seek to preserve as much of the biodiversity identified within the DE as possible by reducing clearing of native vegetation where practicable. Full rehabilitation of any disturbed areas not required for permanent infrastructure will be undertaken to ensure the required species composition, structure and density of the vegetation is retained.
e)	Improved valuation, pricing and incentive mechanisms should be promoted	Horizon Power acknowledges the need for improved valuation, pricing and incentive mechanisms and will continue to look for opportunities to incorporate these principals into the Proposed Action and other projects. The design for the Proposed Action has followed an iterative process that has aimed to reduce its direct and indirect impacts on flora, fauna, heritage and socio-economics. Mitigation of potential impacts and ongoing management and maintenance activities have been incorporated into the overall project costs.

8 Environmental Record of the Person Proposing to Take the Action

Horizon Power is a regional WA electricity generator and retailer. Horizon Power operates across the full energy supply chain with generation, transmission, distribution and retail services and are currently considering the future of energy in the transition to renewables. Horizon operates under an Environmental Management System (EMS) aligned with ISO14001. Note this draft EMS document is being updated and is currently confidential, and as such, will not be published to the public.

Horizon Power has a history of responsible environmental management, actively managing over 8,400 km of overhead and underground electrical transmission and distribution lines, associated infrastructure and generation assets across a 2.3 million square kilometre service area. No pending proceedings under Commonwealth or State legislation for the protection of the environment are in progress.

9 Other Approvals and Conditions

9.1 Land Planning

The DE covers numerous parcels of land, with the majority being Crown Land (23.7%), followed by Freehold Land (15.3%). Approximately 11.6% of the DE is Reserve Land and 7.9% consists of land reserved as Road. Leased land covers approximately 5.1% of the DE.

As an 'energy operator', Horizon Power has certain rights under Sections 46 and 49 of the Western Australian *Energy Operators (Powers) Act 1979* which allow it to access and use land for the purpose of constructing, maintaining and operating electricity infrastructure. Horizon Power will utilise these powers for the transmission line portion of the works. A management order is being obtained for the Burrup substation.

9.2 Other approvals

Other approvals potentially relevant to this Project are detailed in **Table 9-1**.

Table 9-1. Other Approvals

Other approvals	Assessment
Referral to Environmental Protection Authority (EPA)	Horizon Power referred the Project to the WA Environmental Protection Authority (EPA) under Part IV (Section 38) of the *Environmental Protection Act 1986* (EP Act) in November 2022, as the Project is a significant Proposal that has the potential to impact on one or more of the EPA's key environmental factors. The following EPA factors were considered key environmental factors for the Project: – Flora and Vegetation; – Terrestrial Fauna; and – Social Surroundings. An additional six factors were identified as 'other environmental factors' for the Project, including: – Greenhouse Gas (GHG) Emissions; – Air Quality; – Inland Waters; – Terrestrial Environmental Quality; – Coastal Processes; and – Marine Environmental Quality. It was concluded that all factors can be managed through avoidance and mitigation measures or other regulatory mechanisms to meet the EPA's objectives. The EPA responded on 14 August 2023, confirming that the project does not require further assessment under Part IV of the Act.
EPA - Native Vegetation Clearing Permit	An authorisation under Part V of the EP Act will be required to clear Native Vegetation. A clearing permit application has been submitted and the project is under assessment (CPS 10372/1)
Works Approval or Licence under EP Act	Not required. Not a prescribed premise.
Groundwater or surface water licence under the Rights in Water and Irrigation Act 1914	Not required. Covered under the Energy Operators Powers Act 1979 s42 and s 49.
Notice of Intent to Clear system under the Soil and Land Conservation Act 1945	Not required.
State and municipal heritage	The DE overlaps municipal heritage site, 'Dampier Archipelago (including Burrup Peninsula)' (ID: 25086). The Municipal listing is equivalent to the National Heritage Place listing.

Other approvals	Assessment
	The project is within a Municipal heritage site however no specific approvals are required from the Local Government.
Native title	In the 2005 Ngarluma/Yindjibarndi native title determination (Federal Court Files WAD6017/1996, WAD215/2017, and Tribunal File WCD2005/001) the Court ordered and determined that native title does not exist in relation to the Burrup.
Aboriginal Sites of Significance under the Aboriginal Heritage Act 1972 / Aboriginal Cultural Heritage Act 2021.	No known areas of Aboriginal Cultural Heritage will be impacted by the project. The project area has been covered by 5 heritage surveys and all known sites will be avoided. Unknown sites will be subject to an unexpected finds protocol and Aboriginal heritage monitors will be present on site during ground disturbance works. Horizon Power has undertaken a significant program of works to ensure its existing operational works and future projects are compliant with heritage legislation. These works included the release of a corporate Aboriginal Cultural Heritage Policy in March. As a State Government owned Government Trading Enterprise, Horizon Power understands its obligations under the relevant legislation and seeks to make proactive and sustainable business decisions that positively impact Aboriginal and Torres Strait Islander individuals, communities, and businesses. Additional details on how we approach building respectful and sustainable relationships with Aboriginal and Torres Strait Islander stakeholders and organisations can be found in our Reconciliation Action Plan.

10 Relevant Policies and Publications

10.1 Policies and Publications

An assessment of the potential impacts to the Northern Quoll and the Australian Fairy Tern against the key threats identified in the 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' and the 'National Recovery Plan for the Australian Fairy Tern (*Sternula nereis nereis*)' respectively is outlined in **Table 10-1.** Based on this assessment it is considered that the Proposed Action is not inconsistent with the objectives of the recovery plan.

The following Threat Abatement Plans has been identified as being relevant given the potential threats identified for the EPBC Act listed threatened species that have been identified as known or likely to occur in the DE. An assessment of the Proposed Action in the context of these threat abatement plans is provided in **Table 10-1**.

- Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses (DSEWPaC, 2012b);
- Threat abatement plan for predation by feral cats (DoE, 2015); and
- Threat abatement plan for predation by the European red fox (DEWHA, 2008).

Based on this assessment it is considered that the Proposed Action is not inconsistent with the threat abatement plans.

It is noted that while the Threat Abatement Plan for the biological effects, including lethal toxic ingestion, caused by cane toads is identified as being relevant to Northern Quolls, cane toads are yet to reach the part of Australia where the Proposed Action will be undertaken and as such is not addressed here.

Horizon Power confirmed that the following conservation advice have been considered in relation to protected matters that do not have recovery plans.

- Conservation Advice *Macroderma gigas* Ghost Bat;
- Approved Conservation Advice for *Liasis olivaceus barroni* (Olive Python - Pilbara subspecies);
- Conservation Advice *Falco hypoleucos* Grey Falcon;
- Conservation Advice *Calidris ferruginea* Curlew Sandpiper;
- Conservation Advice *Numenius madagascariensis* Eastern Curlew;
- Conservation Advice *Charadrius leschenaultii* Greater sand plover;
- Conservation Advice *Calidris tenuirostriss* Great knot;
- Conservation Advice *Charadrius mongolus* Lesser sand plover;
- Conservation Advice *Calidris canutus* Red knot; and
- Conservation Advice *Limosa lapponica menzbieri* Bar-tailed godwit (northern Siberian).

Table 10-1. Relevant Recovery Plans and Threat Abatement Plans

EPBC Act Listed Species	Recovery Plan Threats / Threat Abatement Plan Objectives		Response
Northern Quoll	**National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hills and Ward, 2010)**		
	1	Cane toads	The Proposed Action is not expected to exacerbate this threat as Cane toads are not present within the Pilbara. However, the Proposed Action has the potential to increase access to such species if they are introduced in future.
	2	Feral predators	The presence of invasive species including introduced predators and invasive weeds may be exacerbated by the Proposed Action. However, the Proposed Action is not likely to significantly increase impacts due to background levels of invasive species.
	3	Inappropriate fire regimes	The Proposed Action is not expected to exacerbate this threat. As any fires resulting from activities associated with the Proposed Action will be accidental and infrequent, and appropriate fire controls will be in place, the risk of fire as a result of the Proposed Action is expected to be minimal and is not expected to result in a significant decline of the species.
	4	Habitat degradation	Up to 14.4 ha would be required to be cleared as a worst case from the 59.5 ha of potential Northern Quoll foraging, feeding, dispersal, and denning/shelter habitat within the DE. This 59.5 ha includes 42.09 ha of rocky hills with exposed boulder piles habitat, which is considered to be critical to the survival of the Northern Quoll according to the species 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*) (Hill and Ward, 2010). The remaining 17.4 ha is made up of minor drainage lines and hummock grassland on low rocky hills, which is also considered to be habitat critical to the survival of the Northern Quoll given the dispersal habitat present. As described in Section 3.1.1, it should be noted that the loss is a very small proportion of the available denning, foraging and dispersal habitat for Northern Quoll in the immediate vicinity of the DE. The referral guideline for the Northern Quoll outlines that mitigation measures that need to be undertaken when clearing critical habitat for the species. Horizon Power plan on avoiding clearing of the rocky hills with exposed boulder piles critical habitat where possible, however, it is still likely that a small portion of critical habitat will need to be cleared and therefore mitigation measures will be implemented to reduce/offset this loss of habitat. These measures are outlined within the Environmental Management Plan (Appendix B). With the mitigation measures in place and the small amount expected to be cleared, it is not anticipated that clearing associated with the Proposed Action will result in a significant decline in the Northern Quoll species. As such, it is considered that this clearing required for the Proposed Action is not inconsistent with the objectives of the recovery plan.
	5	Habitat destruction	
	6	Weeds	The Proposed Action is not expected to exacerbate this threat. As weed species are known to colonise disturbed areas, such as cleared areas as a result of the Proposed Action, it is expected an increase in weeds could occur. Any increase of weeds as a result of the Proposed Action is not predicted to be significant however, due to the planned mitigation measures (refer to the Environmental

EPBC Act Listed Species	Recovery Plan Threats / Threat Abatement Plan Objectives		Response
			Management Plan) such as biosecurity measures. It is also noted that weeds of particular concern for the Northern Quoll such as Gamba Grass and Mission Grass (due to their large biomass and rigidity potentially inhibiting movement and foraging) are not found within the DE and therefore not expected to be spread by construction activities. Given this, impacts to Northern Quolls as a result of the exacerbated presence of weed species due to the Proposed Action are not expected to occur.
	7	Disease	The Proposed Action is not expected to exacerbate this threat. The 'National Recovery Plan for the Northern Quoll (*Dasyurus hallucatus*)' references the potential for disease to impact Northern Quolls but does not raise any specific diseases as being of particular threat. There is no credible impact pathway associated with the Proposed Action that could result in the introduction of a disease that may cause a decline in the Northern Quoll population.
	8	Hunting	The Proposed Action is not expected to exacerbate this threat. No firearms will be allowed on site during the construction phase.
	9	Population isolation	The Proposed Action is not expected to exacerbate this threat. Given the breaks in this linear clearing along the DE with individual Northern Quoll species able to access adjacent habitat in these breaks therefore is not anticipated to result in population isolation. There is no research into whether Northern Quoll individuals in the region would cross the clearing associated with the existing transmission line, however, a study of a Newman population found that the species would cross roads if they intersected high quality habitat (Henderson, 2015). Therefore, due to the breaks in the maximum clearing extent, the narrow width of clearing required and the possibility that the species can cross the transmission line infrastructure, it is not expected that this fragmentation will result in the isolation of Northern Quoll populations. Given this, the fragmentation is not expected to result in a decline in Northern Quoll populations or significantly impact the recovery of the species
	Threat abatement plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses (DSEWPaC, 2011b)		
	1	Develop an understanding of the extent and spread pathways of infestation by the five listed grasses	The Proposed Action has no relation and will not be inconsistent with this objective.
	2	Support and facilitate coordinated management strategies through the design of tools, systems and guidelines	The Proposed Action has no relation and will not be inconsistent with this objective.
	3	Identify and prioritise key assets and areas for strategic management	The Proposed Action has no relation and will not be inconsistent with this objective.

EPBC Act Listed Species	Recovery Plan Threats / Threat Abatement Plan Objectives		Response
	4	Build capacity and raise awareness among stakeholders	The Proposed Action has no relation and will not be inconsistent with this objective.
	5	Implement coordinated, cost-effective on-ground management strategies in high-priority areas	The Proposed Action has no relation and will not be inconsistent with this objective.
	6	Monitor, evaluate and report on the effectiveness of management programs.	The Proposed Action has no relation and will not be inconsistent with this objective.
Northern Quoll, Pilbara Olive Python, Australian Fairy Tern	**Threat abatement plan for predation by feral cats (DoE, 2015)**		
	1	Effectively control feral cats in different landscapes	The Proposed Action will not be inconsistent with this objective. The presence of invasive species including introduced predators and invasive weeds may be exacerbated by the Proposed Action. However, the Proposed Action is not likely to significantly increase impacts due to background levels of invasive species.
	2	Improve effectiveness of existing control options for feral cats	The Proposed Action has no relation and will not be inconsistent with this objective.
	3	Develop or maintain alternative strategies for threatened species recovery	The Proposed Action has no relation and will not be inconsistent with this objective.
	4	Increase public support for feral cat management and promote responsible cat ownership	The Proposed Action has no relation and will not be inconsistent with this objective.
Ghost Bat, Lesser Sand Plover & Bridled Tern	**Threat abatement plan by predation by European red fox (DEWHA, 2008)**		
	There are no specific objectives identified with the abatement plan. The Proposed Action is not expected to result in the introduction or to significantly increase the number of foxes in the DE and surrounding area and as such is not considered to be inconsistent with the threat abatement plan.		
Australian Fairy Tern	**National Recovery Plan for the Australian Fairy Tern (*Sternula nereis nereis*) (DAWE, 2020)**		
	1	Habitat degradation and loss of breeding habitat	Up to 7.6 ha of critical habitat of mudflat with tidal inundation, mangroves and supportive scattered samphire habitat that may potentially by utilised for foraging will be cleared. With no breeding habitat to be impacted by the Proposed Action.

EPBC Act Listed Species	Recovery Plan Threats / Threat Abatement Plan Objectives		Response
			However, given the species does not rely exclusively to the area within the DE. Records of the DBCA data (2023) shows their presence in islands of Dampier Archipelagos such as Dolphin Island, West Lewis Island. Therefore, the Proposed Action is not expected to impact intertidal mudflats to the extent that the species is likely to decline.
	2	Disturbance	The presence of human activities including construction and operation of the transmission line may be exacerbated by the Proposed Action. However, the Proposed Action is not likely to significantly increase impacts due to existing levels of disturbance within the area.
	3	Invasive species	The Proposed Action will not be inconsistent with this objective. The presence of invasive species including introduced predators and invasive weeds may be exacerbated by the Proposed Action. However, the Proposed Action is not likely to significantly increase impacts due to background levels of invasive species.
	4	Native wildlife	The presence of native species that predate on the Australian Fairy Tern is not expected to be exacerbated by the Proposed Action.
	5	Climate variability and change (e.g. rising sea levels)	The Proposed Action is not expected to exacerbate this threat. One of the primary aims and benefits of the Proposed Action is to reduce carbon emissions in the NWIS through connection to renewable energy sources. Any changes to the climate associated with the Proposed Action is anticipated to be negligible. This risk as a result of the Proposed Action is expected to be minimal and is not anticipated to result in a significant decline of the species.
	6	Water management and increased salinity	The Proposed Action is not expected to exacerbate this threat given the limited amount of water use associated with the operational development. Any changes to water salinity associated with the Proposed Action is anticipated to be negligible. This risk as a result of the Proposed Action is expected to be minimal and is not anticipated to result in a significant decline of the species.
	7	Pollution	The Proposed Action is not expected to exacerbate this threat given the pollution prevention measures that will be implemented during construction (**Section 4**) and the limited potential for pollution during operation of the Proposed Action. Any pollution impacts associated with the Proposed Action are anticipated to be negligible. This risk as a result of the Proposed Action is expected to be minimal and is not anticipated to result in a significant decline of the species.
	8	Hybridisation	The Proposed Action has no relation and will not be inconsistent with this objective.

10.2 Australian International Agreements for Migratory Birds

The EPBC Act is also the key mechanism for meeting Australia's obligations and responsibilities under a number of international agreements. Australia is a signatory to the following international agreements relating to migratory shorebird conservation:

- The Convention on Conservation of Migratory Species of Wild Animals (also known as the Bonn Convention).
- Bilateral agreements for the conservation of migratory birds between the Government of Australia and the Government of Japan (JAMBA), the Government of China (CAMBA) and the Government of the Republic of Korea (ROKAMBA).
- The Convention on Wetlands of International Importance (also known as the Ramsar Convention).

Where species are listed on the above agreements, the species are obligated to be listed as 'migratory' species under the EPBC Act. Once listed as 'migratory' under the EPBC Act, they are afforded the protections offered by the EPBC Act and it becomes an offence under the EPBC Act to kill, injure, take or move the species in Commonwealth areas.

The provisions of the EPBC Act reflect the protections provided to migratory species listed under the above international agreements and includes the prohibition on the taking of these species (except in very limited circumstances). Therefore, as the EPBC Act protects species listed as 'migratory' under the Act, where an action is undertaken in accordance with the EPBC Act, the action is consistent with the above international agreements.

11 Information Sources

The reliability and uncertainties in the technical studies undertaken in preparation of the Proposed Action have been outlined in **Table 11-1**.

Table 11-1. Technical studies undertaken in preparation of the Proposed Action

Reference Source	Reliability	Uncertainties
Woodside Power project – Flora and Vegetation Survey (Desktop Assessment Report) (VLA, 2019)	Information is reliable.	The survey was conducted in an adequate time as indicated in the Scope. The relevant survey area was conducted approximately 12 weeks following rainfall, during an appropriate time. Although 20 mm of rain was received before the survey, it was insufficient for grasslands to recover. Therefore, the southern section of the survey was limited, as a significant portion of the study area being dead or dormant, however this was outside of the DE for the Proposed Action. Due to the dry conditions, the records of weed species and abundance were limited. Over the survey area, PECs and Priority species were recorded, but it may not include all PECs and Priority species within the area. Although there are some limitations regarding the Southern survey area, this area comprises a Power Plant, Solar PV and Transmission Corridor, which is not part of the scope of the Proposed Action and the survey in the DE is considered adequate.
Horizon Power 124-KRT-DMP 132kV Line Upgrade Project (Flora and fauna Survey) (GHD, 2019)	Information is reliable.	The field survey was conducted after the Karratha weather station recorded a total of 77.4 mm of rainfall, three months prior to the survey. The weather conditions and the survey timings were appropriate and there weren't constraints related to access restrictions. Minor survey areas were previously disturbed, such as clearing for vehicle tracks, salt ponds and construction of the existing power lines. However, these disturbances did not limit the biological survey. The survey sampling and intensity were considered adequate. The portion of flora collected and identified was moderate, the grass species, annual and herbs were under-recorded, however, it is unlikely these species would be conservation significant.
Woodside Power Pty Ltd – Hybrid Renewable Power Plant (Fauna Survey) (GHD, 2020a)	Information is reliable.	The survey was conducted relatively late in the season for assessing migratory birds (June and July 2019). Therefore, due to the habitats present in the survey area, some migratory species may not have been identified. There were minor constraints related to access restrictions and previously disturbed areas. Areas not accessed by vehicle and/or on foot were visually assessed from distance to determine habitat presence. Additionally, information gained from the survey was extrapolated across those areas to assist with determining the vegetation and habitat types for the entire survey area. Several disturbed areas observed during the survey include current and historic vegetation clearing pipelines and tracks, as well as some historic grazing. No evidence of recent fire was observed. Fauna habitat quality was not reported in the survey report.
Horizon Power Burrup Expansion Project (Flora and Vegetation Survey) (GHD, 2020b)	Information is reliable.	The survey sampling and intensity were considered adequate, and seasonal conditions were considered satisfactory. The field survey was conducted three months

Reference Source	Reliability	Uncertainties
		after the Karratha weather station recorded a total of 341.8mm of rainfall. The weather conditions recorded during the survey were unlikely to have impacted the survey results. Vascular flora was sampled during the surveys and all taxonomic groups were represented. The portion of flora collected and identified was considered moderate. Previously disturbed areas (clearing for vehicle tracks, salt ponds and construction of existing power lines and power infrastructure) represented minor constraints. Additionally, only one small area had access restrictions due to land ownership and could not be accessed. These constraints did not limit the biological survey.
Technical Memorandum – Rev-0 Burrup Additional Areas Reconnaissance/Basic Survey (GHD, 2022)	Information is reliable.	The supplementary survey was completed in the dry season after winter rainfall. The primary objective of this survey was to expand vegetation mapping, vegetation condition mapping and fauna habitat mapping in previously unsurveyed areas of the DE. The vascular flora and terrestrial vertebrate fauna were surveyed, and no access restrictions or previous disturbances (fire, floor, accidental human intervention) were considered constraints. Fauna and flora were adequately surveyed, and additional opportunistic sampling was undertaken throughout all survey areas.

12 References

Ali, S. and Ripley, S.D., 1983. Handbook of the birds of India and Pakistan: Together with those of Bangladesh, Nepal, Bhutan, and Sri Lanka. (Bombay Oxford University Press).

Armstrong, K. N., 2010. Assessing the short-term effect of minerals exploration drilling on colonies of bats of conservation significance: a case study near Marble Bar, Western Australia. Journal of the Royal Society of Western Australia 93, pg.165-174.

Armstrong, K.M., Anstee, S.D., 2011. The current status of bats in Western Australia. In The Biology and Conservation of Australasian Bats (eds B. Law, P. Eby, D. Lunney & L. Lumsden), pp. 257-269. Royal Zoological Society of New South Wales, Mosman.

Armstrong, K.M., Wilmer, W.J., 2004. The importance of determining genetic population structure for the management of Ghost Bats, Macroderma gigas, in the Pilbara region of Western Australia.

Badman, F.J., 1979. Birds of the southern and western Lake Eyre drainage.

Bamford, M., 1988. Kakadu National Park: A Preliminary Survey of Migratory Waders, October/November, 1987. Royal Australian Ornithologists Union.

Bamford, M., Watkins, D., Bancroft, W., Tischler, G. and Wahl, J., 2008. Migratory shorebirds of the East Asian-Australasian flyway: Population estimates and internationally important sites (p. 237). Canberra: Wetlands International, Oceania.

Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). The New Atlas of Australian Birds. Birds Australia (Royal Australasian Ornithologists Union), Melbourne.

Battley, P.F., T. Piersa, D.I. Rogers, A. Dekinga, B. Spaans & J.A. Van Gils., 2004. Do body condition and plumage during fuelling predict northwards departure dates of Great Knots Calidris teuirostris from north-west Australia? Ibis 146, 46-60.

Bevanger, K. (1998). Biological and conservation aspects of bird mortality caused by electricity power lines: a review. Biological Conservation, 86, 67-76.

Bigg, R., 1981. Oriental Plovers near Newcastle. Australian Birds.

BirdLife International. (2007, May 10). BirdLife. Retrieved February 21, 2022, from https://migratorysoaringbirds.birdlife.org/sites/default/files/BHDTF__Position_Power_Lines_and_birds_2007_05_10_.pdf

BirdLife Australia., 2023. Bird profiles: Numenius madagascariensis – Eastern Curlew, viewed 29 September 2023, https://birdlife.org.au/bird-profiles/far-eastern-curlew/.

BirdLife International., 2023a. Species factsheet: *Thalasseus bergii*, viewed 29 September 2023, http://datazone.birdlife.org/species/factsheet/greater-crested-tern-thalasseus-bergii.

BirdLife International., 2023b. Species factsheet: Falco hypoleucos, viewed 29 September 2023, http://datazone.birdlife.org/species/factsheet/grey-falcon-falco-hypoleucosi.

Birdlife International., 2023c. Species factsheet: Charadrius lescenaultii, viewed 29 September 2023, http://datazone.birdlife.org/species/factsheet/greater-sandplover-charadrius-leschenaultii.

BirdLife International., 2023d. Species factsheet: Calidris tenuirostris. viewed 5 October 2023, http://datazone.birdlife.org/species/factsheet/great-knot-calidris-tenuirostris on 05/10/2023.

BirdLife International., 2023r. Species factsheet: Charadrius mongolus, viewed 29 September 2023, http://datazone.birdlife.org/species/factsheet/greater-sandplover-charadrius-leschenaultii.

Birdlife International., 2023f. Species factsheet: Limosa lapponica menzbieri, viewed 29 September 2023, http://datazone.birdlife.org/species/factsheet/bar-tailed-godwit-limosa-lapponica.

Birdlife International., 2023g. Species factsheet: Tringa nebularia, viewed 29 September 2023, http://datazone.birdlife.org/species/factsheet/22693220.

Birdlife International., 2023h. Species factsheet: Hydroprogne caspia, viewed 29 September 2023, http://datazone.birdlife.org/species/factsheet/caspian-tern-hydroprogne-caspia#:~:text=This%20species%20has%20an%20extremely,of%20locations%20or%20severe%20fragmentation).

BirdLife International., 2023i. Species factsheet: Glareola maldivarum, viewed on 12 October 2023, http://datazone.birdlife.org/species/factsheet/oriental-pratincole-glareola-maldivarum.

BirdLife International., 2023j. Species factsheet: Actitis hypoleucos, viewed on 12 October 2023, http://datazone.birdlife.org/species/factsheet/common-sandpiper-actitis-hypoleucos.

BirdLife International., 2023k. Species factsheet: Gelochelidon nilotica, viewed on 12 October 2023, http://datazone.birdlife.org/species/factsheet/common-gull-billed-tern-gelochelidon-nilotica.

BirdLife International., 2023l. Important Bird Area factsheet: Dampier Saltworks. Downloaded from http://datazone.birdlife.org/site/factsheet/dampier-saltworks-iba-australia on 07/12/2023.

Bishop, K.D., 2006. Shorebirds in New Guinea: their status, conservation and distribution. *Stilt*. 50:103-134.

Blakers, S.J.J.F., Davies, M. and Reilly, P.N., 1984. The Atlas of Australian Birds.

Braithwaite, R.W. and Griffiths, A.D., 1994. Demographic variation and range contraction in the northern quoll, Dasyurus hallucatus (Marsupialia: Dasyuridae). Wildlife Research, 21(2), pp.203-218.

Bransbury, J., 1985. Waders of littoral habitats in south-eastern South Australia. South Australian Ornithologist, 29, pp.180-187.

Bullen, R.D., Reiffer, S. and Trainer, J., 2023. Satellite tracking Ghost Bats (Macroderma gigas) in the Pilbara, Western Australia. RECORDS OF THE WESTERN AUSTRALIAN MUSEUM, 1(010), p.010.

Bureau of Meteorology., 2023. Climate statistics for Australian Locations – Summary statistics Karratha Aero, viewed on 15 September 2023, http://www.bom.gov.au/climate/averages/tables/cw_004083.shtml.

Burnett, S., 1997. Colonizing cane toads cause population declines in native predators: reliable anecdotal information and management implications. Pacific Conservation Biology, 3(1), pp.65-72.

Bush, B. and Maryan, B., 2011. Field Guide to Snakes of the Pilbara, Western Australia. Western Australian Museum.

Cabot, D. and Nisbet, I., 2013. Terns (New Naturalist Library Book 123). Collins, London, UK.

Cardno, 2019. Perdaman urea project – pre- and post-wet Season Biological Survey, viewed on 2 October 2023, https://www.epa.wa.gov.au/sites/default/files/PER_documentation2/Appendix%20B%20-%20Biological%20Survey.pdf.

Chatto, R., 2001. The distribution and status of colonial breeding seabirds in the Northern Territory. Parks and Wildlife Commission of the Northern Territory.

Churchill, S.K., 1991. Distribution, abundance and roost selection of the Orange Horseshoebat, Rhinonycteris aurantius, a tropical cave dweller. Wildlife Research 18, pg.343-353.

Churchill, S.K., 2008. Australian Bats., 2nd edn.(Allen and Unwin: Crows Nest, NSW.).

Clemens, R.S., Haslem, A., Oldland, J., Shelley, L., Weston, M.A. and Diyan, M.A.A., 2008. Identification of significant shorebird areas in Australia: mapping, thresholds and criteria. Birds Australia report to the Australian Government's Department of Environment and Water Resources.

Clemens, R., Rogers, D., Carey, M., & Garnett, S. T. (2021a). Curlew Sandpiper Calidris ferruginea. In S. T. Garnett, & G. B. Baker (Eds.), The Action Plan for Australian Birds 2020 (pp. 287-290). Melbourne: CSIRO Publishing

Clemens, R., Rogers, D., Melville, D. S., Carey, M., & Garnett, S. T. (2021b). Great Knot Calidris tenuirostris. In S. T. Garnett, & G. B. Baker, The Action Plan for Australian Birds 2020 (pp. 277-280). Melbourne: CSIRO Publishing.

Clemens, Rogers, Melville, Carey, & Garnett, C. c. rogersi, (2021c). New Siberian Islands Red Knot Calidris canutus piersmai and North-eastern Siberian Red Knot. Melbourne: CSIRO Publishing.

Clemens, R., Rogers, D., Melville, D. S., Carey, M., & Garnett, S. T. (2021d). Anadyr Bar-tailed Godwit Limosa lapponica anaddyrensis, Alaskan Bar-tailed Godwit L. l. baueri, and Yakutian Bar-tailed Godwit L. l. menzbieri. In S. T. Garnett, & G. B. Baker, The Action Plan for Australia Birds 2020 (pp. 267-271). Melbourne: CSIRO Publishing.

Cogger, H.G., 2000. Reptiles and Amphibians of Australia. Reed New Holland, Sydney. New South Wales, Australia.

Collins, P., Boyle, A., Minton, C. and Jessop, R., 2001. The importance of inland claypans for waders in Roebuck Bay, Broome, NW Australia. Stilt, p.4.

Collins, P., 1995. The Birds of Broome. Broome, Western Australia: Broome Bird Observatory.

Commonwealth of Australia., 2015. Wildlife Conservation Plan for Migratory Shorebirds. Canberra, ACT: Department of Environment.

Cornell Lab of Ornithology. (2023). eBird: An online database of bird distribution and abundance. Retrieved February 20, 2022, from http://www.ebird.org

Cox, J.B., 1988. Some records and notes on the identification of the Oriental Plover. South Australian Ornithologist, 30, pp.120-121.

Cramer, V.A., Armstrong, K.N., Bullen, R.D., Cross, S.L., Gibson, L., Hanrahan, N.,Knuckey, C.G., Ottewell, K., Reiffer, S., Ruykys, L., Shaw, R.E.,Thavornkanlapachai, R., Thompson, S.A., Wild, S., van Leeuwen, S., 2022.

Cramp, S., Simmons, K.L.E., Brooks, D.C., Collar, N.J., Dunn, E., Gillmor, R., Hollom, P.A.D., Hudson, R., Nicholson, E.M., Ogilvie, M.A. and Olney, P.J.S., 1983. Handbook of the birds of Europe, the Middle East and North Africa. The birds of the Western Palearctic: 3. Waders to gulls.

Crawford, D.N., 1972. Birds of Darwin area, with some records from other parts of Northern Territory. Emu-Austral Ornithology, 72(4), pp.131-148.

Crossland, A., 2003. Observations at a breeding colony of Oriental Pratincole (Glareola maldivarium) near Songkla Lake, southern Thailand. Stilt. pp.43:28-29.

CSIRO., 2015. Pilbara Water Resource Assessment – An overview report to the Government of Western Australia and industry partners from the CSIRO Pilbara Water Resource Assessment.

Curran, J.M., T.M. Ellis & I.D. Robertson. (2014). Surveillance of Charadriiformes in Northern Australia shows species variations in exposure to Avian Influenza Virus and suggests negligible virus prevalence. Avian Diseases 58: 199-204.

DBCA, 2023a. Data requested from the from the Department of Biodiversity, Conservation and Attraction's Threatened and Priority Fauna Database. Search requested on 18th of August 2023. Confidential subject to DBCA Conditions of Supply.

DBCA, 2023b. Lands of Interest (DBCA-012). Available at:< https://catalogue.data.wa.gov.au/dataset/dbca-lands-of-interest. Accessed on 22/09/2013

DCCEW, 2023c. Species profile – Liasis olivaceus barroni (Plive Python). Available at: < https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66699#:~:text=Whilst%20the%20home%20ranges%20of,larger%20home%20ranges%20than%20females.>

DCCEW,2023b. Dampier Archipelago (including Burrup Peninsula), Karratha Dampier Rd, Dampier, WA, Australia. Available at: < Australian Heritage Database (environment.gov.au)>

DEC (2013) – see 'Department of Environment and Conservation (2013)'.

del Hoyo, J., Collar, N.J., Christie, D.A., Elliott, A. and Fishpool, L.D.C., 2014. HBW and BirdLife International Illustrated Checklist of the Birds of the World. Volume 1: Non-passerines. Lynx Edicions BirdLife International, Barcelona, Spain and Cambridge, UK.

del Hoyo, J., A. Elliott & J. Sargatal, eds., 1996. Handbook of the Birds of the World. Volume 3. Hoatzin to Auks., pg.411-442.

Delany, S. & D. Scott., 2002. Waterbird Population Estimates. Wetlands International, Wageningen, the Netherlands. Wetlands International Global Series.

Dement'ev, G.P. & Gladkov, N.A., 1951. Bird of the Soviet Union, Volume 3. Jerusalem: Israel Program for Scientific Translations.

Dement'ev, G.P., Birron, A. and Cole, Z.S., 1966. Birds of the soviet union.

Department of Agriculture, Water and the Environment (DAWE)., 2020. National Recovery Plan for the Australian Fairy Tern (Sternula nereis nereis). Department of Agriculture, Water and the Environment, Canberra.

Department of Agriculture, Water and the Environment (DAWE)., 2021. Dasyurus hallucatus — Northern Quoll SPRAT Profile. Species Profile Threats Database.

Department of Biodiversity, Conservation and Attractions (DBCA)., n.a. Pilbara.

Department of Climate Change, Energy, the Environment and Water (DCCEEW)., 2008. Pilbara Region.

Department of the Environment (DoE)., 2015. Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia.

Department of Environment and Conservation (DEC) (2013). Murujuga National Park Management Plan 78, Department of Environment and Conservation, Perth, WA. Department of Climate Change, Energy, the Environment and Water (DCCEEW), 2021, National Heritage Places - Dampier Archipelago (including Burrup Peninsula). Available online: https://www.dcceew.gov.au/parks-heritage/heritage/places/national/dampier-archipelago. Accessed August 2022.

Department of Environment and Energy (DEE)., 2020. Light Pollution Guidelines – National Light Pollution Guidelines for Wildlife.

Department of the Environment, Water, Heritage and the Arts (DEWHA)., 2008. Threat abatement plan for predation by the European red fox. DEWHA, Canberra.

Department of Environment, Water, Heritage and the Arts (DEWHA)., 2010. Survey guidelines for Australia's threatened birds.

Department of Primary Industries and regional Development (DPIRD)., 2004. An inventory and condition survey of the Pilbara region, WA.

Department of Primary Industries and regional Development (DPIRD)., 2013. Soil groups of Western Australia: a simple guide to the main soils of Western Australia (4th edn).

Department of Primary Industries and Regional Development (DPIRD)., 2022. Soil Landscape Mapping.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)., 2011. Survey Guidelines for Australia's Threatened Mammals. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)., 2011b. Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads. Canberra, ACT: Commonwealth of Australia.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)., 2012a. How to use the offset assessment guide. Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), 2012b. Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy.

Department of the Environment, Water, Heritage and the Arts (DEWHA), 2008. Approved Conservation Advice for Liasis olivaceus barroni (Olive Python - Pilbara subspecies). Canberra: Department of the Environment, Water, Heritage and the Arts.

Department of the Environment., 2015a. Conservation Advice Calidris ferruginea curlew sandpiper. Canberra: Department of the Environment.

Department of the Environment., 2015b. Conservation Advice Numenius madagascariensis eastern curlew. Canberra: Department of the Environment.

Department of the Environment., 2015c. Conservation Advice Charadrius veredus oriential sand plover. Canberra: Department of the Environment.

Department of the Environment., 2016. EPBC Act referral guideline for the endangered northern quoll, Commonwealth of Australia.

Department of Water., 2009. The Pilbara coast water study – Hydrogeological record series.

Department of Water., 2010. Millstream Water Reserve – Drinking water source protection plan.

Department of Water., 2013. Pilbara Groundwater allocation plan.

Department of Water and Environmental Regulations (DWER)., 2023. Water Information Reporting.

Dunlop, J.N. and Johnstone, R.E., 1994. The migration of bridled terns Sterna anaethetus breeding in Western Australia. Corella, 18, pp.125-129.

Dunlop, J.N., 2018. Fairy Tern (Sternula nereis) conservation in south-western Australia. Conservation Council of Western Australia: Perth, Western Australia, Australia.

Department of Water and Environmental Regulations (DWER), 2021. Clearing Regulations – Environmentally Sensitive Areas (DWER, 046). Available at: https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046. Accessed on: 22/09/2013.

DWER, 2023. Water Information Reporting. Available at: https://wir.water.wa.gov.au/Pages/Water-Information-Reporting.aspx. Accessed on 23/08/2023.

Environmental Protection Authority (EPA), 2016a. Technical Guidance, Terrestrial Fauna Surveys, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA)., 2016b. Environmental Factor Guideline: Flora and Vegetation. Environmental Protection Authority, Western Australia.

Environmental Protection Authority (EPA)., 2020. Technical Guidance – Terrestrial Fauna Surveys for Environmental Impact Assessment. Environmental Protection Authority, Western Australia.

Fortescue Metals Group, 2018. Eliwana Iron Ore Mine Project [WWW Document] URL Eliwana Iron Ore Mine (epa.wa.gov.au).

Garnett S., T & Crowley G,M., 2000. The Action Plan for Australian Birds. Prepared by the Queensland Parks and Wildlife Service and Birds Australia for Environment Australia.

Garnett, S., Szabo, J., Dutson, G., 2011. The Action Plan for Australian Birds 2010. CSIRO Publishing.

Garstone, R., 1978. Notes on the birds of Pelsaert Island, Abrolhos. Western Australian Naturalist, 14, pp.62-64.

Geering, A., Agnew, L. and Harding, S. eds., 2007. Shorebirds of Australia. CSIRO Publishing.

GHD, 2020c. Yara Pilbara Fertilisers – Renewable Hydrogen Project (Flora and Fauna Survey). Available at: < https://www.epa.wa.gov.au/sites/default/files/PER_documentation2/Appendix%20A%20Flora%20and%20Fauna%20Survey.pdf>

GHD., 2019. 124-KRT-DMP 132kV Line Upgrade Project – Flora and Fauna Survey.

GHD., 2020a. Horizon Power. Burrup Expansion Project Flora and Vegetation Survey.

GHD., 2020b. Hybrid Renewable Power Plant – Fauna Survey.

GHD., 2022. Technical memorandum - Burrup Additional Areas reconnaissance/Basic survey.

Gochfeld, M., Burger, J., Kirwan, G.M. and Garcia, E.F.J., 2016. Common Gull-billed Tern (Gelochelidon nilotica). Handbook of the birds of the world alive. Barcelona: Lynx Edicions.

Gosper, D.E.N.N.I.S. and Holmes, G.L.E.N.N., 2002. Status of birds in the Richmond River district, New South Wales, 1973-2000. Corella, 26(4), pp.89-105.

Government of South Australia (GSA)., 2007. Acid Sulfate Soil Material Guideline.

Government of South Australia (GSA)., 2016. Acid Sulfate Soil Potential. Soil and land fact sheet no.5, Department of Environment, Water and Natural Resources.

Greenwell, C.N., Woehler, E.J., Paton, F., Dunlop, N., Menkhorst, P., Garnett, S.T., Paton, D. and Carey, M., 2021. Australian Fairy Tern Sternula nereis nereis. In The Action Plan for Australian Birds 2020 (pp. 327-330). CSIRO Publishing.

Hall, L., Richards, G., McKenzie, N., Dunlop, N., 1997. The importance of abandoned mines as habitat for bats. In Hales, P., Lamb, D., (eds) Conservation

Hayman, P., Marchant, J. and Prater, T., 1986. Shorebirds: An identification guide to the waders of the world. London; Sydney: 1-412.

Henderson, M., 2015. The effects of mining infrastructure on northern quoll movement and habitat. Edith Cowan University: Perth.

Higgins, P.J. and Davies, S.J., 1996. Handbook of Australian, New Zealand & Antarctic birds. Vol. 3, Snipe to pigeons. Oxford University Press.

Higgins, P.J. and Marchant, S., 1993. Handbook of Australian, New Zealand and Antarctic Birds. Vol. 2: Raptors to Lapwings.

Hill, B.M. and Ward, S.J., 2010. National recovery plan for the northern quoll Dasyurus hallucatus. Department of Natural Resources, Environment, The Arts and Sport, Darwin.

Hindwood, K.A. & A.R. McGill., 1953. The Wood-sandpiper in Australia. Emu. 53:1—13.

How, R.A., Spencer, P.B.S. and Schmitt, L.H., 2009. Island populations have high conservation value for northern Australia's top marsupial predator ahead of a threatening process. Journal of Zoology, 278(3), pp.206-217.

Jaensch, R., 2004. Little curlew and other migratory shorebirds on floodplains of the Channel Country, arid inland Australia, 1999–2004. Stilt, 46, pp.15-18.

Johnstone, R.E. and Storr, G.M., 1998. Handbook of western Australian birds (Vol. 1). Western Australian Museum.

Johnstone, R.E., Burbridge, A.H., Darnell, J.C., 2013. Birds of the Pilbara region, including seas and offshore islands, Western Australia: distribution, status and historical changes. Records of the Western Australian Museum 78, 343–441.

Kruger, T., & Garthe, S., 2001. Flight altitudes of coastal birds in relation to wind direction and speed. Atlantic Seabirds, 203-216.

Kuang, F., Coleman, J.T., Hassell, C.J., Leung, K.S.K., Maglio, G., Ke, W., Cheng, C., Zhao, J., Zhang, Z. and Ma, Z., 2020. Seasonal and population differences in migration of Whimbrels in the East Asian–Australasian Flyway. Avian Research, 11, pp.1-12.

Lantzke, Donald., 2003. Report of an Archaeological Survey of a proposed development at King Bay East, Burrup Peninsula, WA.

Lilleyman, A., Woodworth, B. K., Clemens, R., Rogers, D. I., & Garnett, S. T. (2021). Far Eastern Curlew Numenius madagascariensis. In S. T. Garnett, & G. B. Baker, The Action Plan for Australian Birds 2020 (pp. 264-267). Melbourne: CSIRO Publishing.

Lumsden, L. F., Moloney, P., & Smales, I. (2019). Developing a science-based approach to defining key species of birds and bats of concern for wind farm developments in Victoria. Heidelberg: Arthur Rylah Institute for Environmental Research.

McCrie, N., 1984. Further records of the Oriental Plover and a reassessment of some problems in field identification. S. Aust, Om, 29, pp.106-107.

McGill, A.R. and Keast, J.A., 1945. The Mongolian Sand-Dotterel in Australia. Emu-Austral Ornithology, 44(3), pp.202-216.

McKenzie, N.L. and Bullen, R.D., 2009. The echolocation calls, habitat relationships, foraging niches and communities of Pilbara microbats. Records of the Western Australian Museum, Supplement, 78(1), p.123.

Milne, D.J., Burwell, C.J. and Pavey, C.R., 2016. Dietary composition of insectivorous bats of the Top End of Australia. Australian Mammalogy, 38(2), pp.213-220.

Minton, C., Connor, M., Price, D., Jessop, R., Collins, P., Sitters, H., Hassell, C., Pearson, G., and Rogers, D., 2013. Wader numbers and distribution on Eighty Mile Beach, north-west Australia: baseline counts for the period 1981-2003. Conservation Science W. Aust, 8, pp.345-366.

Minton, C., & Watkins, D., 1993. The 1992 North-west Australia Wader Expedition. Stilt 22, pg.10-12.

Minton, C.D.T., 2002. Personal communication. Australasian Wader Studies Group.

Molina, K.C. and Erwin, M., 2006. The distribution and conservation status of the Gull-billed Tern (Gelochelidon nilotica) in North America. Waterbirds, 29(3), pp.271-295.

Moores, N. (2006). South Korea's shorebirds: a review of abundance, distribution, threats and conservation status. Stilt 50, 62-72.

Morcombe, M.K., 2004. Field guide to Australian birds. Steve Parish Publishing Archer Field Queensland Australia.

Mujuga., 2023. Murujuga National Park.

NSW Government., 2017. Grey Falcon – Profile. Office of Environment and Heritage.

Oakwood, M., 2000. Reproduction and demography of the northern quoll, Dasyurus hallucatus, in the lowland savanna of northern Australia. Australian Journal of Zoology, 48(5), pp.519-539.

Oakwood, M. (2002). Spatial and social organization of a carnivorous marsupial, Dasyurus hallucatus. Journal of Zoology, London. 257:237-248.

Outside Nature Reserves. The University of Queensland, Brisbane. pp. 326-333.

Park, P., 1983. Orielton Lagoon and Sorell wader areas. An Occasional Stint, 2, pp.15-33.

Pearson, D.J., 1993. Distribution, status and conservation of pythons in Western Australia. Herpetology in Australia: A diverse discipline, pp.393-395.

Pearson, D.J., 2006. Giant pythons of the Pilbara. Landscope, 19, pp.32-39.

Pegler, J.M., 198). A brief survey of the water birds in the Shoalhaven-Crookhaven estuary. Australian Birds. 17.pg.38-42.

Peters, K. A., & Otis, D. L., 2007. Shorebird roost-site selection at two temporal scales: is human disturbance a factor? Journal of Applied Ecology, 196-209.

Research priorities for the ghost bat (Macroderma gigas) in the Pilbara region of Western Australia. Australian Mammalogy 45. pg.1-12.

Richards, G.C, Hand, S, Armstrong, K.A, & Hall, L.S., 2008. Ghost Bat *Macroderma gigas*. In the Mammals of Australia. Third Edition, pg. 449-450.

Rogers, D., 1999. Roost choice in the waders of Roebuck Bay: is avoiding heat stress their main consideration. Stilt, 35, p.65.

Rogers, D.I., Collins, P., Jessop, R.E., Minton, C.D. and Hassell, C.J., 2005. Gull-billed Terns in north-western Australia: subspecies identification, moults and behavioural notes. Emu-Austral Ornithology, 105(2), pp.145-158.

Rogers, D.I. and Taylor, I., 2001. Conservation and ecology of migratory shorebirds in Roebuck Bay, North-western Australia. Charles Sturt University.

Rogers, D.I., N. Moores & P.F. Battley (2006). Northwards migration of shorebirds through Saemangeum, The Geum estuary and Gomso Bay, South Korea in 2006. Stilt 50, 73-89.

Rogers, D., Clemens, R., Carey, M., & Garnett, S. T. (2021). Eastern Greater Sand Plover Charadrius leschenaultii leschenaultii. In S. T. Garnett, & G. B. Baker, The Action Plan for Australian Birds 2020 (pp. 247-250). Melbourne: CSIRO Publishing.

Schmitt, L.H., A.J. Bradley, C.M. Kemper, D.J. Kitchener, W.F. Humphreys & R.A. How (1989). Ecology and physiology of the Northern Quoll, Dasyurus hallucatus (Marsupialia, Dasyuridae), at Mitchell Plateau, Kimberley, Western Australia. J. Zool., Lond. 217:539- 558.

Schoenjahn, J., 2018. Adaptations of the rare endemic Grey Falcon Falco hypoleucos that enable its permanent residence in the arid zone of Australia.

Serventy, D.L. and Whittell, H.M., 1976. Birds of western Australia. Perth: University of Western Australia Press.

Simpson, K & Day, P., 2004. Field guide to the birds of Australia. Penguin. Melbourne.

Singor, M., 2021. Shorebird populations from 1995 to 2020 at Woodman Point, Western Australia. The Western Australian Naturalist, 32, pp.14-31.

Snow, D.W., Perrins, C.M., Hillcoat, B., Gillmor, R. and Roselaar, C.S., 1997. The birds of the Western Palearctic.

Stewart, D.A., Rogers, D.I., 2007. Species description. In: Geering, A., L. Agnew & S. Harding, eds. Shorebirds of Australia, pg.75-196. Melbourne: CSIRO Publishing.

Storr, G.M., 1980. Birds of the Kimberley Division, Western Australia (No. 11). Western Australian Museum.

Swan, G., 2005. Occasional count no. 7 - Ashmore Reef, 21 to 30 January 2002. Stilt, 47, pg.26-33.

Threatened Species Scientific Committee (TSSC)., 2005. Commonwealth Listing Advice on Northern Quoll (Dasyurus hallucatus).

Threatened Species Scientific Committee (TSSC)., 2008. Conservation Advice Liasis olivaceus barroni (Olive Python – Pilbara subspecies). Canberra: Department of the Environment, Water, Heritage and the Arts.

Threatened Species Scientific Committee (TSSC)., 2011. Commonwealth Listing Advice on Sternula nereis nereis (Fairy Tern). Department of Sustainability, Environment, Water, Population and Communities.

Threatened Species Scientific Committee (TSSC)., 2016b. Conservation Advice Macroderma gigas ghost bat. Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC)., 2016c. Conservation Advice Charadrius leschenaultia greater sand plover. Canberra: Department of the Environment.

Threatened Species Scientific Committee (TSSC)., 2016d. Conservation Advice Charadrius mongolus Lesser Sand Plover. Canberra: Department of Agriculture, Water and the Environment.

Threatened Species Scientific Committee (TSSC)., 2016e. Conservation Advice Calidris canutus Red Knot. Canberra: Department of Agriculture, Water and the Environment.

Threatened Species Scientific Committee (TSSC)., 2016f. Conservation Advice Calidris tenuirostris Great Knot. Canberra: Department of Agriculture, Water and the Environment.

Threatened Species Scientific Committee (TSSC)., 2020. Conservation Advice Falco hypoleucos Grey Falcon. Canberra: Department of Agriculture, Water and the Environment.

Threatened Species Scientific Committee., 2016a. Conservation Advice Limosa lapponica menzbieri Bar-tailed godwit (northern Siberian). Canberra: Department of the Environment.

Tutt, M., Fekete, S., Mitchell, S., Brace, P. and Pearson, D., 2004. Unravelling the mysteries of Pilbara Olive Python ecology. Threatened Species Network Community Grants Final Report–Project WA11, 101.

van Dyck, S, Strahan, R. (Eds.)., 2008. The Mammals of Australia, 3rd edition. Reed New Holland, Sydney, NSW.

WA Museum., 2010. A Biodiversity Survey of the Pilbara Region of Western Australia, 2002-2007.

Watkins, D., 1993. A National Plan for Shorebird Conservation in Australia. RAOU Report Series. 90.

Waugh, J., 1988. An Oriental Pratincole in Tasmania. Stilt, 12, pg.58-60.

Wiersma, P., 1996. Charadriidae (Plovers) species accounts. In: del Hoyo, J., A. Elliott & J. Sargatal, eds. Handbook of the Birds of the World. Volume 3. Hoatzin to Auks. Pg.411-442. Barcelona: Lynx Edicions.

Wilson, S., Swan, G., 2003. A Complete Guide to Reptiles of Australia. Reed New Holland, Sydney

Woinarski, J.C., Burbidge, A.A. and Harrison, P.L., 2014. The action plan for Australian mammals 2012. CSIRO publishing.

Woinarski, J.C.Z., Williams, R.J., Price, O. and Rankmore, B., 2005. Landscapes without boundaries: wildlife and their environments in northern Australia. Wildlife Research, 32(5), pp.377-388.

Appendix A: Ecological Surveys

VLA, 2019. Desktop Assessment Report – Flora and Vegetation Surveys.

WOODSIDE POWER PROJECT
FLORA AND VEGETATION SURVEYS
DESKTOP ASSESSMENT REPORT

JULY 2019

Prepared for Woodside Power Pty Ltd

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WOODSIDE POWER PROJECT
FLORA AND VEGETATION SURVEYS

Prepared for:
Woodside Power

Job No: VLA-056

Reference No: vla56rv01_Rev B_150819

Revision Status

Rev	Date	Description	Author(s)	Reviewer
A	20/03/2019	Desktop Draft Issued for Internal Review	P Aylmore	V Long
B	15/08/2019	Draft Issued for Client Review	P Aylmore / V Long	F Hannon
0	3/12/2019	Final Report	P Aylmore / V Long	F Hannon

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Abbreviation	Definition
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BESS	Battery Energy Storage System
BOM	Bureau of Meteorology
°C	Degrees Celsius
DBCA	Department of Biodiversity, Conservation and Attractions
DBNGP	Dampier Bunbury Natural Gas Pipeline
DEC	Department of Environment and Conservation
DoEE	Department of the Environment and Energy
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
ha	hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometers
m^2	Meters squared
mm	Millimeters
Main Roads	Main Roads Western Australia
MGA50	Map Grid of Australia
MNES	Matters of National Significance
MSIA	Maitland Strategic Industrial Area
NAC	Ngarluma Aboriginal Corporation
NOx	Nitrous Oxide Emissions
P	Priority
PEC	Priority Ecological Community
PP	Power Plant
Solar PV	Solar Photovoltaic Farm
SOx	Sulfur Dioxide Emissions
sp.	Species (singular)
subsp.	Subspecies
T	Threatened
TEC	Threatened Ecological Community
TO	Traditional Owner
TPFL	Threatened and Priority Flora Database (administered by DBCA)
TP List	Threatened and Priority Flora List (administered by DBCA)
WA Herb	Western Australian Herbarium
WC Act	*Wildlife Conservation Act 1950*
WoNS	Weeds of National Significance

Table of Contents

List of Figures

List of Tables

List of Appendices

1. INTRODUCTION

1.1 Project Background

Woodside Power Pty Ltd (Woodside) is proposing to establish a Hybrid Renewable Power Plant (the Proposal), located approximately 15 km south-west of Karratha, Western Australia (WA) (Figure 1). The proposal will generate and supply electricity to third party industrial customers on the Burrup Peninsula.

The Proposal will generate electricity from a large scale solar photovoltaic farm (Solar PV Farm), complemented by a high efficiency gas-fired power plant (Gas Power Plant). This hybrid generator will ensure that a consistent energy supply is provided. The Gas Power Plant is proposed to be located at the Maitland Strategic Industrial Area (MSIA) with the Solar PV Farm located on the adjacent MSIA Industrial Buffer Area (Buffer Area). The electricity generated will be transported along a 31 km transmission corridor, via overhead transmission lines with up to three interposing substations on the Burrup Peninsula for distribution to third party industrial customers. The substations will include a Battery Energy Storage System (BESS) to provide increased electrical system stability as a spinning reserve.

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

Vicki Long and Associates (VLA) was engaged by GHD on behalf of Woodside, to undertake a single season, reconnaissance (previously known as Level 1) flora and vegetation survey of the development envelope (Gas Power Plant, Solar PV Farm and Transmission Corridor) defined in this document as the "Survey Area" (Figure 1). The flora and vegetation survey has been undertaken to support the referral of the Proposal to the EPA and DoEE.

1.2 Scope and Objectives

The scope of work was to undertake the following:

- A Level 1 desktop and reconnaissance flora and vegetation survey for the Survey Area to assess and record the vegetation communities present, the vegetation condition, weeds species and the location of any vegetation or flora of conservation significance.

The flora and vegetation assessment included:

- A desktop assessment to review existing information for the Survey Area (at a local scale) to determine the likelihood of occurrence of conservation significant species and communities. The desktop assessment included a review of all available data including databases, existing studies and geospatial information, including but not limited to the following:

- A review of existing flora and vegetation surveys available for the study area, to understand the vegetation communities present (e.g. dominant species, common Families and diversity).
- A review of the Department of the Environment and Energy (DoEE) Protected Matters database to identify species and communities listed under the EPBC Act potentially occurring within the survey area.
- A review of the Department of Biodiversity Conservation and Attractions (DBCA) NatureMap database for flora species previously recorded within a 40 km buffer of the study area.
- A review of DBCA Threatened and Priority Ecological Communities (TECs and PECs) and threatened and priority flora databases. These databases were used to identify conservation significant communities and flora species present within the survey areas and surrounds, which are contained in DBCA records.
- Previous broad scale vegetation mapping of the survey area (Beard (1975); Trudgen (2002)) and land system mapping.
- Aerial photography, geology/soils and hydrology information: these datasets were reviewed to provide background information on the variability of the environment and likely vegetation types.

- Preparation of a final report which addresses the tasks outlined above, relevant contextual information, methodology, timing and limitations for the flora and vegetation survey.

1.3 Guidance and Legislation

1.3.1 Survey Guidance

The Environmental Protection Authority (EPA) provides guidance on flora and vegetation surveys to ensure that adequate data are obtained to an appropriate standard:

- *Technical Guidance - Flora and Vegetation surveys for Environmental Impact Assessment* (EPA 2016).

The guidance document provides advice on:

- survey preparation and desktop assessment;
- determining the type of survey required;
- sampling techniques and survey design; and
- data analysis and reporting.

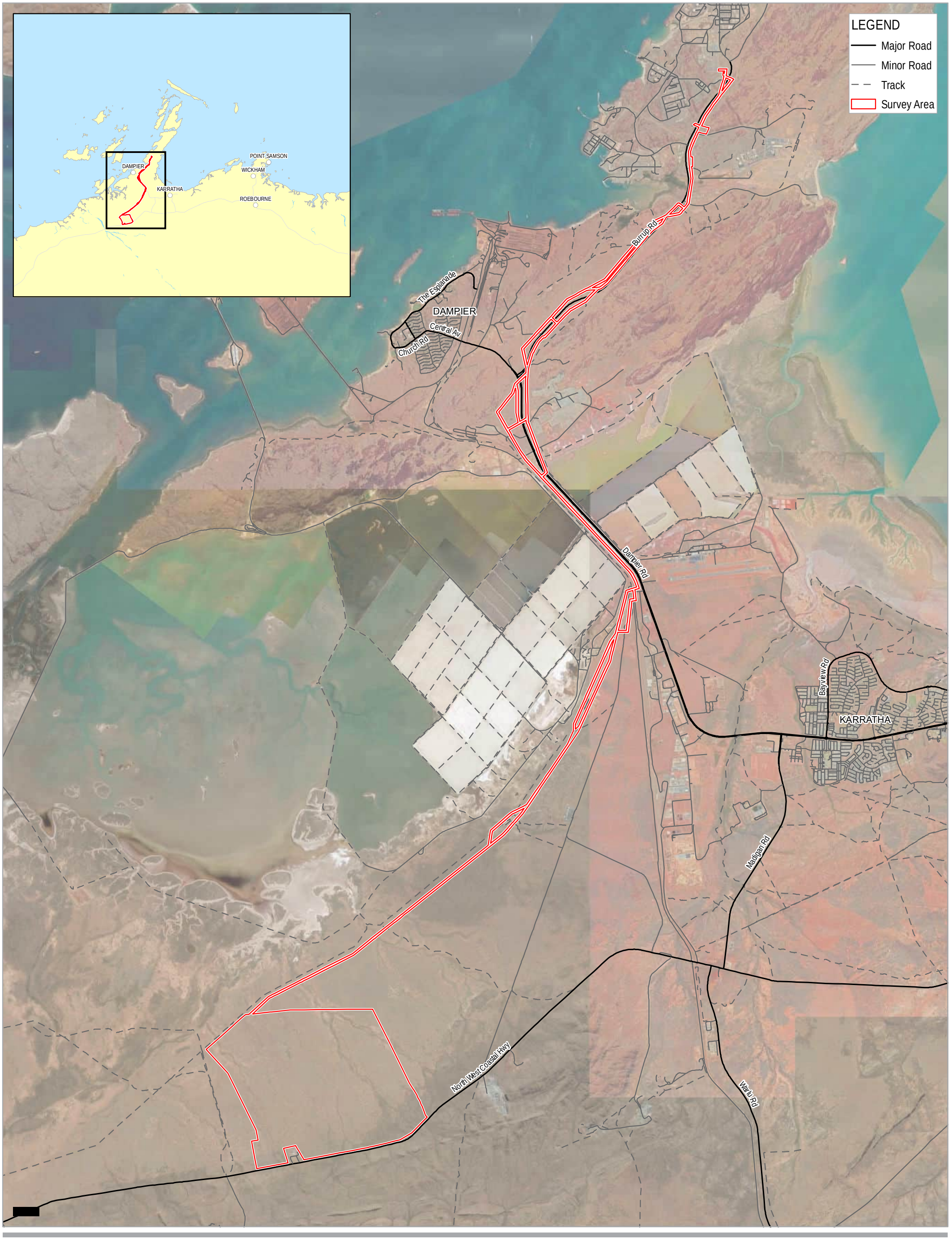
1.3.2 Flora and Vegetation Protection

Flora and vegetation within Western Australia are protected by a range of legislative and non-legislative instruments. A short description of these is provided in Table 1. Definitions for categories of conservation significant species and ecological communities are provided in Appendix A.

Table 1. Flora and vegetation protection - Legislation and Guidance

Legislation and Guidance	Description
COMMONWEALTH	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act provides a legal framework to protect and manage Matters of National Environmental Significance (MNES), which includes Threatened Ecological Communities (TECs) and Threatened Species (DoEE 2019a, DoEE 2019b). Under the EPBC Act, the Commonwealth Department of the Environment and Energy (DoEE) lists threatened species and communities in categories determined by criteria set out in the Act. These categories are summarized in Table A.1 and A.2 in Appendix A. Projects likely to cause a significant impact on MNES should be referred to the DoEE for assessment under the EPBC Act.
Weeds of National Significance (WONS)	The Australian Government along with the State and Territory governments has endorsed 32 WONS, each of which has a national strategy. WONS must be reported and are regarded the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.
WA STATE	
Biodiversity Conservation Act 2016 (BC Act)	The BC Act came into effect in January 2019 to provide for the conservation and protection of biodiversity and biodiversity components in Western Australia; repealing the WC Act. The BC Act provides for native plant species to be specially protected when they are under identifiable threat of extinction, are rare, or otherwise in need of special protection (Table A.3 - Appendix A). (Department of Biodiversity, Conservation, and Attractions (DBCA) 2018a). Such specially protected flora is considered under the BC Act to be 'declared rare' (Threatened). The BC Act also provides for the statutory listing of Threatened Ecological Communities (TECs) by the Minister for Environment. The Department of Biodiversity, Conservation and Attractions (DBCA) lists WA TECs endorsed by the Minister as protected according to their need (DBCA 2018b). The categories of these TECs and PECs are given in Table A.4 and A.5 in Appendix A.
DBCA Priority Lists	The DBCA lists 'Priority' flora that have not been assigned statutory protection as Declared Rare or 'Scheduled' under the WC Act (DBCA 2019b). Flora assessed as Priority 1-3 are in urgent need of further survey. Priority 4 flora require monitoring every 5-10 years and Priority 5 flora are subject to a specific conservation program. Priority flora are categorized according to level of threat and other information; the conservation categories area described in Table A.6 in Appendix A. The DBCA also maintains a list of Priority Ecological Communities (PECs) which identifies ecologically valuable communities that need further investigation before possible nomination for TEC status (DBCA 2019a).
Environmental Protection Act 1986 (EP Act)	Threatened Flora and TECs are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. Exemptions for a clearing permit do not apply in an ESA.

Legislation and Guidance	Description
Biosecurity and Agriculture Management Act 2007 (BAM Act)	Pests may be 'Declared' by the Minister for Agriculture under the BAM Act 2007. The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under BAM Act. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties. Declared pest categories and listed weeds species' priority rankings are presented in Table A.7 in Appendix A.
Informal Recognition of Flora	Certain populations or communities of flora may be of local significance or interest because of their patterns of distribution and abundance (i.e. range extensions or unusual species composition). Many species are also in decline because of threatening processes (land clearing, grazing, changed fire regimes), and relict populations of such species assume local importance for the DBCA.



Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Location of the Woodside Power Project Survey Area

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

FIGURE 1

G:\61\37808O5\GIS\Maps\Working\Report Figures\613780805_Fig1ProjectLocation_Rev0.mxd
Print date: 27 Nov 2019 - 11:58

Data source: GHD: Survey area - 20190719; Landgate: Roads - 20190128, Imagery: 20180408 (accessed: 20190730). Created by: afeeney

2. METHODS

2.1 Desktop Assessment

The purpose of the desktop assessment is to gather contextual information and to identify potential flora and vegetation prior to the field survey.

2.1.1 Physical Environment

A desktop assessment was undertaken of the physical factors of the region and the local area, including climate, geology, land systems, soils, and hydrology. Unusual or restricted geological features (e.g. outcropping, distinctive soil types or hydrological features) were identified and targeted during the survey as they may support significant/unique flora and vegetation to the area.

Database searches included GeoVIEW (Geology 1:50,000, DMIRS 2019), Bureau of Meteorology (Climate Data Online, BoM 2019), Soil Landscape Mapping (DPIRD-027), Soil Landscape Mapping - Systems (DPIRD-064), as well as aerial photography and satellite imagery.

2.1.2 Vegetation

An evaluation of known and likely vegetation within the Survey Area was based on an assessment of regional and local mapping and databases, including:

- Statewide Vegetation Mapping (Beard 1975)
- Regional vegetation mapping (Trudgen 2002)
- EPBC Act List of Threatened Ecological Communities (Protected Matters Search Tool, DoEE 2019c)
- DBCA threatened and priority ecological communities' databases (DBCA 2019c)
- Recovery Plans and other reports/documents containing information on the preferred habitats and distributions of TECs of relevance to the survey areas
- Survey reports or references in the region or locality.
- General environmental databases to identify environmental values of the area and further site characteristics:
    - GeoVIEW to identified geology types for the Survey Area (DMIRS 2019)
    - NationalMap (Commonwealth of Australia 2019)
    - Environmental Planning Tool (WALGA 2019)
    - Locate (via SLIP and Landgate) (Government of Western Australia 2019a)
    - DBCA - Lands and Waters of Interest (DBCA 2018c)
    - DBCA - Legislated Lands and Waters (DBCA 2018d)

2.1.3 Flora

An evaluation of flora known within the area was undertaken to help develop an understanding of dominant flora species, typical families and potential diversity. The desktop flora assessment output consisted of an inventory of known and/or expected flora species within a 20km radius of the Solar PV Farm and Power Plant survey areas and a 5km radius of the Transmission Corridor, based on the following database searches:

- EPBC Act listed Threatened Flora (DoEE 2019a)
- DBCA's Threatened and Priority Flora databases (DBCA 2019b)
- NatureMap custom reports of recorded species in the locality (DBCA 2019d)
- FloraBase (Western Australian Herbarium 2019)
- Survey reports or references in the region or locality.

A 20 km database search radius was used instead of the standard 40 km search radius because the survey habitat, particularly that of both the Burrup Peninsula and Roebourne Plains grasslands, are unique. A larger radius search would identify species from the surrounding Ranges which are not relevant to this specialised habitat.

Details of the database searches conducted are summarised in Table 2 and the search results are presented in Appendix B.

Table 2. Database searches undertaken

Database	Search focus	Search area
Department of the Environment and Energy Protected Matters Search Tool (DoEE 2019b)	MNES – Flora	20 km buffer around coordinates -20.81552 116.67903
Threatened and Priority Flora Database (TPFL) (DBCA 2019b)	Listed threatened and priority flora	20 km radius around survey area shapefiles provided
Western Australia Herbarium Flora Database (WA Herb) (WA Herbarium 2019)		20 km radius around survey area shapefiles provided
Threatened and Priority Ecological Communities Database DBCA 2019c)	Listed threatened and priority ecological communities	20 km radius around survey area shapefiles provided
NatureMap (DBCA 2019d)	Flora of conservation significance	20 km buffer around coordinates -20.81552 116.67903

2.1.4 Introduced Flora

Flora and vegetation surveys undertaken by Trudgen (2002) and Long (numerous surveys), identified a number of introduced flora species as having the potential to occur within the proposed survey areas and surrounds. These species were compared to the Department of Primary Industries and Regional Development list, to determine if any have been listed as declared pests under the BAM Act 2007 (Department of Primary Industries and Regional Development 2019), and the WONS list (Australian Weeds Committee 2012). Introduced flora categories are presented in Appendix A.

2.1.5 Environmentally Sensitive Areas

A search for Environmentally Sensitive Areas (ESAs) in the vicinity of the survey area was conducted using the DBCA Legislated Lands and Waters, and Lands and Waters of Interest datasets (DBCA 2018c, 2018d).

2.2 Field Survey

The flora and vegetation surveys were conducted by VLA's Principal Botanist Vicki Long between the 3 and 5 June 2019 (northern section) and the 22 and 23 July 2019 (southern section). Due to access restrictions in the southern survey areas, only the Transmission Corridor alignment from the Burrup Substation to the Causeway on Dampier Highway (northern section) was able to be surveyed in early

June. Access to the southern survey areas, from south of the Causeway to the proposed Gas Power Plant and Solar PV Farm sites was available in July 2019.

The methods adopted for the flora and vegetation survey were formulated, as far as practicable, in context with:

- EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (Environmental Protection Authority 2016);

Information acquired during the desktop assessment assisted in the design of the field surveys. The survey locations were clearly delineated on aerial imagery, produced both as hard paper copies and on a field Trimble. Previously recorded conservation significant flora records and associated habitat preference information assisted in identifying vegetation types and habitats within the survey locations that have the potential to support conservation significant flora.

The National Vegetation Information System (NVIS) (ESCAVI 2003) is the nationally adopted classification system used for vegetation description for EIA in Western Australia.

Broadly, the 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.

2.2.1 Northern survey area

Forty-seven relevés, approximately equating to 50 m x 50 m each were assessed on the northern part of the alignment (Burrup Substation to the Causeway on Dampier Highway). Site selection was based on the review of aerial photography, ground truthing of habitat and vegetation boundaries in the field (according to Trudgen 2002) and distinct changes of vegetation type as encountered. The following information was collected for each relevé:

- Survey area name and site number
- Date
- Photo number
- Approximate size of area
- Location – coordinates taken using a handheld GPS (MGA50, GDA94) at SE and NW corners.
- Species - vascular plant species present, including weed species.
- Foliar cover – the estimated percentage cover for each species.
- Vegetation condition – assessed according to the vegetation condition scale adapted from Trudgen (1988) in The Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) (Table C.1, Appendix C).
- Habitat - a broad description of the surrounding landscape based on landform, topography and soil.
- Disturbance - records of any obvious disturbances such as fire (and estimated fire age), tracks, weed infestation, or grazing.
- Priority flora (or any suspect Priority flora) and the respective GPS location

- Photographs - a photograph was taken of each relevé.

For the northern survey area, local scale vegetation units have been described at NVIS Level V which is termed 'vegetation type' and classified according to the Aplin (1979) modification of the vegetation classification system of Specht (1970) (Table C.2, Appendix C). Vegetation type mapping is presented in Appendix D and vegetation condition mapping in Appendix E.

The northern area reconnaissance survey allowed for PECs and Priority flora to be recorded within relevés and opportunistically, beyond relevés. These records indicated where PECs and Priority flora were most likely to be found and once a decision on the final alignment is made, a targeted search will be conducted to obtain actual numbers of both species and communities of conservation significance.

2.2.2 Southern survey area (Power Plant, Solar PV and Transmission Corridor)

The majority of the southern survey area Transmission Corridor and the entire area of the proposed Gas Power Plant and Solar PV Farm leases consisted of Roebourne plains grassland, which, depending on associated species present and gilgai type, contains both Priority 3 and Priority 1 Ecological Communities (PECs). Identification of these PECs relies on live, identifiable component grass species, other than the persisting perennial *Eragrostis xerophila* (Roebourne Plains grass). It was immediately obvious that, due to the dry conditions, these associated species could not be identified in the field during the July survey, and that the southern section would require a follow up wet season survey. Therefore, this current survey only recorded vegetation types based on species present. Vegetation types were recorded for 36 inspection sites along the Transmission Corridor and throughout the larger Gas Power Plant and Solar PV Farm areas. These descriptions did not include PECs which could not be identified.

At each inspection site, the following was recorded:

- Site number
- GPS co-ordinates
- Vegetation (based on dominant species identifiable at the time)
- Condition.

Species were identified in the field by Principal botanist Vicki Long. Any species not able to be identified in the field were collected, labelled and pressed for later identification by Vicki Long (utilising the Pilbara Regional Herbarium) or sent to the WA Herbarium. Priority species identified in the field or any suspected Priority species were located with GPS, photographed and collected for confirmation / identification by the WA Herbarium.

2.3 Limitations

A review of any limitations that may have affected a complete assessment of the data collected from the desktop assessment and field surveys is presented in Table 3. The limitations listed are based on those suggested as considerations in EPA's Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016).

Table 3. Statement of limitations

Potential limitation	Statement regarding potential limitations	Constraint
(i) Sources of information and availability of contextual information Is the region well documented?	Previous biological surveys have been conducted in the broader regional area, and broad-scale information is available from Beard (1975) and van Vreeswyk 2004. More specifically, Trudgen (2000, 2001) conducted a detailed survey and mapping of the Burrup Peninsula, and numerous surveys for the resource industry have been conducted by the author (Astron Environmental) from 1999 to 2019. The southern section was also surveyed and well documented for the establishment of the Maitland Heavy Industrial Estate (AGC Woodward-Clyde 1994, Mattiske, 1994) and later Astron Environmental (2002). Therefore contextual information for this project is not a limiting factor for this survey.	Nil
(ii) Scope The level of survey and detail required to undertake the survey. Was there adequate time to complete the survey to the desired standard?	There was adequate time to complete the reconnaissance flora survey as indicated in the Scope. Over the Northern Survey Area PECs and Priority species were recorded within relevés, as well as opportunistically, but this did not include all PECs and Priority Species that may be present. A targeted search following adequate rainfall will address this. Similarly, due the dry conditions not all weed species may have been present, and of those that were, abundance was difficult to estimate. Time for a reconnaissance survey, as per the scope, was not considered a limiting factor. In the Southern Survey Area, it was not possible to record Priority Species or PECs due to the dry conditions of the coastal grasslands; the Scope could not be completed to the level of survey required.	Northern Survey Area - Nil Southern Survey Area Major

Potential limitation	Statement regarding potential limitations	Constraint
(iii) Proportion of flora and fauna identified, recorded and/or collected Was the survey sampling, timing and intensity considered adequate? Was the survey conducted at what was considered an appropriate time of the year for plant identification? Were any taxonomic groups considered to be under-represented?	Summer rainfall was well below average (Section 3.3.1), however the many protected rocky areas in the northern section (Burrup) housed many annuals which had not been expected, given the limited rainfall. The first survey (3-5 June) was conducted approximately 12 weeks following rainfall, giving annuals time to establish and flower. Ephemerals and short lived annual grasses were generally dead, but often still detectable. It was considered that flora recorded during the northern survey was representative of species expected on the Burrup. Some short lived ephemeral species expected to occur in this area were not recorded. However, none of these ephemeral species would be categorized as Priority species. Burrup Rockpile PECs were able to be recorded within the context of PEC information available and the Botanist's knowledge. It is considered that it was an appropriate time to survey the northern section of the Burrup. The southern section was surveyed later between the 22 and 23 July, due to access restrictions. Although 20 mm of rain was received on 21 June 2019, this was insufficient for grasslands to recover. Additionally, these grasslands respond to summer rainfall, not winter rainfall. Timing was not considered appropriate for survey of the Roebourne Plains grassland, nor for identification of the probable PECs which occur there. Grasses were either dead or had died back to rootstock. Identification of the Roebourne grassland PECs relies on sound identification of the variety of grass species that comprise the PEC which was not possible during the July survey. A second survey following adequate summer rainfall is necessary.	Northern Survey Area – Nil Southern Survey Area - Major
(iv) Completeness Is there further work which may be required i.e. was the relevant area fully surveyed?	The northern survey area was considered adequately surveyed to compile representative lists of species, as well as describe vegetation at a level appropriate for management decisions. The southern survey area was not considered adequately surveyed due to the dry condition of the grasslands and the inability to identify component grass species, due to dormancy or die back to rootstock. A second survey following summer rainfall is necessary.	Northern Survey Area – Nil Southern Survey Area - Major
(v) Mapping reliability Were the aerial photographs, satellite images and site maps available considered adequate to fully understand the area surveyed? Was the mapping generated considered to have a high degree of reliability?	Colour aerial photography at a scale of 1:5,000 was used to locate the survey areas and to assist in navigation and delineation of vegetation boundaries. The aerial photography was of good resolution and, in general, accurately represented ground conditions. As such mapping reliability was not considered a limiting factor.	Nil

Potential limitation	Statement regarding potential limitations	Constraint
(vi) Timing When was the survey conducted in terms of season, rainfall, severe weather events etc. Was the survey conducted at an appropriate time for access, observation of the optimal suite of species and for identification of flowering and fruiting species?	See (iii) above – grassland surveys must be conducted following adequate summer rainfall.	Northern Survey Area – Nil Southern Survey Area - Major
(vii) Disturbance Had the survey area been impacted by any disturbance which may have limited the survey, i.e. fire, flood, accidental human intervention etc.?	The alignment in the northern section of the survey area is for all of its length paralleled by Burrup Road, two different gas pipeline alignments, a power line alignment and other off road tracks. Whilst the surveyed alignment is parallel to and not within these areas, it has been impacted by weeds (primarily buffel grass and kapok) from surrounding areas. Some surveyed areas were free of weeds, but the majority have some weed presence. None of these disturbances limited the survey, but need to be noted. The Dampier to Bunbury Natural Gas pipeline (DBNGP) runs in close proximity to, but does not directly impact the proposed Transmission Corridor. However, indirect impacts in the form of weeds at various densities, are apparent along the pipeline in some areas. The larger Power Plant and Solar PV proposed lease areas are not significantly impacted by the DBNGP but the areas have been subject to heavy grazing in the past. Neither of these were considered a limitation to the survey.	Nil
(viii) Intensity In retrospect, was the intensity considered to be adequate?	The intensity of the survey was considered adequate for the northern section to compile representative species lists. Intensity was not considered a limiting factor for the northern section. Intensity was not adequate in the southern section due to a significant portion of the study area, grasslands, being too dead/dormant to be identifiable.	Northern Survey Area – Nil Southern Survey Area - Major
(ix) Resources Were the appropriate tools and materials available to complete the task effectively?	Resources were adequate to complete the survey and all appropriate tools and materials required to complete the task were available. Resources were not considered a limiting factor.	Nil

Potential limitation	Statement regarding potential limitations	Constraint
(x) Access Were there any factors limiting access to the survey area?	The northern section survey area was able to be accessed by a short walk in from Burrup Road. Access for the majority of the northern survey area is not considered a limiting factor for the northern section. The southern section included the large areas of the Power Plant and Solar PV neither of which could, for most of the area, be accessed easily from existing tracks. Areas of apparently different vegetation were assessed from aerial photographs and each was walked into and surveyed at various points. The lack of access was not a limiting factor.	Nil
(xi) Experience Were personnel undertaking the field survey and plant identification trained and/or experienced in undertaking the required tasks?	The botanist responsible for undertaking the field survey has considerable experience (34 years) in conducting vegetation and flora surveys in the local Karratha area. The identification of specimens brought back from the field was conducted either by the lead field botanist or by botanists at the WA Herbarium. Personnel experience was not considered a limiting factor.	Nil

3. RESULTS

3.1 Desktop Assessment

3.1.1 Physical Environment

3.1.1.1 Climate

The climate of the Pilbara region of Western Australia is classified as arid tropical with two distinct seasons: a hot, wet summer (October to April) and a mild, dry winter (May to September) (Bureau of Meteorology 2019).

Based on long-term climatic data from the nearest Bureau of Meteorology weather station at Karratha Airport (Station 004083), approximately 12 km south of the survey area, the mean annual rainfall since 1972 is 297 millimeters (mm) (Figure 2). . The mean maximum temperatures range between 26.3°C in July and 35.9°C in January, and average above 30°C for much of the year (Bureau of Meteorology 2019).

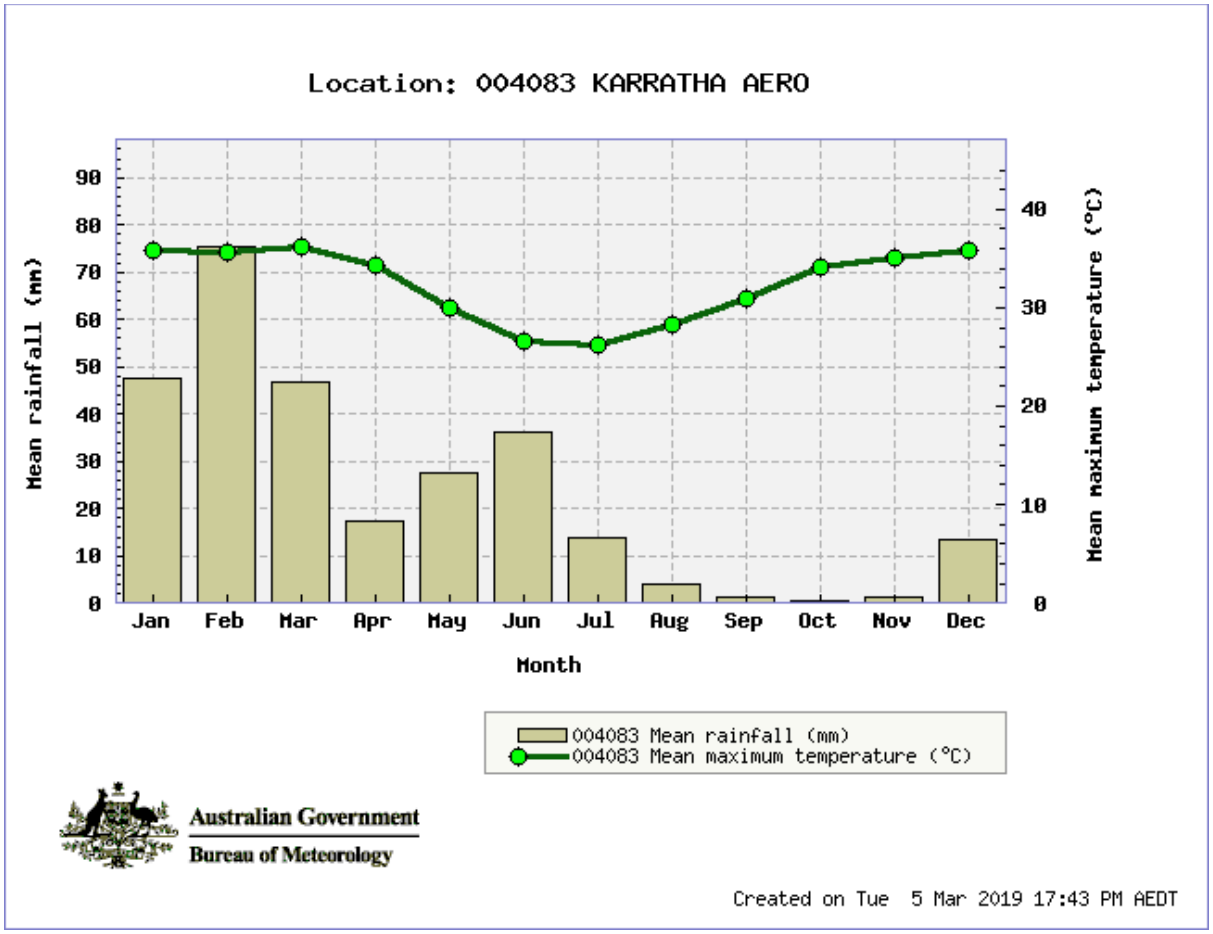


Figure 2. Climate data for Karratha Aero (Station 004083). Mean annual rainfall data has been calculated from 1972 - 2019 and mean maximum temperature has been calculated from 1993-2019 (Bureau of Meteorology 2019)

3.1.1.2 Geology

The surface geology of the survey area is comprised of a number of units (Stewart et al. 2008) (Table 4).

Table 4: Surface geology within the survey area (Stewart et al. 2008)

Geological name	Label	Description	Survey Area Location
Alluvium	Qaa	Sand and gravel in rivers and creeks; clay, silt and sand in channels on floodplains	Drainage lines within the Power Plant, Solar PV and southern section of the Transmission Corridor
Sheetwash	Qwb	Sheetwash sand, silt and clay in distal outwash fans, with gilgai surface in areas of expansive clay	Within the Power Plant and Solar PV areas and within sections of the southern Transmission Corridor
Ferricrete	Czrf	Ferruginous duricrust and pisolitic ironstone on lateritic surface	Sections of the southern Transmission Corridor
Calcrete	Czrk	Massive, nodular, and cavernous limestone, variably silicified; residual origin	Sections of the southern Transmission Corridor
Gidley Granophyre	AyG	Fine- to medium-grained granophyre; commonly porphyritic; underlain by gabbro	Majority of the northern Transmission Corridor
Silt and Mud	Qhmu	Silt and mud in supratidal to intertidal flats and lagoons	Small section of the northern Transmission Corridor, just north of the causeway
Granite to Granodiorite	AgDm	Locally seriate; includes biotite-rich phases, leucocratic syenogranite and pegmatite veins; metamorphosed.	Northern Transmission Corridor
Eolian sand	Qs	Red-yellow wind blown sand; local sand ridges	Small section of the northern Transmission Corridor, just north of the causeway.

3.1.1.3 Land Systems

The Western Australian rangelands have been surveyed by the Department of Primary Industries and Regional Development (previously the Department of Agriculture) with subsequent reports identifying the condition of soils, landforms, vegetation, habitat and the presence of declared plants and animals. Land systems across the surveyed areas were classified according to predominant biophysical features. The Pilbara region was surveyed between 1995 and 1999 with 102 land systems mapped (van Vreeswyk et al. 2004).

The survey area occurs within the Horseflat (Power Plant, Solar PV, Transmission Corridor), Boolgeeda (southern section of Solar PV), Littoral (Transmission Corridor), Calcrete (Transmission Corridor) and Granitic (Transmission Corridor) land systems. Descriptions of the land systems are given below.

- **Horseflat**: Gilgaied clay plains supporting tussock grasslands and minor grassy snakewood shrublands. They consist of depositional surfaces of clay plains, stony plains, narrow linear drainage depressions and dissected slopes marginal to the River land system; mostly internally drained.
- **Boolgeeda**: Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands. Predominantly deposition surfaces of very gently inclined stony slopes and plains becoming almost level further downslope

- **Littoral**: bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches. Depositional surfaces of saline coastal flat, and estuarine and littoral surfaces with extensive bare saline tidal flats subject to infrequent tidal inundation, slightly higher samphire flats and alluvial plains, mangrove seaward fringes with dense branching patterns of shallow tidal creeks, minor coastal dunes, limestone ridges, sandy plains and beaches.
- **Calcrete**: Granitic: rugged granitic hills supporting shrubby hard and soft spinifex grasslands.
- **Granitic**: rugged granitic hills supporting shrubby hard and soft spinifex grassland

3.1.1.4 Surface Water and Hydrology

The Survey Areas lie within the Coastal Catchment of the Port Hedland Coast Basin and do not fall within a Public Drinking Water Source Area (Government of Western Australia 2019a).

The survey areas lie within a *Rights in Water and Irrigation Act* (RIWI) Groundwater Proclamation Area (Pilbara Groundwater Area) and a RIWI Surface Water Proclamation Area (Pilbara Surface Water Area) (Government of Western Australia 2019a).

3.1.1.5 Wetlands

No wetlands of international importance (i.e. Ramsar wetlands) or nationally important wetlands occur within or near the survey area (DoEE 2019d).

3.1.1.6 Conservation Reserves

The Pilbara bioregion has 7.75% of its land area under some form of conservation tenure. The Roebourne PIL04 subregion in which the survey area is located has 9.56% of its area reserved. The Roebourne subregion contains the Cane River, Mount Minnie and Barlee Range Conservation Parks, a number of island Nature Reserves, a portion of the Millstream – Chichester National Park and Murujuga National Park (Kendrick and Stanley 2001).

No conservation reserves occur within the survey area. One national park (Murujuga National Park), one unnamed nature reserve and six unnamed Section 5(1)(h) reserves are located within a 20 km radius from the survey area (Table 5) (DBCA 2018d).

Table 5: Conservation Reserves located within a 20 km radius of the survey area (DBCA 2018d).

Reserve name	Classification	Distance from closest point of survey area (km)
Murujuga National Park	National Park	0.3
Unnamed (R 36915)	Nature Reserve	5.6
Unnamed (R 36907)	Section 5(1)(h) Reserve	9.3
Unnamed (R 36909)	Section 5(1)(h) Reserve	11.5
Unnamed (R 36910)	Section 5(1)(h) Reserve	13.3
Unnamed (R 38287)	Section 5(1)(h) Reserve	18.3
Unnamed (R 32144)	Section 5(1)(h) Reserve	19.2
Unnamed (R 37089)	Section 5(1)(h) Reserve	19.8

3.1.1.7 Environmentally Sensitive Areas

There are no Environmentally Sensitive Areas (ESA) as defined by the Native Vegetation Clearing Regulations within the Survey Area. The closest ESAs are located approximately 20km north of the Solar PV Farm and Gas Power Plant areas, on East Lewis and West Lewis Islands and 10km north-east of the Burrup Substation, in Murujuga National Park.

3.1.2 Vegetation

3.1.2.1 Interim Biogeographic Regionalisation of Australia (IBRA 7)

The Interim Biogeographic Regionalisation for Australia (IBRA version 7) divides the Australian continent into 89 bioregions and 419 subregions (Department of the Environment and Energy 2012). The IBRA regions represent a landscape-based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna. The survey area occurs in the Pilbara Bioregion, of which 5% to 10% is represented in the national reserve system (Department of the Environment and Energy 2016).

The biodiversity of the 53 subregions recognised in Western Australia was documented as part of a national audit to provide priorities for conservation action (Department of Conservation and Land Management 2002). The survey area occurs within the Roebourne subregion of the Pilbara region and is described in the audit as:

- Roebourne PIL 4 – Quaternary alluvial and older colluvial coastal and sub-coastal plains with vegetation described as grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of Acacia species and ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, *Sporobolus* and mangal occur on marine alluvial flats and river deltas (Kendrick and Stanley 2001).

3.1.2.2 Pre-European Vegetation

The Pre-European vegetation mapping of Western Australia dataset maps original natural vegetation presumed to have existed prior to European settlement. Beard (1975) completed broad-scale (1:1,000,000) pre-European vegetation mapping at an association level.

The pre-European vegetation association units mapped within the survey area include:

- 117 (Abydos Plain – Roebourne); hummock grassland, grass steppe; soft spinifex *Triodia* species (Shepherd, Beeston, and Hopkins 2002; Government of Western Australia 2019b)
- 589 (Abydos Plain – Roebourne); Short bunch-grass savanna / Grass-steppe
- 127 (Abydos Plain – Roebourne); Tidal mud flat

The extent of each of the pre-European vegetation units found in the survey areas is summarized in Table 6.

Table 6: Extent of pre-European vegetation in the survey area (Government of Western Australia 2019b).

Vegetation association	Mapping unit (Beard 1975)	Current extent in subregion PIL04 (ha)	Pre-European extent (ha) in subregion PIL04 (ha)	Proportion of pre-European extent remaining (%) in subregion PIL04 (ha)	Pre-European extent with formal protection (%)in subregion PIL04 (ha)
Abydos Plain – Roebourne	117	46,901	50,962	92.0%	32.5%
	589	671,327	675,392	99.4	1.78
	127	159,024	177,179	89.75	0.01

3.1.2.3 Threatened and Priority Ecological Communities

No State or Commonwealth listed TECs are known to occur within the vicinity of the survey area (DBCA 2019c).

Northern Survey Area

Two PECs have previously been recorded for the Burrup Peninsula (Northern Transmission Corridor and Substation sites)

- *Burrup Peninsula rock pile communities* (P1) pockets of vegetation in rock piles, rock pockets and outcrops. Comprises a mixture of Pilbara and Kimberley species, communities are different from those of the Hamersley and Chichester Ranges. Includes short-range endemic land snails. and
- *Burrup Peninsula rock pool communities* (P1): calcareous tufa deposits. Habitat for interesting aquatic snails.

Both Burrup PECs are under threat from industrial development, dust emissions, recreational impacts, possibility of NO_X and sulfur dioxide (SO_X) emissions and weed invasion, including **Cenchrus ciliaris* (buffel grass), **Aerva javanica* (kapok) and **Passiflora foetida* (stinking passionflower).

The location of the PECs in the northern survey area identified from the DBCA database search are presented in Figure 3.

Southern Survey Area

Several PECs are associated with the Roebourne subregion:

- Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays (P1) (eastern section of the Transmission Corridor in the southern survey area, close to the causeway)
- Horseflat land system of the Roebourne plains (P3) (northern section of the Power Plant / Solar PV survey area and/or surrounds)

The 'Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays' (Roebourne Plains gilgai grasslands) PEC (P1) are self-mulching and emerge on depositional surfaces. The Roebourne Plains gilgai grasslands occur on microrelief of deep cracking clays, surrounded by clay plains /flats and sandy coastal and alluvial plains. The gilgai depressions supports ephemeral and perennial tussock grasslands dominated by Sorghum sp. and *Eragrostis xerophila* (Roebourne Plains

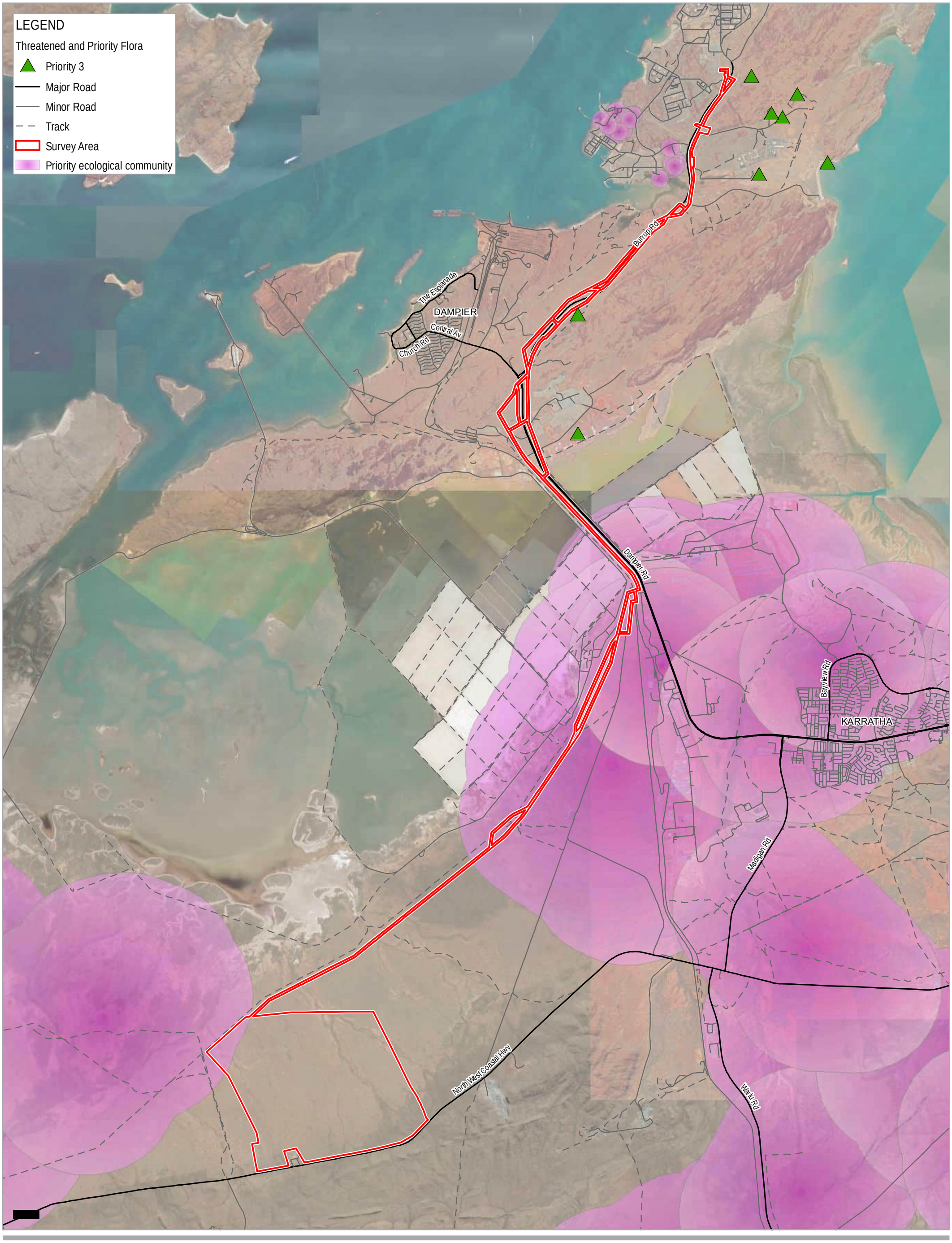
grass) along with other native species including *Astrebla pectinata* (barley mitchell grass), *Eriachne benthamii* (swamp wanderrie grass), *Chrysopogon fallax* (golden beard grass) and *Panicum decompositum* (native millet). They are restricted to the Karratha area but a large proportion of this PEC has been removed during the development of the Gap Ridge Light Industrial Estate.

The Horseflat land system PEC, has been subject to varying degrees of degradation resulting from historical clearing and weed invasion. The Horseflat land system PEC does not include the P1 PECs 'Roebourne plains gilgai grasslands' and the "Chenopod association of the Roebourne Plains area' and is described as:

The Horseflat Land System of the Roebourne Plains are extensive, weakly gilgai clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include *Eragrostis xerophila* (Roebourne Plains grass) and other *Eragrostis* spp, *Eriachne* spp and *Dicanthium* spp. The community also supports a suite of annual grasses including *Sorghum* spp and rare *Astrebla* spp. The community extends from Cape Preston to Balla Balla surrounding the towns of Karratha and Roebourne.

The 'Chenopod association of the Roebourne Plains area' PEC (P1) is currently only mapped as occurring near Roebourne Airport (DBCA 2019c). Recent work by VLA (V Long pers comm) has mapped occurrences of it closer to Karratha, hence it is known to occur within 10 km of the survey area.

The location of the PECs in the northern and southern survey areas identified from the DBCA database search (2019c) are presented in Figure 3.



Paper Size ISO A3

0 0.5 1 1.5 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Conservation Significant Flora and Communities

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

Figure 3

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Print date: 27 Nov 2019 - 11:55

Data source: GHD: Survey area - 20190719; DBCA: Cons Sig Flora, Threatened Ecological Community - 20190612; Landgate: Roads - 20190128, Imagery: 20180408 (accessed: 20190730). Created by: afeeney

3.1.3 Flora

3.1.3.1 Conservation Significant Flora

Database searches of NatureMap (DBCA 2019d), the DBCA Threatened and Priority Flora (DBCA 2019b), and the WA Herbarium Threatened Flora Databases (WA Herbarium 2019) as well as the DoEE protected matters database (DoEE 2019c) were undertaken to determine whether any Threatened or Priority flora are known from within a 5 km radius of the Transmission Corridor and a 20km radius of the Power Plant and Solar PV survey areas. There were no threatened flora species or species listed as MNES under the EPBC Act reported within 20 km of the survey areas.

The literature review and database searches identified 15 previously recorded conservation significant species in proximity of the Survey Area. Of the 15 conservation significant species recorded, five P3 and one P4 species were recorded less than 2km from the Transmission Corridor on the Burrup Peninsula and three P3 species were recorded less than 2km from the Transmission Corridor in the southern survey area, near the causeway.

A summary of the database search results, including conservation significant flora, is presented in Appendix B.

3.1.3.2. Determination of Likelihood of Occurrence of Conservation Significant Species within the Survey Areas

Potential habitat types were identified prior to conducting the field survey using aerial imagery. The conservation significant flora species listed in the database search results were then categorised according to the criteria in Table 7 which were used by VLA to assess potential occurrence within the survey area.

Table 7.Likelihood of occurrence of conservation significant flora criteria.

Likelihood of Occurrence	Desktop Criteria
Likely	o Species has been recorded before in survey area or within 10 km of the Survey Areas o Known to be present in the Survey Areas based on site observations (expert advice) o Species has been recorded within the same habitat as occurs in the Survey Areas
Potential	o Species has been recorded within 20 km of the Survey Areas o Species reported as known in the Survey Areas by local community o Species has been recorded within the same habitat type as occurs in the Survey Areas.
Unlikely	o Species has not been recorded within 20 km of the Survey Areas o No suitable habitat occurs in the Survey Areas

Of the 15 conservation significant species identified from the database searches as occurring within proximity of the survey area, the pre-survey desktop assessment indicated that five species are considered as being 'likely to occur', four with the 'potential to occur' and the remaining six as 'unlikely to occur' in the survey locations (Table F.1, Appendix F).

Following the surveys, the conservation significant flora species identified during the desktop assessment as having the highest potential to occur within the survey locations, but not recorded during the current survey, will be assessed to determine their likelihood of occurrence within the

survey locations. Post-field survey likelihood will be primarily based on validating the presence of suitable habitats within each of the survey locations, combined with life form, habitat and flowering information for each flora species.

3.1.4 Introduced Flora

Trudgen M., (2002) recorded fourteen weed species during the 2000 survey. Long V. (various numerous surveys) has recorded twenty-three weed species, predominantly associated with areas of industry and Burrup road verge. A further 25 weeds have been recorded in the Karratha area and have the potential to invade the Burrup Peninsula.

Five Declared Plants (listed under the BAM Act 2007) and WONS species (**Jatropha gossypifolia, *Lantana camara, *Parkinsonia aculeata, *Opuntia stricta and *Tamarix aphylla*) are represented in the area, but not yet recorded on the Burrup Peninsula. One plant (*Tribulus terrestris*) not currently a WONS species has been recorded on the Burrup. It is regarded as a 'Pest' plant but is not 'Declared'.

Table 8 indicates weeds recorded on the Burrup (B) and also weeds recorded in the Karratha area with the potential to invade the Burrup.

Table 8 Weeds recorded on the Burrup Peninsula (Long 1986-2019) and in the Karratha area with potential to invade the Burrup Peninsula.

Scientific Name	Common Name	B	Scientific Name	Common Name	B
Achyranthes aspers	Chaff flower	+	*Malvastrum americium*	Spiked malvastrum	+
Aerva javanica	Kapok bush	+	*Merremia dissecta*	Hairy merremia	
Albizia lebbeck	Rain tree		*Nerium oleander*	Oleander	
Alternanthera pungens	Khaki weed		***Parkinsonia aculeata*	Parkinsonia	
Arundo donax	Giant reed		***Opuntia stricta*	Common prickly pear	
Bidens bipinnata	Binpinnate beggartick	+	*Passiflora foetida*	Stinking passionflower	+
Calotropis procera	Calotropis, Rubber plant		*Pennisetum setaceum*	Fountain grass	+
Cenchrus ciliaris	Buffel grass	+	*Phoenix dactylifera*	Date palm	+
Cenchrus setiger	Birdwood grass	+	*Phyllanthus tenellus*	Phyllanthus	
Cenchrus enchinatus	Mossman river grass		*Physalis angulata*	Wild gooseberry	+
Clitorea ternata	Butterfly pea		*Raphanus raphanistrum*	Wild radish	
Chloris barbata	Purple top chloris	+	*Rumex vesciarius*	Ruby dock	+
Conyza sumatrensis	Tall fleabane	+	*Schinus terebinthidfolia*	Japanese pepper	
Cotoneaster pannosa	Cotoneaster	+	*Sonchus asper*	Prickly sow thistle	
Dactyloctenium aegyptium	Coastal button grass		*Sonchus oleraceus*	Milk thistle	+
Digitaria ciliaris	Summer grass	+	*Solanum nigrum*	Nightshade	+
Euphorbia hirta	Strawberry weed	+	*Stylosanthes hamata*	Carribbean stylo	+
Gossypium hirsutum	Upland cotton		*#Tamarix aphylla*	Athel pine, tamarisk	
***Jatropha gossypifolia*	Belly ache bush		*Typha sp*	Bull rush	+

Indigofera oblongifolia			*Tecoma stans*	Tecoma	
Indigofera sessliliflora		+	*Trianthema portulacastrum*	Giant pigweed	+
Lactuca saligna	Wild lettuce		*Tribulus terrestris*	Caltrope	+
***Lantana camara*	Lantana		*Tridax procumbens*	Tridax	+
Leucaena leucocephala	Lead tree, coffee bush		*Washingtonia filifera*	Cotton palm	
Macroptilium atropurpureum	Siratro				

** Declared plants and WONS species represented in the region but not currently found on the Burrup Peninsula
# Declared plant and a WONS species.

3.2 Literature Searches and Reviews

3.2.1 Northern Survey Area

The most recent and comprehensive studies of the flora and vegetation of the Burrup Peninsula and adjacent islands were undertaken by Trudgen and Griffin (2001) and Trudgen (2002). These reports included descriptions of the plants surveyed and their habitats, floristic groups and the presence of geographically restricted, rare and newly identified plants in the area. Vegetation mapping of the peninsula (with the exception of immediate coastline vegetation) has also been undertaken at a scale of 1:5 000 (Jackson, Paling, and Stoddart 2006).

A total of 393 vascular plant species were identified as occurring on the Burrup Peninsula and adjacent islands with the area displaying a rich flora for its size, and a high number of geographically restricted or uncommon species (Trudgen 2002).

Some 200 vegetation associations (now referred to as vegetation types) were identified on the Burrup Peninsula alone and Trudgen (2002) concluded that vegetation of the Burrup Peninsula is unique from that of the surrounding area due to a combination of geology, microclimates and episodes of isolation from the mainland at times of higher sea level. Trudgen (2002) mapped the occurrence of all vegetation associations identified during the Burrup survey on a scale of 1-100+. He used seven frequency categories, 1, 2-4, 5-9, 10-24, 25-49, 50-99 and 100+. This map is useful in assessing the regional significance of individual vegetation types. Trudgen (2002) suggests that ten or fewer occurrences of any vegetation association should be treated as significant especially if those occurrences are not represented in areas designated for conservation on the Burrup Peninsula.

Table 9 lists vegetation associations with <9 occurrences that occur along the proposed Transmission Corridor in the northern section. These would be considered, due to the low number of occurrences, to have high conservation value and be vulnerable to any development within the area.

Table 9. Description of Vegetation Associations known to occur along the Transmission Corridor northern survey area which have a high conservation value.

Trudgen Vegetation Code	Description	**Comments from 2019 Survey**
Frequency 5-9 known occurrences on the Burrup – High Conservation Value		
AbCgTe	*Acacia bivenosa, Cassia glutinosa* open shrubland to shrubland over *Triodia epactia* (Burrup form) hummock grassland (can be some **Cenchrus ciliaris*).	Not recorded in this survey
AiImTe	*Acacia inaequilatera, Acacia bivenosa, Grevillea pyramidalis* subsp *pyramidalis* scattered tall shrubs to high open shrubland over *Indigofera monophylla* (Burrup form), scattered low shrubs to low shrubland over *Triodia epactia* (Burrup form) hummock grassland.	Due to dry conditions *Indigofera monophylla* was not a key component in the vegetation therefore this vegetation type was not recorded as such but as AiTe (BaTs)
AiFdTe	*Acacia inaequilatera, Hakea chordophylla, Grevillea pyramidalis* subsp *pyramidalis* scattered shrubs to open shrubland over *Corchorus walcottii* scattered low shrubs over *Triodia epactia* (Burrup form) dense hummock grassland over *Fimristylis* aff *dichotoma* (M75-4) low open sedgeland.	Not recorded – *Fimbristylis dichotoma* is a very short lived annual and was not present (or not in abundance). This was mapped as AiTe (BaTs)
EvAa	*Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus, Eriachne tenuiculmis, Triodia angusta* (Burrup form) sedgeland and tussock/hummock grassland.	Not recorded as *Acacia ampliceps* was not found as a key component in any of the *Eucalyptus victrix* areas surveyed.
ChThSg	*Corymbia hamersleyana* low open woodland to scattered low trees over *Themeda sp* Burrup (B84), *Triodia epactia* (Burrup form) tussock hummock grassland with *Stemodia grossa* low very open herbland.	Not recorded this survey due to the abundance of *Themeda triandra* which was present but not a key component of the *Corymbia hamersleyana* vegetation present. Due to dry conditions, *Stemodia grossa* was not as abundant as it may present following sufficient rainfall. Following rainfall this may split as a different vegetation type of VLA ChAbTe. However VLA considers the *Corymbia* woodland to be of conservation value as stated in Section 3.3.2.2 below
Frequency 2-4 known occurrences on the Burrup -Very High Conservation Value		
AbImTe/TeRm	*Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophylla* (Burrup form) scattered low shrubs to low open shrubland over *Triodia epactia* (Burrup form) hummock grassland to closed hummock grassland with *Rhynchosia* cf. *minima* lianes. .	This is a difficult combination to assess -AbImTe was recorded but the combination of *Triodia epactia / Rhynchosia* minima was not present due to the drier conditions.

Trudgen Vegetation Code	Description	**Comments from 2019 Survey**
BaTsTh	*Brachychiton acuminatus, Terminalia supranitifolia* low open woodland over *Ipomoea costata, Dichrostachys spicata* shrubland over *Themeda* sp Burrup (B84), *Triodia epactia* (Burrup form) tussock/hummock grassland.	The outstanding component of this vegetation is the inclusion of *Themeda triandra* grassland – this was not abundantly present during the 2019 survey and did not warrant being included as a major vegetation component.
EvTaTh	*Eucalyptus victrix* low woodland to low open forest over *Acacia coriacea* subsp *coriacea* scattered shrubs over *Dichrostachys spicata, Stylobasium spathulatum* scattered shrubs to open heath over *Triodia angusta* (Burrup form), *Themeda* sp Burrup (B84) hummock tussock grassland with *Dicliptera armata* open herbland.	Comments regarding *Themeda triandra* as above - mapped as EvAcTa in 2019
GpRmTsTe	*Grevillea pyramidalis* subsp *pyramidalis* scattered shrubs over *Triumfetta appendiculata* (Burrup form) low open shrubland over *Triodia epactia* (Burrup form) hummock grassland with *Rhynchosia* cf *minima* lianes with *Tephrosia* af *supina* (MET12, 357) herbland.	Key component species *Rhynchosia minima* and *Tephrosia supina* were not present (or in very low numbers) and did not warrant inclusion in the vegetation description.

These all occur immediately adjacent to the eastern side of Burrup Road.

Of these nine vegetation associations, seven would be very difficult to fully identify and compare with the Trudgen description due to the current dry conditions and consequent dormancy of at least major component of the vegetation.

Welker Environmental Consultancy (Welker) (2002) reviewed the statistical analysis of Trudgen and Griffin (2001) in order to provide advice on areas of the Burrup Peninsula that may require special consideration in development planning (Jackson, Paling, and Stoddart 2006). Welker (2002) concluded that the vegetation of the Burrup Peninsula should be considered a different floristic sub-region of the west Pilbara, with a high level of conservation value at a regional level.

The vegetation within the mainland portion of the MSIA includes tussock and hummock grasslands not represented on the Burrup, but widespread on the Abydos Plain (Astron Environmental, 2002).

3.2.2 Southern Survey Area

A flora and vegetation survey of the Maitland Industrial Estate was conducted by Mattiske in 1994.

Thirty four vascular plant species, including two introduced species from 16 families and 30 genera, were recorded for Karratha Station and the proposed transmission corridor. The species composition was dominated by the families of Poaceae, Mimosaceae and Papilionaceae (Mattiske 1994). (NOTE: Papilionaceae and Mimosaceae have now been grouped together as Fabaceae).

The two species recorded during the Mattiske (1994) survey as being Priority species *Brachychiton acuminatus* and *Triumfetta appendiculata* are no longer listed as Priority species.

The species composition from this area during the Mattiske (1994) survey was particularly low, due to the poor conditions of the rangeland.

Mattiske (1994) described the area as a relatively flat, coastal plain characterised by hummock grasslands of *Triodia pungens* (now identified as *Triodia epactia*) and tussock grasslands of *Eragrostris xerophila* with low-lying areas dominated by the grass *Xerochloa barbata* and seasonal ephemerals. Emergent shrubs of *Acacia inequilateral, Acacia coriacea* and *Hakea suberea* (now known as *Hakea lorea*) occur in drainage lines.

Table 10 summarises the plant communities identified in the Mattiske (1994) survey and compares them with those identified by VLA in this survey

Table 10. Comparison of Mattiske (1994) Vegetation Units with VLA (2019) Vegetation Units

Site No	Mattiske (1994) Mapping	Comments from 2019 Mapping
K1	Sandy surfaced alluvial plain of hummock grassland of *Triodia pungens* and tussock grassland of *Eragrostis xerophila* with scattered shrubs and trees of *Acacia coriacea, Acacia inequilatera, Hakea subarea*. Some parts severely degraded and eroded.	Matches VLA AbTeEx vegetation type. Note that *Triodia pungens* is not *T. epactia*
K2	Mosaic of tussock grassland of *Eragrostis xerophila* and depressions of *Xerochloa barbata* with seasonal ephemerals on weakly gilgaied soils.	This probably matches VLA Ex spp – to be determined following wet season. VLA mapped this currently as *Eragrostis xerophila* tussock grassland with intrusions of *Eriachne benthamii* and grass species currently not identifiable (spp). It may be that *Xerochloa barbata* is more abundant following rains.
K3	Mosaic of tussock grassland of *Eragrostis xerophila* and hummock grassland of *Triodia pungens* and *Triodia wiseana* with depressions of *Xerochloa barbata* with seasonal ephemerals on weakly gilgaied soils	VLA described this as two separate vegetation types, TW (*Triodia wiseana)* and *Eragrostis xerophila* but in reality they can be mapped as a mosaic over the larger areas.
K4	Coastal mudflats of Chenopods such as *Halosarcia halocnemnoides* ssp. *halocnemnoides*, *Halosarcia indica* ssp.*leiostachya, Muellerolimon salicorniaceum* and grasses such as *Eragrostis xerophila* and *Sporobolus virginicus*	Coastal mudflats were not part of the survey area, however one borrowed area with retained water did house *Tectornia* (was *Halosarcia* – pending identification) This area does not match coastal mudflats.
K5	Sandy coastal plain of hummock grassland of *Triodia pungens* and *Triodia wiseana* with littoral drainage of Chenopods. Some parts severely eroded and degraded.	This habitat not included in the survey area.

3.3 Flora and Vegetation Survey

The single season, reconnaissance flora and vegetation survey was undertaken over a period of three days during June 2019, for the northern survey alignments (Burrup Substation to Causeway) and three days during July 2019, for the southern survey (Solar PV Farm, Gas Power Plant and southern Transmission Corridor).

The survey was conducted by lead Botanist, Vicki Long who has considerable experience in identifying both flora and vegetation and introduced flora of the Eremaean Zone and specifically, 34 years' experience, working on the Burrup Peninsula. The surveys were undertaken in accordance with the requirements of the Scope of Works as outlined in Section 1.2. Representatives of the Ngarluma Aboriginal Corporation (NAC) accompanied the field botanist for the southern section.

A total of 47 relevés were made throughout the northern survey area (Figure 1) and these resulted in the identification of 15 Broad Floristic Formations (NVIS Level 3) and 23 Vegetation Types (NVIS Level 5). These are summarised in Table 11.

Thirty six inspection points were made along the southern section Transmission Corridor, the proposed Solar PV Farm and Gas Power Plan, resulting in the identification of 18 Level 3 Broad Floristic Formations and 25 Level 5 (NVIS) Vegetation Types. These are presented in Table 12.

3.3.1 Weather

Daily weather observations recorded from the Bureau of Meteorology Karratha Aero weather station (004083) were used to describe local rainfall and temperatures in the 6 months preceding the survey (Figure 4) (Bureau of Meteorology 2019). In the 6 months preceding the survey, 88 mm of rainfall was recorded, 142 mm below the long term average. The last significant rainfall (71 mm) was recorded in March 2019 associated with Cyclone Veronica. The average maximum temperature during the survey was 26°C (Bureau of Meteorology 2019).

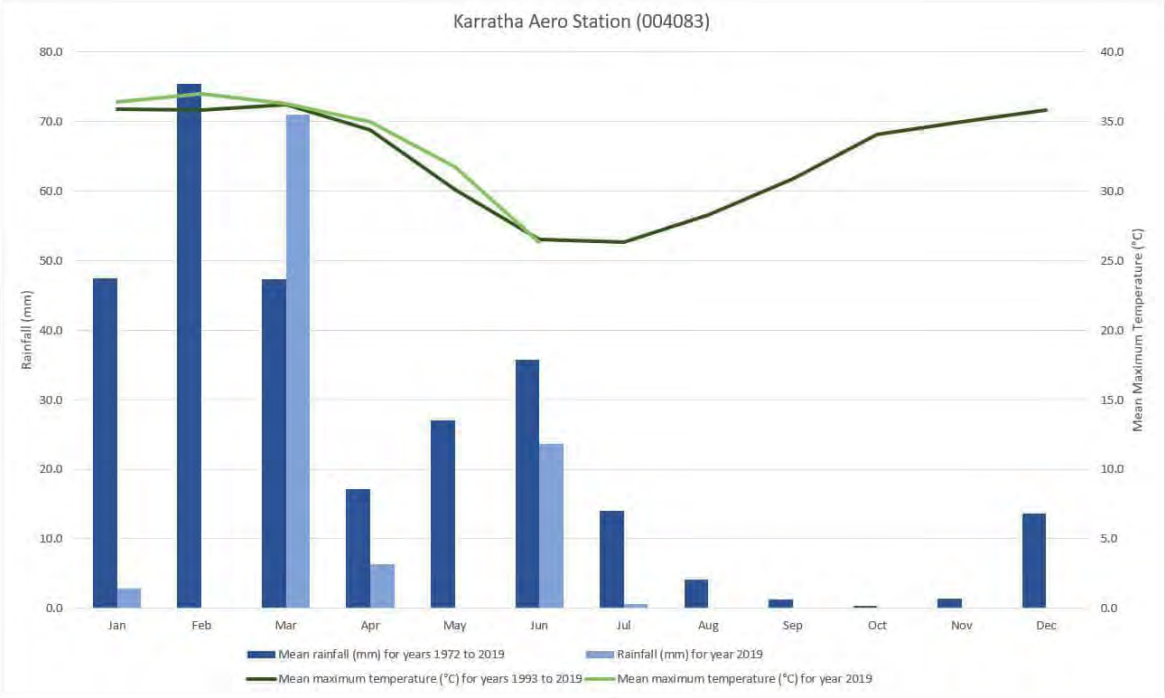


Figure 4. Mean and actual monthly rainfall and temperature data for Karratha Aero weather station (004083)

3.3.2 Vegetation

Northern Survey Area

Broad floristic formations and vegetation types recorded within the northern survey area, together with their condition are summarised in Table 11.

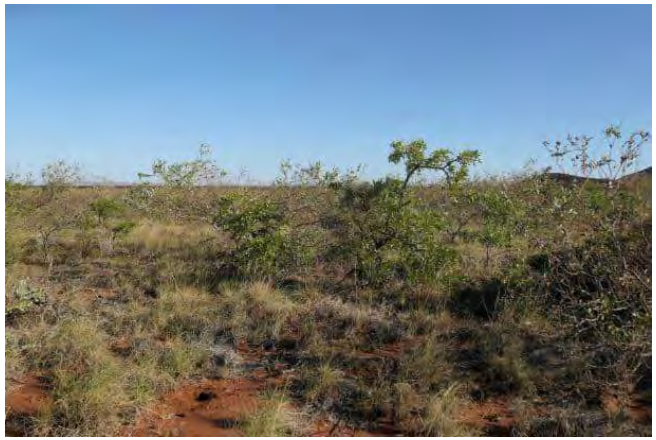
Vegetation recorded throughout the survey sites was comparable to that documented by Trudgen (2002) (Table G.1, Appendix G). The Trudgen (2002) field survey was conducted in 2000 after several seasons of good rainfall. The author was one of the lead botanists on this survey. Species diversity due to good rainfall was high and annual and short lived perennial shrub species (eg *Indigofera monophylla, Corchorus walcottii, Stemoda grossa*) were abundant and were therefore included in vegetation descriptions.

The 2019 survey followed two years of relatively dry conditions, which accounted for the lack of many of these species and consequently, differences between Trudgen (2002) and VLA 2019 vegetation descriptions (Table G.1, Appendix G). It should be remembered that the Trudgen survey was conducted 19 years ago. Since then, there has been infrastructure installed close to the proposed alignment and much of the area has been burnt by wildfire. Both these events have had a significant impact on vegetation – the spread of weeds resulting from infrastructure and changing dominance of species due to fire.

Table 11. Vegetation by broad floristic formation and type and its condition within the northern survey area

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Acacia bivenosa tall shrubland over tussock and/or hummock grassland.					
1	**AbCc** *Acacia bivenosa* tall open to shrubland over **Cenchrus ciliaris* tussock grassland, sometimes closed tussock grassland, with patchy *Triodia angusta.* Occurs on previously disturbed areas on valley floor or low undulating hill slopes, often with stony and/or imported fill.	11 16b 15	Degraded	6.8	
2	**AbTe** *Acacia bivenosa* with occasional *Dichrostachys spicata, Acacia ancistrocarpa* open tall shrubland over mixed *Triodia epactia/T. angusta* hummock and **Cenchrus ciliaris* tussock grassland. Occurs on previously disturbed areas on valley floor or low undulating hill slopes, often with stony and/or imported fill and also on red sands	13 36	Poor	6.8	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
3	**AbTa** *Acacia bivenosa, Grevillea pyramidalis, Hakea lorea* subsp *lorea* tall shrubland over closed *Triodia angusta* hummock grassland. Occurs on valley floor, red-brown silty with moderate stony mantle.	16a	Good	none	
4	**AbImTe** *Acacia bivenosa, Acacia pyrifolia* subsp *morrisonii , Grevillea pyramidalis* open shrubland over *Indigofera monophylla, Corchorus walcottii* open low shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* tussock grassland. Occurs on undulating low hill slopes with stony mantle over red silts.	20a 20b	Good	3.6	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Acacia bivenosa tall shrubland over *Acacia stellaticeps* shrubland over *Diplopeltis eriocarpa* low shrubland over *Triodia angusta, T. epactia* hummock grassland.					
5	**AbAsTe** *Acacia bivenosa* with *Dolichandrone heterophylla* tall shrubland over *Acacia stellaticeps* open to shrubland over *Diplopeltis eriocarpa* low shrubland over *Triodia angusta* or *T. epactia* hummock grassland to closed hummock grassland with patchy *Eriachne obtuse.* Occurs on flats between hills slopes and causeway on red medium grained sands.	38 39	Excellent	3.6	
Acacia inaequilatera tall shrubland over *Triodia epactia* hummock grassland with low trees on rockpiles					
6	**AiTe (BaTs)** *Acacia inaequilatera* tall open shrubland with *Grevillea pyramidalis, Ipomoea costata, Acacia orthocarpa* over *Triodia epactia* hummock grassland with patchy *Themeda triandra* and with low trees of *Brachychiton acuminatus, Terminalia supranitifolia* on small outcropping rocks. Occurs on stony hill slopes and rises, stone and small boulder mantle over red-brown skeletal silts.	26	Excellent	0.4	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Grevillea pyramidalis tall shrubland over *Triodia epactia / T. angusta* hummock grassland.					
7	**GpTeBaTs** *Grevillea pyramidalis* scattered to open tall shrubland, sometimes with scattered *Hakea lorea* subsp *lorea, Ipomoea costata, Acacia inaequilatera* over *Triodia epactia* hummock grassland, sometimes patchy *T. angusta*. There can be open low *Indigofera monophylla* shrubland. There are scattered *Brachychiton acuminatus, Terminalia supranitifolia, Dichrostachys spicata* on small rock outcrops. Occurs on low undulating rises, lower hill slopes and higher plateaux with dense stone and boulder mantle over skeletal red silts.	1, 3 18a(i) 18a (ii) 29 32	Excellent	29.2	
8	**GpCc** *Grevillea pyramidalis* (regenetrating) scattered to open tall shrubland over **Cenchrus ciliaris* tussock and *Triodia epactia* hummock grassland Occurs on low undulating rises and lower hill slopes usually in close proximity to a previous disturbed corridor.	18b	Poor	1.5	

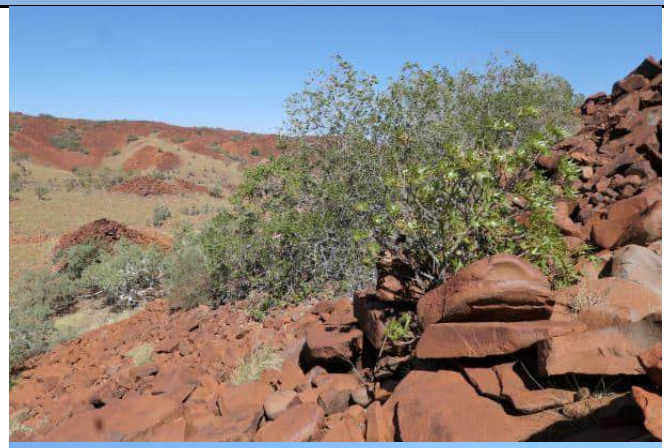
Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
9	**GpIcTe** *Grevillea pyramidalis, Ipomoea costata* tall open shrubland over *Triodia epactia* hummock grassland with scattered *Terminalia circumalata, Brachychiton acuminatus, Erythrina vespertilio* on frequent rockpiles and outcrops. Occurs low and higher rocky hill slopes with frequent larger boulders and small outcropping rockpiles over dense stony mantle and red brown skeletal silts.	34a 34b	Excellent	8.7	
Grevillea pyramidalis, Acacia inaequilatera tall shrubland over mixed low shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* sometimes *Themeda triandra.*					
10	**GpAiTe** *Grevillea pyramidalis, Acacia inaequilatera, Ehretia saligna, Santalum lanceolatum,* tall shrubland over open mixed low shrubland, *Scaevola spinescens, Acacia orthocarpa, Solanum phlomoides, Indigofera monophylla* over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* Occurs on red-brown sands on sandy plain, areas of which have been disturbed historically but have regenerated with no weeds.	33	Good	2.6	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Dichrostachys spicata, Acacia inaequilatera, tall shrubland over open low mixed shrubland over *Triodia epactia / T. angusta* hummock grassland.					
11	**DsAiTe** *Dichrostachys spicata, Acacia inaequilatera, Acacia coriacea* tall shrubland over *Scaevola spinescens, Alectryon oleifolius* open low mixed shrubland over *Triodia epactia / T. angusta* hummock grassland. There can be scattered *Eucalyptus victrix* and *Terminalia circumalata.* Occurs along broader shallow drainage lines with moderate cover of stones and over red-brown alluvial silts.	23a 23b 25	Very good	2.5	
Terminalia circumalata low open woodland over mixed *Dichrostachys spicata* open shrubland over *Triodia epactia / T. angusta* open hummock grassland and *Cyperus vaginatus* open sedgeland.					
12	**TcDsTe/Ta** *Terminalia circumalata* low woodland with occasional *Eucalyptus victrix, Brachychiton acuminatus,* over *Dichrostachys spicata, Acacia coriacea, Ipomoea costata, Flueggea virosa* mixed open shrubland over *Triodia epactia / T. angusta* open hummock grassland and *Cyperus vaginatus* open sedgeland. Occurs along rocky drainage lines, in narrow valley floors between rockpiles and in rock pockets on rock piles and on rockpile ridge.	5a 5b 8 21b	Very Good	2.4	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
					
Eucalyptus victrix low woodland over mixed shrubland over *Triodia angusta / T. epactia* hummock grassland.					
13	**EvAcTa** *Eucalyptus victrix* open low woodland over *Acacia coriacea, Dichrostachys spicata* open shrubland over *Triodia angusta* hummock and **Cenchrus ciliaris* tussock grassland sometimes patchy. Can have dense *Adriana tomentosa*. Occurs along stony broad shallow drainage lines with grey brown stones and rocks over brown grey alluvial silts.	12a 12b 21a	Good	0.5	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
					
14	**EvAbTa** *Eucalyptus victrix* open to scattered low woodland with scattered *Corymbia hamersleyana* over *Acacia bivenosa* tall open shrubland over *Adriana tomentosa / Indigofera monophylla* open low shrubland over *Triodia angusta / T. epactia* open to hummock grassland. Occurs along shallow, broad drainage lines and along valley floors with grey-brown stones over grey-brown alluvial silts.	9a 9c 19	Very Good	3.7	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Corymbia hamersleyana open to low woodland over mixed shrubland over *Triodia epactia / T. angusta* hummock grassland					
15	**ChAbTe** *Corymbia hamersleyana* open to low woodland over *Acacia bivenosa / Acacia coriacea / DIchrostachys spicata* tall shrubland, sometimes *Adriana tomentosa / Stemodia grossa* low shrubland over open *Triodia epactia / T. angusta* hummock and sometimes **Cenchrus ciliaris* tussock grassland. Occurs on outer perimeters of drainage lines, on lower stony areas, in broad valley floor, on lower slopes over moderate to dense stony mantle and red-brown silts or on plain with red-brown medium grained sands.	9b 37 22	Poor to Very Good	4.8	
16	**ChImTe** *Corymbia hamersleyana* open to low woodland over *Indigofera monophylla* open low shrubland over *Triodia epactia* hummock grassland. Occurs on broad valley floor with dense stony mantle over deeper red-brown silts.	10	Excellent	1.6	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Brachychiton acuminatus mixed low woodland over scattered *Triodia epactia* hummock and *Cymbopogon ambiguous/ *Cenchrus ciliaris* tussock grasses.					
17	**BaDslc** *Brachychiton acuminatus* mixed low woodland with *Dichrostachys spicata* over, *Ipomoea costata, Acacia coriacea, Terminalia supranitifolia* open shrubland over scattered *Triodia epactia / Cymbopogon ambiguus/ *Cenchrus ciliaris* grasses. Occasional *Ficus brachypoda* trees. Occurs on large areas of scree and rockpiles, along rocky gullies and on small outcropping rockpiles on hill slopes. Usually a PEC on areas of large rockpile and scree but not on smaller outcropping rocks.	2 4	Good to Very Good	4.4	 

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
18	**BaEsErv** *Brachychiton acuminatus* mixed low woodland with *Ehretia saligna, Erythrina vespertilio, Terminalia circumalata* over *Ipomoea costata, Acacia coriacea* open shrubland over *Triodia epactia* hummock grassland. Scattered **Cenchrus ciliaris.* On rockpiles ridges and outcropping rocks on western end of the alignment on darker brown rocks.	27b 35	Very Good	5.6	
Terminalia supranitifolia low open woodland over *Ipomoea costata, Acacia coriacea* shrubland over scattered to open *Triodia epactia* hummock grass.					
19	**TsIcTe** *Terminalia supranitifolia* low open woodland over *Ipomoea costata, Acacia coriacea, Dichrostachys spicata, Grevillea pyramidalis* mixed shrubland over scattered to open *Triodia epactia* hummock grass sometimes *Themeda triandra*. Scattered *Brachychiton acuminatus* Occurs on and around the base of large rockpiles, scree slopes and on small outcropping rockpiles on higher and lower hill slopes.	27a 28 30	Very Good to Excellent	4.7	

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Triodia epactia hummock grassland					
20	**Te** *Triodia epactia* hummock grassland. Scattered *Grevillea pyramidalis, Hakea lorea* subsp *lorea, Acacia inaequilatera*. Occurs on lower hillslopes and rises, stony valley floor, plains and corridors between rockpiles with dense stony mantle over red-brown skeletal silts.	6 24	Excellent	4.8	
Triodia angusta hummock grassland					
21	**Ta**-*Triodia angusta* hummock grassland	40	Excellent	0.8	No photo

Vegetation Map No.	Vegetation Type code and Description	Sites	Vegetation Condition	Extent of Vegetation Type (ha)	Representative Photograph
Ipomoea costata shrubland over *Triodia epactia* hummock grassland.					
22	**IcHlTe** *Ipomoea costata* open shrubland with *Hakea lorea* subsp *lorea* over *Triodia epactia* hummock grassland. Patchy **Cenchrus ciliaris* along tracks. Scattered *Brachychiton acuminatus, Terminalia supranitifolia.* Occurs on undulating rocky hill slopes with numerous large boulders and boulder outcrops and rock piles. Very dense stone and boulder mantle.	17	Very good	1.1	
Tecticornia ssp low open shrubland					
23	**Tspp** *Tecticornia halocnemoides* subsp *tenuis, T. pruinosa, T. indica* subsp *leiostachya,* with *Muellerolimon salicorniaceum* open low shrubland with patchy *Avicennia marina* trees. Occurs on edges of saline inlet on grey-brown saline silty loams.	14	Excellent	6.3	

Southern Survey Area

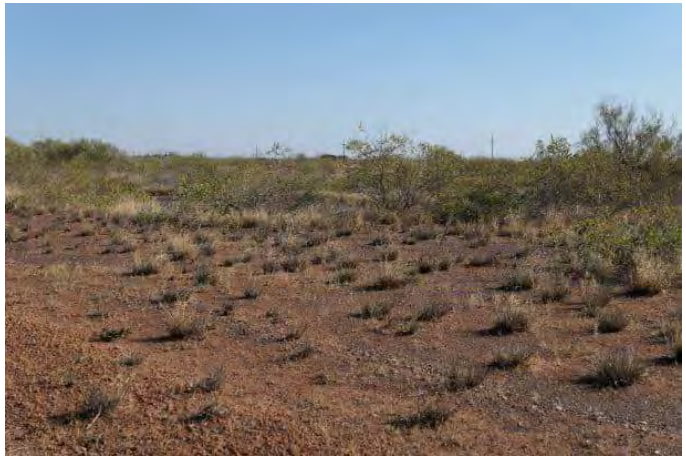
Broad floristic vegetation formations, vegetation types and their condition are summarised in Table 12. Note that the more detailed vegetation types were based on species present during a dry period and these descriptions may change when the wet season survey occurs. The field botanist was relatively confident to assign names to *Triodia* (*T. epactia, T. wiseana, T. angusta), Eragrostis xerophila* (Roebourne plains grass), **Cenchrus ciliaris and *C. setiger* and in most cases *Eriachne benthamii,* without the presence of identifying material, but many other grasses present, only occurred as dry culms and identification could not be verified. These are indicated by a "?" in Table 12 below.

Plates 1 and 2 illustrate the dry conditions found in the southern survey area and hence the difficulty with identifying species.

Plates 1 and 2. Grasslands in the southern survey area illustrating the difficulty associated with identification of species.

Table 12. Vegetation by Broad Floristic Formation and Type and its condition within the Southern Survey Area

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
Acacia bivenosa mixed shrubland over mosaic *Triodia wiseana* hummock and *Eragrostis xerophila* tussock grassland.					
24	**AbTeEx** *Acacia bivenosa, A. coriacea, A. synchronicia* open or scattered shrubland over mosaic *Triodia epactia* hummock and *Eragrostis xerophila* tussock grassland. On flat plain with mosaiced red brown non cracking clays and red shallow loams with scattered pebble mantle.	1	Good	8.0	
Acacia bivenosa mixed shrubland over mixed *Triodia* grassland					
25	**AbTw** *Acacia bivenosa* shrubland to open shrubland with scattered *A. inaequilatera, A coriacea, A. ancistrocarpa, Eremophila longifolia,* over *Triodia wiseana* hummock grassland. There can be patchy *T. epactia* and patches of **Cenchrus ciliiaris* on some scald areas. On flat or very gently sloping plains with non-gilgaied red brown non cracking clays with scattered dark brown and quartz pebbles. There are areas of scald.	5, 10a and 10b	Very Good to Excellent	23.8	

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
Acacia bivenosa shrubland over **Cenchrus ciliaris* tussock grassland.					
26	**AbCc** *Acacia bivenosa* closed to shrubland over **Cenchrus ciliaris, *Cenchrus setiger* tussock grassland. There can be patchy *Eragrostis xerophila, Triodia wiseana, T. epactia.* Occurs on disturbed or in close proximity to disturbed areas on silty loams with varying stones and pebbles.	8	Poor	17.4	
Acacia inaequilatera tall open shrubland over *Triodia epactia* hummock grassland					
27	**AiTe** *Acacia inaequilatera* tall open shrubland with some *Ehretia saligna, Acacia bivenosa* over *Triodia epactia* hummock grassland, patchy *Eragrostis xerophila.* On flat or very gently sloping plains with calcareous red brown loams, scattered to moderate dark brown and quartz pebbles.	4	Very Good	1.0	

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
Acacia inaequilatera A. coriacea tall shrubland over mixed tussock grassland.					
28	**AiAc?Eb** *Acacia inaequilatera, A. coriacea* tall shrubland, sometimes open shrubland over *?Eriachne benthamii, Chrysopogon fallax* patchy **Cenchrus ciliaris* tussock grassland. On broad, shallow drainage line with shallow pinky brown loams and areas of exposed bedrock.	30	Very Good	1.9	
Acacia inaequilatera tall open mixed shrubland over *Triodia wiseana* hummock grassland.					

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
29	**AiTw** *Acacia inaequilatera* tall open shrubland, or scattered shrubs occasional *A. synchronicia, A. coriacea, Hakea lorea* sometimes over *Acacia bivenosa* open shrubs over *Triodia wiseana* hummock grassland. On flat plain with pinky brown calcareous shallow loams with moderate to abundant calcrete and quartz stone and pebbles.	11 & 12 28b	Very Good to Excellent	108.4	
30	**AiAcTw** *Acacia inaequilatera* open shrubland, occasional *A. coriacea* over *Triodia wiseana* closed hummock grassland. Occurs in shallow drainage area with red brown alluvial loam.	16	Excellent	0.9	
**Tamarix aphylla* low open woodland over *Tecticornia* ssp **Aerva javanica* low shrubland					

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
31	**TaTCc** **Tamarix aphylla* (WONS Species) low open woodland over *Tecticornia* species open low shrubland with **Aerva javanica* over open **Cenchrus ciliaris* tussock grassland. Previously disturbed site which has been borrowed and now retains semi saline water – pinky brown disturbed soils and rubble	6	Degraded	2.3	
Tecticornia spp closed low shrubland					
32	**T spp** *Tecticornia haloocnemoides* subsp *tenuis, Tecticornia* ? *indica* closed low shrubland. (Surrounded by Site 6 vegetation) Potentially previously disturbed site now with brown semi saline clays	7	Good	3.4	
Acacia coriacea tall shrubland over *Acacia ampliceps* or **Vachellia farnesiana* shrubland over mixed tussock and hummock grasses					

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
33	**AcCc** *Acacia coriacea* tall shrubland to open tall shrubland over *Acacia ampliceps* or **Vachellia farnesiana* shrubland sometimes over *Stemodia grossa* closed low shrubland over mixed **Cenchrus ciliaris* tussock with *Triodia epactia* scattered grasses. Occurs on narrow drainage line with incised channel, red brown alluvial loams with scattered stones.	14a and site 2 (site 2 disturbed)	Poor to Good	1.1	No Photo
34	**AaAcC?v** *Acacia ampliceps* tall shrubland to closed shrubland with *Acacia coriacea* over *Myoporum montanum* shrubland with occasional *Stemodia grossa* over *Cyperus* sp and *Typha sp* (dead) sedgeland (man made pond in drainage line) Occurs around an artificially created pool in drainage line.	14b	Poor	0.8	No Photo
Acacia coriacea / A. inaequilatera tall shrubland over mixed scattered *Acacia* shrubs over mixed tussock grassland					

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
35	**AcAi** *Acacia coriacea / A.inaequilatera,* tall mixed shrubland over **Vachellia farnesiana* open shrubs over mixed open tussock grassland (too dead to id) and scattered *Triodia wisena* hummocks Occurs on broad drainage line, with incised channel, with red-brown loamy soils.	20	Poor to good	23.7	
36	**Ac?Tt** *Acacia coriacea* with tall shrubland over scattered *Acacia inaequilatera, A. ancistrocarpa* shrubs over ? *Themeda triandra* (dead / dormant) ? with some **Cenchrus ciliaris* (dead)tussock grassland. Occurs on minor shallow drainage line with red brown loams and calcrete fragments. Some erosion evident.	18	Good	0.4	
Acacia coriacea, A. xiphophylla low woodland over mixed tussock grassland					

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
37	**AcAx?Tt** *Acacia coriacea* with *A. xiphophylla* low (old) woodland over scattered **Vachellia farnesiana* shrubs over *?Themeda triandra* and **Cenchrus ciliaris* tussock grassland. Occurs on broad major drainage channel shallowly incised in landscape with red brown clay loams, sometimes skeletal over granite.	19	Very Good	12.2	
**Vachellia farnesiana* shrubland over **Cenchrus ciliaris* tussock grassland					
38	**VfCc** **Vachellia farnesiana* shrubland to closed shrubland over **Cenchrus ciliaris* tussock grassland Minor shallow drainage line on very gently inclined plain with weakly cracking red brown clay loam	24	Poor	4.2	

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
Senna hamersleyensis low shrubland over *Eragrostis xerophila* tussock grassland.					
39	**ShEx** *Senna hamersleyensis* low shrubland (senescing?) over scattered *Eragrostis xerophila* tussocks Occurs on very gently inclined plain with soft spongy red brown clay loam.	25	Poor	1.3	
Acacia xiphophylla open shrubland over *Eragrostis xerophila* tussock grassland					
40	**AxEx** *Acacia xiphophylla* scattered to open shrubland over *Eragrostis xerophila* open tussock grassland. Occurs on gently inclined plain, mosaiced surfaces of weakly cracking and non-cracking clays, silty clay loams with areas of gibber on sandier surfaces.	26	Good	70.5	

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
Corymbia hamersleyana open low woodland over *Acacia coriacea/ *Vachellia farnesiana* open shrubland over mixed hummock and tussock grassland					
41	**ChAcTa** *Corymbia hamersleyana* scattered to open low woodland over *Acacia coriacea, *Vachellia farnesiana* open shrubland to shrubland over *Triodia angusta/T. epactia/*Cenchrus ciliaris* mixed grassland. Occurs on broad shallow drainage line with red brown silty loams, scattered to moderate stones.	27	Poor to Very Good	13.8	
Triodia epactia hummock grassland					
42	**Te** *Triodia epactia* hummock grassland. There can be very scattered *Acacia bivenosa, A. coriacea, A. xiphophylla, Ehretia saligna.* Occurs on flat plain with red brown sandy loams with scattered to moderate stones.	3	Very Good	1.9	

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
Triodia wiseana hummock grassland					
43	**Tw** *Triodia wiseana* hummock grassland. Sometimes scattered *Acacia inaequilatera, A. coriacea, A pyrifolia, A. bivenosa.* Occurs on flat plain with red brown sandy loams with scattered to moderate stones.	22 28a	Excellent	42.9	
Eriachne benthamii tussock grassland					
44	**Eb?Cf** *?Eriachne benthamii, ?Chrysopogon fallax* tussock grassland with other annual grass species (all too dead/dormant to identify). There can be scattered **Vachellia farnesiana, Acacia coriacea* shrubs Very shallow drainage line with red brown soft weakly gilgai light clays	29, 32, 33	Good	20.5	

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
Eragrostis xerophila tussock grassland (with associated dry season remnant grasses)					
45	**Ex spp** *Eragrostis xerophila* tussock grassland. (has apparent *Sorghum plumosum, Panicum sp, Aristida sp* – determine following wet season) with intrusions of ?*Eriachne benthamii* on low areas. Occurs on flat plain with deep red brown weakly to moderate cracking clays. Varying areas of scald.	9, 17, 31	Good to Very Good	27.5	
Eragrostis xerophila tussock grassland (associated species not evident this survey)					
46	**Ex** *Eragrostis xerophila* tussock grassland. Sometimes scattered **Vachellia farnesiana* shrubs. Occurs on flat alluvial plain with deep red brown weakly cracking clays.	21, 23	Good	784.6	

Vegetation Map No.	Vegetation Code and Description	Site	Vegetation Condition	Vegetation Type Extent (ha)	Representative Photograph
**Cenchrus ciliaris* tussock grassland					
47	**Cc** **Cenchrus ciliaris* tussock grassland with scattered shrubs of *Acacia bivenosa, A. inaequilatera.* Occurs on a disturbed site which has been disturbed with tracks, potential laydown areas, has been compacted and had imported soils and gravels.	13	Degraded	177.8	
Mosaic *Triodia wiseana* hummock *Eragrostis xerophila* tussock grassland					
48	*Triodia wiseana* hummock and *Eragrostis xerophila* tussock mosaiced grassland. Occurs on mosaic gilgai or non-gilgai red brown clays and stony silty loams.	15	Very good	10.2	

3.3.2.1 Vegetation Condition

Northern Survey Area

Vegetation condition was assessed using the Trudgen (1988) condition scale, as recommended by the EPA (2016). Vegetation condition results for the 23 vegetation types are summarised in Table 11. Vegetation condition within the survey corridor ranged from 'degraded' to 'excellent'.

Eight vegetation types were disturbance and weed free, hence in excellent condition. One of the most represented along the northern section of the Transmission Corridor, GpTeBaTs, was classified as being generally in excellent condition but the gas pipeline running immediately parallel to it was totally degraded by weeds, indicating the susceptibility of vegetation to disturbance. Rockpile vegetation in some cases had been invaded by weeds spreading from these previously disturbed areas, hence vegetation condition scores were lower than would be expected. Large areas of previous disturbance such as the old laydown and borrow areas, were significantly degraded by dense buffel grass and kapok. These degraded sites had very low species diversity, and even the *Acacia bivenosa* shrub cover which co-existed with the weeds, has now come to the end of its lifespan, leaving large areas of dead shrubs.

Vegetation condition mapping for the northern survey area is presented as Figure E.1, in Appendix E.

Southern Survey Area

Vegetation condition over much of the southern survey area was difficult to estimate due to the dormancy of grasses and weed species. However, from rootstock present, it was apparent to the field botanist that the DBNGP alignment housed varying amounts of buffel grass (**Cenchrus ciliaris*) and some kapok (**Aerva javanica*). This was potentially due to imported gravelly soil imported to stabilise the pipeline. Therefore, vegetation condition along the proposed Woodside Power Transmission Corridor was often considered in good or very good condition, but the adjacent DBNGP pipeline would not be accorded this rating. Buffel grass was also found along some drainage lines, around some of the stonier scalds throughout the area and in areas of disturbance within or in close proximity to the Rio Tinto Dampier Salt lease. Buffel grass and kapok do not favour clay soils and were generally absent from sites with these soil types.

The Roebourne Plains grasslands were difficult to assess for condition. In most cases, they appeared to be dormant, dry and with much reduced foliar cover. This could be due to either over-grazing by stock, a result of the two relatively dry seasons preceding the survey, or a combination of both. Vegetation condition therefore, was rated on what would be expected in a dry season (ie reduced foliar cover and dormancy), which does not necessarily mean the species is in "poor condition" - this is a natural survival strategy.

The shrub **Vachellia farnesiana* is classified as a weed species. It is not a Declared Pest or WoNS species (other *Vachellia* species are Declared Pests). It occurs widely throughout the Pilbara and can become a problem when it occurs in spiny thickets, near water courses. The seeds of the species provide high nutritional value to stock. The plant was recorded as scattered shrubs on the Roebourne Plains grasslands (it tolerates heavy clays) and along a few drainage lines. It is not considered

necessary to control this species at present, but it should be monitored in the future to ensure it does not spread unnaturally as a result of any disturbance.

Vegetation condition mapping for the southern survey area is presented as Figure E.2, in Appendix E.

A summary of the extents of vegetation condition within the northern and southern survey areas is given in Table 13.

Table 13. Extent of vegetation condition within the northern and southern survey areas.

Vegetation Condition	Extent in Northern Survey Area (ha)	Extent in Southern Survey Area (ha)
Cleared	19.2	2.4
Degraded	6.8	3.6
Poor	9.7	48.8
Good	8.0	883.6
Very Good	27.8	258.9
Excellent	54.1	167.0

3.3.2.2 Conservation Significance of Vegetation

The vegetation recorded during the reconnaissance survey, vegetation condition and the likelihood of PECs and conservation significant flora within each vegetation type are summarised in Table H.1, H.2 and H.3 (Appendix H).

No TECs were recorded in the survey area.

Northern Survey Area

PECs were present in the northern survey area on large rockpiles and rockpile ridges, but also occurred on smaller rockpiles on rocky slopes. 'Burrup Peninsula rock pile communities' (P1) PECs are significant because they consist of a combination of Kimberley, Pilbara inland, Pilbara coastal and southern species, most of which are fire sensitive. PECs do not contain weed species. It was noted however, that weeds are ingressing into the rockpile PECs as a result of previous disturbances, which then degrades and negates the PEC.

The reconnaissance survey recorded rockpile PECs as being abundant in vegetation types 'BaEsErv' – and 'TsIcTe' and as represented in low to moderate abundance in 'AiTe' ('BaTS'), 'GpIcTe','IcHlTe' (Table H.1, Appendix H).

A targeted survey needs to be conducted once the final Transmission Corridor alignment has been decided, to determine the location and exact number of PECs present in the whole survey area.

Indicative locations of PECs within the northern survey area based on vegetation types are shown in Appendix H, Figure H.1.

The nine vegetation associations listed by Trudgen as having high to very high conservation significance (Table 9) were generally difficult to identify due to the dry conditions masking abundance

of some of the key flora in his descriptions. The Trudgen survey was conducted following several years of good rainfall meaning that some shorter lived, perennial low shrubs which feature in the Trudgen descriptions were not present in 2019. Weed invasion and fire have also impacted the vegetation since then, changing species dominance. However, VLA agrees with Trudgen that wooded areas, (those which are dominated by *Eucalyptus victrix, Corymbia hamersleyana, Terminalia circumalata)* especially where these occur on broader valley habitats, should be given high conservation value. These wooded areas provide shade and refugia to both fauna and flora in an area which is relatively exposed and lacking in woodland.

Southern Survey Area

The Roebourne Plains grassland was too dry to allow for identification of either of the two potential PECs (a P1 and a P3) (Figure 3, Section 3.1.2.3), both of which depend on a suite of associated grasses and annual species. However, at this stage, the substrate at the inspection points and traverses, indicated that the P1 PEC is less likely to be present, and if it is, only in relatively small areas. Identification of PECs will be undertaken following a wet season survey.

Tree and shrub species found in the drainage lines varies between the proposed Transmission Corridor and those drainage lines that traverse the Solar PV Farm and Gas Power Plant envelopes. One of the larger drainage lines running though the north-east corner of the Solar PV Farm contains large *Acacia coriacea* (wirewood) and *Acacia xiphophylla* (snakewood) trees of considerable age (Plate 3). Both wirewood and snakewood trees are fire sensitive and it is thought they have reached this age due to the fact that the fuel load of the Roebourne Plains grasslands is not sufficient to maintain a large fire. Trees of this age and size in the region, and particularly on the Pilbara coastal plain are unusual and considered by the field botanist to have high conservation value. In addition, they provide shade and refuge for fauna. This drainage line should be preserved. If this is not achievable, any impact should be minimised. This includes direct (removal of vegetation) and indirect (impediment of water flow, erosion, spread of weeds) impacts.

Plate 3. Large Snakewood tree in drainage line, vegetation type AcAx?Tt

3.3.3 Flora

Northern Survey Area

From the reconnaissance survey within the northern area, a total of 138 plant taxa (including subspecies and varieties), comprising 40 families and 91 genera were identified. The Fabaceae, Poaceae and Malvaceae families had the highest levels of species richness (Table 14). Of the 73 genera present, *Acacia*, *Indigofera*, *Senna* and *Solanum* were the most represented genera surveyed, with ten species in the *Acacia* genus and four species recorded for the others. At the time of survey, most species were dormant and there was an absence of annual or ephemeral species. A flora species list is provided in Table I.1 (Appendix I). Despite the dry conditions, it is considered that a diverse range of species were present or were able to be identified from their dormant state.

Table 14. Taxa most frequently recorded in the survey area.

Family	Number of species
Fabaceae	34
Poaceae	15
Malvaceae	13

Site data sheets area summarised in Appendix J.

Southern Survey Area

A total of 106 plant taxa from 26 families were recorded during the reconnaissance survey in the southern area. However, this is not a true representation of the total number of species occurring within the area. Only dominant species were recorded, together with a few identifiable plants that were observed at inspection points throughout the Solar PV, PP and Transmission Corridor areas. This list will be added to following the wet season survey.

Inspection point data sheets are summarised in Appendix J.

3.3.3.1 Conservation Significant Flora

No State or Commonwealth listed Threatened flora were recorded within the survey locations.

Northern Survey Area

Three State listed priority (P) flora species were located within the northern survey area; *Vigna tridiophila* (P3), *Terminalia supranitifolia* (P3) and *Rhynchosia bungarensis* (P4) (Plates 4 to 9). The locations and number of plants of these conservation significant species are summarised in Table H.3 and shown in Figure H.1 (Appendix H). These priority species only represent those found within the relevés and observed opportunistically within the area, not the total number likely to be present. The vegetation types in which these priority species were recorded are summarised in Table H.1 (Appendix H).


Plates 4 and 5. *Vigna triodiophila* (P3)


Plates 6 and 7. *Terminalia supranitifolia* (P3)


Plates 8 and 9. *Rhynchosia bungarensis* (P4)

Southern Survey Area

Species of conservation significance that are likely to occur within the southern survey area are predominantly annual or herbaceous perennial species, which typically die back to rootstock during the dry season. During the 2019 July survey, no flora species of conservation significance were recorded.

Very old, fire sensitive *Acacia coriacea* and *Acacia xiphophylla* trees were recorded as discussed in Section 3.3.2.2. Maslin (World Wide Wattle vers. 2) notes that *A. xiphophylla* is a slow growing species and is readily killed by hot and even moderately hot fires. Maslin also states that where habitat is

infested with a transformer species (buffel grass) such as on the Pilbara coastal plain, fire response of *Acacia coriacea* is extremely poor and typically plants succumb and do not even regenerate from seed (World Wide Wattle vers 2).

3.3.3.2 Introduced Flora (Weeds)

Northern Survey Area

Five weed species were recorded during the northern reconnaissance survey:

- **Aerva javanica* (kapok) – was recorded in 4 locations, <5%. This species is likely to be more abundant than could be detected. Its growth favours the third quarter of the year.
- **Cenchrus ciliaris* (buffel grass) - Buffel grass has significantly dominated previously disturbed sites on the Burrup including the road verge and pipeline alignment running parallel to the proposed Transmission Corridor. It should be noted that buffel grass was generally no more than 10% cover along the proposed Transmission Corridor and a significant 18 of the 47 sites sampled were considered in excellent condition with <1% buffel grass. Buffel grass was more abundant where the alignment runs through old borrow pit areas. The grass is gradually invading rockpile PEC communities – rocks provide shelter and moisture for wind-blown seed.
- **Cenchrus setiger* (birdwood grass)– was recorded in three locations.
- **Malvastrum americanum* (Spiked malvastrum) – (1 site only)
- **Passiflora foetida* (stinking passion flower) – was recorded at one location within the alignment (in a drainage line within 'EvAbTa' at location 0474521E 7719338N) and at one location which was not directly on the alignment, but within 30 m and is of note because it is spreading rapidly on many disturbed Burrup sites and is therefore potentially a threat. Dr Bruce Webber (CSIRO) has indicated that stinking passion flower is currently the biggest weed threat to Northern Australia (2014).

Southern Survey Area

Five weed species, one of which is a Declared Pest under the BAM Act (Department of Primary Industries and Regional Development 2019) and a WoNS (Australian Weeds Committee 2012), species, were recorded during the reconnaissance survey undertaken in July in the southern area, but that number and location of weeds may increase following the wet season survey. The species recorded are:

- **Aerva javanica* (kapok) was recorded along the DBNGP alignment, but rarely along the proposed Transmission Corridor apart from where it crosses though previously disturbed areas (RioTinto Dampier Salt and some areas of imported fill for the gas pipeline) and in three drainage lines where the proposed alignment will cross.
- **Cenchrus ciliaris* (buffel grass) was recorded along the DBNGP alignment and other semi disturbed areas within the Power Plant, Solar PV and Transmission Corridor areas – predominantly along drainage lines and around the edges of scalds.
- **Cenchrus setiger* (Birdwood grass) was not as frequent as buffel grass and was predominantly recorded around semi saline areas of disturbance in the Rio Tinto lease area.
- **Vachellia farnesiana* (mimosa bush) was widespread in its occurrence over the entire southern survey area but was generally not abundant, occurring as individual scattered shrubs

on the plains. It was dense in one drainage line and as scattered understorey in many other drainage lines.

- **Tamarix aphylla* (tamarisk, athel pine), was recorded at one disturbed location associated with the Rio Tinto Dampier Salt lease where soil has been borrowed leaving a semi-saline low area which retains water (GPS 0473702E 7706857N to 0473583 7706475N). Approximately 100 small trees occur in the area and new seedlings are emerging. It is a Declared pest and a WoNs species so it must be removed. This would need to occur prior to any disturbance taking place within the area.

Each of the weeds apart from the **Tamarix aphylla* and **Malvastrum americanum* are classified as having high ecological impact and rapid invasiveness (DPAW 2013) and their further spread should be addressed in a Weed Management Plan.

Because of the relatively dry conditions, it is probable that many other weeds are present and more widely distributed within the survey areas, than that recorded, but were not evident during the survey.

3.3.4 Traditional Owner Participation

The Maitland Industrial Estate (southern survey area) occurs on Ngarluma country and therefore two Traditional Owners (TOs), Kerry Churnside and Darren Lockyer, representing the Ngarluma Aboriginal Corporation (NAC), accompanied the field botanist and zoologist for that part of the survey. Ms Churnside was keen to share her traditional knowledge of the plants and artefact sites we encountered. Ms Churnside made some requests with regard to plants and these have been presented to Woodside in separate correspondence.

4. CONCLUSIONS

The northern survey area comprises lower hillslopes, rocky undulating slopes with outcropping rock, large rockpiles and drainage lines. There were no TECs or ESAs located within the survey area. Several occurrences of the *Burrup Peninsula rock pile community* PEC were recorded within the northern survey area. The two Burrup Peninsula PECs have been described since Trudgen did his survey (Trudgen did not survey rockpile vegetation). PECs are vital to the biodiversity of the Burrup Peninsula – they contain remnant species not found elsewhere as a result of increased humidity on the Burrup, due to the surrounding ocean. Additionally, they house fire sensitive species which have been significantly reduced elsewhere in the region by wild fire. Burrup Peninsula rockpile PECs are being degraded by invasion of weeds in many parts of the area zoned for industry.

Wooded areas, particularly along valleys and broader drainage areas provide rarely occurring shade and protection to both fauna and flora. Trudgen lists two of these has having high (ChThSg) and very high (EvTaTh) conservation value. Any wooded areas along the northern section Transmission Corridor should be minimized to prevent both direct (removal of trees) and indirect (changes to landform and water flow) impacts.

A total of 138 plant taxa were recorded during the reconnaissance survey in the northern survey area. Below average rainfall in the wet season preceding the June survey resulted in the absence of many annual and all ephemeral flora species.

No Threatened flora were located within the northern survey area. Three Priority flora species: *Terminalia supranitifolia* P3, *Vigna tridiop*hila P3 and *Rhynchosia bungarensis* P4 were recorded.
T. supranitifolia P3 was recorded in rockpile, lower hillslope and drainage line habitats. *V. tridiophila* P3 was recorded in rockpile habitats, whilst *R. bungarensis* P4 was recorded across a variety of habitats including rocky hillslopes, rockpiles and a drainage gully. Generally only a single plant was recorded from each location, apart from *Terminalia supranitifolia* where sometimes 2 or 3 plants were recorded on one rockpile. These three species are considered widespread on the Burrup Peninsula and have been recorded outside the survey area in similar habitats to those observed. However, it should be noted that *Terminalia supranitifolia* is a slow growing, long lived species, hence new juvenile plants are rarely encountered. The cumulative impact on the population on the Burrup Peninsula, with the establishment of the many industries and associated infrastructure that has occurred over the years since the Blackwell et al. (1979) report, has never been considered. In the past, there has never been any effort, by any industry on the Burrup to try to propagate and replace plants lost, either through rehabilitation or via landscaping (V Long pers com).

Most of the vegetation mapped during the survey was comparable to that recorded by Trudgen (2002). Differences were potentially due to the fact that the Trudgen survey was conducted over a very large area, following several years of good rainfall, compared with this reconnaissance survey. Changes in vegetation structure have occurred over the past 19 years since the Trudgen survey, mainly due to a large portion of the area having been burnt. In addition, some perennial species (such as the shrub *Indigofera monophylla*) had lower foliage cover than average, due to dry seasonal conditions; therefore, they featured less prominently in vegetation descriptions than they would have under more favorable seasonal conditions.

The condition of the vegetation along the Transmission Corridor varies according to proximity to previous disturbance. However, it should be noted that the number of 'excellent' condition (no weeds)

vegetation types exceeded the 'poor – degraded' vegetation types in excess of twofold. The spread and abundance of weeds on the Burrup Peninsula has increased significantly since the Trudgen (2002) survey. Corridor type disturbances, such as this project, can play a significant role in the spread of weeds through otherwise clean vegetation and therefore, careful weed management needs to be addressed. One weed in particular, *Passiflora foetida*, has recently been described as one of the biggest weed threats to northern Australia (Webber 2014) and every effort should be made to remove it from the survey area before any work is conducted to prevent its spread down the alignment.

The southern section of the project area, which includes the Transmission Corridor and two large areas for a proposed Power Plant and Solar PV farm, occurs on relatively flat coastal plain characterised by areas of hummock grassland, areas of sandy surfaced alluvial soils and tussock grasslands over weakly gilgaied clays, intersected by both shallow grassy and deeper incised wooded drainage lines.

The predominantly grassland nature of the vegetation in the southern survey area meant that most species being annuals, were either sterile, dormant, had died back to rootstock or were dead. This meant that the survey could only superficially identify grasslands. The field botanist was able to confidently identify 25 vegetation types within this survey area, but the identification of any PECs was not possible. It had been decided that given the dry conditions preceding the survey, this would only be a preliminary survey and that a wet season survey would need to be undertaken following decent rain. A flora list comprising 106 identifiable species was recorded for this area. The number of flora species present within this area should increase following rainfall and greater numbers should be observed in the wet season survey.

Although PECs could not be identified, one vegetation type was considered by the field botanist to be of high conservation value. This is vegetation type AcAx?Tt which contained very old, large trees of *Acacia xiphophylla* and *A. coriacea*, both of which are fire sensitive (do not regenerate following fire) and are slow growing species. Both species are experiencing a decline in numbers due to fire (WorldWideWattle) and the field botanist, who does extensive work in the area, rarely sees trees, particularly *A. xiphophylla* (Snakewood), of this size. This vegetation type should be protected from any direct or indirect impacts from the project.

The condition of the Transmission Corridor and the larger development envelopes (Gas Power Plant and Solar PV Farm) was generally rated as being very good, based on what would be expected of the key species during a dry period, the lack of weeds on those areas and minimal cattle damage. Grasslands rely on sufficient summer rainfall (much less on winter rainfall) to respond with growth and flower/seed production. This has not occurred for the past two years. The tussock grassland in particular, appeared impacted by the dry weather conditions and potentially by being overgrazed in the past.

The WoNS and Declared pest, tamarisk or athel pine (*Tamarix aphylla*) occurs on a previously disturbed area. New trees continue to emerge in the area. Both alternative Transmission Corridor options will run through tamarisk infestation. Plants will need to be reported, removed prior to and monitored following, construction. The weeds buffel grass and kapok were recorded in very low percentages (<2%), except along drainage lines, where buffel grass was denser. Buffel grass is a pastoral fodder grass and it is not expected that any control of this species would need to occur, unless PECs are identified. Invasion of buffel grass and kapok into PECs would need to be managed.

The shrub weed, **Vachellia farnesiana* is not considered by the author to warrant control in this area. The weed is not considered a "problem" in the Pilbara where it usually occurs as individuals or small thickets along occasional drainage lines (A. Mitchell pers comm 30/7/19)

The presence of two NAC TOs during the southern survey, provided an opportunity for knowledge sharing and building of trust and positive relationships.

5. REFERENCES

AGC Woodward Clyde, 1994 Maitland Heavy Industry Estate Karrathe. Public Environmental Review. October 1994. Prepared for Landcorp and the Department of Resources Development.

Aplin, TEH 1979, 'The flora', in B. J. O'Brien (ed), *Environment and Science*, University of Western Australia Press, Perth.

Astron Environmental 2002, The Maitland Heavy Industrial Estate: Assessment and Comparison with the Burrup Industrial Estate. Prepared for the Shire of Roebourne.

Australian Weeds Committee 2012, *Weeds of National Significance*, Canberra.

Beard, JS 1975, *Vegetation Survey of Western Australia, Pilbara. 1:1 000 000 Vegetation Series. Explanatory Notes to Sheet 5*, University of Western Australia Press, Nedlands, Western Australia.

Blackwell, M.I., Trudgen, M.E., Weston A.S., 1979, *Report on the Flora and Vegetation of the Burrup Peninsula and the Southern Part of Dolphin Island* Appendix C. Unpublished report for Woodside Petroleum Development.

Bureau of Meteorology 2019, *Climate data online*, <http://www.bom.gov.au/climate/data/index.shtml>.

Commonwealth of Australia (2019) NationalMap (https://nationalmap.gov.au/).

DBCA (2018a). Department of Biodiversity, Conservation and Attractions, Conservation and Attractions. Government of Western Australia. Species and Communities Branch. Threatened (Declared Rare) and Priority Flora List. 5 December 2018 (1). Excel Spreadsheet. https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

DBCA (2018b). Department of Biodiversity, Conservation and Attractions, Conservation and Attractions. Government of Western Australia. Species and Communities Branch. List of Threatened Ecological Communities Endorsed by the Western Australian Minister for Environment, 28 June 2018). www.dpaw.wa.gov.au/images/plants-animals/threatened-species/threatened_ecological_communities_endorsed_by_the_minister_for_the_environment_june_2018.pdf

DBCA 2018c, 'DBCA - Lands and Waters of Interest', Dept. of Biodiversity, Conservation & Attractions, Perth, WA.

DBCA 2018d, 'DBCA - Legislated Lands and Waters', current as of26/02/2018, Dept. of Biodiversity, Conservation and Attractions, Perth WA.

DBCA (2019a). Department of Biodiversity, Conservation and Attractions, Conservation and Attractions. Government of Western Australia. Species and Communities Branch. Priority ecological communities list for Western Australia Version 28, 17 January 2019. https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Priority%20ecological%20communities%20list%20_Jan%202019.pdf

DBCA 2019b, 'Threatened and Priority Flora database', DBCA, Kensington.

DBCA 2019c, 'Threatened and Priority Ecological Communities database', DBCA, Kensington.

DBCA 2019d, NatureMap Database Search, https://naturemap.dpaw.wa.gov.au/

Department of Conservation and Land Management 2002, A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, Department of Conservation and Land Management, Perth.

Department of the Environment and Energy 2012, *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7*, Dept. of the Environment and Energy, Canberra, ACT, viewed 2019.

Department of the Environment and Energy (DoEE) 2016, National Reserve System, http://www.environment.gov.au/land/nrs

DoEE (2019a) Department of the Environment and Energy, Australian Government. EPBC Act List of Threatened Ecological Communities. http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl

DoEE (2019b) Department of the Environment and Energy, Australian Government. Environment Protection and Biodiversity Conservation Act 1999, List of Threatened Flora http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora

DoEE (2019c) Department of the Environment and Energy, Australian Government. Environment Protection and Biodiversity Conservation Act 1999, Protected Matters Search Tool (interactive Map Tool). http://environment.gov.au/epbc/protected-matters-search-tool

DoEE (2019d) Department of the Environment and Energy, 'Australian Wetlands Database: Ramsar Wetlands', Commonwealth of Australia.

Department of Mines, Industry Regulation and Safety (DMIRS) (2019). Department of Mines, Industry Regulation and Safety. Government of Western Australia. Interactive geological map (GeoVIEW.WA). https://geoview.dmp.wa.gov.au/GeoViews/?Viewer=GeoVIEW

Department of Primary Industries and Regional Development (DPIRD) 2019, Western Australian Organism List. https://www.agric.wa.gov.au/organisms

Environmental Protection Authority 2016, *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*, Environmental Protection Authority, Perth.

Executive Steering Committee for Australian Vegetation Information ESCAVI (2003). Australian Vegetation Attribute Manual: National Vegetation Information System, Version 6.0. Department of Environment and Heritage, Canberra. http://www.environment.gov.au/node/18927

Government of Western Australia (2019a) Landgate. Interactive Map 'Locate': providing information from Shared Location Information Platform (SLIP) and Western Australia's location-based information. [https://maps.slip.wa.gov.au/landgate/locate/]

Government of Western Australia (2019b). 2017 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis. Current as of December 2017. WA Department of Biodiversity, Conservation and Attractions, Perth.

Jackson, KJ, Paling, EL & Stoddart, JA 2006, Review of Research and Data Relevent To the Marine and Terrestrial Environment of Dampier, report prepared fro the Dampier Port Authority.

Kendrick, P & Stanley, F 2001, Pilbara 4 (PIL4 - Roebourne Subregion), (M. Cowan, chairman), A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002, Department of Conservation and Land Management, Perth.

Mattiske Environmental Consultants 1994, Karratha Heavy Industry Site Study. Flora, Vegetation and Vertebrate Fauna. Prepared for AGC Woodward Clyde. October 1994.

Shepherd, DP, Beeston, GR & Hopkins, AJM 2002, 'Native Vegetation in Western Australia: Extent, Type and Status', Resource Management Technical Report 249, Department of Agriculture, Western Australia.

Specht, RL 1970, 'Vegetation', in G. W. Leeper (ed), *The Australian Environment*, CSIRO - Melbourne University Press, Melbourne.

Stewart, AJ, Sweet, IP, Needham, RS, Raymond, OL, Whitaker, AJ, Liu, SF, Phillips, D, Retter, AJ, Connolly, DP & Stewart, GR 2008, 'Surface Geology of Australia 1: 1 000 000 Scale, Western Australia [Digital Dataset]', The Commonwealth of Australia, Geoscience Australia (http://www.ga.gov.au), Canberra.

Trudgen, ME 1988, *A Report of the Flora and Vegetation of the Port Kennedy Area*, unpublished report to Bowman Bishaw and Associates.

Trudgen, ME & Griffin, EA 2001, A Flora, Vegetation 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, Perth WA.

Trudgen, ME 2002, 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, Vol. 1, Department of Mineral & Petroleum Resources, Volume 1, Perth.

van Vreeswyk, AME, Payne, AL, Leighton, KA & Hennig, P 2004, An inventory and condition survey of the Pilbara region, Western Australia. Technical Bulletin No. 92, Department of Agriculture and Food, Perth.

WALGA 2019 Western Australian Local Government Association. Environmental Planning Tool. Environmental Planning Tool. https://walga.asn.au/Subscription-Services/Environmental-Planning-Tool.aspx

Webber BL, Yeoh PB, Scott JK (2014) Invasive *Passiflora foetida* in the Kimberley and Pilbara: understanding the threat and exploring solutions. CSIRO, 27 pp.

Welker Environmental Consultancy 2002, Review of Vegetation Study of Burrup Peninsula by Trudgen and Griffin (2001), report prepared for the Department of Mineral Petroleum Resources, Como, WA.

Western Australian Herbarium (2019). FloraBase: The Western Australian Flora. FloraBase is produced by the staff of the Western Australian Herbarium, Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions. Accessed 2019 http://florabase.dpaw.wa.gov.au/http://florabase.dpaw.wa.gov.au/

World Wide Wattle vers. 2 www.worldwidewattle.com Accessed 30 July 2019.

Appendix A: Conservation Categories for Flora, Fauna and Ecological Communities, and Categories for Introduced Flora

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Table A.1: Categories and definitions for threatened flora and fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

Conservation category	Definition
Extinct	Taxa with no reasonable doubt that the last member of the species has died.
Extinct in the wild	Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriated seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically endangered (CR)	Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (E)	Taxa are not critically endangered; and are facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (V)	Taxa are not critically endangered or endangered; and are facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation dependent (CD)	Taxa are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or the following subparagraphs are satisfied: i) the taxa is a species of fish; ii) the taxa is the focus of a management plan that provides management actions necessary to stop the decline of, and support the recovery of, the taxa so that its chances of long term survival in nature are maximized; iii) the management plan is in force under a law of the Commonwealth or of a State or Territory; iv) Cessation of the management plan would adversely affect the conservation status of the taxa Fish includes all taxa of bony fish, sharks, rays, crustaceans, molluscs and other marine organisms, but does not include marine mammals/reptiles.

Table A.2: Definitions and criteria for threatened ecological communities under the *Environment Protection and Biodiversity Conservation Act 1999*.

Categories of ecological communities	
Critically endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Table A.3: Conservation codes for Western Australian flora and fauna under the *Biodiversity Conservation Act 2016*.

Code	Conservation category	Definition
Threatened		
CR	Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines"
EN	Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines"
VU	Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines"
Extinct		
EX	Published as presumed extinct under schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.	Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).	Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially Protected Species		
MI	Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).

CD	Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).
OS	Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Table A.4: Categories of Threatened Ecological Communities (Department of Environment and Conservation 2013).

PD: Presumed Totally Destroyed
An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant **and either** of the following applies (A or B): A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats **or** B) All occurrences recorded within the last 50 years have since been destroyed.
CR : Critically Endangered
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as **Critically Endangered** when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting **any one or more of** the following criteria (A, B or C): A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii): i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
En: Endangered

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting **any one or more** of the following criteria (A, B, or C):

A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement **and either or both** of the following apply (i or ii):

i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;

iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

VU: Vulnerable

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Possible Threatened Ecological Communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (Table A.6).

Table A.5: Definitions and criteria for Priority Ecological Communities (Department of Parks and Wildlife 2017).

P1: Priority One – Poorly-known ecological communities
Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2: Priority Two – Poorly-known ecological communities
Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3: Priority Three – Poorly-known ecological communities
(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4: Priority Four
Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5: Priority Five – Conservation dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Table A.6: Priority species under *Western Australian Biodiversity Conservation Act 2016.*

P1: Priority One – Poorly known taxa
Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2: Priority Two – Poorly known taxa
Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3: Priority Three – Poorly known taxa
Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4: Priority Four: Rare, near threatened and other taxa in need of monitoring
(a)Rare Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5: Priority Five: Conservation dependent taxa
Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

The management of introduced flora species in Western Australia is now regulated through the Biosecurity and Agriculture Management Act 2007 (BAM Act). A list of declared pests, including 'pest' plants is provided under the BAM Act, which has been updated to incorporate a number of other Acts that are administered by Department of Agriculture and Food Western Australia (Department of Agriculture and Food Western Australia 2016). Declared pests can fall into two categories: one that relates to the prevention of introducing the species or eradicating it; and the other relates to managing the species and whether it can be kept (i.e. for scientific purposes, education or other purpose).

The threat and risk posed to site-specific biodiversity values, influences to rehabilitation success, primary production, infrastructure assets or human health will differ depending on the unique characteristics of each site and the associated land management practice or operation. Therefore site or project specific weed assessments and priorities should be reviewed for each project.

As per introduced flora species, the BAM Act seeks to establish a modern biosecurity regulatory scheme to prevent serious animal pests from entering the State and becoming established, and to

minimise the spread and impact of any that are already present within the State. Declared animal pests fall into three categories as Gazetted under the *Biosecurity and Agriculture Management Regulations 2013*. These categories are outlined in Table A.7.

Table A.7: Declared pests control categories as gazetted under the *Biosecurity and Agriculture Management Regulations 2013*.

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

Appendix B: Database Search Results

NatureMap Species Report

Created By Guest user on 05/03/2019

Power Plant and Solar PV Survey Areas

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	116° 40' 49" E,20° 48' 08" S
Buffer	20km
Group By	Kingdom

Kingdom	Species	Records
Animalia	575	5236
Chromista	17	25
Fungi	7	8
Plantae	595	2175
TOTAL	**1194**	**7444**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Animalia					
1.		*? ?*			
2.	25332	*Acanthophis wellsi (Pilbara Death Adder)*			
3.		*Acariformes sp.*			
4.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
5.	25536	*Accipiter fasciatus (Brown Goshawk)*			
6.		*Achnanthidium minutissima (Kütz.) Czarnecki*			
7.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
8.		*Actacarus pacificus*			
9.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
10.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
11.		*Aeshnidae sp.*			
12.		*Alepes apercna*			
13.		*Allodessus bistrigatus*			
14.		*Alona anodonta*			
15.		*Ambassis vachellii*			
16.		*Amblygobius bynoensis*			
17.		*Amniataba caudavittata*			
18.		*Amniataba percoides*			
19.	30831	*Amphibolurus gilberti (Ta-ta, Gilbert's Dragon)*			
20.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
21.		*Aname mellosa*			
22.	24312	*Anas gracilis (Grey Teal)*			
23.	24316	*Anas superciliosa (Pacific Black Duck)*			
24.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
25.		*Anisops canaliculatus*			
26.		*Anomalohalacarus dampierensis*			Y
27.		*Anopheles annulipes s.l.*			
28.	25318	*Antaresia perthensis (Pygmy Python)*			
29.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
30.	25670	*Anthus australis (Australian Pipit)*			
31.		*Anuraeopsis navicula*			
32.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
33.	24285	*Aquila audax (Wedge-tailed Eagle)*			
34.		*Arcella sp.*			
35.	25559	*Ardea intermedia (Intermediate Egret)*			
36.	41324	*Ardea modesta (great egret, white egret)*			
37.	24341	*Ardea pacifica (White-necked Heron)*			
38.	24610	*Ardeotis australis (Australian Bustard)*			
39.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
40.		*Arius leptaspis*			Y
41.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
42.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
43.	24354	*Artamus leucorynchus subsp. leucopygialis (White-breasted Woodswallow)*			

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44.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
45.		*Arthrorhabdus paucispinus*			
46.	25320	*Aspidites melanocephalus (Black-headed Python)*			
47.	25236	*Aspidites ramsayi (Woma)*			
48.	24318	*Aythya australis (Hardhead)*			
49.		*Baetidae sp.*			
50.		*Barnardius zonarius*			
51.		*Bathygobius fuscus*			
52.		*Bathygobius laddi*			
53.		*Bdelloidea sp. 2:2*			
54.		*Bdelloidea sp. 3:3*			
55.		*Belostomatidae sp.*			
56.		*Bennelongia minimus*			
57.		*Berosus pulchellus*			
58.		*Boeckella triarticulata*			
59.		*Bolboleaus truncatus*			
60.		*Boreohesperus undulatus*			
61.		*Brachionus n sp P2 (PSW)*			
62.		*Brachionus quadridentatus*			
63.	25331	*Brachyurophis approximans (North-western Shovel-nosed Snake)*			
64.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
65.	47897	*Butorides striata (Striated Heron, Mangrove Heron)*			
66.	25715	*Cacatua roseicapilla (Galah)*			
67.	25716	*Cacatua sanguinea (Little Corella)*			
68.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
69.		*Caenidae sp.*			
70.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
71.	24780	*Calidris alba (Sanderling)*		IA	
72.	25738	*Calidris canutus (Red Knot, knot)*		IA	
73.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
74.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
75.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
76.	24790	*Calidris tenuirostris (Great Knot)*		T	
77.		*Callionymus japonicus*			Y
78.		*Caloneis silicula (Ehr.) Cl.*			
79.	24253	*Capra hircus (Goat)*	Y		
80.		*Caranx sexfasciatus*			
81.		*Carcharhinus brachyurus*			
82.		*Carenum pulchrum*			
83.		*Carenum subplanatum*			
84.		*Carenum venustum*			
85.	25015	*Carlia munda (Shaded-litter Rainbow Skink)*			
86.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
87.		*Catadromus lacordairei*			
88.	25600	*Centropus phasianinus (Pheasant Coucal)*			
89.		*Cephalodella biungulata*			
90.		*Cephalodella cf forficula*			
91.		*Cephalodella gibba*			
92.		*Ceratopogonidae sp.*			
93.	24181	*Chaerephon jobensis (Greater Northern Freetail-bat, Northern Mastiff Bat)*			
94.		*Chanos chanos*			
95.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
96.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
97.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
98.	24378	*Charadrius veredus (Oriental Plover)*		IA	
99.		*Chelmon marginalis*			
100.		*Chelmon muelleri*			
101.	25336	*Chelonia mydas (Green Turtle)*		T	
102.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
103.		*Chironominae sp.*			
104.		*Chironomus aff. alternans (V24) (CB)*			
105.		*Chlaenius australis*			
106.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
107.		*Choerodon vitta*			
108.		*Chroicocephalus novaehollandiae*			
109.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
110.	24288	*Circus approximans (Swamp Harrier)*			
111.	24289	*Circus assimilis (Spotted Harrier)*			
112.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
113.		*Cloeon sp.*			

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114.		*Coenagrionidae sp.*			
115.	24399	*Columba livia (Domestic Pigeon)*	Y		
116.		*Copidognathus meridianus*			
117.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
118.		*Corixidae sp.*			
119.	24416	*Corvus bennetti (Little Crow)*			
120.	25593	*Corvus orru (Torresian Crow)*			
121.	25701	*Coturnix ypsilophora (Brown Quail)*			
122.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
123.	25595	*Cracticus tibicen (Australian Magpie)*			
124.	30893	*Cryptoblepharus buchananii*			
125.	25020	*Cryptoblepharus plagiocephalus*			
126.	30892	*Cryptoblepharus ustulatus*			
127.		*Cryptochironomus griseidorsum*			
128.		*Cryptoerithus halli*			
129.		*Cryptoerithus occultus*			
130.	25458	*Ctenophorus caudicinctus (Ring-tailed Dragon)*			
131.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
132.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
133.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
134.	24886	*Ctenophorus reticulatus (Western Netted Dragon)*			
135.	25036	*Ctenotus duricola*			
136.	25462	*Ctenotus grandis*			
137.	25043	*Ctenotus grandis subsp. titan*			
138.	25045	*Ctenotus helenae*			
139.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
140.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
141.	25070	*Ctenotus robustus*			
142.	25072	*Ctenotus rubicundus*			
143.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
144.	25074	*Ctenotus schomburgkii*			
145.	25077	*Ctenotus serventyi*			
146.	25465	*Ctenotus uber (Spotted Ctenotus)*			
147.		*Culex (Culex) annulirostris*			
148.		*Culex nr. crinicauda (PSW)*			
149.		*Culicidae sp.*			
150.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
151.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
152.	25375	*Cyclorana maini (Sheep Frog)*			
153.	24322	*Cygnus atratus (Black Swan)*			
154.		*Cymbella delicatula Kütz.*			
155.		*Cypretta ?lutea*			
156.		*Cypretta seurati*			
157.		*Cypricercus salinus*			
158.		*Cypricercus sp. 422 (CB)*			
159.	25547	*Dacelo leachii (Blue-winged Kookaburra)*			
160.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
161.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
162.	25001	*Delma nasuta*			
163.	25002	*Delma pax*			
164.	25004	*Delma tincta*			
165.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
166.	25295	*Demansia psammophis subsp. cupreiceps (Yellow-faced Whipsnake)*			
167.	25297	*Demansia rufescens (Rufous Whipsnake)*			
168.	24324	*Dendrocygna arcuata (Wandering Whistling Duck, Chestnut Whistling Duck)*			
169.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
170.		*Diaphanosoma excisum*			
171.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
172.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
173.	41404	*Diplodactylus galaxias (Northern Pilbara Beak-faced Gecko)*			
174.	24937	*Diplodactylus mitchelli*			
175.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
176.	24084	*Dugong dugon (Dugong)*		S	
177.		*Dytiscidae sp.*			
178.		*Ecnomidae sp.*			
179.	41406	*Egernia cygnitos (Western Pilbara Spiny-tailed Skink)*			
180.	25101	*Egernia pilbarensis (Pilbara Skink)*			
181.		*Egretta garzetta*			
182.		*Egretta novaehollandiae*			
183.		*Elanus axillaris*			

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184.		*Elops hawaiensis*			
185.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
186.	24631	*Emblema pictum (Painted Finch)*			
187.		*Enochrus sp.*			
188.		*Eolophus roseicapillus*			
189.	24653	*Eopsaltria pulverulenta (Mangrove Robin)*			
190.		*Ephemeroporus barroisi s.l.*			
191.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
192.		*Ephydridae sp.*			
193.		*Epinephelus coioides*			
194.		*Epinephelus malabaricus*			
195.		*Epistylis sp*			
196.	24568	*Epthianura aurifrons (Orange Chat)*			
197.	24570	*Epthianura tricolor (Crimson Chat)*			
198.	42404	*Eremiascincus isolepis*			
199.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
200.	24837	*Eremiornis carteri (Spinifex-bird)*			
201.		*Eretes australis*			
202.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
203.	47938	*Esacus magnirostris (Beach Stone-curlew, Beach Thick-knee)*			
204.		*Ethmostigmus curtipes*			
205.		*Euchlanis dilatata*			
206.		*Eulimnadia dahli*			Y
207.		*Eulimnadia sp. P1 (PSW)*			Y
208.	24368	*Eurostopodus argus (Spotted Nightjar)*			
209.		*Eviota queenslandica*			
210.	25621	*Falco berigora (Brown Falcon)*			
211.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
212.	25623	*Falco longipennis (Australian Hobby)*			
213.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
214.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
215.	24476	*Falco subniger (Black Falcon)*			
216.		*Favonigobius melanobranchus*			
217.	24041	*Felis catus (Cat)*	Y		
218.	25327	*Fordonia leucobalia (White-bellied Mangrove Snake)*			
219.	25727	*Fulica atra (Eurasian Coot)*			
220.	25301	*Furina ornata (Moon Snake)*			
221.	24793	*Gallinago stenura (Pin-tailed Snipe)*		IA	
222.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
223.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
224.	42314	*Gavicalis virescens (Singing Honeyeater)*			
225.	24956	*Gehyra pilbara*			
226.	24958	*Gehyra punctata*			
227.	24959	*Gehyra variegata*			
228.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
229.	24401	*Geopelia cuneata (Diamond Dove)*			
230.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
231.	25585	*Geopelia striata (Zebra Dove)*			
232.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
233.		*Geoscaptus laevissimus*			
234.		*Gerres filamentosus*			
235.		*Gerres subfasciatus*			
236.	25530	*Gerygone fusca (Western Gerygone)*			
237.	24276	*Gerygone tenebrosa (Dusky Gerygone)*			
238.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
239.		*Glossogobius giuris*			
240.		*Glossogobius sp.*			
241.		*Gnatholepis argus*			
242.		*Gomphidae sp.*			
243.	24443	*Grallina cyanoleuca (Magpie-lark)*			
244.		*Grayenulla waldockae*			
245.	24484	*Grus rubicunda (Brolga)*			
246.		*Gymnothorax thrysoideus*			
247.		*Gymnothorax undulatus*			
248.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
249.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
250.		*Halacaridae sp.*			
251.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
252.	25541	*Haliastur indus (Brahminy Kite)*			
253.	24295	*Haliastur sphenurus (Whistling Kite)*			

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254.		*Halieutaea brevicaudata?*			
255.	24297	*Hamirostra melanosternon (Black-breasted Buzzard)*			
256.		*Hantzschia amphioxys (Ehr.) Grun.*			
257.		*Hebridae sp.*			
258.		*Hemicypris megalops*			
259.		*Hemiramphus sp.*			
260.		*Heterocypris sp.*			
261.	24633	*Heteromunia pectoralis (Pictorella Mannikin)*			
262.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
263.		*Heteronyx mimus*			
264.		*Heteronyx tepperi*			
265.		*Hexarthra cf brandorffi (PSW)*			
266.		*Hexarthra sp P3 5-2/5-2 (PSW)*			Y
267.	47965	*Hieraaetus morphnoides (Little Eagle)*			
268.	25734	*Himantopus himantopus (Black-winged Stilt)*			
269.	24491	*Hirundo neoxena (Welcome Swallow)*			
270.	25630	*Hirundo rustica (Barn Swallow)*		IA	
271.		*Hogna crispipes*			
272.		*Hydrachna sp. 4/5 (PSW)*			
273.		*Hydraenidae sp.*			
274.	25363	*Hydrelaps darwiniensis*			
275.		*Hydrobiidae sp P1 (not assimineid) (PSW)*			
276.		*Hydroglyphus grammopterus (=trilineatus)*			
277.		*Hydroglyphus orthogrammus*			
278.		*Hydrometridae sp.*			
279.		*Hydrophilidae sp.*			
280.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
281.		*Hydroptilidae sp.*			
282.		*Hyphydrus lyratus*			
283.		*Hyphydrus sp.*			
284.		*Ilyocypris australiensis*			
285.		*Ilyodromus sp. PB*			
286.		*Inegocia japonica*			
287.		*Ischnura aurora aurora*			
288.		*Isobactrus obesus*			
289.		*Isocypris williamsi (ex Ilyodromus sp. 413)*			
290.		*Isopedella tindalei*			
291.	25562	*Ixobrychus flavicollis (Black Bittern)*			
292.		*Knoelle clara*			
293.		*Lacinularia flosculosa*			
294.	24057	*Lagenodelphis hosei (Fraser's Dolphin)*			
295.	24367	*Lalage tricolor (White-winged Triller)*			
296.		*Lampona ampeinna*			
297.		*Lampona cylindrata*			
298.		*Lamponina scutata*			
299.		*Larsia albiceps*			
300.	25637	*Larus novaehollandiae (Silver Gull)*			
301.		*Latrodectus geometricus*			
302.		*Lecane bifastigata*			Y
303.		*Lecane bulla*			
304.		*Lecane cf. ludwigii (PSW)*			
305.		*Lecane cf. rhenana (SAP)*			
306.		*Lecane luna*			
307.		*Lecane papuana*			
308.		*Lecane ungulata*			
309.	24217	*Leggadina lakedownensis (Northern Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga)*		P4	
310.		*Leiopotherapon unicolor*			
311.		*Lepidotrigla sp.*			
312.		*Leptoceridae sp.*			
313.	25125	*Lerista bipes*			
314.	30928	*Lerista clara*			
315.	30929	*Lerista jacksoni*			
316.	25155	*Lerista muelleri*			
317.	30925	*Lerista verhmens*			
318.	25005	*Lialis burtonis*			
319.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
320.		*Libellulidae sp.*			
321.	25661	*Lichmera indistincta (Brown Honeyeater)*			
322.		*Limbodessus compactus*			

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323.	25739	*Limicola falcinellus (Broad-billed Sandpiper)*		IA	
324.		*Limnadopsis birchii*			
325.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
326.		*Liocranium praepositum*			
327.	41417	*Liopholis striata (Night Skink)*			
328.	25392	*Litoria rubella (Little Red Tree Frog)*			
329.		*Liza subviridis*			
330.		*Lophiocharon hutchinsi*			
331.		*Lophiocharon trisignatus*			
332.		*Loxandrus micantior*			
333.	30933	*Lucasium stenodactylum*			
334.		*Luticola mutica (Kütz.) Mann*			
335.		*Lutjanus argentimaculatus*			
336.		*Lychas sp. 2*			
337.		*Lymnaeidae sp.*			
338.	24180	*Macroderma gigas (Ghost Bat)*		T	
339.	25489	*Macropus robustus (Euro, Biggada)*			
340.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
341.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
342.		*Macrothrix sp.*			
343.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
344.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
345.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
346.	24583	*Manorina flavigula (Yellow-throated Miner)*			
347.		*Meedo houstoni*			
348.		*Megacephala greyana*			
349.		*Melanotaenia australis*			
350.	24589	*Melithreptus gularis subsp. laetior (Black-chinned Honeyeater)*			
351.	24736	*Melopsittacus undulatus (Budgerigar)*			
352.	25184	*Menetia greyii*			
353.	24598	*Merops ornatus (Rainbow Bee-eater)*			
354.		*Mesocyclops brooksi*			
355.		*Mesoveliidae sp.*			
356.		*Metavelifer multiradiatus*			
357.		*Microcarbo melanoleucos*			
358.		*Microcyclops varicans*			
359.		*Micrognathus micronotopterus*			
360.		*Micronecta gracilis*			
361.		*Micronecta sp.*			
362.	25542	*Milvus migrans (Black Kite)*			
363.		*Minasteron minusculum*			
364.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
365.	24302	*Mirafra javanica subsp. horsfieldii (Horsfield's Bushlark, Singing Bushlark)*			
366.		*Moina micrura s.l.*			
367.		*Monacanthus chinensis*			
368.		*Monodactylus argenteus*			
369.	25495	*Morethia ruficauda*			
370.	25193	*Morethia ruficauda subsp. exquisita*			
371.		*Mormopterus (Ozimops) cobourgianus*			
372.	24183	*Mormopterus loriae (Little Northern Freetail-bat)*			
373.		*Mugil cephalus*			
374.	24223	*Mus musculus (House Mouse)*	Y		
375.	25344	*Natator depressus (Flatback Turtle)*		T	
376.		*Nematalosa erebi*			
377.		*Nematoda sp. P2/P4 (PSW)*			
378.		*Nemipterus celebicus*			
379.	25422	*Neobatrachus aquilonius (Northern Burrowing Frog)*			
380.	25685	*Neochmia ruficauda (Star Finch)*			
381.		*Neopsephotus bourkii*			
382.		*Neosilurus hyrtlii*			
383.		*Nephila edulis*			
384.	24969	*Nephrurus levis subsp. pilbarensis*			
385.		*Nepidae sp.*			
386.	24327	*Nettapus pulchellus (Green Pygmy-goose)*			
387.		*Netuma bilineata*			
388.		*Netuma proxima*			
389.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
390.	25747	*Ninox connivens (Barking Owl)*			
391.		*Nitzschia microcephala Grun.*			
392.		*Nitzschia perminuta (Grun.) M. Peragallo*			

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393.		*Nitzschia sigma (Kütz.) W. Sm.*			
394.	25430	*Notaden nichollsi (Desert Spadefoot)*			
395.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
396.		*Notonectidae sp.*			
397.	25196	*Notoscincus butleri (lined soil-crevice skink (Dampier))*		P4	
398.	25197	*Notoscincus ornatus subsp. ornatus*			
399.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
400.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
401.	25742	*Numenius phaeopus (Whimbrel)*		IA	
402.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
403.	24192	*Nyctophilus arnhemensis (Arnhem Land Long-eared Bat)*			
404.	42365	*Nyctophilus daedalus (Northwestern Long-eared Bat, Pallid Long-eared Bat)*			
405.		*Nyctophilus geoffroyi subsp. pallescens*			
406.	24742	*Nymphicus hollandicus (Cockatiel)*			
407.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
408.	24976	*Oedura marmorata (Marbled Velvet Gecko)*			
409.		*Oligochaeta sp.*			
410.		*Omobranchus rotundiceps*			
411.		*Omoedus orbiculatus*			
412.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
413.		*Opistognathus darwiniensis*			
414.		*Orthocladiinae sp.*			
415.		*Orthomorpha coarctata*			
416.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
417.	48034	*Osphranter robustus (Euro, Biggada)*			
418.		*Ostracoda (unident.)*			
419.		*Ovatalona cf. cambouei*			
420.		*Oxyopes variabilis*			
421.		*Ozestheria packardi*			
422.	24620	*Pachycephala lanioides (White-breasted Whistler)*			
423.	24621	*Pachycephala melanura subsp. melanura (Mangrove Golden Whistler)*			
424.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
425.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
426.		*Paramonacanthus choirocephalus*			
427.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
428.	25682	*Pardalotus striatus (Striated Pardalote)*			
429.	25687	*Passer domesticus (House Sparrow)*	Y		
430.	24642	*Passer montanus (Eurasian Tree Sparrow)*	Y		
431.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
432.		*Peneoenanthe pulverulenta*			
433.		*Pentapodus porosus*			
434.		*Pentapodus sp.*			
435.	48060	*Petrochelidon ariel (Fairy Martin)*			
436.	48061	*Petrochelidon nigricans (Tree Martin)*			
437.	25697	*Phalacrocorax carbo (Great Cormorant)*			
438.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
439.	25699	*Phalacrocorax varius (Pied Cormorant)*			
440.	24409	*Phaps chalcoptera (Common Bronzewing)*			
441.	24411	*Phaps histrionica (Flock Bronzewing, Flock Pigeon)*			
442.		*Pheropsophus verticalis*			
443.		*Phreodrilid with dissimilar ventral chaetae*			
444.		*Phreodrilid with similar ventral chaetae*			
445.		*Pilbarascutigera incola*			
446.		*Pinnularia divergens W. Sm.*			
447.		*Pinnularia subrostrata (A. Cl.) Cl.-Euler*			
448.		*Planigale sp. nov.*			
449.		*Planorbidae sp.*			
450.	24842	*Platalea regia (Royal Spoonbill)*			
451.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
452.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
453.		*Pleidae sp.*			
454.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
455.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
456.	25703	*Podargus strigoides (Tawny Frogmouth)*			
457.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
458.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
459.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
460.		*Polyarthra dolichoptera*			
461.	25706	*Pomatostomus temporalis (Grey-crowned Babbler)*			
462.	24684	*Pomatostomus temporalis subsp. rubeculus (Grey-crowned Babbler)*			

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463.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
464.	25732	*Porzana pusilla (Baillon's Crake)*			
465.	24771	*Porzana tabuensis (Spotless Crake)*			
466.		*Pristina longiseta*			
467.		*Prodidomus woodleigh*			
468.		*Protonibea diacanthus*			
469.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
470.	25261	*Pseudechis australis (Mulga Snake)*			
471.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
472.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
473.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
474.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
475.	24172	*Pteropus alecto (Black Flying-fox)*			
476.		*Ptilonorhynchus guttatus*			
477.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
478.		*Pyralidae sp.*			
479.		*Quistrachia legendrei*			
480.	24245	*Rattus rattus (Black Rat)*	Y		
481.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
482.		*Regimbartia attenuata*			
483.		*Repomucenus calcaratus*			
484.		*Rhagada convicta*			
485.	43368	*Rhinonicteris aurantia (Orange Leaf-nosed bat)*		P4	
486.	48096	*Rhipidura albiscapa (Grey Fantail)*			
487.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
488.	24457	*Rhipidura phasiana (Mangrove Grey Fantail)*			
489.		*Rhombognathus dispar*			Y
490.		*Rhombognathus scutulatus*			
491.	24982	*Rhynchoedura ornata (Western Beaked Gecko)*			
492.		*Scaptognathides hawaiiensis*			Y
493.		*Scaptognathides ornatus*			Y
494.		*Scatophagus argus*			
495.		*Scolecenchelys macroptera*			
496.		*Scolopendra laeta*			
497.		*Scolopendra morsitans*			
498.		*Selenotoca multifasciata*			
499.		*Selenotoca sp.*			Y
500.		*Simaetha tenuior*			
501.		*Simognathus salebrosus*			
502.		*Simognathus tener*			Y
503.	30948	*Smicrornis brevirostris (Weebill)*			
504.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
505.		*Sorsogona tuberculata*			
506.		*Sphyraena barracuda*			
507.		*Stauroneis anceps Ehr.*			
508.		*Stauroneis phoenicenteron (Nitz.) Ehr.*			
509.	24521	*Sterna bengalensis (Lesser Crested Tern)*			
510.	25642	*Sterna hirundo (Common Tern)*		IA	
511.	48593	*Sternula albifrons (Little Tern)*		IA	
512.	48594	*Sternula nereis (Fairy Tern)*			
513.	24329	*Stictonetta naevosa (Freckled Duck)*			
514.	24482	*Stiltia isabella (Australian Pratincole)*			
515.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
516.	24924	*Strophurus ciliaris subsp. aberrans*			
517.	24927	*Strophurus elderi*			
518.		*Supunna picta*			
519.	25269	*Suta fasciata (Rosen's Snake)*			
520.	25307	*Suta punctata (Spotted Snake)*			
521.		*Synanceia horrida*			
522.		*Tabanidae sp.*			
523.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
524.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
525.	30870	*Taeniopygia guttata (Zebra Finch)*			
526.		*Tanypodinae sp.*			
527.		*Tanytarsus fuscithorax/semibarbitarsus*			
528.		*Tanytarsus sp. P8 (PSW)*			
529.		*Terapon jarbua*			
530.		*Testudinella patina*			
531.		*Thalasseus bengalensis*			
532.	48597	*Thalasseus bergii (Crested Tern)*		IA	

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533.		*Thermocyclops decipiens*			
534.		*Thiaridae sp.*			
535.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
536.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
537.	25548	*Todiramphus chloris (Collared Kingfisher)*			
538.	24306	*Todiramphus chloris subsp. pilbara (Pilbara Collared Kingfisher)*			
539.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
540.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
541.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
542.		*Trichocerca similis*			
543.		*Trichocyclus nigropunctatus*			
544.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
545.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
546.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
547.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
548.		*Triops australiensis australiensis*			
549.		*Triops nr australiensis (PSW) (?nsp BVT)*			Y
550.		*Turbellaria sp.*			
551.	24851	*Turnix velox (Little Button-quail)*			
552.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
553.		*Tylosurus crocodilus*			
554.	30814	*Tympanocryptis cephalus (Pebble Dragon)*			
555.	25445	*Uperoleia russelli (Northwest Toadlet)*			
556.	41428	*Uperoleia saxatilis (Pilbara Toadlet)*			
557.		*Valamugil seheli*			
558.		*Valenciennea muralis*			
559.	24386	*Vanellus tricolor (Banded Lapwing)*			
560.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
561.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
562.	25223	*Varanus panoptes subsp. rubidus*			
563.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
564.		*Veliidae sp.*			
565.		*Venatrix arenaris*			
566.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
567.	24040	*Vulpes vulpes (Red Fox)*	Y		
568.		*Wesmaldra nixaut*			
569.		*Wydundra kennedy*			
570.		*Wydundra nixaut*			Y
571.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
572.		*Yongeichthys nebulosus*			
573.		*Zenodorus orbiculatus*			
574.	24857	*Zosterops luteus (Yellow White-eye)*			
575.	24248	*Zyzomys argurus (Common Rock-rat)*			
Chromista					
576.	35220	*Canistrocarpus cervicornis*			
577.	35910	*Canistrocarpus crispatus*			
578.	26694	*Colpomenia sinuosa*			
579.	26764	*Dictyopteris australis*			
580.	29954	*Dictyopteris woodwardia*			
581.	26775	*Dictyota ciliolata*			
582.	26946	*Hormophysa cuneiformis*			
583.	26949	*Hydroclathrus clathratus*			
584.	27113	*Padina australis*			
585.	48304	*Padina tetrastromatica*			Y
586.	27248	*Sargassum ligulatum*			
587.	27253	*Sargassum peronii*			
588.	42785	*Sirophysalis trinodis*			
589.	27282	*Spatoglossum macrodontum*			
590.	27293	*Sphacelaria rigidula*			
591.		*Turbinaria mesenterina*			
592.		*Turbinaria reniformis*			
Fungi					
593.	27576	*Acarospora nodulosa*			
594.	44918	*Caloplaca michelagoensis*			
595.		*Caloplaca sp.*			
596.	27715	*Diploschistes actinostomus*			
597.	27932	*Peltula bolanderi*			
598.	46616	*Triodiomyces altilis*			
599.	28194	*Xanthoria parietina*			

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Plantae					
600.	4886	*Abutilon amplum*			
601.	4891	*Abutilon fraseri (Lantern Bush)*			
602.	18120	*Abutilon fraseri subsp. fraseri*			
603.	4895	*Abutilon lepidum*			
604.	4899	*Abutilon malvifolium (Bastard Marshmallow)*			
605.	4901	*Abutilon otocarpum (Desert Chinese Lantern)*			
606.	4902	*Abutilon oxycarpum (Flannel Weed)*			
607.	43020	*Abutilon oxycarpum subsp. Prostrate (A.A. Mitchell PRP 1266)*			
608.	3209	*Acacia ampliceps*			
609.	44580	*Acacia ampliceps x bivenosa*			
610.	44586	*Acacia ampliceps x sclerosperma subsp. sclerosperma*			
611.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
612.	3223	*Acacia arida*			
613.	3241	*Acacia bivenosa*			
614.	44588	*Acacia bivenosa x sclerosperma subsp. sclerosperma*			
615.	17013	*Acacia colei var. colei*			
616.	13500	*Acacia coriacea subsp. coriacea*			
617.	13502	*Acacia coriacea subsp. pendens*			
618.	16174	*Acacia elachantha*			
619.	12673	*Acacia glaucocaesia*			
620.	3356	*Acacia gregorii (Gregory's Wattle)*			
621.	3377	*Acacia inaequilatera (Baderi)*			
622.	3434	*Acacia maitlandii (Maitland's Wattle)*			
623.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
624.	3506	*Acacia pyrifolia (Ranji Bush, Kandji)*			
625.	29016	*Acacia pyrifolia var. morrisonii*			
626.	29015	*Acacia pyrifolia var. pyrifolia*			
627.	13078	*Acacia sclerosperma subsp. sclerosperma*			
628.	29135	*Acacia sericophylla*			
629.	3551	*Acacia sphaerostachya*			
630.	19456	*Acacia stellaticeps*			
631.	13070	*Acacia synchronicia*			
632.	3573	*Acacia tenuissima*			
633.	3579	*Acacia trachycarpa (Minni Ritchi, Balgali)*			
634.	20319	*Acacia tumida var. pilbarensis*			
635.	3606	*Acacia xiphophylla*			
636.	26441	*Acanthophora spicifera*			
637.	48409	*Acetabularia caliculus*			
638.	17422	*Adriana tomentosa var. tomentosa*			
639.	2646	*Aerva javanica (Kapok Bush)*	Y		
640.	3680	*Aeschynomene indica (Budda Pea)*			
641.	3609	*Albizia lebbeck*			
642.	4739	*Alectryon oleifolius*			
643.	11487	*Alectryon oleifolius subsp. oleifolius*			
644.	2647	*Alternanthera angustifolia*			
645.	2651	*Alternanthera nana (Hairy Joyweed)*			
646.	2652	*Alternanthera nodiflora (Common Joyweed)*			
647.	17147	*Alysicarpus muelleri*			
648.	2660	*Amaranthus cuspidifolius*			
649.	20018	*Amaranthus undulatus*			
650.	5277	*Ammannia baccifera*			
651.	5278	*Ammannia multiflora*			
652.	26462	*Amphiroa fragilissima*			
653.	2383	*Amyema preissii (Wireleaf Mistletoe)*			
654.	11874	*Amyema sanguinea var. sanguinea*			
655.	204	*Aristida burbidgeae*			
656.	207	*Aristida contorta (Bunched Kerosene Grass)*			
657.	215	*Aristida latifolia (Feathertop Wiregrass)*			
658.	226	*Arundo donax (Giant Reed)*	Y		
659.	26486	*Asparagopsis taxiformis*			
660.	229	*Astrebla pectinata (Barley Mitchell Grass)*			
661.	4740	*Atalaya hemiglauca (Whitewood)*			
662.	2450	*Atriplex amnicola (Swamp Saltbush)*			
663.	2451	*Atriplex bunburyana (Silver Saltbush)*			
664.	2453	*Atriplex codonocarpa (Flat-topped Saltbush)*			
665.	2463	*Atriplex isatidea (Coast Saltbush)*			
666.	2466	*Atriplex lindleyi*			
667.	17520	*Atriplex lindleyi subsp. conduplicata*		P3	
668.	2476	*Atriplex semilunaris (Annual Saltbush)*			

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669.	6828	*Avicennia marina (White Mangrove)*			
670.	5183	*Bergia ammannioides*			
671.	5186	*Bergia trimera*			
672.	7866	*Blumea tenella*			
673.	2769	*Boerhavia burbidgeana*			
674.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
675.	2772	*Boerhavia gardneri*			
676.	2773	*Boerhavia paludosa*			
677.	2774	*Boerhavia repleta*			
678.	2775	*Boerhavia schomburgkiana*			
679.		*Boerhavia sp.*			
680.	11167	*Bonamia erecta*			
681.	6606	*Bonamia media*			
682.	6608	*Bonamia pannosa*			
683.	44782	*Bonamia pilbarensis*			
684.	26509	*Bornetella oligospora*			
685.	26510	*Bornetella sphaerica*			
686.	12716	*Brachychiton acuminatus*			
687.	4603	*Bridelia tomentosa*			
688.	5291	*Bruguiera exaristata (Ribbed Mangrove)*			
689.	750	*Bulbostylis barbata*			
690.	752	*Bulbostylis turbinata*			
691.	11055	*Cajanus cinereus*			
692.	10972	*Cajanus marmoratus*			
693.	11150	*Cajanus pubescens*			
694.	2864	*Calandrinia ptychosperma*			
695.	2866	*Calandrinia quadrivalvis*			
696.	2872	*Calandrinia tepperiana*			
697.	7905	*Calotis multicaulis (Many-stemmed Burr-daisy)*			
698.	7906	*Calotis plumulifera*			
699.	3749	*Canavalia rosea (Wild Jack Bean)*			
700.	2981	*Capparis spinosa*			
701.	48291	*Capparis spinosa subsp. nummularia*			
702.	6567	*Carissa lanceolata (Conkerberry, Marnuwiji)*			
703.	2949	*Cassytha capillaris*			
704.	2950	*Cassytha filiformis (Love Vine, Jirawan)*			
705.	42620	*Caulerpa chemnitzia*			
706.	44539	*Caulerpa cylindracea*			
707.	44547	*Caulerpa lamourouxii*			
708.	26568	*Caulerpa lentillifera*			
709.	26573	*Caulerpa racemosa*			
710.	35122	*Caulerpa racemosa var. racemosa*			
711.	26576	*Caulerpa serrulata*			
712.	26577	*Caulerpa sertularioides*			
713.	26582	*Caulerpa verticillata*			
714.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		
715.	259	*Cenchrus echinatus (Burrgrass)*	Y		
716.	29721	*Cenchrus setiger (Birdwood Grass)*	Y		
717.	7919	*Centipeda minima (Spreading Sneezewood, Kanjirralaa, Inteng-inteng, Karengkal, Kata-palkalpa, Munyu-parnti-parnti)*			
718.	19762	*Centipeda minima subsp. macrocephala*			
719.	39680	*Ceriops australis*			
720.	33	*Cheilanthes contigua*			
721.	12818	*Cheilanthes sieberi subsp. sieberi*			
722.	266	*Chloris barbata (Purpletop Chloris)*	Y		
723.	269	*Chloris pectinata (Comb Chloris)*			
724.	270	*Chloris pumilio*			
725.	33516	*Chrysocephalum gilesii*			
726.	273	*Chrysopogon fallax (Golden Beard Grass)*			
727.	2985	*Cleome oxalidea*			
728.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
729.	6729	*Clerodendrum floribundum (Lollybush)*			
730.	6732	*Clerodendrum tomentosum*			
731.	13689	*Clerodendrum tomentosum var. lanceolatum*			
732.		*Codium platyclados*			Y
733.	2778	*Codonocarpus cotinifolius (Native Poplar, Kundurangu)*			
734.	1165	*Commelina ensifolia (Wandering Jew, Buargu)*			
735.	2776	*Commicarpus australis (Perennial Tar Vine)*			
736.	17339	*Corchorus incanus*			
737.	25847	*Corchorus incanus subsp. incanus*			

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738.	13659	*Corchorus laniflorus*			
739.	4862	*Corchorus parviflorus*			
740.	17661	*Corchorus tectus*			
741.	4865	*Corchorus tridens*			
742.	13467	*Corchorus trilocularis*			
743.	4867	*Corchorus walcottii (Woolly Corchorus)*			
744.	17093	*Corymbia hamersleyana*			
745.	17092	*Corymbia opaca*			
746.	19565	*Cressa australis*			
747.	19378	*Crotalaria dissitiflora subsp. benthamiana*			
748.	20179	*Crotalaria medicaginea var. neglecta*			
749.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
750.	41720	*Cucumis argenteus*			
751.	7371	*Cucumis melo (Ulcardo Melon)*			
752.	41721	*Cucumis variabilis*			
753.	17117	*Cullen cinereum*			
754.	17436	*Cullen graveolens*			
755.	17118	*Cullen leucanthum*			
756.	17120	*Cullen pogonocarpum*			
757.	13733	*Cuscuta victoriana*			
758.	279	*Cymbopogon ambiguus (Scentgrass)*			
759.	280	*Cymbopogon bombycinus (Silky Oilgrass)*			
760.	281	*Cymbopogon obtectus (Silkyheads)*			
761.	6584	*Cynanchum floribundum (Dumara Bush, Tjipa)*			
762.	48280	*Cynanchum viminale subsp. australe*			
763.	46555	*Cynodon prostratus*			
764.	774	*Cyperus bifax (Downs Nutgrass)*			
765.	12801	*Cyperus blakeanus*			
766.	777	*Cyperus bulbosus (Bush Onion, Tjanmata)*			
767.	789	*Cyperus difformis (Rice Sedge)*			
768.	798	*Cyperus iria*			
769.	807	*Cyperus pulchellus*			
770.	814	*Cyperus squarrosus*			
771.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
772.	290	*Dactyloctenium radulans (Button Grass)*			
773.	26740	*Dasya frutescens*			
774.	6962	*Datura leichhardtii (Native Thornapple)*	Y		
775.	6963	*Datura metel (Downy Thornapple)*	Y		
776.	7317	*Dentella asperata*			
777.	7318	*Dentella minutissima*			
778.	3852	*Desmodium campylocaulon*			
779.	3853	*Desmodium filiforme*			
780.	3856	*Desmodium muelleri*			
781.	303	*Dichanthium fecundum (Curly Bluegrass)*			
782.	13741	*Dichanthium sericeum subsp. humilius*			
783.	3612	*Dichrostachys spicata (Pied Piper Bush)*			
784.	7166	*Dicliptera armata*			
785.	26769	*Dictyosphaeria cavernosa*			
786.	26782	*Digenea simplex*			
787.	313	*Digitaria ctenantha (Comb Finger Grass)*			
788.	4745	*Diplopeltis eriocarpa (Hairy Pepperflower)*			
789.	48738	*Distimake dissectus var. dissectus*	Y		
790.	4759	*Dodonaea coriacea*			
791.	33479	*Dysphania melanocarpa (Black Crumbweed)*			
792.	2504	*Dysphania plantaginella*			
793.	2506	*Dysphania rhadinostachya*			
794.	11653	*Dysphania rhadinostachya subsp. inflata*			
795.	11890	*Dysphania rhadinostachya subsp. rhadinostachya*			
796.	32348	*Eccremidium arcuatum*			
797.	6682	*Ehretia saligna (False Cedar)*			
798.	14301	*Ehretia saligna var. saligna*			
799.	827	*Eleocharis geniculata*			
800.	2511	*Enchylaena tomentosa (Barrier Saltbush)*			
801.	12064	*Enchylaena tomentosa var. tomentosa (Barrier Saltbush)*			
802.	357	*Enneapogon caerulescens (Limestone Grass)*			
803.	368	*Enteropogon ramosus (Windmill Grass, Curly Windmill Grass)*			
804.	375	*Eragrostis cumingii (Cuming's Love Grass)*			
805.	378	*Eragrostis dielsii (Mallee Lovegrass)*			
806.	380	*Eragrostis eriopoda (Woollybutt Grass, Wangurnu)*			
807.	16731	*Eragrostis exigua*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
808.	381	*Eragrostis falcata (Sickle Lovegrass)*			
809.	388	*Eragrostis leptocarpa (Drooping Lovegrass)*			
810.	398	*Eragrostis tenellula (Delicate Lovegrass)*			
811.	399	*Eragrostis xerophila (Knotty-butt Neverfail)*			
812.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
813.	16363	*Eremophila maculata subsp. brevifolia (Native Fuchsia)*			
814.	400	*Eriachne aristidea*			
815.	403	*Eriachne benthamii (Swamp Wanderrie)*			
816.	413	*Eriachne mucronata (Mountain Wanderrie Grass)*			
817.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
818.	417	*Eriachne pulchella (Pretty Wanderrie)*			
819.	16485	*Eriachne pulchella subsp. dominii*			
820.	16486	*Eriachne pulchella subsp. pulchella*			
821.	4335	*Erodium cygnorum (Blue Heronsbill)*			
822.	3871	*Erythrina vespertilio (Yulbah)*			
823.	5580	*Eucalyptus camaldulensis (River Gum, Yabalinyba)*			
824.	35345	*Eucalyptus camaldulensis subsp. obtusa (Blunt-budded River Red Gum)*			
825.	35343	*Eucalyptus camaldulensis subsp. refulgens*			
826.	5752	*Eucalyptus prominens*			
827.	14548	*Eucalyptus victrix*			
828.	4617	*Euphorbia australis (Namana)*			
829.	35307	*Euphorbia australis var. australis*			
830.	42843	*Euphorbia australis var. glabra*		P2	
831.	4619	*Euphorbia biconvexa*			
832.	4620	*Euphorbia boophthona (Gascoyne Spurge)*			
833.	9048	*Euphorbia careyi*			
834.	4623	*Euphorbia coghlanii (Namana)*			
835.	4626	*Euphorbia drummondii (Caustic Weed, Piwi)*			
836.	4635	*Euphorbia myrtoides*			
837.	4642	*Euphorbia schultzii*			
838.	4644	*Euphorbia sharkoensis*			
839.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
840.	42879	*Euphorbia trigonosperma*			
841.	42876	*Euphorbia vaccaria var. vaccaria*			
842.	6617	*Evolvulus alsinoides (Tropical Speedwell)*			
843.	11200	*Evolvulus alsinoides var. villosicalyx*			
844.	25811	*Ficus aculeata*			
845.	19648	*Ficus brachypoda*			
846.	1753	*Ficus platypoda (Native Fig, Makartu)*			
847.	1759	*Ficus virens (Albayi)*			
848.	12096	*Ficus virens var. virens*			
849.	851	*Fimbristylis dichotoma (Eight Day Grass)*			
850.	855	*Fimbristylis ferruginea*			
851.	859	*Fimbristylis littoralis*			
852.	862	*Fimbristylis microcarya*			
853.	878	*Fimbristylis rara*			
854.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
855.	4654	*Flueggea virosa*			
856.	5188	*Frankenia ambita*			
857.	5209	*Frankenia pauciflora (Seaheath)*			
858.	26835	*Galaxaura rugosa*			
859.	2836	*Glinus oppositifolius*			
860.	3938	*Glycine canescens (Silky Glycine)*			
861.	2674	*Gomphrena affinis*			
862.	18361	*Gomphrena affinis subsp. pilbarensis*			
863.	2676	*Gomphrena canescens (Batchelors Buttons)*			
864.	18360	*Gomphrena cucullata*		P3	
865.	2680	*Gomphrena cunninghamii*			
866.	2682	*Gomphrena flaccida (Gomphrena Weed)*			
867.	18367	*Gomphrena kanisii*			
868.	2683	*Gomphrena leptoclada*			
869.	18257	*Gomphrena leptoclada subsp. leptoclada*			
870.	17894	*Gomphrena leptophylla*		P3	
871.	11131	*Gomphrena sordida*			
872.	31074	*Gomphrena sp. Martins Well (K.F. Kenneally 6116)*			Y
873.	6151	*Gonocarpus ephemerus*			
874.	7509	*Goodenia forrestii*			
875.	7521	*Goodenia lamprosperma*			
876.	7526	*Goodenia microptera*			
877.	12552	*Goodenia muelleriana*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
878.	12570	*Goodenia pallida*		P1	
879.	10982	*Goodenia stobbsiana*			
880.	7556	*Goodenia tenuiloba*			
881.	4910	*Gossypium australe (Native Cotton)*			
882.	4913	*Gossypium hirsutum (Upland Cotton)*	Y		
883.	2079	*Grevillea pyramidalis (Caustic Bush, Tjungu)*			
884.	19570	*Grevillea pyramidalis subsp. leucadendron*			
885.	13440	*Grevillea wickhamii subsp. aprica*			
886.	12832	*Gymnanthera cunninghamii*		P3	
887.	2177	*Hakea lorea (Witinti)*			
888.	19137	*Hakea lorea subsp. lorea*			
889.	26892	*Halimeda discoidea*			
890.	26894	*Halimeda macroloba*			
891.	47213	*Halimeda versatilis*			
892.	131	*Halodule uninervis*			
893.	163	*Halophila minor*			
894.	164	*Halophila ovalis (Sea Wrack)*			
895.	165	*Halophila spinulosa*			
896.	37642	*Halymenia durvillei*			
897.	6704	*Heliotropium conocarpum*			
898.	6705	*Heliotropium crispatum*			
899.	6706	*Heliotropium cunninghamii*			
900.	6707	*Heliotropium curassavicum (Smooth Heliotrope)*			
901.	6712	*Heliotropium heteranthum*			
902.	17307	*Heliotropium inexplicitum*			
903.	17315	*Heliotropium tanythrix*			
904.	6718	*Heliotropium tenuifolium (Mamukata)*			
905.	26930	*Heterosiphonia crassipes*			
906.	29316	*Hibiscus austrinus*			
907.	29317	*Hibiscus austrinus var. austrinus*			
908.	4923	*Hibiscus brachysiphonius*			
909.	4925	*Hibiscus coatesii*			
910.	4933	*Hibiscus leptocladus*			
911.	4942	*Hibiscus sturtii (Sturt's Hibiscus)*			
912.	5215	*Hybanthus aurantiacus*			
913.	48203	*Hypertelis cerviana*			
914.	14587	*Indigastrum parviflorum*			
915.	3973	*Indigofera colutea (Sticky Indigo)*			
916.	3980	*Indigofera linifolia*			
917.	3981	*Indigofera linnaei (Birdsville Indigo)*			
918.	3982	*Indigofera monophylla*			
919.	3987	*Indigofera trita*			
920.	31035	*Indigofera trita subsp. trita*			
921.	6623	*Ipomoea coptica*			
922.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
923.	6631	*Ipomoea lonchophylla (Cowvine)*			
924.	6633	*Ipomoea muelleri (Poison Morning Glory, Yumbu)*			
925.	6635	*Ipomoea pes-caprae*			
926.	11312	*Ipomoea pes-caprae subsp. brasiliensis*			
927.	6636	*Ipomoea plebeia (Bellvine)*			
928.	6637	*Ipomoea polymorpha*			
929.		*Ipomoea sp.*			
930.	458	*Iseilema dolichotrichum*			
931.	459	*Iseilema eremaeum*			
932.	465	*Iseilema vaginiflorum (Red Flinders Grass)*			
933.	3989	*Isotropis atropurpurea (Poison Sage)*			
934.	8088	*Ixiochlamys cuneifolia*			
935.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
936.	8095	*Lactuca saligna (Wild Lettuce, Willow-leaf Lettuce)*	Y		
937.		*Launaea sarmenstosa*			
938.	8098	*Launaea sarmentosa*			
939.	4960	*Lawrencia viridigrisea*			
940.	3035	*Lepidium pedicellosum*			
941.	3038	*Lepidium pholidogynum*			
942.	37480	*Lobelia arnhemiaca*			
943.	4060	*Lotus australis (Austral Trefoil)*			
944.	4061	*Lotus cruentus (Redflower Lotus)*			
945.	2544	*Maireana georgei (Satiny Bluebush)*			
946.	2556	*Maireana planifolia (Low Bluebush)*			
947.	11662	*Maireana tomentosa subsp. tomentosa*			

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948.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
949.	75	*Marsilea exarata*			
950.	5875	*Melaleuca argentea (Silver Cadjeput, Bandaran)*			
951.	5933	*Melaleuca linophylla*			
952.	5051	*Melhania oblongifolia*			
953.	7082	*Mimulus gracilis*			
954.	8109	*Minuria integerrima (Smooth Minuria)*			
955.	8110	*Minuria leptophylla (Minnie Daisy)*			
956.	6490	*Muellerolimon salicorniaceum*			
957.	17158	*Myoporum montanum (Native Myrtle)*			
958.	2573	*Neobassia astrocarpa*			
959.	44548	*Neomeris bilimbata*			
960.	3614	*Neptunia dimorphantha (Sensitive Plant)*			
961.	3617	*Neptunia monosperma*			
962.	6971	*Nicotiana benthamiana (Tjuntiwari)*			
963.	6976	*Nicotiana occidentalis (Native Tobacco)*			
964.	11331	*Nicotiana occidentalis subsp. obliqua*			
965.	11856	*Nicotiana occidentalis subsp. occidentalis*			
966.	38421	*Notoleptopus decaisnei*			
967.	38422	*Notoleptopus decaisnei var. decaisnei*			
968.	7338	*Oldenlandia crouchiana*			
969.	19640	*Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)*		P3	
970.	6651	*Operculina aequisepala*			
971.	5227	*Opuntia stricta (Common Prickly Pear)*	Y		
972.	36400	*Palisada perforata*			
973.	503	*Panicum decompositum (Native Millet, Kaltu-kaltu)*			
974.	504	*Panicum effusum (Hairy Panic Grass)*			
975.	505	*Panicum laevinode*			
976.	515	*Paraneurachne muelleri (Northern Mulga Grass)*			
977.	10975	*Paspalidium basicladum*			
978.	518	*Paspalidium clementii (Clements Paspalidium)*			
979.	523	*Paspalidium rarum (Rare Paspalidium)*			
980.	525	*Paspalidium tabulatum*			
981.	5226	*Passiflora foetida (Stinking Passion Flower)*	Y		
982.	27121	*Penicillus nodulosus*			
983.	13494	*Pentalepis trichodesmoides*			
984.	7092	*Peplidium muelleri*			
985.	18462	*Peplidium sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768)*			
986.	3675	*Petalostylis labicheoides (Slender Petalostylis)*			
987.	9056	*Phyllanthus baccatus*			
988.	17626	*Phyllanthus erwinii*			
989.	4680	*Phyllanthus maderaspatensis*			
990.	17794	*Phyllanthus tenellus*	Y		
991.	5230	*Pimelea ammocharis*			
992.	8167	*Pluchea dentex*			
993.	17816	*Pluchea ferdinandi-muelleri*			
994.	43944	*Pluchea longiseta*			
995.	8168	*Pluchea rubelliflora*			
996.	8170	*Pluchea tetranthera*			
997.	2901	*Polycarpaea holtzei*			
998.	2903	*Polycarpaea longiflora*			
999.	41365	*Polygala glaucifolia*			
1000.	4572	*Polygala isingii*			
1001.	6653	*Polymeria ambigua (Morning Glory)*			
1002.	6655	*Polymeria calycina*			
1003.	17513	*Polymeria lanata*			
1004.		*Polymeria sp.*			
1005.	2878	*Portulaca conspicua*			
1006.	2879	*Portulaca cyclophylla*			
1007.	43981	*Portulaca decipiens*			
1008.	2884	*Portulaca oleracea (Purslane, Wakati)*			
1009.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
1010.	8192	*Pterocaulon sphacelatum (Apple Bush, Fruit Salad Plant)*			
1011.	8193	*Pterocaulon sphaeranthoides*			
1012.	2690	*Ptilotus aervoides*			
1013.	2696	*Ptilotus astrolasius*			
1014.	2698	*Ptilotus auriculifolius*			
1015.	2699	*Ptilotus axillaris (Mat Mulla Mulla)*			
1016.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
1017.	2706	*Ptilotus carinatus*			

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1018.	2711	*Ptilotus clementii (Tassel Top)*			
1019.	2717	*Ptilotus divaricatus (Climbing Mulla Mulla)*			
1020.	2721	*Ptilotus exaltatus (Tall Mulla Mulla)*			
1021.	2725	*Ptilotus fusiformis*			
1022.	2728	*Ptilotus gomphrenoides*			
1023.	2729	*Ptilotus grandiflorus*			
1024.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
1025.	2741	*Ptilotus macrocephalus (Featherheads)*			
1026.	2745	*Ptilotus murrayi*			
1027.	2746	*Ptilotus nobilis (Tall Mulla Mulla)*			
1028.	2747	*Ptilotus obovatus (Cotton Bush)*			
1029.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
1030.	2766	*Ptilotus villosiflorus*			
1031.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
1032.	2584	*Rhagodia preissii*			
1033.	5295	*Rhizophora stylosa (Spotted-leaved Red Mangrove)*			
1034.	13301	*Rhodanthe floribunda*			
1035.	13246	*Rhodanthe humboldtiana*			
1036.	13310	*Rhodanthe margarethae*			
1037.	4190	*Rhynchosia australis (Rhynchosia)*			
1038.	20862	*Rhynchosia bungarensis*		P4	
1039.	4191	*Rhynchosia minima (Rhynchosia)*			
1040.	48900	*Roepera retivalvis*			
1041.	2443	*Rumex vesicarius (Ruby Dock)*	Y		
1042.	30434	*Salsola australis*			
1043.	2357	*Santalum lanceolatum (Northern Sandalwood, Yarnguli)*			
1044.	12578	*Scaevola acacioides*			
1045.	7608	*Scaevola cunninghamii*			
1046.	7644	*Scaevola spinescens (Currant Bush, Maroon)*			
1047.	41660	*Schenkia australis*			
1048.	41646	*Schenkia clementii*			
1049.	2597	*Sclerolaena bicornis (Goathead Burr)*			
1050.	11650	*Sclerolaena bicornis var. bicornis (Goathead Burr)*			
1051.	2604	*Sclerolaena costata*			
1052.	2607	*Sclerolaena densiflora*			
1053.	8877	*Sclerolaena gardneri*			
1054.	2633	*Sclerolaena uniflora (Two-spined Saltbush)*			
1055.	12279	*Senna artemisioides subsp. helmsii*			
1056.	12280	*Senna artemisioides subsp. oligophylla*			
1057.	12303	*Senna costata*			
1058.	18443	*Senna ferraria*			
1059.	18346	*Senna glutinosa*			
1060.	12305	*Senna glutinosa subsp. chatelainiana*			
1061.	12307	*Senna glutinosa subsp. glutinosa*			
1062.	12309	*Senna glutinosa subsp. pruinosa*			
1063.	12308	*Senna glutinosa subsp. x luerssenii*			
1064.	18451	*Senna hamersleyensis*			
1065.	12312	*Senna notabilis*			
1066.	18450	*Senna symonii*			
1067.	12319	*Senna venusta*			
1068.	4196	*Sesbania cannabina (Sesbania Pea)*			
1069.	4198	*Sesbania formosa (White Dragon Tree)*			
1070.	2818	*Sesuvium portulacastrum*			
1071.	606	*Setaria dielsii (Diels' Pigeon Grass)*			
1072.	608	*Setaria italica (Italian Millet)*	Y		
1073.	613	*Setaria verticillata (Whorled Pigeon Grass)*	Y		
1074.	31758	*Sida arsiniata*			
1075.	4971	*Sida cardiophylla*			
1076.	4976	*Sida echinocarpa*			
1077.	4977	*Sida fibulifera (Silver Sida)*			
1078.	4988	*Sida rohlenae*			
1079.	33698	*Sida sp. Pilbara (A.A. Mitchell PRP 1543)*			
1080.	16617	*Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)*			
1081.	4989	*Sida spinosa (Spiny Sida)*			
1082.	6998	*Solanum cleistogamum*			
1083.	7002	*Solanum diversiflorum*			
1084.	7007	*Solanum esuriale (Quena)*			
1085.	7009	*Solanum gabrielae*			
1086.	7014	*Solanum horridum*			
1087.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			

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1088.	7029	*Solanum phlomoides*			
1089.	12919	*Sorghum plumosum var. plumosum*			
1090.	622	*Sorghum timorense*			
1091.	625	*Spinifex longifolius (Beach Spinifex)*			
1092.	44523	*Spongophloea tissotii*			
1093.	629	*Sporobolus australasicus (Fairy Grass)*			
1094.	635	*Sporobolus virginicus (Marine Couch)*			
1095.	27310	*Spyridia filamentosa*			
1096.	4729	*Stackhousia clementii*		P3	
1097.	4731	*Stackhousia intermedia*			
1098.	19555	*Stackhousia muricata subsp. annual (W.R. Barker 2172)*			
1099.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
1100.	7099	*Stemodia kingii*			
1101.	8234	*Streptoglossa adscendens*			
1102.	8235	*Streptoglossa bubakii*			
1103.	8236	*Streptoglossa cylindriceps*			
1104.	8237	*Streptoglossa decurrens*			
1105.	8238	*Streptoglossa liatroides*			
1106.	8240	*Streptoglossa odora*			
1107.	8241	*Streptoglossa tenuiflora*			
1108.	3182	*Stylobasium spathulatum (Pebble Bush)*			
1109.	2638	*Suaeda arbusculoides*			
1110.	43203	*Surreya diandra*			
1111.	12356	*Swainsona formosa*			
1112.	4231	*Swainsona kingii*			
1113.	4233	*Swainsona leeana*			
1114.	4234	*Swainsona maccullochiana (Ashburton Pea)*			
1115.	4242	*Swainsona pterostylis*			
1116.	7363	*Synaptantha tillaeacea*			
1117.	13339	*Synaptantha tillaeacea var. tillaeacea*			
1118.	31616	*Tecticornia auriculata*			
1119.	33236	*Tecticornia halocnemoides (Shrubby Samphire)*			
1120.	33240	*Tecticornia halocnemoides subsp. longispicata*			
1121.	33238	*Tecticornia halocnemoides subsp. tenuis*			
1122.	33317	*Tecticornia indica*			
1123.	33319	*Tecticornia indica subsp. bidens*			
1124.	33356	*Tecticornia indica subsp. indica*			
1125.	33357	*Tecticornia indica subsp. julacea*			
1126.	33318	*Tecticornia indica subsp. leiostachya (Samphire)*			
1127.	33299	*Tecticornia pergranulata subsp. elongata*			
1128.	31618	*Tecticornia pruinosa*			
1129.	33220	*Tecticornia pterygosperma subsp. denticulata*			
1130.		*Tephrosia Fortescue (A.A. Mitchell 606)*			
1131.	4263	*Tephrosia clementii*			
1132.	49016	*Tephrosia densa*			
1133.	4272	*Tephrosia leptoclada*			
1134.	19531	*Tephrosia rosea var. clementii*			
1135.	19529	*Tephrosia rosea var. rosea*			
1136.	15947	*Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)*			
1137.	17768	*Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)*			
1138.	15949	*Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)*			
1139.	42442	*Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)*			
1140.	40060	*Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)*			
1141.	4285	*Tephrosia supina*			
1142.	5300	*Terminalia canescens (Joolal)*			
1143.	45698	*Terminalia circumalata*			
1144.	5310	*Terminalia platyphylla (Wild Plum, Durin)*			
1145.	5313	*Terminalia supranitifolia*		P3	
1146.	169	*Thalassia hemprichii*			
1147.	17820	*Themeda sp. Hamersley Station (M.E. Trudgen 11431)*		P3	
1148.	17819	*Themeda sp. Mt Barricade (M.E. Trudgen 2471)*			
1149.	673	*Themeda triandra*			
1150.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
1151.	2942	*Tinospora smilacina (Snakevine, Oondala)*			
1152.	6278	*Trachymene oleracea*			
1153.	19043	*Trachymene oleracea subsp. oleracea*			
1154.	678	*Tragus australianus (Small Burrgrass)*			
1155.	44305	*Trianthema pilosum*			
1156.	44362	*Trianthema triquetrum*			
1157.	44360	*Trianthema turgidifolium*			

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1158.	4375	*Tribulus cistoides*			
1159.	4377	*Tribulus hirsutus*			
1160.	4379	*Tribulus macrocarpus*			
1161.	4380	*Tribulus occidentalis (Perennial Caltrop)*			
1162.	4381	*Tribulus platypterus (Cork Hopbush)*			
1163.	4383	*Tribulus terrestris (Caltrop)*	Y		
1164.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			
1165.	11750	*Trichodesma zeylanicum var. zeylanicum*			
1166.	7381	*Trichosanthes cucumerina*			
1167.	12032	*Trichosanthes cucumerina var. cucumerina*			
1168.	48201	*Trigastrotheca molluginea*			
1169.	679	*Triodia angusta*			
1170.	13131	*Triodia epactia*			
1171.	696	*Triodia pungens (Soft Spinifex)*			
1172.	704	*Triodia wiseana (Limestone Spinifex)*			
1173.	706	*Triraphis mollis (Needle Grass)*			
1174.	4873	*Triumfetta appendiculata*			
1175.	14694	*Triumfetta clementii*			
1176.	14942	*Triumfetta maconochieana*			
1177.	27348	*Udotea argentea*			
1178.	27349	*Udotea flabellum*			
1179.	35302	*Udotea glaucescens*			
1180.	7660	*Velleia glabrata (Pee the Bed)*			
1181.	4323	*Vigna lanceolata (Maloga Vigna, Wega)*			
1182.	31391	*Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)*			
1183.	46577	*Vigna triodiophila*		P3	
1184.	7393	*Wahlenbergia tumidifructa*			
1185.	5106	*Waltheria indica*			
1186.	17910	*Washingtonia filifera*	Y		
1187.	728	*Whiteochloa cymbiformis*			
1188.	6578	*Wrightia saligna*			
1189.	729	*Xerochloa barbata (Rice Grass)*			
1190.	731	*Xerochloa laniflora (Rice Grass)*			
1191.	732	*Yakirra australiensis*			
1192.	29095	*Zaleya galericulata subsp. galericulata*			
1193.	4326	*Zornia albiflora*			
1194.	12679	*Zornia muelleriana subsp. congesta*			

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

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

NatureMap Species Report

Created By Guest user on 05/03/2019

Transmission Corridor

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	20° 43' 22" S,116° 45' 12" E 20° 44' 49" S,116° 44' 25" E 20° 45' 45" S,116° 43' 31" E 20° 46' 23" S,116° 42' 11" E 20° 47' 14" S,116° 40' 56" E 20° 47' 51" S,116° 40' 10" E
Group By	Kingdom

Kingdom	Species	Records
Animalia	781	9309
Chromista	20	39
Fungi	8	9
Plantae	693	3266
TOTAL	**1502**	**12623**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Animalia					
1.		*? ?*			
2.		*Abudefduf bengalensis*			
3.		*Acanthophis wellsei*			
4.	25332	*Acanthophis wellsi (Pilbara Death Adder)*			
5.		*Acariformes sp.*			
6.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
7.	25536	*Accipiter fasciatus (Brown Goshawk)*			
8.		*Acentrogobius sp.*			
9.		*Achnanthidium minutissima (Kütz.) Czarnecki*			
10.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
11.		*Actacarus pacificus*			
12.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
13.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
14.		*Aeshnidae sp.*			
15.		*Agauopsis arborea*			Y
16.		*Agauopsis dasyderma*			Y
17.		*Agauopsis moorea*			Y
18.		*Agauopsis obtusa*			Y
19.		*Agraptocorixa parvipunctata*			
20.		*Alepes apercna*			
21.		*Alepes mate*			Y
22.		*Allodessus bistrigatus*			
23.		*Alluaudomyia sp.*			
24.		*Alona anodonta*			
25.		*Alona cf. verrucosa*			
26.		*Alona rigidicaudis*			
27.		*Ambassis vachellii*			
28.		*Amblyeleotris gymnocephala*			
29.		*Amblygobius bynoensis*			
30.		*Amblyomma triguttatum*			
31.		*Amniataba caudavittata*			
32.		*Amniataba percoides*			
33.	30831	*Amphibolurus gilberti (Ta-ta, Gilbert's Dragon)*			
34.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
35.		*Aname mainae*			
36.		*Aname mellosa*			
37.	24312	*Anas gracilis (Grey Teal)*			
38.	24316	*Anas superciliosa (Pacific Black Duck)*			
39.		*Anax papuensis*			
40.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
41.		*Anisops canaliculatus*			
42.		*Anisops hackeri*			
43.		*Anisops nasutus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
44.		*Anisops sp.*			
45.		*Anomalohalacarus dampierensis*			Y
46.		*Anopheles annulipes s.l.*			
47.	24505	*Anous stolidus subsp. pileatus (Common Noddy)*		IA	
48.	25317	*Antaresia childreni (Children's Python)*			
49.	25318	*Antaresia perthensis (Pygmy Python)*			
50.	25448	*Antaresia stimsoni (Stimson's Python)*			
51.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
52.	25670	*Anthus australis (Australian Pipit)*			
53.		*Anuraeopsis navicula*			
54.		*Apogon cavitiensis*			
55.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
56.	24285	*Aquila audax (Wedge-tailed Eagle)*			
57.		*Arcella sp.*			
58.	25559	*Ardea intermedia (Intermediate Egret)*			
59.	41324	*Ardea modesta (great egret, white egret)*			
60.	24341	*Ardea pacifica (White-necked Heron)*			
61.	24610	*Ardeotis australis (Australian Bustard)*			
62.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
63.		*Arius leptaspis*			Y
64.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
65.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
66.	24354	*Artamus leucorynchus subsp. leucopygialis (White-breasted Woodswallow)*			
67.	24355	*Artamus minor (Little Woodswallow)*			
68.	24356	*Artamus personatus (Masked Woodswallow)*			
69.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
70.		*Arthrorhabdus paucispinus*			
71.	25320	*Aspidites melanocephalus (Black-headed Python)*			
72.	25236	*Aspidites ramsayi (Woma)*			
73.		*Asterorhombus intermedius*			
74.		*Austrostrophus stictopygus*			
75.	24318	*Aythya australis (Hardhead)*			
76.		*Baetidae sp.*			
77.		*Barnardius zonarius*			
78.		*Bathygobius fuscus*			
79.		*Bathygobius laddi*			
80.		*Bdelloidea sp. 2:2*			
81.		*Bdelloidea sp. 3:3*			
82.		*Belostomatidae sp.*			
83.		*Bennelongia minimus*			
84.		*Berosus pulchellus*			
85.		*Boeckella triarticulata*			
86.		*Bolboleaus truncatus*			
87.		*Boreohesperus undulatus*			
88.		*Brachionus n sp P2 (PSW)*			
89.		*Brachionus quadridentatus*			
90.	25331	*Brachyurophis approximans (North-western Shovel-nosed Snake)*			
91.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
92.	47897	*Butorides striata (Striated Heron, Mangrove Heron)*			
93.	25715	*Cacatua roseicapilla (Galah)*			
94.	25716	*Cacatua sanguinea (Little Corella)*			
95.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
96.		*Caenidae sp.*			
97.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
98.	24780	*Calidris alba (Sanderling)*		IA	
99.	25738	*Calidris canutus (Red Knot, knot)*		IA	
100.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
101.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
102.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
103.	24790	*Calidris tenuirostris (Great Knot)*		T	
104.		*Callionymus japonicus*			Y
105.		*Callionymus sp.*			
106.		*Callogobius sp. 2*			Y
107.		*Caloneis silicula (Ehr.) Cl.*			
108.	48920	*Canis familiaris (Dog, Dingo)*	Y		
109.	24253	*Capra hircus (Goat)*	Y		
110.		*Carangoides sp.*			
111.		*Caranx bucculentus*			
112.		*Caranx sexfasciatus*			
113.		*Carcharhinus brachyurus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
114.		*Carenum pulchrum*			
115.		*Carenum subplanatum*			
116.		*Carenum venustum*			
117.	25015	*Carlia munda (Shaded-litter Rainbow Skink)*			
118.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
119.		*Catadromus lacordairei*			
120.	25600	*Centropus phasianinus (Pheasant Coucal)*			
121.		*Cephalodella biungulata*			
122.		*Cephalodella cf forficula*			
123.		*Cephalodella gibba*			
124.		*Cephalopholis boenak*			
125.		*Ceratopogonidae sp.*			
126.		*Ceriodaphnia cornuta*			
127.		*Ceriodaphnia n. sp. a (Berner sp.#3) (SAP)*			
128.		*Ceriodaphnia n. sp. c (Berner sp.#1) (SAP)*			
129.	24181	*Chaerephon jobensis (Greater Northern Freetail-bat, Northern Mastiff Bat)*			
130.		*Chanos chanos*			
131.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
132.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
133.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
134.	24378	*Charadrius veredus (Oriental Plover)*		IA	
135.		*Chelmon marginalis*			
136.		*Chelmon muelleri*			
137.	25336	*Chelonia mydas (Green Turtle)*		T	
138.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
139.		*Cheumatopsyche wellsae*			
140.		*Chirocentrus dorab*			
141.		*Chironominae sp.*			
142.		*Chironomus aff. alternans (V24) (CB)*			
143.		*Chlaenius australis*			
144.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
145.		*Choerodon vitta*			
146.		*Chroicocephalus novaehollandiae*			
147.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
148.	24288	*Circus approximans (Swamp Harrier)*			
149.	24289	*Circus assimilis (Spotted Harrier)*			
150.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
151.		*Cloeon sp.*			
152.		*Coenagrionidae sp.*			
153.	24399	*Columba livia (Domestic Pigeon)*	Y		
154.		*Congrogadus spinifer*			
155.		*Copidognathus lutarius*			Y
156.		*Copidognathus meridianus*			
157.		*Copidognathus piger*			Y
158.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
159.		*Coris sp.*			
160.		*Corixidae sp.*			
161.	24416	*Corvus bennetti (Little Crow)*			
162.	25593	*Corvus orru (Torresian Crow)*			
163.	24419	*Corvus splendens (House Crow)*			
164.	25701	*Coturnix ypsilophora (Brown Quail)*			
165.	24673	*Coturnix ypsilophora subsp. australis (Brown Quail)*			
166.	24672	*Coturnix ypsilophora subsp. cervina (Brown Quail)*			
167.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
168.	25595	*Cracticus tibicen (Australian Magpie)*			
169.	25596	*Cracticus torquatus (Grey Butcherbird)*			
170.	24919	*Crenadactylus ocellatus subsp. horni (Clawless Gecko)*			
171.	30893	*Cryptoblepharus buchananii*			
172.	25020	*Cryptoblepharus plagiocephalus*			
173.	30892	*Cryptoblepharus ustulatus*			
174.		*Cryptochironomus griseidorsum*			
175.		*Cryptoerithus halli*			
176.		*Cryptoerithus occultus*			
177.	25458	*Ctenophorus caudicinctus (Ring-tailed Dragon)*			
178.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
179.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
180.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
181.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
182.	24886	*Ctenophorus reticulatus (Western Netted Dragon)*			
183.		*Ctenotrypauchen microcephalus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
184.	25024	*Ctenotus angusticeps (Airlie Island Ctenotus, Northwestern coastal Ctenotus)*		P3	
185.	25027	*Ctenotus australis*			
186.	25036	*Ctenotus duricola*			
187.	25462	*Ctenotus grandis*			
188.	25043	*Ctenotus grandis subsp. titan*			
189.	25045	*Ctenotus helenae*			
190.	25052	*Ctenotus leonhardii*			
191.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
192.	25060	*Ctenotus pantherinus subsp. acripes (Leopard Ctenotus)*			
193.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
194.	25070	*Ctenotus robustus*			
195.	25072	*Ctenotus rubicundus*			
196.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
197.	25074	*Ctenotus schomburgkii*			
198.	25077	*Ctenotus serventyi*			
199.	25465	*Ctenotus uber (Spotted Ctenotus)*			
200.		*Culex (Culex) annulirostris*			
201.		*Culex crinicauda*			
202.		*Culex nr. crinicauda (PSW)*			
203.		*Culex palpalis*			
204.		*Culicidae sp.*			
205.		*Cybister tripunctatus*			
206.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
207.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
208.	25371	*Cyclorana australis (Giant Frog)*			
209.	25375	*Cyclorana maini (Sheep Frog)*			
210.	24322	*Cygnus atratus (Black Swan)*			
211.		*Cymbella delicatula Kütz.*			
212.		*Cynoglossus maculipinnis*			
213.		*Cynoglossus sp.*			
214.		*Cypretta ?lutea*			
215.		*Cypretta seurati*			
216.		*Cypretta sp PSW074*			
217.		*Cypricercus salinus*			
218.		*Cypricercus sp. 422 (CB)*			
219.	25547	*Dacelo leachii (Blue-winged Kookaburra)*			
220.		*Dasyheleinae sp. P2 (PSW)*			
221.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
222.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
223.	25001	*Delma nasuta*			
224.	25002	*Delma pax*			
225.	25004	*Delma tincta*			
226.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
227.	25295	*Demansia psammophis subsp. cupreiceps (Yellow-faced Whipsnake)*			
228.	25297	*Demansia rufescens (Rufous Whipsnake)*			
229.	24324	*Dendrocygna arcuata (Wandering Whistling Duck, Chestnut Whistling Duck)*			
230.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
231.		*Dexillus muelleri*			
232.		*Diaphanosoma excisum*			
233.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
234.		*Dicrotendipes P5 (=balciunasi?) (PSW)*			
235.		*Difflugia sp. P1*			
236.		*Dineutus australis*			
237.		*Diplacodes bipunctata*			
238.		*Diplacodes haematodes*			
239.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
240.	41404	*Diplodactylus galaxias (Northern Pilbara Beak-faced Gecko)*			
241.	24937	*Diplodactylus mitchelli*			
242.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
243.	24470	*Dromaius novaehollandiae (Emu)*			
244.		*Drombus sp.*			
245.	24084	*Dugong dugon (Dugong)*		S	
246.		*Dytiscidae sp.*			
247.		*Ecnomidae sp.*			
248.		*Ecnomus pilbarensis*			
249.	41406	*Egernia cygnitos (Western Pilbara Spiny-tailed Skink)*			
250.	25092	*Egernia depressa (Southern Pygmy Spiny-tailed Skink)*			
251.	25101	*Egernia pilbarensis (Pilbara Skink)*			
252.		*Egretta garzetta*			
253.		*Egretta novaehollandiae*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
254.		*Elanus axillaris*			
255.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
256.		*Eleutheronema tetradactylum*			
257.		*Elops hawaiensis*			
258.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
259.	24631	*Emblema pictum (Painted Finch)*			
260.		*Encentridophorus sarasini*			
261.		*Enchytraeidae sp.*			
262.		*Enneapterygius gracilis*			
263.		*Enneapterygius philippinus*			
264.		*Enneapterygius sp.*			
265.		*Enochrus deserticola*			
266.		*Enochrus sp.*			
267.		*Eolophus roseicapillus*			
268.	24653	*Eopsaltria pulverulenta (Mangrove Robin)*			
269.	25362	*Ephalophis greyae*			
270.		*Ephemeroporus barroisi s.l.*			
271.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
272.		*Ephydridae sp.*			
273.		*Ephydridae sp. 12 (PSW)*			
274.		*Epinephelus coioides*			
275.		*Epinephelus malabaricus*			
276.		*Epinephelus sexfasciatus*			
277.		*Epistylis sp*			
278.	24568	*Epthianura aurifrons (Orange Chat)*			
279.	24570	*Epthianura tricolor (Crimson Chat)*			
280.	42404	*Eremiascincus isolepis*			
281.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
282.	24837	*Eremiornis carteri (Spinifex-bird)*			
283.		*Eretes australis*			
284.	25342	*Eretmochelys imbricata subsp. bissa (Hawksbill Turtle)*		T	
285.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
286.	47938	*Esacus magnirostris (Beach Stone-curlew, Beach Thick-knee)*			
287.		*Ethmostigmus curtipes*			
288.		*Euchlanis dilatata*			
289.		*Euchlanis lyra*			
290.		*Euglypha sp.*			
291.		*Eulimnadia dahli*			Y
292.		*Eulimnadia sp. P1 (PSW)*			Y
293.	24368	*Eurostopodus argus (Spotted Nightjar)*			
294.		*Eviota queenslandica*			
295.	25621	*Falco berigora (Brown Falcon)*			
296.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
297.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
298.	25623	*Falco longipennis (Australian Hobby)*			
299.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
300.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
301.	24476	*Falco subniger (Black Falcon)*			
302.		*Favonigobius melanobranchus*			
303.	24041	*Felis catus (Cat)*	Y		
304.	25327	*Fordonia leucobalia (White-bellied Mangrove Snake)*			
305.	25727	*Fulica atra (Eurasian Coot)*			
306.	25301	*Furina ornata (Moon Snake)*			
307.	24793	*Gallinago stenura (Pin-tailed Snipe)*		IA	
308.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
309.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
310.	42314	*Gavicalis virescens (Singing Honeyeater)*			
311.	24956	*Gehyra pilbara*			
312.	24958	*Gehyra punctata*			
313.	24959	*Gehyra variegata*			
314.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
315.	24401	*Geopelia cuneata (Diamond Dove)*			
316.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
317.	25585	*Geopelia striata (Zebra Dove)*			
318.	24403	*Geopelia striata subsp. placida (Peaceful Dove)*			
319.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
320.		*Geoscaptus laevissimus*			
321.		*Gerres filamentosus*			
322.		*Gerres subfasciatus*			
323.	25530	*Gerygone fusca (Western Gerygone)*			

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324.	24276	*Gerygone tenebrosa (Dusky Gerygone)*			
325.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
326.		*Glossogobius giuris*			
327.		*Glossogobius sp.*			
328.		*Glyptophysa sp*			
329.		*Gnatholepis argus*			
330.		*Gobiodon rivulatus*			
331.		*Gomphidae sp.*			
332.	24443	*Grallina cyanoleuca (Magpie-lark)*			
333.		*Grayenulla waldockae*			
334.	24484	*Grus rubicunda (Brolga)*			
335.		*Gymnothorax thrysoideus*			
336.		*Gymnothorax undulatus*			
337.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
338.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
339.		*Haematopus ostralegus*			Y
340.		*Halacaridae sp.*			
341.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
342.	25541	*Haliastur indus (Brahminy Kite)*			
343.	24294	*Haliastur indus subsp. girrenera (Brahminy Kite)*			
344.	24295	*Haliastur sphenurus (Whistling Kite)*			
345.		*Halichoeres nigrescens*			
346.		*Halichoeres sp.*			
347.		*Halieutaea brevicaudata?*			
348.		*Halophryne diemensis*			
349.	24297	*Hamirostra melanosternon (Black-breasted Buzzard)*			
350.		*Hantzschia amphioxys (Ehr.) Grun.*			
351.		*Hebridae sp.*			
352.		*Hellyethira sp.*			
353.		*Hemicordulia sp.*			
354.		*Hemicypris megalops*			
355.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
356.		*Hemiramphus sp.*			
357.		*Heterocypris sp.*			
358.		*Heterocypris tatei*			
359.	24633	*Heteromunia pectoralis (Pictorella Mannikin)*			
360.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
361.		*Heteronyx mimus*			
362.		*Heteronyx tepperi*			
363.		*Hexarthra cf brandorffi (PSW)*			
364.		*Hexarthra sp P3 5-2/5-2 (PSW)*			Y
365.	47965	*Hieraaetus morphnoides (Little Eagle)*			
366.	25734	*Himantopus himantopus (Black-winged Stilt)*			
367.	24491	*Hirundo neoxena (Welcome Swallow)*			
368.	25630	*Hirundo rustica (Barn Swallow)*		IA	
369.		*Hogna crispipes*			
370.		*Hydrachna sp. 4/5 (PSW)*			
371.		*Hydraena sp.*			
372.		*Hydraenidae sp.*			
373.	25363	*Hydrelaps darwiniensis*			
374.		*Hydrobiidae sp P1 (not assimineid) (PSW)*			
375.		*Hydrochus obscuroaeneus*			
376.		*Hydroglyphus grammopterus (=trilineatus)*			
377.		*Hydroglyphus leai*			
378.		*Hydroglyphus orthogrammus*			
379.		*Hydrometridae sp.*			
380.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
381.		*Hydrophilidae sp.*			
382.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
383.		*Hydroptilidae sp.*			
384.		*Hyphydrus elegans*			
385.		*Hyphydrus lyratus*			
386.		*Hyphydrus sp.*			
387.		*Ilyocypris australiensis*			
388.		*Ilyodromus sp BOS25*			
389.		*Ilyodromus sp. PB*			
390.		*Indolpium sp.*			
391.		*Inegocia japonica*			
392.		*Ischnura aurora aurora*			
393.		*Isidorella egraria*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
394.		*Isobactrus australiensis*			Y
395.		*Isobactrus obesus*			Y
396.		*Isocypris williamsi (ex Ilyodromus sp. 413)*			
397.		*Isopedella gibsandi*			
398.		*Isopedella tindalei*			
399.		*Istiblennius meleagris*			
400.		*Istigobius ornatus*			
401.	25562	*Ixobrychus flavicollis (Black Bittern)*			
402.		*Keratella procurva*			
403.		*Knoelle clara*			
404.		*Laccophilus sharpi*			
405.		*Lacinularia flosculosa*			
406.	24057	*Lagenodelphis hosei (Fraser's Dolphin)*			
407.	24367	*Lalage tricolor (White-winged Triller)*			
408.		*Lampona ampeinna*			
409.		*Lampona cylindrata*			
410.		*Lamponina scutata*			
411.		*Larsia albiceps*			
412.	25637	*Larus novaehollandiae (Silver Gull)*			
413.	25638	*Larus pacificus (Pacific Gull)*			
414.		*Latonopsis australis*			
415.		*Latrodectus geometricus*			
416.		*Leberis cf. diaphanus*			
417.		*Lecane bifastigata*			Y
418.		*Lecane bulla*			
419.		*Lecane cf. ludwigii (PSW)*			
420.		*Lecane cf. rhenana (SAP)*			
421.		*Lecane luna*			
422.		*Lecane papuana*			
423.		*Lecane punctata*			
424.		*Lecane thalera*			
425.		*Lecane ungulata*			
426.	24217	*Leggadina lakedownensis (Northern Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga)*		P4	
427.		*Leiognathus sp.*			
428.		*Leiopotherapon unicolor*			
429.		*Lepadella patella*			
430.		*Lepidotrigla sp.*			
431.		*Leptoceridae sp.*			
432.	25125	*Lerista bipes*			
433.	30928	*Lerista clara*			
434.	30929	*Lerista jacksoni*			
435.	25155	*Lerista muelleri*			
436.	30925	*Lerista verhmens*			
437.	25005	*Lialis burtonis*			
438.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
439.	25239	*Liasis olivaceus subsp. olivaceus (Olive Python)*			
440.		*Libellulidae sp.*			
441.	25661	*Lichmera indistincta (Brown Honeyeater)*			
442.		*Limbodessus compactus*			
443.	25739	*Limicola falcinellus (Broad-billed Sandpiper)*		IA	
444.		*Limnadopsis "pilbarensis" (ex P2)(PSW)*			Y
445.		*Limnadopsis birchii*			
446.		*Limnocythere dorsosicula*			
447.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
448.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
449.		*Liocranium praepositum*			
450.	41417	*Liopholis striata (Night Skink)*			
451.		*Litarachna bartschae*			Y
452.	25392	*Litoria rubella (Little Red Tree Frog)*			
453.		*Liza subviridis*			
454.		*Liza vaigiensis*			
455.		*Lophiocharon hutchinsi*			
456.		*Lophiocharon trisignatus*			
457.		*Loxandrus micantior*			
458.	30933	*Lucasium stenodactylum*			
459.		*Luticola mutica (Kütz.) Mann*			
460.		*Lutjanus argentimaculatus*			
461.		*Lutjanus malabaricus*			
462.		*Lutjanus russellii*			

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463.		*Lychas sp. 2*			
464.		*Lymnaeidae sp.*			
465.		*Macrochaetus sp.*			
466.	24180	*Macroderma gigas (Ghost Bat)*		T	
467.	25489	*Macropus robustus (Euro, Biggada)*			
468.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
469.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
470.		*Macrothrix sp.*			
471.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
472.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
473.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
474.	24583	*Manorina flavigula (Yellow-throated Miner)*			
475.		*Meedo houstoni*			
476.		*Megacephala greyana*			
477.	24051	*Megaptera novaeangliae (Humpback Whale)*		S	
478.		*Melanotaenia australis*			
479.	24589	*Melithreptus gularis subsp. laetior (Black-chinned Honeyeater)*			
480.	24736	*Melopsittacus undulatus (Budgerigar)*			
481.	25184	*Menetia greyii*			
482.	25187	*Menetia surda subsp. surda*			
483.	24598	*Merops ornatus (Rainbow Bee-eater)*			
484.		*Mesocyclops brooksi*			
485.		*Mesovelia hungerfordi*			
486.		*Mesoveliidae sp.*			
487.		*Metacyclops sp. P2 (PSW)*			
488.		*Metavelifer multiradiatus*			
489.		*Microcarbo melanoleucos*			
490.		*Microcyclops varicans*			
491.		*Micrognathus micronotopterus*			
492.		*Micronecta gracilis*			
493.		*Micronecta n. sp. P3 (PSW)*			
494.		*Micronecta sp.*			
495.		*Microvelia (Austromicrovelia) peramoena*			
496.	25542	*Milvus migrans (Black Kite)*			
497.		*Minasteron minusculum*			
498.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
499.	24302	*Mirafra javanica subsp. horsfieldii (Horsfield's Bushlark, Singing Bushlark)*			
500.		*Moina micrura s.l.*			
501.		*Monacanthus chinensis*			
502.		*Monodactylus argenteus*			
503.		*Monommata sp.*			
504.	25495	*Morethia ruficauda*			
505.	25193	*Morethia ruficauda subsp. exquisita*			
506.		*Mormopterus (Ozimops) cobourgianus*			
507.	24183	*Mormopterus loriae (Little Northern Freetail-bat)*			
508.		*Mugil cephalus*			
509.	24223	*Mus musculus (House Mouse)*	Y		
510.		*Muscidae sp. P1*			
511.		*Naididae (ex Tubificidae)*			
512.	25344	*Natator depressus (Flatback Turtle)*		T	
513.		*Nebrius ferrugineus*			Y
514.		*Nematalosa erebi*			
515.		*Nematoda sp. P2/P4 (PSW)*			
516.		*Nemipterus celebicus*			
517.	25422	*Neobatrachus aquilonius (Northern Burrowing Frog)*			
518.	25685	*Neochmia ruficauda (Star Finch)*			
519.		*Neopsephotus bourkii*			
520.		*Neosilurus hyrtlii*			
521.		*Nephila edulis*			
522.	24969	*Nephrurus levis subsp. pilbarensis*			
523.		*Nepidae sp.*			
524.	24327	*Nettapus pulchellus (Green Pygmy-goose)*			
525.		*Netuma bilineata*			
526.		*Netuma proxima*			
527.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
528.	25747	*Ninox connivens (Barking Owl)*			
529.		*Nitzschia microcephala Grun.*			
530.		*Nitzschia perminuta (Grun.) M. Peragallo*			
531.		*Nitzschia sigma (Kütz.) W. Sm.*			
532.	25430	*Notaden nichollsi (Desert Spadefoot)*			

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533.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
534.		*Notonectidae sp.*			
535.	25196	*Notoscincus butleri (lined soil-crevice skink (Dampier))*		P4	
536.	25197	*Notoscincus ornatus subsp. ornatus*			
537.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
538.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
539.	25742	*Numenius phaeopus (Whimbrel)*		IA	
540.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
541.	24192	*Nyctophilus arnhemensis (Arnhem Land Long-eared Bat)*			
542.	42365	*Nyctophilus daedalus (Northwestern Long-eared Bat, Pallid Long-eared Bat)*			
543.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
544.		*Nyctophilus geoffroyi subsp. pallescens*			
545.	24742	*Nymphicus hollandicus (Cockatiel)*			
546.	24497	*Oceanites oceanicus (Wilson's Storm-petrel)*		IA	
547.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
548.	24976	*Oedura marmorata (Marbled Velvet Gecko)*			
549.		*Oligochaeta sp.*			
550.		*Omobranchus punctatus*			
551.		*Omobranchus rotundiceps*			
552.		*Omoedus orbiculatus*			
553.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
554.		*Opisthopora sp.*			
555.		*Opistognathus darwiniensis*			
556.		*Orthetrum caledonicum*			
557.		*Orthocladiinae sp.*			
558.		*Orthomorpha coarctata*			
559.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
560.	48034	*Osphranter robustus (Euro, Biggada)*			
561.		*Ostracoda (unident.)*			
562.		*Ovatalona cf. cambouei*			
563.	34016	*Ovis aries (Sheep)*			
564.		*Oxyopes variabilis*			
565.		*Ozestheria packardi*			
566.	24620	*Pachycephala lanioides (White-breasted Whistler)*			
567.	25678	*Pachycephala melanura (Mangrove Golden Whistler)*			
568.	24621	*Pachycephala melanura subsp. melanura (Mangrove Golden Whistler)*			
569.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
570.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
571.		*Pantala flavescens*			
572.		*Paracymus pygmaeus*			
573.		*Paracymus spenceri*			
574.		*Paramonacanthus choirocephalus*			
575.		*Paratanytarsus sp. P2 (PSW)*			
576.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
577.	48053	*Pardalotus rubricatus subsp. rubricatus (Red-browed Pardalote)*			Y
578.	25682	*Pardalotus striatus (Striated Pardalote)*			
579.	25687	*Passer domesticus (House Sparrow)*	Y		
580.	24642	*Passer montanus (Eurasian Tree Sparrow)*	Y		
581.		*Pediana horni*			
582.		*Pediana tenuis*			
583.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
584.		*Peneoenanthe pulverulenta*			
585.		*Pentapodus porosus*			
586.		*Pentapodus sp.*			
587.	48060	*Petrochelidon ariel (Fairy Martin)*			
588.	48061	*Petrochelidon nigricans (Tree Martin)*			
589.	24144	*Petrogale rothschildi (Rothschild's Rock-wallaby)*			
590.	25697	*Phalacrocorax carbo (Great Cormorant)*			
591.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
592.	25699	*Phalacrocorax varius (Pied Cormorant)*			
593.	24409	*Phaps chalcoptera (Common Bronzewing)*			
594.	24411	*Phaps histrionica (Flock Bronzewing, Flock Pigeon)*			
595.		*Pheropsophus verticalis*			
596.		*Phreodrilid with dissimilar ventral chaetae*			
597.		*Phreodrilid with similar ventral chaetae*			
598.		*Pilbarascutigera incola*			
599.		*Pilbarophreatoicus platyarthricus*			
600.		*Pinnularia divergens W. Sm.*			
601.		*Pinnularia subrostrata (A. Cl.) Cl.-Euler*			
602.	24677	*Pitta moluccensis (Blue-winged Pitta)*			

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603.		*Planigale sp. nov.*			
604.		*Planorbidae sp.*			
605.	24842	*Platalea regia (Royal Spoonbill)*			
606.		*Platycephalus sp.*			
607.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
608.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
609.		*Pleidae sp.*			
610.		*Pleurosicya sp.*			
611.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
612.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
613.	25703	*Podargus strigoides (Tawny Frogmouth)*			
614.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
615.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
616.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
617.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
618.		*Polyarthra dolichoptera*			
619.		*Polydactylus multiradiatus*			
620.		*Polypedilum nubifer*			
621.		*Pomadasys maculatus*			
622.	25706	*Pomatostomus temporalis (Grey-crowned Babbler)*			
623.	24684	*Pomatostomus temporalis subsp. rubeculus (Grey-crowned Babbler)*			
624.		*Pontarachne australis*			Y
625.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
626.	25732	*Porzana pusilla (Baillon's Crake)*			
627.	24771	*Porzana tabuensis (Spotless Crake)*			
628.		*Priacanthus hamrur*			
629.		*Priolepis nuchifasciata*			
630.		*Pristina longiseta*			
631.		*Procladius paludicola*			
632.		*Prodidomus woodleigh*			
633.		*Protonibea diacanthus*			
634.	24105	*Pseudantechinus roryi (Rory's Pseudantechinus)*			
635.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
636.	25261	*Pseudechis australis (Mulga Snake)*			
637.	24233	*Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)*		P4	
638.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
639.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
640.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
641.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
642.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
643.	24172	*Pteropus alecto (Black Flying-fox)*			
644.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			
645.		*Ptilonorhynchus guttatus*			
646.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
647.		*Pyralidae sp.*			
648.		*Quistrachia legendrei*			
649.		*Rastrelliger kanagurta*			
650.	24245	*Rattus rattus (Black Rat)*	Y		
651.	24246	*Rattus tunneyi (Pale Field-rat)*			
652.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
653.		*Regimbartia attenuata*			
654.		*Repomucenus calcaratus*			
655.		*Rhagada angulata*			
656.		*Rhagada convicta*			
657.		*Rhagada dampierana*			
658.		*Rhagada perprima*			
659.		*Rheotanytarsus trivittatus*			
660.	43368	*Rhinonicteris aurantia (Orange Leaf-nosed bat)*		P4	
661.	48096	*Rhipidura albiscapa (Grey Fantail)*			
662.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
663.	24457	*Rhipidura phasiana (Mangrove Grey Fantail)*			
664.		*Rhombognathus dispar*			Y
665.		*Rhombognathus ocularis*			Y
666.		*Rhombognathus scutulatus*			
667.	24982	*Rhynchoedura ornata (Western Beaked Gecko)*			
668.		*Scaptognathides hawaiiensis*			Y
669.		*Scaptognathides ornatus*			Y
670.		*Scatophagus argus*			
671.		*Scirtidae sp.*			
672.		*Scolecenchelys macroptera*			

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673.		*Scolopendra laeta*			
674.		*Scolopendra morsitans*			
675.		*Scolopsis taenioptera*			
676.		*Secutor insidiator*			
677.		*Selenotoca multifasciata*			
678.		*Selenotoca sp.*			Y
679.		*Sillago burrus*			
680.		*Sillago lutea*			
681.		*Simaetha tenuior*			
682.		*Simognathus platyaspis*			Y
683.		*Simognathus salebrosus*			Y
684.		*Simognathus tener*			Y
685.		*Simulium ornatipes*			
686.	30948	*Smicrornis brevirostris (Weebill)*			
687.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
688.		*Sorsogona tuberculata*			
689.		*Sphyraena barracuda*			
690.		*Stauroneis anceps Ehr.*			
691.		*Stauroneis phoenicenteron (Nitz.) Ehr.*			
692.	24521	*Sterna bengalensis (Lesser Crested Tern)*			
693.	25640	*Sterna dougallii (Roseate Tern)*		IA	
694.	25642	*Sterna hirundo (Common Tern)*		IA	
695.		*Sternolophus australis*			
696.	48593	*Sternula albifrons (Little Tern)*		IA	
697.	48594	*Sternula nereis (Fairy Tern)*			
698.	24329	*Stictonetta naevosa (Freckled Duck)*			
699.	24482	*Stiltia isabella (Australian Pratincole)*			
700.		*Stratiomyidae sp.*			
701.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
702.	24924	*Strophurus ciliaris subsp. aberrans*			
703.	24927	*Strophurus elderi*			
704.	24932	*Strophurus jeanae*			
705.	24949	*Strophurus wellingtonae*			
706.		*Suggrundus macracanthus*			
707.	25754	*Sula leucogaster (Brown Booby)*		IA	
708.		*Supunna picta*			
709.	25269	*Suta fasciata (Rosen's Snake)*			
710.	25307	*Suta punctata (Spotted Snake)*			
711.		*Synanceia horrida*			
712.		*Tabanidae sp.*			
713.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
714.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
715.	30870	*Taeniopygia guttata (Zebra Finch)*			
716.		*Tanypodinae sp.*			
717.		*Tanytarsus fuscithorax/semibarbitarsus*			
718.		*Tanytarsus sp. D (SAP)*			
719.		*Tanytarsus sp. P8 (PSW)*			
720.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
721.		*Tasmanocoenis arcuata*			
722.		*Terapon jarbua*			
723.		*Testudinella patina*			
724.		*Thalasseus bengalensis*			
725.	48597	*Thalasseus bergii (Crested Tern)*		IA	
726.		*Thermocyclops decipiens*			
727.		*Thiaridae sp.*			
728.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
729.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
730.	25548	*Todiramphus chloris (Collared Kingfisher)*			
731.	24306	*Todiramphus chloris subsp. pilbara (Pilbara Collared Kingfisher)*			
732.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
733.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
734.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
735.		*Tramea stenoloba*			
736.		*Triacanthus sp.*			
737.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
738.		*Trichocerca similis*			
739.		*Trichocyclus nigropunctatus*			
740.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
741.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
742.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	

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743.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
744.		*Triops australiensis australiensis*			
745.		*Triops nr australiensis (PSW) (?nsp BVT)*			Y
746.		*Turbellaria sp.*			
747.	24851	*Turnix velox (Little Button-quail)*			
748.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
749.		*Tylosurus crocodilus*			
750.	30814	*Tympanocryptis cephalus (Pebble Dragon)*			
751.		*Tyto delicatula*			
752.	25445	*Uperoleia russelli (Northwest Toadlet)*			
753.	41428	*Uperoleia saxatilis (Pilbara Toadlet)*			
754.		*Urodacus armatus*			
755.		*Valamugil seheli*			
756.		*Valenciennea muralis*			
757.	25577	*Vanellus miles (Masked Lapwing)*			
758.	24386	*Vanellus tricolor (Banded Lapwing)*			
759.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
760.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
761.	25212	*Varanus eremius (Pygmy Desert Monitor)*			
762.	25216	*Varanus giganteus (Perentie)*			
763.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
764.	25223	*Varanus panoptes subsp. rubidus*			
765.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
766.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			
767.		*Veliidae sp.*			
768.		*Venatrix arenaris*			
769.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
770.	24040	*Vulpes vulpes (Red Fox)*	Y		
771.		*Wesmaldra nixaut*			
772.		*Wydundra kennedy*			
773.		*Wydundra nixaut*			Y
774.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
775.		*Yirrkala sp.*			
776.		*Yongeichthys nebulosus*			
777.		*Zebrias quagga*			
778.		*Zenodorus orbiculatus*			
779.		*Zonocypretta kalimna*			
780.	24857	*Zosterops luteus (Yellow White-eye)*			
781.	24248	*Zyzomys argurus (Common Rock-rat)*			
Chromista					
782.	35220	*Canistrocarpus cervicornis*			
783.	35910	*Canistrocarpus crispatus*			
784.	26694	*Colpomenia sinuosa*			
785.	26764	*Dictyopteris australis*			
786.	29954	*Dictyopteris woodwardia*			
787.	26775	*Dictyota ciliolata*			
788.	26946	*Hormophysa cuneiformis*			
789.	26949	*Hydroclathrus clathratus*			
790.	27043	*Lobophora variegata*			
791.	27113	*Padina australis*			
792.	48304	*Padina tetrastromatica*			Y
793.	27248	*Sargassum ligulatum*			
794.	27253	*Sargassum peronii*			
795.	42785	*Sirophysalis trinodis*			
796.	27282	*Spatoglossum macrodontum*			
797.	27293	*Sphacelaria rigidula*			
798.	27345	*Turbinaria gracilis*			
799.		*Turbinaria mesenterina*			
800.	27346	*Turbinaria ornata*			
801.		*Turbinaria reniformis*			
Fungi					
802.	27576	*Acarospora nodulosa*			
803.	44918	*Caloplaca michelagoensis*			
804.		*Caloplaca sp.*			
805.	27715	*Diploschistes actinostomus*			
806.	27932	*Peltula bolanderi*			
807.		*Phellinus rimosus*			
808.	46616	*Triodiomyces altilis*			
809.	28194	*Xanthoria parietina*			

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Plantae					
810.	4886	*Abutilon amplum*			
811.	9080	*Abutilon cunninghamii*			
812.	4891	*Abutilon fraseri (Lantern Bush)*			
813.	18120	*Abutilon fraseri subsp. fraseri*			
814.	4895	*Abutilon lepidum*			
815.	4899	*Abutilon malvifolium (Bastard Marshmallow)*			
816.	4901	*Abutilon otocarpum (Desert Chinese Lantern)*			
817.	4902	*Abutilon oxycarpum (Flannel Weed)*			
818.	43020	*Abutilon oxycarpum subsp. Prostrate (A.A. Mitchell PRP 1266)*			
819.	3209	*Acacia ampliceps*			
820.	44580	*Acacia ampliceps x bivenosa*			
821.	44586	*Acacia ampliceps x sclerosperma subsp. sclerosperma*			
822.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
823.	3223	*Acacia arida*			
824.	3241	*Acacia bivenosa*			
825.	44588	*Acacia bivenosa x sclerosperma subsp. sclerosperma*			
826.	13403	*Acacia colei*			
827.	17013	*Acacia colei var. colei*			
828.	3270	*Acacia coriacea (Wirewood)*			
829.	13500	*Acacia coriacea subsp. coriacea*			
830.	13502	*Acacia coriacea subsp. pendens*			
831.	16174	*Acacia elachantha*			
832.	12673	*Acacia glaucocaesia*			
833.	3356	*Acacia gregorii (Gregory's Wattle)*			
834.	3372	*Acacia holosericea (Candelbra Wattle, Liringgin)*			
835.	3377	*Acacia inaequilatera (Baderi)*			
836.	3434	*Acacia maitlandii (Maitland's Wattle)*			
837.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
838.	3506	*Acacia pyrifolia (Ranji Bush, Kandji)*			
839.	29016	*Acacia pyrifolia var. morrisonii*			
840.	29015	*Acacia pyrifolia var. pyrifolia*			
841.	13078	*Acacia sclerosperma subsp. sclerosperma*			
842.	29135	*Acacia sericophylla*			
843.	3551	*Acacia sphaerostachya*			
844.	19456	*Acacia stellaticeps*			
845.	13070	*Acacia synchronicia*			
846.	3573	*Acacia tenuissima*			
847.	3579	*Acacia trachycarpa (Minni Ritchi, Balgali)*			
848.	20319	*Acacia tumida var. pilbarensis*			
849.	3606	*Acacia xiphophylla*			
850.	26441	*Acanthophora spicifera*			
851.	48409	*Acetabularia caliculus*			
852.	2645	*Achyranthes aspera (Chaff Flower)*			
853.	4583	*Adriana tomentosa*			
854.	17422	*Adriana tomentosa var. tomentosa*			
855.	6486	*Aegialitis annulata (Club Mangrove)*			
856.	6478	*Aegiceras corniculatum (River Mangrove)*			
857.	2646	*Aerva javanica (Kapok Bush)*	Y		
858.	3680	*Aeschynomene indica (Budda Pea)*			
859.	3609	*Albizia lebbeck*			
860.	4739	*Alectryon oleifolius*			
861.	11487	*Alectryon oleifolius subsp. oleifolius*			
862.	2647	*Alternanthera angustifolia*			
863.	2651	*Alternanthera nana (Hairy Joyweed)*			
864.	2652	*Alternanthera nodiflora (Common Joyweed)*			
865.	17147	*Alysicarpus muelleri*			
866.	2660	*Amaranthus cuspidifolius*			
867.	20018	*Amaranthus undulatus*			
868.	5277	*Ammannia baccifera*			
869.	5278	*Ammannia multiflora*			
870.	26461	*Amphiroa foliacea*			
871.	26462	*Amphiroa fragilissima*			
872.	2383	*Amyema preissii (Wireleaf Mistletoe)*			
873.	11874	*Amyema sanguinea var. sanguinea*			
874.	35872	*Anadyomene plicata*			
875.	7832	*Angianthus milnei (Cone-spike Angianthus)*			
876.	204	*Aristida burbidgeae*			
877.	207	*Aristida contorta (Bunched Kerosene Grass)*			
878.	215	*Aristida latifolia (Feathertop Wiregrass)*			

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879.	217	*Aristida nitidula (Flat-awned Threeawn)*			
880.	226	*Arundo donax (Giant Reed)*	Y		
881.	6580	*Asclepias curassavica (Redhead Cottonbush)*	Y		
882.	26486	*Asparagopsis taxiformis*			
883.	229	*Astrebla pectinata (Barley Mitchell Grass)*			
884.	4740	*Atalaya hemiglauca (Whitewood)*			
885.	2450	*Atriplex amnicola (Swamp Saltbush)*			
886.	2451	*Atriplex bunburyana (Silver Saltbush)*			
887.	2453	*Atriplex codonocarpa (Flat-topped Saltbush)*			
888.	2463	*Atriplex isatidea (Coast Saltbush)*			
889.	2466	*Atriplex lindleyi*			
890.	17520	*Atriplex lindleyi subsp. conduplicata*		P3	
891.	2476	*Atriplex semilunaris (Annual Saltbush)*			
892.	6828	*Avicennia marina (White Mangrove)*			
893.	14555	*Avicennia marina subsp. marina*			
894.	5183	*Bergia ammannioides*			
895.	5186	*Bergia trimera*			
896.	7854	*Bidens bipinnata (Bipinnate Beggartick)*	Y		
897.	7866	*Blumea tenella*			
898.	2769	*Boerhavia burbidgeana*			
899.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
900.	2772	*Boerhavia gardneri*			
901.	2773	*Boerhavia paludosa*			
902.	2774	*Boerhavia repleta*			
903.	2775	*Boerhavia schomburgkiana*			
904.		*Boerhavia sp.*			
905.	11167	*Bonamia erecta*			
906.	6606	*Bonamia media*			
907.	6608	*Bonamia pannosa*			
908.	44782	*Bonamia pilbarensis*			
909.	6609	*Bonamia rosea (Felty Bellflower)*			
910.	26508	*Boodlea composita*			
911.	26509	*Bornetella oligospora*			
912.	26510	*Bornetella sphaerica*			
913.	12716	*Brachychiton acuminatus*			
914.	2995	*Brassica x napus*	Y		
915.	4603	*Bridelia tomentosa*			
916.	5291	*Bruguiera exaristata (Ribbed Mangrove)*			
917.	750	*Bulbostylis barbata*			
918.	752	*Bulbostylis turbinata*			
919.	11055	*Cajanus cinereus*			
920.	10972	*Cajanus marmoratus*			
921.	11150	*Cajanus pubescens*			
922.	2864	*Calandrinia ptychosperma*			
923.	2866	*Calandrinia quadrivalvis*			
924.	2872	*Calandrinia tepperiana*			
925.	7905	*Calotis multicaulis (Many-stemmed Burr-daisy)*			
926.	7906	*Calotis plumulifera*			
927.	3749	*Canavalia rosea (Wild Jack Bean)*			
928.	2981	*Capparis spinosa*			
929.	48291	*Capparis spinosa subsp. nummularia*			
930.	6567	*Carissa lanceolata (Conkerberry, Marnuwiji)*			
931.	2949	*Cassytha capillaris*			
932.	2950	*Cassytha filiformis (Love Vine, Jirawan)*			
933.	42620	*Caulerpa chemnitzia*			
934.	35158	*Caulerpa corynephora*			
935.	47053	*Caulerpa cupressoides var. cupressoides*			
936.	47054	*Caulerpa cupressoides var. elegans*			
937.	27378	*Caulerpa cupressoides var. lycopodium*			
938.	36368	*Caulerpa cupressoides var. mamillosa*			
939.	44539	*Caulerpa cylindracea*			
940.	44547	*Caulerpa lamourouxii*			
941.	26568	*Caulerpa lentillifera*			
942.	26573	*Caulerpa racemosa*			
943.	35122	*Caulerpa racemosa var. racemosa*			
944.	26576	*Caulerpa serrulata*			
945.	26577	*Caulerpa sertularioides*			
946.	26579	*Caulerpa taxifolia*			
947.	26582	*Caulerpa verticillata*			
948.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		

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949.	259	*Cenchrus echinatus (Burrgrass)*	Y		
950.	41568	*Cenchrus setaceus (Fountain Grass)*	Y		
951.	29721	*Cenchrus setiger (Birdwood Grass)*	Y		
952.	6539	*Centaurium erythraea (Common Centaury)*	Y		
953.	7919	*Centipeda minima (Spreading Sneezewood, Kanjirralaa, Inteng-inteng, Karengkal, Kata-palkalpa, Munyu-parnti-parnti)*			
954.	19762	*Centipeda minima subsp. macrocephala*			
955.	39680	*Ceriops australis*			
956.	33	*Cheilanthes contigua*			
957.	12818	*Cheilanthes sieberi subsp. sieberi*			
958.	266	*Chloris barbata (Purpletop Chloris)*	Y		
959.	269	*Chloris pectinata (Comb Chloris)*			
960.	270	*Chloris pumilio*			
961.	33516	*Chrysocephalum gilesii*			
962.	273	*Chrysopogon fallax (Golden Beard Grass)*			
963.	2985	*Cleome oxalidea*			
964.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
965.	6729	*Clerodendrum floribundum (Lollybush)*			
966.	6732	*Clerodendrum tomentosum*			
967.	13689	*Clerodendrum tomentosum var. lanceolatum*			
968.	3769	*Clitoria ternatea*	Y		
969.		*Codium platyclados*			Y
970.	2778	*Codonocarpus cotinifolius (Native Poplar, Kundurangu)*			
971.	1165	*Commelina ensifolia (Wandering Jew, Buargu)*			
972.	2776	*Commicarpus australis (Perennial Tar Vine)*			
973.	19880	*Convolvulus angustissimus*			
974.	6612	*Convolvulus clementii*			
975.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
976.	4857	*Corchorus elachocarpus*			
977.	17339	*Corchorus incanus*			
978.	25847	*Corchorus incanus subsp. incanus*			
979.	13659	*Corchorus laniflorus*			
980.	4862	*Corchorus parviflorus*			
981.	17661	*Corchorus tectus*			
982.	4865	*Corchorus tridens*			
983.	13467	*Corchorus trilocularis*			
984.	4867	*Corchorus walcottii (Woolly Corchorus)*			
985.	17093	*Corymbia hamersleyana*			
986.	17092	*Corymbia opaca*			
987.	19565	*Cressa australis*			
988.	3774	*Crotalaria cunninghamii (Green Birdflower, Bilbun)*			
989.	19378	*Crotalaria dissitiflora subsp. benthamiana*			
990.	20179	*Crotalaria medicaginea var. neglecta*			
991.	3785	*Crotalaria novae-hollandiae (New Holland Rattlepod)*			
992.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
993.	41720	*Cucumis argenteus*			
994.	7371	*Cucumis melo (Ulcardo Melon)*			
995.	41721	*Cucumis variabilis*			
996.	17117	*Cullen cinereum*			
997.	17436	*Cullen graveolens*			
998.	17439	*Cullen lachnostachys*			
999.	17118	*Cullen leucanthum*			
1000.	17119	*Cullen leucochaites*			
1001.	17120	*Cullen pogonocarpum*			
1002.	13733	*Cuscuta victoriana*			
1003.	279	*Cymbopogon ambiguus (Scentgrass)*			
1004.	280	*Cymbopogon bombycinus (Silky Oilgrass)*			
1005.	281	*Cymbopogon obtectus (Silkyheads)*			
1006.	6584	*Cynanchum floribundum (Dumara Bush, Tjipa)*			
1007.	48280	*Cynanchum viminale subsp. australe*			
1008.	46558	*Cynodon convergens*			
1009.	46555	*Cynodon prostratus*			
1010.	774	*Cyperus bifax (Downs Nutgrass)*			
1011.	12801	*Cyperus blakeanus*			
1012.	777	*Cyperus bulbosus (Bush Onion, Tjanmata)*			
1013.	786	*Cyperus cunninghamii*			
1014.	789	*Cyperus difformis (Rice Sedge)*			
1015.	798	*Cyperus iria*			
1016.	804	*Cyperus nervulosus*			
1017.	807	*Cyperus pulchellus*			

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1018.	814	*Cyperus squarrosus*			
1019.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
1020.	290	*Dactyloctenium radulans (Button Grass)*			
1021.	26740	*Dasya frutescens*			
1022.	6962	*Datura leichhardtii (Native Thornapple)*	Y		
1023.	6963	*Datura metel (Downy Thornapple)*	Y		
1024.	7317	*Dentella asperata*			
1025.	7318	*Dentella minutissima*			
1026.	3852	*Desmodium campylocaulon*			
1027.	3853	*Desmodium filiforme*			
1028.	3856	*Desmodium muelleri*			
1029.	303	*Dichanthium fecundum (Curly Bluegrass)*			
1030.	13741	*Dichanthium sericeum subsp. humilius*			
1031.	3612	*Dichrostachys spicata (Pied Piper Bush)*			
1032.	7166	*Dicliptera armata*			
1033.	26769	*Dictyosphaeria cavernosa*			
1034.	26782	*Digenea simplex*			
1035.	310	*Digitaria brownii (Cotton Panic Grass)*			
1036.	313	*Digitaria ctenantha (Comb Finger Grass)*			
1037.	4745	*Diplopeltis eriocarpa (Hairy Pepperflower)*			
1038.	48738	*Distimake dissectus var. dissectus*	Y		
1039.	4759	*Dodonaea coriacea*			
1040.	48390	*Dolichandrone occidentalis*			
1041.	33479	*Dysphania melanocarpa (Black Crumbweed)*			
1042.	2504	*Dysphania plantaginella*			
1043.	2506	*Dysphania rhadinostachya*			
1044.	11653	*Dysphania rhadinostachya subsp. inflata*			
1045.	11890	*Dysphania rhadinostachya subsp. rhadinostachya*			
1046.	32348	*Eccremidium arcuatum*			
1047.	328	*Echinochloa colona (Awnless Barnyard Grass)*	Y		
1048.	343	*Ectrosia leporina (Hare's-foot Grass)*			
1049.	6682	*Ehretia saligna (False Cedar)*			
1050.	14301	*Ehretia saligna var. saligna*			
1051.	827	*Eleocharis geniculata*			
1052.	2511	*Enchylaena tomentosa (Barrier Saltbush)*			
1053.	12064	*Enchylaena tomentosa var. tomentosa (Barrier Saltbush)*			
1054.	357	*Enneapogon caerulescens (Limestone Grass)*			
1055.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
1056.	363	*Enneapogon pallidus (Conetop Nineawn)*			
1057.	365	*Enneapogon polyphyllus (Leafy Nineawn)*			
1058.	368	*Enteropogon ramosus (Windmill Grass, Curly Windmill Grass)*			
1059.	375	*Eragrostis cumingii (Cuming's Love Grass)*			
1060.	378	*Eragrostis dielsii (Mallee Lovegrass)*			
1061.	380	*Eragrostis eriopoda (Woollybutt Grass, Wangurnu)*			
1062.	16731	*Eragrostis exigua*			
1063.	381	*Eragrostis falcata (Sickle Lovegrass)*			
1064.	388	*Eragrostis leptocarpa (Drooping Lovegrass)*			
1065.	38505	*Eragrostis surreyana*		P3	
1066.	398	*Eragrostis tenellula (Delicate Lovegrass)*			
1067.	399	*Eragrostis xerophila (Knotty-butt Neverfail)*			
1068.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
1069.	16363	*Eremophila maculata subsp. brevifolia (Native Fuchsia)*			
1070.	400	*Eriachne aristidea*			
1071.	403	*Eriachne benthamii (Swamp Wanderrie)*			
1072.	413	*Eriachne mucronata (Mountain Wanderrie Grass)*			
1073.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
1074.	417	*Eriachne pulchella (Pretty Wanderrie)*			
1075.	16485	*Eriachne pulchella subsp. dominii*			
1076.	16486	*Eriachne pulchella subsp. pulchella*			
1077.	421	*Eriachne tenuiculmis*			
1078.	4335	*Erodium cygnorum (Blue Heronsbill)*			
1079.	3871	*Erythrina vespertilio (Yulbah)*			
1080.	5580	*Eucalyptus camaldulensis (River Gum, Yabalinyba)*			
1081.	35345	*Eucalyptus camaldulensis subsp. obtusa (Blunt-budded River Red Gum)*			
1082.	35343	*Eucalyptus camaldulensis subsp. refulgens*			
1083.	5714	*Eucalyptus microtheca (Coolibah)*			
1084.	5752	*Eucalyptus prominens*			
1085.	14548	*Eucalyptus victrix*			
1086.	11011	*Eulalia aurea*			
1087.	4617	*Euphorbia australis (Namana)*			

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1088.	35307	*Euphorbia australis var. australis*			
1089.	42843	*Euphorbia australis var. glabra*		P2	
1090.	35303	*Euphorbia australis var. subtomentosa*			
1091.	4619	*Euphorbia biconvexa*			
1092.	4620	*Euphorbia boophthona (Gascoyne Spurge)*			
1093.	9048	*Euphorbia careyi*			
1094.	4623	*Euphorbia coghlanii (Namana)*			
1095.	4626	*Euphorbia drummondii (Caustic Weed, Piwi)*			
1096.	4629	*Euphorbia hirta (Asthma Plant)*	Y		
1097.	4635	*Euphorbia myrtoides*			
1098.	4642	*Euphorbia schultzii*			
1099.	4644	*Euphorbia sharkoensis*			
1100.	4647	*Euphorbia tannensis*			
1101.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
1102.	42879	*Euphorbia trigonosperma*			
1103.	13281	*Euphorbia vaccaria*			
1104.	42876	*Euphorbia vaccaria var. vaccaria*			
1105.	6617	*Evolvulus alsinoides (Tropical Speedwell)*			
1106.	11200	*Evolvulus alsinoides var. villosicalyx*			
1107.	25811	*Ficus aculeata*			
1108.	31578	*Ficus aculeata var. indecora (Ranji)*			
1109.	19648	*Ficus brachypoda*			
1110.	1753	*Ficus platypoda (Native Fig, Makartu)*			
1111.	1759	*Ficus virens (Albayi)*			
1112.	12096	*Ficus virens var. virens*			
1113.	851	*Fimbristylis dichotoma (Eight Day Grass)*			
1114.	855	*Fimbristylis ferruginea*			
1115.	859	*Fimbristylis littoralis*			
1116.	862	*Fimbristylis microcarya*			
1117.	878	*Fimbristylis rara*			
1118.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
1119.	4654	*Flueggea virosa*			
1120.	12013	*Flueggea virosa subsp. melanthesoides (Dogwood, Guwal)*			
1121.	5188	*Frankenia ambita*			
1122.	5209	*Frankenia pauciflora (Seaheath)*			
1123.	26835	*Galaxaura rugosa*			
1124.	2836	*Glinus oppositifolius*			
1125.	3938	*Glycine canescens (Silky Glycine)*			
1126.	2674	*Gomphrena affinis*			
1127.	18361	*Gomphrena affinis subsp. pilbarensis*			
1128.	2676	*Gomphrena canescens (Batchelors Buttons)*			
1129.	18360	*Gomphrena cucullata*		P3	
1130.	2680	*Gomphrena cunninghamii*			
1131.	2682	*Gomphrena flaccida (Gomphrena Weed)*			
1132.	18367	*Gomphrena kanisii*			
1133.	2683	*Gomphrena leptoclada*			
1134.	18257	*Gomphrena leptoclada subsp. leptoclada*			
1135.	17894	*Gomphrena leptophylla*		P3	
1136.	11131	*Gomphrena sordida*			
1137.	31074	*Gomphrena sp. Martins Well (K.F. Kenneally 6116)*			Y
1138.	6151	*Gonocarpus ephemerus*			
1139.	7509	*Goodenia forrestii*			
1140.	7515	*Goodenia heterochila*			
1141.	7521	*Goodenia lamprosperma*			
1142.	7526	*Goodenia microptera*			
1143.	12552	*Goodenia muelleriana*			
1144.	12570	*Goodenia pallida*		P1	
1145.	10982	*Goodenia stobbsiana*			
1146.	7556	*Goodenia tenuiloba*			
1147.	4910	*Gossypium australe (Native Cotton)*			
1148.	4913	*Gossypium hirsutum (Upland Cotton)*	Y		
1149.	2079	*Grevillea pyramidalis (Caustic Bush, Tjungu)*			
1150.	19570	*Grevillea pyramidalis subsp. leucadendron*			
1151.	15975	*Grevillea pyramidalis subsp. pyramidalis*			
1152.	13440	*Grevillea wickhamii subsp. aprica*			
1153.	12832	*Gymnanthera cunninghamii*		P3	
1154.	2177	*Hakea lorea (Witinti)*			
1155.	19137	*Hakea lorea subsp. lorea*			
1156.	26891	*Halimeda cylindracea*			
1157.	26892	*Halimeda discoidea*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1158.	26894	*Halimeda macroloba*			
1159.	47213	*Halimeda versatilis*			
1160.	131	*Halodule uninervis*			
1161.	162	*Halophila decipiens*			
1162.	163	*Halophila minor*			
1163.	164	*Halophila ovalis (Sea Wrack)*			
1164.	165	*Halophila spinulosa*			
1165.	37642	*Halymenia durvillei*			
1166.	17301	*Heliotropium chrysocarpum*			
1167.	6704	*Heliotropium conocarpum*			
1168.	6705	*Heliotropium crispatum*			
1169.	6706	*Heliotropium cunninghamii*			
1170.	6707	*Heliotropium curassavicum (Smooth Heliotrope)*			
1171.	6712	*Heliotropium heteranthum*			
1172.	17307	*Heliotropium inexplicitum*			
1173.	17315	*Heliotropium tanythrix*			
1174.	6718	*Heliotropium tenuifolium (Mamukata)*			
1175.	26930	*Heterosiphonia crassipes*			
1176.	29316	*Hibiscus austrinus*			
1177.	29317	*Hibiscus austrinus var. austrinus*			
1178.	4923	*Hibiscus brachysiphonius*			
1179.	4925	*Hibiscus coatesii*			
1180.	4933	*Hibiscus leptocladus*			
1181.	4942	*Hibiscus sturtii (Sturt's Hibiscus)*			
1182.	5215	*Hybanthus aurantiacus*			
1183.	5219	*Hybanthus enneaspermus*			
1184.	48203	*Hypertelis cerviana*			
1185.	14587	*Indigastrum parviflorum*			
1186.	3973	*Indigofera colutea (Sticky Indigo)*			
1187.	3980	*Indigofera linifolia*			
1188.	3981	*Indigofera linnaei (Birdsville Indigo)*			
1189.	3982	*Indigofera monophylla*			
1190.	3987	*Indigofera trita*			
1191.	31035	*Indigofera trita subsp. trita*			
1192.	6623	*Ipomoea coptica*			
1193.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
1194.	6631	*Ipomoea lonchophylla (Cowvine)*			
1195.	6633	*Ipomoea muelleri (Poison Morning Glory, Yumbu)*			
1196.	6635	*Ipomoea pes-caprae*			
1197.	11312	*Ipomoea pes-caprae subsp. brasiliensis*			
1198.	6636	*Ipomoea plebeia (Bellvine)*			
1199.	6637	*Ipomoea polymorpha*			
1200.		*Ipomoea sp.*			
1201.	458	*Iseilema dolichotrichum*			
1202.	459	*Iseilema eremaeum*			
1203.	465	*Iseilema vaginiflorum (Red Flinders Grass)*			
1204.	3989	*Isotropis atropurpurea (Poison Sage)*			
1205.	8088	*Ixiochlamys cuneifolia*			
1206.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
1207.	8095	*Lactuca saligna (Wild Lettuce, Willow-leaf Lettuce)*	Y		
1208.		*Launaea sarmenstosa*			
1209.	8098	*Launaea sarmentosa*			
1210.	4960	*Lawrencia viridigrisea*			
1211.		*Lawsonia inermis*			
1212.	3035	*Lepidium pedicellosum*			
1213.	3038	*Lepidium pholidogynum*			
1214.	3613	*Leucaena leucocephala (Leucaena)*	Y		
1215.	37480	*Lobelia arnhemiaca*			
1216.	4060	*Lotus australis (Austral Trefoil)*			
1217.	4061	*Lotus cruentus (Redflower Lotus)*			
1218.	2544	*Maireana georgei (Satiny Bluebush)*			
1219.	2556	*Maireana planifolia (Low Bluebush)*			
1220.	2564	*Maireana stipitata*			
1221.	11662	*Maireana tomentosa subsp. tomentosa*			
1222.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
1223.	75	*Marsilea exarata*			
1224.	76	*Marsilea hirsuta (Nardoo)*			
1225.	5875	*Melaleuca argentea (Silver Cadjeput, Bandaran)*			
1226.	5933	*Melaleuca linophylla*			
1227.	5051	*Melhania oblongifolia*			

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1228.	7082	*Mimulus gracilis*			
1229.	8109	*Minuria integerrima (Smooth Minuria)*			
1230.	8110	*Minuria leptophylla (Minnie Daisy)*			
1231.	6490	*Muellerolimon salicorniaceum*			
1232.	27079	*Mychodea carnosa*			
1233.	17158	*Myoporum montanum (Native Myrtle)*			
1234.	139	*Najas tenuifolia (Water Nymph)*			
1235.	2573	*Neobassia astrocarpa*			
1236.	44548	*Neomeris bilimbata*			
1237.	3614	*Neptunia dimorphantha (Sensitive Plant)*			
1238.	3617	*Neptunia monosperma*			
1239.	6971	*Nicotiana benthamiana (Tjuntiwari)*			
1240.	6976	*Nicotiana occidentalis (Native Tobacco)*			
1241.	11331	*Nicotiana occidentalis subsp. obliqua*			
1242.	11856	*Nicotiana occidentalis subsp. occidentalis*			
1243.	11734	*Nicotiana rosulata subsp. rosulata*			
1244.	38421	*Notoleptopus decaisnei*			
1245.	38422	*Notoleptopus decaisnei var. decaisnei*			
1246.	7338	*Oldenlandia crouchiana*			
1247.	19640	*Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)*		P3	
1248.	6651	*Operculina aequisepala*			
1249.	6652	*Operculina brownii (Potato Vine, Bara)*			
1250.	5227	*Opuntia stricta (Common Prickly Pear)*	Y		
1251.	36400	*Palisada perforata*			
1252.	503	*Panicum decompositum (Native Millet, Kaltu-kaltu)*			
1253.	504	*Panicum effusum (Hairy Panic Grass)*			
1254.	505	*Panicum laevinode*			
1255.	515	*Paraneurachne muelleri (Northern Mulga Grass)*			
1256.	10975	*Paspalidium basicladum*			
1257.	518	*Paspalidium clementii (Clements Paspalidium)*			
1258.	523	*Paspalidium rarum (Rare Paspalidium)*			
1259.	525	*Paspalidium tabulatum*			
1260.	5226	*Passiflora foetida (Stinking Passion Flower)*	Y		
1261.	27121	*Penicillus nodulosus*			
1262.	13494	*Pentalepis trichodesmoides*			
1263.	7092	*Peplidium muelleri*			
1264.	18462	*Peplidium sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768)*			
1265.	3675	*Petalostylis labicheoides (Slender Petalostylis)*			
1266.	9056	*Phyllanthus baccatus*			
1267.	17626	*Phyllanthus erwinii*			
1268.	4680	*Phyllanthus maderaspatensis*			
1269.	17794	*Phyllanthus tenellus*	Y		
1270.	20652	*Physalis angulata*	Y		
1271.	5230	*Pimelea ammocharis*			
1272.	41300	*Pittosporum phillyreoides (Weeping Pittosporum, Yaliti)*			
1273.	8167	*Pluchea dentex*			
1274.	17816	*Pluchea ferdinandi-muelleri*			
1275.	43944	*Pluchea longiseta*			
1276.	8168	*Pluchea rubelliflora*			
1277.	8170	*Pluchea tetranthera*			
1278.	2901	*Polycarpaea holtzei*			
1279.	2903	*Polycarpaea longiflora*			
1280.	41365	*Polygala glaucifolia*			
1281.	4572	*Polygala isingii*			
1282.	6653	*Polymeria ambigua (Morning Glory)*			
1283.	6655	*Polymeria calycina*			
1284.	17513	*Polymeria lanata*			
1285.		*Polymeria sp.*			
1286.		*Pomax Desert (A.S. George 11968)*			Y
1287.	2878	*Portulaca conspicua*			
1288.	2879	*Portulaca cyclophylla*			
1289.	43981	*Portulaca decipiens*			
1290.	2884	*Portulaca oleracea (Purslane, Wakati)*			
1291.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
1292.	8192	*Pterocaulon sphacelatum (Apple Bush, Fruit Salad Plant)*			
1293.	8193	*Pterocaulon sphaeranthoides*			
1294.	2690	*Ptilotus aervoides*			
1295.	2696	*Ptilotus astrolasius*			
1296.	2698	*Ptilotus auriculifolius*			
1297.	2699	*Ptilotus axillaris (Mat Mulla Mulla)*			

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1298.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
1299.	2706	*Ptilotus carinatus*			
1300.	2711	*Ptilotus clementii (Tassel Top)*			
1301.	2717	*Ptilotus divaricatus (Climbing Mulla Mulla)*			
1302.	2721	*Ptilotus exaltatus (Tall Mulla Mulla)*			
1303.	2725	*Ptilotus fusiformis*			
1304.	2728	*Ptilotus gomphrenoides*			
1305.	2729	*Ptilotus grandiflorus*			
1306.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
1307.	2741	*Ptilotus macrocephalus (Featherheads)*			
1308.	2745	*Ptilotus murrayi*			
1309.	2746	*Ptilotus nobilis (Tall Mulla Mulla)*			
1310.	2747	*Ptilotus obovatus (Cotton Bush)*			
1311.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
1312.	2766	*Ptilotus villosiflorus*			
1313.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
1314.	2584	*Rhagodia preissii*			
1315.	11240	*Rhagodia preissii subsp. obovata*			
1316.	5295	*Rhizophora stylosa (Spotted-leaved Red Mangrove)*			
1317.	13301	*Rhodanthe floribunda*			
1318.	13246	*Rhodanthe humboldtiana*			
1319.	13310	*Rhodanthe margarethae*			
1320.	4190	*Rhynchosia australis (Rhynchosia)*			
1321.	20862	*Rhynchosia bungarensis*		P4	
1322.	4191	*Rhynchosia minima (Rhynchosia)*			
1323.		*Riccia albida*			
1324.	48900	*Roepera retivalvis*			
1325.	2443	*Rumex vesicarius (Ruby Dock)*	Y		
1326.	30434	*Salsola australis*			
1327.	2357	*Santalum lanceolatum (Northern Sandalwood, Yarnguli)*			
1328.	12578	*Scaevola acacioides*			
1329.	7606	*Scaevola crassifolia (Thick-leaved Fan-flower)*			
1330.	7608	*Scaevola cunninghamii*			
1331.	7614	*Scaevola globulifera*			
1332.	7644	*Scaevola spinescens (Currant Bush, Maroon)*			
1333.	41660	*Schenkia australis*			
1334.	41646	*Schenkia clementii*			
1335.	16257	*Schoenoplectus subulatus*			
1336.	1010	*Schoenus punctatus*		P3	
1337.	2597	*Sclerolaena bicornis (Goathead Burr)*			
1338.	11650	*Sclerolaena bicornis var. bicornis (Goathead Burr)*			
1339.	2604	*Sclerolaena costata*			
1340.	2607	*Sclerolaena densiflora*			
1341.	2609	*Sclerolaena diacantha (Grey Copperburr)*			
1342.	8877	*Sclerolaena gardneri*			
1343.	2633	*Sclerolaena uniflora (Two-spined Saltbush)*			
1344.	12279	*Senna artemisioides subsp. helmsii*			
1345.	12280	*Senna artemisioides subsp. oligophylla*			
1346.	18444	*Senna charlesiana*			
1347.	12303	*Senna costata*			
1348.	18443	*Senna ferraria*			
1349.	18346	*Senna glutinosa*			
1350.	12305	*Senna glutinosa subsp. chatelainiana*			
1351.	12307	*Senna glutinosa subsp. glutinosa*			
1352.	12309	*Senna glutinosa subsp. pruinosa*			
1353.	12308	*Senna glutinosa subsp. x luerssenii*			
1354.	18451	*Senna hamersleyensis*			
1355.	12312	*Senna notabilis*			
1356.	18450	*Senna symonii*			
1357.	12319	*Senna venusta*			
1358.	4196	*Sesbania cannabina (Sesbania Pea)*			
1359.	4198	*Sesbania formosa (White Dragon Tree)*			
1360.	2818	*Sesuvium portulacastrum*			
1361.	606	*Setaria dielsii (Diels' Pigeon Grass)*			
1362.	608	*Setaria italica (Italian Millet)*	Y		
1363.	613	*Setaria verticillata (Whorled Pigeon Grass)*	Y		
1364.		*Sida Excedentifolia (J.L. Egan 1925)*			
1365.	31758	*Sida arsiniata*			
1366.	4971	*Sida cardiophylla*			
1367.	4976	*Sida echinocarpa*			

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1368.	4977	*Sida fibulifera (Silver Sida)*			
1369.	4988	*Sida rohlenae*			
1370.	33698	*Sida sp. Pilbara (A.A. Mitchell PRP 1543)*			
1371.	16617	*Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)*			
1372.	4989	*Sida spinosa (Spiny Sida)*			
1373.	6998	*Solanum cleistogamum*			
1374.	7002	*Solanum diversiflorum*			
1375.	7007	*Solanum esuriale (Quena)*			
1376.	7009	*Solanum gabrielae*			
1377.	7014	*Solanum horridum*			
1378.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
1379.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
1380.	7029	*Solanum phlomoides*			
1381.	7036	*Solanum sturtianum (Thargomindah Nightshade)*			
1382.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
1383.	619	*Sorghum plumosum (Plume Canegrass)*			
1384.	12919	*Sorghum plumosum var. plumosum*			
1385.	622	*Sorghum timorense*			
1386.	625	*Spinifex longifolius (Beach Spinifex)*			
1387.	44523	*Spongophloea tissotii*			
1388.	629	*Sporobolus australasicus (Fairy Grass)*			
1389.	635	*Sporobolus virginicus (Marine Couch)*			
1390.	27310	*Spyridia filamentosa*			
1391.	4729	*Stackhousia clementii*		P3	
1392.	4731	*Stackhousia intermedia*			
1393.	19555	*Stackhousia muricata subsp. annual (W.R. Barker 2172)*			
1394.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
1395.	7099	*Stemodia kingii*			
1396.	8234	*Streptoglossa adscendens*			
1397.	8235	*Streptoglossa bubakii*			
1398.	8236	*Streptoglossa cylindriceps*			
1399.	8237	*Streptoglossa decurrens*			
1400.	8238	*Streptoglossa liatroides*			
1401.	8240	*Streptoglossa odora*			
1402.	8241	*Streptoglossa tenuiflora*			
1403.	7729	*Stylidium fluminense*			
1404.	3182	*Stylobasium spathulatum (Pebble Bush)*			
1405.	12353	*Stylosanthes hamata (Verano Stylo)*	Y		
1406.	2638	*Suaeda arbusculoides*			
1407.	43203	*Surreya diandra*			
1408.	12356	*Swainsona formosa*			
1409.	4231	*Swainsona kingii*			
1410.	4233	*Swainsona leeana*			
1411.	4234	*Swainsona maccullochiana (Ashburton Pea)*			
1412.	4242	*Swainsona pterostylis*			
1413.	7363	*Synaptantha tillaeacea*			
1414.	13339	*Synaptantha tillaeacea var. tillaeacea*			
1415.	132	*Syringodium isoetifolium*			
1416.	31616	*Tecticornia auriculata*			
1417.	33236	*Tecticornia halocnemoides (Shrubby Samphire)*			
1418.	33240	*Tecticornia halocnemoides subsp. longispicata*			
1419.	33238	*Tecticornia halocnemoides subsp. tenuis*			
1420.	33317	*Tecticornia indica*			
1421.	33319	*Tecticornia indica subsp. bidens*			
1422.	33356	*Tecticornia indica subsp. indica*			
1423.	33357	*Tecticornia indica subsp. julacea*			
1424.	33318	*Tecticornia indica subsp. leiostachya (Samphire)*			
1425.	33299	*Tecticornia pergranulata subsp. elongata*			
1426.	31618	*Tecticornia pruinosa*			
1427.	33220	*Tecticornia pterygosperma subsp. denticulata*			
1428.		*Tephrosia Fortescue (A.A. Mitchell 606)*			
1429.	4263	*Tephrosia clementii*			
1430.	49016	*Tephrosia densa*			
1431.	4272	*Tephrosia leptoclada*			
1432.	4280	*Tephrosia rosea (Flinders River Poison, Bungoo'dah)*			
1433.	19531	*Tephrosia rosea var. clementii*			
1434.	19529	*Tephrosia rosea var. rosea*			
1435.	15947	*Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)*			
1436.	17768	*Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)*			
1437.	15949	*Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)*			

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1438.	42442	*Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)*			
1439.	40060	*Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)*			
1440.	4285	*Tephrosia supina*			
1441.	5300	*Terminalia canescens (Joolal)*			
1442.	45698	*Terminalia circumalata*			
1443.	5310	*Terminalia platyphylla (Wild Plum, Durin)*			
1444.	5313	*Terminalia supranitifolia*		P3	
1445.	169	*Thalassia hemprichii*			
1446.	17820	*Themeda sp. Hamersley Station (M.E. Trudgen 11431)*		P3	
1447.	17819	*Themeda sp. Mt Barricade (M.E. Trudgen 2471)*			
1448.	673	*Themeda triandra*			
1449.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
1450.	2942	*Tinospora smilacina (Snakevine, Oondala)*			
1451.	27336	*Tolypiocladia glomerulata*			
1452.	6270	*Trachymene didiscoides*			
1453.	6273	*Trachymene glaucifolia (Wild Carrot)*			
1454.	6278	*Trachymene oleracea*			
1455.	19043	*Trachymene oleracea subsp. oleracea*			
1456.	678	*Tragus australianus (Small Burrgrass)*			
1457.	44305	*Trianthema pilosum*			
1458.	2830	*Trianthema portulacastrum (Giant Pigweed)*	Y		
1459.	44362	*Trianthema triquetrum*			
1460.	44360	*Trianthema turgidifolium*			
1461.	4375	*Tribulus cistoides*			
1462.	4377	*Tribulus hirsutus*			
1463.	4379	*Tribulus macrocarpus*			
1464.	4380	*Tribulus occidentalis (Perennial Caltrop)*			
1465.	4381	*Tribulus platypterus (Cork Hopbush)*			
1466.	4383	*Tribulus terrestris (Caltrop)*	Y		
1467.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			
1468.	11750	*Trichodesma zeylanicum var. zeylanicum*			
1469.	7381	*Trichosanthes cucumerina*			
1470.	12032	*Trichosanthes cucumerina var. cucumerina*			
1471.	8252	*Tridax procumbens (Tridax, Tridax Daisy)*	Y		
1472.	48201	*Trigastrotheca molluginea*			
1473.	679	*Triodia angusta*			
1474.	13131	*Triodia epactia*			
1475.	696	*Triodia pungens (Soft Spinifex)*			
1476.	704	*Triodia wiseana (Limestone Spinifex)*			
1477.	706	*Triraphis mollis (Needle Grass)*			
1478.	4873	*Triumfetta appendiculata*			
1479.	14694	*Triumfetta clementii*			
1480.	14942	*Triumfetta maconochieana*			
1481.	27348	*Udotea argentea*			
1482.	27349	*Udotea flabellum*			
1483.	35302	*Udotea glaucescens*			
1484.	30716	*Vachellia farnesiana (Mimosa Bush)*	Y		
1485.	27357	*Valoniopsis pachynema*			
1486.	7660	*Velleia glabrata (Pee the Bed)*			
1487.	4323	*Vigna lanceolata (Maloga Vigna, Wega)*			
1488.	31391	*Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)*			
1489.	46577	*Vigna triodiophila*		P3	
1490.	7393	*Wahlenbergia tumidifructa*			
1491.	5106	*Waltheria indica*			
1492.	17910	*Washingtonia filifera*	Y		
1493.	725	*Whiteochloa airoides*			
1494.	728	*Whiteochloa cymbiformis*			
1495.	6578	*Wrightia saligna*			
1496.	729	*Xerochloa barbata (Rice Grass)*			
1497.	731	*Xerochloa laniflora (Rice Grass)*			
1498.	732	*Yakirra australiensis*			
1499.	2834	*Zaleya galericulata (Hogweed)*			
1500.	29095	*Zaleya galericulata subsp. galericulata*			
1501.	4326	*Zornia albiflora*			
1502.	12679	*Zornia muelleriana subsp. congesta*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1

NatureMap Species Report

Created By Guest user on 05/03/2019

Burrup Peninsula

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Line'
Vertices	20° 42' 50" S,116° 45' 30" E 20° 41' 00" S,116° 43' 48" E 20° 40' 47" S,116° 42' 33" E 20° 36' 36" S,116° 46' 50" E
Group By	Kingdom

Kingdom	Species	Records
Animalia	323	1701
Chromista	11	16
Fungi	7	8
Plantae	301	788
TOTAL	**642**	**2513**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Animalia					
1.		*? ?*			
2.	25332	*Acanthophis wellsi (Pilbara Death Adder)*			
3.		*Acentrogobius sp.*			
4.		*Actacarus pacificus*			
5.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
6.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
7.		*Agauopsis arborea*			Y
8.		*Agauopsis dasyderma*			Y
9.		*Agauopsis moorea*			Y
10.		*Agauopsis obtusa*			Y
11.		*Alepes apercna*			
12.		*Alepes mate*			Y
13.		*Amblyeleotris gymnocephala*			
14.		*Amblyomma triguttatum*			
15.		*Amniataba caudavittata*			
16.		*Aname mainae*			
17.	24312	*Anas gracilis (Grey Teal)*			
18.	24316	*Anas superciliosa (Pacific Black Duck)*			
19.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
20.		*Anomalohalacarus dampierensis*			Y
21.	24505	*Anous stolidus subsp. pileatus (Common Noddy)*		IA	
22.	25318	*Antaresia perthensis (Pygmy Python)*			
23.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
24.	25670	*Anthus australis (Australian Pipit)*			
25.	24285	*Aquila audax (Wedge-tailed Eagle)*			
26.	41324	*Ardea modesta (great egret, white egret)*			
27.	24341	*Ardea pacifica (White-necked Heron)*			
28.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
29.		*Arius leptaspis*			Y
30.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
31.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
32.	24354	*Artamus leucorynchus subsp. leucopygialis (White-breasted Woodswallow)*			
33.	24355	*Artamus minor (Little Woodswallow)*			
34.	25320	*Aspidites melanocephalus (Black-headed Python)*			
35.		*Austrostrophus stictopygus*			
36.	24318	*Aythya australis (Hardhead)*			
37.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
38.	47897	*Butorides striata (Striated Heron, Mangrove Heron)*			
39.	25716	*Cacatua sanguinea (Little Corella)*			
40.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
41.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
42.	24780	*Calidris alba (Sanderling)*		IA	
43.	25738	*Calidris canutus (Red Knot, knot)*		IA	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
44.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
45.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
46.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
47.	24790	*Calidris tenuirostris (Great Knot)*		T	
48.		*Callionymus japonicus*			Y
49.		*Carangoides sp.*			
50.		*Caranx bucculentus*			
51.		*Carcharhinus brachyurus*			
52.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
53.	25600	*Centropus phasianinus (Pheasant Coucal)*			
54.		*Cephalopholis boenak*			
55.	24181	*Chaerephon jobensis (Greater Northern Freetail-bat, Northern Mastiff Bat)*			
56.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
57.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
58.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
59.	24378	*Charadrius veredus (Oriental Plover)*		IA	
60.		*Chelmon marginalis*			
61.		*Chelmon muelleri*			
62.	25336	*Chelonia mydas (Green Turtle)*		T	
63.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
64.		*Chroicocephalus novaehollandiae*			
65.	24289	*Circus assimilis (Spotted Harrier)*			
66.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
67.	24399	*Columba livia (Domestic Pigeon)*	Y		
68.		*Copidognathus lutarius*			Y
69.		*Copidognathus meridianus*			
70.		*Copidognathus piger*			Y
71.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
72.	25593	*Corvus orru (Torresian Crow)*			
73.	25701	*Coturnix ypsilophora (Brown Quail)*			
74.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
75.	25595	*Cracticus tibicen (Australian Magpie)*			
76.	24919	*Crenadactylus ocellatus subsp. horni (Clawless Gecko)*			
77.	30893	*Cryptoblepharus buchananii*			
78.	25020	*Cryptoblepharus plagiocephalus*			
79.	30892	*Cryptoblepharus ustulatus*			
80.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
81.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
82.	25043	*Ctenotus grandis subsp. titan*			
83.	25052	*Ctenotus leonhardii*			
84.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
85.	25072	*Ctenotus rubicundus*			
86.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
87.	25077	*Ctenotus serventyi*			
88.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
89.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
90.	25375	*Cyclorana maini (Sheep Frog)*			
91.	24322	*Cygnus atratus (Black Swan)*			
92.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
93.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
94.	25002	*Delma pax*			
95.	25004	*Delma tincta*			
96.	25295	*Demansia psammophis subsp. cupreiceps (Yellow-faced Whipsnake)*			
97.	25297	*Demansia rufescens (Rufous Whipsnake)*			
98.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
99.	41404	*Diplodactylus galaxias (Northern Pilbara Beak-faced Gecko)*			
100.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
101.		*Drombus sp.*			
102.	24084	*Dugong dugon (Dugong)*		S	
103.	25092	*Egernia depressa (Southern Pygmy Spiny-tailed Skink)*			
104.	25101	*Egernia pilbarensis (Pilbara Skink)*			
105.		*Egretta novaehollandiae*			
106.		*Elanus axillaris*			
107.		*Elops hawaiensis*			
108.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
109.	24631	*Emblema pictum (Painted Finch)*			
110.		*Enneapterygius sp.*			
111.		*Eolophus roseicapillus*			
112.	24653	*Eopsaltria pulverulenta (Mangrove Robin)*			
113.	25362	*Ephalophis greyae*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
114.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
115.		*Epinephelus coioides*			
116.		*Epinephelus malabaricus*			
117.	24568	*Epthianura aurifrons (Orange Chat)*			
118.	24570	*Epthianura tricolor (Crimson Chat)*			
119.	42404	*Eremiascincus isolepis*			
120.	25342	*Eretmochelys imbricata subsp. bissa (Hawksbill Turtle)*		T	
121.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
122.	47938	*Esacus magnirostris (Beach Stone-curlew, Beach Thick-knee)*			
123.	25621	*Falco berigora (Brown Falcon)*			
124.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
125.	25623	*Falco longipennis (Australian Hobby)*			
126.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
127.	24476	*Falco subniger (Black Falcon)*			
128.	24041	*Felis catus (Cat)*	Y		
129.	25727	*Fulica atra (Eurasian Coot)*			
130.	25301	*Furina ornata (Moon Snake)*			
131.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
132.	24956	*Gehyra pilbara*			
133.	24958	*Gehyra punctata*			
134.	24959	*Gehyra variegata*			
135.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
136.	24401	*Geopelia cuneata (Diamond Dove)*			
137.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
138.	25585	*Geopelia striata (Zebra Dove)*			
139.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
140.		*Gerres subfasciatus*			
141.	24276	*Gerygone tenebrosa (Dusky Gerygone)*			
142.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
143.		*Gobiodon rivulatus*			
144.	24443	*Grallina cyanoleuca (Magpie-lark)*			
145.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
146.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
147.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
148.	25541	*Haliastur indus (Brahminy Kite)*			
149.	24295	*Haliastur sphenurus (Whistling Kite)*			
150.		*Halieutaea brevicaudata?*			
151.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
152.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
153.	47965	*Hieraaetus morphnoides (Little Eagle)*			
154.	25734	*Himantopus himantopus (Black-winged Stilt)*			
155.	24491	*Hirundo neoxena (Welcome Swallow)*			
156.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
157.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
158.		*Indolpium sp.*			
159.		*Isobactrus australiensis*			Y
160.		*Isobactrus obesus*			Y
161.	25637	*Larus novaehollandiae (Silver Gull)*			
162.		*Latrodectus geometricus*			
163.		*Leiognathus sp.*			
164.		*Lepidotrigla sp.*			
165.	25125	*Lerista bipes*			
166.	30928	*Lerista clara*			
167.	30929	*Lerista jacksoni*			
168.	25155	*Lerista muelleri*			
169.	25005	*Lialis burtonis*			
170.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
171.	25239	*Liasis olivaceus subsp. olivaceus (Olive Python)*			
172.	25661	*Lichmera indistincta (Brown Honeyeater)*			
173.	25739	*Limicola falcinellus (Broad-billed Sandpiper)*		IA	
174.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
175.		*Litarachna bartschae*			Y
176.	25392	*Litoria rubella (Little Red Tree Frog)*			
177.		*Liza subviridis*			
178.		*Lophiocharon trisignatus*			
179.	30933	*Lucasium stenodactylum*			
180.		*Lutjanus argentimaculatus*			
181.		*Lutjanus malabaricus*			
182.		*Lutjanus russellii*			
183.	24180	*Macroderma gigas (Ghost Bat)*		T	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
184.	25489	*Macropus robustus (Euro, Biggada)*			
185.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
186.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
187.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
188.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
189.	24583	*Manorina flavigula (Yellow-throated Miner)*			
190.	24736	*Melopsittacus undulatus (Budgerigar)*			
191.	25184	*Menetia greyii*			
192.	25187	*Menetia surda subsp. surda*			
193.	24598	*Merops ornatus (Rainbow Bee-eater)*			
194.		*Metavelifer multiradiatus*			
195.	25542	*Milvus migrans (Black Kite)*			
196.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
197.		*Monacanthus chinensis*			
198.		*Monodactylus argenteus*			
199.	25193	*Morethia ruficauda subsp. exquisita*			
200.		*Mormopterus (Ozimops) cobourgianus*			
201.		*Mugil cephalus*			
202.	24223	*Mus musculus (House Mouse)*	Y		
203.	25344	*Natator depressus (Flatback Turtle)*		T	
204.		*Nemipterus celebicus*			
205.	25685	*Neochmia ruficauda (Star Finch)*			
206.		*Neopsephotus bourkii*			
207.		*Nephila edulis*			
208.		*Netuma proxima*			
209.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
210.	25430	*Notaden nichollsi (Desert Spadefoot)*			
211.	25197	*Notoscincus ornatus subsp. ornatus*			
212.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
213.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
214.	25742	*Numenius phaeopus (Whimbrel)*		IA	
215.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
216.		*Nyctophilus geoffroyi subsp. pallescens*			
217.	24742	*Nymphicus hollandicus (Cockatiel)*			
218.	24497	*Oceanites oceanicus (Wilson's Storm-petrel)*		IA	
219.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
220.	24976	*Oedura marmorata (Marbled Velvet Gecko)*			
221.		*Omobranchus punctatus*			
222.	48034	*Osphranter robustus (Euro, Biggada)*			
223.	24620	*Pachycephala lanioides (White-breasted Whistler)*			
224.	24621	*Pachycephala melanura subsp. melanura (Mangrove Golden Whistler)*			
225.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
226.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
227.		*Paramonacanthus choirocephalus*			
228.	25682	*Pardalotus striatus (Striated Pardalote)*			
229.	25687	*Passer domesticus (House Sparrow)*	Y		
230.	24642	*Passer montanus (Eurasian Tree Sparrow)*	Y		
231.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
232.		*Peneoenanthe pulverulenta*			
233.		*Pentapodus sp.*			
234.	48060	*Petrochelidon ariel (Fairy Martin)*			
235.	48061	*Petrochelidon nigricans (Tree Martin)*			
236.	24144	*Petrogale rothschildi (Rothschild's Rock-wallaby)*			
237.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
238.	25699	*Phalacrocorax varius (Pied Cormorant)*			
239.		*Planigale sp. nov.*			
240.		*Platycephalus sp.*			
241.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
242.		*Pleurosicya sp.*			
243.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
244.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
245.	25703	*Podargus strigoides (Tawny Frogmouth)*			
246.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
247.		*Pomadasys maculatus*			
248.		*Pontarachne australis*			Y
249.		*Priacanthus hamrur*			
250.	24105	*Pseudantechinus roryi (Rory's Pseudantechinus)*			
251.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
252.	25261	*Pseudechis australis (Mulga Snake)*			
253.	24233	*Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)*		P4	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
254.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
255.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
256.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
257.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
258.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			
259.		*Ptilonorhynchus guttatus*			
260.		*Quistrachia legendrei*			
261.		*Rastrelliger kanagurta*			
262.	24245	*Rattus rattus (Black Rat)*	Y		
263.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
264.		*Rhagada angulata*			
265.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
266.	24457	*Rhipidura phasiana (Mangrove Grey Fantail)*			
267.		*Rhombognathus dispar*			Y
268.		*Rhombognathus ocularis*			Y
269.		*Rhombognathus scutulatus*			
270.		*Scaptognathides hawaiiensis*			Y
271.		*Scaptognathides ornatus*			Y
272.		*Scatophagus argus*			
273.		*Scolopendra morsitans*			
274.		*Scolopsis taenioptera*			
275.		*Secutor insidiator*			
276.		*Sillago burrus*			
277.		*Sillago lutea*			
278.		*Simaetha tenuior*			
279.		*Simognathus platyaspis*			Y
280.		*Simognathus salebrosus*			Y
281.		*Simognathus tener*			Y
282.	30948	*Smicrornis brevirostris (Weebill)*			
283.		*Sorsogona tuberculata*			
284.		*Sphyraena barracuda*			
285.	24521	*Sterna bengalensis (Lesser Crested Tern)*			
286.	48593	*Sternula albifrons (Little Tern)*		IA	
287.	48594	*Sternula nereis (Fairy Tern)*			
288.	24482	*Stiltia isabella (Australian Pratincole)*			
289.	24924	*Strophurus ciliaris subsp. aberrans*			
290.	24927	*Strophurus elderi*			
291.	24949	*Strophurus wellingtonae*			
292.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
293.	30870	*Taeniopygia guttata (Zebra Finch)*			
294.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
295.		*Terapon jarbua*			
296.		*Thalasseus bengalensis*			
297.	48597	*Thalasseus bergii (Crested Tern)*		IA	
298.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
299.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
300.	25548	*Todiramphus chloris (Collared Kingfisher)*			
301.	24306	*Todiramphus chloris subsp. pilbara (Pilbara Collared Kingfisher)*			
302.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
303.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
304.		*Triacanthus sp.*			
305.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
306.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
307.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
308.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
309.	24851	*Turnix velox (Little Button-quail)*			
310.		*Tylosurus crocodilus*			
311.		*Urodacus armatus*			
312.		*Valamugil seheli*			
313.	24386	*Vanellus tricolor (Banded Lapwing)*			
314.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
315.	25223	*Varanus panoptes subsp. rubidus*			
316.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
317.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			
318.		*Venatrix arenaris*			
319.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
320.	24040	*Vulpes vulpes (Red Fox)*	Y		
321.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
322.	24857	*Zosterops luteus (Yellow White-eye)*			
323.	24248	*Zyzomys argurus (Common Rock-rat)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Chromista					
324.	35220	*Canistrocarpus cervicornis*			
325.	35910	*Canistrocarpus crispatus*			
326.	26764	*Dictyopteris australis*			
327.	29954	*Dictyopteris woodwardia*			
328.	26949	*Hydroclathrus clathratus*			
329.	27113	*Padina australis*			
330.	48304	*Padina tetrastromatica*			Y
331.	27248	*Sargassum ligulatum*			
332.	27253	*Sargassum peronii*			
333.	42785	*Sirophysalis trinodis*			
334.	27282	*Spatoglossum macrodontum*			
Fungi					
335.	27576	*Acarospora nodulosa*			
336.	44918	*Caloplaca michelagoensis*			
337.		*Caloplaca sp.*			
338.	27715	*Diploschistes actinostomus*			
339.	27932	*Peltula bolanderi*			
340.		*Phellinus rimosus*			
341.	28194	*Xanthoria parietina*			
Plantae					
342.	4891	*Abutilon fraseri (Lantern Bush)*			
343.	4895	*Abutilon lepidum*			
344.	4899	*Abutilon malvifolium (Bastard Marshmallow)*			
345.	44580	*Acacia ampliceps x bivenosa*			
346.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
347.	3223	*Acacia arida*			
348.	3241	*Acacia bivenosa*			
349.	44588	*Acacia bivenosa x sclerosperma subsp. sclerosperma*			
350.	17013	*Acacia colei var. colei*			
351.	3270	*Acacia coriacea (Wirewood)*			
352.	13500	*Acacia coriacea subsp. coriacea*			
353.	13502	*Acacia coriacea subsp. pendens*			
354.	12673	*Acacia glaucocaesia*			
355.	3356	*Acacia gregorii (Gregory's Wattle)*			
356.	3377	*Acacia inaequilatera (Baderi)*			
357.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
358.	29016	*Acacia pyrifolia var. morrisonii*			
359.	29015	*Acacia pyrifolia var. pyrifolia*			
360.	13078	*Acacia sclerosperma subsp. sclerosperma*			
361.	3551	*Acacia sphaerostachya*			
362.	3579	*Acacia trachycarpa (Minni Ritchi, Balgali)*			
363.	3606	*Acacia xiphophylla*			
364.	26441	*Acanthophora spicifera*			
365.	48409	*Acetabularia caliculus*			
366.	4583	*Adriana tomentosa*			
367.	17422	*Adriana tomentosa var. tomentosa*			
368.	6486	*Aegialitis annulata (Club Mangrove)*			
369.	6478	*Aegiceras corniculatum (River Mangrove)*			
370.	2646	*Aerva javanica (Kapok Bush)*	Y		
371.	3609	*Albizia lebbeck*			
372.	11487	*Alectryon oleifolius subsp. oleifolius*			
373.	2651	*Alternanthera nana (Hairy Joyweed)*			
374.	20018	*Amaranthus undulatus*			
375.	5277	*Ammannia baccifera*			
376.	26462	*Amphiroa fragilissima*			
377.	7832	*Angianthus milnei (Cone-spike Angianthus)*			
378.	207	*Aristida contorta (Bunched Kerosene Grass)*			
379.	215	*Aristida latifolia (Feathertop Wiregrass)*			
380.	226	*Arundo donax (Giant Reed)*	Y		
381.	6828	*Avicennia marina (White Mangrove)*			
382.	14555	*Avicennia marina subsp. marina*			
383.	7854	*Bidens bipinnata (Bipinnate Beggartick)*	Y		
384.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
385.	2772	*Boerhavia gardneri*			
386.	2773	*Boerhavia paludosa*			
387.	44782	*Bonamia pilbarensis*			
388.	26508	*Boodlea composita*			
389.	26510	*Bornetella sphaerica*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
390.	12716	*Brachychiton acuminatus*			
391.	4603	*Bridelia tomentosa*			
392.	5291	*Bruguiera exaristata (Ribbed Mangrove)*			
393.	11055	*Cajanus cinereus*			
394.	11150	*Cajanus pubescens*			
395.	48291	*Capparis spinosa subsp. nummularia*			
396.	2949	*Cassytha capillaris*			
397.	42620	*Caulerpa chemnitzia*			
398.	44539	*Caulerpa cylindracea*			
399.	44547	*Caulerpa lamourouxii*			
400.	26568	*Caulerpa lentillifera*			
401.	26573	*Caulerpa racemosa*			
402.	26576	*Caulerpa serrulata*			
403.	26577	*Caulerpa sertularioides*			
404.	26582	*Caulerpa verticillata*			
405.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		
406.	41568	*Cenchrus setaceus (Fountain Grass)*	Y		
407.	29721	*Cenchrus setiger (Birdwood Grass)*	Y		
408.	6539	*Centaurium erythraea (Common Centaury)*	Y		
409.	39680	*Ceriops australis*			
410.	33	*Cheilanthes contigua*			
411.	269	*Chloris pectinata (Comb Chloris)*			
412.	273	*Chrysopogon fallax (Golden Beard Grass)*			
413.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
414.	6732	*Clerodendrum tomentosum*			
415.	13689	*Clerodendrum tomentosum var. lanceolatum*			
416.	3769	*Clitoria ternatea*	Y		
417.		*Codium platyclados*			Y
418.	2778	*Codonocarpus cotinifolius (Native Poplar, Kundurangu)*			
419.	1165	*Commelina ensifolia (Wandering Jew, Buargu)*			
420.	2776	*Commicarpus australis (Perennial Tar Vine)*			
421.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
422.	4857	*Corchorus elachocarpus*			
423.	25847	*Corchorus incanus subsp. incanus*			
424.	13659	*Corchorus laniflorus*			
425.	4865	*Corchorus tridens*			
426.	13467	*Corchorus trilocularis*			
427.	4867	*Corchorus walcottii (Woolly Corchorus)*			
428.	17093	*Corymbia hamersleyana*			
429.	17092	*Corymbia opaca*			
430.	3774	*Crotalaria cunninghamii (Green Birdflower, Bilbun)*			
431.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
432.	41720	*Cucumis argenteus*			
433.	41721	*Cucumis variabilis*			
434.	279	*Cymbopogon ambiguus (Scentgrass)*			
435.	6584	*Cynanchum floribundum (Dumara Bush, Tjipa)*			
436.	774	*Cyperus bifax (Downs Nutgrass)*			
437.	12801	*Cyperus blakeanus*			
438.	777	*Cyperus bulbosus (Bush Onion, Tjanmata)*			
439.	814	*Cyperus squarrosus*			
440.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
441.	290	*Dactyloctenium radulans (Button Grass)*			
442.	7318	*Dentella minutissima*			
443.	3856	*Desmodium muelleri*			
444.	13741	*Dichanthium sericeum subsp. humilius*			
445.	3612	*Dichrostachys spicata (Pied Piper Bush)*			
446.	7166	*Dicliptera armata*			
447.	26769	*Dictyosphaeria cavernosa*			
448.	26782	*Digenea simplex*			
449.	313	*Digitaria ctenantha (Comb Finger Grass)*			
450.	48738	*Distimake dissectus var. dissectus*	Y		
451.	2504	*Dysphania plantaginella*			
452.	11653	*Dysphania rhadinostachya subsp. inflata*			
453.	11890	*Dysphania rhadinostachya subsp. rhadinostachya*			
454.	14301	*Ehretia saligna var. saligna*			
455.	827	*Eleocharis geniculata*			
456.	2511	*Enchylaena tomentosa (Barrier Saltbush)*			
457.	357	*Enneapogon caerulescens (Limestone Grass)*			
458.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
459.	399	*Eragrostis xerophila (Knotty-butt Neverfail)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
460.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
461.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
462.	417	*Eriachne pulchella (Pretty Wanderrie)*			
463.	421	*Eriachne tenuiculmis*			
464.	5752	*Eucalyptus prominens*			
465.	14548	*Eucalyptus victrix*			
466.	4617	*Euphorbia australis (Namana)*			
467.	35307	*Euphorbia australis var. australis*			
468.	35303	*Euphorbia australis var. subtomentosa*			
469.	4619	*Euphorbia biconvexa*			
470.	9048	*Euphorbia careyi*			
471.	4623	*Euphorbia coghlanii (Namana)*			
472.	4626	*Euphorbia drummondii (Caustic Weed, Piwi)*			
473.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
474.	42879	*Euphorbia trigonosperma*			
475.	13281	*Euphorbia vaccaria*			
476.	11200	*Evolvulus alsinoides var. villosicalyx*			
477.	31578	*Ficus aculeata var. indecora (Ranji)*			
478.	19648	*Ficus brachypoda*			
479.	1759	*Ficus virens (Albayi)*			
480.	851	*Fimbristylis dichotoma (Eight Day Grass)*			
481.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
482.	12013	*Flueggea virosa subsp. melanthesoides (Dogwood, Guwal)*			
483.	5188	*Frankenia ambita*			
484.	2680	*Gomphrena cunninghamii*			
485.	18367	*Gomphrena kanisii*			
486.	7521	*Goodenia lamprosperma*			
487.	7556	*Goodenia tenuiloba*			
488.	4910	*Gossypium australe (Native Cotton)*			
489.	4913	*Gossypium hirsutum (Upland Cotton)*	Y		
490.	19570	*Grevillea pyramidalis subsp. leucadendron*			
491.	15975	*Grevillea pyramidalis subsp. pyramidalis*			
492.	19137	*Hakea lorea subsp. lorea*			
493.	26892	*Halimeda discoidea*			
494.	26894	*Halimeda macroloba*			
495.	131	*Halodule uninervis*			
496.	162	*Halophila decipiens*			
497.	163	*Halophila minor*			
498.	164	*Halophila ovalis (Sea Wrack)*			
499.	165	*Halophila spinulosa*			
500.	37642	*Halymenia durvillei*			
501.	6704	*Heliotropium conocarpum*			
502.	6707	*Heliotropium curassavicum (Smooth Heliotrope)*			
503.	6718	*Heliotropium tenuifolium (Mamukata)*			
504.	29316	*Hibiscus austrinus*			
505.	4923	*Hibiscus brachysiphonius*			
506.	4933	*Hibiscus leptocladus*			
507.	4942	*Hibiscus sturtii (Sturt's Hibiscus)*			
508.	5215	*Hybanthus aurantiacus*			
509.	3973	*Indigofera colutea (Sticky Indigo)*			
510.	3980	*Indigofera linifolia*			
511.	3982	*Indigofera monophylla*			
512.	3987	*Indigofera trita*			
513.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
514.	6633	*Ipomoea muelleri (Poison Morning Glory, Yumbu)*			
515.	6635	*Ipomoea pes-caprae*			
516.	11312	*Ipomoea pes-caprae subsp. brasiliensis*			
517.	465	*Iseilema vaginiflorum (Red Flinders Grass)*			
518.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
519.	4960	*Lawrencia viridigrisea*			
520.		*Lawsonia inermis*			
521.	3035	*Lepidium pedicellosum*			
522.	3038	*Lepidium pholidogynum*			
523.	3613	*Leucaena leucocephala (Leucaena)*	Y		
524.	4060	*Lotus australis (Austral Trefoil)*			
525.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
526.	5051	*Melhania oblongifolia*			
527.	6490	*Muellerolimon salicorniaceum*			
528.	17158	*Myoporum montanum (Native Myrtle)*			
529.	2573	*Neobassia astrocarpa*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
530.	44548	*Neomeris bilimbata*			
531.	3614	*Neptunia dimorphantha (Sensitive Plant)*			
532.	19640	*Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)*		P3	
533.	6651	*Operculina aequisepala*			
534.	503	*Panicum decompositum (Native Millet, Kaltu-kaltu)*			
535.	518	*Paspalidium clementii (Clements Paspalidium)*			
536.	525	*Paspalidium tabulatum*			
537.	5226	*Passiflora foetida (Stinking Passion Flower)*	Y		
538.	4680	*Phyllanthus maderaspatensis*			
539.	17794	*Phyllanthus tenellus*	Y		
540.	20652	*Physalis angulata*	Y		
541.	41300	*Pittosporum phillyreoides (Weeping Pittosporum, Yaliti)*			
542.	43944	*Pluchea longiseta*			
543.	8168	*Pluchea rubelliflora*			
544.	2903	*Polycarpaea longiflora*			
545.	17513	*Polymeria lanata*			
546.	2878	*Portulaca conspicua*			
547.	2884	*Portulaca oleracea (Purslane, Wakati)*			
548.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
549.	8192	*Pterocaulon sphacelatum (Apple Bush, Fruit Salad Plant)*			
550.	8193	*Pterocaulon sphaeranthoides*			
551.	2690	*Ptilotus aervoides*			
552.	2696	*Ptilotus astrolasius*			
553.	2698	*Ptilotus auriculifolius*			
554.	2706	*Ptilotus carinatus*			
555.	2721	*Ptilotus exaltatus (Tall Mulla Mulla)*			
556.	2728	*Ptilotus gomphrenoides*			
557.	2746	*Ptilotus nobilis (Tall Mulla Mulla)*			
558.	2747	*Ptilotus obovatus (Cotton Bush)*			
559.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
560.	2766	*Ptilotus villosiflorus*			
561.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
562.	11240	*Rhagodia preissii subsp. obovata*			
563.	5295	*Rhizophora stylosa (Spotted-leaved Red Mangrove)*			
564.	13310	*Rhodanthe margarethae*			
565.	4190	*Rhynchosia australis (Rhynchosia)*			
566.	20862	*Rhynchosia bungarensis*		P4	
567.	4191	*Rhynchosia minima (Rhynchosia)*			
568.	2443	*Rumex vesicarius (Ruby Dock)*	Y		
569.	30434	*Salsola australis*			
570.	12578	*Scaevola acacioides*			
571.	7608	*Scaevola cunninghamii*			
572.	7644	*Scaevola spinescens (Currant Bush, Maroon)*			
573.	16257	*Schoenoplectus subulatus*			
574.	2633	*Sclerolaena uniflora (Two-spined Saltbush)*			
575.	12280	*Senna artemisioides subsp. oligophylla*			
576.	12303	*Senna costata*			
577.	12308	*Senna glutinosa subsp. x luerssenii*			
578.	12312	*Senna notabilis*			
579.	4196	*Sesbania cannabina (Sesbania Pea)*			
580.	4977	*Sida fibulifera (Silver Sida)*			
581.	4989	*Sida spinosa (Spiny Sida)*			
582.	7014	*Solanum horridum*			
583.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
584.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
585.	7029	*Solanum phlomoides*			
586.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
587.	622	*Sorghum timorense*			
588.	625	*Spinifex longifolius (Beach Spinifex)*			
589.	44523	*Spongophloea tissotii*			
590.	629	*Sporobolus australasicus (Fairy Grass)*			
591.	27310	*Spyridia filamentosa*			
592.	4729	*Stackhousia clementii*		P3	
593.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
594.	7099	*Stemodia kingii*			
595.	8237	*Streptoglossa decurrens*			
596.	8238	*Streptoglossa liatroides*			
597.	12353	*Stylosanthes hamata (Verano Stylo)*	Y		
598.	12356	*Swainsona formosa*			
599.	4231	*Swainsona kingii*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
600.	4242	*Swainsona pterostylis*			
601.	33236	*Tecticornia halocnemoides (Shrubby Samphire)*			
602.	33240	*Tecticornia halocnemoides subsp. longispicata*			
603.	33356	*Tecticornia indica subsp. indica*			
604.	33318	*Tecticornia indica subsp. leiostachya (Samphire)*			
605.	33220	*Tecticornia pterygosperma subsp. denticulata*			
606.		*Tephrosia Fortescue (A.A. Mitchell 606)*			
607.	4263	*Tephrosia clementii*			
608.	49016	*Tephrosia densa*			
609.	4272	*Tephrosia leptoclada*			
610.	4280	*Tephrosia rosea (Flinders River Poison, Bungoo'dah)*			
611.	19531	*Tephrosia rosea var. clementii*			
612.	15947	*Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)*			
613.	4285	*Tephrosia supina*			
614.	45698	*Terminalia circumalata*			
615.	5313	*Terminalia supranitifolia*		P3	
616.	17820	*Themeda sp. Hamersley Station (M.E. Trudgen 11431)*		P3	
617.	17819	*Themeda sp. Mt Barricade (M.E. Trudgen 2471)*			
618.	673	*Themeda triandra*			
619.	2942	*Tinospora smilacina (Snakevine, Oondala)*			
620.	6278	*Trachymene oleracea*			
621.	19043	*Trachymene oleracea subsp. oleracea*			
622.	2830	*Trianthema portulacastrum (Giant Pigweed)*	Y		
623.	44362	*Trianthema triquetrum*			
624.	44360	*Trianthema turgidifolium*			
625.	4380	*Tribulus occidentalis (Perennial Caltrop)*			
626.	4383	*Tribulus terrestris (Caltrop)*	Y		
627.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			
628.	8252	*Tridax procumbens (Tridax, Tridax Daisy)*	Y		
629.	48201	*Trigastrotheca molluginea*			
630.	679	*Triodia angusta*			
631.	13131	*Triodia epactia*			
632.	704	*Triodia wiseana (Limestone Spinifex)*			
633.	4873	*Triumfetta appendiculata*			
634.	14694	*Triumfetta clementii*			
635.	27348	*Udotea argentea*			
636.	35302	*Udotea glaucescens*			
637.	7660	*Velleia glabrata (Pee the Bed)*			
638.	31391	*Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)*			
639.	46577	*Vigna triodiophila*		P3	
640.	17910	*Washingtonia filifera*	Y		
641.	725	*Whiteochloa airoides*			
642.	29095	*Zaleya galericulata subsp. galericulata*			

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

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

Australian Government
Department of the Environment and Energy

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.

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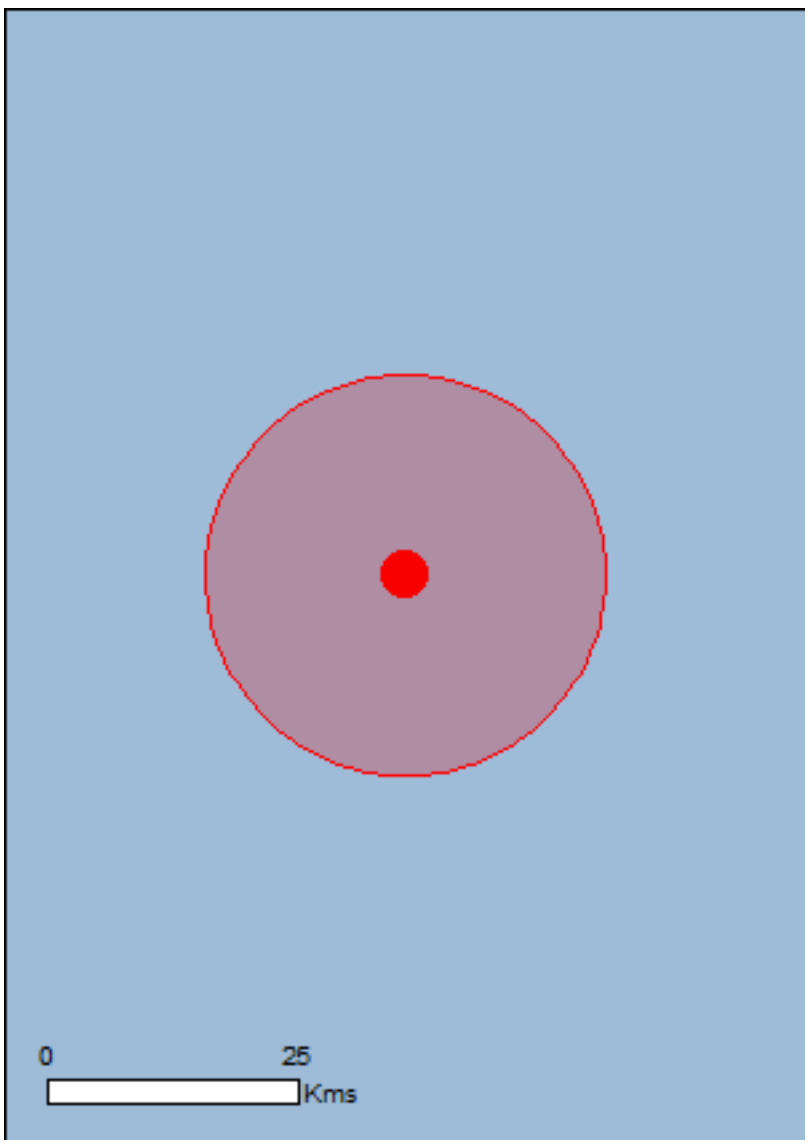

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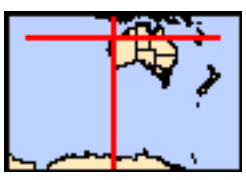

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	31
Listed Migratory Species:	57

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	97
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus angusticeps Northwestern Coastal Ctenotus, Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area

Name	Status	Type of Presence
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas		
Streaked Shearwater [1077]		Species or species habitat may occur within area
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus		
Bridled Tern [82845]		Breeding known to occur within area
Sterna dougallii		
Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata		
Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon		
Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Manta alfredi		
Reef Manta Ray, Coastal Manta Ray, Inshore		Species or species

Name	Threatened	Type of Presence
Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994] Manta birostris		habitat known to occur within area
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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur

Name	Threatened	Type of Presence
		within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species 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 -

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

Name	Threatened	Type of Presence within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area

Name	Status	Type of Presence
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. 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
Birds		
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

Name	Status	Type of Presence
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Mammals		
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 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
Plants		
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
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
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

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

-20.81552 116.67903

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact Us page.

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Appendix C: Condition Scale and Vegetation Classification System

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Table C.1: Vegetation condition scale as adapted from Trudgen (1988) (Environmental Protection Authority 2016a).

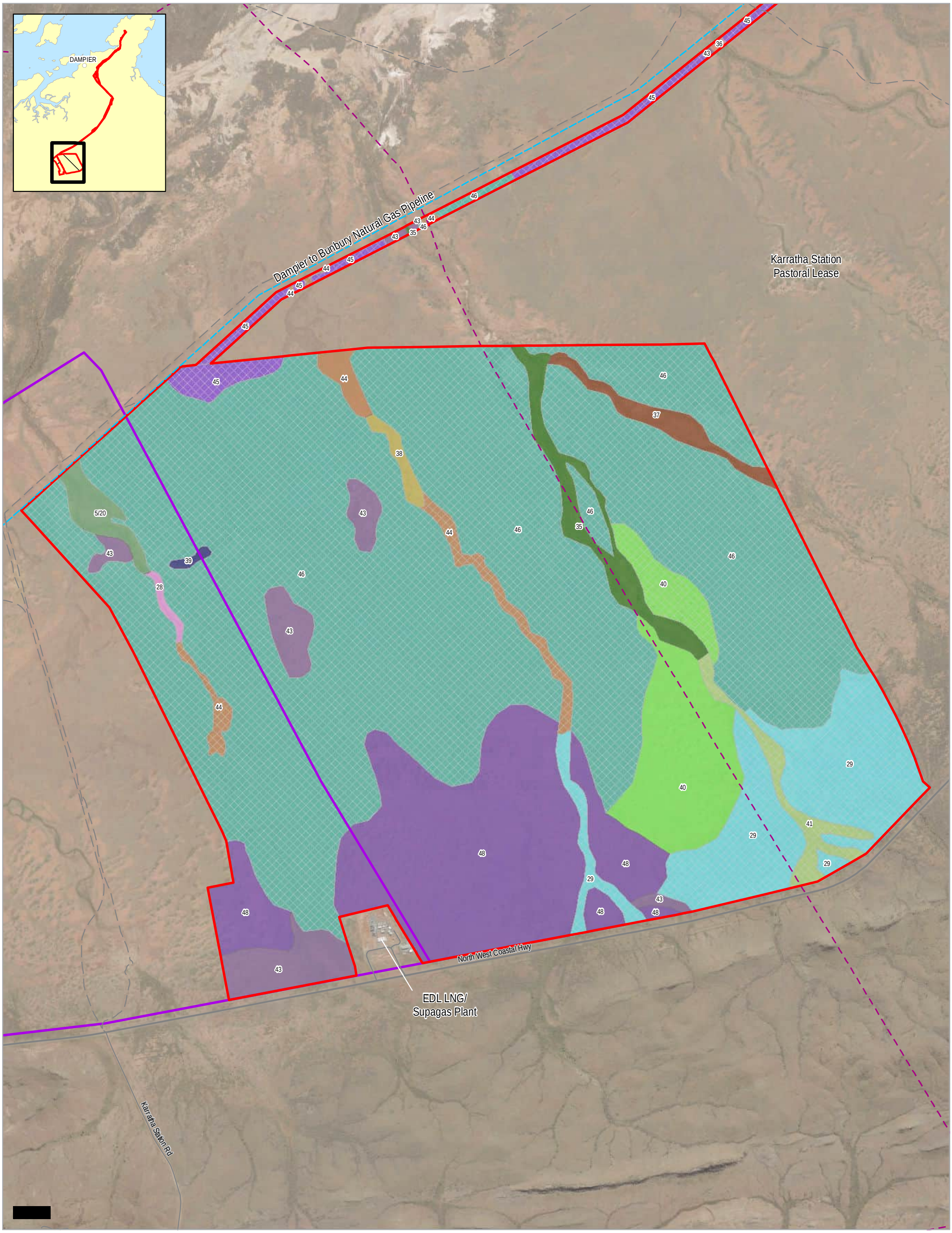
Condition	Description
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated 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.

Table C.2: Vegetation Classification System Specht (1970) as modified by Aplin (1979).

Stratum	70-100% cover	30-70% cover	10-30% cover	2-10% cover	<2% cover
Trees > 30 m	Tall closed forest	Tall open Forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees < 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs > 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs < 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses

Stratum	70-100% cover	30-70% cover	10-30% cover	2-10% cover	<2% cover
Grasses, sedges, herbs	Closed tussock grassland/ sedgeland/ herbland	Tussock grassland/ sedgeland/ herbland	Open tussock grassland/ sedgeland/ herbland	Very open tussock grassland/ sedgeland/ herbland	Scattered tussock grasses /sedges/herbs

Appendix D: Vegetation Type Mapping



LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- MSIA Buffer
- Maitland Strategic Industrial Area
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT05/20
- VT28 - AiAc?Eb
- VT29 - AiTw
- VT35 - AcAi
- VT36 - Ac?Tt
- VT37 - AcAx?Tt
- VT38 - VfCc
- VT39 - ShEx
- VT40 - AxEx
- VT41 - ChAcTa
- VT43 - Tw
- VT44 - Eb?Cf
- VT45 - Ex spp
- VT46 - Ex
- VT48 - AbTw

Paper Size ISO A3

0 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

Appendix D

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppD_VegetationTypes_Page1_Rev0.mxd
Print date: 27 Nov 2019 - 12:18

Data source: GHD: Development envelopes - 20181218, Vegetation Condition - 20190917; Woodside: Substation Sites - 20190909; Landgate: Roads - 20190128, Imagery - 20180408 (accessed: 20190703).
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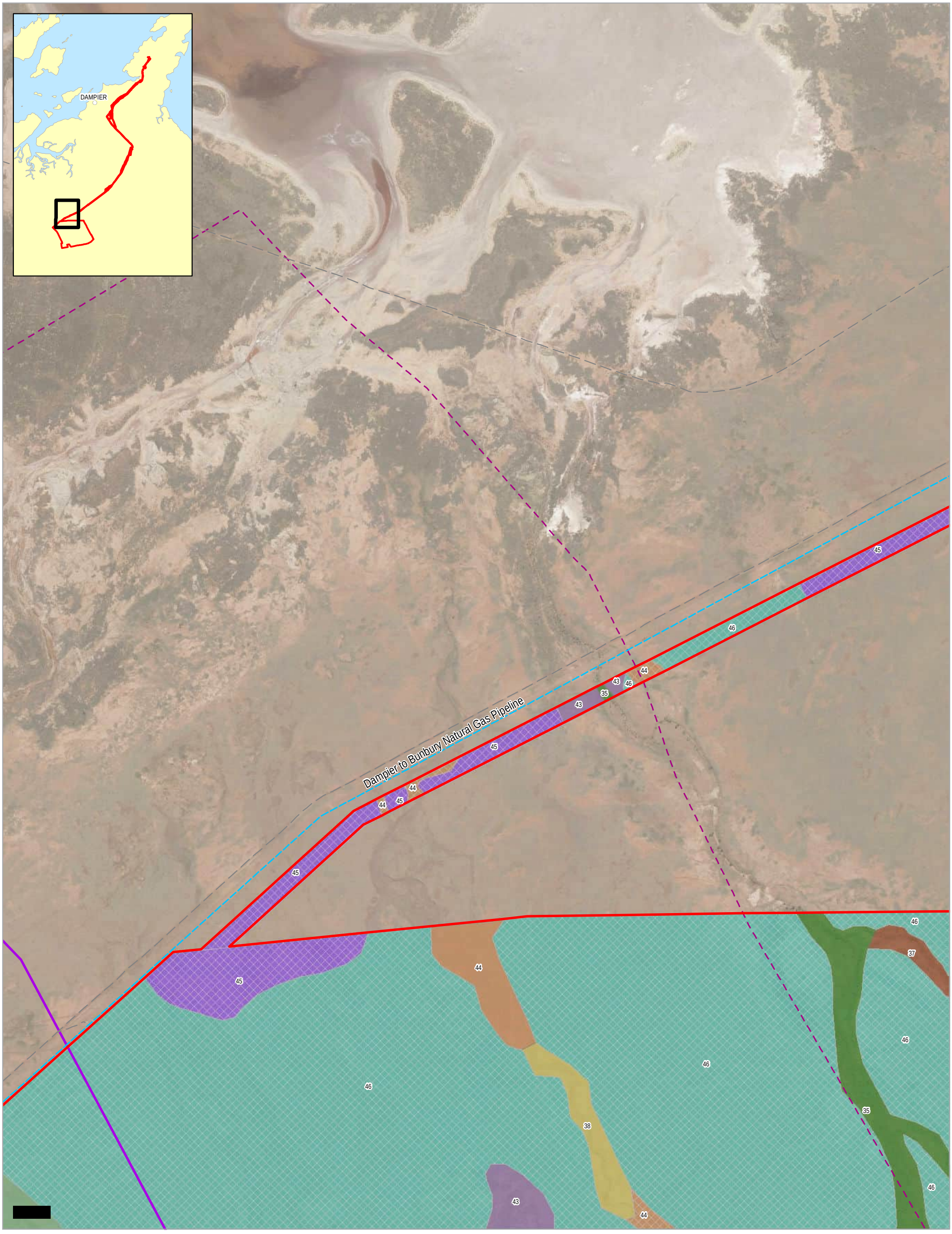

LEGEND

- Track
- Dampier to Bunbury Natural Gas Pipeline
- MSIA Buffer
- Maitland Strategic Industrial
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT05/20
- VT35 - AcAi
- VT37 - AcAx?Tt
- VT38 - VfCc
- VT43 - Tw
- VT44 - Eb?Cf
- VT45 - Ex spp
- VT46 - Ex

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

Appendix D1

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppD_VegetationTypes_Rev0.mxd
Print date: 27 Nov 2019 - 12:31

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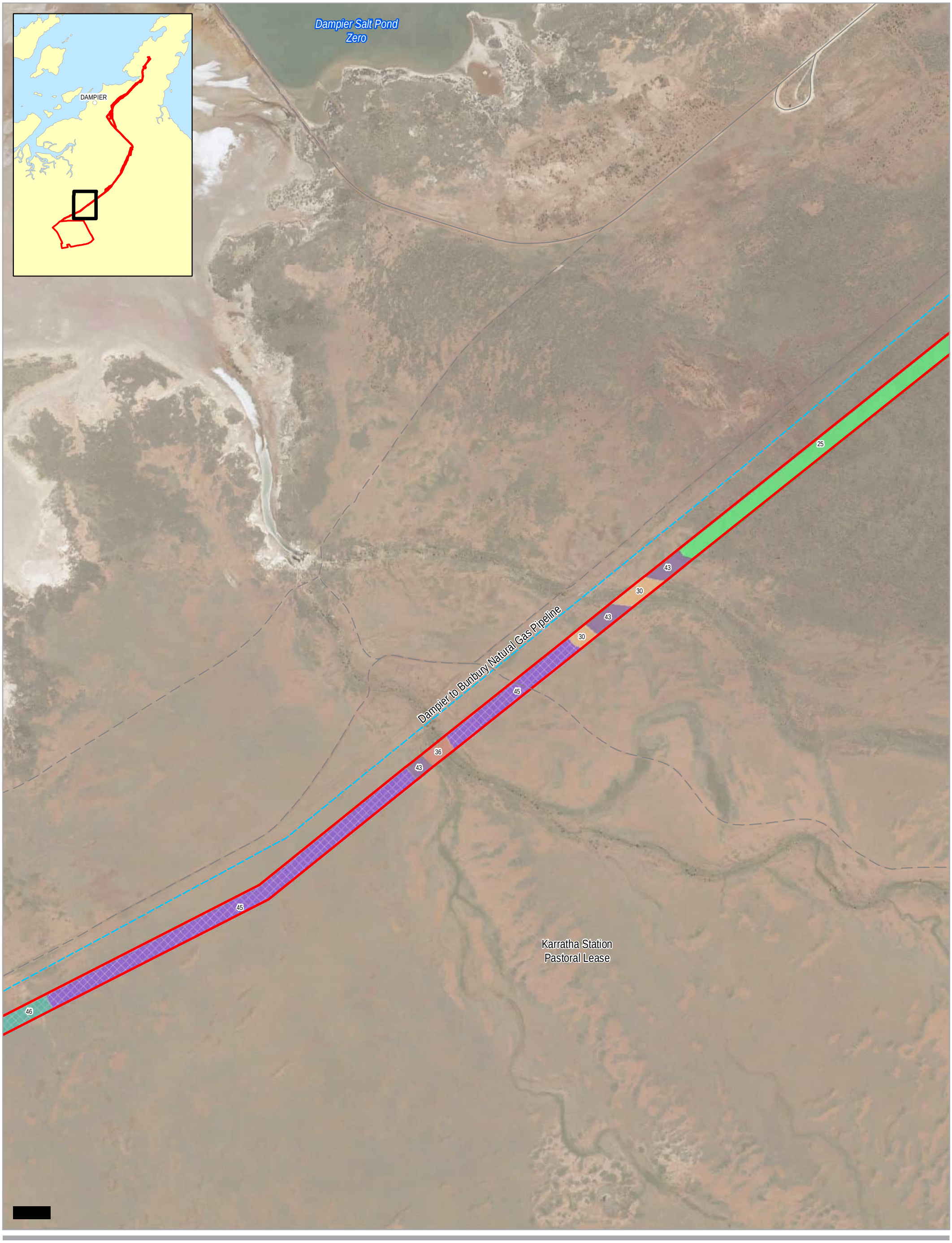

LEGEND

- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT25 - AbTw
- VT30 - AiAcTw
- VT36 - Ac?Tt
- VT43 - Tw
- VT45 - Ex spp
- VT46 - Ex

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppD_VegetationTypes_Rev0.mxd
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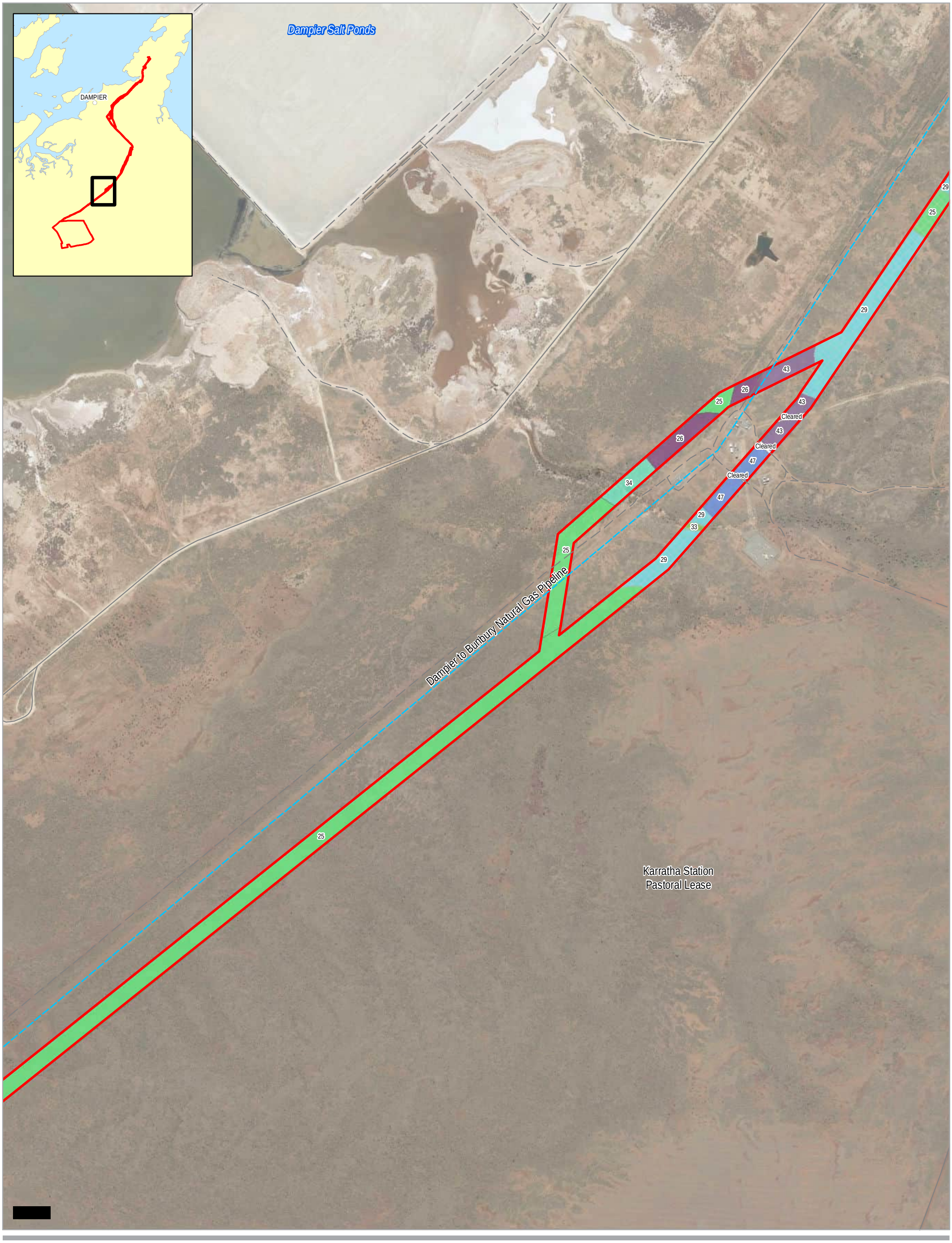

LEGEND

- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT25 - AbTw
- VT26 - AbCc
- VT29 - AiTw
- VT33 - AcCc
- VT34 - AaAcC?v
- VT43 - Tw
- VT47 - Cc
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

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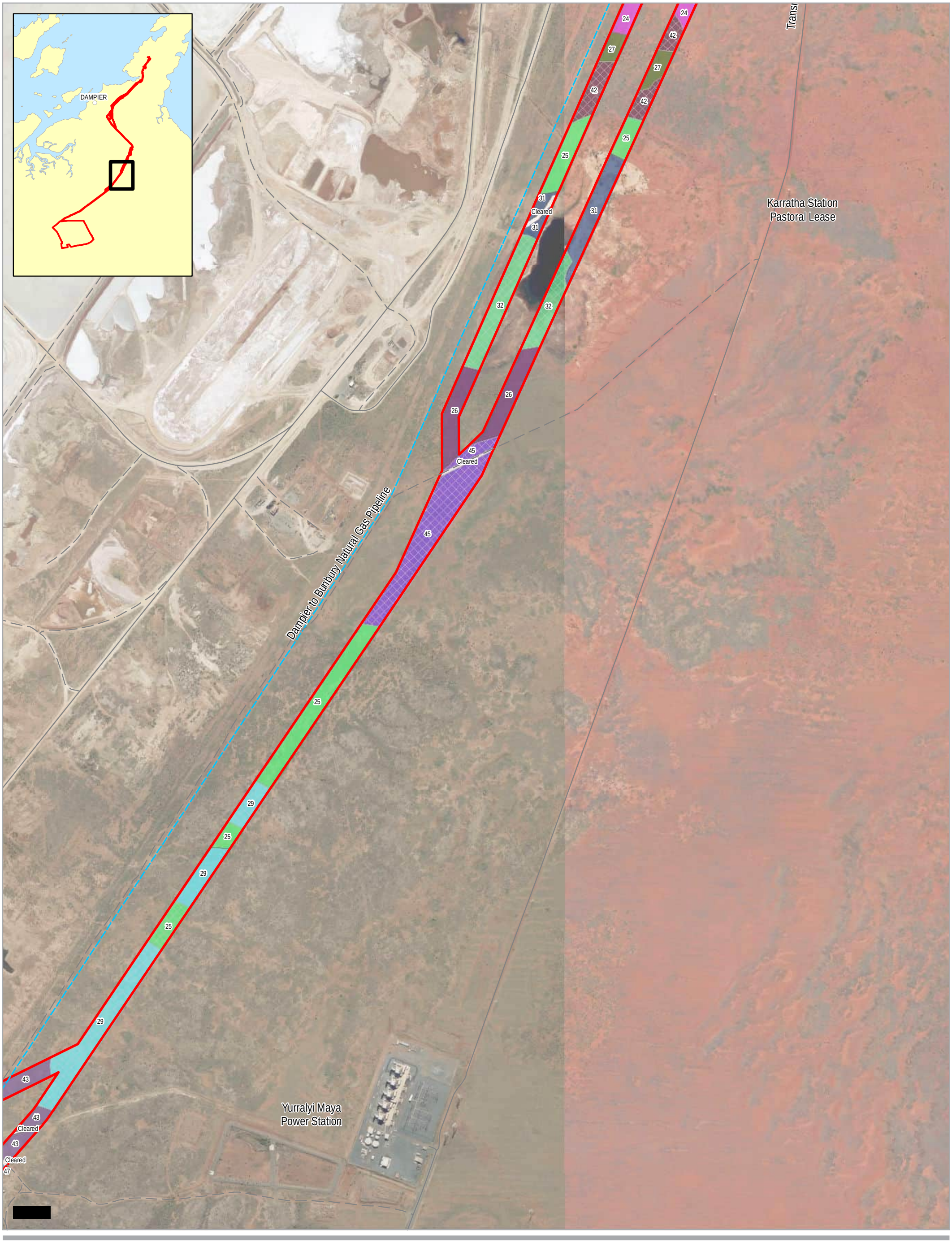

LEGEND

- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area

Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT24 - AbTeEx
- VT25 - AbTw
- VT26 - AbCc
- VT27 - AiTe
- VT29 - AiTw
- VT31 - TaTCc
- VT32 - T supp
- VT42 - Te
- VT43 - Tw
- VT45 - Ex spp
- VT47 - Cc
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppD_VegetationTypes_Rev0.mxd
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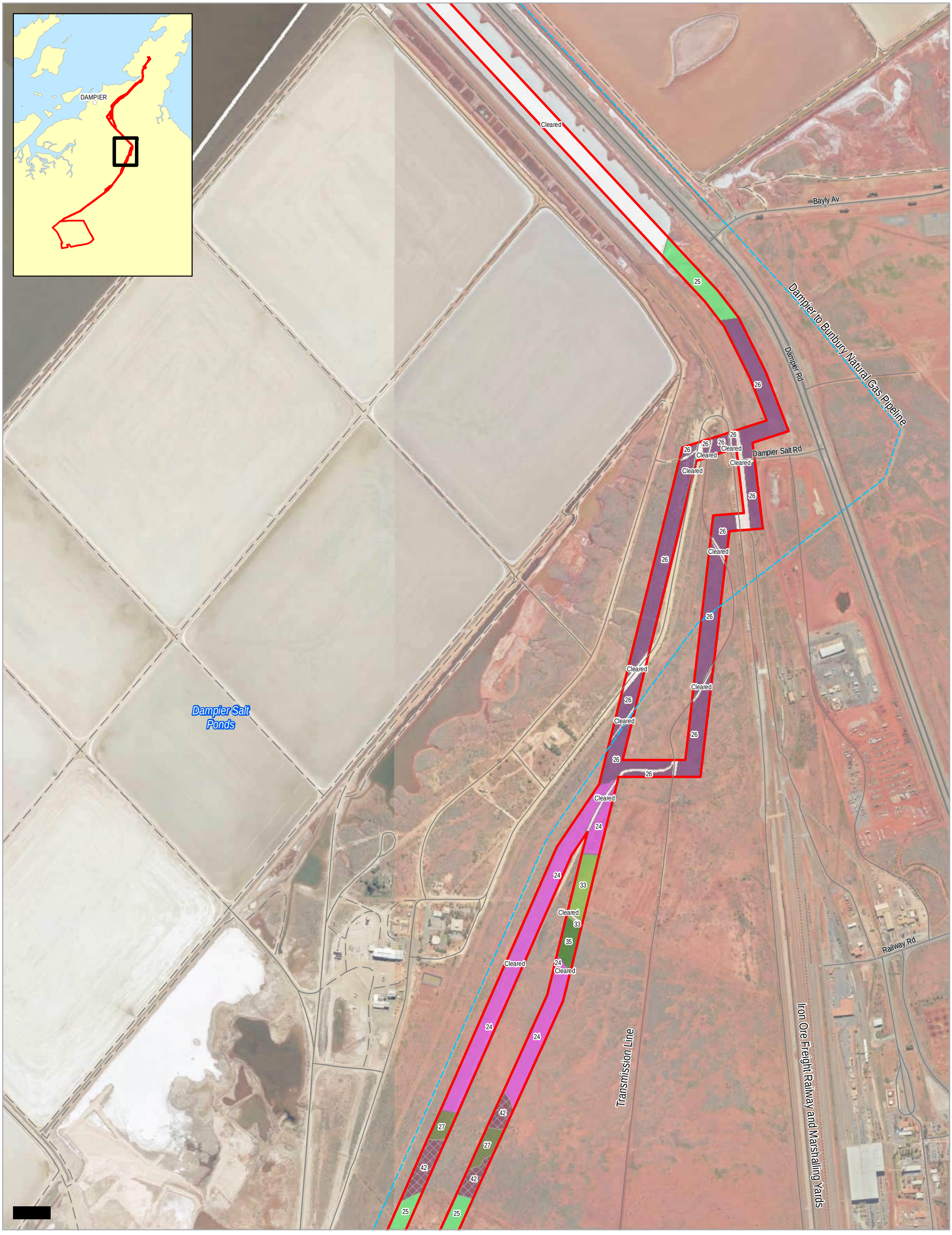

LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT24 - AbTeEx
- VT25 - AbTw
- VT26 - AbCc
- VT27 - AiTe
- VT33 - AcCc
- VT35 - AcAi
- VT42 - Te
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

Appendix D1

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppD_VegetationTypes_Rev0.mxd
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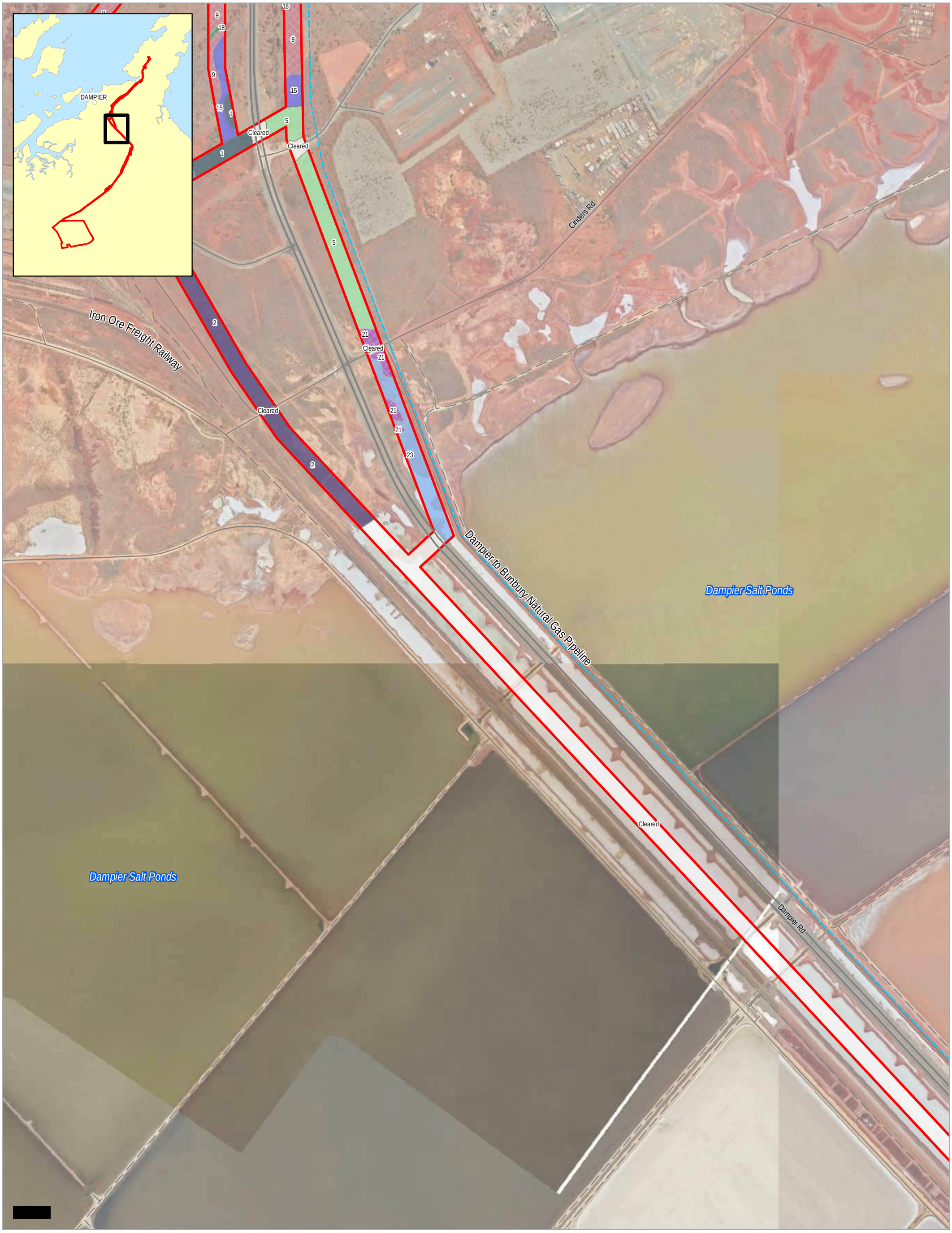

LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT01 - AbCc
- VT02 - AbTe
- VT05 - AbAsTe
- VT09 - GplcTe
- VT10 - GpAiTe
- VT12 - TcDsTe/Ta
- VT15 - ChAbTe
- VT18 - BaEsErv
- VT21 - Ta
- VT23 - Tspp
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppD_VegetationTypes_Rev0.mxd
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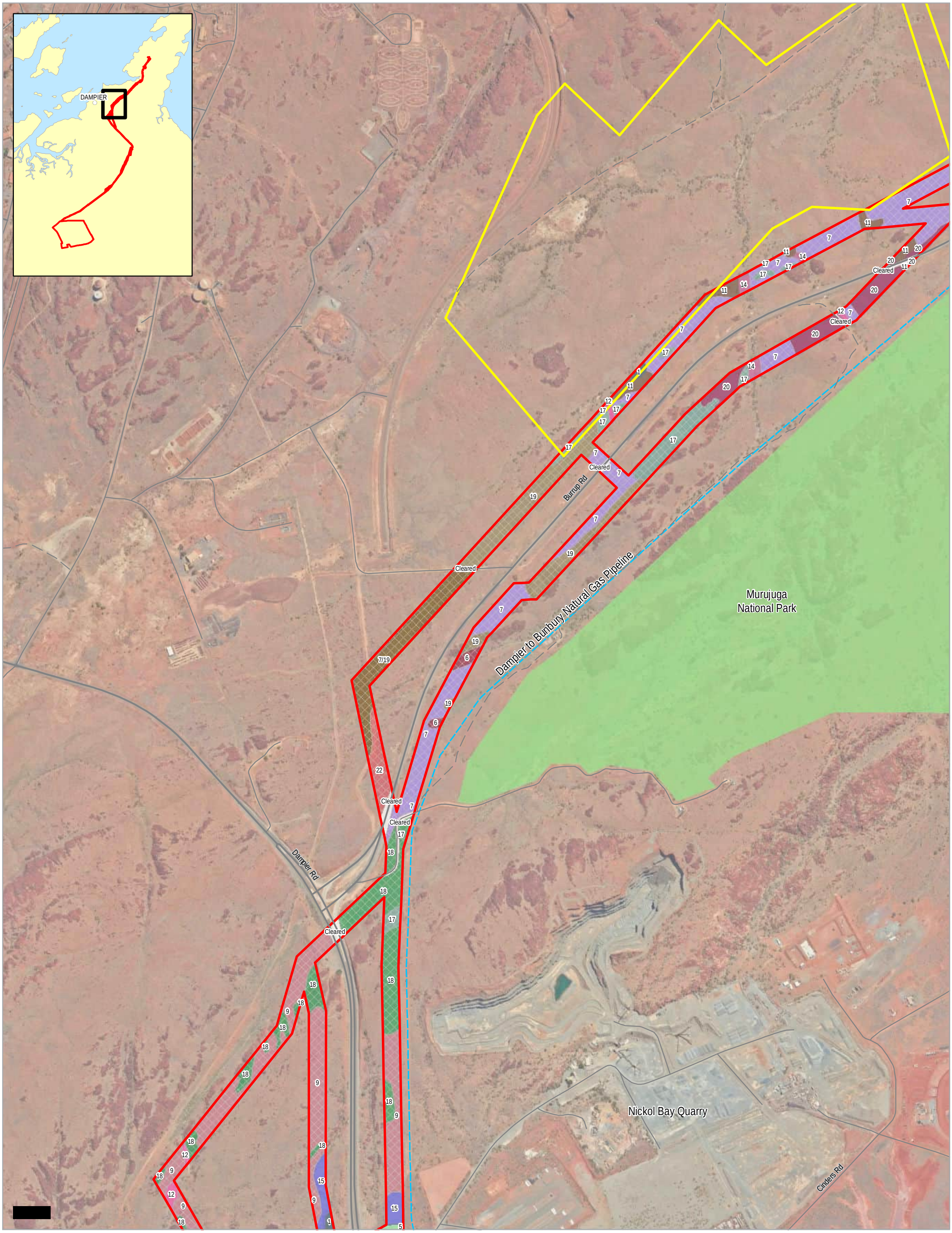

LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Burrup Strategic Industrial
- Murujuga National Park
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT01 - AbCc
- VT05 - AbAsTe
- VT06 - AiTe (BaTs)
- VT07 - GpTeBaTs
- VT07/19
- VT09 - GpIcTe
- VT11 - DsAiTe
- VT12 - TcDsTe/Ta
- VT14 - EvAbTa
- VT15 - ChAbTe
- VT17 - BaDs
- VT18 - BaEsErv
- VT19 - TsIcTe
- VT20 - Te
- VT22 - IcHiTe
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

Appendix D1

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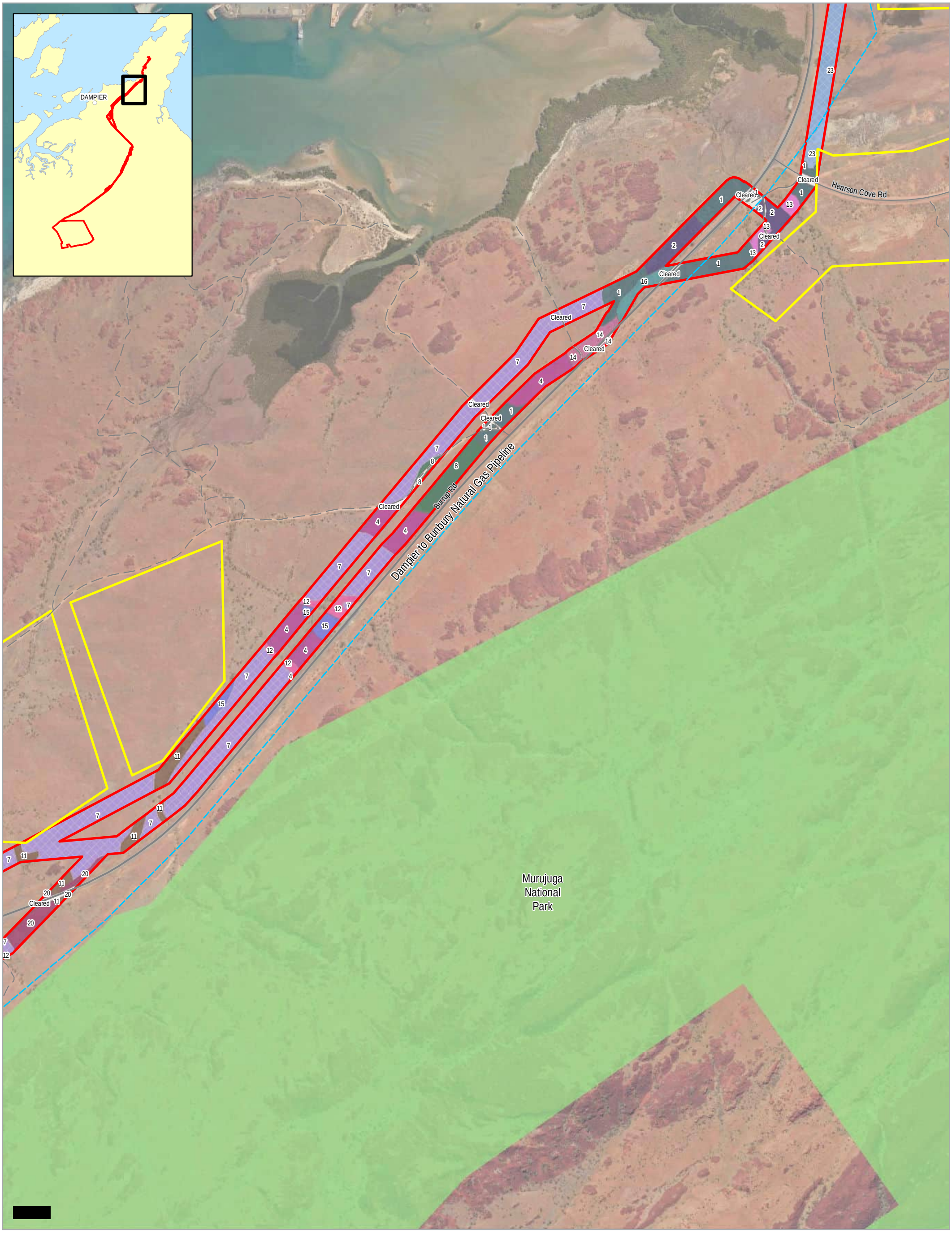

LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Burrup Strategic Industrial
- Murujuga National Park
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT01 - AbCc
- VT02 - AbTe
- VT04 - AbImTe
- VT07 - GpTeBaTs
- VT08 - GpCc
- VT11 - DsAiTe
- VT12 - TcDsTe/Ta
- VT13 - EvAcTa
- VT14 - EvAbTa
- VT15 - ChAbTe
- VT16 - ChImTe
- VT20 - Te
- VT23 - Tspp
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

Appendix D1

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppD_VegetationTypes_Rev0.mxd
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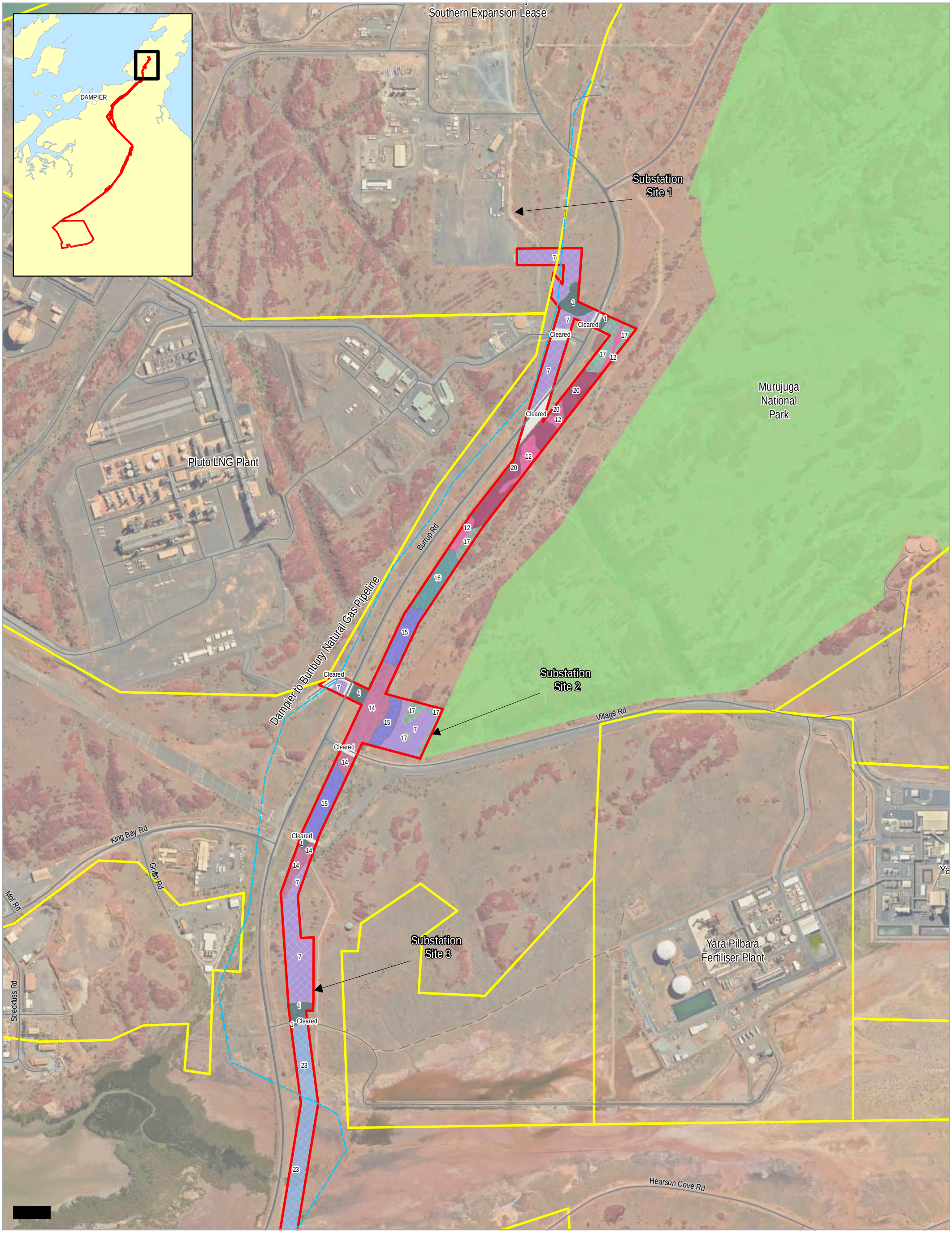

LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Burrup Strategic Industrial
- Murujuga National Park
- Survey Area
- Priority 1 PEC Burrup Peninsula rock pile communities

Vegetation Type

- VT01 - AbCc
- VT07 - GpTeBaTs
- VT12 - TcDsTe/Ta
- VT14 - EvAbTa
- VT15 - ChAbTe
- VT16 - ChlmTe
- VT17 - BaDs
- VT20 - Te
- VT23 - Tspp
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Types

Project No. 61-37808
Revision No. 0
Date 27 Nov 2019

Appendix D1

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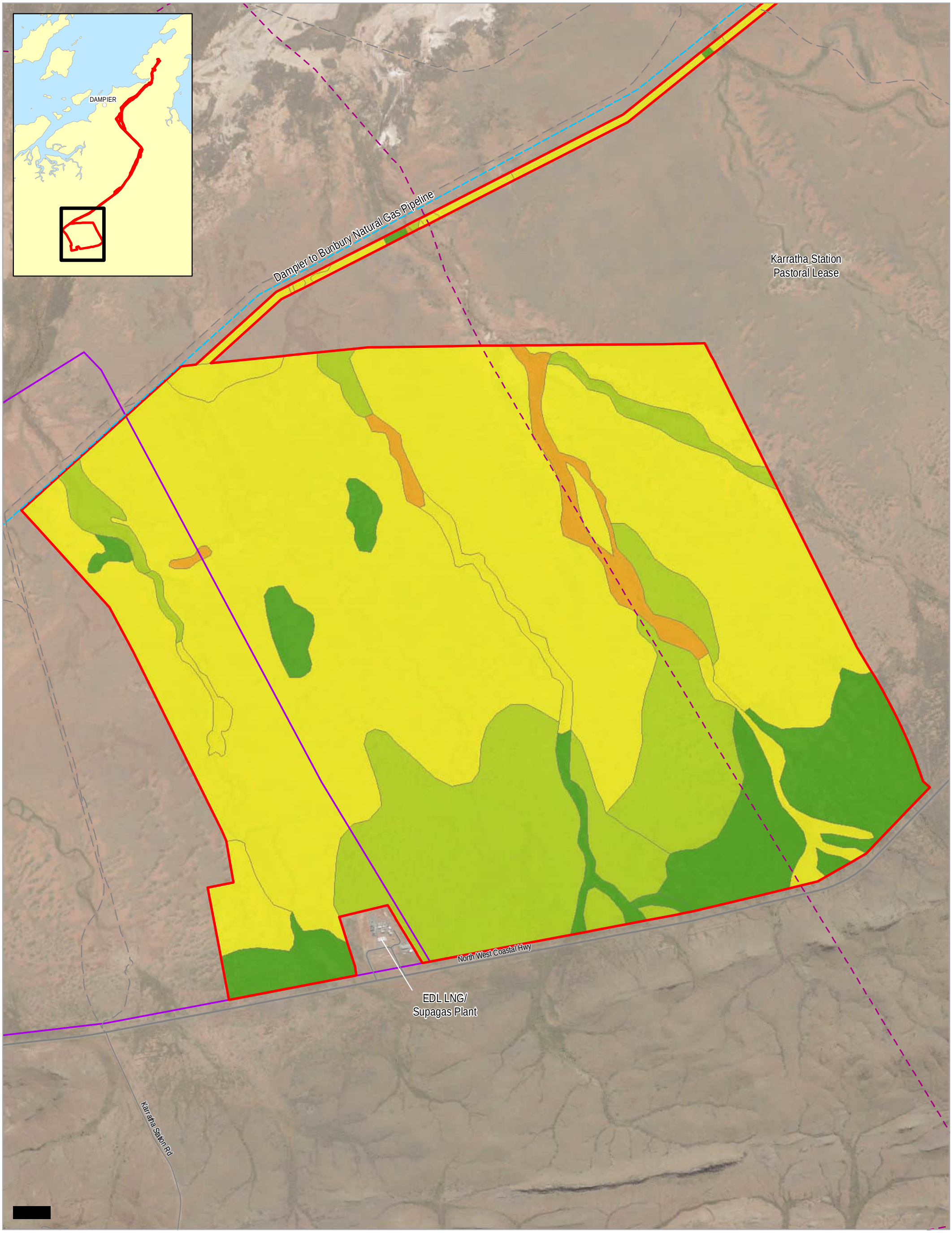
Data source: GHD: Development envelopes - 20181218; Woodside: Substation Sites - 20190909; Landgate: Roads - 20190128, Imagery - 20180408 (accessed: 20190703). Created by: afeeney

Appendix E: Vegetation Condition Mapping



LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Maitland Strategic Industrial Area
- MSIA Buffer
- Survey Area

Vegetation Condition

- Excellent
- Excellent to very good
- Very good
- Good
- Poor
- Degraded
- Cleared

Paper Size ISO A3

0 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

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Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

Appendix E

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppE_VegetationCondition_Page1_Rev0.mxd
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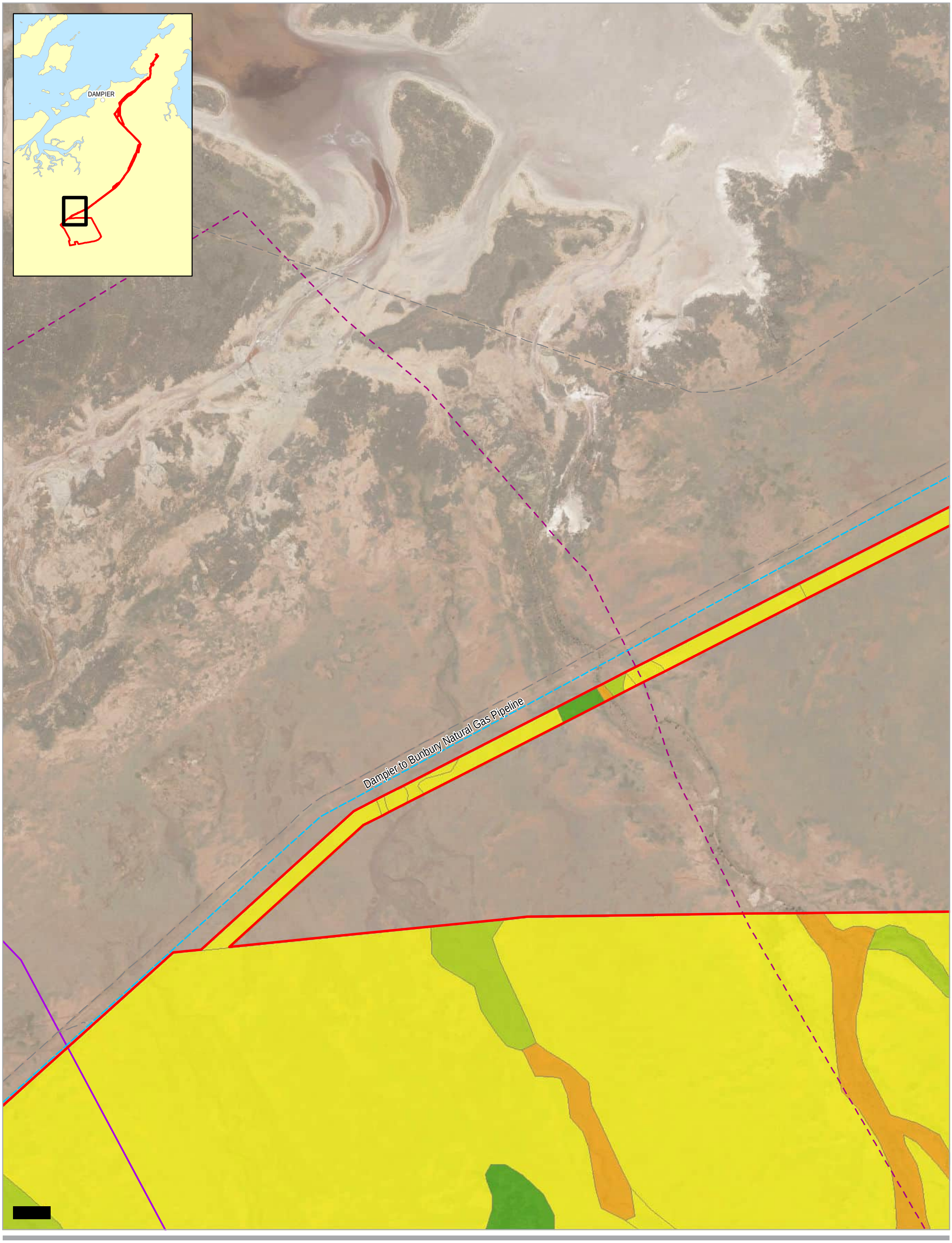

LEGEND

- Track
- Dampier to Bunbury Natural Gas Pipeline
- MSIA Buffer Area
- Maitland Strategic Industrial Area
- Survey Area

Vegetation Condition

- Excellent
- Excellent to very good
- Very good
- Good
- Poor
- Degraded
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

APPENDIX E

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppE_VegetationCondition_Rev0.mxd
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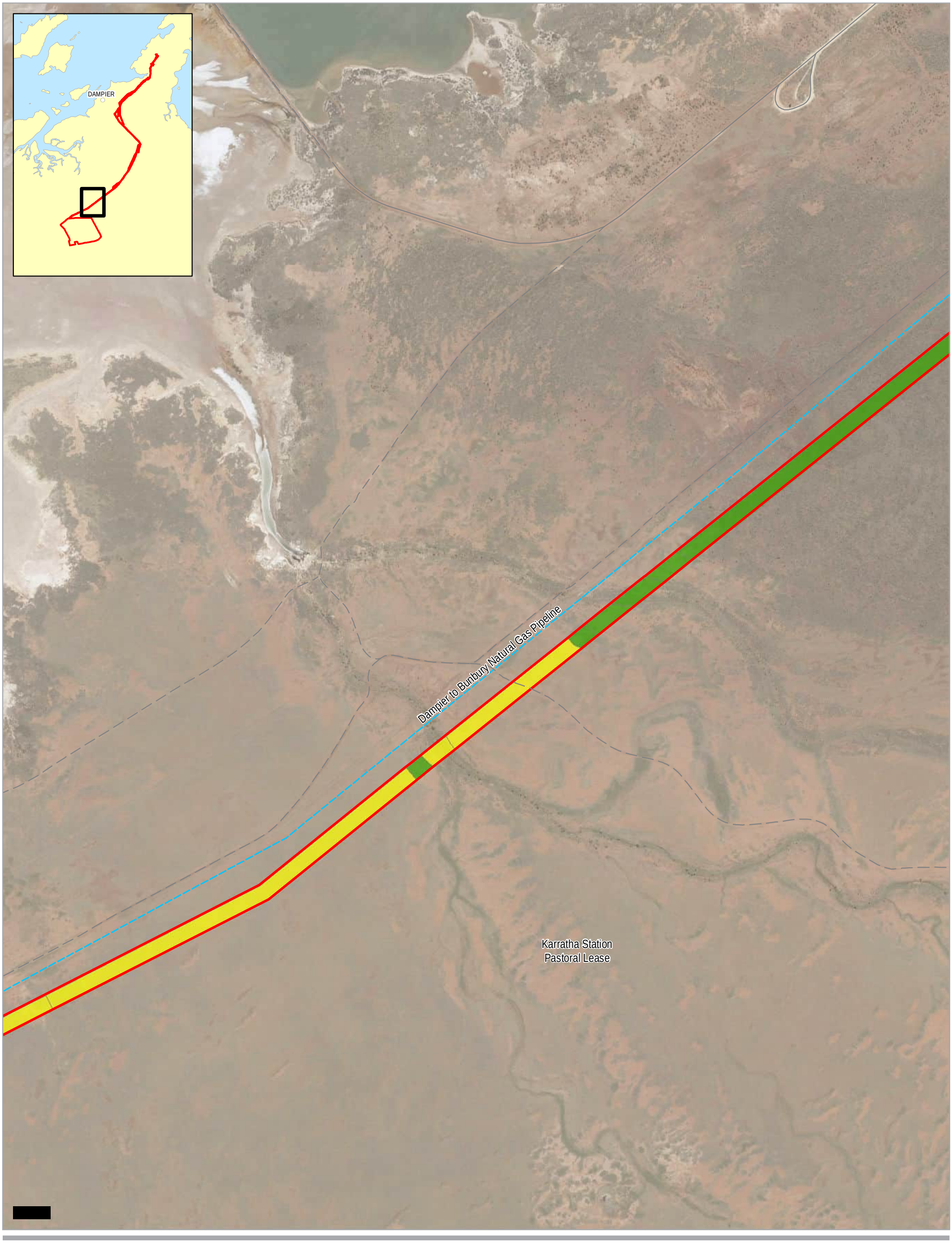

LEGEND

- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area

Vegetation Condition

- Excellent
- Excellent to very good
- Very good
- Good
- Poor
- Degraded
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

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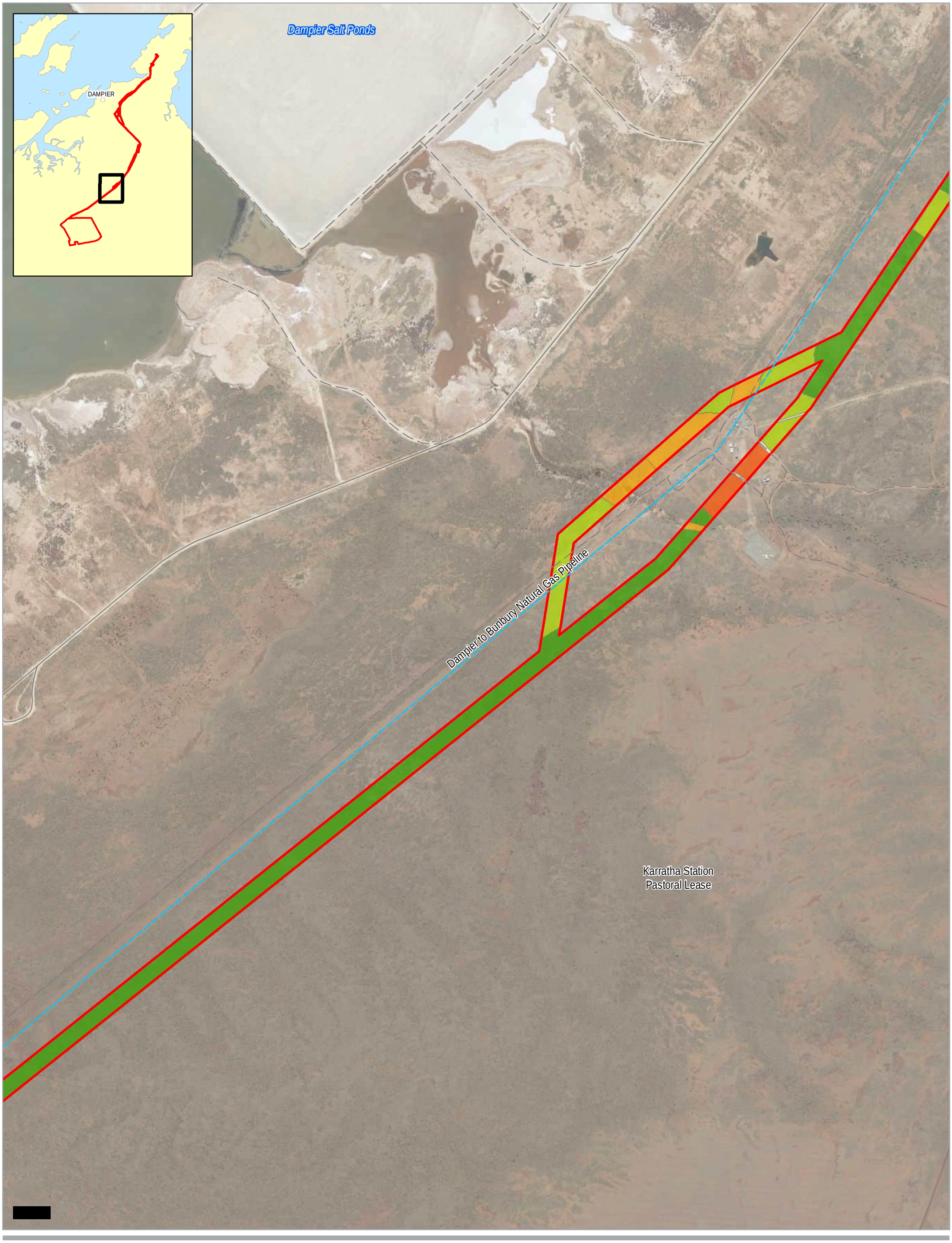

LEGEND

- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area

Vegetation Condition

- Excellent
- Excellent to very good
- Very good
- Good
- Poor
- Degraded
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

G:\61\3780805\GIS\Maps\Working\Report Figures\613780805_AppE_VegetationCondition_Rev0.mxd
Print date: 27 Nov 2019 - 12:10

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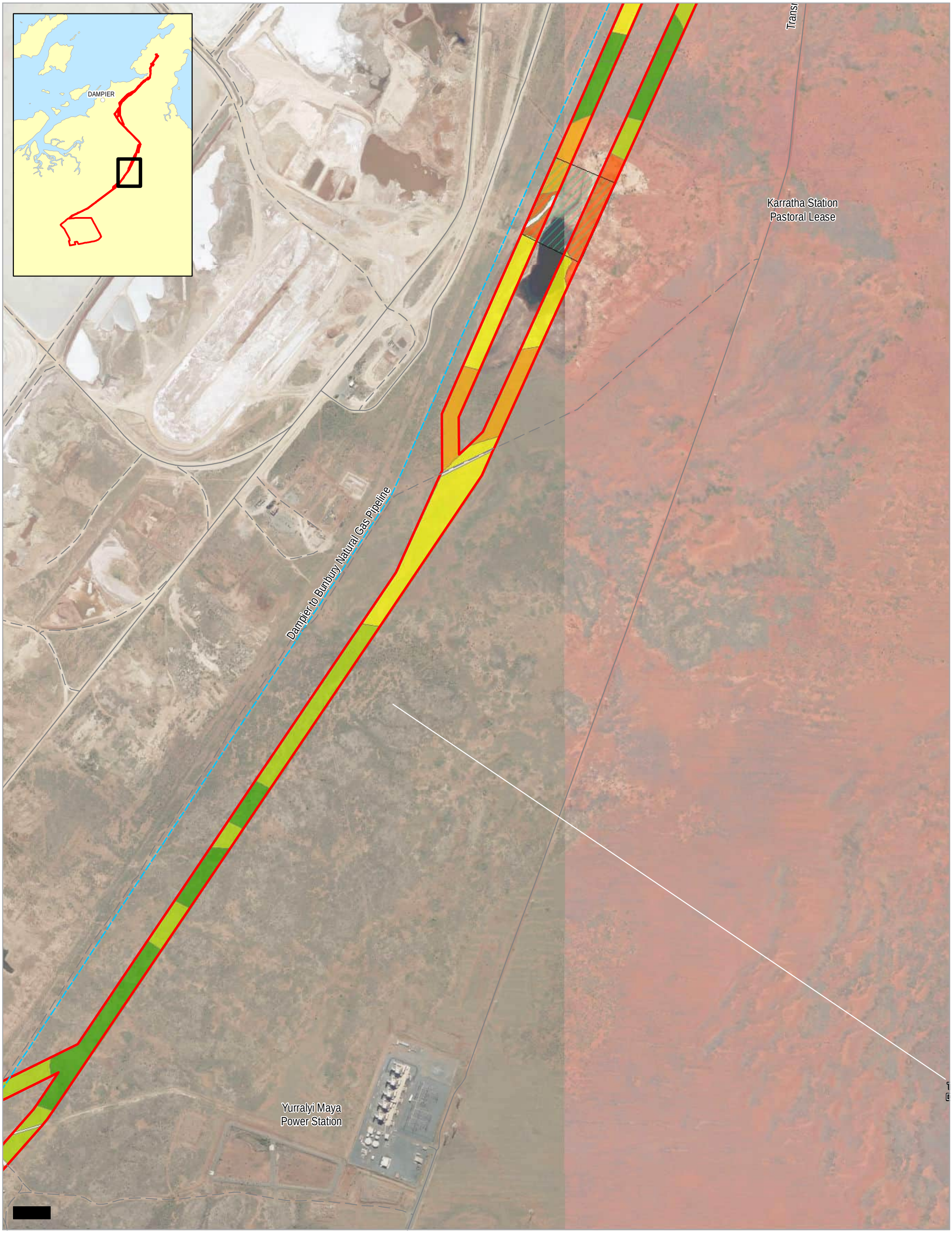

LEGEND

- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area
- *Tamarix aphylla* location
- Vegetation Condition
  - Excellent
  - Excellent to very good
  - Very good
  - Good
  - Poor
  - Degraded
  - Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

APPENDIX E

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Print date: 27 Nov 2019 - 12:10

Data source: GHD: Development envelopes - 20181218; Woodside: Substation Sites - 20190909; Landgate: Roads - 20190128, Imagery - 20180408 (accessed: 20190703). Created by: afeeney

LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Survey Area

Vegetation Condition

- Excellent
- Excellent to very good
- Very good
- Good
- Poor
- Degraded
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

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LEGEND

- Major Road
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- Degraded
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Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Project
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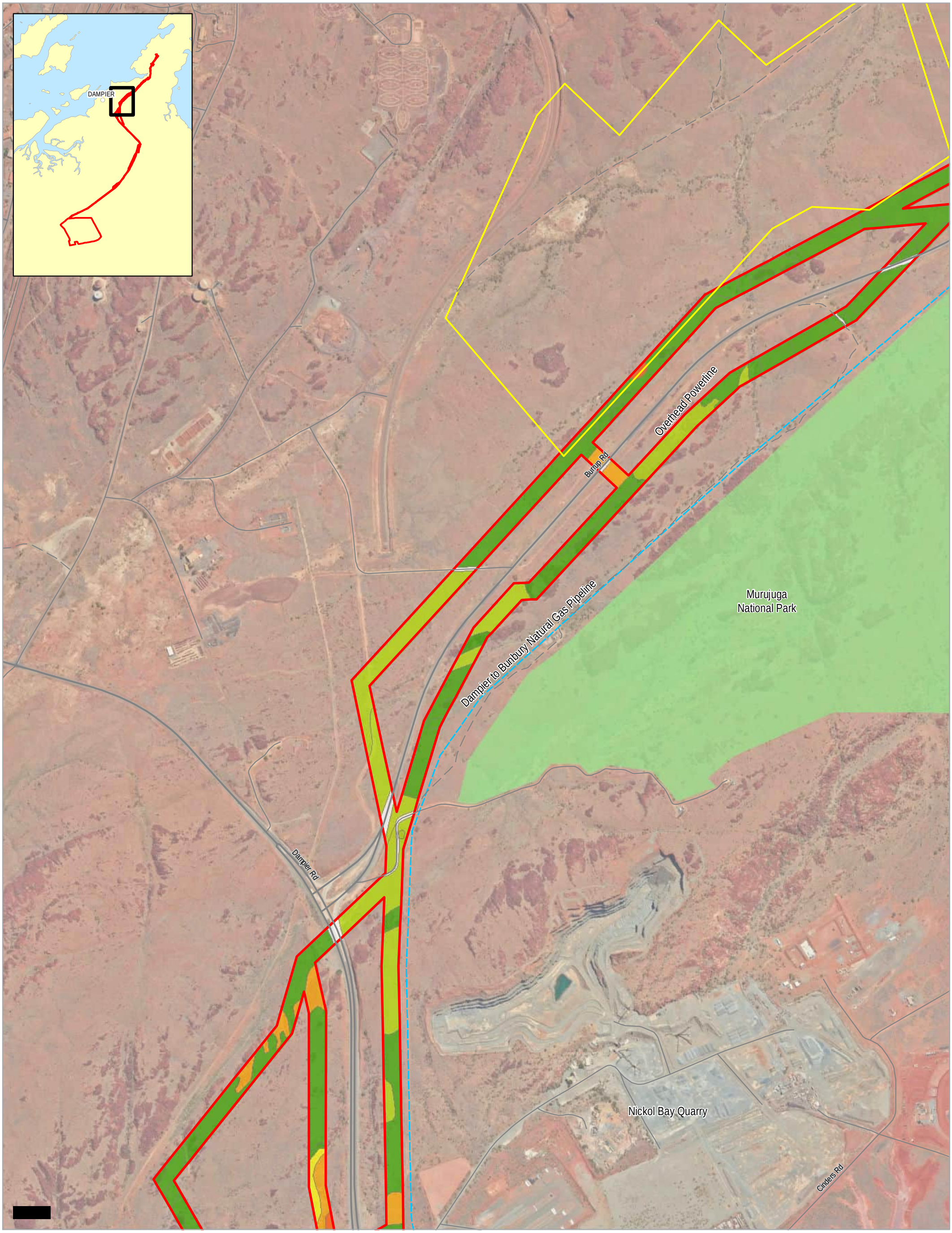

LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Burrup Strategic Industrial Area
- Survey Area
- Murujuga National Park

Vegetation Condition

- Excellent
- Excellent to very good
- Very good
- Good
- Poor
- Degraded
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

APPENDIX E

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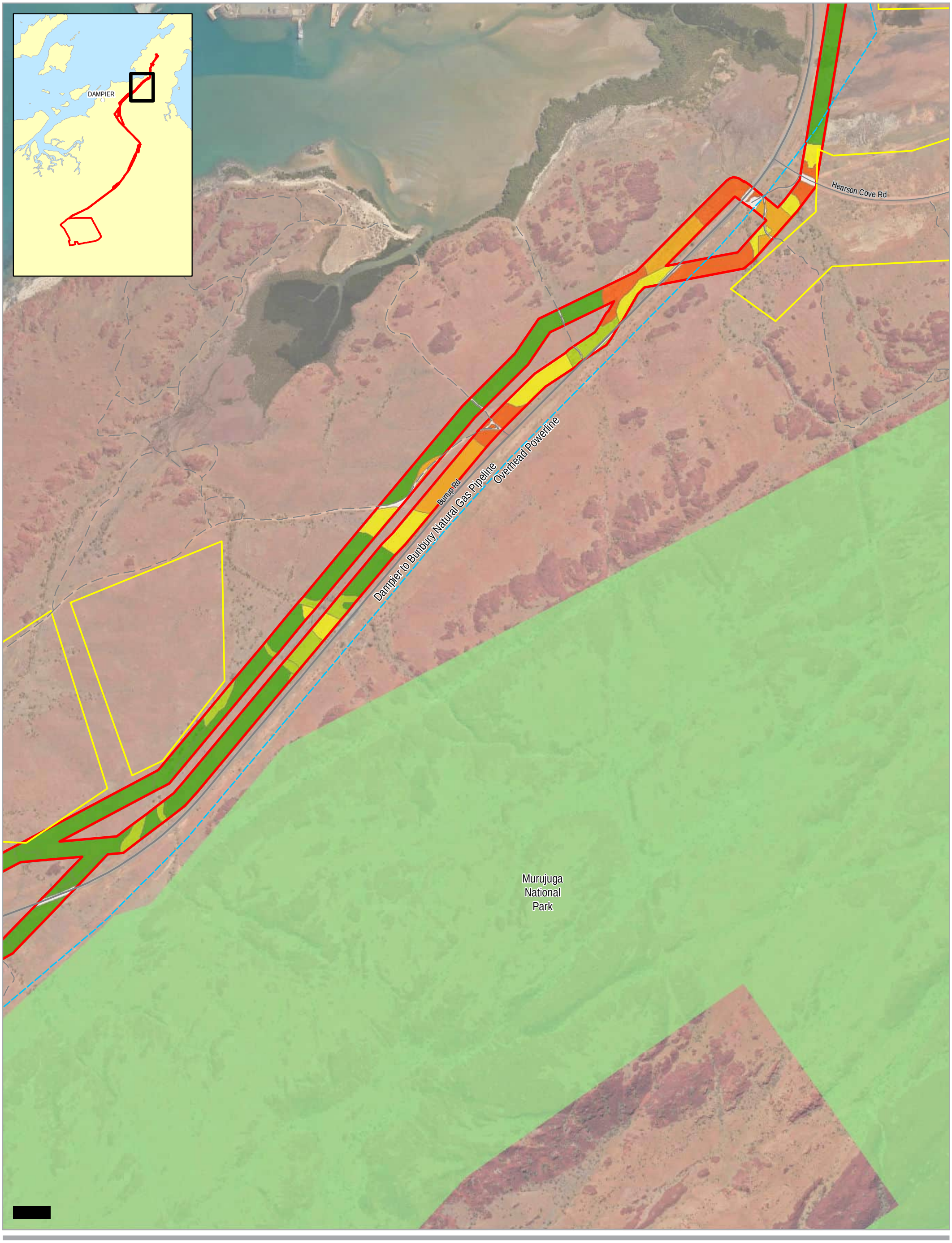
Print date: 27 Nov 2019 - 12:11

Data source: GHD: Development envelopes - 20181218; Woodside: Substation Sites - 20190909; Landgate: Roads - 20190128, Imagery - 20180408 (accessed: 20190703). Created by: afeeney



LEGEND

- Major Road
- Minor Road
- Track
- Dampier to Bunbury Natural Gas Pipeline
- Burrup Strategic Industrial Area
- Survey Area
- Murujuga National Park

Vegetation Condition

- Excellent
- Excellent to very good
- Very good
- Good
- Poor
- Degraded
- Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

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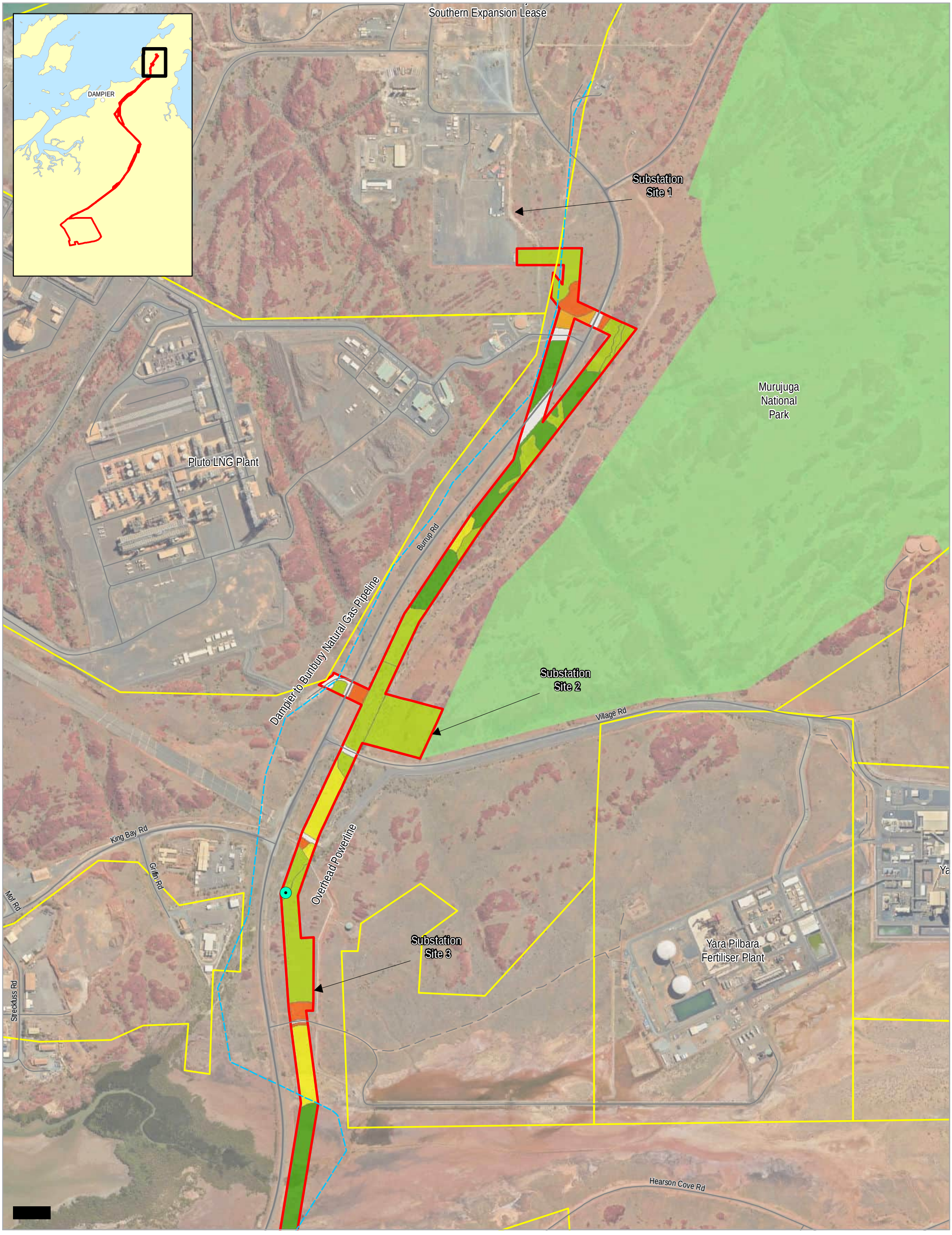
Print date: 27 Nov 2019 - 12:11

Data source: GHD: Development envelopes - 20181218; Woodside: Substation Sites - 20190909; Landgate: Roads - 20190128, Imagery - 20180408 (accessed: 20190703). Created by: afeeney



LEGEND

Passiflora foetida (stinking passionflow...
Major Road
Minor Road
Track
Dampier to Bunbury Natural Gas Pipeline
Burrup Strategic Industrial Area
Survey Area
Murujuga National Park
Vegetation Condition
Excellent
Excellent to very good
Very good
Good
Poor
Degraded
Cleared

Paper Size ISO A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Project
Flora and Vegetation Surveys

Vegetation Condition

Project No. 61-3780805
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Data source: GHD: Development envelopes - 20181218; Woodside: Substation Sites - 20190909; Landgate: Roads - 20190128, Imagery - 20180408 (accessed: 20190703). Created by: afeeney

Appendix F: Likelihood of Occurrence Table for Conservation Significant Flora Species

Table F.1: Likelihood of occurrence of Threatened and Priority flora recorded within 20 km of the survey area (Department of Biodiversity, Conservation, and Attractions 2019b). The Threatened and Priority Flora List database is searched using place names and as a result some of the records obtained from this database may occur beyond 20 km of the survey area.

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post survey
Priority 1					
Goodenia pallida	Erect herb to 50 cm. Corolla pale purple (very little information available)	Annual	Red soils	Unlikely	Unlikely
Priority 2					
Euphorbia australis var. glabra	Herb	Annual	Creek banks. Red brown loam, some pebbles.	Unlikely	Unlikely
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	Prostrate and open herb: 0.02 m high and 0.20 m wide. Pink flower.	Annual	Flood plain. Rangeland. Brown dry rocky soil.	Potential	Potential subject to further survey
Priority 3					
Acacia glaucocaesia	Glabrous pale grey-green shrub or tree 1.5-3 m, globular yellow flowers July to Sept.	Perennial	Floodplains, red, sandy loams.	Unlikely	Unlikely

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post survey
Atriplex lindleyi subsp. conduplicata	Open straggly rotund shrub, growing up to 0.2 m tall.	Biennial	Sparse tussock grassland of *Eragrostis xerophila*.	Potential	Potential subject to further survey
Eragrostis surreyana	Grass 1-2 cm high.	Annual	Wetland, waterhole	Unlikely	Unlikely
Gomphrena cucullata	Herb, compact 5-10 cm x 5-10 c m, wiry red stems slightly hairy. Revolute linear leaves, acute 10-47 mm long x 1mm wide. Flowers white- pink. Flower head cylindrical 20 mm x 7 mm, axillary bracts in-curved almost uncinated slightly woolly. Flower June/July after summer rains	Annual.	Various: Red sands with quartz rock; flood plain with red-brown loam; flats with light clay and chenopods.	Potential	Potential subject to further survey

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post survey
Gomphrena leptophylla	Prostrate, compact herb 20 cm high x 60 cm wide. Stem leaves acute, mucronate, rebolute 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	Annual	Various: sand, sandy to clay-loam, granite, quartzite, open flats, sandy creek beds edges of salt pans, stony hill slopes.	Likely	Potential subject to further survey
Gymnanthera cunninghamii	Slender erect shrub 1-2 m high. Stems bronze. Leaves glabrous, glossy, bright green above, dull beneath, opposite and pendulous on petioles 2-2.5cm. Milky sap. Small white cream-yellow-green flowers.	Perennial	Various: Creek line with red sands, ironstone scree slope, rockpiles, base of rockpiles; sand plain; saline bulldust with algal crust over calcrete; limestone with solution pockets	Likely	Potential subject to further survey
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Spreading annual, herb, 0.05-0.1 m high. Fl. blue, Mar.	Annual	Cracking clay, basalt. Gently undulating plain with large surface rocks, flat crabholed plain.	Likely	Likely

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post survey
Stackhousia clementii	Dense broom-like perennial, herb, to 0.45 m high. Fl. green/yellow/brown.	Perennial	Skeletal soils. Sandstone hills.	Potential	Potential subject to further survey
Terminalia supranitifolia	Spreading, tangled shrub or tree, 1.5-3 m high. Fl. green-yellow, May or Jul or Dec.	Perennial	Sand. Among basalt rocks.	Likely	Recorded
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Tussocky perennial, grass-like or herb, 0.9-1.8 m high. Fl. Aug.	Perennial	Red clay. Clay pan, grass plain.	Unlikely	Unlikely
Vigna triodiophila	Herb. Slender vine with thickened root. Flowers yellow.	Probably perennial but dying back to rootstock in dry.	Rockpile, rocky hillslopes.	Likely	Recorded

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post survey
Priority 4					
Rhynchosia bungarensis	Compact, prostrate shrub, to 0.5 m high. Fl. yellow.	Perennial	Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	Likely	Recorded

Appendix G: Comparison of VLA Vegetation Types with Trudgen Vegetation Associations

Table G.1: Comparison of Trudgen Vegetation Descriptions (2002) with VLA Vegetation Descriptions of Vegetation Communities within the Woodside Project Area.

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
Acacia bivenosa tall shrubland over tussock and/or hummock grassland.				
AbCc	*Acacia bivenosa* tall open to shrubland over **Cenchrus ciliaris* tussock grassland, sometimes closed tussock grassland, with patchy *Triodia angusta*	AbCc	*Acacia bivenosa* high open shrubland to high shrubland over **Cenchrus ciliaris* grassland. Associated species include *Triodia epactia* (Burrup form), *Tephrosia aff. supina* (MET 12,357) and occasional *Acacia stellaticeps*.	*Tephrosia supina* was present but due to the dry conditions certainly not a key component of the vegetation. (<2%)
AbTe	*Acacia bivenosa* with occasional *Dichrostachys spicata, Acacia ancistrocarpa* open tall shrubland over mixed *Triodia epactia/T. angusta* hummock and **Cenchrus ciliaris* tussock grassland	AbTe	*Acacia bivenosa* scattered tall shrubs to high shrubland over *Triodia epactia* (Burrup form) hummock grassland. Associated species included *Grevillea pyramidalis* subsp. *pyramidalis* at one site and *Pterocaulon sphacelatum*, *Adriana tomentosa* at another site.	
AbTa	*Acacia bivenosa, Grevillea pyramidalis, Hakea lorea* subsp *lorea* tall shrubland over closed *Triodia angusta* hummock grassland	AbTa	*Acacia bivenosa* high open shrubs over *Triodia angusta* (Burrup form) hummock grassland. Associated species includes *Trianthema turgidifolia*. *Indigofera monophylla* (Burrup form) or *Trichodesma zeylanicum* var. *zeylanicum* may also be present.	
AbImTe	*Acacia bivenosa, Acacia pyrifolia* subsp *morrisonii , Grevillea pyramidalis* open shrubland over *Indigofera monophyla, Corchorus walcottii* open low shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* tussock grassland.	AbImTe	*Acacia bivenosa* tall open shrubs to high shrubland over *Indigofera monophyla* (Burrup form) scattered low shrubs to low open shrubland over *Triodia epactia* (Burrup form) hummock grassland to closed hummock grassland	
		AbCgTe	*Acacia bivenosa, Cassia glutinosa* open shrubland to shrubland over *Triodia epactia* (Burrup form) hummock grassland (can be some **Cenchrus ciliaris*).	

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
		AbImTe/TeRm	*Acacia bivenosa* high open shrubland to high shrubland over *Indigofera monophyla* (Burrup form) scattered low shrubs to low open shrubland over *Triodia epactia* (Burrup form) hummock grassland to closed hummock grassland with *Rhynchosia* cf. *minima* lianes.	= AbImTe as above – the *Rynchosia minima* was not abundant due to dry conditions and not a key component of the vegetation
Acacia bivenosa tall shrubland over *Acacia stellaticeps* shrubland over *Diplopeltis eriocarpa* low shrubland over *Triodia angusta, T. epactia* hummock grassland.				
AbAsTe	*Acacia bivenosa* with *Dolichandrone heterophylla* tall shrubland over *Acacia stellaticeps* open to shrubland over *Diplopeltis eriocarpa* low shrubland over *Triodia angusta* or *T. epactia* hummock grassland to closed hummock grassland with patchy *Eriachne obtusa*			This area (north of Causeway) was not surveyed by Trudgen
Acacia inaequilatera (with various other species scattered shrubs to high shrublands				
		AiImTw	*Acacia inaequilatera (Acacia colei)* scattered tall srhubs to tall open shrubland over *Indigofera monophyla* (Burrup form) low open shrubland to low shrubland over *Triodia wiseana* (Burrup form), *Triodia epactia* (Burrup form) hummock grassland.	
		AiImTe	*Acacia inaequilatera, Acacia bivenosa, Grevillea pyramidalis* subsp *pyramidalis* scattered tall shrubs to high open shrubland over *Indigofera monophyla* (Burrup form), scattered low shrubs to low shrubland over *Triodia epactia* (Burrup form) hummock grassland.	

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
AiTe(BaTs)	*Acacia inaequilatera* tall shrubland with *Grevillea pyramidalis, Ipomea costata, Acacia orthocarpa* over *Triodia epactia* hummock grassland with patchy *Themeda triandra* and with low trees of *Brachychiton acuminatus, Terminalia supranitifolia* on small outcropping rocks.	AiFdTe	*Acacia inaequilatera, Hakea chordophylla, Grevillea pyramidalis* subsp *pyramidalis* scattered shrubs to open shrubland over *Corchorus walcottii* scattered low shrubs over *Triodia epactia* (Burrup form) dense hummock grassland over *Fimristylis* aff *dichotoma* (M75-4) low open sedgeland	*Fimbristylis dichotoma* is a very short lived annual and not an abundant component of this vegetation in 2019
Grevillea pyramidalis tall shrubland over *Triodia epactia / T. angusta* hummock grassland.				
GpTeBa	*Grevilla pryamidalis* scattered to open tall shrubland, sometimes with scattered *Hakea lorea* subsp *lorea, Ipomoea costata, Acacia inaequilatera* over *Triodia epactia* hummock grassland, sometimes patchy *T. angusta.* There can be open low *Indigofera monophyla* shrubland. On numerous small rockpiles within this vegetation are scattered *Brachychiton acuminatus, Terminalia supranitifolia, Dichrostachys spicata* on small rock outcrops.			This was the most commonly occurring vegetation type along the Burrup corridor.
GpCc	*Grevilla pryamidalis* scattered to open tall shrubland over **Cenchrus ciliaris* tussock with *Triodia epactia* hummock grassland	GpTe	*Grevillea pyramidalis* subsp. *pyramidalis* scattered shrubs over *Triodia epactia* (Burrup form) hummock grassland to closed hummock grassland. Associated species includes **Cenchrus ciliaris*, *Evolvulus alsinoides* var. *villosicalyx*, *Triumfetta appendiculata* (Burrup form) and *Triumfetta clementii*.	Associated with infrastructure – illustrates increase in buffel grass to dominant component in the vegetation.

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
GpIcTe	*Grevillea pyramidalis, Ipomoea costata* tall open shrubland over *Triodia epactia* hummock grassland. On numerous small rockpiles within this vegetation are scattered *Terminalia circumalata, Brachychiton acuminatus, Erythrina vespertilio.*			
		GpRmTsTe	*Grevillea pyramidalis* subsp *pyramidalis* scattered shrubs over *Triumfetta appendiculata* (Burrup form) low open shrubland over *Triodia epactia* (Burrup form) hummock grassland with *Rhynchosia* cf *minima* lianes with *Tephrosia* af *supina* (MET12, 357) herbland.	*Rhynchosia minima* and *Tephrosia supina* were not key components of the vegetation.
Grevillea pyramidalis, Acacia inaequilatera tall shrubland over mixed low shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* sometimes *Themeda triandra.*				
GpAiTe	*Grevillea pyramidalis, Acacia inaequilatera* tall shrubland sometimes with *Ehretia saligna, Acacia orthocarpa* over open mixed low shrubland, *Scaevola spinescens, Solanum phlomoides, Indigofera monophyla* over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris*			RioTinto lease – not surveyed by Trudgen

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
Dichrostachys spicata, Acacia inaequilatera, tall shrubland over open low mixed shrubland over *Triodia epactia / T. angusta* hummock grassland.				
DsAiTe	*Dichrostachys spicata, Acacia inaequilatera, Acacia coriacea* tall shrubland over *Scaevola spinescens, Alectryon oleifolius* open low mixed shrubland over *Triodia epactia / T. angusta* hummock grassland. There can be scattered *Eucalyptus victrix* and *Terminalia circumalata.*	AiDs	*Acacia inaequilatera*, *Dichrostachys spicata* open heath to high shrubland over *Triodia epactia* (Burrup from) hummock grassland and *Tephrosia* aff. *supina* (MET 12,357) scattered herbs to herbland. The unit varies to include *Ipomoea costata* in the shrubland layer or **Cenchrus ciliaris* grassland. Associated species included *Acacia coriacea* subsp. *coriacea*, *Scaevola spinescens* (narrow form) and *Tephrosia* aff. *supina* (MET 12,357).	Similar.
Ipomoea costata scattered shrubs to shrublands.				
IcHlTe	*Ipomoea costata* open shrubland with *Hakea lorea* subsp *lorea* over *Triodia epactia* hummock grassland. Patchy **Cenchrus ciliaris* along tracks. Scattered *Brachychiton acuminatus, Terminalia supranitifolia.*	IcTsTh	*Ipomoea costata* scattered shrubs to open shrubland over *Triumfetta clementii* scattered shrubs to low open shrubland over *Themeda sp* Burrup (B84), *Triodia epactia* (Burrup form) tussock / hummock grassland with *Tephrosia* aff *supina* (MET12,357) very open annual herbland.	*Tephrosia supina* and *Triumfetta appendiculata* were dominant components of the vegetation, probably due to dry conditions. Similarly with the grass *Themeda triandra.* Trudgen mapped this vegetation type along much of the alignment which VLA mapped as GpTeBa where the grevillea was dominant. Much of the alignment has previously been burnt (5-10 yrs) and *Ipomoea costata* responds well to fire whereas *Grevillea pyramidalis* does not.

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
Terminalia circumalata low open woodland over *Dichrostachys spicata* open shrubland over *Triodia epactia / T. angusta* open hummock grassland				
TcDsTe/ Ta	*Terminalia circumalata* low woodland with occasional *Eucalyptus victrix, Brachychiton acuminatus,* over *Dichrostachys spicata, Acacia coriacea, Ipomoea costata, Flueggea virosa* mixed open shrubland over *Triodia epactia / T. angusta* open hummock grassland and *Cyperus vaginatus* open sedgeland.	TcDsTa	*Terminalia canescens* low open woodland to low closed forest over (*Dichrostachys spicata*, *Flueggea virosa* subsp. *melanthesoides*) high open shrubland to shrubland over *Dicliptera armata* annual herbland Associated species recorded included *Triodia angusta* (Burrup form), *Cyperus bifax*, *Cyperus vaginatus*, *Triodia epactia* (Burrup form), *Acacia colei* and *Stemodia grossa*.	*Terminalia canescens* (recorded by Trudgen) is now *Terminalia circumalata.*
Eucalyptus victrix low woodland over mixed shrubland over *Triodia angusta / T. epactia* hummock grassland.				
EvAcTa	*Eucalyptus victrix* open low woodland over *Acacia coriacea, Dichrostachys spicata* open shrubland over *Triodia angusta* hummock and **Cenchrus ciliaris* tussock grassland sometimes patchy.	EvAcTa	*Eucalyptus victrix* low open forest over *Acacia coriacea* subsp. *coriacea* high open shrubland over *Dichrostachys spicata* open shrubland over *Indigofera monophylla* (Burrup form) low open shrubland over *Triodia angusta* (Burrup form), *Cyperus vaginatus* closed hummock grassland/very open sedgeland with *Rhynchosia* cf. *minima*, *Commelina ensifolia* herbland	*Rhynchosia minima* and *Commelina ensifolia* are annual herbs and not likely to be present in abundance in the dry. The latter species is rarely present. The low shrub *Indigofera monophylla* was in abundance in the 2000 Trudgen survey because of several years of good rainfall prior to survey – not a major component of the vegetation in 2019l
		EvTaCv (map) = ?EvTaCa	*Eucalyptus victrix* scattered low trees over scattered shrubs of *Acacia colei, Acacia bivenosa, Acacia coriacea* subsp *coriacea* over *Triodia angusta* (Burrup form) *Cymbopogon ambiguous* hummock/tussock grassland and *Rhynchosia* sp Burrup (82-1C) herbland.	

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
EvAbTa	*Eucalyptus victrix* open to scattered low woodland with scattered *Corymbia hamersleyana* over *Acacia bivenosa* tall open shrubland over *Adriana tomentosa / Indigofera monophyla* open low shrubland over *Triodia angusta / T. epactia* open to 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. Associated species included *Corymbia hamersleyana*, *Acacia coriacea* subsp. *coriacea*, *Corchorus walcottii* and *Triodia epactia* (Burrup form).	
		EvDsTa (map) = ?EvDsTe	*Eucalyptus victrix* low open woodland to scattered low trees over *Dichrostachys spicata* high open shrubland over *Triodia epactia* (Burrup form) hummock grassland.	Trudgen mapping (EvDsTa) is not listed in the map legend – potentially EvDsTe?
		EvAa	*Eucalyptus victrix* low woodland over *Acacia ampliceps* open heath over *Cyperus vaginatus, Eriachne tenuiculmis, Triodia angusta* (Burrup form) sedgeland and tussock/hummock grassland.	
		EvTaTh	*Eucalyptus victrix* low woodland to low open forest over *Acacia coriacea* subsp *coriacea* scattered shrubs over *Dichrostachys spicata, Stylobasium spathulatum* scattered shrubs to open heath over *Triodia angusta* (Burrup form), *Themeda* sp Burrup (B84) hummock tussock grassland with *Dicliptera armata* open herbland.	Similar to EvAcTe – the *Themeda triandra* grassland was not dominant in 2019 in this or other areas.

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
Corymbia hamersleyana open to low woodland over mixed shrubland over *Triodia epactia / T. angusta* hummock grassland				
ChAbTe	*Corymbia hamersleyana* open to low woodland over *Acacia bivenosa / Acacia coriacea/ DIchrostachys spicata* tall shrubland, sometimes *Adriana tomentosa/ Stemodia grossa* low shrubland over open *Triodia epactia / T. angusta* hummock and sometimes **Cenchrus ciliaris* tussock 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. Associated species included *Triodia angusta* (Burrup form), *Alectryon oleifolius* and *Cymbopogon ambiguus*.	Due to the dry, *Stemodia grossa* shrubland was variable in its occurrence and not as abundant as in the 2000 Trudgen survey.
ChImTe	*Corymbia hamersleyana* open to low woodland over *Indigofera monophylla* open low shrubland over *Triodia epactia* hummock grassland.	ChImTe	*Corymbia hamersleyana* scattered low trees to low open woodland over (*Acacia bivenosa*, *Acacia coriacea* subsp. *coriacea*) scattered tall shrubs over (*Dichrostachys spicata*) M.E. Trudgen and Associates 103 scattered shrubs over *Indigofera monophylla* (Burrup form) low open shrubs to low shrubland over *Triodia epactia* (Burrup form) hummock grassland. Associated species included *Acacia bivenosa*, *Acacia coriacea* subsp. *coriacea*, *Terminalia supranitifolia* and *Rhagodia eremaea* and *Triodia angusta* (Burrup form).	
		ChDs	*Corymbia hamersleyana* scattered low trees to low woodland over *Dichrostachys spicata* open shrubland to open heath over *Triodia epactia* (Burrup form), *Triodia wiseana* (Burrup form), *Triodia angusta* (Burrup form) hummock grassland.	Combined with ChAbTe above

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
		ChThSg	*Corymbia hamersleyana* low open woodland to scattered low trees over *Themeda sp* Burrup (B84), *Triodia epactia* (Burrup form) tussock hummock grassland with *Stemodia grossa* lowe very open herbland.	*Themeda triandra* was not a dominant component of the vegetation in the 2019 dry survey.
Brachychiton acuminatus mixed low woodland over scattered *Triodia epactia* hummock and *Cymbopogon ambiguous/ *Cenchrus ciliaris* tussock grasses.				
BaDs	*Brachychiton acuminatus* mixed low woodland with *Dichrostachys spicata* over *Ipomoea costata, Acacia coriacea,* open shrubland over scattered *Triodia eapctia / Cymbopogon ambiguous/ *Cenchrus ciliaris* grasses. Occasional *Ficus brachypoda* trees.	BaTeDa	*Brachychiton acuminatus*, *Terminalia supranitifolia* scattered low trees over *Dichrostachys spicata*, *Flueggea virosa* subsp. *melanthesoides* subsp. *melanthesoides* high shrubland over *Triodia epactia* (Burrup form) hummock grassland with *Dicliptera armata* open herbland. Associated species included *Acacia coriacea* subsp. *coriacea*, *Abutilon fraseri*, *Triumfetta appendiculata* (Burrup form), *Scaevola spinescens* (narrow form) and *Cymbopogon ambiguus*.	
BaEsErv	*Brachychiton acuminatus* mixed low woodland with *Ehretia saligna, Erythrina vespertilio, Terminalia circumalata* over *Ipomoea costata, Acacia coriacea* open shrubland over *Triodia epactia* hummock grassland. Scattered **Cenchrus ciliaris.*			Beyond Trudgen mapping limit.

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
		BaTsTh	*Brachychiton acuminatus, Terminalia supranitifolia* low open woodland over *Ipomoea costata, Dichrostachys spicata* shrubland over *Themeda* sp Burrup (B84), *Triodia epactia* (Burrup form) tussock/hummock grassland.	
Terminalia supranitifolia low open woodland over *Ipomoea costata, Acacia coriacea* shrubland over scattered to open *Triodia epactia* hummock grass.				
TsIcTe	*Terminalia supranitifolia* low open woodland over *Ipomoea costata, Acacia coriacea, Dichrostachys spicata, Grevillea pyramidalis* mixed shrubland over scattered to open *Triodia epactia* hummock grass sometimes *Themeda triandra.*			
Indigofera monophylla (Burrup form) scattered low open shrubs to shrubland.				
		ImTeAc	*Indigofera monophyla* (Burrup form) scattered shrubs to low open heath over *Triodia epactia* (Burrup form) hummock grassland to closed hummock grassland.	*Indigofera monophylla* was not abundant during the 2019 survey (it was during the 2000 survey) therefore this Trudgen vegetation would be described as Te this survey.
Triodia epactia humoock grassland				
Te	*Triodia epactia* hummock grassland. Scattered *Grevillea pyramidalis, Hakea lorea* subsp *lorea, Acacia inaequilatera.*	Te	*Triodia epactia* (Burrup form) hummock grassland. Associated species included *Grevillea pyramidalis* subsp. *pyramidalis*, *Acacia elacantha*, *Acacia colei* and *Indigofera monophylla* (Burrup form).	
		TeTh	*Triodia epactia* (Burrup form) *Themeda sp* Burrup (B84) hummock / tussock grassland.	*Themeda triandra* was not abundant during the 2019 survey – this vegetation would be described as Te in 2019
		TeRm	*Triodia epactia* (Burrup form) hummock grassland with *Rhynchosia* cf *minima* lianes.	*Rhynchosia minima* was present but not a major component of the vegetation in 2019 due to the dry.

VLA Code	VLA 2019 Vegetation Description	Trudgen Code	Trudgen 2002 Vegetation Description	Comment
Triodia angusta hummock grassland				
Ta	*Triodia angusta* hummock grassland. Scattered *Terminalia circumalata, Corymbia hamersleyana* trees and *Acacia orthocarpa* shrubs	Ta	*Triodia angusta* (Burrup form) hummock grassland	
Herblands				
		SgTeTa	*Stemodia grossa* low open shrubland to open scrub over *Triodia epactia* (Burrup form) *Triodia angusta* (Burrup form) hummock grassland to closed hummock grassland.	
Tecticornia ssp low open shrubland				
Tspp	**Tssp.** *Tecticornia halocnemoides* subsp *tenuis, T. pruinosa, T. indica* subsp *leiostachya,* with *Muellerolimon salicorniaceum* open low shrubland with patchy *Avicennia marina* trees.	Sm	*Halosarcia* spp scattered low shrubs to low open heath.	*Halosarcia* have not been re-named *Tecticornia*

Appendix H: Vegetation Recorded, Condition and Likelihood of PECs and Priority Species from the Reconnaissance Survey

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Table H.1. Vegetation Recorded, Condition and Likelihood of PECs and Priority Species in the Northern Survey Area (All PECs found in the northern survey area are the Burrup Rockpile PEC (P1)).

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
	Acacia bivenosa tall shrubland over tussock and/or hummock grassland.				
1	**AbCc** *Acacia bivenosa* tall open to shrubland over **Cenchrus ciliaris* tussock grassland, sometimes closed tussock grassland, with patchy *Triodia angusta*.	11 16b 15	Degraded	Not present	Unlikely
2	**AbTe** *Acacia bivenosa* with occasional *Dichrostachys spicata, Acacia ancistrocarpa* open tall shrubland over mixed *Triodia epactia/T. angusta* hummock and **Cenchrus ciliaris* tussock grassland.	13 36	Poor - Good	Not present	Present (*Terminalia supranitifolia)*
3	**AbTa** *Acacia bivenosa, Grevillea pyramidalis, Hakea lorea* subsp *lorea* tall shrubland over closed *Triodia angusta* hummock grassland.	16a	Good	Not present	Unlikely
4	**AbImTe** *Acacia bivenosa, Acacia pyrifolia* subsp *morrisonii , Grevillea pyramidalis* open shrubland over *Indigofera monophylla, Corchorus walcottii* open low shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* tussock grassland.	20a 20b	Good	Not present	
	Acacia bivenosa tall shrubland over *Acacia stellaticeps* shrubland over *Diplopeltis eriocarpa* low shrubland over *Triodia angusta, T. epactia* hummock grassland.				
5	**AbAsTe** *Acacia bivenosa* with *Dolichandrone heterophylla* tall shrubland over *Acacia stellaticeps* open to shrubland over *Diplopeltis eriocarpa* low shrubland over *Triodia angusta* or *T. epactia* hummock grassland to closed hummock grassland with patchy *Eriachne obtusa*	38 39	Excellent	Not present	Unlikely
	Acacia inaequilatera tall shrubland over *Triodia epactia* hummock grassland with low trees on rockpiles				
6	**AiTe (BaTs)** *Acacia inaequilatera* tall shrubland with *Grevillea pyramidalis, Ipomoea costata, Acacia orthocarpa* over *Triodia epactia* hummock grassland with patchy *Themeda triandra* and with low trees of *Brachychiton acuminatus, Terminalia supranitifolia* on small outcropping rocks.	26	Excellent	Present on some smaller individual rockpiles	Present (*Terminalia supranitifolia* – moderate occurrence on small outcrops)
	Grevillea pyramidalis tall shrubland over *Triodia epactia / T. angusta* hummock grassland.				
7	**GpTeBaTs** *Grevillea pryamidalis* scattered to open tall shrubland, sometimes with scattered *Hakea lorea* subsp *lorea, Ipomoea costata, Acacia inaequilatera* over	1, 3	Excellent	Present on some	Present (*Terminalia*

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
	Triodia epactia hummock grassland, sometimes patchy *T. angusta.* There can be open low *Indigofera monophylla* shrubland. There are scattered *Brachychiton acuminatus, Terminalia supranitifolia, Dichrostachys spicata* on small rock outcrops.	18a(i) 18a (ii) 29 32		smaller individual rockpiles and outcrops	*supranitifolia* – moderate occurrence on small outcrops*)*
8	**GpCc** *Grevillea pryamidalis* scattered to open tall shrubland over **Cenchrus ciliaris* tussock with *Triodia epactia* hummock grassland	18b	Poor	No present	Unlikely
9	**GpIcTe** *Grevillea pyramidalis, Ipomoea costata* tall open shrubland over *Triodia epactia* hummock grassland with scattered *Terminalia circumalata, Brachychiton acuminatus, Erythrina vespertilio* on frequent rockpiles and outcrops.	34a 34b	Excellent	Present on some smaller individual rockpiles and outcrops	Present (*Vigna triodiophila*)
	Grevillea pyramidalis, Acacia inaequilatera tall shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris.*				
10	**GpAiTe** *Grevillea pyramidalis, Acacia inaequilatera, Ehretia saligna, Santalum lanceolatum* tall shrubland over open mixed low shrubland, *Scaevola spinescens, Acacia orthocarpa, Solanum phlomoides, Indigofera monophylla* over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris*	33	Good	Not present But unusual remnant vegetation type	Unlikely
	Dichrostachys spicata, Acacia inaequilatera, tall shrubland over open low mixed shrubland over *Triodia epactia / T. angusta* hummock grassland.				
11	**DsAiTe** *Dichrostachys spicata, Acacia inaequilatera, Acacia coriacea* tall shrubland over *Scaevola spinescens, Alectryon oleifolius* open low mixed shrubland over *Triodia epactia / T. angusta* hummock grassland. There can be scattered *Eucalyptus victrix* and *Terminalia circumalata.*	23a 23b 25		Not present	Potential
	Terminalia circumalata low open woodland over mixed *Dichrostachys spicata* open shrubland over *Triodia epactia / T. angusta* open hummock grassland and *Cyperus vaginatus* open sedgeland.				
12	**TcDsTe/Ta** *Terminalia circumalata* low woodland with occasional *Eucalyptus victrix, Brachychiton acuminatus,* over *Dichrostachys spicata, Acacia coriacea, Ipomoea costata, Flueggea virosa* mixed open shrubland over *Triodia epactia / T. angusta* open hummock grassland and *Cyperus vaginatus* open sedgeland.	5a 5b 8 21b	Very Good	Not present	Present (*Rhynchosia bungarensis)*

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
	Eucalyptus victrix low woodland over mixed shrubland over *Triodia angusta / T. epactia* hummock grassland.				
13	**EvAcTa** *Eucalyptus victrix* open low woodland over *Acacia coriacea, Dichrostachys spicata* open shrubland over *Triodia angusta* hummock and **Cenchrus ciliaris* tussock grassland sometimes patchy.	12a 12b 21a	Good	Not present	Potential
14	**EvAbTa** *Eucalyptus victrix* open to scattered low woodland with scattered *Corymbia hamersleyana* over *Acacia bivenosa* tall open shrubland over *Adriana tomentosa / Indigofera monophylla* open low shrubland over *Triodia angusta / T. epactia* open to hummock grassland.	9a 9c 19	Very Good	Not present	Present (*Rhynchosia bungarensis)*
	Corymbia hamersleyana open to low woodland over mixed shrubland over *Triodia epactia / T. angusta* hummock grassland				
15	**ChAbTe** *Corymbia hamersleyana* open to low woodland over *Acacia bivenosa / Acacia coriacea/ DIchrostachys spicata* tall shrubland, sometimes *Adriana tomentosa/ Stemodia grossa* low shrubland over open *Triodia epactia / T. angusta* hummock and sometimes **Cenchrus ciliaris* tussock grassland.	9b 37 22	Poor to Very Good	Not present	Unlikely
16	**ChImTe** *Corymbia hamersleyana* open to low woodland over *Indigofera monophylla* open low shrubland over *Triodia epactia* hummock grassland.	10	Excellent	Not present	Unlikely
	Brachychiton acuminatus mixed low woodland over scattered *Triodia epactia* hummock and *Cymbopogon ambiguous/ *Cenchrus ciliaris* tussock grasses.				
17	**BaDsIc** *Brachychiton acuminatus* mixed low woodland with *Dichrostachys spicata* over *Ipomoea costata, Acacia coriacea,Terminalia supranitifolia* open shrubland over scattered *Triodia eapctia / Cymbopogon ambiguus/ *Cenchrus ciliaris* grasses. Occasional *Ficus brachypoda* trees.	2 4	Good to Very Good	Present	Present (*Vigna triodiophila Terminalia supranitifolia Rhynchosia bungarensis)*
18	**BaEsErv** *Brachychiton acuminatus* mixed low woodland with *Ehretia saligna, Erythrina vespertilio, Terminalia circumalata* over *Ipomoea costata, Acacia coriacea* open shrubland over *Triodia epactia* hummock grassland. Scattered **Cenchrus ciliaris.*	27b 35	Very Good	Present (abundant)	Present (*Rhynchosia bungarensis*) Potential (entire area not covered) (*Terminalia supranitifolia*)
	Terminalia supranitifolia low open woodland over *Ipomoea costata, Acacia coriacea* shrubland over scattered to open *Triodia epactia*				

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
	hummock grass.				
19	**TsIcTe** *Terminalia supranitifolia* low open woodland over *Ipomoea costata, Acacia coriacea, Dichrostachys spicata, Grevillea pyramidalis,* mixed shrubland over scattered to open *Triodia epactia* hummock grass sometimes *Themeda triandra.* Scattered *Brachychiton acuminatus.*	27a 28 30	Very Good to Excellent	Present (abundant)	Present (*Terminalia supranitifolia* - numerous *Rhynchosia bungarensis Vigno triodiophila*)
	Triodia epactia humoock grassland				
20	**Te** *Triodia epactia* hummock grassland. Scattered *Grevillea pyramidalis, Hakea lorea* subsp *lorea, Acacia inaequilatera.*	6 24	Excellent	Not present	Present (*Terminalia supranitifolia Vigna triodiophila)*
	Triodia angusta hummock grassland				
21	**Ta** *Triodia angusta* hummock grassland. Scattered *Terminalia circumalata, Corymbia hamersleyana* trees and *Acacia orthocarpa* shrubs.	40	Excellent	Not present	Unlikely
	Ipomoea costata shrubland over *Triodia epactia* hummock grassland.				
22	**IcHlTe** *Ipomoea costata* open shrubland with *Hakea lorea* subsp *lorea* over *Triodia epactia* hummock grassland. Patchy **Cenchrus ciliaris* along tracks. Scattered *Brachychiton acuminatus, Terminalia supranitifolia.*	17	Very Good	Present not abundant	Present *(Terminalia supranitifolia)*
	Tecticornia ssp low open shrubland				
23	**Tspp** *Tecticornia halocnemoides* subsp. *tenuis, T. pruinosa, T. indica* subsp. *leiostachya*, with *Muellerlion salicorniaceum* open low shrubland with patchy *Avicennia marina* trees.	14	Excellent	Not Present	Not present

Table H.2 Vegetation Recorded, Condition and Likelihood of PECs and Priority Species in the Southern Survey Area. Presence of PECs could not be validated on the Roebourne Plains grassland areas and Priority Species were absent due to dry conditions. Likelihood can only be made from the desktop study

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
	Acacia bivenosa mixed shrubland over mosaic *Triodia wiseana* hummock and *Eragrostis xerophila* tussock grassland.				
1	**AbTeEx** *Acacia bivenosa, A. coriacea, A. synchronicia* open or scattered shrubland over mosaic *Triodia epactia* hummock and *Eragrostis xerophila* tussock grassland.	1	Good	Not Present	Unlikely
	Acacia bivenosa mixed shrubland over mixed *Triodia* grassland				
2	**AbTw** *Acacia bivenosa* shrubland to open shrubland with scattered *A. inaequilatera, A coriacea, A. ancistrocarpa, Eremophila longifolia,* over *Triodia wiseana* hummock grassland. There can be patchy *T. epactia a*nd patches of **Cenchrus ciliiaris* on some scald areas.	5, 10a and 10b	Very Good to Excellent	Not Present	Potential
	Acacia bivenosa shrubland over **Cenchrus ciliaris* tussock grassland.				
3	**AbCc** *Acacia bivenosa* closed to shrubland over **Cenchrus ciliaris, *Cenchrus setiger* tussock grassland. There can be patchy *Eragrostis xerophila, Triodia wiseana, T. epactia.*	8	Poor	Not Present	Unlikely
	Acacia inaequilatera tall open shrubland over *Triodia epactia* hummock grassland				
4	**AiTe** *Acacia inaequilatera* tall open shrubland with some *Ehretia saligna, Acacia bivenosa* over *Triodia epactia* hummock grassland, patchy *Eragrostis xerophila.*	4	Very Good	Not Present	Potential
	Acacia inaequilatera A. coriacea tall shrubland over mixed tussock grassland				
5	**AiAc?Eb** *Acacia inaequilatera, A. coriacea* tall shrubland, sometimes open shrubland over *?Eriachne benthamii, Chrysopogon fallax* patchy **Cenchrus ciliaris* tussock grassland.	30	Very Good	Not Present	Potential
	Acacia inaequilatera tall open mixed shrubland over *Triodia wiseana* hummock grassland				
6	**AiTw** *Acacia inaequilatera* tall open shrubland, or scattered shrubs occasional *A. synchronicia, A. coriacea, Hakea lorea* sometimes over *Acacia bivenosa* open shrubs over *Triodia wiseana* hummock grassland.	11 & 12 28b	Very Good to Excellent	Not Present	Potential
7	**AiAcTw** *Acacia inaequilatera* open shrubland, occasional *A. coriacea* over *Triodia wiseana* closed hummock grassland.	16	Excellent	Not Present	Potential

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
	**Tamarix aphylla* low open woodland over *Tecticornia* ssp **Aerva javanica* low shrubland				
8	**TaTCc** **Tamarix aphylla* (WONS Species) low open woodland over *Tecticornia* species open low shrubland with **Aerva javanica* over open **Cenchrus ciliaris* tussock grassland.	6	Degraded	Not Present	Not Present
	Tecticornia spp closed low shrubland				
9	**T spp** *Tecticornia haloocnemoides* subsp *tenuis, Tecticornia* ? *indica* closed low shrubland. (Surrounded by Site 6 vegetation)	7	Good	Not Present	Not Present
	Acacia coriacea tall shrubland over *Acacia ampliceps* or **Vachellia farnesiana* shrubland over mixed tussock and hummock grasses				
10	**AcCc** *Acacia coriacea* tall shrubland to open tall shrubland over *Acacia ampliceps* or **Vachellia farnesiana* shrubland sometimes over *Stemodia grossa* closed low shrubland over mixed **Cenchrus ciliaris* tussock with *Triodia epactia* scattered grasses.	14a and site 2 (site 2 disturbed)	Poor to Good	Not Present	Unlikely
11	**AaAcC?v** *Acacia ampliceps* tall shrubland to closed shrubland with *Acacia coriacea* over *Myoporum montanum* shrubland with occasional *Stemodia grossa* over *Cyperus* sp and *Typha sp* (dead) sedgeland (manmade pond in drainage line)	14b	Poor	Not Present	Unlikely
	Acacia coriacea / A. inaequilatera tall shrubland over mixed scattered *Acacia* shrubs over mixed tussock grassland				
12	**AcAi** *Acacia coriacea / A.inaequilatera,* tall mixed shrubland over **Vachellia farnesiana* open shrubs over mixed open tussock grassland (too dead to id) and scattered *Triodia wisena* hummocks	20	Poor to good	Not Present	Unlikely
13	**Ac?Tt** *Acacia coriacea* with tall shrubland over scattered *Acacia inaequilatera, A. ancistrocarpa* shrubs over ? *Themeda triandra* (dead / dormant) ? with some **Cenchrus ciliaris* (dead)tussock grassland.	18	Good	Not Present	Unlikely
	Acacia coriacea, A. xiphophylla low woodland over mixed tussock grassland				
14	**AcAx?Tt** *Acacia coriacea* with *A. xiphophylla* low (old) woodland over scattered **Vachellia farnesiana* shrubs over *?Themeda triandra* and **Cenchrus ciliaris* tussock grassland.	19	Very Good	Not Present But rarely occurring old large	Potential

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
				trees.	
	**Vachellia farnesiana* shrubland over **Cenchrus ciliaris* tussock grassland				
15	**VfCc** **Vachellia farnesiana* shrubland to closed shrubland over **Cenchrus ciliaris* tussock grassland.	24	Poor	Not Present	Potential
	Senna hamersleyensis low shrubland over *Eragrostis xerophila* tussock grassland.				
16	**ShEx** *Senna hamersleyensis* low shrubland (senescing?) over scattered *Eragrostis xerophila* tussocks.	25	Poor	Not Present	Not likely
	Acacia xiphophylla open shrubland over *Eragrostis xerophila* tussock grassland				
17	**AxEx** *Acacia xiphophylla* scattered to open shrubland over *Eragrostis xerophila* open tussock grassland.	26	Good	Not Present	Potential
	Corymbia hamersleyana open low woodland over *Acacia coriacea/ *Vachellia farnesiana* open shrubland over mixed hummock and tussock grassland				
18	**ChAcTa** *Corymbia hamersleyana* scattered to open low woodland over *Acacia coriacea, *Vachellia farnesiana* open shrubland to shrubland over *Triodia angusta/T. epactia/*Cenchrus ciliaris* mixed grassland.	27	Poor to Very Good	Not Present	Unlikely
	Triodia epactia hummock grassland				
19	**Te** *Triodia epactia* hummock grassland. There can be very scattered *Acacia bivenosa, A. coriacea, A. xiphophylla, Ehretia saligna.*	3	Very Good	Not Present	Unlikely
	Triodia wiseana hummock grassland				
20	**Tw** *Triodia wiseana* hummock grassland. Sometimes scattered *Acacia inaequilatera, A. coriacea, A pyrifolia, A. bivenosa.*	22 28a	Excellent	Not Present	Unlikely
	Eriachne benthamii tussock grassland				
21	**Eb?Cf** *?Eriachne benthamii, ?Chrysopogon fallax* tussock grassland with other annual grass species (all too dead/dormant to identify).	29, 32, 33	Good	Potential [1]	Potential
	Eragrostis xerophila tussock grassland (with associated dry season remnant grasses)				
22	**Ex spp** *Eragrostis xerophila* tussock grassland. (has apparent *Sorghum plumosum, Panicum sp, Aristida sp* – determine following	9, 17, 31	Good to Very Good	Likely [1]	Potential

Vegetation Mapping No.	Vegetation Type code and Description	Sites	Vegetation Condition	PEC	Priority*
	wet season) with intrusions of ?*Eriachne benthamii* on low areas.				
	Eragrostis xerophila tussock grassland (associated species not evident this survey)				
23	**Ex** *Eragrostis xerophila* tussock grassland. Sometimes scattered **Vachellia farnesiana* shrubs.	21, 23	Good	Likely [2]	Potential
	**Cenchrus ciliaris* tussock grassland				
24	**Cc** **Cenchrus ciliaris* tussock grassland with scattered shrubs of *Acacia bivenosa, A. inaequilatera.*	13	Degraded	Not Present	Not Present
	Mosaic *Triodia wiseana* hummock *Eragrostis xerophila* tussock grassland				
25	*Triodia wiseana* hummock and *Eragrostis xerophila* tussock mosaiced grassland.	15	Very good	Not Present	Potential

[1]**Potentia**l Roebourne Plains coastal grassland with gilgai microrelief on deep cracking clays (P1)

[2] **Potential** Horseflat land system of the Roebourne Plains (P3)

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Appendix I: Flora Species List

Table I.1: Northern Survey Area Flora species list.

Family	Species	Conservation Code	Naturalised status
Acanthaceae	*Dicliptera armata*		
Aizoaceae	*Trianthema pilosa*		
	Trianthema turgidifolia		
Amaranthaceae	**Aerva javanica*		*
	Gomphrena cunninghamii		
	Ptilotus exaltatus		
	Ptilotus fusiformis		
	Ptilotus obovatus		
Apocynaceae	*Cynanchum floribundum*		
Araliaceae	*Trachymene oleracea*		
Asteraceae	*Peripleura virgata*		
	Pluchea ferdinandi-muelleri		
	Pterocaulon sphaeranthoides		
	Streptoglossa decurrens		
Bignoniaceae	*Dolichandrone heterophylla*		
	Dolichandrone occidentalis		
Boraginaceae	*Ehretia saligna*		
	Trichodesma zeylanicum		
Capparaceae	*Capparis spinosa*		
Caryophyllaceae	*Polycarpaea longiflora*		
Chenopodiaceae	*Enchylaena tomentosa*		
	Neobassia astrocarpa		
	Rhagodia eremaea		
	Salsola australis		
	Tecticornia halocnemoides subsp *tenuis*		
	Tecticornia indica subsp *leiostachya*		
	Tecticornia pruinosa		
	Threlkeldia diffusa		
Cleomaceae	*Cleome viscosa*		
Combretaceae	*Terminalia circumalata*		
	Terminalia supranitifolia	P3	
Commelinaceae	*Commelina ensifolia*		
Convolvulaceae	*Bonamia media*		
	Ipomoea costata		
	Ipomea mulleri		
Cucurbitaceae	*Cucumis variabilis*		
	Trichosanthes cucumerina		

Family	Species	Conservation Code	Naturalised status
Cyperaceae	*Bulbostylis barbata*		
	Cyperus vaginatus		
Elatinaceae	*Bergia perennis*		
Euphorbiaceae	*Adriana tomentosa*		
	Euphorbia coghlanii		
	Euphorbia tannensis		
Fabaceae	*Acacia ampliceps*		
	Acacia ancistrocarpa		
	Acacia bivenosa		
	Acacia colei		
	Acacia coriacea		
	Acacia inaequilatera		
	Acacia orthocarpa		
	Acacia pyrifolia		
	Acacia pyrifolia var. morrisonii		
	Acacia stellaticeps		
	Cajanus cinereus		
	Crotalaria medicaginea		
	Crotalaria novae-hollandiae		
	Cullen lachnostachys		
	Dichrostachys spicata		
	Erythrina vespertilio		
	Evolvulus alsinoides var. villosicalyx		
	Indigofera colutea		
	Indigofera linifolia		
	Indigofera monophylla		
	Indigofera trita		
	Neptunia dimorphantha		
	Rhynchosia bungarensis	P4	
	Rhynchosia minima		
	Senna glutinosa		
	Senna glutinosa subsp. pruinosa (F.Muell.) Randell		
	Senna hamersleyensis		
	Senna artemisioides subsp. oligophylla		
	Swainsona formosa		
	Tephrosia rosea var. *clementii*		
	Tephrosia sp Kimberley Flora (C.A.Gardner 7300)		

Family	Species	Conservation Code	Naturalised status
	Tephrosia supina		
	Vigna lanceolata		
	Vigna triodiophila	P3	
Goodeniaceae	*Goodenia microptera*		
	Goodenia lamprosperma		
	Scaevola spinescens		
Lamiaceae	*Clerodendrum tomentosum*		
Lauraceae	*Cassytha capillaris*		
Malvaceae	*Abutilon cunninghamii*		
	Abutilon fraseri		
	Abutilon lepidum		
	Brachychiton acuminatus		
	Corchorus walcottii		
	Gossypium australe		
	Hibiscus coatesii		
	Hibiscus sturtii var. campylochlamys		
	**Malvastrum americanum*		*
	Triumfetta appendiculata		
	Triumfetta clementii		
	Triumfetta maconochieana		
	Waltheria indica		
Menispermaceae	*Tinospora smilacina*		
Moraceae	*Ficus brachypoda*		
	Ficus aculeata var.indecora		
Myrtaceae	*Corymbia hamersleyana*		
	Eucalyptus xerothermica		
	Eucalyptus victrix		
Nyctaginaceae	*Boerhavia coccinea*		
	Boerhavia gardneri		
Oleaceae	*Jasminum didymum* subsp. *lineare*		
Phyllanthaceae	*Flueggea virosa subsp. melanthesoides*		
	Notoleptopus decaisnei		
	Phyllanthus maderaspatensis		
Pittosporaceae	*Pittosporum phillyreoides*		
Plantaginaceae	*Stemodia grossa*		
Plumbaginaceae	*Plumbago zeylanica*		
	Muellerolimon salicorniaceum		
Poaceae	**Cenchrus ciliaris*		*
	**Cenchrus setiger*		

Family	Species	Conservation Code	Naturalised status
	Chrysopogon fallax		
	Cymbopogon ambiguus		
	Eragrostis eriopoda		
	Eragrostis falcatta		
	Eriachne obtusa		
	Eriachne mucronata		
	Eriachne tenuiculmis		
	Paraneurachne muelleri		
	Paspalidium clementii		
	Paspalidium tabulatum		
	Themeda triandra		
	Triodia angusta		
	Triodia epactia		
Portulacaceae	*Portulaca pilosa*		
Proteaceae	*Grevillea pyramidalis*		
	Hakea lorea subsp. lorea		
Rubiaceae	*Oldenlandia crouchiana*		
	Synaptantha tillaeacea		
Sapindaceae	*Alectryon oleifolius subsp. oleifolius*		
	Diplopeltis eriocarpa		
Solanaceae	*Solanum cleistogamum*		
	Solanum horridum		
	Solanum diversiflorum		
	Solanum phloides		
Violaceae	*Hybanthus aurantiacus*		

Table I.2: Southern Survey Area Flora species list.

Family	Genus Species	Conservation Code	Naturalised Status
AIZOACEAE	*Trianthema turgidifolia*		
	Trianthema triquetra		
AMARANTHACEAE	**Aerva javanica*		*
	Ptilotus aervoides		
	Ptilotus exaltatus		
	Ptilotus gomphrenoides		
	Ptilotus helipteroides		
	Ptilotus macrocephala		
APOCYMACEAE	*Cynanchum viminale* subsp *australe*		
ASTERACEAE	*Centipeda minima*		
	Pluchea rubelliflora		
	Pterocaulon sphacelatum		
	Streptoglossa bubakii		
	Streptaglossa decurrens		
	Streptaglossa ? liatroides (Sterile)		
	Streptoglossa odora		
BORAGINACEAE	*Trichodesma zeylanicum*		
CAPPARACEAE	*Capparis spinosa* subsp *nummularia*		
	Cleome viscosa		
CHENOPODIACEAE	*Atriplex lindleyi* subsp *inflata (out of range – collect)* *Atriplex lindleyi* sterile – potentially subsp *conduplicata* (P3)		
	Atriplex semilunaris		
	Halosarcia ? pruinose		
	Halosarcia halocnemoides		
	Halosarcia sp (various)		
	Salsola tragus		
	Scleroleana bicornis		
	Scleroleana cuneata		
	Scleroleana hostilis		
	Scleroleana sp		
CONVOLVULACEAE	*Bonamia media*		
	Evolvulos alsinoides		
	Ipomaea muellerii		
	Polymeria ambigua		
EUPHORBIACEAE	*Adriana tomentosa*		
	Euphorbia coghlanii		
	Euphorbia tannensis		
	Phyllanthus maderaspatana		
FABACEAE	*Acacia ampliceps*		
	Acacia bivenosa		
	Acacia coriacea		
	Acacia inaequilatera		
	Acacia pyrifolia		

Family	Genus Species	Conservation Code	Naturalised Status
	Acacia sclerosperma		
	Acacia synchronisia		
	Acacia xerophylla		
	Alysicarpus muelleri		
	Indigofera linifolia		
	Indigofera linnaei		
	Indigofera ? trita (dead/dormant)		
	Neptunia dimorphantha.		
	Rhagodia eremaea		
	Rhychosia minima		
	Senna hamersleyensis		
	Senna notablis		
	Senna oligiophylla		
	Senna glutinosa subsp. pruinosa		
	Sesbania canabinna		
	Swainsonia formosa		
	**Vachellia farnesiana*		*
GOODENIACEAE	*Goodenia lamprosperma*		
	Goodenia micoptera		
	Scaevola spinescens		
LAURACEAE	*Cassytha* sp sterile		
MALVACEAE	*Gossypium australe*		
	Sida fibulifera		
	Sida sp.		
	Waltheria indica		
MYOPORACEAE	*Eremophila longifolia*		
	Myoporum montanum		
MYRTACEAE	*Corymbia hamersleyana*		
	Eucalyptus victrix		
PHYLLANTHACEAE	*Notoleptopus decaisnei*		
PLANTAGINACEAE	*Stemodia grossa*		
POACEAE	*Aristida* sp (dead/dormant)		
	Aristida contorta		
	Astrebla pectinata		
	**Cenchrus ciliaris*		*
	**Cenchrus setiger*		*
	Chrysopogon fallax (dead/ dormant)		
	Dactyloctenium radulans		
	Dicanthium sericeum subsp ? (dead/dormant)		
	Enneapogon caerulescens		
	Eragrostis eriopoda		
	Eragrostis falcatta		
	Eragrostis sp (dead/dormant)		
	Eragrostis xerophila		
	Eriachne benthamii		
	Eulalia aurea		

Family	Genus Species	Conservation Code	Naturalised Status
	Panicum decompositum		
	Sorghum plumosum (dead / dormant)		
	Triodia angusta		
	Triodia epactia		
	Triodia wiseana		
	Xerochlora sp (dead/dormant)		
PORTULACACEAE	*Portulaca conspicua*		
PROTEACEAE	*Hakea lorea* subsp *lorea*		
SAPINDACEAE	*Diplopeltis eriocarpa*		
SOLANACEAE	*Solanum diversiflorum*		
	Solanum lasiophyllum		
	Solanum phlomoides		
SURIANACEAE	*Stylobasium spathulatum*		
TAMARICACEAE	**Tamarix aphylla*		*
TILIACEAE	*Corchorus walcottii*		
	Triumfetta clementii		
ZYGOPHYLLACEAE	*Tribulus hirsutus*		
	Tribulus occidentalis		

Appendix J: Field Data Sheets

Northern Survey Area
Field Data Sheets

Site: 1
Type: 30 x 30 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476669 **Northing:** 7721235

Habitat/Landform: Rocky hillslope with dense rock and boulder mantle, with occasional small rockpiles
Soil: Dense stone and boulder mantle over skeletal red silts.
Rock type: Red brown rocks and boulders
Vegetation: *Grevillea pyramidalis* tall shrubland with *Acacia inaequilatera over Triodia epactia* hummock grassland
Veg Condition: Excellent
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia bivenosa	2
Acacia inaequilatera	2
Alectryon oleifolius subsp. oleifolius	<2
Bonamia media	<2
Brachychiton acuminatus	<2
Cleome viscosa	<2
Corchorus walcottii	<2
Crotalaria medicaginea	<2
Cullen lachnostachys	<2
Grevillea pyramidalis	5-10
Hakea lorea	<2
Indigofera colutea	<2
Indigofera monophylla	<2
Jasminum didymum subsp. *lineare*	<2
Senna glutinosa	<2
Solanum diversiflorum	<2
Swainsona formosa	<2
Tephrosia rosea var. *clementii*	<2
Trichodesma zeylanicum	<2
Triodia epactia	65
Triumfetta appendiculata	<2
Triumfetta clementii	<2

Site: 2
Type: Vegetation Pocket
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476707 **Northing:** 7721219

Habitat/Landform: Small rockpile with medium to large rocks
Soil: Medium to large block rocks with areas of scree
Rock type:
Vegetation: *Brachychiton acuminatus Ipomoea costata* low open woodland over *Dichrostachys spicata* over open low shrubland over *Cenchrus ciliaris* tussock grassland.
Veg Condition: Poor to Degraded
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia coriacea	2
Brachychiton acuminatus	5
Cleome viscosa	<2
Crotalaria medicaginea	<2
Cucumis variabilis	<2
Cymbopogon ambiguus	<2
Dichrostachys spicata	5
Gomphrena cunninghamii	<2
Grevillea pyramidalis	<2
Hybanthus aurantiacus	<2
Ipomoea costata	5
Trachymene oleracea	<2
Triodia epactia	10
Triumfetta clementii	<2
Vigna triodiophila	<2
**Cenchrus ciliaris*	15-20

* denotes weed species

Site: 3
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476754 **Northing:** 7721209

Habitat/Landform: Undulating gentle slope with larger boulders, small boulder and rock outcrops, with dense stone and rock mantle.
Soil:
Rock type:
Vegetation: *Grevillea pyramidalis* open tall shrubland over *Indigofera monophylla* open low shrubland over *Triodia epactia* hummock grassland with *Brachychiton acuminatus* trees (scattered) on the rockpiles.
Veg Condition: Excellent
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia colei	2
Cucumis variabilis	<2
Cullen lachnostachys	<2
Euphorbia coghlanii	<2
Grevillea pyramidalis	5
Indigofera monophylla	5
Indigofera linifolia	<2
Pterocaulon sphaeranthoides	<2
Tephrosia rosea var. *clementii*	<2
Trachymene oleraceae	<2
Trichodesma zeylanicum	*<2*
Triodia epactia	65-70
Triumfetta appendiculata	<2
Triumfetta clementii	<2
Rhynchosia minima	<2
Brachychiton acuminatus	<2

* denotes weed species

Site: 4
Type: Vegetation Patch
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476878 **Northing:** 7720989

Habitat/Landform: Large rockpile and rockpile ridge with medium to large rocks.
Soil: Skeletal red silts in rock pockets
Rock type: Medium to large red brown block rocks
Vegetation: *Brachychiton acuminatus, Ficus brachypoda* low open woodland over *Ipomoea costata* shrubland over scattered *Triodia epactia*.
Vegetation Condition: Poor - Degraded
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia coriaceae	2
Brachychiton acuminatus	5-10
Cucumis variabilis	<2
Cymbopogon ambiguus	<2
Eriachne obtusa	<2
Ficus aculeata	<2
Ficus brachypoda	10
Ipomoea costata	5
Jasminum didymium subsp. *lineare*	<2
Pterocaulon sphaeranthoides	<2
Themeda triandra	<2
Triodia epactia	65-70
Triumfetta appendiculata	<2
Rhynchosia bungarensis P4	<2
**Cenchrus ciliaris*	<2

* denotes weed species

Site: 5
Type: Vegetation Patch
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476909 **Northing:** 7720984

Habitat/Landform: Narrow rocky gully bordered by steep rockpiles and ridges
Soil: Grey brown alluvial silts between many rocks on gully floor
Rock type:
Vegetation: *Terminalia circumulata* and *Eucalyptus victrix* woodland with occasional *Brachychiton acuminatus, Flueggea virosa subsp. melanthesoides* over *Dichrostachys spicata* and *Acacia coriaceae* open shrubland over open Triodia epactia hummock grassland over open *Cyperus vaginatus* sedges and open mixed herbland.
Vegetation Condition: Excellent
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia coriaceae	<2-2
Brachychiton acuminatus	2
Cleome viscosa	2
Cymbopogon ambiguus	2
Cyperus vaginatus	2
Dichrostachys spicata	<2-2
Dicliptera armata	2
Eriachne tenuiculmis	<2
Eucalyptus victrix	5-10
Flueggea virosa subsp. melanthesoides	2
Phyllanthus maderaspatensis	2
Tephrosia sp Kimberley Flora (C.A.Gardner 7300)	<2
Terminalia circumalata	20
Tinospora smilacina	<2
Triodia epactia	10-20
Rhynchosia bungarensis P4	<2
Swainsona formosa	<2
Waltheria indica	<2
**Cenchrus ciliaris*	<2

* denotes weed species

Site: 6
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476814 **Northing:** 7720864

Habitat/Landform: Undulating slope with dense boulders with dense boulder and rocky mantle with occasional small outcropping rockpiles.
Soil: Red brown skeletal silts
Rock type:
Vegetation: *Triodia epactia* hummock grassland. Scattered *Grevillea pyramidalis, Hakea lorea* subsp *lorea, Acacia inaequilatera*.

Vegetation Condition: Very good

Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Acacia inaequilatera	<2
Boerhavia gardneri	<2
Cleome viscosa	<2
Crotalaria novae-hollandiae	<2
Cymbopogon ambiguus	<2
Euphorbia tannensis	<2
Gomphrena cunninghamii	<2
Grevillea pyramidalis	<2
Hakea lorea subsp. lorea	<2
Hibiscus sturtii var. campylochlamys	<2
Indigofera monophylla	<2
Trachymene oleracea	<2
Triodia epactia	60-70
Triumfetta appendiculata	<2
Vigna triodiophila (P3)	<2

* denotes weed species

Site: 8
Type: Vegetation Patch
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476608 **Northing:** 7720579

Habitat/Landform: Broad rocky gully between hillslopes
Soil: Grey brown alluvial silts
Rock type: red brown rock walls and block rock
Vegetation: *Terminalia circumulata, Brachychiton acuminatus* low woodland over open *Ipomoea costata, Rhagodia eremaea, Acacia coriaceae and Dichrostachys spicata* over open *Triodia epactia* hummock grassland.
Vegetation Condition: Excellent
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia coriaceae	<2-2
Brachychiton acuminatus	10
Cymbopogon ambiguus	<2
Dichrostachys spicata	<2
Enchylaena tomentosa	<2
Eucalyptus victrix	<2
Flueggea virosa subsp. melanthesoides	<2-2
Hakea lorea	<2-2
Ipomoea costata	5
Jasminum didymum subsp. *lineare*	<2
Pittosporum phillyreoides	2
Rhagodia eremaea	<2-2
Rhynchosia bungarensis P4	<2
Terminalia circumalata	20
Tinospora smilacina	<2-2
Triodia epactia	2-10
Triumfetta appendiculata	<2

* denotes weed species

Site: 9a
Type: 25 x 100 (Drainage line) Relevé
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476240 **Northing:** 7720028

Habitat/Landform: Broad shallow drainage line
Soil: Grey-brown alluvial silts, scattered stone
Rock type: Rock piles
Vegetation: *Eucalyptus victrix* open low woodland with occasional *Corymbia hamersleyana* over *Acacia bivenosa* tall open shrubland over *Adriana tomentosa* low shrubland over *Triodia angusta* open hummock grassland with open herbland of *Stemodia grossa.*
Veg Condition: Good
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Eucalyptus victrix	5-10
Corymbia hamersleyana	2
Adriana tomentosa	15
Triodia angusta	15-30
Tiodia epactia	5
Stemodia grossa	2
Cyperus vaginatus	5
Sida fibulifera	<2
Capparis spinosa	<2
Rhagodia eremea	<2
**Aerva javanica*	<2
Ptiolotus exaltatus	<2
Chrysopogon fallax	<2
Euphorbia tannensis	<2

* denotes weed species
? denotes unconfirmed ID

Site: 9b
Type: 25 x 100 (Drainage line) Relevé
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476299 **Northing:** 7720155

Habitat/Landform: Broad shallow drainage line
Soil: Grey-brown alluvial silts, scattered stone
Rock type:
Vegetation: *Corymbia hamersleyana* low woodland over *Acacia bivenosa* tall open shrubland over *Adriana tomentosa* low shrubland over open *Triodia angusta* hummock grassland with patchy *T. epactia*
Veg Condition: Very Good
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Corymbia hamersleyana	15
Adriana tomentosa	10
Acacia bivensosa	5
Triodia angusta	15-20
Tiodia epactia	5
Stemodia grossa	<2
Corchorus walcottii	<2
Triumfetta appendiculata	<2
Eucalyptus victrix	<2
Indigofera monophylla	<2
Enchyleana tomentosa	<2
Chrysopogon fallax	<2

* denotes weed species
? denotes unconfirmed ID

Site: 9c
Type: 25 x 100 (Drainage line) Relevé
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476187 **Northing:** 7719891

Habitat/Landform: Broad shallow drainage line
Soil: Grey-brown alluvial silts, scattered stone
Rock type:
Vegetation: *Eucalyptus victrix* scattered low trees with *Corymbia hamersleyana* over open low shrubland of *Indigofera monophyla* over mixed *Triodia angusta/T. epactia* open hummock grassland.
Veg Condition: Very Good
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Corymbia hamersleyana	<2
Eucalyptus victrix	<2
Acacia bivensosa	<2
Triodia angusta	20
Tiodia epactia	10
**Cenchrus ciliaris*	2
Adriana tomentose	5
Tephrosia rosea subsp clementii	<2

* denotes weed species
? denotes unconfirmed ID

Site: 10
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476814 **Northing:** 7720864

Habitat/Landform: Very gentle rocky and stony slope sloping down into broad drainage valley.
Soil: Red-brown silts.
Rock type: Dense stony mantle
Vegetation: *Corymbia hamersleyana* open to low woodland over *Indigofera monophylla* open low shrubland over *Triodia epactia* hummock grassland.

PEC above site 10 on rocks at 0476452E 7720354N

Vegetation Condition: Excellent

Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum -	<2
Acacia coriacea -	<2-2
Corchorus walcottii	2
Corymbia hamersleyana	5-15 (20)
Cucumis variabilis	<2
Dichrostachys spicata -	<2
Ehretia saligna -	<2
Enchylaena tomentosa	<2
Flueggea virosa subsp. melanthesoides -	<2
Grevillea pyramidalis	2
Hibiscus sturtii var. campylochlamys	<2
Indigofera monophylla	2
Paspalidium tabulatum	<2
Terminalia supranitifolia (P3)	<2
Triodia epactia	30-40
Triumfetta clementii	<2
Waltheria indica	<2
**Cenchrus ciliaris*	<2

* denotes weed species

Site: 11
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476814 **Northing:** 7720864

Habitat/Landform: Old borrow pit, flat are with disturbed soils and rubble
Soil: Red-brown silts.
Rock type: Dense stony mantle
Vegetation: *Acacia bivenosa* tall to open shrubland (80% senesced) over **Cenchrus ciliaris* tussock grassland, sometimes closed tussock grassland, with patchy *Triodia angusta.*

Vegetation Condition: Degraded

Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Acacia bivenosa	40
Corchorus walcottii	<2
Senna glutinosa	<2
Salsola australis	<2
Trianthema turgidifolia	<2
Triodia angusta	5
Triodia epactia	<2
**Cenchrus ciliaris*	50-60

* denotes weed species

Site: 12a
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475855 **Northing:** 7718092

Habitat/Landform: Narrow, stony creekline with dense stony bed
Soil: Grey brown silty alluvium
Rock type: Dense stony mantle
Vegetation: *Eucalyptus victrix* open low woodland over *Acacia coriacea, Dichrostachys spicata* open shrubland over *Triodia angusta* hummock and **Cenchrus ciliaris* tussock grassland sometimes patchy, sometimes dominant.

Vegetation Condition: Good

Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Acacia coriaceae	2
Alectryon oleifolius subsp. oleifolius	<2-2
Corchorus walcottii	<2
Cymbopogon ambiguus	2
Dichrostachys spicata	<2-5
Eriachne obtusa	2
Eucalyptus victrix	5
Grevillea pyramidalis	<2
Solanum horridum	<2
Triodia angusta	15
**Cenchrus ciliaris*	5-10

* denotes weed species

Site: 12b
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475738 **Northing:** 7718007

Habitat/Landform: Narrow, stony creekline with dense stony bed
Soil: Grey brown silty alluvium
Rock type: Dense stony mantle
Vegetation: *Eucalyptus victrix* open low woodland over *Acacia coriacea, Dichrostachys spicata* open tall shrubland over **Cenchrus ciliaris* tussock grassland sometimes patchy *Triodia angusta.*

Vegetation Condition: Good

Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia coriaceae	5
Acacia ampliceps	2
Adriana tomentosa	<2
Alectryon oleifolius subsp. oleifolius	<2
Corchorus walcottii	<2
Cucumis variabilis	<2
Cyperus vaginatus	<2
Dichrostachys spicata	2
Eucalyptus victrix	10
Pittosporum phillyreoides	<2
Tephrosia sp Kimberley Flora (C.A.Gardner 7300)	<2
Terminalia circumalata	<2
Triodia angusta	10-15
Triumfetta appendiculata	<2
**Cenchrus ciliaris*	20-25

* denotes weed species

Site: 13
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475813 **Northing:** 7718060

Habitat/Landform: Low valley floor, only scattered stones
Soil: Grey brown silts
Rock type:
Vegetation: Mixed open tall shrubland of *Acacia bivenosa* (mostly dead) with occasional *Dichrostachys spicata, Acacia ancistrocarpa* over open low shrubland of *Corchorus walcottii* over mixed *Triodia epactia/T. angusta* hummock and **Cenchrus ciliaris* tussock grassland.

Vegetation Condition: Poor

Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia bivenosa	2
Acacia coriaceae	<2
Cassytha capillaris	<2
Chrysopogon fallax	2
Corchorus walcottii	5
Cucumis variabilis	1
Dichrostachys spicata	2
Eriachne mucronata	<2
Gossypium australe	<2
Grevillea pyramidalis	<2
Hakea lorea subsp. lorea	<2
Phyllanthus maderaspatensis	<2
Pterocaulon sphaeranthoides	<2
Senna glutinosa	<2
Solanum cleistogamum	<2
Solanum diversiflorum	<2
Tephrosia supina	<2
Terminalia supranitifolia (P3)	<2
Trichodesma zeylanicum	<2
Triodia angusta	2
Triodia epactia	<2
Triumfetta appendiculata	<2
Triumfetta clementii	<2
Waltheria indica	<2
**Aerva javanica*	<2
**Cenchrus ciliaris*	5-15

* denotes weed species

Site: 14
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 476026 **Northing:** 7718631

Habitat/Landform: Saline tidal inlet
Soil: Grey brown saline silty loams
Rock type:
Vegetation: *Tecticornia halocnemoides* subsp *tenuis, T. pruinose, T. indica* subsp *leiostachya,*with *Muellerolimon salicorniaceum* open low shrubland with patchy *Avicennia marina* trees.

Vegetation Condition: Excellent

Fire Age: 0 yrs

Species List

Name	Cover (%)
Avicennia marina	<2
Eragrostis falcatta	<2
Muellerolimon salicorniaceum	2
Neobassia astrocarpa	5
Tecticornia halocnemoides subsp *tenuis*	15
Tecticornia pruinosa	15
Tecticornia indica subsp *leiostachya*	2

* denotes weed species

Site: 15
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475644 **Northing:** 7717965

Habitat/Landform: Stony plain disturbed previously for powerline, gas pipeline and road (possible old borrow pit).
Soil: Pinky brown fill and rubble.
Rock type: Stony mantle
Vegetation: Scattered to open mixed shrubland of *Acacia bivenosa (much senesced); Grevillea pyramidalis* over closed *Cenchrus ciliaris* tussock grassland. Scattered *Corymbia hamersleyana*

Vegetation Condition: Degraded

Fire Age: 0-5 yr

Species List

Name	Cover (%)
Acacia ampliceps	<2
Acacia bivenosa	2
Corchorus walcottii	<2
Corymbia hamersleyana	<2
Cucumis variabilis	<2
Grevillea pyramidalis	<2
Scaevola spinescens	<2
Salsola australis	<2
Trianthema turgidifolia	<2
**Cenchrus ciliaris*	75
**Cenchrus setiger*	2

* denotes weed species

Site: 16a
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475644 **Northing:** 7717965

Habitat/Landform: Valley floor
Soil: Reddish brown alluvial soils
Rock type: Stony mantle
Vegetation: *Acacia bivenosa, Grevillea pyramidalis, Hakea lorea* subsp *lorea* tall shrubland over closed *Triodia angusta* hummock grassland.

Vegetation Condition: Good

Fire Age: 10 yr

Species List

Name	Cover (%)
Acacia bivenosa	5
Acacia coriaceae	2
Brachychiton acuminatus	<2
Chrysopogon fallax	<2
Corymbia hamersleyana	<2
Ehretia saligna	<2
Eucalyptus xerothermica	<2
Euphorbia tannensis	<2
Evolvulus alsinoides var. villosicalyx	<2
Goodenia microptera	<2
Grevillea pyramidalis	2
Hakea lorea subsp. lorea	<2
Indigofera monophylla	<2
Pluchea ferdinandi-muelleri	<2
Rhynchosia minima	<2
Scaevola spinescens	<2
Triodia angusta	70
Triodia epactia	10
**Cenchrus ciliaris*	2-15

* denotes weed species

Site: 16b
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475516 **Northing:** 7717941

Habitat/Landform: Old borrow area
Soil: Mantle sands
Rock type:
Vegetation: *Acacia bivenosa* tall shrubland over **Cenchrus ciliaris* tussock grassland.
Vegetation Condition: Degraded

Fire Age: 10 yr

Species List

Name	Cover (%)
Acacia bivenosa	15-20
Triodia angusta	7<2
**Cenchrus ciliaris*	50

* denotes weed species

Site: 17
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472184 **Northing:** 7714685

Habitat/Landform: Undulating rocky slopes and rises with frequent rock outcrops
Soil:
Rock type:
Vegetation: *Ipomoea costata* open shrubland with *Hakea lorea* subsp *lorea* over *Triodia epactia* hummock grassland. Patchy **Cenchrus ciliaris* along tracks. Scattered *Brachychiton acuminatus, Terminalia supranitifolia.*

Vegetation Condition: Good

Fire Age: >10 yr

Species List

Name	Cover (%)
Bonamia media	<2
Brachychiton acuminatus	2
Crotalaria medicaginea	<2
Ehretia saligna	<2
Evolvulus alsinoides var. villosicalyx	<2
Grevillea pyramidalis	2
Hakea lorea subsp. lorea	2-5
Indigofera linifolia	<2
Indigofera monophylla	<2
Ipomoea costata	5-10
Solanum phlmoides	<2
Streptoglossa decurrens	<2
Swainsona formosa	<2
Terminalia supranitifolia (P3)	<2
Trichodesma zeylanicum	1
Triodia epactia	60
Triumfetta clementii	1
**Cenchrus ciliaris*	<2
**Aerva javanica*	<2

* denotes weed species

Site: 18a
Type: 50 x 50
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 474876 **Northing:** 7717410
Repeat at : Easting: 472978 Northing: 7715743
Easting: 475144 Northing 7717741

Habitat/Landform: Low gentle hill slopes with dense boulder and stony mantle and numerous small rockpiles
Soil: Skeletal red silts
Rock type: Boulders, dense stone mantle, outcrops
Vegetation: *Grevillea pyramidalis* scattered to open tall shrubland, scattered *Hakea lorea* subsp *lorea, Ipomoea costata, Acacia inaequilatera* over *Triodia epactia* hummock grassland with scattered *T. angusta* hummocks.
Scattered *Brachychiton acuminatus, Terminalia supranitifolia, Dichrostachys spicata* on small rockpiles.
Veg Condition: Very Good
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Triodia epactia	60
Grevillea pyramidalis	2-5
Trachymene oleraceae	<2
Rhynchosia minima	<2
**Cenchrus ciliaris*	10
Evolvulus alsinoides var *villosiflorus*	<2
Crotalaria novae-hollandiae	<2
Abutilon lepidum	<2
Trichodesma zeylanicum	<2
Indigofera linnaei	<2
Boerhavia coccinea	<2
Salsola australis	<2
Corchorus walcottii	<2
**Aerva javanica*	<2
Gomphrena cunninghamii	<2
Acacia pyrifolia var *morrisonii*	<2
Brachychiton acuminatus	<2
DIchrostachys spicata	<2

* denotes weed species

Site: 18b
Type: 50 x 50
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 473783 **Northing:** 7716163

Habitat/Landform: Disturbed area on low gentle hill slopes with stones and rubble over pinky silts and stones, numerous small rockpiles
Soil: Disturbed pinky silts with rubble – potentially imported
Rock type:
Vegetation: *Grevillea pyramidalis* scattered to open tall shrubland, over **Cenchrus ciliaris* tussock grassland with scattered *Triodia epactia.*
.
Veg Condition: Very Good
Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Triodia epactia	30
Grevillea pyramidalis	2
**Cenchrus ciliaris*	45
**Cenchrus setiger*	5
Rhynchosia minima	<2
Abutilon lepidum	<2
Trichodesma zeylanicum	<2
Indigofera linnaei	<2
Boerhavia coccinea	<2
Salsola australis	<2
Corchorus walcottii	<2
**Aerva javanica*	<2
Acacia pyrifolia var *morrisonii*	<2
DIchrostachys spicata	<2

* denotes weed species
? denotes unconfirmed ID

Site: 19
Type: 20 x 75 Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475255 **Northing:** 7717677

Habitat/Landform: Broad shallow drainage line
Soil: Grey-brown alluvial silts, scattered stone
Rock type:
Vegetation: *Eucalyptus victrix* open low woodland with occasional *Corymbia hamersleyana* over *Triodia angusta* open hummock grassland with patchy invading **Cenchrus ciliaris* and *Triodia epactia*
Veg Condition: Very good
Fire Age: 5-10 yr

Species List

Name	Cover (%)
Acacia bivenosa	<2
Acacia colei	<2
Acacia pyrifolia var. morrisonii	<2
Corchorus walcottii	<2
Corymbia hamersleyana	2
Crotalaria medicaginea	<2
Cucumis variabilis	<2
Cyperus vaginatus	<2
Dichrostachys spicata	<2
Eucalyptus victrix	5
Goodenia lamprosperma	<2
Indigofera trita	<2
Neptunia dimorphantha	<2
Rhynchosia bungarensis (P4)	<2
Swainsona formosa	<2
Tephrosia supina	<2
Threlkeldia diffusa	<2
Triodia angusta	30
Triodia epactia	25
Triumfetta appendiculata	<2
**Cenchrus ciliaris*	15-30

* denotes weed species

Site: 20
Type: 50 x 50 Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475155 **Northing:** 7717591

Habitat/Landform: Undulating low hill slopes
Soil: Red silts, stony mantle
Rock type:
Vegetation: *Acacia bivenosa, Acacia pyrifolia* subsp *morrisonii , Grevillea pyramidalis* open shrubland over *Indigofera monophylla, Corchorus walcottii* open low shrubland over *Triodia epactia* hummock grassland with patchy **Cenchrus ciliaris* tussock grassland.
Veg Condition: Good
Fire Age: 5-10 yr

Species List

Name	Cover (%)
Acacia bivenosa	2-5
Acacia pyrifolia var. morrisonii	<2
Corchorus walcottii	5
Cucumis variabilis	<2
Cynanchum floribundum	<2
Dichrostachys spicata	<2
Euphorbia tannensis	<2
Evolvulus alsinoides var. villosicalyx	<2
Goodenia microptera	<2
Grevillea pyramidalis	<2-2
Indigofera monophylla	5
Notoleptopus decaisnei	<2
Phyllanthus maderaspatensis	<2
Pterocaulon sphaeranthoides	<2
Streptoglossa decurrens	<2
Solanum cleistogamum	<2
Stemodia grossa	10
Swainsona formosa	<2
Tephrosia rosea var. *clementii*	<2
Tephrosia supina	<2
Triodia angusta	10
Triodia epactia	35-50
Triumfetta clementii	<2
**Cenchrus ciliaris*	2-30

* denotes weed species

Site: 21a
Type: 30 x 70 m (Drainage line) Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 474507 **Northing:** 7716923

Habitat/Landform: Broad shallow drainage line
Soil: Grey-brown alluvial silts, scattered stone
Rock type:
Vegetation: *Eucalyptus victrix, Terminalia circumalata* open low woodland to scattered low woodland over *Acacia coriacea* open shrubland over *Triodia angusta* open hummock grassland over *Cyperus vaginatus* open sedgeland.
Veg Condition: Excellent
Fire Age: 5-10 yr

Species List

Name	**Cover (%)**
Eucalyptus victrix	10-15
Terminalia circumalata	10-15
Acacia coriacea	2
Triodia angusta	50
Cyperus vaginatus	2
**Cenchrus ciliaris*	5
Rhynchosia minima	<2
Dicliptera armata	<2
Tinospora smilacina	<2
Flueggea virosa	<2
*Scaevola spinescens (*broad form)	<2
Acacia colei	<2
Chrysopogon fallax	<2
Threlkeldia diffusa	<2
Triumfetta appendiculata	<2
Dichrostahys spicata	<2

* denotes weed species
? denotes unconfirmed ID

Site: 22
Type: 30 x 50 Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 474456 **Northing:** 7716570

Habitat/Landform: Valley floor
Soil: Grey brown silts, moderate stony mantle
Rock type:
Vegetation: *Corymbia hamersleyana* open to low woodland over *Acacia coriacea/ DIchrostachys spicata tall* shrubland, over *T. angusta* hummock grassland and patchy **Cenchrus ciliaris* tussock grassland..
Veg Condition: Good
Fire Age: <10 yr

Species List

Name	Cover (%)
Acacia bivenosa	<2
Acacia coriacea	5
Corymbia hamersleyana	15
Corchorus walcottii	<2
Dichrostachys spicata	2
Grevillea pyramidalis	<2
Indigofera monophylla	<2
Scaevola spinescens	<2
Solanum cleistogamum	<2
Triodia angusta	60
Triodia epactia	10
**Cenchrus ciliaris*	5-10

* denotes weed species

Site: 23a
Type: 25 x 75 Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 474065 **Northing:** 7716467

Habitat/Landform: Valley floor
Soil: Grey brown silts, moderate stony mantle
Rock type:
Vegetation: *Eucalyptus victrix* open woodland over *Terminalia circumalata* over *Dichrostachys spicata, Acacia coriacea, Alectryon oleifolius* mixed shrubland over *Triodia epactia* hummock grassland with patchy *T. angusta.*
Veg Condition: Very good
Fire Age: 5-10 yr

Species List

Name	Cover (%)
Acacia coriacea	5
Cymbopogon ambiguus	<2
Dichrostachys spicata	5
Eriachne tenuiculmis	1
Eucalyptus victrix	2
Rhagodia eremaea	<2
Terminalia circumalata	<2
Triodia angusta	20
Triodia epactia	30
**Cenchrus ciliaris*	5-15

* denotes weed species

Site: 23b
Type: 50 x 20 Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472867 **Northing:** 7715663

Habitat/Landform: Very shallow drainage zone associated with larger drainage area.
Soil: Grey brown alluvial silts
Rock type:
Vegetation: *Dichrostachys spicata, Acacia inaequilatera,* tall shrubland over *Acacia coriacea* over *Scaevola spinescens* shrubland over *Triodia epactia* hummock grassland.

Veg Condition: Excellent
Fire Age: 5-10 yr

Species List

Name	Cover (%)
Acacia coriacea	10
Acacia inaequilatera	15
Alectryon oleifolius subsp. oleifolius	<2
Brachychiton acuminatus	<2
Clerodendrum tomentosum	<2
Dichrostachys spicata	10
Grevillea pyramidalis	<2
Scaevola spinescens	5
Solanum cleistogamum	<2
Triodia epactia	40
**Cenchrus ciliaris*	5

* denotes weed species

Site: 24
Type: 50 x 50 Releve
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 473658 **Northing:** 77715970

Habitat/Landform: Low hill slopes with stony, rocky mantle
Soil: Red brown silts
Rock type:
Vegetation: *Triodia epactia* hummock grassland

Vegetation Condition: Very good

Fire Age: 5 -10 yrs

Species List

Name	Cover (%)
Abutilon lepidum	<2
Boerhavia coccinea	<2
Corchorus walcottii	<2
Crotalaria novae-hollandiae	<2
Euphorbia australis	<2
Gomphrena cunninghamii	<2
Grevillea pyramidalis	<2
Hakea lorea subsp. lorea	<2
Indigofera linifolia	<2
Paspalidium clementii	<2
Rhynchosia minima	<2
Senna artemisioides subsp. oligophylla	<2
Trachymene oleracea	<2
Triodia epactia	50
Triumfetta appendiculata	<2
Triumfetta clementii	<2

* denotes weed species

Site: 26
Type: 40x 60 Releve
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472827 **Northing:** 7715528

Habitat/Landform: Low rocky hills and ridges with drainage areas between dense boulder and rocks and scattered stones.
Soil: Red brown silts with pied brown alluvium in drainage areas.
Rock type: Outcropping rockpiles
Vegetation: Mixed *Acacia inaequilatera* tall open shrubland with *Grevillea pyramidalis, Ipomea costata, Acacia orthocarpa* over *Triodia epactia* hummock grassland with patchy *Themeda triandra* and with low trees of *Brachychiton acuminatus, Terminalia supranitifolia* on small outcropping rocks.

Vegetation Condition: Excellent

Fire Age: <10 yr
Species List

Name	Cover (%)
Acacia inaequilatera	2
Acacia orthocarpa	2-5
Bergia perennis	<2
Brachychiton acuminatus	<2
Cajanus cinereus	2
Corchorus walcottii	<2
Crotalaria medicaginea	<2
Evolvulus alsinoides var. villosicalyx	<2
Gomphrena cunninghamii	<2
Grevillea pyramidalis	<2
Indigofera monophylla	<2
Ipomoea costata	2
Oldenlandia crouchiana	<2
Scaevola spinescens	<2
Senna glutinosa subsp. *pruinosa*	<2
Solanum diversiflorum	<2
Stemodia grossa	<2
Streptoglossa decurrens	<2
Tephrosia supina	<2
Terminalia supranitifolia (P3)	5
Themeda triandra	5-15
Tinospora smilacina	<2
Trachymene oleracea	<2
Trichodesma zeylanicum	<2
Triodia epactia	60
Triumfetta appendiculata	<2
Triumfetta clementii	<2
**Cenchrus ciliaris*	2-5

Site: 27a
Type: 50 x 50 Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 473042 **Northing:** 7715595

Habitat/Landform: High rockpile ridge
Soil: Very scarce skeletal red silts in packets
Rock type: large block red - brown
Vegetation: *Terminalia supranitifolia* low open woodland with *Ipomoea costata Acacia coriacea, Dichrostachys spicata, Grevillea pyramidalis, Flueggea virosa* open mixed shrubland over scattered *Triodia epactia* hummocks and *Cymobopogon ambiguous* tussocks and **Cenchrus ciliaris*.. Scattered *Brachychiton acuminatus* trees PEC.
Veg Condition: Excellent
Fire Age:>10 yrs

Species List

Name	Cover (%)
Terminalia supranitifolia	2-10
Brachychiton acuminatus	<2-2
Ipomoea costata	2
Dichrostachys spicata	2
Greillea pyramidalis	<2-2
**Cenchrus ciliaris*	2-5
Triodia epactia	2-5
Cymbopogon ambiguus	2
Jasminum didymium subsp *lineare*	<2
Ptilotus obovatus	<2
Cleome viscosa	<2
Ehretia saligna	<2
Clerodendrum tomentosa	<2
Acacia coriacea	<2
Enchychleana tomentose	<2
Scaevola spinescens	<2
Gomphrena cunninghamii	<2
Cynanchum viminale australe	<2
Pittosporum phillyreoides	<2
Alectryon oleifolius	<2
Paspalidium tabulatum	<2
Rhagodia eremea	<2
Senna oligophylla	<2
Polygala insingii	<2

* denotes weed species
? denotes unconfirmed ID

Site: 27b
Type: 50 x 50 Relevé
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 473042 **Northing:** 7715595

Habitat/Landform: Boulder strewn upper hill sloe and crest with numerous small rockpiles
Soil: Skeletal red-brown and pinky silts
Rock type: medium to large red-brown and grey boulders and small rockpiles
Vegetation : *Brachychiton acuminatua* open low woodland with *Erythrina vespertilio* over *Ipomoea costata* and *Acacia coriacea* open shrubland over *Triodia epactia* hummock grassland patchy *Themeda triandra,* and mixed herbland PEC.
Veg Condition: Excellent
Fire Age: >10 years

Species List

Name	Cover (%)
Brachychiton acuminatus	5-15
Erythrina vespertilio	2
Triodia epactia	50
Themeda triandra	5-10
Ehretia saligna	2
Ipomoea cosatat	2
Dichrostachys spicata	<2-2
Acacia coriacea	<2-2
Streptoglossa decurrens	<2
Trachymene oleraceae	<2
**Cenchrus ciliaris*	<2
Abutilon lepidum	<2
Ptilotus fusiformis	<2
Grevillea pyramidalis	<2
Acacia pyrifolia var morrisonii	<2
Triumfetta clementii	<2
Indigofera linnaei	<2
Bonamia media	<2
Vigna lanceolate	<2
Hybanthus aurantiacus	<2
Euphorbia coghlanii	<2
Bulbostylis barbata	<2
Gomphrena cunninghamii	<2
Commelina ensifolia	<2
Phyllanthus maderaspatensis	<2
Crotalaria medicagineae	<2
Cucumis variabilis	<2
Triumfetta appendiculata	<2
Vittadina	<2
Cleome viscosa	<2
Fluggea virosa	<2
Portulaca filiformis / pilosa	<2

Name	Cover (%)
Cymbopogon ambiguous	<2
Evolvulus alsinoides villosicalyx	<2
Tinospora smilacina	<2
Terminalia supranitifolia	<2
Solanum cleistogamum	<2

* denotes weed species

? denotes unconfirmed ID

Site: 28
Type: 50x 15 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472580 **Northing:** 7715378

Habitat/Landform: Shallow narrow drainage line between hillslopes with moderate boulders and stony mantle.
Soil: Brown silts
Rock type:
Vegetation: *Terminalia supranitifolia* low open woodland over *Ipomoea costata, Acacia coriacea, Dichrostachys spicata,* mixed shrubland over scattered to open *Triodia epactia* hummock grass. Scattered *Brachychiton acuminatus*

Vegetation Condition: Excellent

Fire Age: >10 yr
Species List

Name	Cover (%)
Abutilon cunninghamii	<2
Abutilon lepidum	<2
Acacia coriaceae	5
Acacia pyrifolia var. morrisonii	<2
Bonamia media	<2
Brachychiton acuminatus	2
Cucumis variabilis	<2
Cymbopogon ambiguus	<2
Dichrostachys spicata	<2
Eriachne obtusa	<2
Flueggea virosa subsp. melanthesoides	<2
Goodenia lamprosperma	<2
Grevillea pyramidalis	<2
Ipomoea costata	<2
Phyllanthus maderaspatensis	<2
Scaevola spinescens	<2
Terminalia supranitifolia (P3)	15
Tinospora smilacina	<2
Triodia epactia	40
Triumfetta appendiculata	<2
**Cenchrus ciliaris*	<2-5

* denotes weed species

Site: 29
Type: 50x 50 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472550 **Northing:** 7715308

Habitat/Landform: Gentle hill slope with boulders and rocks
Soil: Skeletal red brown silts
Rock type:
Vegetation: Mixed *Hakea lorea* subsp *lorea, Ipomoea costata, Grevilla pryamidalis* shrubland over *Triodia epactia* hummock grassland with scattered *Brachychiton acuminatus, Terminalia supranitifolia, Dichrostachys spicata* on small rock outcrops.

Vegetation Condition: Excellent

Fire Age: >10 yr
Species List

Name	Cover (%)
Acacia bivenosa	<2
Acacia inaequilater	<2
Acacia pyrifolia var. morrisonii	<2
Brachychiton acuminatus	<2
Corchorus walcottii	<2
Cucumis variabilis	<2
Dichrostachys spicata	<2
Euphorbia tannensis	<2
Goodenia lamprosperma	<2
Grevillea pyramidalis	2
Hakea lorea subsp. lorea	2-5
Hybanthus aurantiacus	<2
Indigofera monophylla	<2
Ipomoea costata	2
Scaevola spinescens	<2
Solanum cleistogamum	<2
Solanum diversiflorum	<2
Terminalia supranitifolia (P3)	??
Tinospora smilacina	<2
Trachymene oleracea	<2
Triodia epactia	50

* denotes weed species

Site: 30
Type: 50x 50 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472792 **Northing:** 7715346

Habitat/Landform: High slopes and crests, boulders strewn with numerous small rock outcrops
Soil: Skeletal red brown silts
Rock type:
Vegetation: *Terminalia supranitifolia* low open woodland over *Ipomoea costata, Acacia coriacea, Grevillea pyramidalis* tall shrubland over scattered to open *Triodia epactia* hummock grassland sometimes *Themeda triandra*

Vegetation Condition: Excellent

Fire Age: >10 yr
Species List

Name	Cover (%)
Abutilon cunninghamii	<2
Abutilon lepidum	<2
Acacia coriacea	<2
Brachychiton acuminatus	<2-2
Cajanus cinerea	<2
Dichrostachys spicata	<2
Euphorbia coghlanii	<2
Evolvulus alsinoides var. villosicalyx	<2
Gomphrena cunninghamii	<2
Grevillea pyramidalis	<2
Ipomoea costata	2-10
Paspalidium tabulatum	<2
Portulaca pilosa	<2
Ptilotus fusiformis	<2
Tephrosia supina	<2
Terminalia supranitifolia (P3)	2-5
Themeda triandra	5-10
Tinospora smilacina	<2
Trachymene oleracea	<2
Trichodesma zeylanicum	<2
Triumfetta appendiculata	<2
Triodia epactia	55-60
Vigna triodiophila (P3)	<2
**Cenchrus ciliaris*	<2

* denotes weed species

Site: 32
Type: 50 x 50
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472372 **Northing:** 7714714

Habitat/Landform: Narrow shallow valley between hillslopes with rock and stony mantle.
Soil: Red-brown silty loams with stony mantle.
Rock type: Red-brown medium to large scattered rocks.
Vegetation: *Grevillea pyramidalis* tall woodland over mixed *Triodia epactia* and *Triodia angusta* hummock grassland.
Veg Condition: Excellent
Fire Age: >10 yrs

Species List

Name	Cover (%)
Triodia epactia	50
Triodia angusta	20
Grevillea pyramidalis	15
Corymbia hamersleyana	<2
Acacia bivenosa	<2
Abutilon lepidum	<2
Corchorus walcottii	<2
Acacia inaequilatera	<2
Trichodesma zeylanicum	<2
Solanum phlomoides	<2
Triumfetta appendiculata	<2
Acacia orthocarpa	<2
Bonamia media	<2
Ipomoea costata	<2

* denotes weed species

Site: 33
Type: 50 x 50
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 471665 **Northing:** 7713038

Habitat/Landform: Broad flat plain with fine red pindan sand (unusual for this area)
Soil: Red-brown silty sands..
Rock type: N/A
Vegetation: *Grevillea pyramidalis, Acacia inaequilatera, Ehretia saligna* tall shrubland over *Scaevola spinescens, Solanum phlomoides, Indigofera monophylla* open low shrubland over *Triodia epactia* hummock grassland with patches of **Cenchrus ciliaris*
Veg Condition: Good
Fire Age: >10 yrs

Species List

Name	Cover (%)
Acacia inaequilatera	10-15
Grevillea pyramidalis	10-15
Ehretia saligna	10
Santalum lanceolatum	5-10
Triodia epactia	45
Solanum phlomoides	2
Indigofera monophylla	2
Scaevola spinescens	2
Ptilotus polystachys	2
Diplopeltis eriocarpa	<2
Trianthema pilosa	<2
Trigastrotheca molluginae	<2
Tinospora smilacina	<2
Solanum clementii	<2
Cucumis variabilis	<2
Euphorbia tannensis	<2
Trichodesma zeylanicum	<2
Sida fibulifera	<2
Eragrostis eriopoda	<2
Rhagodia eremaea	<2
Crotalaria cunninghamii	<2
Hibiscus coatesii	<2
Pterocaulon sphaeranthoides	<2
Swainsonia formosa	<2
Cynanchum floribundum	<2

* denotes weed species
? denotes unconfirmed ID

Site: 34a
Type: 50 x 50 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 471620 **Northing:** 7713292

Habitat/Landform: Hillslopes and upper slopes with dense rock and boulders.
Soil: Red/brown silts with frequent small to large rockpiles.
Rock type:
Vegetation: *Grevillea pyramidalis, Ipomoea costata* tall open shrubland over *Triodia epactia* hummock grassland with scattered *Terminalia circumalata, Brachychiton acuminatus, Erythrina vespertilio* on frequent rockpiles and outcrops
Vegetation Condition: Excellent

Fire Age: >15
Species List

Name	Cover (%)
Abutilon lepidum	<2
Acacia pyrifolia var. morrisonii	<2
Brachychiton acuminatus	2
Cleome viscosa	<2
Clerodendrum tomentosum	<2
Crotalaria medicaginea	10
Crotalaria novae-hollandiae	<2
Cucumis variabilis	<2
Cymbopogon ambiguus	<2
Grevillea pyramidalis	2
Hybanthus aurantiacus	<2
Ipomoea costata	2
Phyllanthus maderaspatensis	<2
Ptilotus fusiformis	<2
Scaevola spinescens	<2
Solanum cleistogamum	<2
Streptoglossa decurrens	<2
Terminalia circumalata	<2
Trachymene oleracea	<2
Triodia epactia	70
Triumfetta appendiculata	<2
Triumfetta clementii	<2
Trichodesma zeylanicum	<2
Vigna triodiophila (P4)	<2
**Cenchrus ciliaris*	5

Site: 34b
Type: 50 x 50 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 471994 **Northing:** 7713743

Habitat/Landform: Hillslopes and upper slopes with dense rock and boulders.
Soil: Red/brown silts with frequent small to large rockpiles.
Rock type:
Vegetation: *Grevillea pyramidalis, Ipomoea costata* tall open shrubland over *Triodia epactia* hummock grassland with scattered *Terminalia circumalata, Brachychiton acuminatus, Erythrina vespertilio* on frequent rockpiles and outcrops
Vegetation Condition: Excellent

Fire Age: >15
Species List

Name	Cover (%)
Acacia pyrifolia var. morrisonii	<2
Brachychiton acuminatus	2
Cucumis variabilis	<2
Erythrina vespertilio	2
Gomphrena cunninghamii	<2
Grevillea pyramidalis	2-5
Hakea lorea subsp. lorea	2
Hybanthus aurantiacus	<2
Ipomoea costata	2-5
Ptilotus fusiformis	<2
Trachymene oleracea	<2
Trichodesma zeylanicum	<2
Triodia epactia	65
Vigna lanceolata	<2
**Cenchrus ciliaris*	<2

Site: 35
Type: Vegetation Patch
Date: 04/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 471610 **Northing:** 7713428

Habitat/Landform: Rockpiles – small and larger ridges on upper slopes
Soil: Skeletal silts
Rock type: Outcropping rockpiles
Vegetation: *Brachychiton acuminatus* mixed low woodland with *Ehretia saligna, Erythrina vespertilio, Terminalia circumalata* over *Ipomoea costata, Clerodendrum tomentosum* open shrubland over *Triodia epactia* hummock grassland. Scattered **Cenchrus ciliaris and Cymbopogon ambiguus.*
Vegetation Condition: Very good -Excellent

Fire Age: >15
Species List

Name	Cover (%)
Acacia coriaceae	1
Brachychiton acuminatus	2-5
Clerodendrum tomentosum	<2
Cymbopogon ambiguus	<2
Ehretia saligna	2-5
Erythrina vespertilio	2
Flueggea virosa subsp. melanthesoides	2
Jasminum didymum subsp. *lineare*	<2
Ipomoea costata	<2
Plumbago zeylanica	<2
Rhynchosia bungarensis (P4)	<2
Terminalia circumalata	<2-5
Triodia epactia	<2
**Cenchrus ciliaris*	<2

* denotes weed species

Site: 36
Type: 50 x 50 Releve
Date: 03/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 475813 **Northing:** 7718060

Habitat/Landform: Disturbed plain with "borrow pit"
Soil: Pindan sand
Rock type:
Vegetation: *Acacia bivenosa* and *Acacia ancistrocarpa* open tall shrubland over *Acacia stellaticeps, Scaevola spinescens, Diplopeltis eriocarpa* over mixed *Triodia epactia* hummock grassland and **Cenchrus ciliaris* tussock grassland.
Vegetation Condition: Good

Fire Age: 0-5 yrs

Species List

Name	Cover (%)
Acacia ancistrocarpa	5
Acacia bivenosa	2-5
Acacia colei	<2
Acacia inaequilatera	<2
Acacia stellaticeps	<2
Corymbia hamersleyana	<2
Diplopeltis eriocarpa	<2
Grevillea pyramidalis	<2
Scaevola spinescens	<2
Senna oligoclada	<2
Trianthema pilosa	<2
Trigastrotheca molluginea	
Triodia epactia	30
**Cenchrus ciliaris*	20

* denotes weed species

Site: 37
Type: 50 x 50 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472212 **Northing:** 7713254

Habitat/Landform: Plain
Soil: Pink brown alluvial silts, very scattered stones
Rock type:
Vegetation: *Corymbia hamersleyana* open to low woodland over *Acacia coriacea* open shrubland, over mixed *Triodia epactia* hummock grassland and **Cenchrus ciliaris* tussock grassland. There is patchy low woodland of *Dolichandrone heterophylla.*
Vegetation Condition: Poor

Fire Age: >15
Species List

Name	Cover (%)
Acacia coriaceae	5
Acacia inaequilatera	<2
Acacia pyrifolia var. morrisonii	<2
Corymbia hamersleyana	30
Cucumis variabilis	<2
Dolichandrone heterophylla	<2-20
Ehretia saligna	<2
Erythrina vespertilio	<2
Evolvulus alsinoides var. villosicalyx	<2
Grevillea pyramidalis	<2
Hybanthus aurantiacus	<2
Scaevola spinescens	<2
Senna artemisioides subsp. oligophylla	<2
Tephrosia supina	<2
Triodia epactia	25
**Cenchrus ciliaris*	25

* denotes weed species

Site: 38
Type: 50 x 50 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472271 **Northing:** 7712979

Habitat/Landform: Flats between hillslopes and causeway.
Soil: Red pindan sand plain
Rock type:
Vegetation: *Acacia bivenosa* with *Dolichandrone heterophylla* tall shrubland over *Diplopeltis eriocarpa* open, low shrubland over *Triodia. epactia* hummock grassland

Vegetation Condition: Excellent

Fire Age: >15
Species List

Name	Cover (%)
Acacia bivenosa	15
Acacia coriaceae	<2
Acacia stellaticeps	<2
Diplopeltis eriocarpa	2-15
Dolichandrone heterophylla	<2-20
Eragrostis eriopoda	<2
Grevillea pyramidalis	<2
Hibiscus coatesii	<2
Indigofera monophylla	<2
Triodia angusta	10
Triodia epactia	40
**Cenchrus ciliaris*	<2

* denotes weed species

Site: 39
Type: 50 x 50 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472324 **Northing:** 7712818

Habitat/Landform: Silt plain.
Soil: Grey/brown Alluvial
Rock type:
Vegetation: *Acacia bivenosa* with *Dolichandrone heterophylla* tall shrubland over *Acacia stellaticeps* shrubland over *Diplopeltis eriocarpa* low shrubland over *Triodia angusta* or *T. epactia* hummock grassland to closed hummock grassland with patchy *Eriachne obtusa.*
Vegetation Condition: Excellent

Fire Age: >15 yrs
Species List

Name	Cover (%)
Acacia bivenosa	10
Acacia coriaceae	<2
Acacia stellaticeps	10-20
Chrysopogon fallax	2
Diplopeltis eriocarpa	10
Dolichandrone heterophylla	<2
Eriachne obtusa	<2-2
Hakea lorea subsp. lorea	<2
Paraneurachne muelleri	<2
Triodia angusta	60
Triodia epactia	15

Site: 40
Type: 30 x 30 Releve
Date: 05/06/2019 **Described by:** VL
MGA Zone: 50 **Easting:** 472429 **Northing:** 7712267

Habitat/Landform: Slightly raised sand chenier bordering saline tidal inlet
Soil: Greyish pink sands
Rock type:
Vegetation: *Triodia angusta* hummock grassland
Vegetation Condition: Excellent

Fire Age: >15 yrs
Species List

Name	Cover (%)
Triodia angusta	60
Trainthema turgidifolia	<2
Neobassia astrocarpa	<2
Indigofera ? trita	<2

Southern Survey Area
Field Data Sheets

Vegetation at inspection points – Southern Section

Site No	1
GPS Co-Ordinates (Easting Northing)	474247 77708172
Vegetation Description	*Acacia bivenosa, A. synchronicia, A. coriacea* open or scattered mixed shrubland over mosaic *Triodia epactia* hummock and *Eragrostis xerophila* tussock grassland.
Habitat and Soils	Flat plain with mosaiced red brown non cracking clays and red shallow loams with scattered pebble mantle.
Vegetation Condition	Very good
PEC Potential	Not present

Site No	2
GPS Co-Ordinates (Easting Northing)	474182 7707982
Vegetation Description	*Acacia coriacea* tall open shrubland or scattered shrubs with occasional **Vachellia farnesiana* over *Stemodia grossa* closed low shrubland over **Cenchrus ciliaris* open tussock grassland..
Habitat and Soils	Previously disturbed low area with red-brown silty loams and rubble.
Vegetation Condition	Poor
PEC Potential	Not present

Site No	3
GPS Co-Ordinates (Easting Northing)	473866 7707290
Vegetation Description	*Triodia epactia* hummock grassland. There can be scattered *Acacia bivenosa, A. coriacea, A. xiphophylla, Ehretia saligna.*
Habitat and Soils	Flat plain with red brown sand loams with scattered to moderate stones.
Vegetation Condition	Very good
PEC Potential	Not present

Site No	4
GPS Co-Ordinates (Easting Northing)	473829 7707249
Vegetation Description	*Acacia inaequilatera* tall shrubland with some *Ehretia saligna, Acacia bivenosa* over *Triodia epactia* hummock grassland, patchy *Eragrostis xerophila.*
Habitat and Soils	On flat or very gently sloping plains with calcareous red brown loams, scattered to moderate dark brown and quartz pebbles.
Vegetation Condition	Very good
PEC Potential	Not present

Site No	5
GPS Co-Ordinates (Easting Northing)	473733 7707076
Vegetation Description	*Acacia bivenosa* shrubland to open shrubland with scattered *A. inaequilatera, A coriacea, A. ancistrocarpa, Eremophila longifolia* over *Triodia wiseana* hummock grassland. There can be patchy *T. epactia a*nd patches of **Cenchrus ciliiaris* on track verges.
Habitat and Soils	On flat or very gently sloping plains with non-gilgaied red brown non cracking clays with scattered dark brown and quartz pebbles.
Vegetation Condition	Very good
PEC Potential	Not present

Site No	6
GPS Co-Ordinates (Easting Northing)	473702 7706857
Vegetation Description	*Tamarix aphylla* (WoNS Species) low open woodland over *Tecticornia* species open low shrubland with **Aerva javanica* over open **Cenchrus ciliaris* tussock grassland.
Habitat and Soils	Previously disturbed site which has been borrowed and now retains semi saline water – pinky brown disturbed soils and rubble
Vegetation Condition	Degraded
PEC Potential	Not present
NOTE	**MUST remove Tamarisk before any clearing.**

Site No	7
GPS Co-Ordinates (Easting Northing)	473583 7706475
Vegetation Description	*Tecticornia haloocnemoides* subsp *tenuis, Tecticornia* ? *indica* closed low shrubland. Samphire surrounded by vegetation site 6
Habitat and Soils	Potentially previously disturbed site now with brown semi saline clays
Vegetation Condition	Good
PEC Potential	Not present

Site No	8
GPS Co-Ordinates (Easting Northing)	473352 7706250
Vegetation Description	*Acacia bivenosa* closed to shrubland over **Cenchrus ciliaris, *Cenchrus setiger* tussock grassland. There can be patchy *Eragrostis xerophila, Triodia wiseana, T. epactia.*
Habitat and Soils	Occurs on disturbed or in close proximity to disturbed areas on silty loams with varying stones and pebbles.
Vegetation Condition	Poor
PEC Potential	Not present

Site No	9
GPS Co-Ordinates (Easting Northing)	473235 7705871
Vegetation Description	**Ex spp** *Eragrostis xerophila* tussock grassland with dormant ? *Sorghum plumosum, Panicum sp,* and intrusions of ?*Eriachne benthamii* on low areas.
Habitat and Soils	Occurs on flat plain with deep red brown weakly to moderate cracking clays
Vegetation Condition	Ver good
PEC Potential	Likely

Site No	10a
GPS Co-Ordinates (Easting Northing)	742792 7705126
Vegetation Description	*Acacia bivenosa* shrubland to open shrubland with scattered *A. inaequilatera, A coriacea, A. ancistrocarpa, Eremophila longifolia, Scaevola spinescens* (broad form) over *Triodia wiseana* hummock grassland. Occasional *T. epactia*
Habitat and Soils	On flat or very gently sloping plains with non-gilgaied red brown non cracking clays with scattered dark brown and quartz pebbles. Small scalds
Vegetation Condition	Excellent
PEC Potential	Unlkely

Site No	10b
GPS Co-Ordinates (Easting Northing)	471453 7703712
Vegetation Description	*Acacia bivenosa* shrubland to open shrubland with scattered *A. inaequilatera, A coriacea, A. ancistrocarpa, Eremophila longifolia,* over *Triodia wiseana* hummock grassland. Patches of **Cenchrus ciliiaris* around large scald areas.
Habitat and Soils	On flat or very gently sloping plains with non-gilgaied red brown non cracking clays with scattered dark brown and quartz pebbles. There are areas of scald.
Vegetation Condition	Very good
PEC Potential	Not present

Site No	11
GPS Co-Ordinates (Easting Northing)	472621 7704929
Vegetation Description	*Acacia inaequilatera* tall open shrubland, or scattered shrubs, with scattered *A. synchronicia, Hakea lorea* shrubs over *Triodia wiseana* hummock grassland.
Habitat and Soils	On flat plain with pinky brown calcareous shallow loams with moderate to abundant calcrete and quartz stone and pebbles
Vegetation Condition	Excellent
PEC Potential	Not present

Site No	12
GPS Co-Ordinates (Easting Northing)	472288 7704369
Vegetation Description	*Acacia inaequilatera* tall open shrubland, or scattered shrubs occasional *A. synchronicia, A. coriacea, Hakea lorea* sometimes over *Acacia bivenosa* open shrubs over *Triodia wiseana* hummock grassland.
Habitat and Soils	On flat plain with pinky brown calcareous shallow loams with moderate to abundant calcrete and quartz stone and pebbles.
Vegetation Condition	Excellent
PEC Potential	Not present

Site No	13
GPS Co-Ordinates (Easting Northing)	471962 7703948
Vegetation Description	**Cenchrus ciliaris* tussock grassland with scattered shrubs of *Acacia bivenosa, A. inaequilatera.*
Habitat and Soils	Occurs on a disturbed site which has been disturbed with tracks, potential laydown areas, has been compacted and had imported soils and gravels.
Vegetation Condition	Degraded
PEC Potential	Not present

Site No	14a
GPS Co-Ordinates (Easting Northing)	471727 7703738
Vegetation Description	*Acacia coriacea* tall shrubland to open tall shrubland over *Acacia ampliceps* or **Vachellia farnesiana* shrubland over mixed **Cenchrus ciliaris* tussock with *Triodia epactia* scattered grasses.
Habitat and Soils	Occurs on narrow drainage line with incised channel, red brown alluvial loams with scattered stones.
Vegetation Condition	Good
PEC Potential	Not present

Site No	14b
GPS Co-Ordinates (Easting Northing)	471575 7703837
Vegetation Description	**AaAcC?v** *Acacia ampliceps* tall shrubland to closed shrubland with *Acacia coriacea* over *Myoporum montanum* shrubland with occasional *Stemodia grossa* over *Cyperus* sp and *Typha sp* (dead) sedgeland
Habitat and Soils	Occurs around an artificially created pool in drainage line. Disturbed alluvial loam
Vegetation Condition	Poor
PEC Potential	Not present

Site No	15
GPS Co-Ordinates (Easting Northing)	469491 7701837
Vegetation Description	*Triodia wiseana* hummock and *Eragrostis xerophila* tussock mosaiced grassland
Habitat and Soils	Occurs on mosaic gilgai or non-gilgai red brown clays and stony silty loams.
Vegetation Condition	Very good
PEC Potential	Areas of gilgai may contain PEC

Site No	16
GPS Co-Ordinates (Easting Northing)	469234 7701715
Vegetation Description	*Acacia inaequilatera* open shrubland, occasional *A. coriacea* over *Triodia wiseana* closed hummock grassland.
Habitat and Soils	Occurs in shallow drainage area with red brown alluvial loam
Vegetation Condition	Excellent
PEC Potential	Not present

Site No	17
GPS Co-Ordinates (Easting Northing)	458990 7701507
Vegetation Description	*Eragrostis xerophila* tussock grassland with dormant/dead tussock grasses with intrusions of ?*Eriachne benthamii* on low areas.
Habitat and Soils	Occurs on flat plain with deep red brown weakly to moderate cracking clays.
Vegetation Condition	Very good
PEC Potential	Likely

Site No	18
GPS Co-Ordinates (Easting Northing)	468732 7701257
Vegetation Description	*Acacia coriacea* with tall shrubland over scattered *Acacia inaequilatera, A. ancistrocarpa* shrubs over ? *Themeda triandra* (dead / dormant) ? with some **Cenchrus ciliaris* (dead)tussock grassland.
Habitat and Soils	Occurs on minor shallow drainage line with red brown loams and calcrete fragments. Some erosion evident.
Vegetation Condition	Good
PEC Potential	Not present

Site No	19
GPS Co-Ordinates (Easting Northing)	467854 7699492
Vegetation Description	*Acacia coriacea* with *A. xiphophylla* low (old) woodland over scattered **Vachellia farnesiana* shrubs over *?Themeda triandra* and **Cenchrus ciliaris* tussock grassland.
Habitat and Soils	Occurs on broad major drainage channel shallowly incised in landscape with red brown clay loams, sometimes skeletal over granite
Vegetation Condition	Very good
PEC Potential	Not present but rarely occurring old large trees should be conserved.

Site No	20
GPS Co-Ordinates (Easting Northing)	467738 7699031
Vegetation Description	*Acacia coriacea / A.inaequilatera,* tall mixed shrubland over **Vachellia farnesiana* open shrubs over mixed open tussock grassland (too dead to id) and scattered *Triodia wisena* hummocks
Habitat and Soils	Occurs on broad drainage line, with incised channel, with red-brown loamy soils.
Vegetation Condition	Poor to Good
PEC Potential	Not present

Site No	21
GPS Co-Ordinates (Easting Northing)	467899 7698966
Vegetation Description	*Eragrostis xerophila* tussock grassland. There are scattered **Vachellia farnesiana* shrubs.
Habitat and Soils	Occurs on flat alluvial plain with deep red brown weakly cracking clays
Vegetation Condition	Good
PEC Potential	Potential

Site No	22
GPS Co-Ordinates (Easting Northing)	466718 7698637
Vegetation Description	*Triodia wiseana* hummock grassland.
Habitat and Soils	Occurs on flat plain with red brown sandy loams with scattered to moderate stones.
Vegetation Condition	Excellent
PEC Potential	Not present

Site No	23
GPS Co-Ordinates (Easting Northing)	466837 7698673
Vegetation Description	*Eragrostis xerophila* tussock grassland.
Habitat and Soils	Occurs on flat alluvial plain with deep red brown weakly cracking clays.
Vegetation Condition	Good
PEC Potential	Potential

Site No	24
GPS Co-Ordinates (Easting Northing)	466988 7698748
Vegetation Description	**Vachellia farnesiana* shrubland to closed shrubland over **Cenchrus ciliaris* tussock grassland
Habitat and Soils	Minor shallow drainage line on very gently inclined plain with weakly cracking red brown clay loam
Vegetation Condition	Poor
PEC Potential	Not present

Site No	25
GPS Co-Ordinates (Easting Northing)	465846 7698276
Vegetation Description	*Senna hamersleyensis* low shrubland (senescing?) over scattered *Eragrostis xerophila* tussocks
Habitat and Soils	Occurs on very gently inclined plain with soft spongy red brown clay loam.
Vegetation Condition	Poor
PEC Potential	Not present

Site No	26
GPS Co-Ordinates (Easting Northing)	467049 7696417
Vegetation Description	*Acacia xiphophylla* scattered to open shrubland over *Eragrostis xerophila* open tussock grassland.
Habitat and Soils	Occurs on gently inclined plain, mosaiced surfaces of weakly cracking and non-cracking clays, silty clay loams with areas of gibber on sandier surfaces
Vegetation Condition	Good
PEC Potential	Unlikely

Site No	27
GPS Co-Ordinates (Easting Northing)	469082 7696983
Vegetation Description	*Corymbia hamersleyana* scattered to open low woodland over *Acacia coriacea, *Vachellia farnesiana* open shrubland to shrubland over *Triodia angusta/T. epactia/*Cenchrus ciliaris* mixed grassland.
Habitat and Soils	Occurs on broad shallow drainage line with red brown silty loams, scattered to moderate stones.
Vegetation Condition	Good
PEC Potential	Not present

Site No	28a
GPS Co-Ordinates (Easting Northing)	469132 7696866
Vegetation Description	*Triodia wiseana* hummock grassland. Sometimes scattered *Acacia inaequilatera, A. coriacea, A pyrifolia, A. bivenosa.*
Habitat and Soils	Occurs on flat plain with red brown sandy loams with scattered to moderate stones.
Vegetation Condition	Excellent
PEC Potential	Not present

Site No	28b
GPS Co-Ordinates (Easting Northing)	469249 7696892
Vegetation Description	*Acacia inaequilatera* tall open shrubland, or scattered shrubs occasional *A. synchronicia, A. coriacea, Hakea lorea* sometimes over *Acacia bivenosa* open shrubs over *Triodia wiseana* hummock grassland.
Habitat and Soils	On flat plain with pinky brown calcareous shallow loams with moderate to abundant calcrete and quartz stone and pebbles
Vegetation Condition	Excellent
PEC Potential	Not present

Site No	29
GPS Co-Ordinates (Easting Northing)	465720 7697828
Vegetation Description	*Eriachne benthamii, ?Chrysopogon fallax* tussock grassland with other annual grass species (all too dead/dormant to identify). Scattered **Vachellia farnesiana*
Habitat and Soils	Very shallow drainage line with red brown soft weakly gilgai light clays
Vegetation Condition	Good
PEC Potential	May form part of PEC

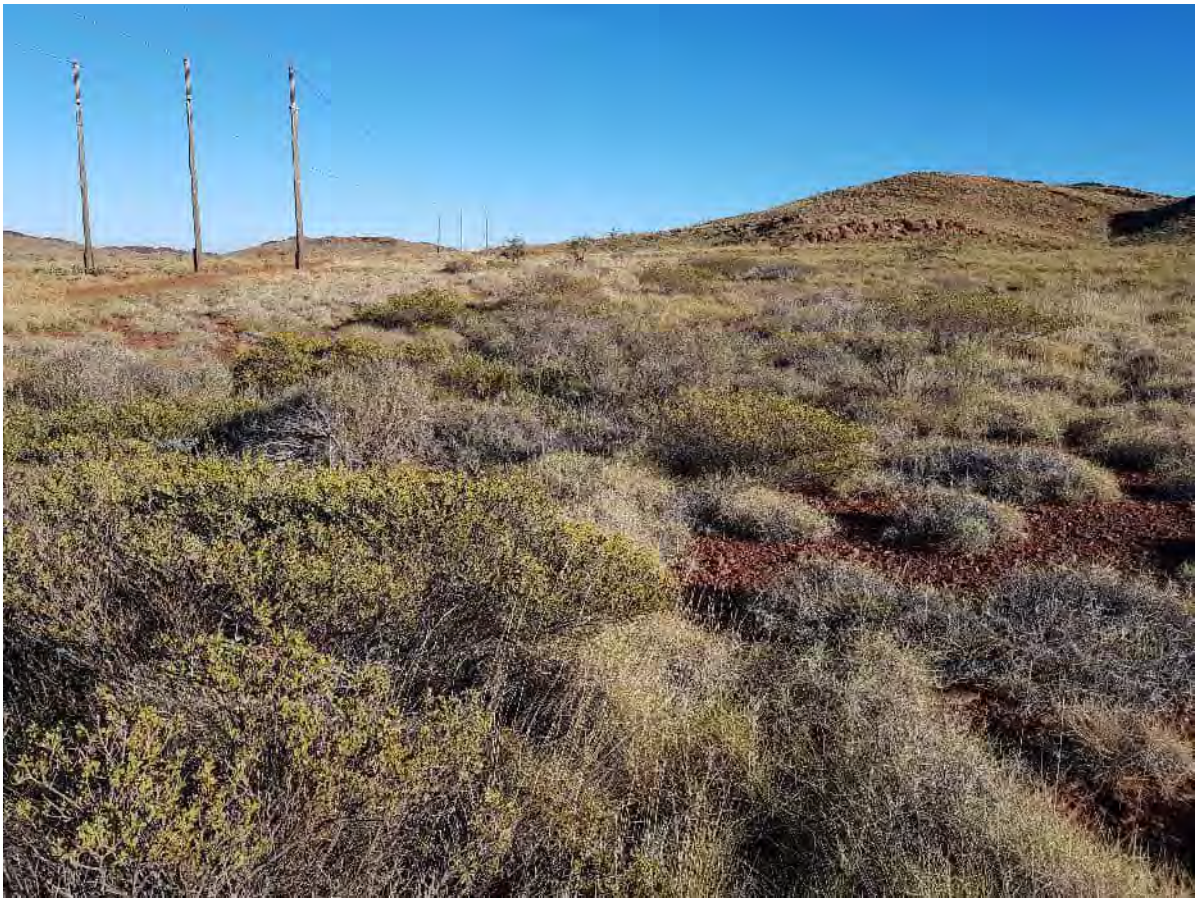
Site No	30
GPS Co-Ordinates (Easting Northing)	4695592 7698101
Vegetation Description	*Acacia inaequilatera, A. coriacea* tall shrubland, sometimes open shrubland over *?Eriachne benthamii, Chrysopogon fallax* patchy **Cenchrus ciliaris* tussock grassland.
Habitat and Soils	On broad, shallow drainage line with shallow pinky brown loams and areas of exposed bedrock.
Vegetation Condition	Very good
PEC Potential	Not present

Site No	31
GPS Co-Ordinates (Easting Northing)	466124 7697765
Vegetation Description	*Eragrostis xerophila* tussock grassland. There are patchy intrusions of ?*Eriachne benthamii* on low areas.
Habitat and Soils	Occurs on flat plain with deep red brown weakly to moderate cracking clays – areas of scald.
Vegetation Condition	Good
PEC Potential	Potential

Site No	32
GPS Co-Ordinates (Easting Northing)	467076 7700252
Vegetation Description	*Eriachne benthamii, ?Chrysopogon fallax* tussock grassland with other annual grass species (all too dead/dormant to identify). Very scattered **Vachellia farnesiana, Acacia coriacea* shrubs
Habitat and Soils	Very shallow drainage line with red brown soft weakly gilgai light clays
Vegetation Condition	Very good
PEC Potential	May form part of PEC

Site No	33
GPS Co-Ordinates (Easting Northing)	466413 7699941
Vegetation Description	*Eriachne ? benthamii* mixed tussock grassland -all too dead/dormant to identify.
Habitat and Soils	Very shallow drainage line with red brown soft weakly gilgai light clays
Vegetation Condition	Good
PEC Potential	May form part of PEC

GHD, 2019. 124-KRT-DMP 132kV Line Upgrade Project – Flora and Fauna Survey.



Horizon Power

124-KRT-DMP 132kV Line Upgrade Project
Flora and Fauna Survey

August 2019

Executive summary

Horizon Power is planning to replace sections of the overhead power line running from Karratha to Dampier (KRT – DMP 132 kv Line (the Line)), located in the Pilbara Region of Western Australia. The sections of the line considered to be in need of replacement are those which are considered to have reached the end of their life from an asset serviceability perspective. The purpose of the works are to replace infrastructure to ensure a continuous and reliable supply.

Horizon Power commissioned GHD Pty Ltd to undertake a vegetation, flora and fauna survey of the proposed clearing area ('survey area') for the proposed Karratha to Dampier Line re-build. The purpose of the assessment is to delineate key flora, vegetation and fauna values and potential impact to areas of sensitivity. The outcomes of the assessment will be used to inform the project design and provide information to support a native vegetation clearing permit application under Part V of the *Environmental Protection Act 1986*.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.6 and the assumptions and qualifications contained throughout this report.

Key findings

- Nine vegetation types were identified and described for the survey area, as well as cleared and/or highly degraded areas. The survey area is predominantly located along an existing power line corridor and adjacent access tracks. The vegetation condition throughout the survey area was generally consistent, with the majority of the survey area determined to be in Very Good to Good condition
- Vegetation type VT_5 is considered representative of riparian vegetation
- No vegetation communities identified within the survey area are representative of a Threatened Ecological Community (TEC). The presence of two Priority Ecological Communities (PECs) were identified within the survey area:
  - Burrup Peninsula rock pile communities (Priority 1). Vegetation type 6 (VT_6) is considered to be representative of this PEC. There is approximately 0.53 ha of this PEC occurring within the survey area of which all is in Very Good condition.
  - Horseflat land system of the Roebourne Plains (Priority 3). Vegetation type 9 (VT_09) is considered to be representative of this PEC. There is approximately 1.72 ha of this PEC occurring within the survey area which ranged from Poor to Good condition.
- The survey recorded a total of 133 flora taxa (including subspecies and varieties) representing 35 families and 81 genera within the survey area
- No threatened flora species listed under the EPBC Act and/or BC Act was recorded within the survey area. One Priority species listed by the DBCA, *Rhynchosia bungarensis* (Priority 4), was recorded within the survey area along the bases of rockpiles on the Burrup Peninsula. A total of 48 plants from 14 locations were recorded in the survey area
- Six broad fauna habitat types have been identified within the survey area including rocky plains and low rises, minor drainage lines, rock piles, saline flats, sandy loam plains and gilgai grasslands
- A total of 77 fauna species, including 50 birds, 13 mammals and 14 reptiles were recorded during the survey
- No Threatened or priority fauna species or evidence of their presence was recorded in the survey area during the field assessment.

- An assessment of the proposed native vegetation clearing within the survey area against the Ten Clearing Principles was undertaken. This assessment concluded the proposed clearing associated with the survey area may be at variance to Principles (g) and (j).

Table of Contents

Table index

Figure index

Appendices

1. Introduction

1.1 Background

Horizon Power is planning to replace sections of the overhead power line running from Karratha to Dampier (KRT – DMP 132 kv Line (the Line)), located in the Pilbara Region of Western Australia. The sections of the line considered to be in need of replacement are those which are considered to have reached the end of their life from an asset serviceability perspective. The purpose of the works are to replace infrastructure to ensure a continuous and reliable supply.

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by Horizon Power to complete a desktop assessment of the preferred new line route. The purpose of the assessment was to identify environmental values and constraints to inform the design and provide information to support future biological surveys. Subsequent to the desktop assessment, GHD was commissioned by Horizon Power to undertake a vegetation, flora and fauna survey for the preferred new line route. The purpose of the assessment was to delineate key flora, vegetation and fauna values and potential impact to areas of sensitivity. The outcomes of the biological survey will be used to inform the project design and provide information to support a native vegetation clearing permit application under Part V of the *Environmental Protection Act 1986* (EP Act).

1.3 Location

The proposed line route extends from Karratha to Dampier and mostly follows the existing Line with deviations in the northern and southern parts. For the purpose of the desktop assessment a project area was defined which includes the existing and proposed line route as well as adequate access areas for construction purposes. The project area (as shown in Figure 1, Appendix A) is approximately 18 kilometres (km) long and covers 210.93 hectares (ha).

A desktop study area was defined for the desktop based searches of the assessment and includes a 20 km buffer of the project area.

The project area was further refined for the purposes of the biological survey and to minimise project impacts on the environment. The 'survey area' is approximately 18 km long and 30 metres (m) wide and covers a total of 39.36 ha. The clearing footprint will be wholly contained within the survey area. The survey area is mapped in Figure 5, Appendix A.

1.4 Scope of works

GHD understands the scope of works includes the following:

- Undertake a flora and vegetation survey to broadly map vegetation units, condition and identify conservation significant flora and ecological communities within the disturbance footprint
- Undertake a fauna survey broadly map fauna habitat types and identify potential habitat for conservation significant fauna
- Update the existing desktop assessment to include the field survey findings
- Prepare a technical report (this report) that documents the methods and results, and includes an assessment of the project area against the ten clearing principles
- Provide spatial data suitable to support the submission of a native vegetation clearing permit application to the Department of Water, Environment and Regulation (DWER).

1.5 Relevant legislation and background information

Key Commonwealth and WA environmental legislation that may be relevant to the project is outlined in Table 1. An overview of key legislation and guidelines, conservation codes and background information relevant to this project is provided in Appendix B.

Table 1 Key environmental legislation relevant to the project

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

1.6 Limitations and assumptions

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

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

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

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

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

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

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

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

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

This report has assessed the flora and fauna within the survey area (Figure 5, Appendix A). Should the survey area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop assessment

A desktop assessment of the project area to identify environmental values and constraints was undertaken by viewing GIS spatial files largely sourced from Government of Western Australia (GoWA) (2019a) and reviewing publically available, government managed databases. The information sources utilised in this assessment are presented in Table 2.

Table 2 Information sources

Aspect	Information source
Climate	Bureau of Meteorology (BoM) Climate Data Online (2019)
Geology, landforms and soil	1:500 000 State linear structures layer (DMIRS-015) Soil Landscape Mapping – Systems (DPIRD-064)
Acid Sulphate Soils (ASS)	Acid Sulfate Soil Risk Map, Pilbara Coastline (DWER-053)
Environmentally Sensitive Areas (ESAs)	Clearing Regulations - Environmentally Sensitive Areas (DWER-046)
Conservation reserves and areas	DBCA – Legislated Lands and Waters (DBCA-011) DBCA – Lands of Interest (DBCA-012)
Hydrology	Public Drinking Water Source Areas (DWER-033) RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037) RIWI Act, Groundwater Areas (DWER-034) RIWI Act, Rivers (DWER-036) Waterways Conservation Act Management Areas (DWER-072) Ramsar Sites (DBCA-010) Directory of Important Wetlands in Australia - Western Australia (DBCA-045) Water Information Reporting System (DWER 2019) City of Karratha Water Management Strategy (Essential Environmental 2016)
Vegetation	Pre-European Vegetation (DPIRD-006) Native Vegetation Extent (DPIRD-005) Statewide Vegetation Statistics (GoWA 2019b)
Threatened and Priority Ecological Communities (TECs and PECs)	DBCA Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) spatial dataset Priority Ecological Communities for Western Australia Version 28 (DBCA 2019)
Conservation significant flora and fauna	DBCA NatureMap database (DBCA 2007–) DBCA Threatened and Priority Flora database (TPFL) Western Australian Herbarium database (WAHERB)
Matters of National Environmental Significance	EPBC Act Protected Matters Search Tool (PMST) (DEE 2019a)

2.2 Field survey

2.2.1 Flora and vegetation

The detailed flora and vegetation field survey was carried out by GHD botanist Joel Collins (flora licence no. SL012542) and ecologist Erin Lynch (flora licence no. SL012374) over five days from the 10 to 14 June 2019. This is the preferred survey timing from an ecological perspective.

The flora and vegetation survey methodology and reporting has been conducted with reference to the Environmental Protection Authority (EPA) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a).

The field survey included the following:

- GHD placed 15 non-permanent quadrats across the survey area to adequately characterise the vegetation. In addition to quadrat sampling, the project area was traversed in representative vegetation types to allow opportunistic collection of flora species. GHD have compiled an inventory of flora species (native and exotic) by vegetation type.
- Collected quadrat data included physical features (e.g. landform, soil types, litter cover), a list of dominant flora from each structural layer and a list of all species (native and introduced) within the quadrat including average height and cover (using the National Vegetation Information System). A photograph of each quadrat, and other representative vegetation types and conditions were taken.
- Vegetation units have been delineated using a combination of aerial photography, topographical features and field data. Vegetation mapping has been conducted in the field with boundaries drawn over aerial photography using handheld GPS equipment (Samsung tablet). Vegetation units were described based on structure, dominant taxa and cover characteristics as defined by quadrat and relevé data and field observations. Vegetation unit descriptions follow the National Vegetation Information System (NVIS) and are consistent with NVIS Level V (Association). At Level V up to three taxa per stratum are used to describe the association (NVIS Technical Working Group 2017).
- The vegetation condition was assessed and mapped in accordance with the vegetation condition rating scale for the Eremaean and Northern Botanical Provinces of Western Australia (IBRA) (devised by Keighery (1994) and adapted by EPA (2016a)). The scale recognises the intactness of vegetation and consists of six rating levels. The vegetation condition rating scale is located in Appendix B.
- Based on results of the desktop assessment, GHD identified areas within the project area that have the potential to contain conservation significant vegetation and flora. During the field survey GHD undertook non-systematic targeted searches for conservation significant flora and vegetation within these areas. Where conservation significant flora taxa or vegetation were identified in the field, the locations of boundaries and/or individuals were recorded using a GPS.
- Flora species that are well known to GHD ecologists were identified in the field. Where field identification of plant taxa was not possible, specimens were collected in a systematic manner and identified at the WA Herbarium by comparison with the reference collection and/or use of identification keys.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by DEE (2019b). Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase*.

2.2.2 Fauna

GHD ecologist Erin Lynch undertook a level 1 fauna survey (reconnaissance survey) in conjunction with the flora and vegetation survey. The survey methodology employed by GHD was undertaken in accordance with the EPA Technical Guidance – Sampling methods for terrestrial vertebrate fauna (EPA 2016b) and Technical Guidance – Terrestrial Fauna Surveys (EPA 2016c).

The field survey included the following:

- Opportunistic fauna searches were conducted across the survey area
- Identification and mapping of faunal habitat types including habitat types suitable for conservation significant species. Representative fauna habitats were photographed. Where appropriate the fauna habitat types were aligned with the vegetation types. An inventory was made of the vertebrate fauna species (native and feral) within the survey area through opportunistic recording of species.
- Areas identified as potential habitat for conservation significant fauna were traversed to identify key distinguishing features/descriptions (including tracks, diggings, scats, bones, mounds, refuge types). The active searches (where relevant) assisted with targeting conservation significant species such as the Pilbara Olive Python.
- Avifauna surveys were undertaken selectively throughout the survey area, but included areas of known species resources such as water points, riparian areas and foraging areas. Avifauna survey were used to assist with targeting migratory birds.
- Deployment of remote camera traps to target cryptic species such as the Northern Quoll and other small mammals. These were deployed for four nights with a focus on areas where the Northern Quoll may be present, such as rocky screes and breakaways. Reconyx Hyperfire 550 remote camera locations were recorded via GPS.
- Deployment of a Songmeter SM4Bat+FS, Acoustic SM4 recorder to assess for bats (such as Ghost Bat and Orange-leaf nose Bat). The detector was deployed between sunset and sunrise across the project area.

Identification of fauna species was made in the field using available field guides and electronic guides. Where identification was not possible, photographs of specimens were collected to be later identified.

Nomenclature used in this report follows that used by the Western Australian Museum and the NatureMap database (DBCA 2007–) with the exception of birds, where Christidis and Boles (2008) was used.

2.3 Limitations

2.3.1 Desktop limitations

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

2.3.2 Field survey limitations

The EPA (2016a, b) states that flora and fauna survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 3.

Table 3 Flora and fauna survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Nil	Adequate information is available for the survey area. Broad scale (1:250,000) mapping by Beard (1975) and digitised by Shepherd et al. (2002) Regional biogeography (Van Vreeswyk et al. 2004).
Scope (what life forms were sampled etc.)	Nil	Vascular flora and terrestrial vertebrate fauna were sampled during the survey. Non-vascular flora, invertebrate and aquatic fauna were not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity) Proportion of fauna identified, recorded and/or collected	Nil	The survey sampling and intensity was considered adequate, and seasonal conditions were considered satisfactory. All taxonomic groups were considered to be represented. The portion of flora collected and identified was considered moderate; and it is likely the survey under-recorded some grass species (Poaceae), annuals and herbs due to lower than average rainfall and consequently poor flowering material. However, based on the likelihood assessment it is unlikely these species would be conservation significant. The fauna assessment sampled those species that can be easily seen, heard or have distinctive signs, such as tracks, scats, diggings, etc. Many cryptic species would not have been identified during a reconnaissance survey and seasonal variation within species often requires targeted surveys at a particular time of the year. Of the fauna species recorded during the survey, all were identified to species level.
Flora determination	Minor	Flora determination was undertaken by GHD botanist/ecologist in the field and at the WA Herbarium. Two taxa could be identified to genus level only, and three taxa could be tentatively identified to species level, due to lack of flowering and/or fruiting material required for identification. None of these species were considered to be potential conservation significant flora. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time of report development, but it should be noted this may change in response to ongoing research and review of the International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Minor	The entire survey area was accessible and was accessed by foot and vehicle. Adequate time was available to complete the biological survey to the required standard.

Aspect	Constraint	Comment
Mapping reliability	Nil	The vegetation was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Beard 1975) and field data. Data was recorded in the field using hand-held GPS tools (e.g. Samsung tablet and Garmin GPS). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ±5 metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/ season/cycle	Minor	The field survey was conducted in June 2019. In the three months prior to the flora survey (March to May 2019), the Karratha weather station recorded a total of 77.4 mm of rainfall. This rainfall total is lower than the long term average for the same period (March-May; 92 mm) (BoM 2019). The weather conditions recorded during the survey were considered unlikely to have impacted the survey results. The survey timings were considered appropriate for the flora and fauna field survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Minor	Some of the survey area had been subjected to previous disturbances includes clearing for vehicle tracks, salt ponds and construction of the existing power lines. These disturbances did not limit the biological survey.
Resources	Nil	Adequate resources were employed during the field survey. The person days were spent undertaking the survey using a dedicated botanist and ecologist.
Access restrictions	Nil	No access problems were encountered during the survey.
Experience levels	Nil	The ecologists who executed the survey were practitioners suitably qualified in their respective fields. Joel Collins and Erin Lynch are botanists/ecologists with over 12 years' experience in undertaking ecological surveys in Western Australia.

3. Desktop assessment

3.1 Physical environment

3.1.1 Climate

The project is located in the Pilbara region of Western Australia and experiences a semi-arid climate. Temperatures are warm to hot year round, rainfall is generally low and mostly falls in the late summer months due to the influence of tropical cyclones and monsoon. The closest meteorological recording station is located at Karratha (No. 004083) approximately 1.4 km from the project area. Climatic data from this station indicates the mean maximum temperature ranges from 36.2 °C in January to March to 26.3 °C in July. The mean minimum temperature ranges from 26.8 °C in January to 13.8 °C in July. The mean annual rainfall is 296.7 mm with an average of 19.7 rain days per year (BoM 2019).

3.1.2 Geology, landforms and soils

The project is located in the Karratha Coast Zone of the Pilbara Province. The Pilbara Province lies over the Pilbara Craton, which consists of two different tectonic components. The two broad geologic sequences are the ancient Archaean granite-greenstone terrain and the younger volcano-sedimentary sequence of the Hamersley Basin (Tille 2006).

The Karratha Coast Zone is characterised by coastal mudflats with sandy coastal plains and some hills on marine deposits and some sedimentary and volcanic rocks of the Pilbara Craton. Soils include tidal soils with some calcareous loamy earths, salt lake soils and red/brown non-cracking clays (Tille 2006).

3.1.3 Land systems

The Pilbara region has been surveyed for the purposes of land classification, mapping and resource evaluation. A total of 102 land systems which are grouped into 20 broad land types have been described for the region, which are distinguished on the basis of topography, geology, soils and vegetation (Van Vreeswyk et al. 2004). The project area intersects five land systems; details of these land systems are presented in Table 4.

Table 4 Land systems within the project area

Land system	Description	Location
Granitic	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands. Geology: Archaean and Proterozoic granite, gneiss, granodiorite and porphyry. Geomorphology: Erosional surfaces; hill tracts and domes on granitic rocks with rough crests, associated rocky hill slopes, restricted lower stony plains; narrow, widely spaced tributary drainage floors and channels.	Intersects the northern part of the project area
Cheerawarra	Sandy coastal plains and saline clay plains supporting soft and hard spinifex grasslands and minor tussock grasslands. Geology: Quaternary eolian sand and alluvium. Geomorphology: Depositional surfaces; gently undulating, sandy surfaced coastal plains and level plains with saline clay soils and bare saline scalds with wind hummocks; very rare distributary drainage lines.	Intersects the northern and central parts of the project area

Land system	Description	Location
Littoral	Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches. Geology: Quaternary mudflat deposits, clay, salt and sand; eolian sand. Geomorphology: Depositional surfaces; saline coastal flats; estuarine and littoral surfaces with extensive bare saline tidal flats subject to infrequent tidal inundation, slightly higher samphire flats and alluvial plains, mangrove seaward fringes with dense branching patterns of shallow tidal creeks, minor coastal dunes, limestone ridges, sandy plains and beaches.	Intersects the central part of the project area
Horseflat	Gilgaied clay plains supporting tussock grasslands and minor grassy snakewood shrublands. Geology: Quaternary alluvium. Geomorphology: Depositional surfaces; gilgaied and non-gilgaied clay plains, stony plains, narrow linear drainage depressions and dissected slopes marginal to the River land system; mostly internally drained, some through going trunk drainage channels.	Intersects the central part of the project area
Ruth	Hills and ridges of volcanic and other rocks supporting hard spinifex (occasionally soft spinifex) grasslands. Geology: Archaean and Proterozoic intermediate and basic volcanic rocks; also quartz, minor chert, jaspilite, shale and siltstone. Geomorphology: Erosional surfaces; rounded hills and ridges with restricted lower slopes and stony interfluves, moderately to widely spaced drainage patterns.	Intersects the southern part of the project area

3.1.4 Acid sulphate soils

A review of the ASS risk mapping indicates the soil under the project area has a 'high to moderate' and 'moderate to low' risk of containing ASS. The 'high to moderate' risk rating indicates the risk of ASS occurring within 3 m of the natural soil surface. The 'moderate to low' risk rating indicates the risk of ASS occurring within 3 m of natural soil surface however this rating indicates a high to moderate risk of ASS beyond 3 m of natural soil surface.

3.2 Land use

3.2.1 Conservation reserves and areas

No DBCA managed lands intersect the project area. Six conservation areas are located within the study area, with the closest Murujuga National Park located approximately 250 m east of the project area on the Burrup Peninsula (Figure 6, Appendix A).

3.2.2 Environmentally sensitive areas

No ESAs intersect the project area. One ESA occurs within the study area; this ESA is approximately 7.6 km north west of the project area and covers the Dampier Archipelago which is a National Heritage Place (Figure 6, Appendix A).

3.3 Hydrology

Desktop searches of the GoWA data layers identified the water resource aspects present in the project area. These are detailed below in Table 5.

Table 5 Hydrology aspects within the project area

Aspect	Details	Results
Groundwater Areas	Groundwater areas proclaimed under the RIWI Act	Pilbara Groundwater Area
Surface Water Areas	Surface water areas proclaimed under the RIWI Act	Pilbara Surface Water Area
Irrigation District	Irrigation Districts proclaimed under the RIWI Act	None present
Rivers	Rivers proclaimed under the Rights in RIWI Act	None present
Public Drinking Water Source Areas (PDWSA)	PDWSA is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas declared (gazetted) under the provisions of the *Metropolitan Water Supply, Sewage and Drainage Act 1909* or the *Country Area Water Supply Act 1947*.	None present
Waterways Management Areas	Areas proclaimed under *the Waterway Conservation Act 1976*	None present

3.3.1 Groundwater

The project area lies within the proclaimed Pilbara Groundwater Area (Figure 7, Appendix A). A search of the Water Information Reporting (DWER 2019) system found 94 registered groundwater bores within the study area. This does not include unregistered bores. Groundwater levels recorded from available bore data indicate that groundwater beneath the project area lies at approximately 12-13 m blow ground level. The groundwater levels beneath the project area are expected to vary seasonally and be influenced by tidal processes. The northern part of the project area is adjacent to evaporation ponds, the groundwater is expected to sit much closer to the surface in this area.

3.3.2 Surface water and drainage

The project area is located within the proclaimed Pilbara Surface Water Area (Figure 7, Appendix A) and is in close proximity to the ocean. Surface water in broader area is largely reliant on weather and surface water in waterways is generally only present or flowing for parts of the year, often in response to larger cyclonic, rainfall events. The City of Karratha Water Management Strategy (Essential Environment 2016) indicate that drainage issues arise from the high erosion tendencies of the red soils and the large volumes of stormwater that flow in the wet season.

3.3.3 Wetlands

No Internationally (Ramsar) or nationally important wetlands are located within 20 km of the project area.

3.4 Vegetation and flora

3.4.1 Regional biogeography

The project area is located in the Pilbara bioregion and Roebourne sub-region as described by Interim Biogeographic Regionalisation of Australia (IBRA).

The Roebourne sub-region is characterised by 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 (Kendrick and Stanley 2001).

3.4.2 Broad vegetation mapping and extent

Broad scale (1:250,000) pre-European vegetation mapping of the area was completed by Beard (1975) at an association level. The mapping indicates that four vegetation associations are present within the project area:

- Hummock grasslands, grass steppe; soft spinifex (association 117)
- Bare areas; mudflats (association 127)
- Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex (association 589)
- Hummock grasslands, grass steppe; hard spinifex, *Triodia wiseana* (association 157).

The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by DBCA (latest update March 2019 – GoWA 2019b). As shown in Table 6, the current extents remaining of all vegetation associations are greater than 77% of their calculated pre European extents at all scales (e.g. State, IBRA bioregion, IBRA subregion and Local Government Area (LGA)).

The Native Vegetation Extent data layer indicates that approximately 10 % of the project area has been cleared. The clearing is largely associated with the central part of the project area that is adjacent to the Dampier salt ponds.

3.4.3 Conservation significant ecological communities

Searches of the EPBC Act PMST did not identify any TECs within the project area. Searches of the DBCA TEC/PEC database identified four PECs within 20 km of the project area, two of which intersect the project area boundary (Figure 2, Appendix A). Details of these communities are provided in Table 7.

Table 6 Extent of pre-European vegetation associations mapped within the project area (Beard 1975, GoWA 2019b)

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	%current extent in all DBCA managed land (proportion of current extent)
117	State: Western Australia	919,517.05	886,005.79	96.36	14.79
	IBRA bioregion: Pilbara	82,705.78	78,096.64	94.43	22.54
	IBRA sub-region: Roebourne	50,962.94	46,901.57	92.03	37.53
	LGA: City of Karratha	41,173.74	31,921.58	77.53	58.03
127	State: Western Australia	737,724.05	697,871.38	94.60	10.03
	IBRA bioregion: Pilbara	177,749.75	159,595.04	89.79	2.32
	IBRA sub-region: Roebourne	177,178.87	159,024.16	89.75	2.33
	LGA: City of Karratha	96,204.40	83,703.29	87.01	4.37
589	State: Western Australia	807,698.58	802,713.40	99.93	1.91
	IBRA bioregion: Pilbara	728,768.20	724,695.82	99.44	2.11
	IBRA sub-region: Roebourne	675,391.80	671327.48	99.40	2.14
	LGA: City of Karratha	312,813.63	310,512.32	99.26	0.78
157	State: Western Australia	502,728.56	499,311.84	99.32	18.24
	IBRA bioregion: Pilbara	199,832.17	198,409.23	99.29	5.84
	IBRA sub-region: Roebourne	14,972.09	14,451.45	96.52	1.56
	LGA: City of Karratha	73,039.72	71,600.83	98.03	0.31

Table 7 Threatened and Priority Ecological Communities identified in the desktop searches

Community type	EPBC Act	DBCA	Description (DBCA 2019)
Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays (Roebourne Plains gilgai grasslands)	-	Priority 1	The Roebourne Plains coastal grasslands with gilgai micro-relief occur on deep cracking clays that are self-mulching and emerge on depositional surfaces. The Roebourne Plains gilgai grasslands occur on microrelief of deep cracking clays, surrounded by clay plains/flats and sandy coastal and alluvial plains. The gilgai depressions supports ephemeral and perennial tussock grasslands dominated by *Sorghum* sp. and *Eragrostis xerophila* along with other native species *including Astrebla pectinata, Eriachne benthamii, Chrysopogon fallax* and *Panicum decompositum*. Restricted to the Karratha area, this community differs from the surrounding clay flats of the Horseflat land system which are dominated by *Eragrostis xerophila* and other perennial tussock grass species (*Eragrostis* mostly). Buffer area intersects the project area.
Horseflat land system of the Roebourne Plains	-	Priority 3	The Horseflat Land System of the Roebourne Plains are extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include *Eragrostis xerophila* and other *Eragrostis* spp., *Eriachne* spp. and *Dichanthium* spp. The community also supports a suite of annual grasses including Sorghum spp. and rare *Astrebela* spp. The community extends from Cape Preston to Balla Balla surrounding the towns of Karratha and Roebourne. This community does not include priority ecological communities 'Roebourne Plains gilgai grasslands' and the 'Chenopod association of the Roebourne Plains area. Buffer area intersects the project area.
Coastal dune native tussock grassland dominated by *Whiteochloa airoides*	-	Priority 3	Tussock grassland of Whiteochloa airoides occurs on the landward side of foredunes, hind dunes or remnant dunes with white or pinkish white medium sands with marine fragments. There may be occasional *Spinifex longifolius* tussock or *Triodia epactia* hummock grasses and scattered low shrubs of *Olearia dampieri* subsp. *dampieri*, *Scaevola spinescens*, S. *cunninghamii*, *Trianthema turgidifolia* and *Corchorus* species (*C. walcottii, C. laniflorus*). Occurs on Barrow Island, Tent Island and possibly some unaffected littoral areas in West Pilbara. Closest known occurrence is approximately 5.5 km north east of the southern half of the project area.
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 endemics land snails.

Community type	EPBC Act	DBCA	Description (DBCA 2019)
			Know occurrences located approximately 5.3 km north east of the project area on the Burrup Peninsula.

3.4.4 Flora diversity

A search of the *NatureMap* database identified 606 taxa previously recorded within the study area (Appendix C). This total comprised 569 native taxa and 37 naturalised (introduced) taxa. The most commonly recorded families were Fabaceae, Poaceae, Malvaceae and Chenopodiaceae.

3.4.5 Conservation significant flora

Searches of the EPBC Act PMST and *NatureMap* database identified the presence/potential presence of 12 conservation significant flora within the study area. The desktop search recorded:

- One Priority 2 taxon
- Ten Priority 3 taxa
- One Priority 4 taxon.

3.5 Fauna

3.5.1 Fauna diversity

A search of the *NatureMap* database identified 694 fauna species previously recorded within the study area (Appendix C). This total comprised 207 birds, four amphibians, 104 reptiles, 212 invertebrates, 42 mammals and 125 fish. Of the 694 fauna species previously recorded 694 were native species and 12 were naturalised (introduced) species.

3.5.2 Conservation significant fauna

Searches of the EPBC Act PMST and *NatureMap* database identified the presence/potential presence of 52 conservation significance fauna within the study area. This total does not include those species that are exclusively marine as no marine habitat is present within the project area. The desktop searches recorded:

- Eighteen species listed as Threatened under the EPBC Act and/or the BC Act
- One species listed as Threatened under the EPBC Act and as Priority 3 by DBCA
- Twenty seven species listed as migratory under the EPBC Act and/or the BC Act
- One species listed as Specially protected species (Other specially protected fauna) under the BC Act
- Five species listed as Priority by DBCA.

4. Field survey results

4.1 Vegetation

4.1.1 Vegetation types

Nine vegetation types were identified and described for the survey area, as well as cleared and/or highly degraded areas (total cleared 14.81 ha). The survey area is predominantly located along an existing power line corridor and adjacent access tracks.

The vegetation within the survey area primarily consists of hummock grasslands of *Triodia epactia* and *T. wiseana* with scattered to open shrublands dominated by *Acacia*, *Hakea*, *Grevillea* and *Senna* species on rocky sandy loam plains and low undulating rocky rises and slopes. Minor drainage lines which dissect the plain and rocky slopes are lined by *Corymbia hamersleyana* with the occasional *Eucalyptus camaldulensis*. The clay flats associated with the salt flats adjacent to Burrup Road are dominated by an open hummock grasslands of *Triodia angusta* and scattered chenopod shrubs.

Vegetation type VT_5 is considered representative of riparian vegetation.

A description of the vegetation types mapped across the survey area is provided in Table 8 and mapped in Figure 7, Appendix A.

Table 8 Vegetation types recorded within the survey area

Vegetation type code	Vegetation type description	Sample locations and extent (ha)	Photograph
VT_1	*Acacia inaequilatera, Acacia bivenosa* and *Hakea lorea* subsp. *lorea* open shrubland over *Eremophila longifolia*, *Senna glutinosa* subsp. *pruinosa* and *Solanum lasiophyllum* sparse shrubland over *Cymbopogon ambiguus* open tussock grassland over *Triodia wiseana* and *Triodia epactia* hummock grassland over *Fimbristylis ?dichotoma* and *Bulbostylis barbata* scattered forbs on low undulating rocky rises and slopes. Other associated species include *Acacia stellaticeps.*	KAR_01, KAR_02, KAR_03, KAR_05, KAR_06 Area: 5.91 ha	

Vegetation type code	Vegetation type description	Sample locations and extent (ha)	Photograph
VT_2	*Acacia pyrifolia* var. *pyrifolia* and *Acacia bivenosa* open shrubland over *Acacia arida*, *Senna glutinosa* subsp. *pruinosa* and *Indigofera monophylla* sparse shrubland over *Triodia wiseana* hummock grassland on rocky hill and slopes. Other associated species include *Acacia stellaticeps, Scaevola spinescens, Acacia maitlandii* and *Triumfetta clementii.*	KAR_07, KAR_08, KAR_21 Area: 2.95 ha	
VT_3	*Acacia xiphophylla* open shrubland over *Rhagodia preissii, Hibiscus sturtii* var. ?*platychlamys* and *Gossypium australe* sparse shrubland over *Triodia wiseana* and *Triodia epactia* open hummock grassland and **Cenchrus ciliaris* sparse tussock grassland.	KAR_04 Area: 0.55 ha	

Vegetation type code	Vegetation type description	Sample locations and extent (ha)	Photograph
VT_4	*Grevillea pyramidalis* subsp. *pyramidalis*, *Hakea lorea* subsp. *lorea*, *Acacia inaequilatera* and *Ehretia saligna* var. *saligna* open shrubland over *Solanum lasiophyllum*, *Diplopeltis eriocarpa* and *Solanum lasiophyllum* scattered shrubs over *Triodia epactia* sparse hummock grassland on flat rocky sandy loam plains near rock piles. Associated species include *Indigofera monophylla*, *Triumfetta propinqua*, *Acacia orthocarpa*, *Trichodesma zeylanicum* var. *zeylanicum* and *Acacia ampliceps*.	KAR_09, KAR_14, KAR_23 Area: 9.01 ha	
VT_5	*Eucalyptus camaldulensis* and *Corymbia hamersleyana* open woodland over *Grevillea pyramidalis* subsp. *pyramidalis*, *Acacia sericophylla*, *Acacia sclerosperma* subsp. *sclerosperma* open shrubland over *Triodia epactia* and *Triodia wiseana* hummock grassland and **Cenchrus ciliaris* tussock grassland on minor drainage lines.	KAR_24 Area: 0.26 ha	

Vegetation type code	Vegetation type description	Sample locations and extent (ha)	Photograph
VT_6	*Terminalia circumalata* and *Brachychiton acuminatus* scattered low trees over *Grevillea pyramidalis* subsp. *pyramidalis*, *Flueggea virosa* subsp. *melanthesoides* and *Senna artemisioides* scattered shrubs over *Triodia epactia* open hummock grassland over *Cymbopogon ambiguus* and **Cenchrus ciliaris* open tussock grassland and *Tinospora smilacina* and *Ipomoea costata* open vineland on rock piles. Associated species include *Rhynchosia bungarensis* (P4). **Priority 1 PEC Burrup Peninsula rock pile communities.**	KAR_11, KAR_12, KAR_13, KAR_15, KAR_16 Area: 0.53 ha	
VT_7	*Triodia angusta* open hummock grassland and **Cenchrus ciliaris* open tussock grassland over *Tecticornia ?indica* subsp. *leiostachya*, *Tecticornia ?pterygosperma* and *Sclerolaena diacantha* open chenopod shrubland on saline flats with some rock outcrop.	KAR_22 Area: 0.53 ha	

Vegetation type code	Vegetation type description	Sample locations and extent (ha)	Photograph
VT_8	*Acacia bivenosa, Acacia synchronicia* and *Acacia ancistrocarpa* open *shrubland* over *Triodia wiseana* open hummock grassland and **Cenchrus ciliaris* sparse tussock grasses on disturbed sandy loam plains.	KAR_18, KAR_19 Area: 3.08 ha	
VT_9	*Acacia pyrifolia* var. *pyrifolia* scattered shrubs over *Eragrostis xerophila, Chrysopogon fallax* and *Eriachne benthamii* open tussock grassland and *Triodia epactia* isolated hummock grassland on deep cracking gilgai clay plains. Associated species include *Dactyloctenium radulans, *Cenchrus setiger, Corchorus incanus* subsp. *incanus, Operculina aequisepala* and *Phyllanthus maderaspatensis.* **Priority 3 Horseflat land systems of the Roebourne Plains**	KAR_20 Area: 1.72 ha	

4.1.2 Conservation significant ecological communities

There are no TECs present within the survey area. The field assessment did identify the presence of two PECs within the survey area:

- Burrup Peninsula rock pile communities (Priority 1)
- Horseflat land system of the Roebourne Plains (Priority 3).

PEC Community mapping is provided in Figure 8, Appendix A.

The 'Burrup Peninsula rock pile communities' are pockets of vegetation in the rock piles and outcrops. The rock piles are important for providing fire and revolutionary refuge for flora (Kendrick and Stanley 2001). The rock pocket communities vary from open *Cymbopogon ambiguus* assemblages with *Ptilotus obovatus* and few small forbs and grasses on otherwise bare calcrete, through to *Triodia* sub shrub communities, to dense shrub/tree communities with *Flueggea virosa* subsp. melanthesoides, *Phyllanthus ciccoides*, small spreading trees of *Ficus brachypoda, Brachychiton acuminatus*, *Pittosporum phylliraeoides* and *Terminalia supranitifolia* often as large trees and sometimes in numbers (DEC 2009).

Vegetation type 6 (VT_6) is considered to be representative of the Burrup Peninsula rock pile communities PEC. This vegetation type includes scattered low trees of *Brachychiton acuminatus, Terminalia circumalata, Ficus aculeata* var. *indecora* and *Flueggea virosa* subsp. *melanthesoides*, scattered patches of *Cymbopogon ambiguus* tussock grasses and *Tinospora smilacina* and *Ipomoea costata* vines on rock piles. There is approximately 0.53 ha of this PEC occurring within the survey area of which all is in Very Good condition.

The Horseflat Land System of the Roebourne Plains are extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include *Eragrostis xerophila* and other *Eragrostis* spp., *Eriachne* spp. and *Dichanthium* spp. The community also supports a suite of annual grasses including Sorghum spp. and rare *Astrebla* spp (DBCA 2019).

Vegetation type 9 (VT_09) is considered to be representative of the Horseflat land system of the Roebourne Plains PEC. Vegetation type 9 is situated on the Horseflat land system and is dominated by an *Eragrostis xerophila*, *Chrysopogon fallax* and *Eriachne benthamii* open tussock grassland on deep cracking gilgai clay plains. Associated species include *Dactyloctenium radulans, *Cenchrus setiger, Corchorus incanus subsp. incanus, Operculina aequisepala* and *Phyllanthus maderaspatensis*. There is approximately 1.72 ha of this PEC occurring within the survey area which ranged from Poor to Good condition.

4.1.3 Vegetation condition

The vegetation condition throughout the survey area was generally consistent, with the majority of the survey area determined to be in Very Good to Good condition. The exceptions were areas which had been previously cleared or disturbed such as roads and access tracks, roadsides, and along the existing pipelines and power lines, where the weed species **Cenchrus ciliaris* (Buffel grass) and **Aerva javanica* (Kapok bush) were more common. Fire has also had an impact on the structure and condition of the vegetation throughout the survey area.

The extent of the vegetation condition mapped within the survey area is provided in Table 9 and mapped in Figure 7, Appendix A.

Table 9 Extent of vegetation condition mapped within the survey area

Vegetation Condition (EPA 2016a)	Extent mapped (ha)
Very Good	10.30 ha
Good	7.31 ha
Poor	4.55 ha
Degraded	1.14 ha
Completely Degraded	1.23 ha
Cleared	14.81 ha

4.2 Flora

4.2.1 Flora diversity

The survey recorded a total of 133 flora taxa (including subspecies and varieties) representing 35 families and 81 genera within the survey area. This total comprised of 130 native taxa and three introduced taxa, **Cenchrus ciliaris* (Buffel grass), **Aerva javanica* (Kapok), and **Vachellia farnesiana* (Mimosa bush).

Buffel grass and Kapok have been rated as having 'high' potential ecological impact under the invasive plant prioritisation process. Buffel grass significantly alters environmental conditions when invading new habitats as it reduces soil fertility, increases soil erosion (which increases surface run-off) and creates unstable watersheds with degraded water quality. It also exudes chemicals that are toxic to other plats (DEC 2013). Buffel grass is most common in disturbed areas such as vehicle tracks, roadsides and other previously cleared areas. Mimosa bush was present in the northern section of the survey area along the existing pipeline on the rocky slopes and drainage areas.

The list of flora recorded within the survey area is provided in Appendix D.

4.2.2 Conservation significant flora

No threatened flora species listed under the EPBC Act and/or BC Act was recorded within the survey area. One Priority species listed by the DBCA was recorded within the survey area, *Rhynchosia bungarensis* (Priority 4).

The location of priority flora recorded within the survey area is provided in Appendix D and mapped on Figure 9, Appendix A.

Rhynchosia bungarensis

Rhynchosia bungarensis (Plate 1) is listed Priority 4 and is a compact, prostrate shrub, to 0.5 m high with yellow flowers. It is known to occur on pebbly, shingly coarse sand amongst boulders and banks of flow line in the mouth of a gully wall (Western Australian Herbarium 1998–). According to *NatureMap* there are 110 records of this species, with a large number of records concentrated on the Burrup Peninsula.

A total of 48 plants from 14 locations were recorded in the survey area. This species was typically recorded along the bases of rockpiles on the Burrup Peninsula.

Plate 1 *Rhynchosia bungarensis*

Likelihood of occurrence

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment based on the desktop searches (provided in Appendix C). This assessment took into account previous records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and the cryptic nature of the species (Appendix D).

The likelihood of occurrence assessment post-field survey concluded that one species was present (*Rhynchosia bungarensis*) and the remaining priority flora are considered unlikely to occur within the survey area.

4.3 Fauna

4.3.1 Fauna habitat

Six broad fauna habitat types have been identified within the survey area. These habitat types closely align with the vegetation types described in section 4.1.1. The topography of the survey area is generally flat plains to low undulating rises with some rocky outcropping in the southern section of the survey area. The habitat types of the northern section of the survey area ranges from gilgai grasslands and mixed *Acacia* shrublands on sandy loam plains on the mainland, saline flats which extend between the mainland and the Burrup Peninsula and low undulating rocky hills, rock piles and drainage areas on the Burrup Peninsula.

The habitat types recorded in the survey area are described in Table 10.

Table 10 Habitat types within the survey area

Fauna habitat	Representative photograph
Rocky plains and low rises This habitat type is associated with stony/rocky plains and low undulating rises and consists of scattered shrubs of *Acacia*, *Grevillea*, *Hakea* and *Senna* species over a *Triodia* hummock grassland. The hummock grasslands provides refuge for reptiles (such as snakes, skinks, goannas and dragons) and small mammals and ground dwelling birds. The open shrublands provide refuge and a food source for native birds. Rocky outcrops contain small crevices which provide refuge for reptile species and small mammals. The majority of the habitat was well connected with some minor clearing as a result of access tracks and existing powerlines. This habitat type aligns with VT_1, VT_2, VT_3, VT_4	
Minor drainage lines The minor drainage lines are dominated by open woodlands of *Corymbia hamersleyana* and the occasional *Eucalyptus camaldulensis*. Mixed *Acacia* shrublands dominated the mid layer over an open hummock and tussock grassland of *Triodia* species and **Cenchrus ciliaris*. The drainage areas within the survey area on the Burrup Peninsula are very broad and not well defined. Creeklines are considered to be important ecological corridors to other broader habitats within the local area and provide a source of water during periods of heavy rainfall. Trees and shrubs provide shelter and food resources to a number of native fauna species, in particular birds. This habitat type aligns with VT_5	

Fauna habitat	Representative photograph
Rock piles The rock pile habitat is found on hill tops on the Burrup Peninsula. The rock crevices and over hangs provide shelter for fauna species in particular the Pilbara olive python (Vulnerable), Northern Quoll (Endangered) and rock-wallabies. The scattered trees (*Brachychiton* and *Terminalia* species) provide food resources and refuge for a number of fauna species, particularly birds. This habitat type aligns with VT_6	
Saline flats The saline flats consists of the salt pans and the adjacent low chenopod shrubland/low open hummock grassland on sandy clay flats. The vegetation is low and sparse with large bare areas of sandy clay and rocky outcrops. This habitat type may provide suitable foraging habitat for a range of migratory waders. The causeway and adjacent salt works link the mainland to the Burrup Peninsula. The salt ponds along the causeway are man-made and do not support native vegetation This habitat type aligns with VT_7	

Fauna habitat	Representative photograph
Sandy loam plains This habitat type occurs on the mainland adjacent to Dampier Highway. The vegetation is dominated by open shrublands of *Acacia* species over a sparse hummock and tussock grassland of *Triodia wiseana* and **Cenchrus ciliaris*. This habitat type has been disturbed and generally in poor condition as a result of adjacent land uses and previous clearing. The ground cover is generally sparse and provides limited habitat for reptiles and small mammals. The *Acacia* shrublands provide suitable habitat for a number of bird species. This habitat type aligns with VT_8	
Gilgai grassland The gilgai grassland habitat type consists of a low open tussock grassland of *Eragrostis xerophila* grassland with isolated patches of *Triodia epactia* on deep cracking gilgai clay plains. The area has been subject to varying degrees of degradation from historical clearing in adjacent areas and weed invasion. The gilgai grassland provides suitable habitat for the Short-tailed mouse (Priority 4) who favours cracking clay and adjacent habitats. This habitat type aligns with VT_9	

4.3.2 Habitat corridors and linkages

The habitat types within the survey area is well connected and part of a largely contiguous landscape. The fauna habitats of the survey area are part of a much larger area of similar habitats within the local area and surrounding region. The vegetation within the northern section of the survey area is connected to the Murujuga National Park (located on the Burrup Peninsula). Main roads, including Madigan Road and the Dampier Highway, the man-made salt pans between the mainland and the peninsula as well as industrial and urban development around Karratha are existing barriers to fauna moving east-west and north-south through the landscape, particularly for mammal and reptiles species.

4.3.3 Diversity

A total of 77 fauna species, including 50 birds, 13 mammals and 14 reptiles were recorded during the survey. Of these three species are introduced: black rat, dog and feral cat. All fauna species recorded during the survey are generally common and are known to occur in the area.

A full list of fauna recorded during the survey is provided in Appendix E.

4.3.4 Conservation significant fauna

No Threatened or priority fauna species or evidence of their presence was recorded in the survey area during the field assessment.

Likelihood of occurrence

A likelihood of occurrence assessment was conducted post-field survey for conservation significant fauna identified in the desktop assessment. This assessment was based on species biology, habitat requirements, the quality and availability of suitable habitat, and local occurrence (Appendix E).

The likelihood of occurrence assessment concluded six species are likely to occur and the remaining species are considered unlikely or highly unlikely to occur within the survey area. Species identified as likely to occur are listed in Table 11.

Table 11 Conservation significant fauna likely to occur in the survey area

Species	EPBC Act	BC Act/ DBCA	Likelihood of occurrence
Peregrine Falcon (*Falco peregrinus*)		OS	Likely –The habitats present within the survey area represents suitable foraging habitat, however lacks suitable breeding habitat. Therefore likely to occur at least on an occasional basis.
Osprey (*Pandion haliaetus*)	Mi	Mi	Likely –The survey area is situated near the coastline. This species is likely to fly over, and opportunistically utilise portions of the habitat.
Northern Quoll (*Dasyurus hallucatus*)	En	En	Likely – Known to occur locally. The rocky areas provide suitable habitat however no evidence of their presence was observed during the survey.
Water-rat (*Hydromys chrysogaster*)		P4	Likely – Known to occur on the Burrup Peninsula however not on the mainland. The habitat within the survey area is considered marginally suitable.
Pilbara Olive Python (*Liasis olivaceus* subsp. *barroni*)	Vu	Vu	Likely - Species known to occur locally and rocky habitat within survey area is considered suitable habitat however there are no permanent pools within the survey area.

Species	EPBC Act	BC Act/ DBCA	Likelihood of occurrence
Lined soil-crevice skink (Dampier) (*Notoscincus butleri*)		P4	Likely – Species known to occur locally (West Intercourse Island and less than 2 km south of Karratha). The rocky habitat within the survey area is considered suitable habitat however there are no major creeks or rivers within the survey area.

The likelihood of occurrence assessment identified other fauna species of conservation significance could occasionally occur within the habitats of the survey area (e.g. species deemed unlikely). However, it is considered unlikely the survey area provides important habitat (e.g. breeding habitat or key foraging habitat) for any of these species and that these other species may occasional use the habitats of the survey area for temporary refuge and dispersal between other areas of habitat.

No species of conservation significance are likely to be solely dependent on the habitats present within the survey area.

5. Assessment of vegetation clearing

The clearing of vegetation in Western Australia is regulated by DWER and requires a permit under Part V of the EP Act, except when a project is assessed under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing Native Vegetation) Regulations 2004* and not in an ESA.

When preparing a native vegetation clearing application, an assessment of the proposed project clearing against the Ten Clearing Principles should be undertaken to inform this process. The Ten Clearing Principles aim to ensure potential impacts resulting from removal of native vegetation can be assessed in an integrated way.

An assessment of the proposed native vegetation clearing within the survey area against the Ten Clearing Principles was undertaken (Table 12). This assessment concluded the proposed clearing associated with the survey area may be at variance to Principles (g) and (j).

Table 12 Assessment of survey area against the ten clearing principles

Principle	Assessment	Outcome	Reference
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	The survey area is situated within the Pilbara IBRA bioregion and the Roebourne subregion. The flora of the Roebourne subregion is diverse with 992 native vascular flora taxa recorded. A search of the NatureMap database identified 606 flora taxa, representing 66 families and 223 genera previously recorded within 20 km of the project area. This total comprised 569 native flora taxa and 37 naturalised (introduced) flora taxa. The flora survey recorded a total of 133 flora taxa (including three introduced species) representing 35 families and 81 genera within the survey area. Searches of the EPBC Act PMST, *NatureMap* database and DBCA TPFL and WAHERB databases identified the presence/potential presence of 12 conservation significance flora taxa within a 20 km buffer of the survey area. No threatened flora species listed under the EPBC Act and/or BC Act was recorded within the survey area. One priority 4 species, *Rhynchosia bungarensis*, was recorded along the base of rock piles on the Burrup Peninsula. A total of 48 plants from 14 locations were recorded. *Rhynchosia bungarensis* is well represented on a local scale on the Burrup Peninsula however is less represented elsewhere in the Pilbara region. A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment. The assessment concluded that no further threatened or priority flora are considered likely to occur within the survey area. The survey area intersects native vegetation which provides fauna habitat. The habitat types present within the survey area are well represented in the local and regional area. A search of the *NatureMap* database identified 694 fauna species (including 12 naturalised/ introduced species) previously recorded within 20 km of the survey area. This total comprised 207 birds, four amphibians, 104 reptiles, 212 invertebrates, 42 mammals and 125 fish. The fauna survey	The proposed clearing is unlikely to be at variance to this principle.	Beard (1975) DBCA (2007–) DBCA TPFL and WAHerb databases DEE (2019a) GHD field survey GoWA (2019a)

Principle	Assessment	Outcome	Reference
	identified a total of 77 fauna species, including 50 birds, 13 mammals and 14 reptiles from the survey area. Searches of the EPBC Act PMST and *NatureMap* database identified the presence/potential presence of 52 conservation significant fauna within a 20 km buffer of the survey area. This total does not include those species that are exclusively marine as no suitable marine habitat is present within the survey area. No Threatened or priority fauna species or evidence of their presence was recorded during the fauna assessment. A likelihood of occurrence assessment was conducted post-field survey for all conservation significant fauna species identified in the desktop assessment which concluded six species are likely to occur within the survey area. The presence of two PECs were identified within the survey area. Vegetation type 6 (VT_6) is considered to be representative of the Burrup Peninsula rock pile communities PEC (Priority 1). There is approximately 0.53 ha of this PEC occurring within the survey area of which all is in Very Good condition. Vegetation type 9 (VT_09) is considered to be representative of the Horseflat land system of the Roebourne Plains PEC (Priority 3). There is approximately 1.72 ha of this PEC occurring within the survey area which ranged from Poor to Good condition. The project will result in vegetation and habitat loss through direct clearing of native vegetation. Clearing will largely occur along an existing transmission line. Whilst the project will further fragment fauna habitat, it is unlikely to have a significant impact on local and regional linkages given its location to existing infrastructure and the extent of native vegetation in local and regional areas. The proposed clearing for linear infrastructure is unlikely to impact on the conservation status of conservation significant flora and fauna. The project footprint is unlikely to comprise greater biological diversity than the surrounding areas.		

Principle	Assessment	Outcome	Reference
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Six broad fauna habitat types have been identified within the survey area including rocky plains and low rises, minor drainage lines, rock piles, saline flats, sandy loam plains and gilgai grasslands. Searches of the EPBC Act PMST and NatureMap database identified the presence/potential presence of 52 conservation significant fauna within a 20 km buffer of the survey area. This total does not include those species that are exclusively marine as no marine habitat is present within the survey area. The results identified: • 18 species listed as Threatened under the EPBC Act and/or BC Act • One species listed as Threatened under the EPBC Act and as Priority 3 by DBCA • 27 species listed as Migratory under the EPBC Act and/or BC Act, • Five species listed as Priority by the DBCA • One species listed as Specially protected species under the BC Act. The fauna assessment identified a total of 77 fauna species, including 50 birds, 13 mammals and 14 reptiles within the survey area. No Threatened or priority fauna species or evidence of their presence was recorded in the survey area during the field assessment. A likelihood of occurrence assessment was conducted post-field survey for all conservation significant fauna species identified in the desktop assessment which concluded six species are likely to occur within the survey area. Suitable habitat for these species is present within the survey area however no evidence of their presence was observed during the survey. The project area is unlikely to support fauna habitat that is in better condition than the surrounding available habitat. Furthermore, the project footprint is not likely to comprise of significant habitat for indigenous fauna.	The proposed clearing is unlikely to be at variance to this principle.	DBCA (2007–) DEE (2019a) GHD field survey GoWA (2019a)

Principle	Assessment	Outcome	Reference
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No EPBC Act and/or BC Act listed flora have been identified within 20 km of the project area. The survey area is not likely to include or be necessary for the continued existence of rare/threatened flora.	The proposed clearing is unlikely to be at variance to this principle.	DBCA TPFL and WAHERB databases DBCA (2007–) DEE (2019a) GHD field survey
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	Searches of the EPBC Act PMST and the DBCA TEC databases identified no TECs within 20 km of the survey area. No TECs were identified during the flora and vegetation survey.	The proposed clearing is unlikely to be at variance to this principle.	DBCA TEC/PEC database DEE (2019a) GHD field survey
(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	The survey area is located within the Pilbara bioregion and Roebourne subregion as described by the IBRA. Broad scale (1:250,000) pre-European vegetation mapping of the area was completed by Beard (1975) at an association level. The mapping indicates that four vegetation associations are present within the survey area: • Hummock grasslands, grass steppe; soft spinifex (association 117 • Bare areas; mudflats (association 127) • Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex (association 589) • Hummock grasslands, grass steppe; hard spinifex, *Triodia wiseana* (association 157) The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by DBCA (latest update March 2019 – GoWA	The proposed clearing is unlikely to be at variance to this principle.	Beard (1975) Shepherd et al. (2002) GoWA (2019a, b)

Principle	Assessment	Outcome	Reference
	2019b). The current extents remaining of all vegetation associations are greater than 77 % of their calculated pre European extents at all scales (e.g. State, IBRA bioregion, IBRA subregion and Local Government Area (LGA) levels). Given the vegetation extents remaining, the survey area is not located within an area that has been extensively cleared.		
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The survey area does not intersect any significant drainage lines or wetlands. The survey area does intersect a couple of minor/broad ephemeral drainage lines, however, these are associated with infrequent surface water caused by sporadic weather events like seasonal cyclones. The northern part of the survey area is adjacent to evaporation ponds. These ponds are man-made and do not support native vegetation. The project area is unlikely to support vegetation that grows in association with a watercourse or wetlands.	The proposed clearing is unlikely to be at variance to this principle.	GHD field survey GoWA (2019a)
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The soils of the survey area comprise tidal soils with some calcareous loamy earths, salt lake soils and red/brown non-cracking clays. Land system mapping indicates the Granitic and Ruth Systems, and tidal flat areas of the Littorial Systems are not susceptible to erosion, however, the Cheerawarra and Horseflat Systems are moderately to highly susceptible to erosion. The City of Karratha Water Management Plan (Essential Environmental 2016) indicates that the City has issues with erosion from seasonal floors removing the red dirt. The removal of vegetation may increase the risk of wind and water erosion, particularly during the wet season. A review of the ASS risk mapping indicates that the survey area is located within an area that has a high to moderate, and moderate to low probability of occurrence of ASS. Undisturbed ASS do not pose a risk, and only become an issue where excavation occurs. Measures	The proposed clearing may be at variance to this principle.	GoWA (2019a)

Principle	Assessment	Outcome	Reference
	may need to be implemented to ensure that ASS is not exposed during construction.		
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The survey area does not intersect any conservation areas. The closest conservation area is Murujuga National Park which is located approximately 250 m east of the survey area, on the Burrup Peninsula. The project will not directly impact on any conservation areas. It is anticipated that standard management practices will be implemented during construction to mitigate aspects that have the potential to cause indirect impacts on nearby conservation areas, such as contamination through hydrocarbon spills and weed spread.	The proposed clearing is unlikely to be at variance to this principle.	DEE (2019) GoWA (2019a)
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The survey area does not intersect any significant drainage lines. The survey area intersects a couple of minor/broad ephemeral drainage lines, however, these are likely to be associated with infrequent surface water caused by sporadic weather events like seasonal cyclones. No Internationally (Ramsar) or Nationally Important Wetlands intersect the survey area. The survey area is located within the proclaimed Pilbara Groundwater Area and Pilbara Surface Water Area. It is considered unlikely that any clearing will significantly disturb or interrupt any natural drainage and surface run-off patterns. However, during heavy localised rainfall events erosion may occur in cleared areas leading to temporary soil erosion and/or sedimentation. These impacts are expected to be minimal and short-term. Furthermore, given the depth to groundwater it is considered unlikely that clearing will impact groundwater. It is anticipated that the surface water hydrology can be maintained in its current regime with appropriate drainage design. Given appropriate management measures are undertaken during the project, the proposed clearing is unlikely to cause deterioration in the quality of surface or underground water.	The proposed clearing is unlikely to be at variance to this principle.	DEE (2019) GoWA (2019a)
(j) Native vegetation should not be cleared if the clearing of the vegetation is likely to	The survey area comprises tidal soils with some calcareous loamy earths, salt lake soils and red/brown non-cracking clays. Removal of vegetation in areas with clay soils may exacerbate the incidence or intensity of flooding or localised waterlogging.	The proposed clearing may be at variance to this principle.	BoM (2019)

Principle	Assessment	Outcome	Reference
cause, or exacerbate, the incidence or intensity of flooding.			Essential Environmental (2016)

6. References

Beard, JS 1975, *Vegetation Survey of Western Australia: Pilbara, map and explanatory memoir* 1:1,000,000 series, Nedlands, University of Western Australia Press.

Bureau of Meteorology (BoM) 2019, *Climate Data Online*, retrieved February and June 2019, from http://www.bom.gov.au/climate/data/

Christidis, L and Boles, WE 2008, Systematics and Taxonomy of Australian Birds, Melbourne, Australia, CSIRO Publishing.

Department of Biodiversity, Conservation and Attractions (DBCA) 2007–, *NatureMap: Mapping Western Australia's Biodiversity*, retrieved February 2019, from http://naturemap.dpaw.wa.gov.au/default.aspx/.

Department of Biodiversity, Conservation and Attractions (DBCA) 2019, *Priority Ecological Communities for Western Australia Version 28.* Species and Communities Program, DBCA, 17 January 2019.

Department of Environment and Conservation (DEC) 2013, *Murujuga National Park Management Plan 78,* Department of Environment and Conservation, Perth

Department of the Environment and Energy (DEE) 2019a, *Environmental Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results*, retrieved February 2019, from http://www.environment.gov.au/epbc/pmst/index.html.

Department of the Environment and Energy (DEE) 2019b, Environment Protection and Biodiversity Act 1999 List of Threatened Flora, retrieved June 2019, from http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl?wanted=flora.

Department of Water and Environment Regulation (DWER) 2019, *Water Information Reporting*, retrieved February 2019, from http://wir.water.wa.gov.au/Pages/Water-Information-Reporting.aspx.

Environmental Protection Authority (EPA) 2016a, Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2016b, Technical Guide – Sampling for Terrestrial Vertebrate Fauna Surveys, Perth, Environmental Protection Authority and the Department of Environment and Conservation.

Environmental Protection Authority (EPA) 2016c, Technical Guidance, Terrestrial Fauna Surveys, Perth, Environmental Protection Authority.

Essential Environment 2016, *City of Karratha Water Management Plan*, unpublished report prepared for the City of Karratha.

Government of Western Australia (GoWA) 2019a, *Data WA*, retrieved February and June 2019, from https://data.wa.gov.au/.

Government of Western Australia (GoWA) 2019b, 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report), Current as of March 2019, Perth, Australia, Department of Biodiversity, Conservation and Attractions, retrieved June 2019, from https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Kendrick, P & Stanley, F (2001). Pilbara 4 (PIL4 – Roebourne synopsis), *A biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002*.

Keighery, BJ 1994, Bushland Plant Survey: A Guide to Plant Community Survey for the Community, Nedlands, Australia, Wildflower Society of Western Australia (Inc.).

NVIS Technical Working Group 2017, Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0, Department of the Environment and Energy, Canberra.

Shepherd, DP, Beeston, GR, and Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status*, Resource Management Technical Report 249, Department of Agriculture, Western Australia.

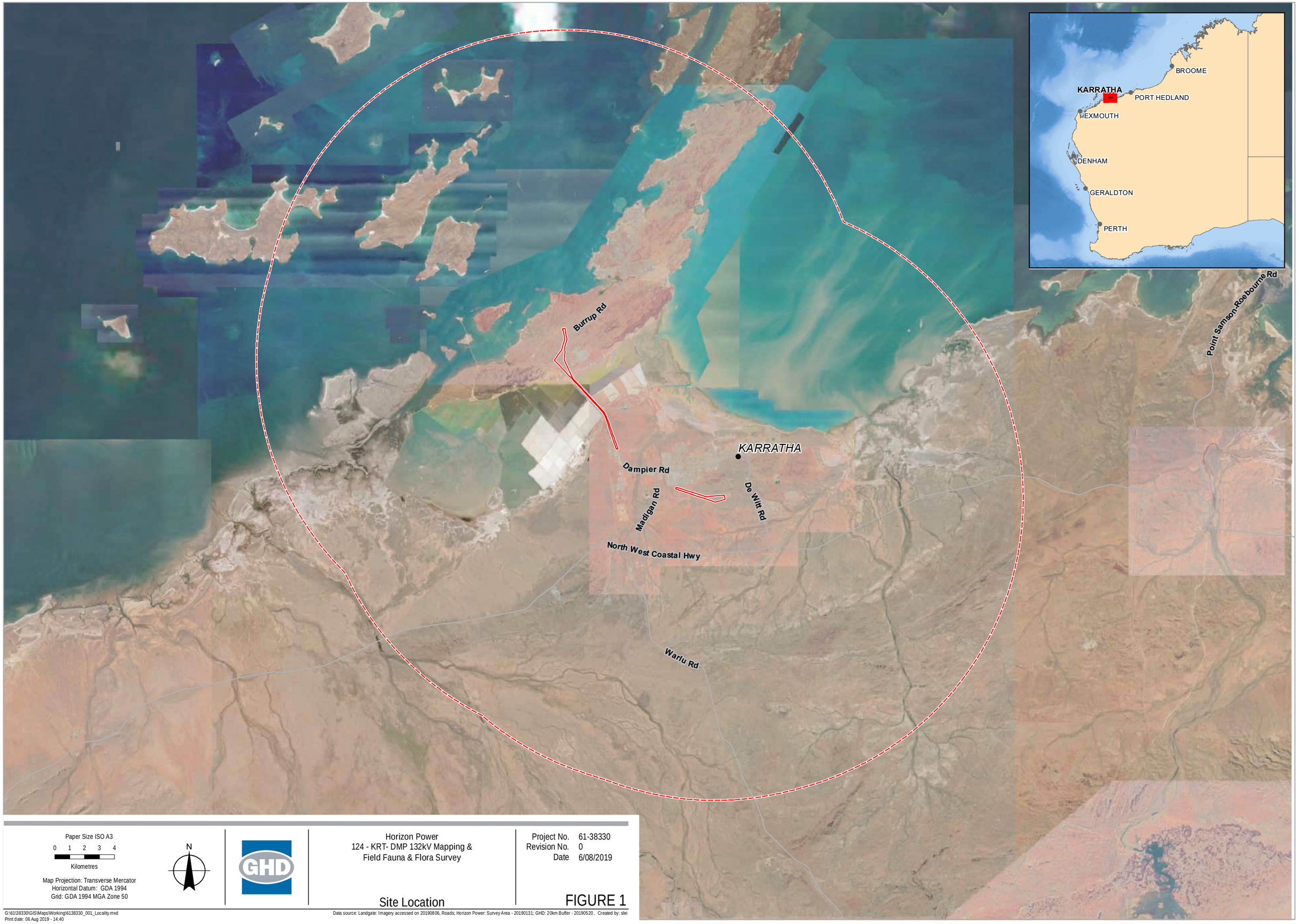
Tille, P 2006, *Soil-landscapes of Western Australia's Rangelands and Arid Interior*, Resource Management Technical Report 313, Perth, Department of Agriculture and Food.

Van Vreeswyk, AME, Payne, AL, Leighton, KA and Hennig, P 2004, *An inventory and condition survey of the Pilbara region*, Technical Bulletin No. 92, Western Australia, South Perth, Department of Agriculture.

Western Australian (WA) Herbarium 1998–, FloraBase–the Western Australian Flora, Biodiversity, Conservation and Attractions, retrieved June 2019, from http://florabase.dpaw.wa.gov.au/.

Appendices

Appendix A – Figures



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Horizon Power
124 - KRT- DMP 132kV Mapping &
Field Fauna & Flora Survey

Site Location

Project No. 61-38330
Revision No. 0
Date 6/08/2019

FIGURE 1

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Murrujuga National Park

Burrup Rd

Dampier Rd

KARRATHA

Madigan Rd

De Witt Rd

North West Coastal Hwy

Point Samson-Roebourne Rd

Warlu Rd

Legend

- ESA (Schedule One Area)
- Survey area
- Desktop study area

DBCA Managed Lands

- National Park
- Nature Reserve
- Section 5(1)(h) Reserve

Paper Size ISO A3

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Field Fauna & Flora Surve

Land use constraints

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FIGURE 2

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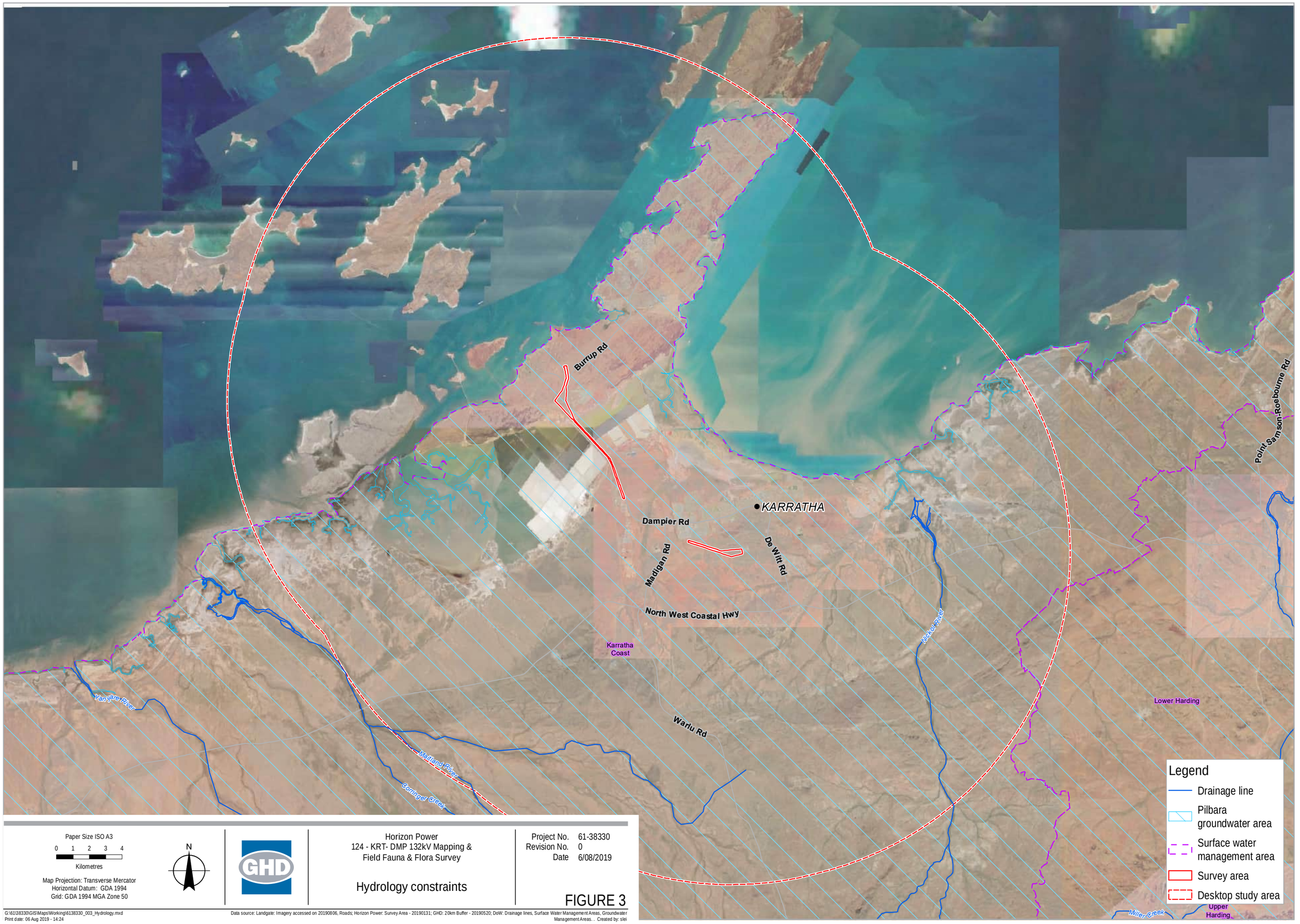

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Horizon Power
124 - KRT- DMP 132kV Mapping &
Field Fauna & Flora Survey

Hydrology constraints

Project No. 61-38330
Revision No. 0
Date 6/08/2019

FIGURE 3

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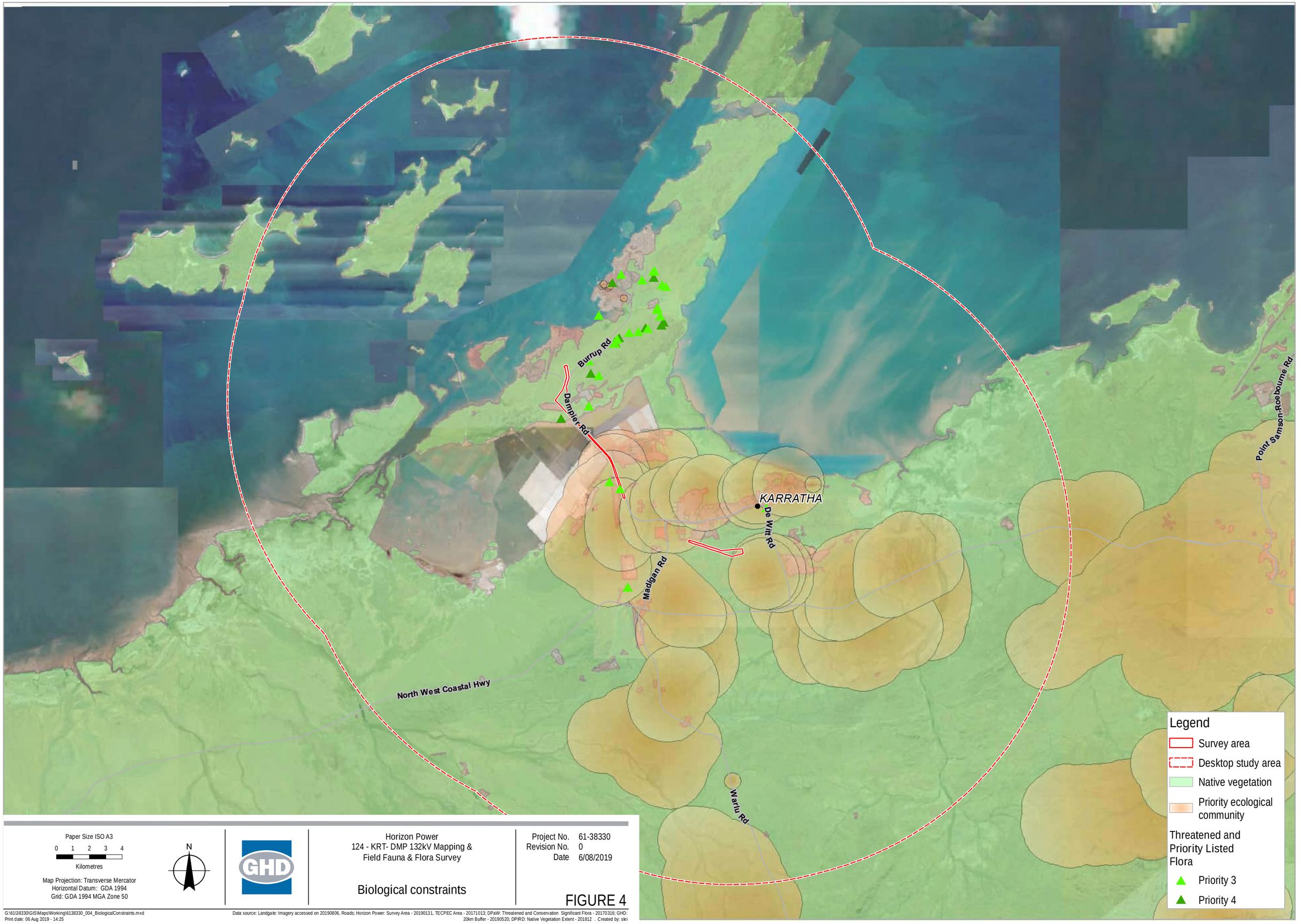

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Horizon Power
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Biological constraints

Project No. 61-38330
Revision No. 0
Date 6/08/2019

FIGURE 4

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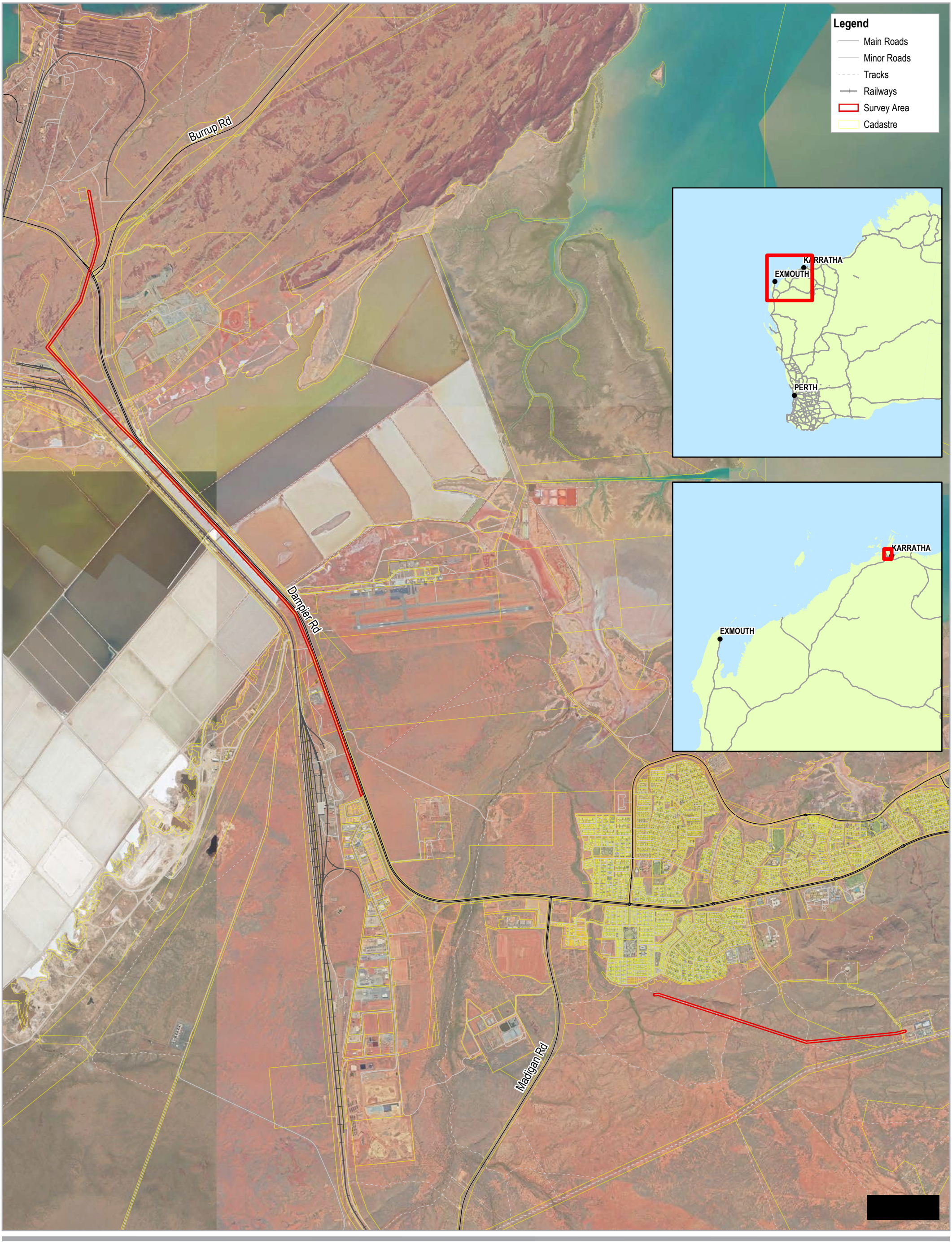

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Horizon Power
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Location of Survey Area

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 5

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Horizon Power
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Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6
Page 1 of 14

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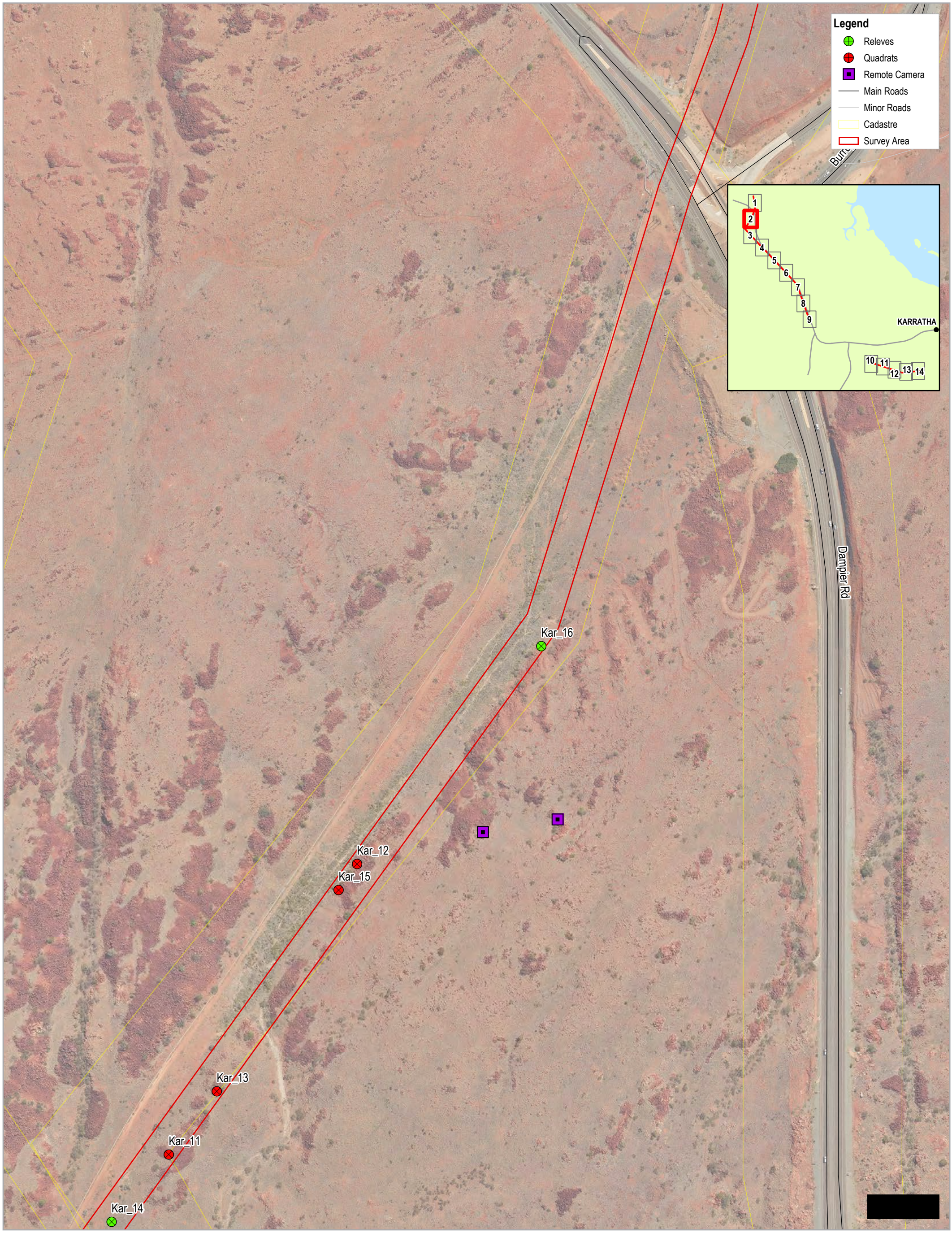

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Survey Sampling Effort

Project No. **61-38330**
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Date **6/08/2019**

FIGURE 6
Page 2 of 14

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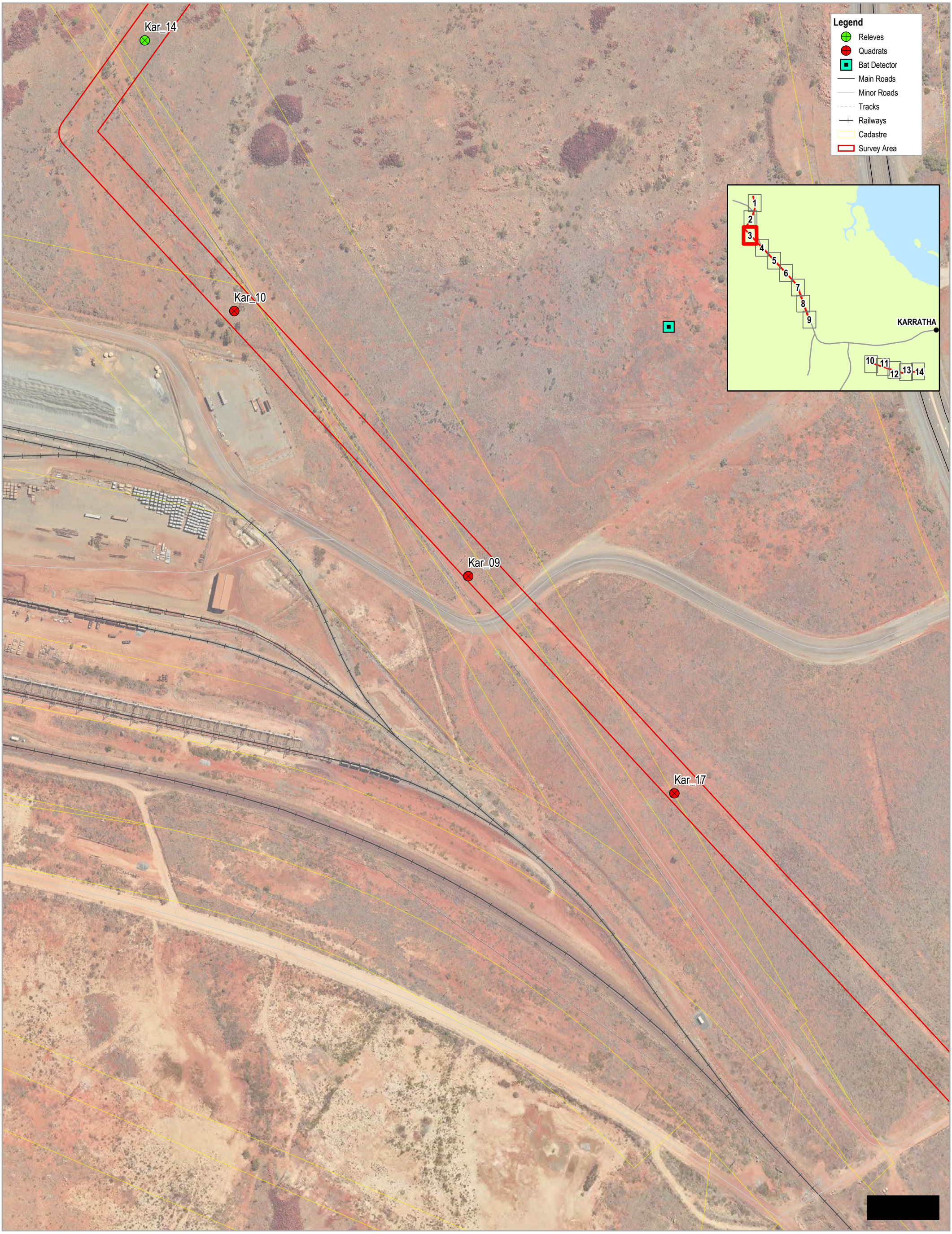

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Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6
Page 3 of 14

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Project No. **61-38330**
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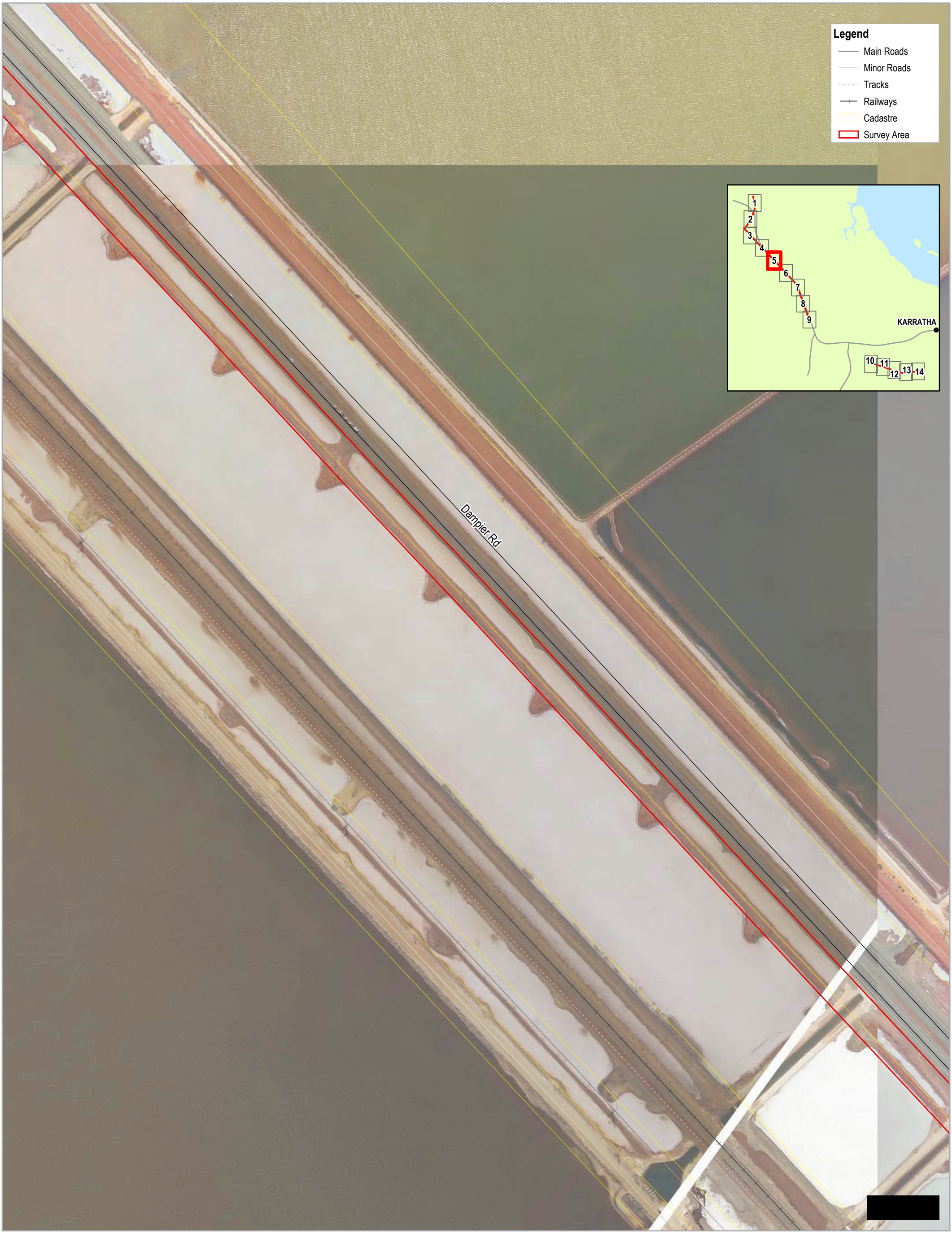

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Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6
Page 5 of 14

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Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

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Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Survey Sampling Effort

Project No. **61-38330**
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Date **6/08/2019**

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Horizon Power
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Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6
Page 8 of 14

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Horizon Power
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Survey Sampling Effort

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Date **6/08/2019**

FIGURE 6

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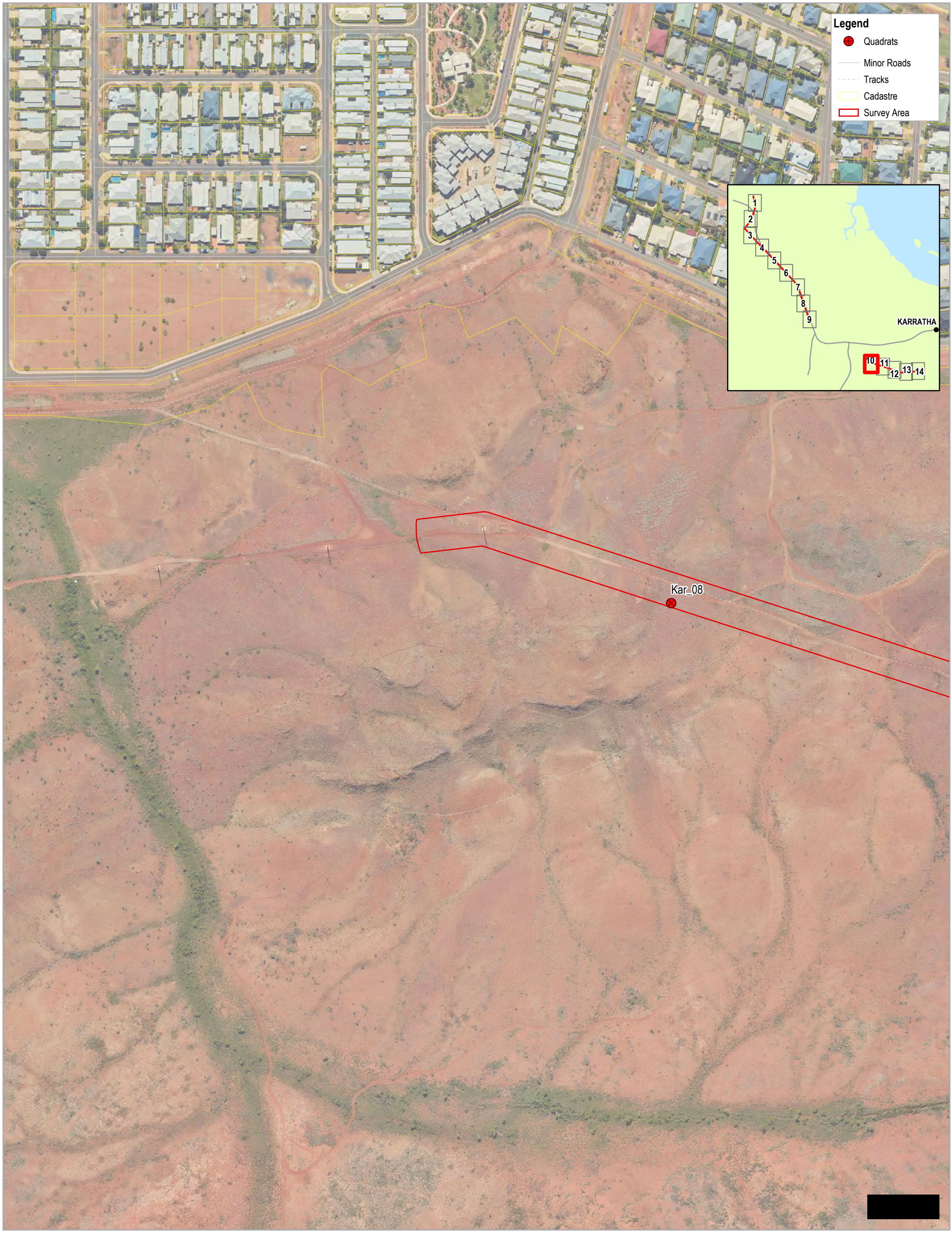

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_006_SurveySamplingEffort_RevA
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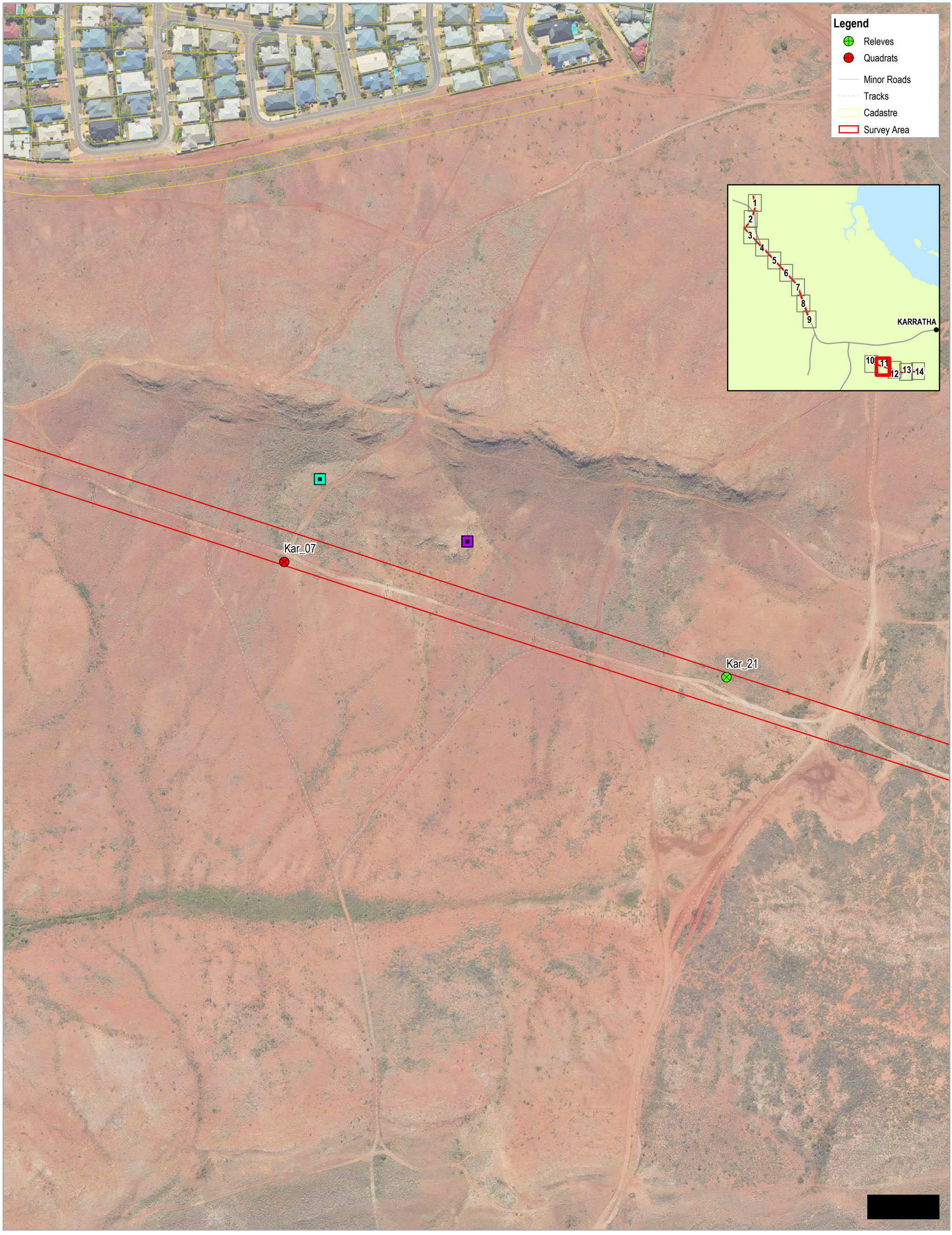

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6

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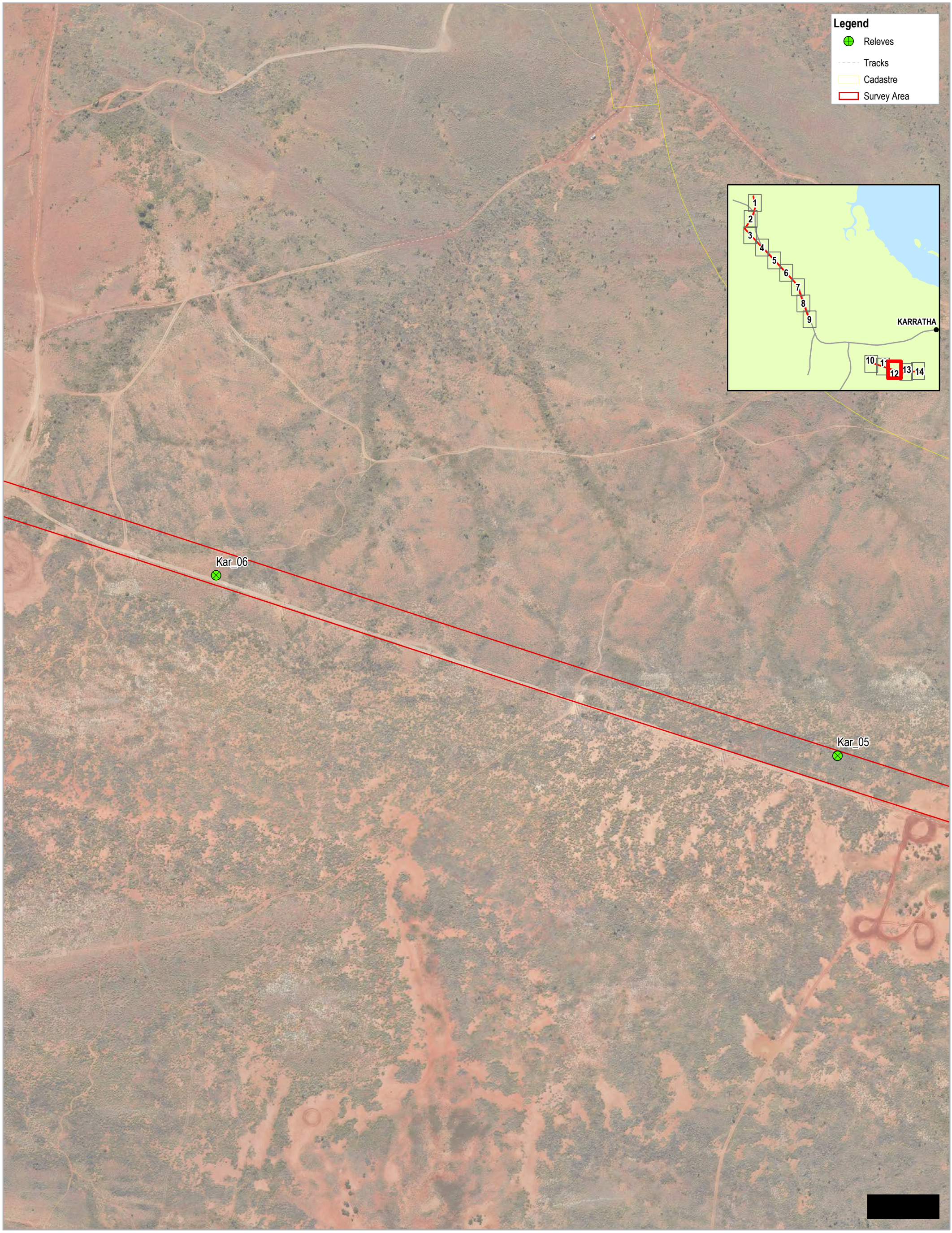

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Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6

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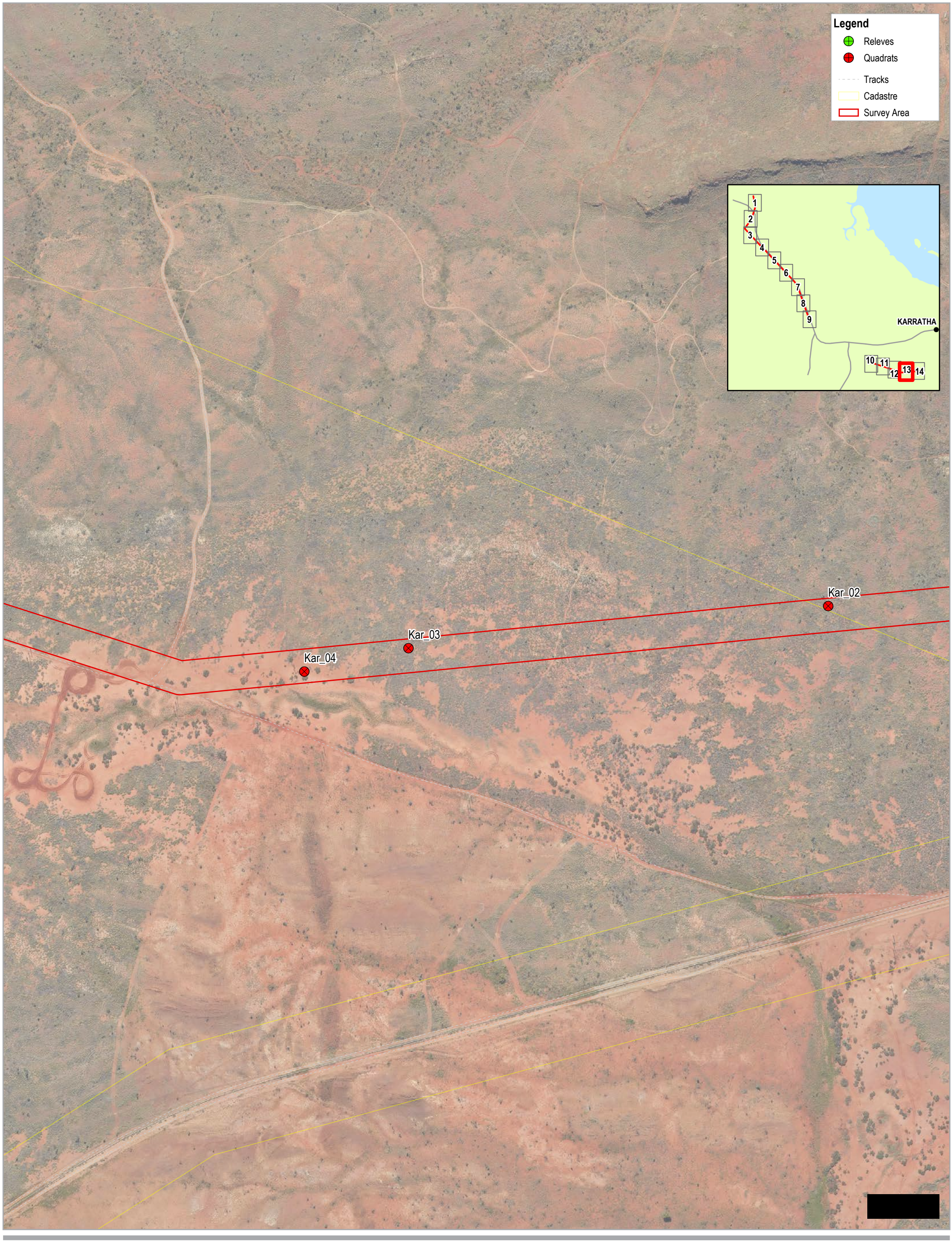

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Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Survey Sampling Effort

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 6

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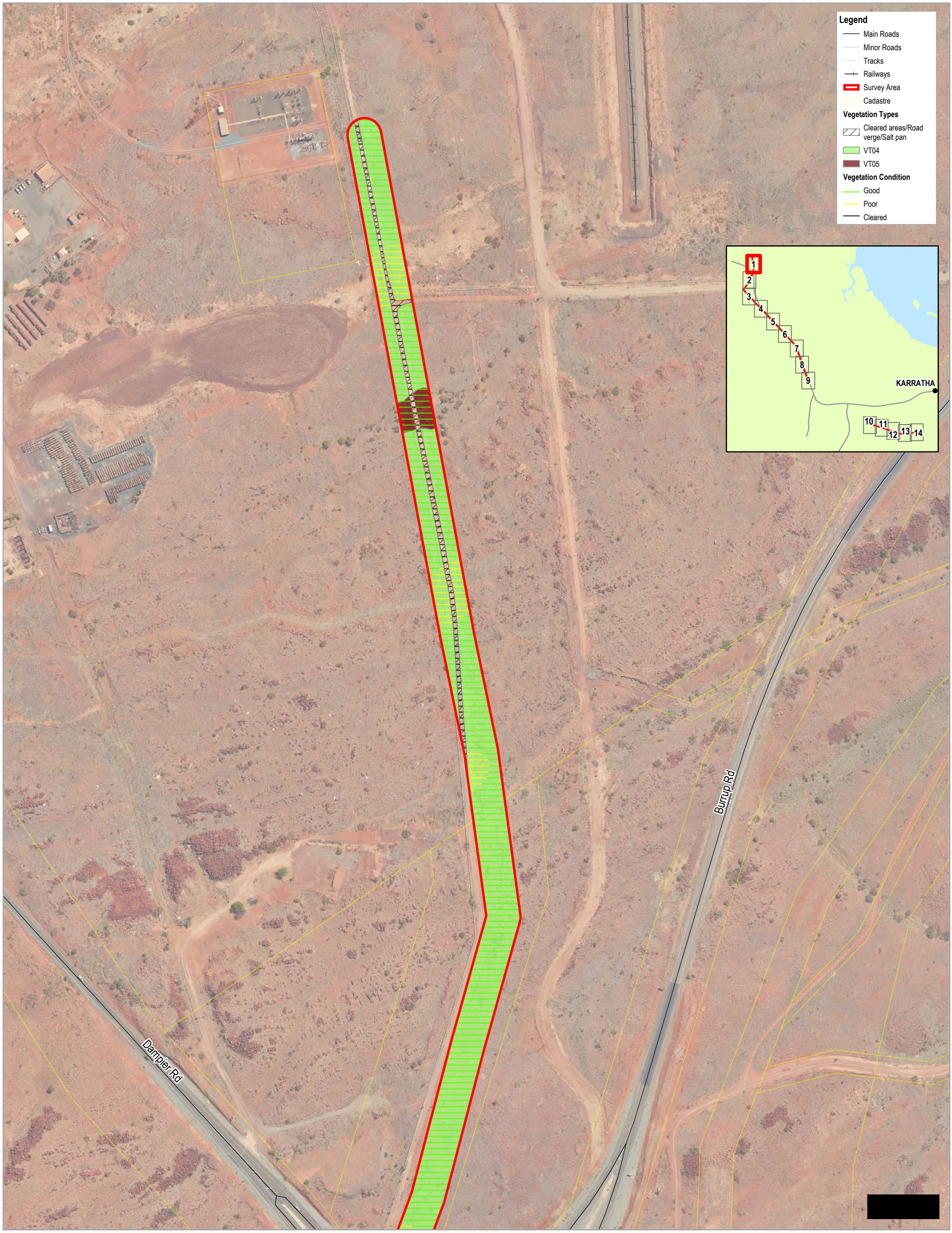

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Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

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Print date: 06 Aug 2019 - 16:01

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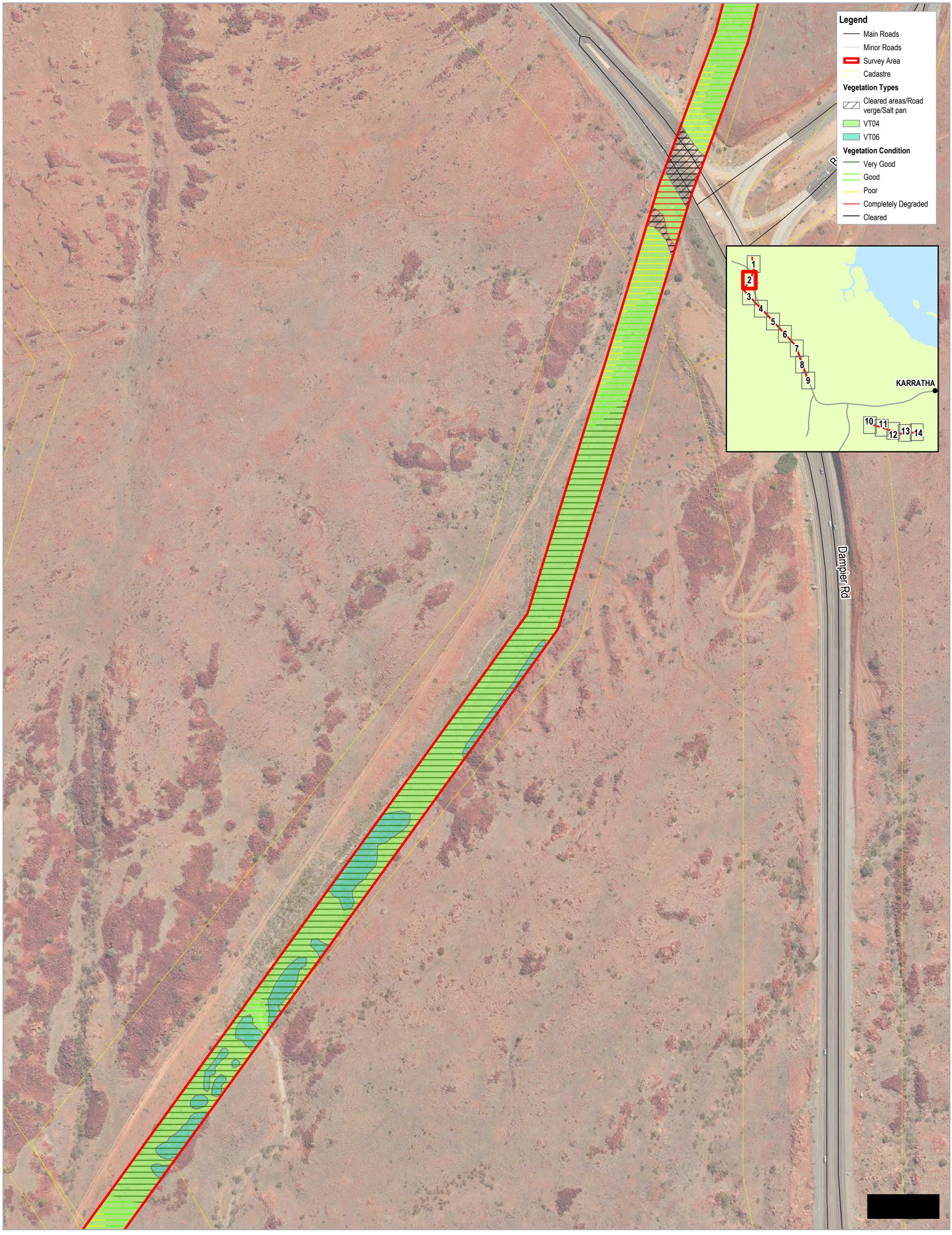

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7
Page 2 of 14

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
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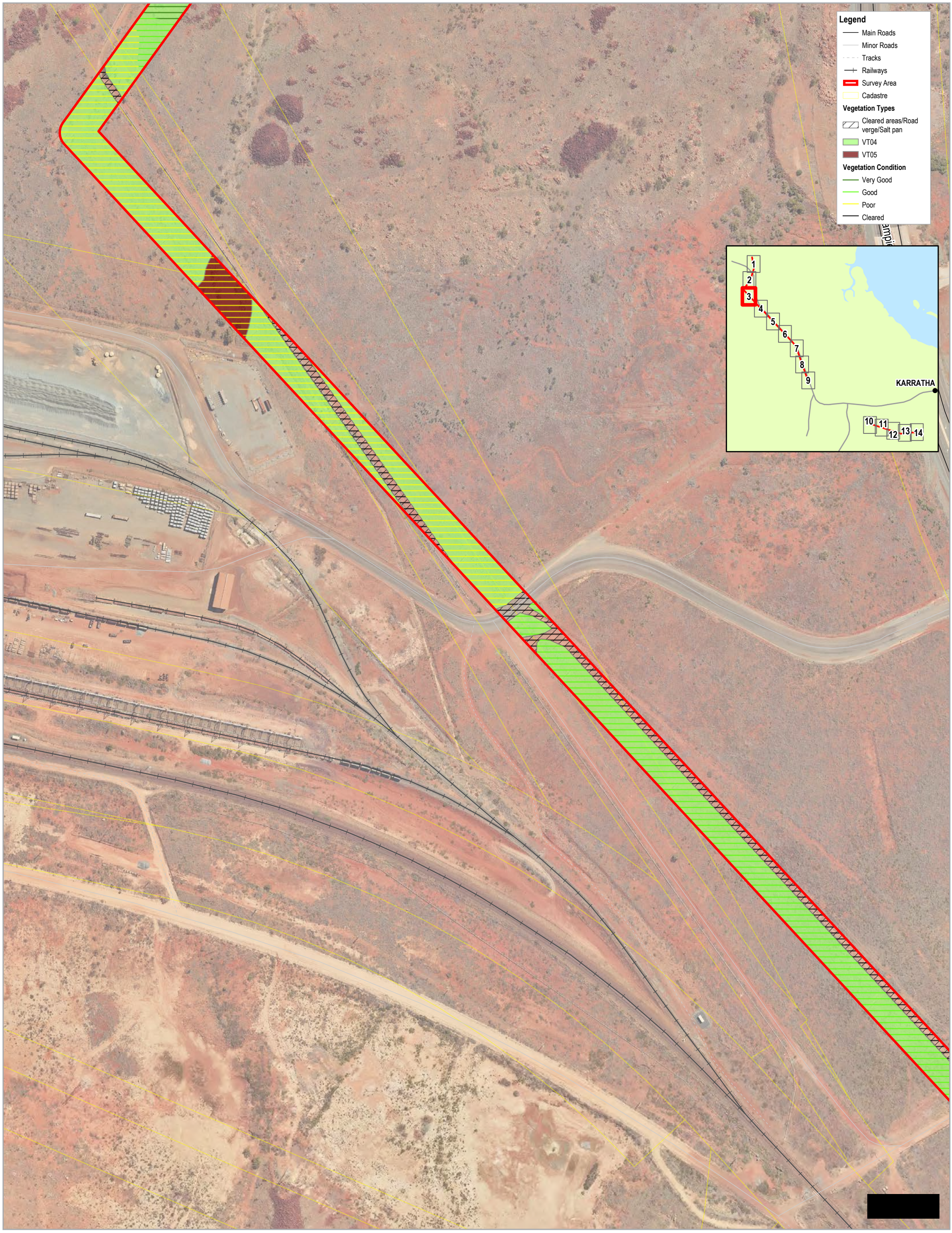

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7
Page 3 of 14

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
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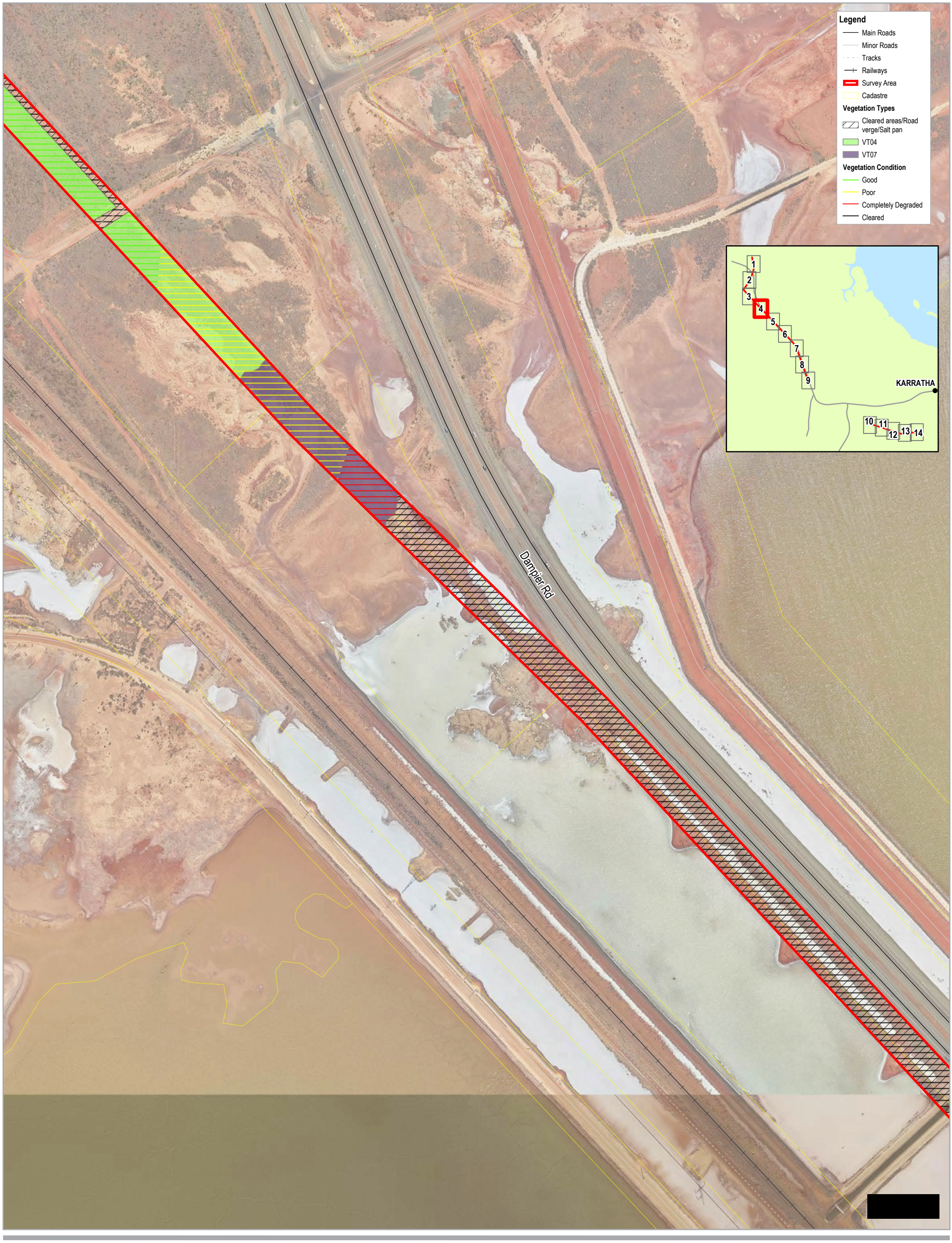

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

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Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7
Page 5 of 14

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
Print date: 06 Aug 2019 - 16:05

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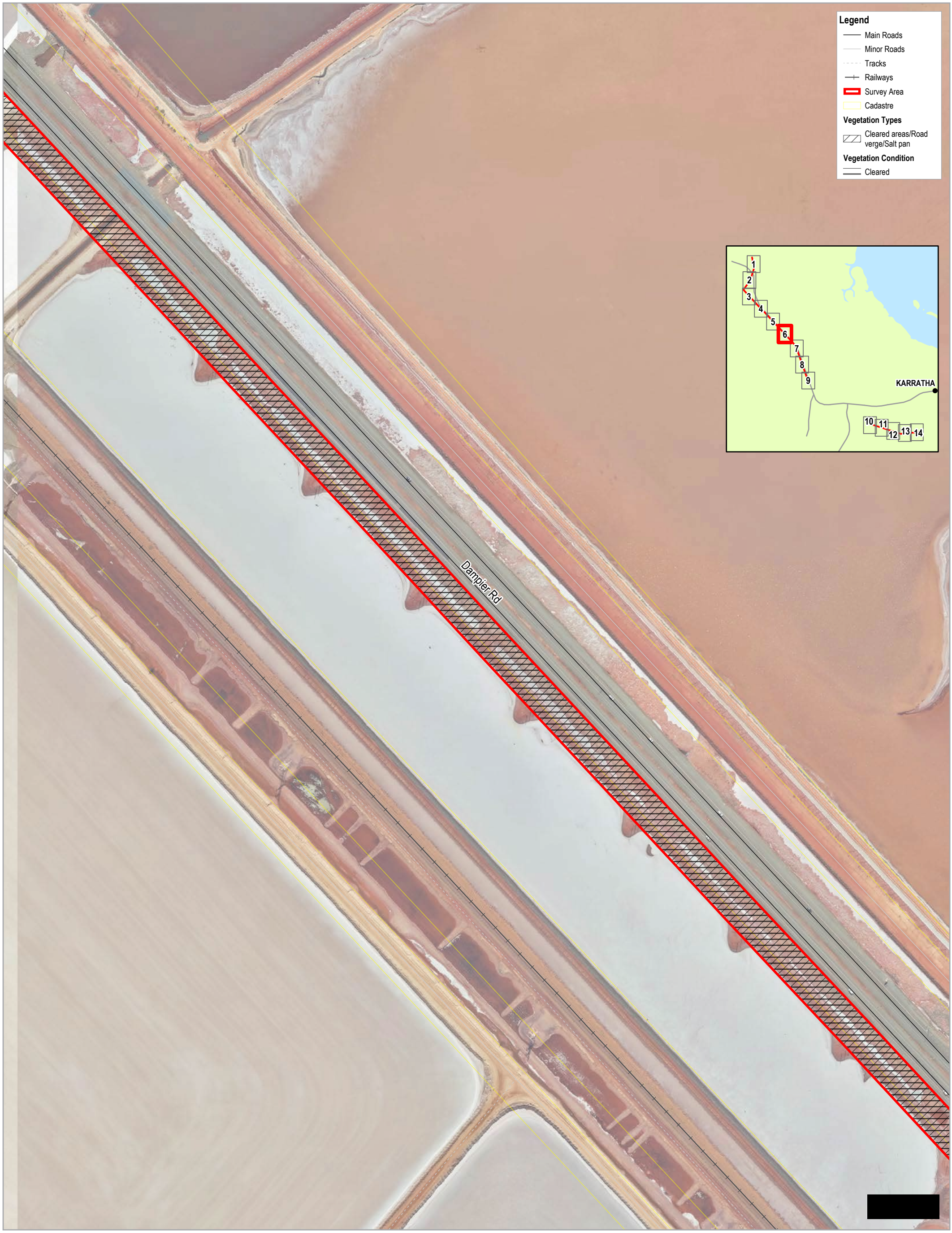

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Metres

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Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7
Page 6 of 14

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
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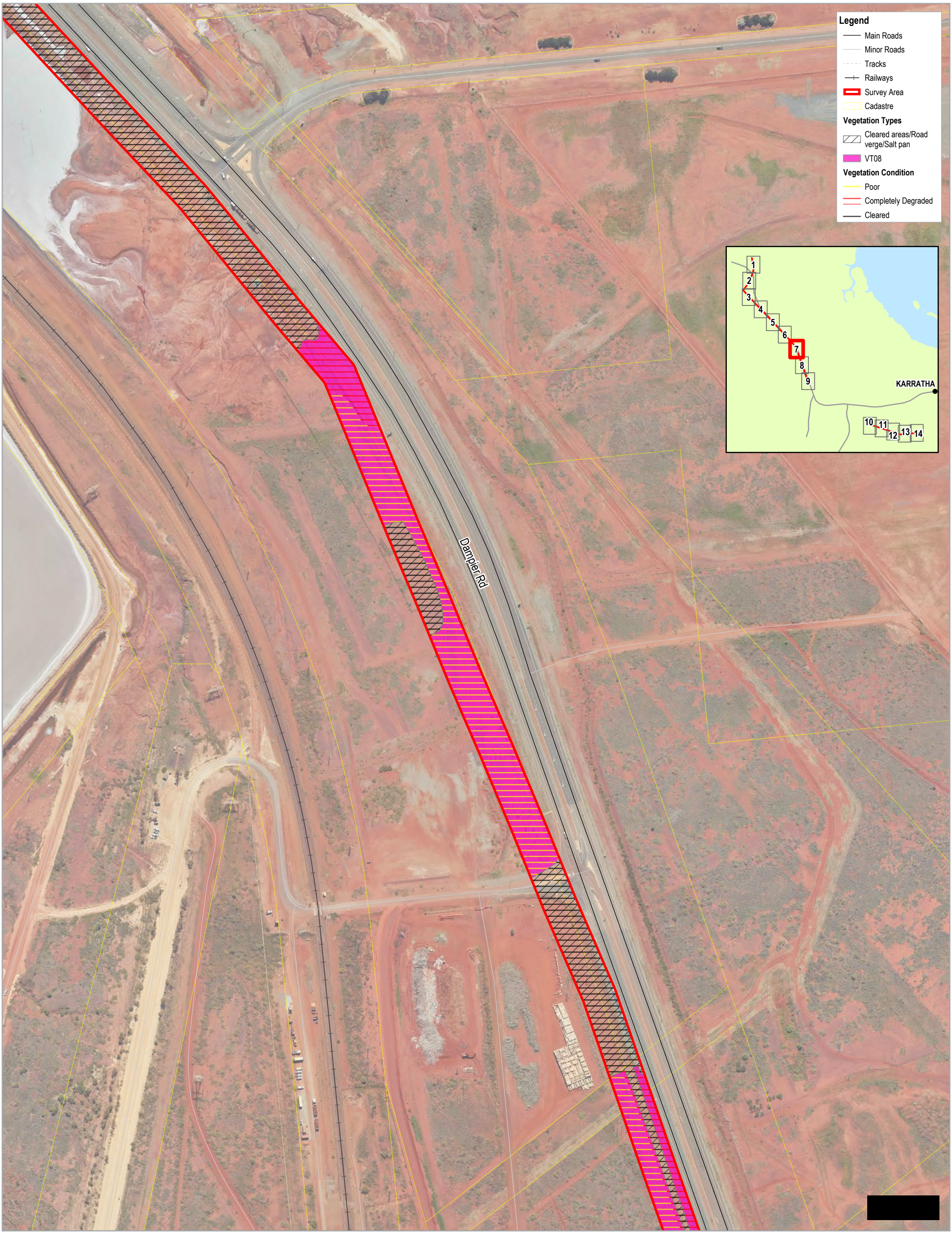

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
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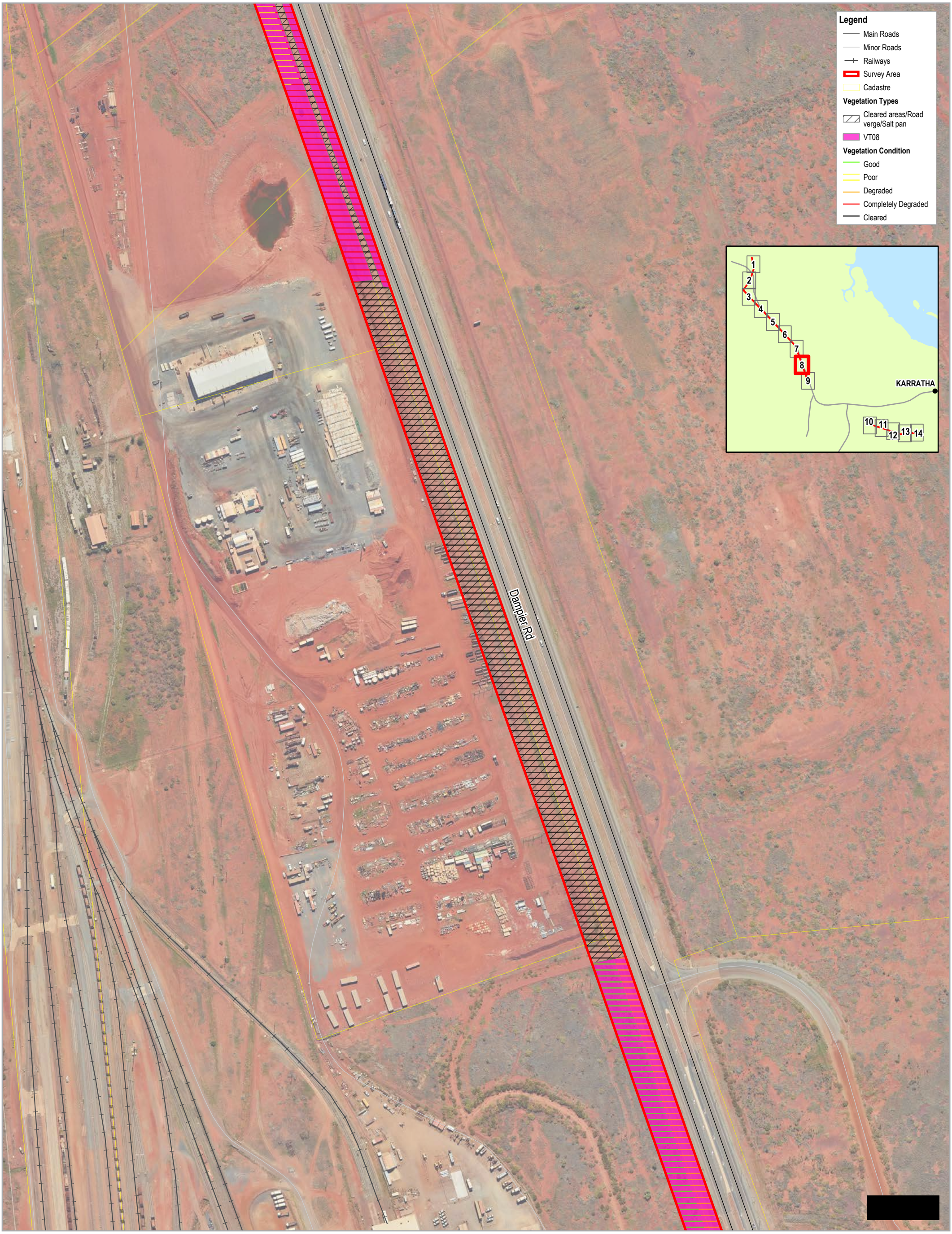

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
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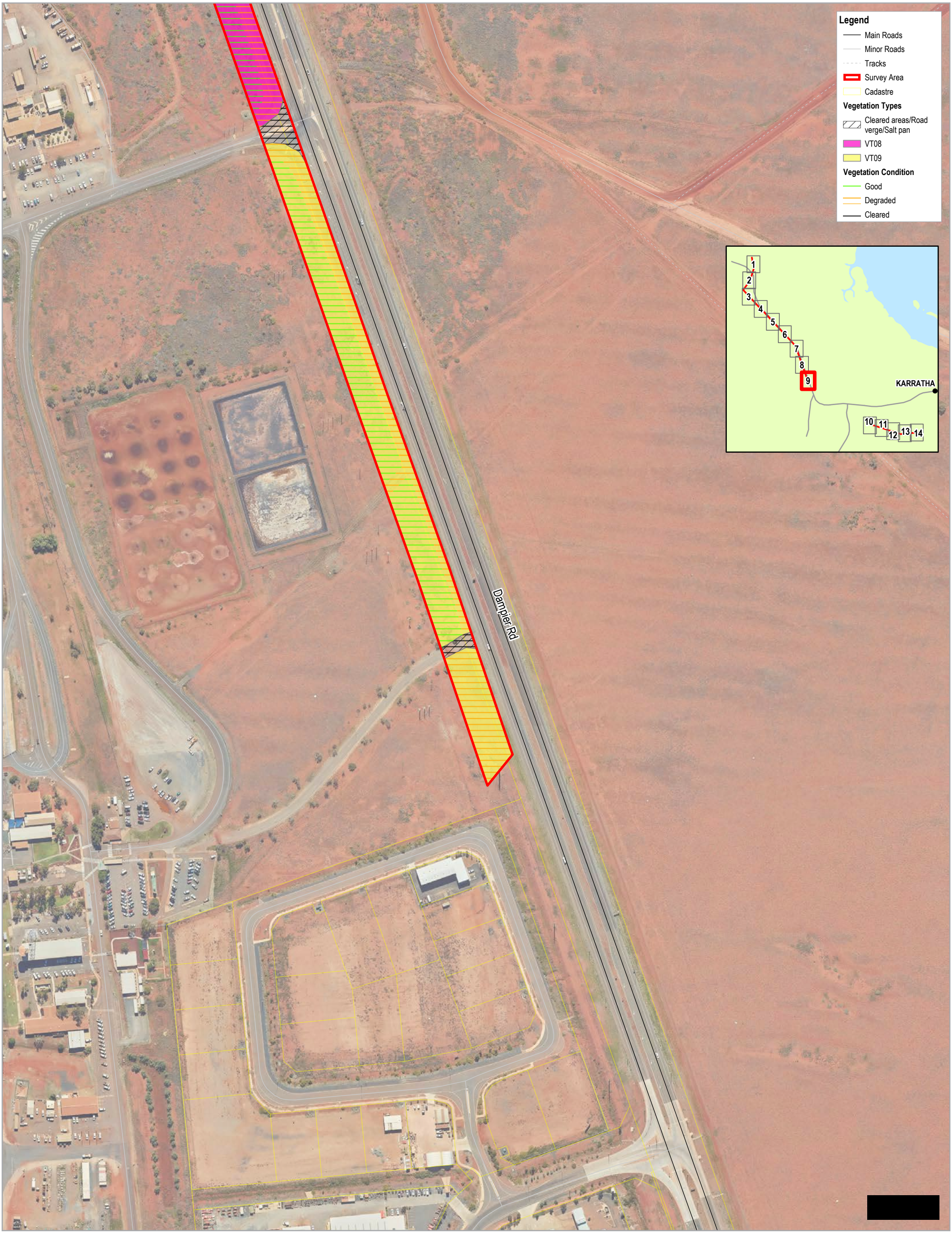

Paper Size ISO A3

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Metres

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Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
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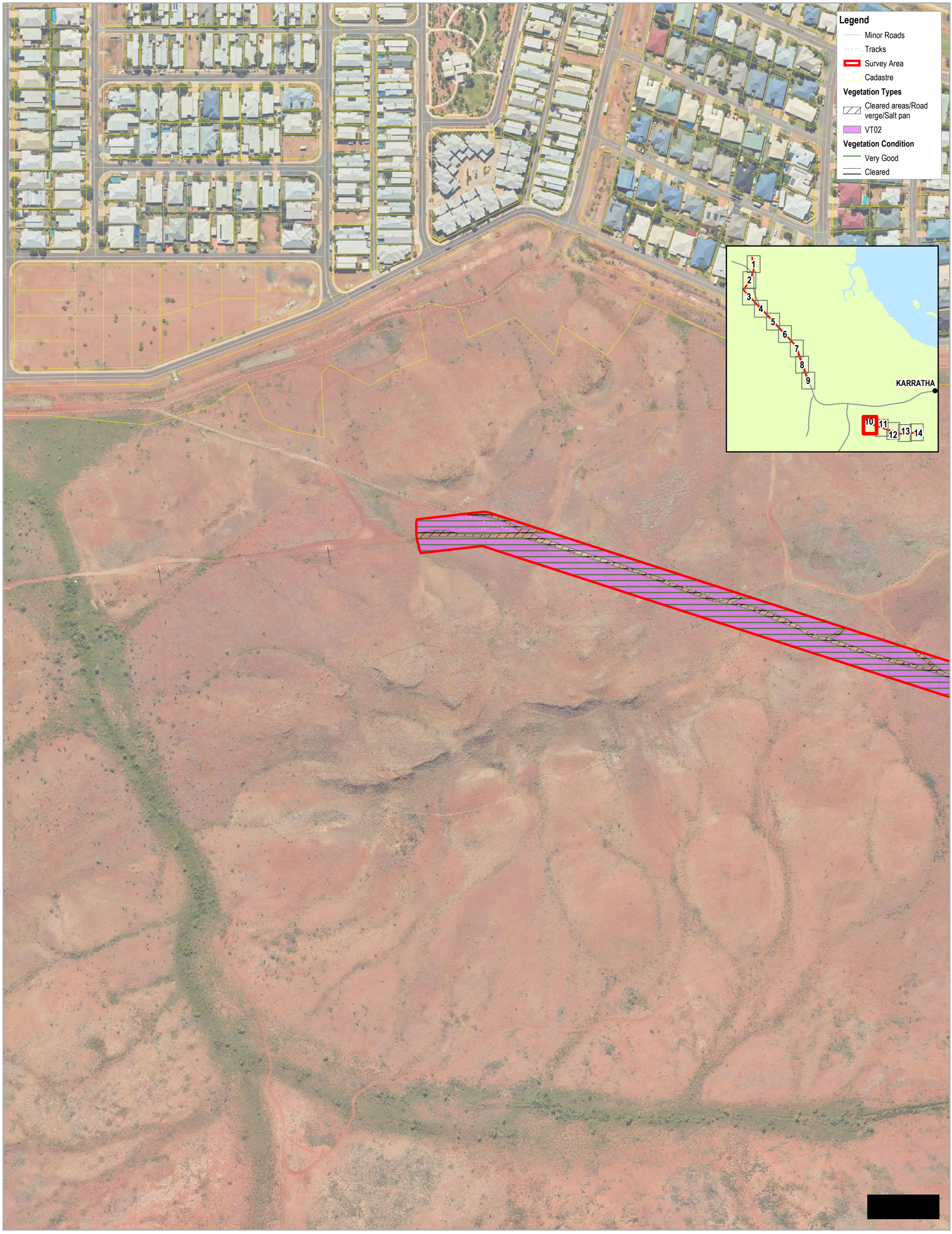

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N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

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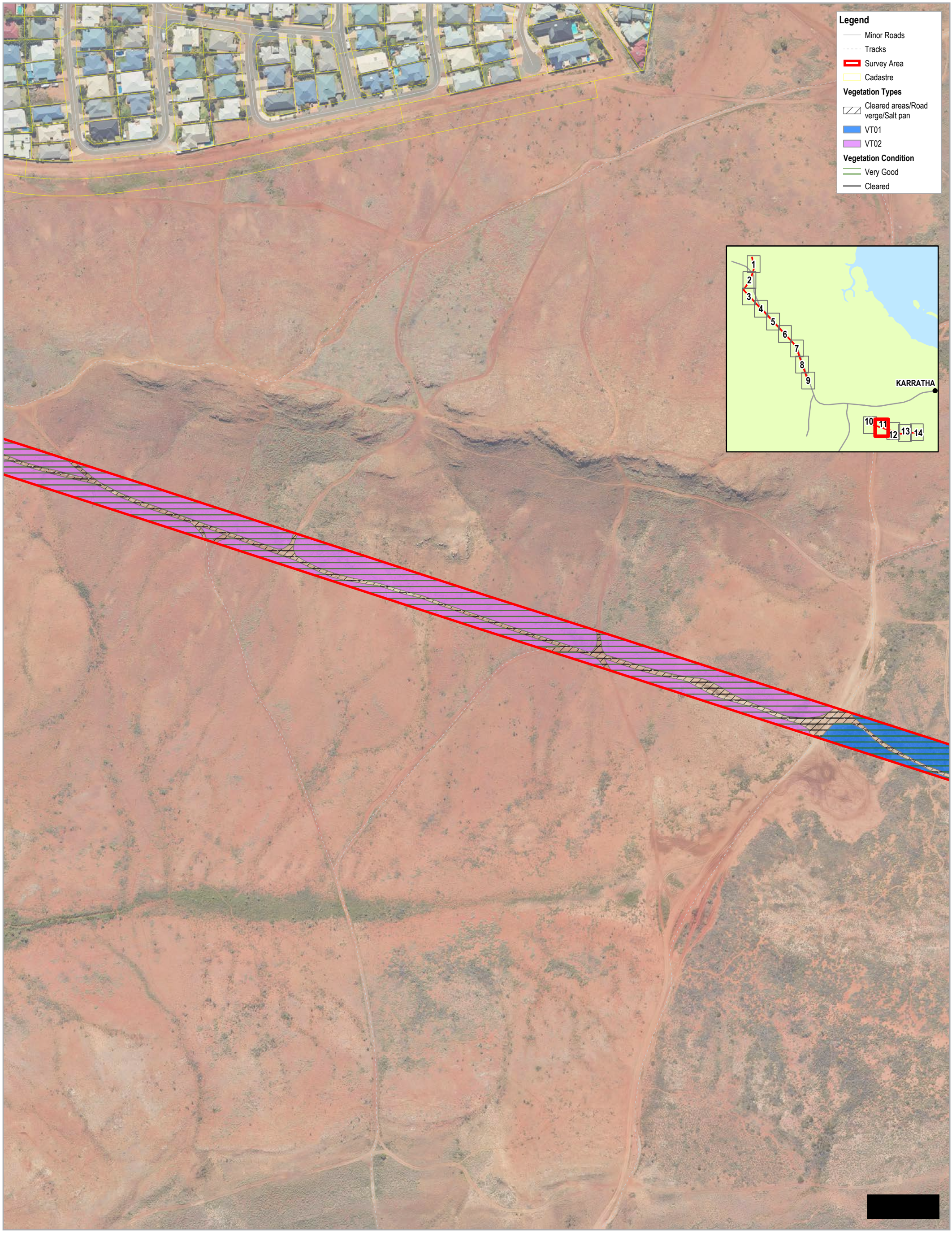

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7
Page 11 of 14

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
Print date: 06 Aug 2019 - 16:10

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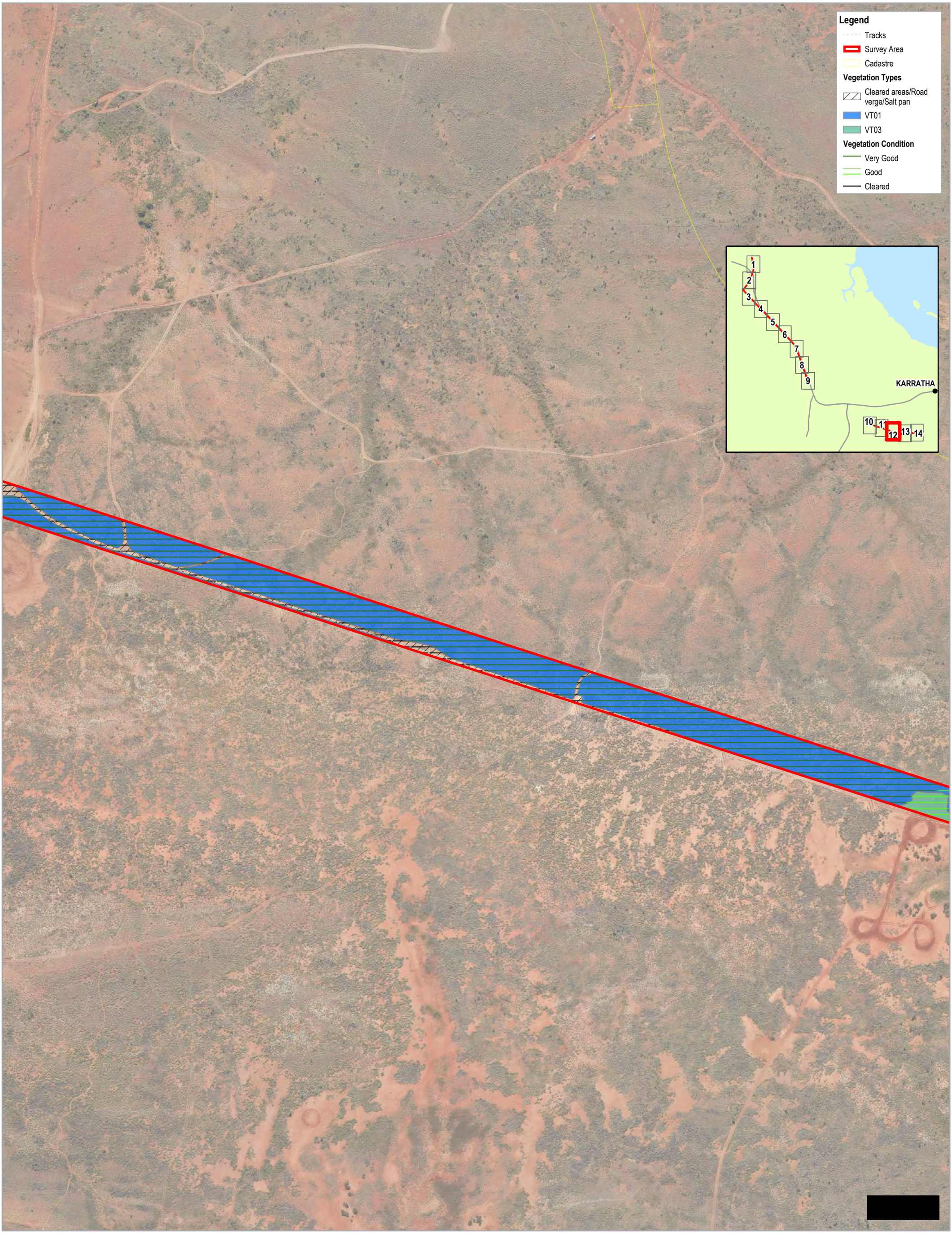

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

G:\61\38330\GIS\Maps\Working\6138330_ProjectFolder\6138330_ProjectFolder.aprx\6138330_007_VegTypesCons_Rev0
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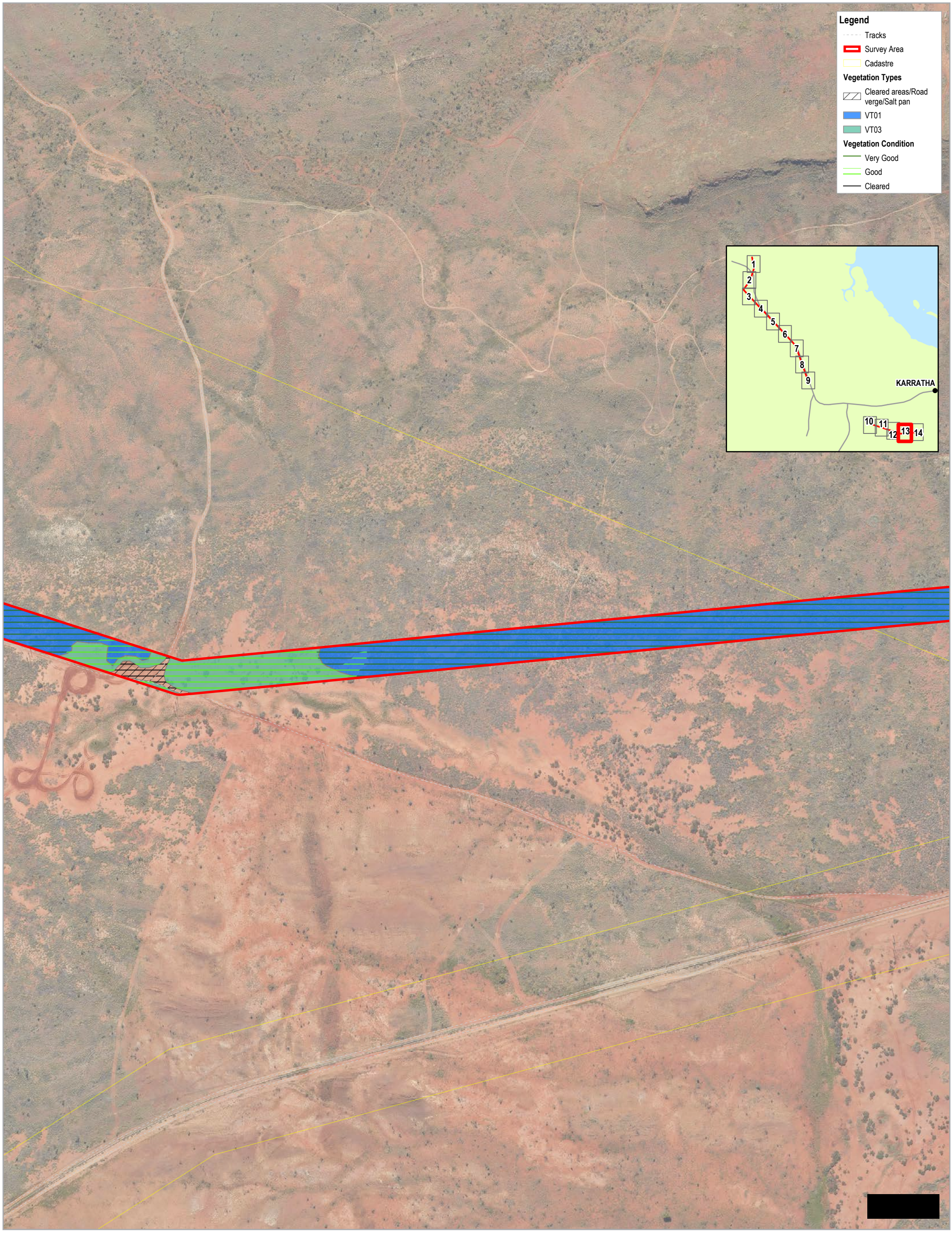

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

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Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Vegetation Types and Conditions

Project No. **61-38330**
Revision No. **0**
Date **6/08/2019**

FIGURE 7

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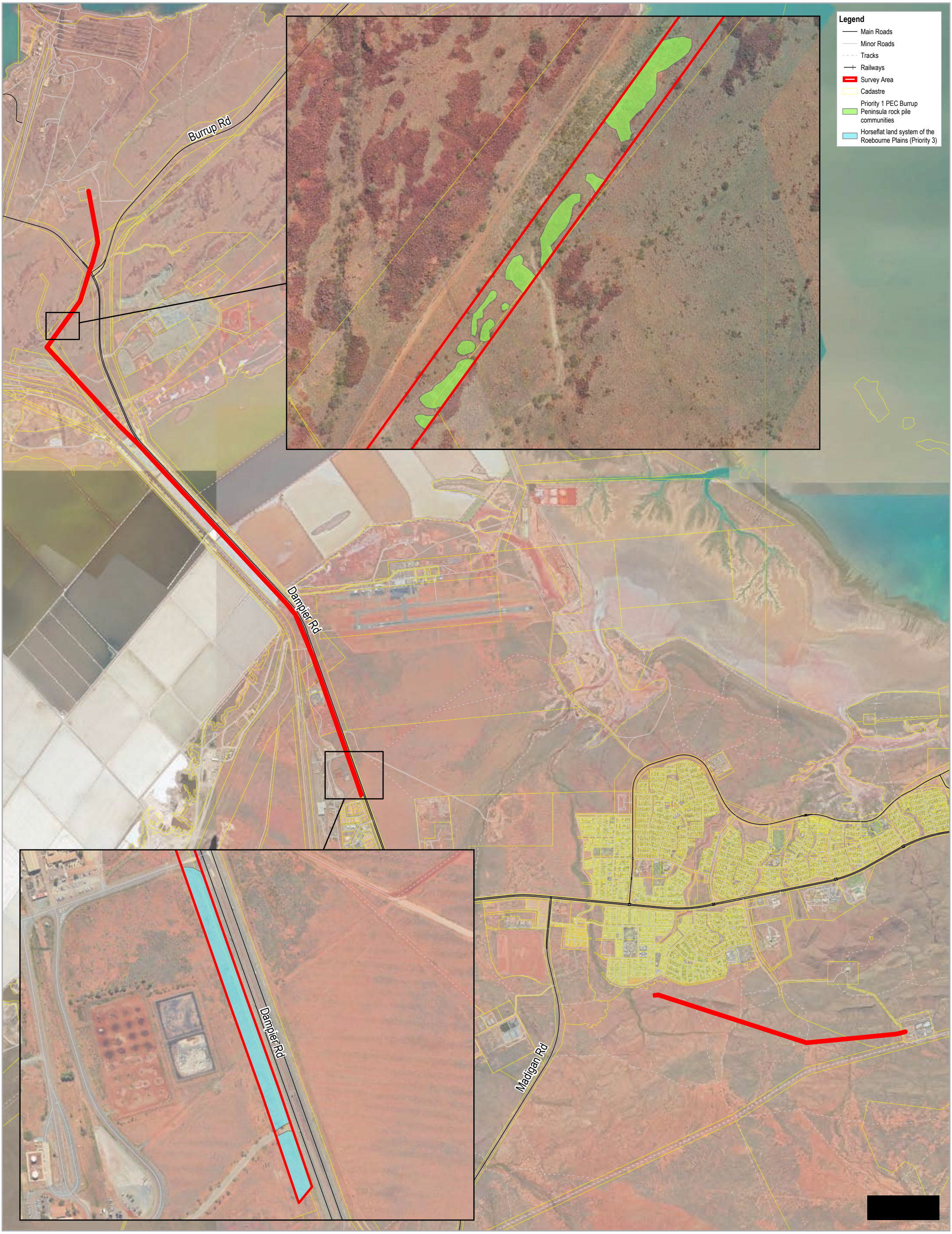

Paper Size ISO A3

0 0.25 0.5 0.75 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Horizon Power
124 - KRT- DMP 132kV Mapping & Field Fauna & Flora Survey

Priority Ecological Community Location

Project No. **61-38330**
Revision No. **B**
Date **10/07/2019**

FIGURE 8

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Data source: GHD: Survey Area - 20190614, PEC Locations - 20190708; LGATE: Cadastre, Road Network - 20190128, Railway - 20190304, Imagery accessed on 20190704. Created by: slei

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Appendix B – Relevant legislation and background information

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

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

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

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

State *Environmental Protection Act 1986*

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

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

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

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

State *Biodiversity and Conservation Act 2016*

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

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

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

State *Biosecurity and Agriculture Management Act 2007*

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

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

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

DPIRD Categories for Declared Pests under the BAM Act

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

Background information

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared by the Minister for Environment under Section 51B of the EP Act. The Table below outlines the aspects of areas declared as ESA in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005.

Aspects of ESAs

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the EPBC Act.
An area that is included on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a Threatened Ecological Community.
A Bush Forever Site listed in “Bush Forever” Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission.
The areas covered by the *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.
The areas covered by the *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) applies.
Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

Reserves and conservation areas

Department of Biodiversity, Conservation and Attractions managed lands and waters

DBCA manages lands and waters throughout Western Australia to conserve ecosystems and species, and to provide for recreation and appreciation of the natural environment. DBCA managed lands and waters include national parks, conservation parks and reserves, marine parks and reserves, regional parks, nature reserves, State forest and timber reserves. DBCA managed conservation estate, is vested with the Conservation Commission of Western Australia. Access to, or through, some areas of DBCA managed lands may require a permit or could be restricted due to management activities. Proposed land use changes and development proposals that abut DBCA managed lands will generally be referred to DBCA throughout the assessment process.

Wetlands

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil.

Ramsar Listed Wetlands

The Convention of Wetlands of International Importance was signed in 1971 at the Iranian town of Ramsar. The Convention has since been referred to as the Ramsar Convention. Ramsar Listed wetlands are “sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity … because of their ecological, botanical, zoological, limnological or hydrological importance” (DEE 2019b). Once a Ramsar Listed Wetland is designated, the country agrees to manage its conservation and ensure its wise use. Under the Convention, wise use is broadly defined as “maintaining the ecological character of a wetland” (DEE 2019b).

Nationally important wetlands

Wetlands of national significance are listed under the Directory of Important Wetlands in Australia. Nationally important wetlands are wetlands which meet at least one of the following criteria (DEE 2019a):

- It is a good example of a wetland type occurring within a biogeographic region in Australia
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail
- The wetland supports one percent or more of the national populations of any native plant or animal taxa
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level
- The wetland is of outstanding historical or cultural significance

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia’s biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia’s Biological Diversity (ANZECC 2000).

The extent of remnant native vegetation in WA has been assessed by Shepherd et al. (2002) and the GoWA (2018), based on broadscale vegetation association mapping by Beard (various publications). The GoWA produces Statewide Vegetation Statistics Reports that are used for a number of purposes including conservation planning, land use planning and when assessing development applications. The reports are updated at least every two years.

Vegetation condition

The vegetation condition can be assessed in accordance with the vegetation condition rating scale for the Eremaean and Northern Botanical Provinces (EPA 2016a). The scale recognises the intactness of vegetation and consists of six rating levels as outlined below.

Vegetation condition rating scale for the Eremaean and Northern Botanical Provinces

Condition	Eremaean and Northern Botanical Provinces description
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.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State BC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Ecological communities

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act. The BC Act provides for the Minister to list an ecological community as a TEC (section 27), or as a collapsed ecological community (section 31) statutory listing of State TECs by the Minister. The legislation also describes statutory processes for preparing recovery plans for TECs, the registration of their critical habitat, and penalties for unauthorised modification of TECs.

Possible TECs that do not meet survey criteria are added to the DBCA Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5. PECs are not listed under any formal Federal or State legislation, however, may be listed as TECs under the EPBC Act.

Conservation codes and definitions for TECs listed under the EPBC Act and/ or BC Act

Categories	Definition
Federal Government Conservation Categories (EPBC Act)	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Western Australia Conservation Categories (BC Act)	
Threatened Ecological Communities	

Categories	Definition
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.
Collapsed ecological communities	
An ecological community is eligible for listing as a collapsed ecological community at a particular time if, at that time – (a) there is no reasonable doubt that the last occurrence of the ecological community has collapsed); or (b) the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover – (i) its species composition or structure; or (ii) its species composition and structure. Section 33 of the BC Act provides for a collapsed ecological community to be regarded as a threatened ecological community if it is discovered in a state that no longer makes it eligible for listing as a collapsed ecological community.	

Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	Poorly known ecological communities. Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2	Poorly known ecological communities. Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Category	Description
Priority 3	Poorly known ecological communities. (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
Priority 4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority 5	Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Other significant vegetation

Vegetation may be significant for a range of reasons other than a statutory listing. The EPA (2016b) states that significant vegetation may include vegetation that includes the following:

- Restricted distribution
- Degree of historical impact from threatening processes
- Local endemism in restricted habitats
- Novel combinations of taxa
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of a vegetation unit in ‘pristine’ condition in a highly cleared landscape, recently discovered range extensions, or isolated outliers of the main range)
- Being poorly reserved.

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the BC Act can warrant referral to the DEE and/or the EPA.

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

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

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

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

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna 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.

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

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

Conservation category	Definition
Threatened species	
Critically Endangered (CR)	Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.
Endangered (EN)	Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines
Vulnerable (VU)	Threatened species considered to be “facing a high risk of extinction in the wild in the medium term future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.
Extinct species	
Extinct (EX)	Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
Extinct in the Wild (EW)	Species that “is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).
Specially protected species	
Migratory (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species

Conservation category	Definition
Species of special conservation interest (conservation dependent fauna) (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other specially protected fauna (OS)	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Conservation codes for DBCA listed Priority flora and fauna

Priority category	Definition
Priority 1	Poorly-known taxa Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	Poorly-known taxa Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	Poorly-known taxa Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	Rare, Near Threatened and other taxa in need of monitoring A. Rare: Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. B. Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. C. Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.

Other significant flora

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than a statutory listing. The EPA (2016b) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened or Priority flora or fauna species, or large populations representing a considerable proportion of the local or regional total population of a species
- Relictual status, being representation of taxonomic or physiognomic groups that no longer occur widely in the broader landscape
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism (a restricted distribution) or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- Being poorly reserved

Other significant fauna

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

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007.*

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty-two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012.

References

ANZECC 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.

Commonwealth of Australia 2001, *National Targets and Objectives for Biodiversity Conservation 2001–2005*, Canberra, AGPS.

DEE 2019a, *Criteria for determining nationally important wetlands*, retrieved 2019, from http://www.environment.gov.au/topics/water/water-our-environment/wetlands/australian-wetlands-database/directory-important.

DEE 2019b, *The Ramsar Convention on Wetlands*, retrieved 2019, from http://www.environment.gov.au/topics/water/water-our-environment/wetlands/ramsar-convention-wetlands.

English, V and Blyth, J 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, Perth, Department of Conservation and Land Management.

EPA 2010, *Technical Guide – Terrestrial Fauna Surveys*, EPA, Perth, WA.

EPA 2016a, *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Perth, WA.

EPA 2016b, *Environmental Factor Guideline - Flora and Vegetation*, EPA, Perth, WA.

GoWA 2018, *Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report)*, Current as of December 2017, Perth Western Australia, Department of Environment and Conservation, from https://www2.landgate.wa.gov.au/web/guest/downloader.

Shepherd, DP, Beeston, GR & Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status, Resource Management Technical Report 249*, Perth, Department of Agriculture.

Appendix C – Desktop searches

EPBC Act PMST (20 km buffer)

NatureMap Flora Report (20 km buffer)

NatureMap Fauna Report (20 km buffer)

Australian Government
Department of the Environment and Energy

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.

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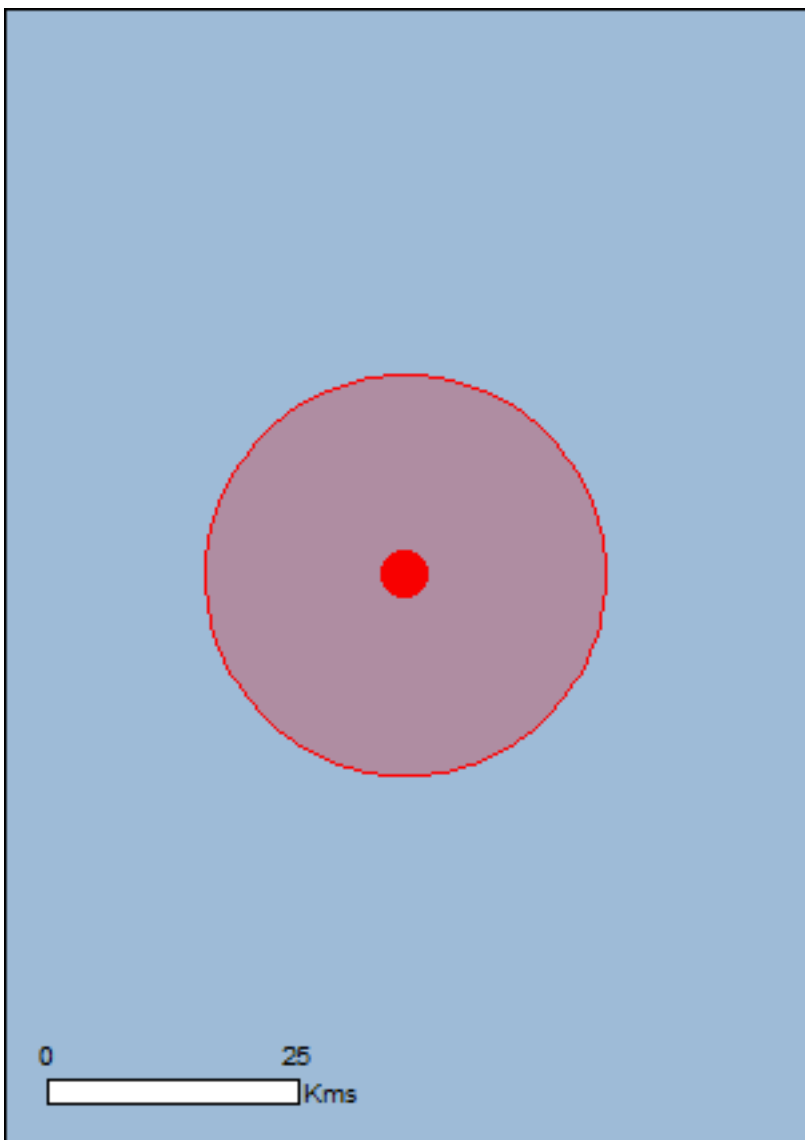

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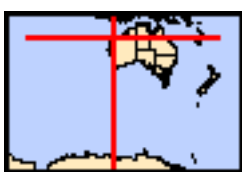

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	31
Listed Migratory Species:	59

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	100
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	6
Regional Forest Agreements:	None
Invasive Species:	17
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus angusticeps Northwestern Coastal Ctenotus, Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area

Name	Threatened	Type of Presence
Manta alfredi 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
Manta birostris 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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species 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
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area

Name	Threatened	Type of Presence
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Puffinus pacificus Wedge-tailed Shearwater [1027]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Breeding known to occur within area
Sterna caspia Caspian Tern [59467]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Stiltia isabella Australian Pratincole [818]		Species or species

Name	Threatened	Type of Presence
		habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species

Name	Threatened	Type of Presence
		habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		

Name	Status	Type of Presence
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Murujuga	WA
Unnamed WA36907	WA
Unnamed WA36909	WA
Unnamed WA36910	WA
Unnamed WA36915	WA
Unnamed WA38287	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
Birds		
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
Mammals		
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 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
Plants		
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 within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species

Name	Status	Type of Presence
		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

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

-20.69227 116.73771

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact Us page.

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NatureMap Species Report

Created By Guest user on 25/02/2019

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Species Group Vascular Plants
Method 'By Circle'
Centre 116° 44' 55" E,20° 42' 17" S
Buffer 20km
Group By Family

Family	Species	Records
Acanthaceae	3	23
Aizoaceae	6	33
Amaranthaceae	36	221
Apocynaceae	6	22
Araliaceae	4	22
Arecaceae	1	1
Asteraceae	38	143
Bignoniaceae	1	1
Boraginaceae	12	59
Brassicaceae	3	18
Cactaceae	1	64
Capparaceae	2	9
Caryophyllaceae	2	8
Celastraceae	3	7
Chenopodiaceae	41	180
Cleomaceae	2	27
Combretaceae	4	61
Commelinaceae	1	4
Convolvulaceae	27	95
Cucurbitaceae	4	18
Cymodoceaceae	2	17
Cyperaceae	18	50
Elatinaceae	2	2
Euphorbiaceae	18	109
Fabaceae	110	693
Frankeniaceae	2	6
Gentianaceae	3	3
Geraniaceae	1	1
Goodeniaceae	13	79
Gyrostemonaceae	1	1
Hydrocharitaceae	6	28
Lamiaceae	3	9
Lauraceae	2	5
Lythraceae	3	7
Malvaceae	42	292
Menispermaceae	1	7
Molluginaceae	1	5
Montiaceae	1	1
Moraceae	6	26
Myrtaceae	5	20
Nyctaginaceae	8	30
Oleaceae	1	6
Passifloraceae	1	4
Phrymaceae	2	3
Phyllanthaceae	9	34
Pittosporaceae	1	5
Plantaginaceae	2	11
Plumbaginaceae	2	7
Poaceae	82	439
Polygalaceae	2	5
Polygonaceae	1	1
Portulacaceae	4	27
Primulaceae	1	1
Proteaceae	6	16
Pteridaceae	2	5
Rhizophoraceae	3	32
Rubiaceae	7	27
Santalaceae	1	5
Sapindaceae	4	16
Scrophulariaceae	3	23
Solanaceae	15	73
Stylidiaceae	1	3
Surianaceae	1	6
Thymelaeaceae	1	1
Violaceae	2	19
Zygophyllaceae	7	31
TOTAL	**606**	**3207**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Acanthaceae					
1.	6828	*Avicennia marina (White Mangrove)*			
2.	14555	*Avicennia marina subsp. marina*			
3.	7166	*Dicliptera armata*			
Aizoaceae					
4.	2818	*Sesuvium portulacastrum*			
5.	2830	*Trianthema portulacastrum (Giant Pigweed)*	Y		
6.	44362	*Trianthema triquetrum*			
7.	44360	*Trianthema turgidifolium*			
8.	2834	*Zaleya galericulata (Hogweed)*			
9.	29095	*Zaleya galericulata subsp. galericulata*			
Amaranthaceae					
10.	2645	*Achyranthes aspera (Chaff Flower)*			
11.	2646	*Aerva javanica (Kapok Bush)*	Y		
12.	2651	*Alternanthera nana (Hairy Joyweed)*			
13.	2652	*Alternanthera nodiflora (Common Joyweed)*			
14.	2660	*Amaranthus cuspidifolius*			
15.	20018	*Amaranthus undulatus*			
16.	2674	*Gomphrena affinis*			
17.	18361	*Gomphrena affinis subsp. pilbarensis*			
18.	2676	*Gomphrena canescens (Batchelors Buttons)*			
19.	2680	*Gomphrena cunninghamii*			
20.	2682	*Gomphrena flaccida (Gomphrena Weed)*			
21.	18367	*Gomphrena kanisii*			
22.	2683	*Gomphrena leptoclada*			
23.	18257	*Gomphrena leptoclada subsp. leptoclada*			
24.	11131	*Gomphrena sordida*			
25.	31074	*Gomphrena sp. Martins Well (K.F. Kenneally 6116)*			Y
26.	2690	*Ptilotus aervoides*			
27.	2696	*Ptilotus astrolasius*			
28.	2698	*Ptilotus auriculifolius*			
29.	2699	*Ptilotus axillaris (Mat Mulla Mulla)*			
30.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
31.	2706	*Ptilotus carinatus*			
32.	2711	*Ptilotus clementii (Tassel Top)*			
33.	2717	*Ptilotus divaricatus (Climbing Mulla Mulla)*			
34.	2721	*Ptilotus exaltatus (Tall Mulla Mulla)*			
35.	2725	*Ptilotus fusiformis*			
36.	2728	*Ptilotus gomphrenoides*			
37.	2729	*Ptilotus grandiflorus*			
38.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
39.	2741	*Ptilotus macrocephalus (Featherheads)*			
40.	2745	*Ptilotus murrayi*			
41.	2746	*Ptilotus nobilis (Tall Mulla Mulla)*			
42.	2747	*Ptilotus obovatus (Cotton Bush)*			
43.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
44.	2766	*Ptilotus villosiflorus*			
45.	43203	*Surreya diandra*			
Apocynaceae					
46.	6580	*Asclepias curassavica (Redhead Cottonbush)*	Y		
47.	6567	*Carissa lanceolata (Conkerberry, Marnuwiji)*			
48.	6584	*Cynanchum floribundum (Dumara Bush, Tjipa)*			
49.	48280	*Cynanchum viminale subsp. australe*			
50.	12832	*Gymnanthera cunninghamii*		P3	
51.	6578	*Wrightia saligna*			
Araliaceae					
52.	6270	*Trachymene didiscoides*			
53.	6273	*Trachymene glaucifolia (Wild Carrot)*			
54.	6278	*Trachymene oleracea*			
55.	19043	*Trachymene oleracea subsp. oleracea*			
Arecaceae					
56.	17910	*Washingtonia filifera*	Y		
Asteraceae					
57.	7832	*Angianthus milnei (Cone-spike Angianthus)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
58.	7854	*Bidens bipinnata (Bipinnate Beggartick)*	Y		
59.	7866	*Blumea tenella*			
60.	7905	*Calotis multicaulis (Many-stemmed Burr-daisy)*			
61.	7919	*Centipeda minima (Spreading Sneezewood, Kanjirralaa, Inteng-inteng, Karengkal, Kata-palkalpa, Munyu-parnti-parnti)*			
62.	19762	*Centipeda minima subsp. macrocephala*			
63.	33516	*Chrysocephalum gilesii*			
64.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
65.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
66.	8088	*Ixiochlamys cuneifolia*			
67.	8095	*Lactuca saligna (Wild Lettuce, Willow-leaf Lettuce)*	Y		
68.		*Launaea sarmenstosa*			
69.	8098	*Launaea sarmentosa*			
70.	8109	*Minuria integerrima (Smooth Minuria)*			
71.	8110	*Minuria leptophylla (Minnie Daisy)*			
72.	13494	*Pentalepis trichodesmoides*			
73.	42160	*Pentalepis trichodesmoides subsp. trichodesmoides*			
74.	8167	*Pluchea dentex*			
75.	17816	*Pluchea ferdinandi-muelleri*			
76.	43944	*Pluchea longiseta*			
77.	8168	*Pluchea rubelliflora*			
78.	8170	*Pluchea tetranthera*			
79.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
80.		*Pterocaulon sp.*			
81.	8192	*Pterocaulon sphacelatum (Apple Bush, Fruit Salad Plant)*			
82.	8193	*Pterocaulon sphaeranthoides*			
83.	13301	*Rhodanthe floribunda*			
84.	13246	*Rhodanthe humboldtiana*			
85.	13310	*Rhodanthe margarethae*			
86.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
87.	8234	*Streptoglossa adscendens*			
88.	8235	*Streptoglossa bubakii*			
89.	8236	*Streptoglossa cylindriceps*			
90.	8237	*Streptoglossa decurrens*			
91.	8238	*Streptoglossa liatroides*			
92.	8240	*Streptoglossa odora*			
93.	8241	*Streptoglossa tenuiflora*			
94.	8252	*Tridax procumbens (Tridax, Tridax Daisy)*	Y		
Bignoniaceae					
95.	48390	*Dolichandrone occidentalis*			
Boraginaceae					
96.	6682	*Ehretia saligna (False Cedar)*			
97.	14301	*Ehretia saligna var. saligna*			
98.	17301	*Heliotropium chrysocarpum*			
99.	6704	*Heliotropium conocarpum*			
100.	6706	*Heliotropium cunninghamii*			
101.	6707	*Heliotropium curassavicum (Smooth Heliotrope)*			
102.	6712	*Heliotropium heteranthum*			
103.	17307	*Heliotropium inexplicitum*			
104.	17315	*Heliotropium tanythrix*			
105.	6718	*Heliotropium tenuifolium (Mamukata)*			
106.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			
107.	11750	*Trichodesma zeylanicum var. zeylanicum*			
Brassicaceae					
108.	2995	*Brassica x napus*	Y		
109.	3035	*Lepidium pedicellosum*			
110.	3038	*Lepidium pholidogynum*			
Cactaceae					
111.	5227	*Opuntia stricta (Common Prickly Pear)*	Y		
Capparaceae					
112.	2981	*Capparis spinosa*			
113.	48291	*Capparis spinosa subsp. nummularia*			
Caryophyllaceae					
114.	2901	*Polycarpaea holtzei*			
115.	2903	*Polycarpaea longiflora*			
Celastraceae					
116.	4729	*Stackhousia clementii*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
				P3	
117.	4731	*Stackhousia intermedia*			
118.	19555	*Stackhousia muricata subsp. annual (W.R. Barker 2172)*			
Chenopodiaceae					
119.	2450	*Atriplex amnicola (Swamp Saltbush)*			
120.	2451	*Atriplex bunburyana (Silver Saltbush)*			
121.	2453	*Atriplex codonocarpa (Flat-topped Saltbush)*			
122.	2463	*Atriplex isatidea (Coast Saltbush)*			
123.	2466	*Atriplex lindleyi*			
124.	2476	*Atriplex semilunaris (Annual Saltbush)*			
125.	2504	*Dysphania plantaginella*			
126.	2506	*Dysphania rhadinostachya*			
127.	11653	*Dysphania rhadinostachya subsp. inflata*			
128.	11890	*Dysphania rhadinostachya subsp. rhadinostachya*			
129.	2511	*Enchylaena tomentosa (Barrier Saltbush)*			
130.	12064	*Enchylaena tomentosa var. tomentosa (Barrier Saltbush)*			
131.	2544	*Maireana georgei (Satiny Bluebush)*			
132.	2556	*Maireana planifolia (Low Bluebush)*			
133.	2564	*Maireana stipitata*			
134.	11662	*Maireana tomentosa subsp. tomentosa*			
135.	2573	*Neobassia astrocarpa*			
136.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
137.	2584	*Rhagodia preissii*			
138.	11240	*Rhagodia preissii subsp. obovata*			
139.	30434	*Salsola australis*			
140.	11650	*Sclerolaena bicornis var. bicornis (Goathead Burr)*			
141.	2604	*Sclerolaena costata*			
142.	2607	*Sclerolaena densiflora*			
143.	2609	*Sclerolaena diacantha (Grey Copperburr)*			
144.	8877	*Sclerolaena gardneri*			
145.	2633	*Sclerolaena uniflora (Two-spined Saltbush)*			
146.	2638	*Suaeda arbusculoides*			
147.	31616	*Tecticornia auriculata*			
148.	33236	*Tecticornia halocnemoides (Shrubby Samphire)*			
149.	33240	*Tecticornia halocnemoides subsp. longispicata*			
150.	33238	*Tecticornia halocnemoides subsp. tenuis*			
151.	33317	*Tecticornia indica*			
152.	33319	*Tecticornia indica subsp. bidens*			
153.	33356	*Tecticornia indica subsp. indica*			
154.	33357	*Tecticornia indica subsp. julacea*			
155.	33318	*Tecticornia indica subsp. leiostachya (Samphire)*			
156.	33299	*Tecticornia pergranulata subsp. elongata*			
157.	31618	*Tecticornia pruinosa*			
158.	33220	*Tecticornia pterygosperma subsp. denticulata*			
159.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
Cleomaceae					
160.	2985	*Cleome oxalidea*			
161.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
Combretaceae					
162.	5300	*Terminalia canescens (Joolal)*			
163.	45698	*Terminalia circumalata*			
164.	5310	*Terminalia platyphylla (Wild Plum, Durin)*			
165.	5313	*Terminalia supranitifolia*		P3	
Commelinaceae					
166.	1165	*Commelina ensifolia (Wandering Jew, Buargu)*			
Convolvulaceae					
167.	11167	*Bonamia erecta*			
168.	6606	*Bonamia media*			
169.	6608	*Bonamia pannosa*			
170.	44782	*Bonamia pilbarensis*			
171.	6609	*Bonamia rosea (Felty Bellflower)*			
172.	19880	*Convolvulus angustissimus*			
173.	6612	*Convolvulus clementii*			
174.	19565	*Cressa australis*			
175.	13733	*Cuscuta victoriana*			
176.	48738	*Distimake dissectus var. dissectus*	Y		
177.	6617	*Evolvulus alsinoides (Tropical Speedwell)*			
178.	11200	*Evolvulus alsinoides var. villosicalyx*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
179.	6623	*Ipomoea coptica*			
180.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
181.	6631	*Ipomoea lonchophylla (Cowvine)*			
182.	6633	*Ipomoea muelleri (Poison Morning Glory, Yumbu)*			
183.	6635	*Ipomoea pes-caprae*			
184.	11312	*Ipomoea pes-caprae subsp. brasiliensis*			
185.	6636	*Ipomoea plebeia (Bellvine)*			
186.	6637	*Ipomoea polymorpha*			
187.		*Ipomoea sp.*			
188.	6651	*Operculina aequisepala*			
189.	6652	*Operculina brownii (Potato Vine, Bara)*			
190.	6653	*Polymeria ambigua (Morning Glory)*			
191.	6655	*Polymeria calycina*			
192.	17513	*Polymeria lanata*			
193.		*Polymeria sp.*			
Cucurbitaceae					
194.	41720	*Cucumis argenteus*			
195.	7371	*Cucumis melo (Ulcardo Melon)*			
196.	41721	*Cucumis variabilis*			
197.	7381	*Trichosanthes cucumerina*			
Cymodoceaceae					
198.	131	*Halodule uninervis*			
199.	132	*Syringodium isoetifolium*			
Cyperaceae					
200.	750	*Bulbostylis barbata*			
201.	752	*Bulbostylis turbinata*			
202.	774	*Cyperus bifax (Downs Nutgrass)*			
203.	12801	*Cyperus blakeanus*			
204.	777	*Cyperus bulbosus (Bush Onion, Tjanmata)*			
205.	786	*Cyperus cunninghamii*			
206.	12811	*Cyperus cunninghamii subsp. cunninghamii*			
207.	789	*Cyperus difformis (Rice Sedge)*			
208.	798	*Cyperus iria*			
209.	804	*Cyperus nervulosus*			
210.	814	*Cyperus squarrosus*			
211.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
212.	827	*Eleocharis geniculata*			
213.	851	*Fimbristylis dichotoma (Eight Day Grass)*			
214.	862	*Fimbristylis microcarya*			
215.	878	*Fimbristylis rara*			
216.	16257	*Schoenoplectus subulatus*			
217.	1010	*Schoenus punctatus*		P3	
Elatinaceae					
218.	5183	*Bergia ammannioides*			
219.	5186	*Bergia trimera*			
Euphorbiaceae					
220.	4583	*Adriana tomentosa*			
221.	17422	*Adriana tomentosa var. tomentosa*			
222.	4617	*Euphorbia australis (Namana)*			
223.	35307	*Euphorbia australis var. australis*			
224.	35303	*Euphorbia australis var. subtomentosa*			
225.	4619	*Euphorbia biconvexa*			
226.	4620	*Euphorbia boophthona (Gascoyne Spurge)*			
227.	9048	*Euphorbia careyi*			
228.	4623	*Euphorbia coghlanii (Namana)*			
229.	4626	*Euphorbia drummondii (Caustic Weed, Piwi)*			
230.	4629	*Euphorbia hirta (Asthma Plant)*	Y		
231.	4635	*Euphorbia myrtoides*			
232.	4644	*Euphorbia sharkoensis*			
233.	4647	*Euphorbia tannensis*			
234.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
235.	42879	*Euphorbia trigonosperma*			
236.	13281	*Euphorbia vaccaria*			
237.	42876	*Euphorbia vaccaria var. vaccaria*			
Fabaceae					
238.	3209	*Acacia ampliceps*			
239.	44580	*Acacia ampliceps x bivenosa*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
240.	44586	*Acacia ampliceps x sclerosperma subsp. sclerosperma*			
241.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
242.	3223	*Acacia arida*			
243.	3241	*Acacia bivenosa*			
244.	44588	*Acacia bivenosa x sclerosperma subsp. sclerosperma*			
245.	13403	*Acacia colei*			
246.	17013	*Acacia colei var. colei*			
247.	3270	*Acacia coriacea (Wirewood)*			
248.	13500	*Acacia coriacea subsp. coriacea*			
249.	13502	*Acacia coriacea subsp. pendens*			
250.	16174	*Acacia elachantha*			
251.	12673	*Acacia glaucocaesia*			
252.	3356	*Acacia gregorii (Gregory's Wattle)*			
253.	3372	*Acacia holosericea (Candelbra Wattle, Liringgin)*			
254.	3377	*Acacia inaequilatera (Baderi)*			
255.	3434	*Acacia maitlandii (Maitland's Wattle)*			
256.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
257.	3506	*Acacia pyrifolia (Ranji Bush, Kandji)*			
258.	29016	*Acacia pyrifolia var. morrisonii*			
259.	29015	*Acacia pyrifolia var. pyrifolia*			
260.	13078	*Acacia sclerosperma subsp. sclerosperma*			
261.	29135	*Acacia sericophylla*			
262.	3551	*Acacia sphaerostachya*			
263.	19456	*Acacia stellaticeps*			
264.	13070	*Acacia synchronicia*			
265.	3573	*Acacia tenuissima*			
266.	3579	*Acacia trachycarpa (Minni Ritchi, Balgali)*			
267.	3606	*Acacia xiphophylla*			
268.	3680	*Aeschynomene indica (Budda Pea)*			
269.	3609	*Albizia lebbeck*			
270.	17147	*Alysicarpus muelleri*			
271.	11055	*Cajanus cinereus*			
272.	10972	*Cajanus marmoratus*			
273.	11150	*Cajanus pubescens*			
274.	3749	*Canavalia rosea (Wild Jack Bean)*			
275.	3769	*Clitoria ternatea*	Y		
276.	3774	*Crotalaria cunninghamii (Green Birdflower, Bilbun)*			
277.	19378	*Crotalaria dissitiflora subsp. benthamiana*			
278.	20179	*Crotalaria medicaginea var. neglecta*			
279.	3785	*Crotalaria novae-hollandiae (New Holland Rattlepod)*			
280.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
281.	17117	*Cullen cinereum*			
282.	17436	*Cullen graveolens*			
283.	17439	*Cullen lachnostachys*			
284.	17118	*Cullen leucanthum*			
285.	17119	*Cullen leucochaites*			
286.	17120	*Cullen pogonocarpum*			
287.	3852	*Desmodium campylocaulon*			
288.	3853	*Desmodium filiforme*			
289.	3856	*Desmodium muelleri*			
290.	3612	*Dichrostachys spicata (Pied Piper Bush)*			
291.	3871	*Erythrina vespertilio (Yulbah)*			
292.	3938	*Glycine canescens (Silky Glycine)*			
293.	14587	*Indigastrum parviflorum*			
294.	3973	*Indigofera colutea (Sticky Indigo)*			
295.	3980	*Indigofera linifolia*			
296.	3981	*Indigofera linnaei (Birdsville Indigo)*			
297.	3982	*Indigofera monophylla*			
298.	3987	*Indigofera trita*			
299.	31035	*Indigofera trita subsp. trita*			
300.	3613	*Leucaena leucocephala (Leucaena)*	Y		
301.	4060	*Lotus australis (Austral Trefoil)*			
302.	4061	*Lotus cruentus (Redflower Lotus)*			
303.	3614	*Neptunia dimorphantha (Sensitive Plant)*			
304.	3675	*Petalostylis labicheoides (Slender Petalostylis)*			
305.	4190	*Rhynchosia australis (Rhynchosia)*			
306.	20862	*Rhynchosia bungarensis*		P4	
307.	4191	*Rhynchosia minima (Rhynchosia)*			
308.	12279	*Senna artemisioides subsp. helmsii*			
309.	12280	*Senna artemisioides subsp. oligophylla*			

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310.	18444	*Senna charlesiana*			
311.	12303	*Senna costata*			
312.	18443	*Senna ferraria*			
313.	18346	*Senna glutinosa*			
314.	12305	*Senna glutinosa subsp. chatelainiana*			
315.	12307	*Senna glutinosa subsp. glutinosa*			
316.	12309	*Senna glutinosa subsp. pruinosa*			
317.	12308	*Senna glutinosa subsp. x luerssenii*			
318.	18451	*Senna hamersleyensis*			
319.	12312	*Senna notabilis*			
320.	18450	*Senna symonii*			
321.	12319	*Senna venusta*			
322.	4196	*Sesbania cannabina (Sesbania Pea)*			
323.	4198	*Sesbania formosa (White Dragon Tree)*			
324.	12353	*Stylosanthes hamata (Verano Stylo)*	Y		
325.	12356	*Swainsona formosa*			
326.	4231	*Swainsona kingii*			
327.	4233	*Swainsona leeana*			
328.	4234	*Swainsona maccullochiana (Ashburton Pea)*			
329.	4242	*Swainsona pterostylis*			
330.		*Tephrosia Fortescue (A.A. Mitchell 606)*			
331.	4263	*Tephrosia clementii*			
332.	49016	*Tephrosia densa*			
333.	4272	*Tephrosia leptoclada*			
334.	4280	*Tephrosia rosea (Flinders River Poison, Bungoo'dah)*			
335.	19531	*Tephrosia rosea var. clementii*			
336.	15947	*Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)*			
337.	17768	*Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)*			
338.	15949	*Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)*			
339.	42442	*Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)*			
340.	40060	*Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)*			
341.	4285	*Tephrosia supina*			
342.	30716	*Vachellia farnesiana (Mimosa Bush)*	Y		
343.	4323	*Vigna lanceolata (Maloga Vigna, Wega)*			
344.	31391	*Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)*			
345.	46577	*Vigna triodiophila*		P3	
346.	4326	*Zornia albiflora*			
347.	12679	*Zornia muelleriana subsp. congesta*			
Frankeniaceae					
348.	5188	*Frankenia ambita*			
349.	5209	*Frankenia pauciflora (Seaheath)*			
Gentianaceae					
350.	6539	*Centaurium erythraea (Common Centaury)*	Y		
351.	41660	*Schenkia australis*			
352.	41646	*Schenkia clementii*			
Geraniaceae					
353.	4335	*Erodium cygnorum (Blue Heronsbill)*			
Goodeniaceae					
354.	7509	*Goodenia forrestii*			
355.	7515	*Goodenia heterochila*			
356.	7521	*Goodenia lamprosperma*			
357.	7526	*Goodenia microptera*			
358.	12552	*Goodenia muelleriana*			
359.	10982	*Goodenia stobbsiana*			
360.	7556	*Goodenia tenuiloba*			
361.	12578	*Scaevola acacioides*			
362.	7606	*Scaevola crassifolia (Thick-leaved Fan-flower)*			
363.	7608	*Scaevola cunninghamii*			
364.	7614	*Scaevola globulifera*			
365.	7644	*Scaevola spinescens (Currant Bush, Maroon)*			
366.	7660	*Velleia glabrata (Pee the Bed)*			
Gyrostemonaceae					
367.	2778	*Codonocarpus cotinifolius (Native Poplar, Kundurangu)*			
Hydrocharitaceae					
368.	162	*Halophila decipiens*			
369.	163	*Halophila minor*			
370.	164	*Halophila ovalis (Sea Wrack)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
371.	165	*Halophila spinulosa*			
372.	139	*Najas tenuifolia (Water Nymph)*			
373.	169	*Thalassia hemprichii*			
Lamiaceae					
374.	6729	*Clerodendrum floribundum (Lollybush)*			
375.	6732	*Clerodendrum tomentosum*			
376.	13689	*Clerodendrum tomentosum var. lanceolatum*			
Lauraceae					
377.	2949	*Cassytha capillaris*			
378.	2950	*Cassytha filiformis (Love Vine, Jirawan)*			
Lythraceae					
379.	5277	*Ammannia baccifera*			
380.	5278	*Ammannia multiflora*			
381.		*Lawsonia inermis*			
Malvaceae					
382.	4886	*Abutilon amplum*			
383.	9080	*Abutilon cunninghamii*			
384.	4891	*Abutilon fraseri (Lantern Bush)*			
385.	18120	*Abutilon fraseri subsp. fraseri*			
386.	4895	*Abutilon lepidum*			
387.	4899	*Abutilon malvifolium (Bastard Marshmallow)*			
388.	4902	*Abutilon oxycarpum (Flannel Weed)*			
389.	43020	*Abutilon oxycarpum subsp. Prostrate (A.A. Mitchell PRP 1266)*			
390.	12716	*Brachychiton acuminatus*			
391.	18411	*Corchorus congener*		P3	
392.	4857	*Corchorus elachocarpus*			
393.	17339	*Corchorus incanus*			
394.	25847	*Corchorus incanus subsp. incanus*			
395.	13659	*Corchorus laniflorus*			
396.	4862	*Corchorus parviflorus*			
397.	4865	*Corchorus tridens*			
398.	13467	*Corchorus trilocularis*			
399.	4867	*Corchorus walcottii (Woolly Corchorus)*			
400.	4910	*Gossypium australe (Native Cotton)*			
401.	4913	*Gossypium hirsutum (Upland Cotton)*	Y		
402.	29316	*Hibiscus austrinus*			
403.	29317	*Hibiscus austrinus var. austrinus*			
404.	4923	*Hibiscus brachysiphonius*			
405.	4925	*Hibiscus coatesii*			
406.	4933	*Hibiscus leptocladus*			
407.	4942	*Hibiscus sturtii (Sturt's Hibiscus)*			
408.	4960	*Lawrencia viridigrisea*			
409.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
410.	5051	*Melhania oblongifolia*			
411.		*Sida Excedentifolia (J.L. Egan 1925)*			
412.	31758	*Sida arsiniata*			
413.	4971	*Sida cardiophylla*			
414.	4976	*Sida echinocarpa*			
415.	4977	*Sida fibulifera (Silver Sida)*			
416.	4988	*Sida rohlenae*			
417.	33698	*Sida sp. Pilbara (A.A. Mitchell PRP 1543)*			
418.	16617	*Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)*			
419.	4989	*Sida spinosa (Spiny Sida)*			
420.	4873	*Triumfetta appendiculata*			
421.	14694	*Triumfetta clementii*			
422.	14942	*Triumfetta maconochieana*			
423.	5106	*Waltheria indica*			
Menispermaceae					
424.	2942	*Tinospora smilacina (Snakevine, Oondala)*			
Molluginaceae					
425.	48201	*Trigastrotheca molluginea*			
Montiaceae					
426.	2864	*Calandrinia ptychosperma*			
Moraceae					
427.	25811	*Ficus aculeata*			
428.	31578	*Ficus aculeata var. indecora (Ranji)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
429.	19648	*Ficus brachypoda*			
430.	1753	*Ficus platypoda (Native Fig, Makartu)*			
431.	1759	*Ficus virens (Albayi)*			
432.	12096	*Ficus virens var. virens*			
Myrtaceae					
433.	17093	*Corymbia hamersleyana*			
434.	17092	*Corymbia opaca*			
435.	5714	*Eucalyptus microtheca (Coolibah)*			
436.	5752	*Eucalyptus prominens*			
437.	14548	*Eucalyptus victrix*			
Nyctaginaceae					
438.	2769	*Boerhavia burbidgeana*			
439.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
440.	2772	*Boerhavia gardneri*			
441.	2773	*Boerhavia paludosa*			
442.	2774	*Boerhavia repleta*			
443.	2775	*Boerhavia schomburgkiana*			
444.		*Boerhavia sp.*			
445.	2776	*Commicarpus australis (Perennial Tar Vine)*			
Oleaceae					
446.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
Passifloraceae					
447.	5226	*Passiflora foetida (Stinking Passion Flower)*	Y		
Phrymaceae					
448.	7082	*Mimulus gracilis*			
449.	18462	*Peplidium sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768)*			
Phyllanthaceae					
450.	4603	*Bridelia tomentosa*			
451.	4654	*Flueggea virosa*			
452.	12013	*Flueggea virosa subsp. melanthesoides (Dogwood, Guwal)*			
453.	38421	*Notoleptopus decaisnei*			
454.	38422	*Notoleptopus decaisnei var. decaisnei*			
455.	9056	*Phyllanthus baccatus*			
456.	17626	*Phyllanthus erwinii*			
457.	4680	*Phyllanthus maderaspatensis*			
458.	17794	*Phyllanthus tenellus*	Y		
Pittosporaceae					
459.	41300	*Pittosporum phillyreoides (Weeping Pittosporum, Yaliti)*			
Plantaginaceae					
460.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
461.	7099	*Stemodia kingii*			
Plumbaginaceae					
462.	6486	*Aegialitis annulata (Club Mangrove)*			
463.	6490	*Muellerolimon salicorniaceum*			
Poaceae					
464.	172	*Acrachne racemosa*			
465.	204	*Aristida burbidgeae*			
466.	207	*Aristida contorta (Bunched Kerosene Grass)*			
467.	215	*Aristida latifolia (Feathertop Wiregrass)*			
468.	217	*Aristida nitidula (Flat-awned Threeawn)*			
469.	226	*Arundo donax (Giant Reed)*	Y		
470.	229	*Astrebla pectinata (Barley Mitchell Grass)*			
471.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		
472.	259	*Cenchrus echinatus (Burrgrass)*	Y		
473.	41568	*Cenchrus setaceus (Fountain Grass)*	Y		
474.	29721	*Cenchrus setiger (Birdwood Grass)*	Y		
475.	266	*Chloris barbata (Purpletop Chloris)*	Y		
476.	269	*Chloris pectinata (Comb Chloris)*			
477.	270	*Chloris pumilio*			
478.	273	*Chrysopogon fallax (Golden Beard Grass)*			
479.	279	*Cymbopogon ambiguus (Scentgrass)*			
480.	280	*Cymbopogon bombycinus (Silky Oilgrass)*			
481.	281	*Cymbopogon obtectus (Silkyheads)*			
482.	46558	*Cynodon convergens*			
483.	46555	*Cynodon prostratus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
484.	290	*Dactyloctenium radulans (Button Grass)*			
485.	303	*Dichanthium fecundum (Curly Bluegrass)*			
486.	13741	*Dichanthium sericeum subsp. humilius*			
487.	310	*Digitaria brownii (Cotton Panic Grass)*			
488.	313	*Digitaria ctenantha (Comb Finger Grass)*			
489.	328	*Echinochloa colona (Awnless Barnyard Grass)*	Y		
490.	343	*Ectrosia leporina (Hare's-foot Grass)*			
491.	357	*Enneapogon caerulescens (Limestone Grass)*			
492.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
493.	363	*Enneapogon pallidus (Conetop Nineawn)*			
494.	365	*Enneapogon polyphyllus (Leafy Nineawn)*			
495.	368	*Enteropogon ramosus (Windmill Grass, Curly Windmill Grass)*			
496.	378	*Eragrostis dielsii (Mallee Lovegrass)*			
497.	380	*Eragrostis eriopoda (Woollybutt Grass, Wangurnu)*			
498.	16731	*Eragrostis exigua*			
499.	381	*Eragrostis falcata (Sickle Lovegrass)*			
500.	38505	*Eragrostis surreyana*		P3	
501.	398	*Eragrostis tenellula (Delicate Lovegrass)*			
502.	399	*Eragrostis xerophila (Knotty-butt Neverfail)*			
503.	400	*Eriachne aristidea*			
504.	403	*Eriachne benthamii (Swamp Wanderrie)*			
505.	413	*Eriachne mucronata (Mountain Wanderrie Grass)*			
506.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
507.	417	*Eriachne pulchella (Pretty Wanderrie)*			
508.	16485	*Eriachne pulchella subsp. dominii*			
509.	16486	*Eriachne pulchella subsp. pulchella*			
510.	421	*Eriachne tenuiculmis*			
511.	425	*Eriochloa procera (Cupgrass)*			
512.	11011	*Eulalia aurea*			
513.	458	*Iseilema dolichotrichum*			
514.	459	*Iseilema eremaeum*			
515.	465	*Iseilema vaginiflorum (Red Flinders Grass)*			
516.	503	*Panicum decompositum (Native Millet, Kaltu-kaltu)*			
517.	504	*Panicum effusum (Hairy Panic Grass)*			
518.	505	*Panicum laevinode*			
519.	515	*Paraneurachne muelleri (Northern Mulga Grass)*			
520.	10975	*Paspalidium basicladum*			
521.	518	*Paspalidium clementii (Clements Paspalidium)*			
522.	523	*Paspalidium rarum (Rare Paspalidium)*			
523.	525	*Paspalidium tabulatum*			
524.	606	*Setaria dielsii (Diels' Pigeon Grass)*			
525.	608	*Setaria italica (Italian Millet)*	Y		
526.	613	*Setaria verticillata (Whorled Pigeon Grass)*	Y		
527.	619	*Sorghum plumosum (Plume Canegrass)*			
528.	12919	*Sorghum plumosum var. plumosum*			
529.	622	*Sorghum timorense*			
530.	625	*Spinifex longifolius (Beach Spinifex)*			
531.	629	*Sporobolus australasicus (Fairy Grass)*			
532.	635	*Sporobolus virginicus (Marine Couch)*			
533.	17820	*Themeda sp. Hamersley Station (M.E. Trudgen 11431)*		P3	
534.	17819	*Themeda sp. Mt Barricade (M.E. Trudgen 2471)*			
535.	673	*Themeda triandra*			
536.	679	*Triodia angusta*			
537.	13131	*Triodia epactia*			
538.	696	*Triodia pungens (Soft Spinifex)*			
539.	704	*Triodia wiseana (Limestone Spinifex)*			
540.	706	*Triraphis mollis (Needle Grass)*			
541.	725	*Whiteochloa airoides*			
542.	728	*Whiteochloa cymbiformis*			
543.	729	*Xerochloa barbata (Rice Grass)*			
544.	731	*Xerochloa laniflora (Rice Grass)*			
545.	732	*Yakirra australiensis*			
Polygalaceae					
546.	41365	*Polygala glaucifolia*			
547.	4572	*Polygala isingii*			
Polygonaceae					
548.	2443	*Rumex vesicarius (Ruby Dock)*	Y		
Portulacaceae					
549.	2878	*Portulaca conspicua*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
550.	2879	*Portulaca cyclophylla*			
551.	43981	*Portulaca decipiens*			
552.	2884	*Portulaca oleracea (Purslane, Wakati)*			
Primulaceae					
553.	6478	*Aegiceras corniculatum (River Mangrove)*			
Proteaceae					
554.	2079	*Grevillea pyramidalis (Caustic Bush, Tjungu)*			
555.	19570	*Grevillea pyramidalis subsp. leucadendron*			
556.	15975	*Grevillea pyramidalis subsp. pyramidalis*			
557.	13440	*Grevillea wickhamii subsp. aprica*			
558.	2177	*Hakea lorea (Witinti)*			
559.	19137	*Hakea lorea subsp. lorea*			
Pteridaceae					
560.	33	*Cheilanthes contigua*			
561.	12818	*Cheilanthes sieberi subsp. sieberi*			
Rhizophoraceae					
562.	5291	*Bruguiera exaristata (Ribbed Mangrove)*			
563.	39680	*Ceriops australis*			
564.	5295	*Rhizophora stylosa (Spotted-leaved Red Mangrove)*			
Rubiaceae					
565.	7317	*Dentella asperata*			
566.	7318	*Dentella minutissima*			
567.	7338	*Oldenlandia crouchiana*			
568.	19640	*Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)*		P3	
569.		*Pomax Desert (A.S. George 11968)*			Y
570.	7363	*Synaptantha tillaeacea*			
571.	13339	*Synaptantha tillaeacea var. tillaeacea*			
Santalaceae					
572.	2357	*Santalum lanceolatum (Northern Sandalwood, Yarnguli)*			
Sapindaceae					
573.	4739	*Alectryon oleifolius*			
574.	11487	*Alectryon oleifolius subsp. oleifolius*			
575.	4745	*Diplopeltis eriocarpa (Hairy Pepperflower)*			
576.	4759	*Dodonaea coriacea*			
Scrophulariaceae					
577.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
578.	16363	*Eremophila maculata subsp. brevifolia (Native Fuchsia)*			
579.	17158	*Myoporum montanum (Native Myrtle)*			
Solanaceae					
580.	6963	*Datura metel (Downy Thornapple)*	Y		
581.	6971	*Nicotiana benthamiana (Tjuntiwari)*			
582.	6976	*Nicotiana occidentalis (Native Tobacco)*			
583.	11331	*Nicotiana occidentalis subsp. obliqua*			
584.	11856	*Nicotiana occidentalis subsp. occidentalis*			
585.	20652	*Physalis angulata*	Y		
586.	6998	*Solanum cleistogamum*			
587.	7002	*Solanum diversiflorum*			
588.	7007	*Solanum esuriale (Quena)*			
589.	7009	*Solanum gabrielae*			
590.	7014	*Solanum horridum*			
591.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
592.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
593.	7029	*Solanum phlomoides*			
594.	7036	*Solanum sturtianum (Thargomindah Nightshade)*			
Stylidiaceae					
595.	7729	*Stylidium fluminense*			
Surianaceae					
596.	3182	*Stylobasium spathulatum (Pebble Bush)*			
Thymelaeaceae					
597.	5230	*Pimelea ammocharis*			
Violaceae					
598.	5215	*Hybanthus aurantiacus*			
599.	5219	*Hybanthus enneaspermus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Zygophyllaceae					
600.	48900	*Roepera retivalvis*			
601.	4375	*Tribulus cistoides*			
602.	4377	*Tribulus hirsutus*			
603.	4379	*Tribulus macrocarpus*			
604.	4380	*Tribulus occidentalis (Perennial Caltrop)*			
605.	4381	*Tribulus platypterus (Cork Hopbush)*			
606.	4383	*Tribulus terrestris (Caltrop)*	Y		

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

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

NatureMap Fauna Species Report

Created By Guest user on 12/02/2019

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	116° 44' 55" E,20° 42' 17" S
Buffer	20km
Group By	Species Group

Species Group	Species	Records
Amphibian	4	49
Bird	207	5509
Fish	125	159
Invertebrate	212	445
Mammal	42	439
Reptile	104	1284
TOTAL	**694**	**7885**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amphibian					
1.	25371	*Cyclorana australis (Giant Frog)*			
2.	25375	*Cyclorana maini (Sheep Frog)*			
3.	25392	*Litoria rubella (Little Red Tree Frog)*			
4.	25430	*Notaden nichollsi (Desert Spadefoot)*			
Bird					
5.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
6.	25536	*Accipiter fasciatus (Brown Goshawk)*			
7.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
8.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
9.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
10.	24312	*Anas gracilis (Grey Teal)*			
11.	24316	*Anas superciliosa (Pacific Black Duck)*			
12.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
13.	24505	*Anous stolidus subsp. pileatus (Common Noddy)*		IA	
14.	25670	*Anthus australis (Australian Pipit)*			
15.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
16.	24285	*Aquila audax (Wedge-tailed Eagle)*			
17.	25559	*Ardea intermedia (Intermediate Egret)*			
18.	41324	*Ardea modesta (great egret, white egret)*			
19.	24341	*Ardea pacifica (White-necked Heron)*			
20.	24610	*Ardeotis australis (Australian Bustard)*			
21.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
22.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
23.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
24.	24354	*Artamus leucorynchus subsp. leucopygialis (White-breasted Woodswallow)*			
25.	24355	*Artamus minor (Little Woodswallow)*			
26.	24356	*Artamus personatus (Masked Woodswallow)*			
27.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
28.	24318	*Aythya australis (Hardhead)*			
29.		*Barnardius zonarius*			
30.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
31.	47897	*Butorides striata (Striated Heron, Mangrove Heron)*			
32.	25715	*Cacatua roseicapilla (Galah)*			
33.	25716	*Cacatua sanguinea (Little Corella)*			
34.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
35.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
36.	24780	*Calidris alba (Sanderling)*		IA	
37.	25738	*Calidris canutus (Red Knot, knot)*		IA	
38.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
39.	24788	*Calidris ruficollis (Red-necked Stint)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
				IA	
40.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
41.	24790	*Calidris tenuirostris (Great Knot)*		T	
42.	25600	*Centropus phasianinus (Pheasant Coucal)*			
43.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
44.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
45.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
46.	24378	*Charadrius veredus (Oriental Plover)*		IA	
47.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
48.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
49.		*Chroicocephalus novaehollandiae*			
50.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
51.	24288	*Circus approximans (Swamp Harrier)*			
52.	24289	*Circus assimilis (Spotted Harrier)*			
53.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
54.	24399	*Columba livia (Domestic Pigeon)*	Y		
55.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
56.	24416	*Corvus bennetti (Little Crow)*			
57.	25593	*Corvus orru (Torresian Crow)*			
58.	24419	*Corvus splendens (House Crow)*			
59.	25701	*Coturnix ypsilophora (Brown Quail)*			
60.	24673	*Coturnix ypsilophora subsp. australis (Brown Quail)*			
61.	24672	*Coturnix ypsilophora subsp. cervina (Brown Quail)*			
62.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
63.	25595	*Cracticus tibicen (Australian Magpie)*			
64.	25596	*Cracticus torquatus (Grey Butcherbird)*			
65.	24322	*Cygnus atratus (Black Swan)*			
66.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
67.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
68.	24470	*Dromaius novaehollandiae (Emu)*			
69.		*Egretta garzetta*			
70.		*Egretta novaehollandiae*			
71.		*Elanus axillaris*			
72.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
73.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
74.	24631	*Emblema pictum (Painted Finch)*			
75.		*Eolophus roseicapillus*			
76.	24653	*Eopsaltria pulverulenta (Mangrove Robin)*			
77.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
78.	24568	*Epthianura aurifrons (Orange Chat)*			
79.	24570	*Epthianura tricolor (Crimson Chat)*			
80.	24837	*Eremiornis carteri (Spinifex-bird)*			
81.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
82.	47938	*Esacus magnirostris (Beach Stone-curlew, Beach Thick-knee)*			
83.	24368	*Eurostopodus argus (Spotted Nightjar)*			
84.	25621	*Falco berigora (Brown Falcon)*			
85.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
86.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
87.	25623	*Falco longipennis (Australian Hobby)*			
88.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
89.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
90.	24476	*Falco subniger (Black Falcon)*			
91.	24478	*Fregata ariel (Lesser Frigatebird)*		IA	
92.	25727	*Fulica atra (Eurasian Coot)*			
93.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
94.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
95.	42314	*Gavicalis virescens (Singing Honeyeater)*			
96.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
97.	24401	*Geopelia cuneata (Diamond Dove)*			
98.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
99.	25585	*Geopelia striata (Zebra Dove)*			
100.	24403	*Geopelia striata subsp. placida (Peaceful Dove)*			
101.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
102.	25530	*Gerygone fusca (Western Gerygone)*			
103.		*Gerygone sp.*			
104.	24276	*Gerygone tenebrosa (Dusky Gerygone)*			
105.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
106.	24443	*Grallina cyanoleuca (Magpie-lark)*			
107.	24484	*Grus rubicunda (Brolga)*			
108.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			

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109.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
110.		*Haematopus ostralegus*			Y
111.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
112.	25541	*Haliastur indus (Brahminy Kite)*			
113.	24294	*Haliastur indus subsp. girrenera (Brahminy Kite)*			
114.	24295	*Haliastur sphenurus (Whistling Kite)*			
115.	24297	*Hamirostra melanosternon (Black-breasted Buzzard)*			
116.	47965	*Hieraaetus morphnoides (Little Eagle)*			
117.	25734	*Himantopus himantopus (Black-winged Stilt)*			
118.	24491	*Hirundo neoxena (Welcome Swallow)*			
119.	25630	*Hirundo rustica (Barn Swallow)*		IA	
120.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
121.	24367	*Lalage tricolor (White-winged Triller)*			
122.	25637	*Larus novaehollandiae (Silver Gull)*			
123.	25638	*Larus pacificus (Pacific Gull)*			
124.	25661	*Lichmera indistincta (Brown Honeyeater)*			
125.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
126.	25739	*Limicola falcinellus (Broad-billed Sandpiper)*		IA	
127.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
128.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
129.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
130.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
131.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
132.	24583	*Manorina flavigula (Yellow-throated Miner)*			
133.	24736	*Melopsittacus undulatus (Budgerigar)*			
134.	24598	*Merops ornatus (Rainbow Bee-eater)*			
135.	25542	*Milvus migrans (Black Kite)*			
136.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
137.	25685	*Neochmia ruficauda (Star Finch)*			
138.		*Neopsephotus bourkii*			
139.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
140.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
141.	25742	*Numenius phaeopus (Whimbrel)*		IA	
142.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
143.	24742	*Nymphicus hollandicus (Cockatiel)*			
144.	24497	*Oceanites oceanicus (Wilson's Storm-petrel)*		IA	
145.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
146.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
147.	24620	*Pachycephala lanioides (White-breasted Whistler)*			
148.	25678	*Pachycephala melanura (Mangrove Golden Whistler)*			
149.	24621	*Pachycephala melanura subsp. melanura (Mangrove Golden Whistler)*			
150.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
151.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
152.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
153.	48053	*Pardalotus rubricatus subsp. rubricatus (Red-browed Pardalote)*			Y
154.	25682	*Pardalotus striatus (Striated Pardalote)*			
155.	25687	*Passer domesticus (House Sparrow)*	Y		
156.	24642	*Passer montanus (Eurasian Tree Sparrow)*	Y		
157.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
158.		*Peneoenanthe pulverulenta*			
159.	48060	*Petrochelidon ariel (Fairy Martin)*			
160.	48061	*Petrochelidon nigricans (Tree Martin)*			
161.	25697	*Phalacrocorax carbo (Great Cormorant)*			
162.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
163.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
164.	25699	*Phalacrocorax varius (Pied Cormorant)*			
165.	24411	*Phaps histrionica (Flock Bronzewing, Flock Pigeon)*			
166.	24677	*Pitta moluccensis (Blue-winged Pitta)*			
167.	24842	*Platalea regia (Royal Spoonbill)*			
168.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
169.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
170.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
171.	25703	*Podargus strigoides (Tawny Frogmouth)*			
172.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
173.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
174.		*Ptilonorhynchus guttatus*			
175.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
176.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
177.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
178.	48096	*Rhipidura albiscapa (Grey Fantail)*			

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179.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
180.	24457	*Rhipidura phasiana (Mangrove Grey Fantail)*			
181.	30948	*Smicrornis brevirostris (Weebill)*			
182.	24521	*Sterna bengalensis (Lesser Crested Tern)*			
183.	25640	*Sterna dougallii (Roseate Tern)*		IA	
184.	25642	*Sterna hirundo (Common Tern)*		IA	
185.	48593	*Sternula albifrons (Little Tern)*		IA	
186.	48594	*Sternula nereis (Fairy Tern)*			
187.	24329	*Stictonetta naevosa (Freckled Duck)*			
188.	24482	*Stiltia isabella (Australian Pratincole)*			
189.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
190.	25754	*Sula leucogaster (Brown Booby)*		IA	
191.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
192.	30870	*Taeniopygia guttata (Zebra Finch)*			
193.		*Thalasseus bengalensis*			
194.	48597	*Thalasseus bergii (Crested Tern)*		IA	
195.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
196.	25548	*Todiramphus chloris (Collared Kingfisher)*			
197.	24306	*Todiramphus chloris subsp. pilbara (Pilbara Collared Kingfisher)*			
198.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
199.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
200.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
201.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
202.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
203.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
204.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
205.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
206.	24851	*Turnix velox (Little Button-quail)*			
207.		*Tyto delicatula*			
208.	25577	*Vanellus miles (Masked Lapwing)*			
209.	24386	*Vanellus tricolor (Banded Lapwing)*			
210.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
211.	24857	*Zosterops luteus (Yellow White-eye)*			
Fish					
212.		*? ?*			
213.		*Abudefduf bengalensis*			
214.		*Acanthopagrus latus*			
215.		*Acentrogobius gracilis*			
216.		*Acentrogobius sp.*			
217.		*Alepes apercna*			
218.		*Alepes mate*			Y
219.		*Ambassis vachellii*			
220.		*Amblyeleotris gymnocephala*			
221.		*Amblygobius bynoensis*			
222.		*Amniataba caudavittata*			
223.		*Amniataba percoides*			
224.		*Apistus carinatus*			
225.		*Arius leptaspis*			Y
226.		*Asterorhombus intermedius*			
227.		*Bathygobius fuscus*			
228.		*Bathygobius laddi*			
229.		*Batrachomoeus dahli*			
230.		*Bostrychus sinensis*			Y
231.		*Callionymus japonicus*			Y
232.		*Callionymus sp.*			
233.		*Carangoides sp.*			
234.		*Caranx bucculentus*			
235.		*Carcharhinus brachyurus*			
236.		*Centrogenys vaigiensis*			
237.		*Cephalopholis boenak*			
238.		*Chelmon marginalis*			
239.		*Chelmon muelleri*			
240.		*Chirocentrus dorab*			
241.		*Coris sp.*			
242.		*Craterocephalus pauciradiatus*			
243.		*Ctenotrypauchen microcephalus*			
244.		*Cynoglossus maculipinnis*			
245.		*Cynoglossus sp.*			
246.		*Dexillus muelleri*			
247.		*Drombus sp.*			

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248.		*Eleutheronema tetradactylum*			
249.		*Elops hawaiensis*			
250.		*Enneapterygius gracilis*			
251.		*Enneapterygius philippinus*			
252.		*Enneapterygius sp.*			
253.		*Epinephelus coioides*			
254.		*Epinephelus malabaricus*			
255.		*Epinephelus sexfasciatus*			
256.		*Euristhmus microceps*			
257.		*Euristhmus sandrae*			Y
258.		*Eviota queenslandica*			
259.		*Favonigobius melanobranchus*			
260.		*Gerres filamentosus*			
261.		*Gerres subfasciatus*			
262.		*Glossogobius giuris*			
263.		*Gnatholepis argus*			
264.		*Gobiodon rivulatus*			
265.		*Gobiodon sp.*			
266.		*Halichoeres nigrescens*			
267.		*Halichoeres sp.*			
268.		*Halieutaea brevicaudata?*			
269.		*Halophryne diemensis*			
270.		*Hippichthys penicillus*			
271.		*Hypopterus macropterus*			
272.		*Inegocia japonica*			
273.		*Istiblennius meleagris*			
274.		*Istigobius ornatus*			
275.		*Leiognathus sp.*			
276.		*Lepidotrigla sp.*			
277.		*Liocranium praepositum*			
278.		*Liza subviridis*			
279.		*Liza vaigiensis*			
280.		*Lophiocharon trisignatus*			
281.		*Lutjanus argentimaculatus*			
282.		*Lutjanus malabaricus*			
283.		*Lutjanus russellii*			
284.		*Melanotaenia australis*			
285.		*Metavelifer multiradiatus*			
286.		*Micrognathus micronotopterus*			
287.		*Monacanthus chinensis*			
288.		*Monodactylus argenteus*			
289.		*Mugil cephalus*			
290.		*Nebrius ferrugineus*			Y
291.		*Nemipterus celebicus*			
292.		*Netuma proxima*			
293.		*Omobranchus punctatus*			
294.		*Omobranchus rotundiceps*			
295.		*Omobranchus sp.*			
296.		*Ophichthus celebicus?*			
297.		*Opistognathus darwiniensis*			
298.		*Oxyurichthys sp.*			
299.		*Pandaka lidwilli*			
300.		*Parachaeturichthys sp.*			Y
301.		*Paraexocoetus brachypterus*			Y
302.		*Paramonacanthus choirocephalus*			
303.		*Parapercis diplospilus*			
304.		*Parascorpaena picta*			
305.		*Pentapodus porosus*			
306.		*Pentapodus sp.*			
307.		*Periophthalmus argentilineatus*			
308.		*Pisodonophis cancrivorus*			
309.		*Platycephalus sp.*			
310.		*Pleurosicya sp.*			
311.		*Polydactylus multiradiatus*			
312.		*Pomadasys maculatus*			
313.		*Priacanthus hamrur*			
314.		*Priolepis nuchifasciata*			
315.		*Protonibea diacanthus*			
316.		*Rastrelliger kanagurta*			
317.		*Repomucenus calcaratus*			

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318.		*Scatophagus argus*			
319.		*Scolecenchelys macroptera*			
320.		*Scolopsis taenioptera*			
321.		*Secutor insidiator*			
322.		*Sillago burrus*			
323.		*Sillago lutea*			
324.		*Sorsogona tuberculata*			
325.		*Sphyraena barracuda*			
326.		*Sphyraena sp.*			
327.		*Suggrundus macracanthus*			
328.		*Synanceia horrida*			
329.		*Terapon jarbua*			
330.		*Triacanthus sp.*			
331.		*Tylosurus crocodilus*			
332.		*Valamugil seheli*			
333.		*Valenciennea muralis*			
334.		*Yirrkala sp.*			
335.		*Yongeichthys nebulosus*			
336.		*Zebrias quagga*			

Invertebrate

337.		*Actacarus pacificus*			
338.		*Agauopsis arborea*			Y
339.		*Agauopsis dasyderma*			Y
340.		*Agauopsis moorea*			Y
341.		*Agauopsis obtusa*			Y
342.		*Agraptocorixa parvipunctata*			
343.		*Allodessus bistrigatus*			
344.		*Alluaudomyia sp.*			
345.		*Alona cf. verrucosa*			
346.		*Alona rigidicaudis*			
347.		*Amblyomma triguttatum*			
348.		*Aname mainae*			
349.		*Aname mellosa*			
350.		*Anax papuensis*			
351.		*Anisops canaliculatus*			
352.		*Anisops hackeri*			
353.		*Anisops nasutus*			
354.		*Anisops sp.*			
355.		*Anomalohalacarus dampierensis*			Y
356.		*Anopheles annulipes s.l.*			
357.		*Anuraeopsis navicula*			
358.		*Arcella sp.*			
359.		*Arthrorhabdus paucispinus*			
360.		*Austrostrophus stictopygus*			
361.		*Bdelloidea sp. 2:2*			
362.		*Bennelongia minimus*			
363.		*Berosus pulchellus*			
364.		*Boeckella triarticulata*			
365.		*Bolboleaus truncatus*			
366.		*Boreohesperus undulatus*			
367.		*Brachionus n sp P2 (PSW)*			
368.		*Brachionus quadridentatus*			
369.		*Carenum pulchrum*			
370.		*Carenum subplanatum*			
371.		*Carenum venustum*			
372.		*Catadromus lacordairei*			
373.		*Cephalodella cf forficula*			
374.		*Cephalodella gibba*			
375.		*Ceriodaphnia cornuta*			
376.		*Ceriodaphnia n. sp. a (Berner sp.#3) (SAP)*			
377.		*Ceriodaphnia n. sp. c (Berner sp.#1) (SAP)*			
378.		*Cheumatopsyche wellsae*			
379.		*Chironomus aff. alternans (V24) (CB)*			
380.		*Chlaenius australis*			
381.		*Cloeon sp.*			
382.		*Copidognathus lutarius*			Y
383.		*Copidognathus meridianus*			
384.		*Copidognathus piger*			Y
385.		*Cryptochironomus griseidorsum*			
386.		*Cryptoerithus halli*			

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387.		*Cryptoerithus occultus*			
388.		*Culex (Culex) annulirostris*			
389.		*Culex crinicauda*			
390.		*Culex palpalis*			
391.		*Cybister tripunctatus*			
392.		*Cypretta ?lutea*			
393.		*Cypretta sp PSW074*			
394.		*Cypricercus sp. 422 (CB)*			
395.		*Dasyheleinae sp. P2 (PSW)*			
396.		*Diaphanosoma excisum*			
397.		*Dicrotendipes P5 (=balciunasi?) (PSW)*			
398.		*Difflugia sp. P1*			
399.		*Dineutus australis*			
400.		*Diplacodes bipunctata*			
401.		*Diplacodes haematodes*			
402.		*Ecnomus pilbarensis*			
403.		*Encentridophorus sarasini*			
404.		*Enchytraeidae sp.*			
405.		*Enochrus deserticola*			
406.		*Enochrus sp.*			
407.		*Ephemeroporus barroisi s.l.*			
408.		*Ephydridae sp.*			
409.		*Ephydridae sp. 12 (PSW)*			
410.		*Epistylis sp*			
411.		*Eretes australis*			
412.		*Ethmostigmus curtipes*			
413.		*Euchlanis dilatata*			
414.		*Euchlanis lyra*			
415.		*Euglypha sp.*			
416.		*Geoscaptus laevissimus*			
417.		*Glyptophysa sp*			
418.		*Halacaridae sp.*			
419.		*Hellyethira sp.*			
420.		*Hemicordulia sp.*			
421.		*Hemicypris megalops*			
422.		*Heterocypris sp.*			
423.		*Heterocypris tatei*			
424.		*Hexarthra cf brandorffi (PSW)*			
425.		*Hogna crispipes*			
426.		*Hydrachna sp. 4/5 (PSW)*			
427.		*Hydraena sp.*			
428.		*Hydrobiidae sp P1 (not assimineid) (PSW)*			
429.		*Hydrochus obscuroaeneus*			
430.		*Hydroglyphus grammopterus (=trilineatus)*			
431.		*Hydroglyphus leai*			
432.		*Hydroglyphus orthogrammus*			
433.		*Hyphydrus elegans*			
434.		*Hyphydrus lyratus*			
435.		*Ilyocypris australiensis*			
436.		*Ilyodromus sp BOS25*			
437.		*Indolpium sp.*			
438.		*Ischnura aurora aurora*			
439.		*Isidorella egraria*			
440.		*Isobactrus australiensis*			Y
441.		*Isobactrus obesus*			Y
442.		*Isopedella gibsandi*			
443.		*Isopedella tindalei*			
444.		*Keratella procurva*			
445.		*Laccophilus sharpi*			
446.		*Lacinularia flosculosa*			
447.		*Lampona ampeinna*			
448.		*Lampona cylindrata*			
449.		*Lamponina scutata*			
450.		*Larsia albiceps*			
451.		*Latonopsis australis*			
452.		*Latrodectus geometricus*			
453.		*Leberis cf. diaphanus*			
454.		*Lecane bulla*			
455.		*Lecane cf. rhenana (SAP)*			
456.		*Lecane luna*			

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457.		*Lecane papuana*			
458.		*Lecane punctata*			
459.		*Lecane thalera*			
460.		*Lecane ungulata*			
461.		*Lepadella patella*			
462.		*Limbodessus compactus*			
463.		*Limnadopsis "pilbarensis" (ex P2)(PSW)*			Y
464.		*Limnadopsis birchii*			
465.		*Limnocythere dorsosicula*			
466.		*Litarachna bartschae*			Y
467.		*Loxandrus micantior*			
468.		*Lychas sp. 2*			
469.		*Macrochaetus sp.*			
470.		*Macrothrix sp.*			
471.		*Meedo houstoni*			
472.		*Megacephala greyana*			
473.		*Mesocyclops brooksi*			
474.		*Mesovelia hungerfordi*			
475.		*Metacyclops sp. P2 (PSW)*			
476.		*Microcyclops varicans*			
477.		*Micronecta gracilis*			
478.		*Micronecta n. sp. P3 (PSW)*			
479.		*Microvelia (Austromicrovelia) peramoena*			
480.		*Monommata sp.*			
481.		*Muscidae sp. P1*			
482.		*Naididae (ex Tubificidae)*			
483.		*Nematoda sp. P2/P4 (PSW)*			
484.		*Nephila edulis*			
485.		*Omoedus orbiculatus*			
486.		*Opisthopora sp.*			
487.		*Orthetrum caledonicum*			
488.		*Orthomorpha coarctata*			
489.		*Ostracoda (unident.)*			
490.		*Ovatalona cf. cambouei*			
491.		*Oxyopes variabilis*			
492.		*Ozestheria packardi*			
493.		*Pantala flavescens*			
494.		*Paracymus pygmaeus*			
495.		*Paracymus spenceri*			
496.		*Paratanytarsus sp. P2 (PSW)*			
497.		*Pediana horni*			
498.		*Pediana tenuis*			
499.		*Phreodrilid with dissimilar ventral chaetae*			
500.		*Phreodrilid with similar ventral chaetae*			
501.		*Pilbarascutigera incola*			
502.		*Pilbarophreatoicus platyarthricus*			
503.		*Polyarthra dolichoptera*			
504.		*Polypedilum nubifer*			
505.		*Pontarachne australis*			Y
506.		*Procladius paludicola*			
507.		*Prodidomus woodleigh*			
508.		*Quistrachia legendrei*			
509.		*Regimbartia attenuata*			
510.		*Rhagada angulata*			
511.		*Rhagada convicta*			
512.		*Rhagada dampierana*			
513.		*Rhagada minima*			
514.		*Rhagada perprima*			
515.		*Rheotanytarsus trivittatus*			
516.		*Rhombognathus dispar*			Y
517.		*Rhombognathus ocularis*			Y
518.		*Rhombognathus scutulatus*			
519.		*Scaptognathides hawaiiensis*			Y
520.		*Scaptognathides ornatus*			Y
521.		*Scirtidae sp.*			
522.		*Scolopendra laeta*			
523.		*Scolopendra morsitans*			
524.		*Simaetha tenuior*			
525.		*Simognathus platyaspis*			Y
526.		*Simognathus salebrosus*			Y

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
527.		*Simognathus tener*			Y
528.		*Simulium ornatipes*			
529.		*Sternolophus australis*			
530.		*Stratiomyidae sp.*			
531.		*Supunna picta*			
532.		*Tabanidae sp.*			
533.		*Tanytarsus fuscithorax/semibarbitarsus*			
534.		*Tanytarsus sp. D (SAP)*			
535.		*Tasmanocoenis arcuata*			
536.		*Testudinella patina*			
537.		*Thermocyclops decipiens*			
538.		*Tramea stenoloba*			
539.		*Trichocerca similis*			
540.		*Trichocyclus nigropunctatus*			
541.		*Triops australiensis australiensis*			
542.		*Urodacus armatus*			
543.		*Venatrix arenaris*			
544.		*Wesmaldra nixaut*			
545.		*Wydundra kennedy*			
546.		*Wydundra nixaut*			Y
547.		*Zenodorus orbiculatus*			
548.		*Zonocypretta kalimna*			
Mammal					
549.	48920	*Canis familiaris (Dog, Dingo)*	Y		
550.	24253	*Capra hircus (Goat)*	Y		
551.	24181	*Chaerephon jobensis (Greater Northern Freetail-bat, Northern Mastiff Bat)*			
552.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
553.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
554.	24084	*Dugong dugon (Dugong)*		S	
555.	24041	*Felis catus (Cat)*	Y		
556.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
557.	24217	*Leggadina lakedownensis (Northern Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga)*		P4	
558.	24180	*Macroderma gigas (Ghost Bat)*		T	
559.	25489	*Macropus robustus (Euro, Biggada)*			
560.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
561.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
562.	24051	*Megaptera novaeangliae (Humpback Whale)*		S	
563.		*Mormopterus (Ozimops) cobourgianus*			
564.	24183	*Mormopterus loriae (Little Northern Freetail-bat)*			
565.	24223	*Mus musculus (House Mouse)*	Y		
566.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
567.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
568.	24192	*Nyctophilus arnhemensis (Arnhem Land Long-eared Bat)*			
569.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
570.		*Nyctophilus geoffroyi subsp. pallescens*			
571.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
572.	48034	*Osphranter robustus (Euro, Biggada)*			
573.	34016	*Ovis aries (Sheep)*			
574.	24144	*Petrogale rothschildi (Rothschild's Rock-wallaby)*			
575.		*Planigale sp. nov.*			
576.	24105	*Pseudantechinus roryi (Rory's Pseudantechinus)*			
577.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
578.	24233	*Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)*		P4	
579.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
580.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
581.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			
582.	24245	*Rattus rattus (Black Rat)*	Y		
583.	24246	*Rattus tunneyi (Pale Field-rat)*			
584.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
585.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
586.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
587.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
588.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
589.	24040	*Vulpes vulpes (Red Fox)*	Y		
590.	24248	*Zyzomys argurus (Common Rock-rat)*			
Reptile					
591.		*Acanthophis wellsei*			
592.	25332	*Acanthophis wellsi (Pilbara Death Adder)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
593.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
594.	25317	*Antaresia childreni (Children's Python)*			
595.	25318	*Antaresia perthensis (Pygmy Python)*			
596.	25448	*Antaresia stimsoni (Stimson's Python)*			
597.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
598.	25320	*Aspidites melanocephalus (Black-headed Python)*			
599.	25236	*Aspidites ramsayi (Woma)*			
600.	25331	*Brachyurophis approximans (North-western Shovel-nosed Snake)*			
601.	25015	*Carlia munda (Shaded-litter Rainbow Skink)*			
602.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
603.	25336	*Chelonia mydas (Green Turtle)*		T	
604.	24919	*Crenadactylus ocellatus subsp. horni (Clawless Gecko)*			
605.	30893	*Cryptoblepharus buchananii*			
606.	25020	*Cryptoblepharus plagiocephalus*			
607.	30892	*Cryptoblepharus ustulatus*			
608.	25458	*Ctenophorus caudicinctus (Ring-tailed Dragon)*			
609.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
610.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
611.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
612.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
613.	24886	*Ctenophorus reticulatus (Western Netted Dragon)*			
614.	25024	*Ctenotus angusticeps (Airlie Island Ctenotus, Northwestern coastal Ctenotus)*		P3	
615.	25027	*Ctenotus australis*			
616.	25036	*Ctenotus duricola*			
617.	25462	*Ctenotus grandis*			
618.	25043	*Ctenotus grandis subsp. titan*			
619.	25045	*Ctenotus helenae*			
620.	25052	*Ctenotus leonhardii*			
621.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
622.	25060	*Ctenotus pantherinus subsp. acripes (Leopard Ctenotus)*			
623.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
624.	25070	*Ctenotus robustus*			
625.	25072	*Ctenotus rubicundus*			
626.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
627.	25074	*Ctenotus schomburgkii*			
628.	25077	*Ctenotus serventyi*			
629.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
630.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
631.	25001	*Delma nasuta*			
632.	25002	*Delma pax*			
633.	25004	*Delma tincta*			
634.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
635.	25295	*Demansia psammophis subsp. cupreiceps (Yellow-faced Whipsnake)*			
636.	25297	*Demansia rufescens (Rufous Whipsnake)*			
637.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
638.	41404	*Diplodactylus galaxias (Northern Pilbara Beak-faced Gecko)*			
639.	24937	*Diplodactylus mitchelli*			
640.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
641.	25092	*Egernia depressa (Southern Pygmy Spiny-tailed Skink)*			
642.	25101	*Egernia pilbarensis (Pilbara Skink)*			
643.	25362	*Ephalophis greyae*			
644.	42404	*Eremiascincus isolepis*			
645.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
646.	25342	*Eretmochelys imbricata subsp. bissa (Hawksbill Turtle)*		T	
647.	25327	*Fordonia leucobalia (White-bellied Mangrove Snake)*			
648.	25301	*Furina ornata (Moon Snake)*			
649.	24956	*Gehyra pilbara*			
650.	24958	*Gehyra punctata*			
651.	24959	*Gehyra variegata*			
652.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
653.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
654.	25363	*Hydrelaps darwiniensis*			
655.	25125	*Lerista bipes*			
656.	30928	*Lerista clara*			
657.	30929	*Lerista jacksoni*			
658.	25155	*Lerista muelleri*			
659.	30925	*Lerista verhmens*			
660.	25005	*Lialis burtonis*			
661.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
662.	25239	*Liasis olivaceus subsp. olivaceus (Olive Python)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
663.	30933	*Lucasium stenodactylum*			
664.	25184	*Menetia greyii*			
665.	25187	*Menetia surda subsp. surda*			
666.	25495	*Morethia ruficauda*			
667.	25193	*Morethia ruficauda subsp. exquisita*			
668.	25344	*Natator depressus (Flatback Turtle)*		T	
669.	25196	*Notoscincus butleri (lined soil-crevice skink (Dampier))*		P4	
670.	25197	*Notoscincus ornatus subsp. ornatus*			
671.	24976	*Oedura marmorata (Marbled Velvet Gecko)*			
672.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
673.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
674.	25261	*Pseudechis australis (Mulga Snake)*			
675.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
676.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
677.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
678.	24924	*Strophurus ciliaris subsp. aberrans*			
679.	24927	*Strophurus elderi*			
680.	24932	*Strophurus jeanae*			
681.	24949	*Strophurus wellingtonae*			
682.	25269	*Suta fasciata (Rosen's Snake)*			
683.	25307	*Suta punctata (Spotted Snake)*			
684.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
685.	30814	*Tympanocryptis cephalus (Pebble Dragon)*			
686.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
687.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
688.	25212	*Varanus eremius (Pygmy Desert Monitor)*			
689.	25216	*Varanus giganteus (Perentie)*			
690.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
691.	25223	*Varanus panoptes subsp. rubidus*			
692.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
693.	25526	*Varanus tristis (Racehorse Monitor)*			
694.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			

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

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

Appendix D – Flora data

Flora species list

Quadrat and releve data

Conservation significant flora locations

Flora likelihood of occurrence assessment

Flora species recorded within the survey area

Family	Taxon	Status
Aizoaceae	*Trianthema pilosum*	
Aizoaceae	*Trianthema turgidifolia*	
Amaranthaceae	*Aerva javanica*	*
Amaranthaceae	*Gomphrena cunninghamii*	
Amaranthaceae	*Ptilotus aervoides*	
Amaranthaceae	*Ptilotus astrolasius*	
Amaranthaceae	*Ptilotus auriculifolius*	
Amaranthaceae	*Ptilotus calostachyus*	
Amaranthaceae	*Ptilotus exaltatus*	
Amaranthaceae	*Ptilotus fusiformis*	
Amaranthaceae	*Ptilotus helipteroides*	
Amaranthaceae	*Ptilotus nobilis*	
Amaranthaceae	*Ptilotus obovatus*	
Araliaceae	*Trachymene oleracea* subsp. *oleracea*	
Asteraceae	*Chrysocephalum gilesii*	
Asteraceae	*Pluchea dentex*	
Asteraceae	*Pterocaulon sphacelatum*	
Asteraceae	*Pterocaulon sphaeranthoides*	
Asteraceae	*Streptoglossa decurrens*	
Asteraceae	*Streptoglossa tenuiflora*	
Boraginaceae	*Ehretia saligna var. saligna*	
Boraginaceae	*Trichodesma zeylanicum* var. *zeylanicum*	
Capparaceae	*Capparis spinosa*	
Chenopodiaceae	*Enchylaena tomentosa* var. *tomentosa*	
Chenopodiaceae	*Rhagodia preissii*	
Chenopodiaceae	*Salsola australis*	
Chenopodiaceae	*Sclerolaena costata*	
Chenopodiaceae	*Sclerolaena diacantha*	
Chenopodiaceae	*Tecticornia ?indica* subsp. *leiostachya*	
Chenopodiaceae	*Tecticornia ?pterygosperma*	
Cleomaceae	*Cleome viscosa*	
Combretaceae	*Terminalia circumalata*	
Convolvulaceae	*Bonamia erecta*	
Convolvulaceae	*Evolvulus alsinoides*	
Convolvulaceae	*Ipomoea costata*	
Cucurbitaceae	*Cucumis variabilis*	
Cyperaceae	*Bulbostylis barbata*	
Cyperaceae	*Cyperus vaginatus*	
Cyperaceae	*Fimbristylis ?dichotoma*	
Euphorbiaceae	*Adriana tomentosa* var. *tomentosa*	
Euphorbiaceae	*Euphorbia australis*	
Euphorbiaceae	*Euphorbia tannensis* subsp. *eremophila*	
Euphorbiaceae	*Euphorbia trigonosperma*	
Euphorbiaceae	*Euphorbia vaccaria* var. *vaccaria*	

Family	Taxon	Status
Fabaceae	**Vachellia farnesiana*	*
Fabaceae	*Acacia ampliceps*	
Fabaceae	*Acacia ancistrocarpa*	
Fabaceae	*Acacia arida*	
Fabaceae	*Acacia bivenosa*	
Fabaceae	*Acacia coriacea subsp. coriacea*	
Fabaceae	*Acacia inaequilatera*	
Fabaceae	*Acacia maitlandii*	
Fabaceae	*Acacia orthocarpa*	
Fabaceae	*Acacia pyrifolia* var. *pyrifolia*	
Fabaceae	*Acacia sclerosperma* subsp. *sclerosperma*	
Fabaceae	*Acacia sericophylla*	
Fabaceae	*Acacia stellaticeps*	
Fabaceae	*Acacia synchronicia*	
Fabaceae	*Acacia tumida* var. *pilbarensis*	
Fabaceae	*Acacia xiphophylla*	
Fabaceae	*Cajanus cinereus*	
Fabaceae	*Crotalaria medicaginea* var. *neglecta*	
Fabaceae	*Indigofera monophylla*	
Fabaceae	*Indigofera trita*	
Fabaceae	*Rhynchosia bungarensis*	Priority 4
Fabaceae	*Rhynchosia minima*	
Fabaceae	*Senna artemisioides*	
Fabaceae	*Senna artemisioides* subsp. *oligophylla*	
Fabaceae	*Senna glutinosa*	
Fabaceae	*Senna glutinosa* subsp. *pruinosa*	
Fabaceae	*Senna glutinosa* subsp. *x luerssenii*	
Fabaceae	*Senna venusta*	
Fabaceae	*Swainsona formosa*	
Fabaceae	*Tephrosia supina*	
Goodeniaceae	*Goodenia forrestii*	
Goodeniaceae	*Goodenia lamprosperma*	
Goodeniaceae	*Goodenia microptera*	
Goodeniaceae	*Goodenia stobbsiana*	
Goodeniaceae	*Scaevola spinescens*	
Lamiaceae	*Clerodendrum tomentosum* var. *lanceolata*	
Lauraceae	*Cassytha capillaris*	
Malvaceae	**Malvastrum americanum*	*
Malvaceae	*Abutilon lepidum*	
Malvaceae	*Brachychiton acuminatus*	
Malvaceae	*Corchorus incanus* subsp. *incanus*	
Malvaceae	*Corchorus parviflorus*	
Malvaceae	*Gossypium australe*	
Malvaceae	*Hibiscus sturtii* var. *?platychlamys*	
Malvaceae	*Lawrencia viridigrisea*	
Malvaceae	*Malvastrum americanum*	

Family	Taxon	Status
Malvaceae	*Sida fibulifera*	
Malvaceae	*Triumfetta clementii*	
Malvaceae	*Triumfetta propinqua*	
Malvaceae	*Triumfetta propinqua*	
Malvaceae	*Waltheria indica*	
Menispermaceae	*Tinospora smilacina*	
Molluginaceae	*Trigastrotheca molluginea*	
Moraceae	*Ficus aculeata* var. *indecora*	
Myrtaceae	*Eucalyptus camaldulensis*	
Nyctaginaceae	*Boerhavia coccinea*	
Oleaceae	*Jasminum didymum* subsp. *lineare*	
Phyllanthaceae	*Flueggea virosa* subsp. *melanthesoides*	
Phyllanthaceae	*Phyllanthus maderaspatensis*	
Pittosporaceae	*Pittosporum angustifolium*	
Passifloraceae	*Passiflora foetida*	
Poaceae	*Aristida contorta*	
Poaceae	*Cenchrus ciliaris*	
Poaceae	*Cenchrus setiger*	
Poaceae	*Chrysopogon fallax*	
Poaceae	*Cymbopogon ambiguus*	
Poaceae	*Cymbopogon obtectus*	
Poaceae	*Dactyloctenium radulans*	
Poaceae	*Eragrostis desertorum*	
Poaceae	*Eragrostis xerophila*	
Poaceae	*Eriachne benthamii*	
Poaceae	*Eriachne aristidea*	
Poaceae	*Iseilema vaginiflorum*	
Poaceae	*Paraneurachne muelleri*	
Poaceae	*Sporobolus australasicus*	
Poaceae	*Themeda* sp. Mt Barricade (M.E. Trudgen 2471)	
Poaceae	*Themeda triandra*	
Poaceae	*Triodia angusta*	
Poaceae	*Triodia epactia*	
Poaceae	*Triodia wiseana*	
Portulacaceae	*Portulaca oleracea*	
Proteaceae	*Grevillea pyramidalis* subsp. *pyramidalis*	
Proteaceae	*Hakea lorea* subsp. *lorea*	
Rubiaceae	*Operculina aequisepala*	
Sapindaceae	*Alectryon oleifolius* subsp. *oleifolius*	
Sapindaceae	*Diplopeltis eriocarpa*	
Scrophulariaceae	*Eremophila longifolia*	
Solanaceae	*Solanum diversiflorum*	
Solanaceae	*Solanum lasiophyllum*	
Violaceae	*Hybanthus aurantiacus*	

Quadrat and releve data

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_01	*Acacia inaequilatera*	<10%	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Hakea lorea* subsp. *lorea*	<2% Numerous	2.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Acacia bivenosa*	<2% Numerous	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Indigofera monophylla*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_01	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_01	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_01	*Eremophila longifolia*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Senna glutinosa* subsp. *pruinosa*	<2% Few than 10	0.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Solanum lasiophyllum*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Pterocaulon sphacelatum*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_01	*Senna glutinosa*	<2% Few than 10	0.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Cymbopogon ambiguus*	<2% Few than 10	0.25	Tussock grass (G)	Quadrat
KAR_01	*Cassytha capillaris*	<2% Few than 10	0.25	Vine (G)	Quadrat
KAR_01	*Fimbristylis ?dichotoma*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_01	*Bulbostylis barbata*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_01	*Erianchne aristidea*	<2% Few than 10	0.25	Tussock grass (G)	Quadrat
KAR_01	*Bonamia erecta*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Solanum diversiflorum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Gossypium australe*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Hibiscus sturtii* var. *?platychlamys*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_01	*Acacia ancistrocarpa*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Acacia inaequilatera*	<10%	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Hakea lorea* subsp. *lorea*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Acacia bivenosa*	<2% Numerous	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Indigofera monophylla*	<2% Numerous	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_02	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_02	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_02	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_02	*Acacia pyrifolia* var. *pyrifolia*	<2% Few than 10	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Diplopeltis eriocarpa*	<2% Few than 10	0.75	Forb (G)	Quadrat
KAR_02	*Rhynchosia minima*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_02	*Fimbristylis ?dichotoma*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_02	*Bulbostylis barbata*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_02	*Erianchne aristidea*	<2% Few than 10	0.25	Tussock grass (G)	Quadrat
KAR_02	*Bonamia erecta*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Solanum diversiflorum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Gossypium australe*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Hibiscus sturtii* var. *?platychlamys*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_02	*Acacia ancistrocarpa*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Acacia inaequilatera*	<2% Few than 10	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Hakea lorea* subsp. *lorea*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Acacia bivenosa*	<10%	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Indigofera monophylla*	<2% Numerous	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_03	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_03	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_03	*Acacia pyrifolia var. pyrifolia*	<2% Few than 10	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Fimbristylis ?dichotoma*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_03	*Bulbostylis barbata*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_03	*Solanum diversiflorum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Gossypium australe*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Hibiscus sturtii* var. *?platychlamys*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_03	*Eremophila longifolia*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Acacia synchronicia*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Rhagodia preissii*	<2% Few than 10	0.75	Chenopod shrub (M)	Quadrat
KAR_03	*Senna artemisioides* subsp. *oligophylla*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_03	*Dactyloctenium radulans*	<2% Few than 10	0.1	Other grass (G)	Quadrat
KAR_03	*Sporobolus australasicus*	<2% Few than 11	0.1	Other grass (G)	Quadrat
KAR_03	*Euphorbia vaccaria* var. *vaccaria*	<2% Few than 12	0.1	Forb (G)	Quadrat
KAR_04	*Acacia xiphophylla*	30-10%	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_04	*Triodia epactia*	70-30%	0.75	Hummock grass (G)	Quadrat
KAR_04	*Fimbristylis ?dichotoma*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_04	*Cenchrus ciliaris*	<2% Numerous	0.5	Tussock grass (G)	Quadrat
KAR_04	*Gossypium australe*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_04	*Hibiscus sturtii* var. *?platychlamys*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_04	*Rhagodia preissii*	<2% Few than 10	1	Chenopod shrub (M)	Quadrat
KAR_04	*Pterocaulon sphacelatum*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_04	*Triodia wiseana*	30-10%	0.5	Hummock grass (G)	Quadrat
KAR_04	*Enchylaena tomentosa* var. *tomentosa*	<2% Few than 10	0.25	Chenopod shrub (M)	Quadrat
KAR_04	*Senna artemisioides*	<2% Few than 10	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_04	*Acacia bivenosa*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_04	*Bonamia erecta*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_04	*Bulbostylis barbata*	<2% Numerous	0.1	Sedge (G)	Quadrat
KAR_04	*Streptoglossa decurrens*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_04	*Ptilotus helipteroides*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_04	*Sclerolaena costata*	<2% Few than 10	0.1	Chenopod shrub (M)	Quadrat
KAR_04	*Indigofera trita*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_05	*Acacia inaequilatera*	<2% Few than 10	3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_05	*Hakea lorea* subsp. *lorea*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_05	*Acacia bivenosa*	<10%	2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_05	*Indigofera monophylla*	<2% Numerous	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_05	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Releve
KAR_05	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Releve
KAR_05	*Fimbristylis ?dichotoma*	<2% Numerous	0.1	Sedge (G)	Releve
KAR_05	*Solanum diversiflorum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_05	*Gossypium australe*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_05	*Diplopeltis eriocarpa*	<2% Numerous	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_05	*Eremophila longifolia*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Acacia inaequilatera*	<2% Few than 10	3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Hakea lorea* subsp. *lorea*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Acacia bivenosa*	<10%	2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Acacia stellaticeps*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Releve
KAR_06	*Fimbristylis ?dichotoma*	<2% Numerous	0.1	Sedge (G)	Releve
KAR_06	*Diplopeltis eriocarpa*	<2% Numerous	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Eremophila longifolia*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Indigofera monophylla*	<2% Numerous	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_06	*Acacia ancistrocarpa*	<2% Few than 10	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_07	*Acacia pyrifolia* var. *pyrifolia*	<2% Few than 10	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Acacia bivenosa*	<2% Few than 10	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Acacia arida*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_07	*Indigofera monophylla*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Fimbristylis ?dichotoma*	<2% Few than 10	0.1	Sedge (G)	Quadrat
KAR_07	*Senna glutinosa* subsp. *pruinosa*	<2% Few than 10	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Bulbostylis barbata*	<2% Few than 10	0.1	Sedge (G)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_07	*Hybanthus aurantiacus*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Scaevola spinescens*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Acacia maitlandii*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Triumfetta clementii*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_07	*Ptilotus calostachyus*	<2% Few than 10	0.5	Forb (G)	Quadrat
KAR_08	*Acacia inaequilatera*	<2% Few than 10	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_08	*Acacia bivenosa*	<2% Few than 10	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_08	*Acacia arida*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_08	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_08	*Indigofera monophylla*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_08	*Senna glutinosa* subsp. *pruinosa*	<2% Few than 10	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_08	*Scaevola spinescens*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_08	*Acacia ancistrocarpa*	<2% Few than 10	1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_09	*Cenchrus ciliaris*	70-30%	0.5	Tussock grass (G)	Quadrat
KAR_09	*Grevillea pyramidalis* subsp. *pyramidalis*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_09	*Hakea lorea* subsp. *lorea*	<2% Few than 10	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_09	*Eragrostis desertorum*	<10%	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_09	*Ehretia saligna* var. *saligna*	<10%	0.5	Forb (G)	Quadrat
KAR_09	*Triodia epactia*	<2% Few than 10	0.5	Hummock grass (G)	Quadrat
KAR_09	*Indigofera monophylla*	<2% Few than 10	0.5	Vine (G)	Quadrat
KAR_09	*Cassytha capillaris*	<2% Numerous	0.25	Vine (G)	Quadrat
KAR_09	*Streptoglossa decurrens*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_09	*Solanum lasiophyllum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_09	*Diplopeltis eriocarpa*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_09	*Senna artemisioides* subsp. *oligophylla*	<2% Few than 10	0.1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_09	*Trianthema pilosum*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_09	*Acacia inaequilatera*	<2% Few than 10	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_10	*Cenchrus ciliaris*	70-30%	0.5	Tussock grass (G)	Quadrat
KAR_10	*Grevillea pyramidalis* subsp. *pyramidalis*	<2% Few than 10	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_10	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_10	*Eucalyptus camaldulensis*	<10%	9	Tree, palm (U)	Quadrat
KAR_10	*Solanum lasiophyllum*	<2% Few than 10	0.1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_10	*Cyperus vaginatus*	<2% Few than 10	0.75	Sedge (G)	Quadrat
KAR_10	*Triumfetta propinqua*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_10	*Cleome viscosa*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_10	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_10	*Trianthema pilosum*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_10	*Swainsona formosa*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_10	**Vachellia farnesiana*	<2% Few than 10	0.1	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_10	*Acacia sclerosperma* subsp. *sclerosperma*	<2% Few than 10	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_10	*Triodia wiseana*	30-10%	0.5	Hummock grass (G)	Quadrat
KAR_10	*Ptilotus nobilis*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_11	*Acacia tumida* var. *pilbarensis*	<2% Few than 10	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Terminalia circumalata*	<2% Numerous	9	Tree, palm (U)	Quadrat
KAR_11	**Vachellia farnesiana*	<2% Numerous	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Cymbopogon obtectus*	<2% Numerous	0.75	Tussock grass (G)	Quadrat
KAR_11	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_11	*Acacia ?sericophylla*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Acacia inaequilatera*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Cenchrus ciliaris*	<2% Numerous	0.5	Tussock grass (G)	Quadrat
KAR_11	*Flueggea virosa* subsp. *melanthesoides*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Grevillea pyramidalis* subsp. *pyramidalis*	<2% Few than 10	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Senna artemisioides*	<2% Few than 10	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Indigofera monophylla*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_11	*Portulaca oleracea*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_11	*Solanum diversiflorum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Corchorus parviflorus*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Triumfetta propinqua*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Evolvulus alsinoides*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_11	*Cucumis variabilis*	<2% Few than 10	0.25	Vine (G)	Quadrat
KAR_11	*Acacia orthocarpa*	<2% Few than 10	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_11	*Triumfetta clementii*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_11	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_11	*Tinospora smilacina*	<2% Few than 10	0.75	Vine (G)	Quadrat
KAR_11	*Trachymene oleracea* subsp. *oleracea*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_12	*Grevillea pyramidalis* subsp. *pyramidalis*	<10%	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_12	**Vachellia farnesiana*	<2% Numerous	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_12	*Triumfetta propinqua*	<2% Numerous	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_12	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_12	*Trachymene oleracea* subsp. *oleracea*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_12	*Indigofera monophylla*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_12	*Boerhavia coccinea*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_12	*Cajanus cinereus*	<2% Few than 10	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_12	*Gomphrena cunninghamii*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_12	*Portulaca oleracea*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_12	*Cucumis variabilis*	<2% Few than 10	0.1	Vine (G)	Quadrat
KAR_12	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_12	*Swainsona formosa*		0.1	Forb (G)	Quadrat
KAR_12	*Abutilon lepidum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_12	*Themeda* sp. Mt Barricade (M.E. Trudgen 2471)	<2% Few than 10	0.5	Tussock grass (G)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_13	*Triumfetta propinqua*	<2% Numerous	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_13	*Gomphrena cunninghamii*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_13	*Abutilon lepidum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Brachychiton acuminatus*	<2% Few than 10	4	Tree, palm (U)	Quadrat
KAR_13	*Ipomoea costata*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Cenchrus ciliaris*	<10%	0.5	Tussock grass (G)	Quadrat
KAR_13	*Solanum diversiflorum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Abutilon lepidum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Aerva javanica*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_13	*Rhynchosia bungarensis* (P4)	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_13	*Cymbopogon ambiguus*	<2% Few than 10	1	Tussock grass (G)	Quadrat
KAR_13	*Flueggea virosa* subsp. *melanthesoides*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Triumfetta clementii*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	**Vachellia farnesiana*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Jasminum didymum* subsp. *lineare*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Cleome viscosa*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_13	*Clerodendrum tomentosum* var. *lanceolata*	<2% Few than 10	2.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_13	*Indigofera monophylla*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_14	*Grevillea pyramidalis* subsp. *pyramidalis*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_14	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Releve
KAR_14	*Indigofera monophylla*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_14	*Terminalia circumalata*	<2% Numerous	2.75	Tree, palm (U)	Releve
KAR_14	*Acacia inaequilatera*	<2% Numerous	2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_14	*Triafetta propinqua*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_14	*Acacia orthocarpa*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_14	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.1	Forb (G)	Releve

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_14	*Swainsona formosa*		0.1	Forb (G)	Releve
KAR_14	*Acacia ampliceps*	<2% Few than 10	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_15	*Triumfetta propinqua*	<2% Numerous	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_15	*Gomphrena cunninghamii*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_15	*Brachychiton acuminatus*	<2% Few than 10	4	Tree, palm (U)	Quadrat
KAR_15	*Ipomoea costata*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Cenchrus ciliaris*	<2% Numerous	0.5	Tussock grass (G)	Quadrat
KAR_15	*Solanum diversiflorum*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Rhynchosia bungarensis*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_15	*Cymbopogon ambiguus*	<2% Few than 10	1	Tussock grass (G)	Quadrat
KAR_15	*Flueggea virosa* subsp. *melanthesoides*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Triumfetta clementii*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Jasminum didymum* subsp. *lineare*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Clerodendrum tomentosum* var. *lanceolata*	<2% Few than 10	2.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Indigofera monophylla*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Acacia ampliceps*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_15	*Ficus aculeata* var. *indecora*	<2% Few than 10	1.75	Tree, palm (U)	Quadrat
KAR_15	*Cassytha capillaris*	<2% Few than 10	0.5	Vine (G)	Quadrat
KAR_15	*Acacia orthocarpa*	<2% Few than 10	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_16	*Triumfetta propinqua*	<2% Numerous	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_16	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_16	*Gomphrena cunninghamii*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_16	*Brachychiton acuminatus*	<2% Few than 10	4	Tree, palm (U)	Quadrat
KAR_16	*Ipomoea costata*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_16	*Cenchrus ciliaris*	70-30%	0.5	Tussock grass (G)	Quadrat
KAR_16	*Rhynchosia bungarensis*	<2% Few than 10	0.25	Forb (G)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_16	*Flueggea virosa* subsp. *melanthesoides*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_16	*Indigofera monophylla*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Cenchrus ciliaris*	30-10%	0.5	Tussock grass (G)	Quadrat
KAR_17	*Grevillea pyramidalis* subsp. *pyramidalis*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Hakea lorea subsp. lorea*	<2% Few than 10	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Ehretia saligna var. saligna*	<2% Numerous	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Triodia epactia*	30-10%	0.5	Hummock grass (G)	Quadrat
KAR_17	*Solanum lasiophyllum*	<2% Numerous	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Portulaca oleracea*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_17	*Diplopeltis eriocarpa*	<10%	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Trianthema pilosum*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_17	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_17	*Acacia pyrifolia* var. *pyrifolia*	30-10%	0.75	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Trigastrotheca molluginea*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_17	*Corchorus incanus subsp. incanus*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Aristida contorta*	<2% Few than 10	0.25	Tussock grass (G)	Quadrat
KAR_17	*Goodenia microptera*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_17	*Euphorbia tannensis subsp. eremophila*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_17	*Ptilotus nobilis*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_17	*Ptilotus aervoides*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_17	*Acacia stellaticeps*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Acacia bivenosa*	<10%	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_17	*Triodia wiseana*	70-30%	0.5	Hummock grass (G)	Quadrat
KAR_18	*Acacia bivenosa*	30-10%	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_18	*Acacia synchronicia*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_18	*Aristida contorta*	<10%	0.1	Tussock grass (G)	Releve
KAR_18	*Acacia ancistrocarpa*	<2% Numerous	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Releve

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_18	*Cenchrus ciliaris*	<2% Numerous	0.25	Tussock grass (G)	Releve
KAR_18	*Solanum lasiophyllum*	<2% Few than 10	0.25	Forb (G)	Releve
KAR_18	*Ptilotus helipteroides*	<2% Few than 10	0.1	Forb (G)	Releve
KAR_19	*Acacia bivenosa*	30-10%	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_19	*Acacia synchronicia*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_19	*Aristida contorta*	<10%	0.1	Tussock grass (G)	Releve
KAR_19	*Acacia ancistrocarpa*	<2% Numerous	1.75	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_19	*Cenchrus ciliaris*	<2% Numerous	0.25	Tussock grass (G)	Releve
KAR_19	*Solanum lasiophyllum*	<2% Few than 10	0.25	Forb (G)	Releve
KAR_19	*Ptilotus helipteroides*	<2% Few than 10	0.1	Forb (G)	Releve
KAR_19	*Triodia wiseana*	30-10%	0.5	Hummock grass (G)	Releve
KAR_19	*Indigofera monophylla*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_19	*Trichodesma zeylanicum* var. *zeylanicum*	<2% Few than 10	0.1	Forb (G)	Releve
KAR_19	*Triodia epactia*	70-30%	0.5	Hummock grass (G)	Releve
KAR_19	*Scaevola spinescens*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_19	*Acacia pyrifolia* var. *pyrifolia*	<10%	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_19	*Eremophila longifolia*	<2% Numerous	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_20	*Dactyloctenium radulans*	<2% Numerous	0.1	Tussock grass (G)	Quadrat
KAR_20	*Salsola australis*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_20	*Cenchrus setiger*	<2% Numerous	0.5	Tussock grass (G)	Quadrat
KAR_20	*Eragrostis xerophila*	70-30%	0.25	Tussock grass (G)	Quadrat
KAR_20	*Corchorus incanus* subsp. *incanus*	<2% Few than 10	0.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_20	*Chrysopogon fallax*	<2% Numerous	1.25	Tussock grass (G)	Quadrat
KAR_20	*Evolvulus alsinoides*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_20	*Acacia pyrifolia* var. *pyrifolia*	<2% Numerous	1.25	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
KAR_20	*Triodia epactia*	<2% Numerous	0.25	Hummock grass (G)	Quadrat
KAR_20	*Eriachne benthamii (*	<10%	0.25	Tussock grass (G)	Quadrat

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_20	*Cucumis variabilis*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_20	*Portulaca oleracea*	<2% Few than 10	0.1	Forb (G)	Quadrat
KAR_20	*Rhynchosia minima*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_20	*Phyllanthus maderaspatensis*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_20	*Enchylaena tomentosa* var. *tomentosa*	<2% Few than 10	0.5	Chenopod shrub (M)	Quadrat
KAR_20	*Chrysocephalum gilesii*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_20	*Operculina aequisepala*	<2% Few than 10	0.25	Forb (G)	Quadrat
KAR_21	*Acacia stellaticeps*	30-10%	1.3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Senna glutinosa* subsp. *pruinosa*	<2% Few than 10	0.9	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Acacia pyrifolia* var. *pyrifolia*	<2% Few than 10	1.6	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Cymbopogon ambiguus*	<2% Few than 10	1	Tussock grass (G)	Releve
KAR_21	*Bonamia erecta*	<10%	0.2	Forb (G)	Releve
KAR_21	*Ptilotus exaltatus*	<2% Few than 10	0.1	Forb (G)	Releve
KAR_21	*Diplopeltis eriocarpa*	<10%	0.2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Corchorus incanus* subsp. *incanus*	<2% Few than 10	0.2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Triodia wiseana*	>70%	0.8	Hummock grass (G)	Releve
KAR_21	*Indigofera monophylla*	<2% Few than 10	0.3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Scaevola spinescens*	<2% Few than 10	0.4	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Cassytha capillaris*	<2% Few than 10	climber	Forb (G)	Releve
KAR_21	*Acacia inaequilatera*	<2% Few than 10	1.7	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Acacia sclerosperma* subsp. *sclerosperma*	<2% Few than 10	1.7	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Acacia arida*	<10%	1	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Triodia epactia*	<10%	0.5	Hummock grass (G)	Releve
KAR_21	*Grevillea pyramidalis* subsp. *pyramidalis*	<2% Few than 10	1.8	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Acacia bivenosa*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_21	*Trigastrotheca molluginea*	<2% Few than 10	0.2	Forb (G)	Releve
KAR_22	*Triodia angusta*	70-30%	0.5	Hummock grass (G)	Releve

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_22	*Tecticornia ?indica* subsp. *leiostachya*	<2% Few than 10	0.3	Chenopod shrub (M)	Releve
KAR_22	*Tecticornia ?pterygosperma*	<2% Few than 10	0.3	Chenopod shrub (M)	Releve
KAR_22	*Chrysocephalum gilesii*	<2% Few than 10	0.4		Releve
KAR_22	*Salsola australis*	<2% Few than 10	0.2	Chenopod shrub (M)	Releve
KAR_22	*Aerva javanica*	<2% Few than 10	0.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_22	*Euphorbia trigonosperma*	<2% Few than 10	0.2	Forb (G)	Releve
KAR_22	*Solanum sp.*	<2% Few than 10	0.1	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_22	*Trianthema turgidifolia*	<2% Few than 10	0.2	Forb (G)	Releve
KAR_22	*Corchorus sp.*	<2% Few than 10	0.2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_22	*Diplopeltis eriocarpa*	<2% Few than 10	0.2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_22	*Lawrencia viridigrisea*	<2% Few than 10	0.4		Releve
KAR_22	*Diplopeltis eriocarpa*	<2% Few than 10	0.3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_22	*Sclerolaena diacantha*	<2% Few than 10	0.2	Chenopod shrub (M)	Releve
KAR_22	*Euphorbia tannensis subsp. eremophila*	<2% Few than 10	0.2	Forb (G)	Releve
KAR_22	*Streptoglossa tenuiflora*	<2% Few than 10	0.2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_22	*Cenchrus ciliaris*	30-10%	0.5	Tussock grass (G)	Releve
KAR_23	*Acacia bivenosa*	<10%	2.1	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_23	*Grevillea pyramidalis subsp. pyramidalis*	<10%	2.7	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_23	*Acacia sclerosperma subsp. sclerosperma*	<10%	2.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_23	*Triodia epactia*	70-30%	0.8	Hummock grass (G)	Releve
KAR_23	*Triodia wiseana*	70-30%	0.9	Hummock grass (G)	Releve
KAR_23	*Cenchrus ciliaris*	30-10%	0.4	Tussock grass (G)	Releve
KAR_23	*Brachychiton acuminatus*	<2% Few than 10	2	Tree, palm (U)	Releve
KAR_23	*Swainsona formosa*	<2% Few than 10	0.3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_23	*Euphorbia australis*	<2% Few than 10	0.1	Forb (G)	Releve
KAR_23	*Ipomoea costata*	<2% Few than 10	climber	Vine (G)	Releve
KAR_23	*Indigofera monophylla*	<2% Few than 10	0.4	Shrub, cycad, grass-tree, tree-fern (M)	Releve

Site name	Taxa	Cover	Height	Form/stratum	Site type
KAR_23	*Acacia pyrifolia var. pyrifolia*	<2% Few than 10	2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_23	*Acacia tumida var. pilbarensis*	<2% Few than 10	1.9	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_23	*Goodenia microptera*	<2% Few than 10	0.3	Forb (G)	Releve
KAR_23	*Corymbia hamersleyana*	<10%	3	Tree, palm (U)	Releve
KAR_24	*Corymbia hamersleyana*	<10%	4	Tree, palm (U)	Releve
KAR_24	*Acacia sericophylla*	70-30%	3.5	Tree, palm (U)	Releve
KAR_24	*Ehretia saligna var. saligna*	<2% Few than 10	3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_24	*Triodia epactia*	70-30%	0.8	Hummock grass (G)	Releve
KAR_24	*Cenchrus ciliaris*	30-10%	0.4	Tussock grass (G)	Releve
KAR_24	*Acacia arida*	<2% Few than 10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_24	*Evolvulus alsinoides (*	<2% Few than 10	0.1	Forb (G)	Releve
KAR_24	*Solanum lasiophyllum*	<2% Few than 10	0.2	Shrub, cycad, grass-tree, tree-fern (M)	Releve
KAR_24	*Goodenia microptera*	<2% Few than 10	0.3	Forb (G)	Releve

Conservation significant flora recorded within the survey area

Genus	Species	Population count	Easting	Northing
Fabaceae	*Rhynchosia bungarensis*	1	471511.3	7713375
Fabaceae	*Rhynchosia bungarensis*	3	471501.9	7713362
Fabaceae	*Rhynchosia bungarensis*	3	471506.9	7713357
Fabaceae	*Rhynchosia bungarensis*	4	471491.9	7713355
Fabaceae	*Rhynchosia bungarensis*	3	471572.5	7713451
Fabaceae	*Rhynchosia bungarensis*	3	471584.2	7713486
Fabaceae	*Rhynchosia bungarensis*	5	471592.6	7713500
Fabaceae	*Rhynchosia bungarensis*	5	471641.6	7713575
Fabaceae	*Rhynchosia bungarensis*	1	471651.8	7713598
Fabaceae	*Rhynchosia bungarensis*	6	471686.1	7713633
Fabaceae	*Rhynchosia bungarensis*	1	471694.5	7713645
Fabaceae	*Rhynchosia bungarensis*	6	471774.3	7713733
Fabaceae	*Rhynchosia bungarensis*	2	471811.1	7713782
Fabaceae	*Rhynchosia bungarensis*	5	471819.6	7713793

Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within survey area from field survey results.
Likely	Species previously recorded within 20 km and large areas of suitable habitat occur in the project area.
Possible	Species previously recorded within 20 km and areas of suitable habitat occur/may occur in the project area.
Unlikely	Species previously recorded within 20 km, but suitable habitat does not occur in the project area.
Highly unlikely	Species not previously recorded within 20 km, suitable habitat does not occur in the project area and/or the project area is outside the natural distribution of the species.
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Flora likelihood of occurrence assessment

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Aizoaceae	*Trianthema* sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)		P2	Prostrate to near prostrate annual herb. Flowers pink. Clayey-sand, clayey-loam. Plains, low undulating hills.	**Unlikely –** the closest known record is located more than 20 km south of the survey area. Was not recorded during the survey.	WAHerb
Apocynaceae	*Gymnanthera cunninghamii*		P3	Erect shrub, 1-2 m high. Flowers cream-yellow-green, January to December. Sandy soils.	**Unlikely** – no suitable habitat is present within the survey area.	NatureMap
Celastraceae	*Stackhousia clementii*		P3	Dense broom-like perennial, herb, to 0.45 m high. Flowers green/yellow/brown. Skeletal soils. Sandstone hills.	**Unlikely –** the species has been recorded within 500 m of the survey area. Suitable habitat is present however given survey effort this species is considered unlikely to occur within the survey area.	NatureMap, TPFL, WAHerb

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Combretaceae	*Terminalia supranitifolia*		P3	Spreading, tangled shrub or tree, 1.5-3 m high. Flowers green-yellow, May or July or December. Sand. Among basalt rocks.	**Unlikely** – the species has been recorded within 1.1 km of the survey area. Suitable habitat is present however given the survey effort this species is considered unlikely to occur within the survey area.	NatureMap, TPFL, WAHerb
Cyperaceae	*Schoenus punctatus*		P3	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), ca 0.6 m high. Flowers brown, August. Watercourses.	**Unlikely** – there are no records of the species in close proximity to the survey area. Limited suitable habitat is present however given the survey effort this species is considered unlikely to occur within the survey area.	NatureMap
Fabaceae	*Acacia glaucocaesia*		P3	Dense, glabrous shrub or tree, 1.8-6 m high. Fl. yellow, Jul to Sep. Red loam, sandy loam, clay. Floodplains.	**Unlikely** – the species has been recorded within 20 km of the project area. Limited suitable habitat present. Given the survey effort this species is considered unlikely to occur within the survey area.	WAHerb
Fabaceae	*Rhynchosia bungarensis*		P4	Compact, prostrate shrub, to 0.5 m high. Flowers yellow. Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	**Present** – the species was recorded in the northern section of the survey area on the Burrup Peninsula.	NatureMap, WAHerb

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Fabaceae	*Vigna triodiophila*		P3	Fine-stemmed prostrate or scrambling vine, small, ovate to elliptic leaves. Known to flower and fruit between May and September. Endemic to basalt rockpile habitats in shallow, red-brown or brown, clayey sand or loam.	**Unlikely** – the species has been recorded within 3.2 km of the project area. Suitable habitat is present however given the survey effort this species is considered unlikely to occur within the survey area.	NatureMap, WAHerb
Malvaceae	*Corchorus congener*		P3	Spreading shrub, to 0.6 m high. Flowers yellow, April to June or August to November. Sand, red sandy loam with limestone. Sand dunes, plains	**Unlikely –** limited suitable habitat present. Given survey effort this species is unlikely to occur within the survey area.	NatureMap
Poaceae	*Eragrostis surreyana*		P3	-	**Unlikely** – the species has not been recorded within 10 km of the survey area. Given survey effort this species is unlikely to occur within the survey area.	NatureMap
Poaceae	*Themeda* sp. *Hamersley Station* (M.E. Trudgen 11431)		P3	Tussocky perennial, grass-like or herb, 0.9-1.8 m high. Flowers August. Red clay. Clay pan, grass plain.	**Unlikely** – there is one record immediately adjacent to the survey area (1992). This area was thoroughly searched and no specimens were identified during the survey. Additionally the area had been disturbed. Given survey effort this species is unlikely to occur within the survey area.	NatureMap, WAHerb

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Rubiaceae	*Oldenlandia* sp. *Hamersley Station* (A.A. Mitchell PRP 1479)		P3	Spreading annual, herb, 0.05-0.1 m high. Flowers blue, March. Cracking clay, basalt. Gently undulating plain with large surface rocks, flat crabholed plain.	**Unlikely** – the species has been recorded within 5 km of the survey area. Limited suitable habitat is present.	NatureMap

Appendix E – Fauna data

Fauna species

Fauna likelihood of occurrence assessment

Fauna species recorded from the survey area

Family	Genus	Species	Common Name	Status	Notes
Birds					
Acanthizidae	*Smicrornis*	*brevirostris*	Weebill		
Acanthizidae	*Gerygone*	*tenebrosa*	Dusky Gerygone		
Accipitridae	*Aquila*	*audax*	Wedge-tailed Eagle		
Accipitridae	*Circus*	*assimilis*	Spotted Harrier		
Accipitridae	*Elanus*	*axilaris*	Black-shouldered Kite		
Accipitridae	*Haliaeetus*	*leucogaster*	White-bellied Sea Eagle		
Accipitridae	*Haliastur*	*indus*	Brahminy Kite		
Accipitridae	*Haliastur*	*sphenurus*	Whistling Kite		
Accipitridae	*Milvus*	*migrans*	Black Kite		
Aegothelidae	*Aegotheles*	*cristatus*	Australian Owlet-nightjar		
Artamidae	*Artamus*	*cinereus*	Black-faced Woodswallow		
Artamidae	*Artamus*	*leucorynchus*	White-breasted Woodswallow		
Artamidae	*Artamus*	*minor*	Little Woodswallow		
Artamidae	*Cracticus*	*nigrogularis*	Pied Butcherbird		
Burhinidae	*Burhinus*	*grallarius*	Bush Stone-curlew		
Cacatuidae	*Cacatua*	*sanguinea westralensis*	Little Corella		
Cacatuidae	*Eolophus*	*roseicapilla*	Galah		
Cacatuidae	*Nymphicus*	*hollandicus*	Cockatiel		
Campephagidae	*Coracina*	*novaehollandiae*	Black-faced Cuckoo-Shrike		
Campephagidae	*Lalage*	*sueurii*	White-winged Triller		
Columbidae	*Geophaps*	*plumifera*	Spinifex Pigeon		
Columbidae	*Geopelia*	*cuneata*	Diamond Dove		
Columbidae	*Geopelia*	*striata*	Peaceful Dove		
Columbidae	*Ocyphaps*	*lophotes*	Crested Pigeon		
Corvidae	*Corvus*	*orru*	Torresian Crow		
Cuculidae	*Cacomantis*	*pallidus*	Pallid Cuckoo		
Estrildidae	*Emblema*	*pictum*	Painted Finch		
Estrildidae	*Taeniopygia*	*guttata*	Zebra Finch		
Falconidae	*Falco*	*cenchroides*	Nankeen Kestrel		
Falconidae	*Falco*	*berigora*	Brown Falcon		
Falconidae	*Falco*	*longipennis*	Hobby Falcon		
Halcyonidae	*Todiramphus*	*pyrrhopygius*	Red-backed Kingfisher		
Hirundinidae	*Hirundo*	*neoxena*	Welcome Swallow		
Hirundinidae	*Petrochelidon*	*nigricans*	Tree Martin		
Megaluridae	*Cincloramphus*	*cruralis*	Brown Songlark		
Megaluridae	*Cincloramphus*	*mathewsi*	Rufous Songlark		

Family	Genus	Species	Common Name	Status	Notes
Meliphagidae	*Epthianura*	*tricolor*	Crimson Chat		
Meliphagidae	*Lichenostomus*	*penicillatus*	White-plumed Honeyeater		
Meliphagidae	*Lichenostomus*	*virescens*	Singing Honeyeater		
Meliphagidae	*Lichmera*	*indistincta*	Brown Honeyeater		
Meliphagidae	*Manorina*	*flavigula*	Yellow-throated Miner		
Meropidae	*Merops*	*ornatus*	Rainbow Bee-eater		
Monarchidae	*Grallina*	*cyanoleuca*	Magpie-lark		
Motacillidae	*Anthus*	*novaeseelandiae*	Australasian Pipit		
Pachycephalidae	*Colluricincla*	*harmonica*	Grey Shrike-thrush		
Psittacidae	*Barnardius*	*zonarius zonarius*	Port Lincoln Parrot		
Psittacidae	*Melopsittacus*	*undulatus*	Budgerigar		
Ptilonorhynchidae	*Ptilonorhynchus*	*guttatus*	Western Bowerbird		
Rhipiduridae	*Rhipidura*	*leucophrys*	Willie Wagtail		
Tunicidae	*Turnix*	*velox*	Little Button-quail		
Reptiles					
Agamidae	*Ctenophorus*	*caudocinctus caudocinctus*	Ringtail Dragon		
Gekkonidae	*Gehyra*	*peninsularis*	Burrup Peninsular Dtella		
Gekkonidae	*Gehyra*	*punctata*	Spotted Dtella		
Gekkonidae	*Gehyra*	*vaiegata or crypta*	Dtella		
Gekkonidae	*Heteronotia*	*binoei*	Bynoe's Gecko		
Scincidae	*Cryptoblephurus*	*ustulatus*	Russet Snake-eyed Skink		
Scincidae	*Ctenotus*	*pantherinus ocellifer*	Panther's Skink		
Scincidae	*Ctenotus*	*saxatalis*	Rock Ctenotus		
Scincidae	*Lerista*	*clara*	Sharp-blazed Three-toed Skink		
Scincidae	*Lerista*	*onsloviana*	Onslow Broad-striped Slider		
Scincidae	*Menetia*	*surda surda*	Surd's Dwarf Skink		
Scincidae	*Morethia*	*ruficauda exquisita*	Fire-tailed Skink		
Varanidae	*Vananus*	*accanthurus*	Ridge-tailed Monitor		
Varanidae	*Vananus*	*panopties rubidus*	Yellow spotted Monitor		
Mammals					
Canidae	*Canus*	*lupis domesticus*	Dog	intro	
Dasyuridae	*Pseudantechinus*	*woolleyae*	Woolley's Pseudantechinus		Camera
Emballonuridae	*Taphozous*	*georgianus*	Common Sheathtail-bat		Present
Felidae	*Felis*	*catus*	Cat	intro	Camera
Macropodidae	*Macropus*	*robustus*	Euro		

Family	Genus	Species	Common Name	Status	Notes
Macropodidae	*Petrogale*	*rothchildi*	Rothchilds Rock Wallaby		Camera
Molossidae	*Austronomus*	*australis*	White-striped freetail Bat		Present
Molossidae	*Chaerephon*	*jobensis*	Northern Freetail Bat		Probable
Molossidae	*Mormopetrus*	*ozimops cobourgianus*	North-western Free-tail Bat		Probable
Molossidae	*Mormopetrus*	*ozimops lumsdenae*	Northern Free-tailed Bat		Probable
Muridae	*Rattus*	*rattus*	Black Rat	intro	Camera
Tachyglossidae	*Tachyglossus*	*aculeatus*	Echidna		
Vespertilionidae	*Vespadelus*	*finlaysoni*	Inland Cave Bat		Present

Parameters of fauna likelihood of occurrence assessment

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

Definitions

Term	Description
Study area	A 20 km buffer around the survey area
Survey area	The potential project footprint
Cr	Critically endangered
En	Endangered
Vu	Vulnerable
IA	International agreement
Mi, Ma	Migratory, Marine
CD	Conservation dependent
OS	Other specially protected fauna
P1 – P4	Priority 1 – Priority 4
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
DBCA	Department of Biodiversity and Conservation Attractions 2019 WA Government, Department of Parks and Wildlife Threatened and Priority fauna rankings
BC Act	*Biodiversity Conservation Act 2016*

Fauna likelihood of occurrence assessment

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
Birds							
Actitis hypoleucos	Common Sandpiper	Mi	Mi	X		The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (DEE 2019)	**Unlikely** Species known from the region and may opportunistically occur on minor drainage lines during the wet season however use would be opportunistic and seasonal.
Arenaria interpres	Ruddy Turnstone	Mi	Mi	X		In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In north Australia it is known to occur in a wide variety of habitats, and may prefer wide mudflats. In southern Australia the Ruddy Turnstone prefers rockier coastlines and is less numerous on large embayments with extensive mudflats. On Flinders Island, Tasmania, it has been sighted around rocky reefs during spring and summer, and moves to bays and estuaries for autumn and winter. In south-west Australia, it	**Unlikely** Project area provides a limited amount of seasonally suitable habitat.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						may occur on pebble-strewn shores of salt lakes near the coast. On Rottnest Island, the Ruddy Turnstone prefers shores with scattered fragments of limestone. In New Zealand it has occasionally been recorded in paddocks or grassy areas. Surveys demonstrate that the Ruddy Turnstone can live away from coastal areas in habitats such river beds, and on inland lakes and adjacent farmland (Higgins & Davies 1996).	
Calidris acuminata	Sharp-tailed Sandpiper	Mi	Mi	X		In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry (DEE 2019).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.
Calidris alba	Sanderling	Mi	Mi	X		In Australia, the species is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and amongst rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops. Less often the species occurs on more sheltered sandy shorelines of estuaries, inlets and harbours (DEE 2019)	**Unlikely** No suitable present within the survey area.
Calidris canutus	Red Knot, knot	EN	EN, MI	X	X	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (DEE 2019).	
Calidris ferruginea	Curlew Sandpiper	CR	CR, MI	X	X	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats (DEE 2019).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.
Calidris ruficollis	Red-necked Stint	MI	MI	X		In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation (Higgins & Davies 1996).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
Calidris subminuta	Long-toed Stint	MI	MI	X		In Australia, the Long-toed Stint occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has also been observed at open, less vegetated shores of larger lakes and ponds and is common on muddy fringes of drying ephemeral lakes and swamps. The Long-toed Stint also frequents permanent wetlands such as reservoirs and artificial lakes (DEE 2019).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.
Calidris tenuirostris	Great Knot	CR	CR, MI	X	X	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps (Higgins & Davies 1996). Typically, the Great Knot roosts in large groups in open areas, often at the waters edge or in shallow water close to feeding grounds (Higgins & Davies 1996; Rogers 2001). It is known that in hot conditions, waders prefer to roost where a damp substrate lowers the local temperature (Rogers 1999b). A group of approximately 8610 birds have been recorded roosting at an inland claypan near Roebuck Bay in north-west Western Australia (Collins et al. 2001).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.
Charadrius leschenaultii	Greater Sand Plover	V	V, MI	X	X	In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches	**Unlikely** Species known from the region and may opportunistically occur on

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. They are occasionally recorded on near-coastal saltworks and saltlakes, including marginal saltmarsh, and on brackish swamps (Stewart et al. 2007).	the saltpans however use would be opportunistic and seasonal.
Charadrius mongolus	Lesser Sand Plover	EN	EN, MI	X	X	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. In north-western Australia, the species appears to use the Port Hedland saltworks in preference to nearby beaches. The species is seldom recorded away from the coast, at margins of lakes, soaks and swamps associated with artesian bores (Marchant & Higgins 1993).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.
Charadrius veredus	Oriental Plover	MI	MI	X		Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland. Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps or open areas that have been recently burnt (Storr 1980).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.
Chlidonias leucopterus	White-winged Black Tern, white-winged tern	MI	MI	X		The White-winged Black Tern is a non-breeding migrant to Australia. The species is widespread and common along south-western, northern and central-eastern coasts, with only scattered records of small numbers along the coasts elsewhere in southern Australia (Barrett et al. 2003; Blakers et al. 1984; Chatto 2006; Higgins	**Unlikely** The project area represents marginal habitat at best.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						& Davies 1996; Johnstone & Storr 1998). In Western Australia, the species is widespread on the southern west coast to the coasts of the Pilbara region and Kimberley. Few records are from inland regions, mainly along major river systems, such as the Ord drainage.	
Falco peregrinus	Peregrine Falcon	OS		X		The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, from coastal heath to alpine. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2004).	**Likely** This species is likely to fly over, and opportunistically utilise portions of the habitat.
Gelochelidon nilotica	Gull-billed Tern	MI	MI	X		The Gull-billed Tern is nomadic or migratory species in Australia. Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands, where resources are favourable (Morcombe 2004). They are only rarely found over the ocean. The Gull-billed Tern, although essentially an inland species, outside breeding season it shows a distinct preference for saltmarshes and lagoons near the coast. Movements are not fully understood but it is common and widespread in Australia (Morcombe 2004).	**Unlikely** The Project area represents marginal habitat at best.
Glareola maldivarum	Oriental Pratincole	MI	MI	X		In non-breeding grounds in Australia, the Oriental Pratincole usually inhabits open plains, floodplains or short grassland (including farmland or airstrips), often with extensive bare areas. They often occur near terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins. The species also occurs along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons (Lloyd and Lloyd 1991).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
Hirundo rustica	Barn Swallow	MI	MI	X		In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland (Schodde & Mason 1999).	**Unlikely** The grassland plains provide suitable foraging habitat for this species. However the species is a rare vagrant to Western Australia and is likely to occur on an occasional or seasonal basis
Limicola falcinellus	Broad-billed Sandpiper	MI	MI	X		The Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby. Occasionally they occur on reefs or rocky platforms. They have also been recorded in creeks, swamps and lakes near the coast, particularly those with bare mudflats or sand exposed by receding water. They often favour mud among, or fringed by, mangroves, particularly on the seaward side and sometimes occur in estuaries edged by saltmarsh. They are rarely recorded inland. Foraging occurs on exposed flats of soft mud or wet sand at edges of coastal and near-coastal wetlands, often around channels on mudflats or in accumulated mud in swales between shell banks. In northern Australia, they forage in soft mud near mangroves, but may remain on same muddy section, even though fresher substrate may be exposed by the receding tide. They also forage in shallow water on muddy edges of ponds. They roost on the banks of sheltered sandy, shelly or shingly beaches (Higgins & Davies 1996). They nest on the ground, frequently in the top of a tussock (Cramp 1985).	**Unlikely** Species known from the region and may opportunistically occur on the saltpans however use would be opportunistic and seasonal.
Limosa lapponica baueri	Bar-tailed Godwit (baueri), Western	VU	VU		X	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks,	**Unlikely**

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
	Alaskan Bar-tailed Gotwit					mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas (Marchant & Higgins 1993).	Limited suitable habitat present. Species may opportunistically occur however use would be opportunistic and seasonal.
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit, Gar-tailed Godwit (menzbieri)	CR	CR		X	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh (Morcombe 2004). They usually forage near the edge of water or in shallow water, mainly in tidal estuaries and harbours and roost on sandy beaches, sandbars, spits and also in near-coastal saltmarshs (Marchant & Higgins 1993).	**Unlikely** Limited suitable habitat present. Species may opportunistically occur however use would be opportunistic and seasonal.
Limosa limosa	Black-tailed Godwit	MI	MI	X		In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore overflows. They also use lagoons in sewage farms and saltworks (Higgins & Davies 1996).	**Unlikely** Limited suitable habitat present. Species may opportunistically occur however use would be opportunistic and seasonal.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
Macronectes giganteus	Southern Giant-Petrel	MI	EN, MI		X	The Southern Giant Petrel is a marine bird and occurs over open seas and inshore waters in Antarctic and subtropical waters. In summer it occurs predominantly in sub-Antarctic to Antarctic waters, usually below 60º S in the South Pacific and southeast Indian Oceans. During winter most adults disperse widely and are rare in the southern waters of the Indian Ocean. The Southern Giant Petrel breeds on the Antarctic Continent, Peninsula and islands, and on sub-Antarctic islands and South America (Morcombe 2004).	**Highly unlikely** The habitat is not considered suitable to support this species
Numenius madagascariensis	Eastern Curlew	CR	CR, MI	X		The Eastern Curlew is a large non-breeding migratory shorebird, found commonly along the north coast of Western Australia, but rarely south of Shark Bay. The species is found along the coastline from Barrow Island and Dampier Archipelago, through the Kimberley in WA to the NT. It is found in estuaries, bays, harbours, inlets and coastal lagoons, saltworks and sewerage farms, areas (e.g. intertidal mudflats or sandflats fringed by mangroves) often with beds of seagrass and occasionally on ocean beaches, coral reefs, rock platforms and rocky islets. The Eastern Curlew forages on soft, sheltered, intertidal sand- or mudflats, often near mangroves, on saltflats, saltmarshes, rockpools, coastal reefs and ocean beaches near the tideline. The species roosts in large flocks, separate from other waders on sandy spits and islets, dry beach sand near the high-water mark, among coastal vegetation (including low saltmarsh and mangroves) and occasionally on reef-flats, in the shallow water of lagoons, near-coastal wetlands, in trees and posts (Morcombe 2004).	**Unlikely** Limited suitable habitat present. Species may opportunistically occur however use would be opportunistic and seasonal.
Numenius minutus	Little Curlew, Little Whimbrel	MI	MI	X		When resting during the heat of day, the Little Curlew congregates around pools, river beds and water-filled tidal channels, and shallow	**Unlikely** No suitable habitat present within the survey area.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						water at edges of billabongs. The species prefers pools with bare dry mud (including mudbanks in shallow water) and they do not use pools if they are totally dry, flooded or heavily vegetated (Higgins & Davies 1996). Birds may also rest in grassy, open woodlands and on bare blacksoil plains, or on dry or recently burnt grasslands on floodplains, which may be without vegetation for hundreds of metres, and occasionally on mudflats when nearby grasslands are unburnt, or around swamps. Resting has also been recorded under partly submerged vegetation. After freshwater pools dry up, roosting may occur in the shallows of reservoirs and the sea (Higgins & Davies 1996).	
Numenius phaeopus	Whimbrel	MI	MI	X		The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also used salt flats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and salt fields (Higgins & Davies 1996). There are a small number of inland records from saline lakes and cane grass swamps (Jarman 1978). It has also been recorded in coastal dunes and on a football field (Smith & Chafer 1987).	**Unlikely** Limited suitable habitat present. Species may opportunistically occur however use would be opportunistic and seasonal.
Pandion cristatus	Osprey, Eastern Osprey	MI	MI	X		Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline	**Likely** Suitable habitat is present within the survey area.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						water for foraging (Marchant & Higgins 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays.	
Pezoporus occidentalis	Night Parrot	CR	EN		X	The Night Parrot inhabits arid and semi-arid areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of Triodia grasslands in stony or sandy environments and of samphire and chenopod shrublands, including genera such as Atriplex, Bassia and Maireana, on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (Parker, 1980). It has also been observed to enter dense Muehlenbecki growth when flushed from a more typical habitat (Boles et al. 1994).	**Unlikely** The Dampier region is considered marginal in terms of potential habitat for this species.
Plegadis falcinellus	Glossy Ibis	MI	MI	X		The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat is inland and northern floodplains (Marchant & Higgins 1990).	**Unlikely** The survey area represents marginal wetland habitat at best for the Glossy Ibis
Pluvialis fulva	Pacific Golden Plover	MI	MI	X		In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in	**Unlikely** Limited suitable habitat present. Species may opportunistically occur however use would be opportunistic and seasonal.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks. The species is also sometimes recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, usually wetlands such as fresh, brackish or saline lakes, billabongs, pools, swamps and wet claypans, especially those with muddy margins and often with submerged vegetation or short emergent grass. Other terrestrial habitats inhabited include short (or, occasionally, long) grass in paddocks, crops or airstrips, or ploughed or recently burnt areas, and they are very occasionally recorded well away from water (Marchant & Higgins 1993).	
Pluvialis squatarola	Grey Plover	MI	MI	X		In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or saltlakes. The species is also very occasionally recorded further inland, where they occur around wetlands or saltlakes (Marchant & Higgins 1993).	**Unlikely** Limited suitable habitat present. Species may opportunistically occur however use would be opportunistic and seasonal.
Puffinus pacificus	Wedge-tailed Shearwater	EN		X		The Wedge-tailed Shearwater is a pelagic, marine bird known from tropical and subtropical waters. The species tolerates a range of surface-temperatures and salinities, but is most abundant where temperatures are greater than 21 °C and salinity is greater than 34.6 %. In tropical zones the species may feed over cool nutrient-rich waters.	**Unlikely** The habitat is not considered suitable to support this species
Rostratula australis	Australian painted-snipe	EN	EN		X	The Australian Painted Snipe is rarely seen as it is extremely secretive, keeping to dense vegetation of swamps, emerging only in	**Unlikely**

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						subdued light of dawn and dusk. The preferred habitat of this species includes surrounds and shallows of wetlands that are well vegetated with dense low cover (Morcombe 2004).	No suitable habitat present within the survey area.
Sterna hirundo	Common Tern	MI	MI	X		Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores. Occasionally they are recorded in coastal and near-coastal wetlands, either saline or freshwater, including lagoons, rivers, lakes, swamps and saltworks. Sometimes they occur in mangroves or saltmarsh and, in bad weather, in coastal sand-dunes or coastal embayments (Brandis et al. 1992; Chatto 2006; Higgins & Davies 1996; Hitchcock 1965; Morris 1989; Morris et al. 1981, 1990; Wood 1991). Common Terns forage in marine environments, often close to the shore, including sheltered embayments and in the surf-zone, but also well out to sea. They also forage in near-coastal terrestrial wetlands, including estuaries, rivers and swamps (Cramp 1985; Gochfeld & Burger 1996; Higgins & Davies 1996; Hitchcock 1965; Milledge 1977; Nisbet 2002; Serventy et al. 1971).	**Unlikely** The Project area represents marginal coastal habitat at best for this species.
Sternula albifrons	Little Tern	MI	MI	X		The Little Tern is a small, slender and elegant marine tern. In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches. Little Terns nest on sand-spits, banks, ridges or islets in sheltered coastal environments, such as coastal lakes, estuaries and inlets, and also on	**Unlikely** The Project area represents marginal coastal habitat at best for this species.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						wide and flat or gently sloping sandy ocean beaches, and also, occasionally, in sand-dunes.	
Sternula nereis neries	Australian Fairy Tern	VU	VU		X	The habitat of the fairy tern is essentially marine, including sheltered coasts, bays, inlets, estuaries, coastal lagoons, ocean beaches but rarely out to sea or out of sight of land. They also inhabit wetlands near the coast including salt ponds and lakes. This species favours sites with sand spits and small sand islets in river mouth channels (Morcombe 2004).	**Unlikely** The Project area represents marginal coastal habitat at best for this species.
Sula leucogaster	Brown Booby	MI	MI	X		The Brown Booby is common in the north west of WA and offshore of the Dampier Archipelago. Nests are scrapes in sand, or low collection of sponges, seaweeds; on edges of and in small clearings on islands in groups.	**Unlikely** The Project area represents marginal coastal habitat at best for this species.
Thalasseus bergii	Crested Tern	MI	MI	X		The habitat of the Crested Tern comprises coastal, offshore waters; beaches, bays, inlets, tidal rivers, salt swamps, lakes and larger rivers.	**Unlikely** The Project area represents marginal coastal habitat at best for this species.
Tringa brevipes	Grey-tailed Tattler	P4, MI	MI	X		The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. In Moreton Bay, Queensland, it is most abundant in areas with dense beds of seagrass. In Tasmania it is also abundant in areas with seagrass beds. It is less often on open flat sandy beaches or sandbanks, especially around accumulated seaweed or isolated clumps of dead coral. It is occasionally found around	**Unlikely** No suitable habitat present within the survey area.
Tringa glareola	Wood Sandpiper	MI	MI	X		The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps,	**Unlikely**

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums (Eucalyptus camaldulensis) and often with fallen timber. They also frequent inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. They are also found at some small wetlands only when they are drying. They are rarely found using brackish wetlands, or dry stunted saltmarsh. Typically they do not use coastal flats, but are occasionally recorded in stony wetlands. This species uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains (Higgins & Davies 1996). In Western Australia, within wetlands, birds often occur within a few metres of one another and are concentrated at a few sites in a wetland (Higgins & Davies 1996).	No suitable habitat present within the survey area.
Tringa nebularia	Common Greenshank, greenshank	MI	MI	X		The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with	**Unlikely** Species known from the region and may opportunistically occur on claypans and minor drainage lines during the wet season however use would be opportunistic and seasonal.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees. It was once recorded with Black-winged Stilts (Himantopus himantopus) in pasture, but are generally not found in dry grassland (Higgins & Davies 1996).	
Tringa stagnatilis	Marsh Sandpiper, little greenshank	MI	MI	X		The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats (Higgins & Davies 1996), although surveys in Kakadu National Park recorded more birds around shallow freshwater lakes than in areas influenced by tide (Bamford 1988). At the Top End they often use ephemeral pools on inundated freshwater and tidal floodplains (Higgins & Davies 1996). Three of the five sites with highest recorded numbers are saltwater habitats (Hunter Estuary, NSW; Port Hedland Saltworks, Western Australia; Tullakool Evaporation Ponds, NSW) (Watkins 1993). In the south-east Gulf of Carpentaria they have been recorded round both saline and fresh waters (Garnett 1989). Elsewhere they said to avoid, or rarely occur in, tidal habitats, and rarely occur on beaches. In Western Australia they prefer freshwater to marine environments. In south-east Australia they prefer inland saline lakes and coastal saltworks. They are found infrequently around mangroves (Higgins & Davies 1996).	**Unlikely** Species may opportunistically occur on claypans however use would be opportunistic and seasonal.
Xenus cinereus	Terek Sandpiper	MI	MI	X		The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or	**Unlikely**

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (Halosarcia spp.). Birds are seldom near the edge of water, however, birds may wade into the water (Marchant & Higgins 1993). Occasionally, on sandy beaches, among seaweed and other debris and in rocky areas, Terek Sandpipers will use the supralittoral or upper littoral zone, where a film of water covers the sand. However, on exposed rock platforms, the species forages in the lower littoral zone and not the supralittoral or upper littoral zones (Marchant & Higgins 1993). Less often seen on sandy or shingle beaches, or on rock or coral reefs or platforms, Terek Sandpipers are occasionally sighted around drying sewage ponds and saltpans if surrounded by mudflats. The species is also found around brackish coastal swamps, lagoons and dune-lakes; and also on gravel or rocky edges of estuarine pools and freshwater river-pools (Marchant & Higgins 1993). Very occasionally, birds use swampy, grassy or cultivated paddocks near the coast (Marchant & Higgins 1993). Preferring to roost in or among mangroves, birds may perch in branches or roots up to 2 m from the ground, or beneath them in the shade on hot days. Occasionally, they roost in dead trees or among tangled driftwood. In Westernport Bay, Victoria, the Terek Sandpiper prefers to roost on isolated banks of mangroves, surrounded by water. Elsewhere, they may roost with other waders on flat shores, on muddy spits, islets or banks, and sometimes on sandy and pebbly beaches (Marchant & Higgins 1993).	The survey area does not provide significant habitat for this species.
Mammals							

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
Dasyurus hallucatus	Northern Quoll	EN	EN	X	X	The Northern Quoll once occurred across the majority of northern Australia but its range has significantly contracted. It occurs in the Pilbara region but in disjunct populations. The Northern Quoll inhabits a range of vegetation associations but is especially abundant on dissected rocky escarpment and eucalypt woodland within 200 km of the coast. It is known to den in rock crevices and rock piles and favours rocky areas. They are predominantly nocturnal but are occasionally active during the day, particularly during the mating season and are known to have a large home range (Van Dyck and Strahan 2008).	**Likely** Known to occur locally, and rocky areas within the survey area provide suitable habitat. No evidence of their presence was recorded during the survey.
Hydromys chrysogaster	Water-rat, Rakali	P4		X		The Water Rat lives in the vicinity of permanent bodies of fresh or brackish water, from sub-alpine streams to lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. It can travel considerable distance overland and is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck and Strahan 2008).	**Likely** This species is known to occur on the Burrup Peninsula. The habitat within the survey area is considered marginally suitable.
Leggadina lakedownensis	Northern Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga	P4		X		The Lakeland Downs Mouse occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, tropical Eucalyptus and Melaleuca woodlands and stony ranges. Most habitats, however, are seasonally inundated on red or white sandy-clay soils. They are nocturnal, largely solitary, and individuals spend the day in simple, single-chambered burrows (Van Dyck and Strahan 2008).	**Unlikely** There are no records within 10 km of the survey area. There is very limited suitable habitat within the survey area.
Macroderma gigas	Ghost Bat	Vu	VU	X	X	The Ghost Bat occurs in a wide range of habitats, and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia,	**Unlikely** This species has been previously recorded on the Burrup Peninsula and nearby West Intercourse

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						and is sensitive to disturbance (Van Dyck and Strahan 2008).	Island and is known to occur on the adjacent mainland. The survey area does not provide suitable roosting habitat however the area may be used occasionally for foraging.
Macrotis lagotis	Greater Bilby	VU	VU		X	Bilbies are generalist animals and were once found across 70% of Australia. They now occur in fragmented populations in mulga shrublands and spinifex grasslands in the Tanami Desert of the Northern Territory; in the Gibson and Great Sandy Deserts and the Pilbara and Kimberley regions of Western Australia; and the Mitchell Grasslands of southwest Queensland (DotEE 2019).	**Highly unlikely** The project area lacks suitable habitat and lacks local records of species occurrence.
Pseudomys chapmani	Western Pebble-mound Mouse, Ngadji	P4		X		The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the Western Pebble-mound Mouse can be found on stony hillsides with hummocky grasslands and little or no soil. It constructs large mounds of pebbles on stony slopes which cover an area of 0.5-9.0 square metres. 'Active' mounds are characterized by volcano-like cones capped by 'craters' that mark occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck and Strahan 2008).	**Unlikely** This species is known to have or likely to have become extinct on the Burrup Peninsula and around Karratha town. No potential pebble mounds were observed within the survey area.
Rhinonicteris aurantia	Pilbara Leaf-nosed Bat	VU	VU		X	The Pilbara Leaf-nosed Bat roosts in deep caves or mines in the wet season and forages nearby. This species occurs in the Pilbara region where its populations are scattered and localised. There are a few known populations of this species in the western Pilbara, roosting in caves formed in gorges that dissect massive siliceous sedimentary geology. It is most often observed in flight over waterholes in gorges (Van Dyck and Strahan 2008). Optimal roosts are thought	**Highly unlikely** The project area lacks suitable roosting caves. There are no records of this species within 20 km of the survey area.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						to occur in caves that form between ascending rock layers, where humidity is maintained from seeping groundwater (Van Dyck and Strahan 2008). Roosts are commonly located over pools of water, or areas deep within the mine or cave structure which provides elevated temperature and humidity. Foraging habitat includes: Triodia hummock grasslands covering low rolling hills and shallow gullies, with Eucalyptus camaldulensis along the creeks; over small watercourses throughout granite boulder terrain; over pools and low shrubs in ironstone gorges; and in and around gravelly watercourses with Melaleuca leucadendron.	
Reptiles							
Ctenotus angusticeps	Airlie Island Ctenotus, Northwestern coastal Ctenotus	P3	VU	X	X	This species was formerly known from only two widely separated localities in Western Australia: Airlie Island, off the north-west coast and Roebuck Bay, just south of Broome. On Airlie Island it inhabits Acacia shrublands, coastal spinifex and tussock grasses. On the mainland, the Airlie Island Ctenotus generally inhabits samphire shrubland in the intertidal zone along mangrove (Grey Mangrove (Avicennia marina) with occasional Red Mangrove (Rhizophora stylosa) margins, however, subtle differences in vegetation/topography exist among sites where the species has been recorded. The Roebuck Bay lizards have been observed on coastal mudflats vegetated with samphire (Wilson and Swan 2010). Earlier this year (2012) this species was recorded in Port Hedland in samphire adjacent to mangroves. Recent surveys to determine the extent of this species' distribution outside of Port Hedland recorded species 70 km west and 50 km east of Port Hedland and an additional 10 locations between Karratha and Broome (BHP pers. comm.) therefore showing	**Unlikely** There is no suitable habitat within the survey area.

Species name	Common name	Status		Search		Description and habitat requirements (DEE 2019)	Likelihood of occurrence
		State	Federal	NM	PMST		
						the distribution of this species is more widespread than previously thought.	
Liasis olivaceus subsp. barroni	Pilbara Olive Python	Vu	VU	X	X	The Olive Python (Pilbara subspecies) is a dull olive-brown to pale fawn or rich-brown python with a white underside and pale finely dotted lips. This species reaches an average size of 2.5 m but can grow up to 4 m long. The Olive Python's range is restricted to the Pilbara region, north Western Australia, and the Dampier Archipelago. Habitat consists of rocky escarpments, gorges and waterholes within the Pilbara region. The preferred microhabitats for this species are under rock piles, on top of rocks, and under spinifex as well as in man-made features such as overburden heaps, railway embankments and sewerage treatment ponds. The species' breeding season occurs from June to August, with males moving long distances in search of breeding females (Wilson and Swan 2010).	**Likely** Species known to occur locally and rocky habitat within survey area is considered suitable habitat however there are no permanent pools within the survey area.
Notoscincus butleri	Lined soil-crevice skink (Dampier)	P4		X		*Notoscincus butleri* is a pale coppery-brown skink with bold black vertebral and dorsal stripes, broad black upper lateral stripes, white midlateral stripes and a narrow dark ventrolateral stripe. *Notoscincus butleri* range is restricted to arid, rocky areas of near-coastal Pilbara region. Habitat is found in spinifex dominated areas near creek and river margins (Wilson and Swan 2010).	**Likely** Species known to occur locally (West Intercourse island and less than 2 km south of Karratha). The rocky habitat within the survey area is considered suitable habitat however there are no major creeks or rivers within the survey area.

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GHD, 2020a. Burrup Expansion Project – Flora and Vegetation Survey.

Horizon Power

Burrup Expansion Project

Flora and Vegetation Survey

July 2020

Executive summary

Horizon Power is proposing the development of new transmission lines and a substation to supply electricity from the Maitland Strategic Industrial Area (MSIA) to the Burrup Strategic Industrial Area (BSIA), located in the Pilbara Region of Western Australia.

Horizon Power commissioned GHD Pty Ltd to undertake a vegetation and flora survey of the proposed transmission line (survey area) which will require clearing of native vegetation. The purpose of the assessment is to delineate key flora and vegetation values and potential impact to areas of sensitivity. The outcomes of the assessment will inform the project design and provide information to support a native vegetation clearing permit application under Part V of the *Environmental Protection Act 1986*.

This report is subject to and must be read in conjunction with, the limtations set out in section 1.6 and the assumptions and qualifications contained throughout this report.

Key findings

- Ninteen vegetation types were identified and described for the survey area, as well as cleared and/or highly degraded areas. The survey area is mostly located along the existing power line corridor and some adjacent access tracks. The southernmost portion of the survey area, particularly the east-west stretch of the proposed corridor is less developed. The vegetation condition throughout the survey area varied, but was mostly in Very Good and Good condition.
- No vegetation communities identified within the survey area are representative of a Threatened Ecological Community (TEC). The presence of two Priority Ecological Communities (PECs) were identified within the survey area:
  - Horseflat land system of the Roebourne Plains (Priority 3). Vegetation type 11 (VT11) is representative of this PEC. There is 173.47 ha of this PEC occurring within the survey area and contains areas of Excellent, Very Good, Good and Degraded condition.
  - Burrup Peninsula rock pile communities (Priority 1). Vegetation type 1 (VT01) is representative of this PEC. There is 4.67 ha of this PEC occurring within the survey area and is of Very Good condition.
- The survey recorded a total of 131 flora taxa (including subspecies and varieties) representing 35 families and 86 genera within the survey area.
- No Threatened flora species listed under the EPBC Act and/or BC Act were recorded within the survey area. Four Priority species listed by the DBCA, *Rhynchosia bungarensis* (Priority 4), *Terminalia supranitifolia* (Priority 3), *Vigna triodiophila* (Priority 3) and *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) were recorded in the survey area.

Table of contents

Table index

Appendices

1. Introduction

1.1 Background

Horizon Power is proposing to develop new transmission lines and substation infrastructure to supply electricity from the Maitland Strategic Industrial Area (MSIA) to the Burrup Strategic Industrial Area (BSIA) and Karratha, in the Pilbara region of Western Australia.

The generation of power at the MSIA will require a transmission line to Burrup Peninsula, which is approximately 35 km northeast by road. Currently, Horizon Power has a single 33 kV feeder on the Burrup fed from Dampier substation, which is not suitable for the future BSIA load cases.

A Flora and Vegetation Survey is required to support the environmental approval, anticipated to be a Native Vegetation Clearing Permit under Part V of the *Environmental Protection Act 1986* (EP Act)

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by Horizon Power to complete a detailed vegetation and flora survey of the new proposed transmission line route. The purpose of the assessment is to delineate key flora and vegetation values within the survey area and potential impact to areas of sensitivity. The outcomes of the biological survey will be used to inform the project design and provide information to support a native vegetation clearing permit application under Part V of the EP Act.

1.3 Location

The transmission line route extends from Dampier to Karratha and further south. There is some crossover with an existing transmission line, in the northern and eastern sections. The survey area (Figure 1, Appendix A) is approximately 31 km long (north, south) and covers 805.87 hectares (ha). The clearing footprint will be wholly contained within the survey area.

1.4 Scope of works

GHD completed the following scope of works to achieve the purpose of the commission:

- Undertake a desktop assessment of the survey area to guide survey effort prior to the commencement of the survey
- Undertake a flora and vegetation survey to map vegetation units, condition and identify conservation significant flora and ecological communities within the disturbance footprint
- Prepare a technical report (this report) that documents the methods and results of the desktop assessment and field survey, and includes an assessment of the survey area against the ten clearing principles as a separate memorandum
- Provide spatial data suitable to support the submission of a native vegetation clearing permit application to the Department of Water, Environmental and Regulation (DWER).

1.5 Relevant legislation and background information

Key Commonwealth and WA environmental legislation that may be relevant to the project is outlined in Table 1. An overview of key legislation and guidelines, conservation codes and background information relevant to this project is provided in Appendix B.

Table 1 Key environmental legislation relevant to the project

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

1.6 Limitations and assumptions

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

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

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

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

The opinions, conclusions and any recommendations in this report are based on information obtained from specific sample points. Site conditions at other areas of the site may be different from the site conditions found at the specific sample points. GHD disclaims liability arising from any of the assumptions being incorrect.

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

2. Methodology

2.1 Desktop assessment

The desktop assessment was for the survey area with a 20 km buffer (study area), to identify environmental values and constraints by viewing GIS spatial files largely sourced from Government of Western Australia (GoWA) (2020a) and reviewing publically available, government managed databases. The information sources utilised in this assessment are presented in Table 2.

Table 2 Information sources

Aspect	Information source
Climate	Bureau of Meteorology (BoM) Climate Data Online (2020)
Geology, landforms and soil	1:500 000 State linear structures layer (DMIRS-015) Soil Landscape Mapping – Systems (DPIRD-064)
Acid Sulphate Soils (ASS)	Acid Sulfate Soil Risk Map, Pilbara Coastline (DWER-053)
Environmentally Sensitive Areas (ESAs)	Clearing Regulations – Environmentally Sensitive Areas (DWER-046)
Conservation reserves and areas	DBCA – Legislated Land and Waters (DBCA-011) DBCA – Lands of interest (DBCA-012)
Hydrology	Public Drinking Water Source Areas (DWER-033) RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037) RIWI Act, Groundwater Areas (DWER-034) RIWI Act, Rivers (DWER-036) Waterways Conservation Act Management Areas (DWER-072) Ramsar Sites (DBCA-010) Directory of Important Wetlands in Australia – Western Australia (DBCA-045) Water Information Reporting System (DWER 2019) City of Karratha Water Management Strategy (Essential Environmental 2016)
Vegetation	Pre-European Vegetation (DPIRD-006) Native Vegetation Extent (DPIRD-005) Statewide Vegetation Statistics (DoWA 2019b)
Threatened and Priority Ecological Communities (TECs and PECs)	DBCA Threatened Ecological Community (TEC) and Priority Ecological Community (PEC) spatial dataset Priority Ecological Communities for Western Australia Version 28 (DBCA 2019)
Conservation significant flora and fauna	DBCA NatureMap database (DBCA 2007-) DBCA Threatened and Priority Flora database (TPFL) Western Australian Herbarium database (WAHerb)
Matters of National Environmental Significance	EPBC Act Protected Matters Search Tool (PMST) (DAWE 2020a)

Where spatial data was available from the desktop assessment, this has been presented on Figure 2, Appendix A.

2.2 Field survey

2.2.1 Previous studies

GHD undertook a Level 1 flora and fauna survey for Horizon Power in 2019 for the 132kV Line Upgrade Project (GHD 2019). Part of the survey area scoped for this project (this report) directly aligns with the 2019 project, and some results have been utilised from the previous report to provide consistency. The vegetation types VT08, VT09 and VT16 (refer section 4.1.1) align with sample sites KAR_18, KAR_05, KAR_06, KAR_07, KAR_08 and KAR_21 (GHD 2019).

2.2.2 Flora and vegetation

The detailed flora and vegetation field survey was carried out by GHD botanist Joel Collins (flora license no. FB62000200) and ecologist Sarah Flemington (flora license no. FB62000202) over six days from 23 – 28 April 2020. This is the preferred survey timing from an ecological perspective (EPA 2016).

The flora and vegetation survey methodology and reporting has been conducted with references to the Environmental Protection Authority (EPA) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016).

The field survey included the following:

- GHD placed 23 non-permanent quadrats and 19 relevés across the survey area to adequately characterise the vegetation (Figure 3, Appendix A). In addition to quadrat and relevé sampling, the survey area was traversed in representative vegetation types to delineate extent and allow opportunistic collection of flora species. GHD have compiled an inventory of flora species (native and exotic) by vegetation type (Appendix D).
- Collected quadrat data included physical features (e.g. landform, soil types, litter cover), a list of dominant flora from each structural layer and a list of all species (native and introduced) within the quadrat including average height and cover (using the National Vegetation Information System (NVIS)). A photograph of each quadrat, and other presentative vegetation types and conditions were taken
- Vegetation units have been delineated using a combination of aerial photography, topographical features and field data. Vegetation mapping has been conducted in the field with boundaries drawn over aerial photography using handheld GPS equipment (Samsung tablet). Vegetation units were described based on structure, dominant taxa and cover characteristics as defined by quadrat and relevé data and field observations. Vegetation unit descriptions follow the NVIS and are consistent with NVIS Level V (Association). At Level V up to three taxa per stratum are used to describe the association (NVIS Technical Working Group 2017). Some vegetation was delineated after the survey was completed, due to an extension in the survey area. These vegetation types have been extrapolated by senior botanist Joel Collins and undertaken using aerial imagery and on-ground information obtained during the survey
- The vegetation condition was assessed and mapped in accordance with the vegetation condition rating scale for the Eremaean and Northern Botanical Provinces of Western Australia (IBRA) (devised by Keighery (1994) and adapted by EPA (2016)). The scale recognises the intactness of vegetation and consists of six rating levels. The vegetation condition rating scale is located in Appendix B. The vegetation condition was extrapolated in the extended survey areas using the on-ground information obtained survey the survey and the history of the site
- Based on results of the desktop assessment, GHD identified areas within the survey area that have the potential to contain conservation significant vegetation and flora. During the

field survey GHD undertook non-systematic targeted searches for conservation significant flora and vegetation within these areas. Where conservation significant flora taxa or vegetation were identified in the field, the locations of boundaries and/or individuals were recorded using a GPS

- Flora species that are well known to GHD ecologists were identified in the field. Where field identification of plant taxa was not possible, specimens were collected in a systematic manner and identified at the WA Herbarium by comparison with the reference collection and/or use of identification keys.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by DAWE (2019b). Nomenclature used in this report follows that used by the WA Herbarium as reported on *FloraBase.*

2.3 Limitations

2.3.1 Desktop limitations

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

2.3.2 Field survey limitations

The EPA (2016) states that flora and fauna survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 3.

Table 3 Flora and fauna survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Nil	Adequate information is available for the survey area. Broad scale (1:250,000) mapping by Beard (1975) and digitised by Shepherd et al. (2002 Regional biogeography (Van Vreeswyk et al. 2004).
Scope (what life forms were sampled etc).	Nil	Vascular flora were sampled during the survey. Non-vascular flora were not surveyed.
Proportion of flora collected and identified (based on sampling, timing and intensity)	Nil	The survey sampling and intensity was considered adequate, and seasonal conditions were considered satisfactory. All taxonomic groups were considered to be represented. The portion of flora collected and identified was considered moderate; and it is likely the survey under-recorded some grass species (Poaceae), annuals and herbs due to lower than average rainfall and consequently poor flowering material. However, based on the likelihood assessment it is unlikely these species would be conservation significant.
Flora determination	Minor	Flora determination was undertaken by GHD botanist/ecologist in the field and at the WA Herbarium. Six taxa could be identified to genus level only, and one taxon could be tentatively identified to species level, due to lack of

Aspect	Constraint	Comment
		flowering and/or fruiting material required for identification. None of these species were considered to be potential conservation significant flora. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time of report development, but it should be noted this may change in response to ongoing research and review of the International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Minor	Mostly all of the survey area was accessible and was accessed by foot and vehicle. A small portion of the western side of the survey area was inaccessible due to land access (Rio Tinto owned land). Adequate time was available to complete the biological survey to the required standard.
Mapping reliability	Minor	The vegetation was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Beard 1975) and field data. Data was recorded in the field using hand-held GPS tools (e.g. Samsung tablet and Garmin GPS). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ±5 metres on average. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies. The mapping of some additional survey areas were extrapolated as they were introduced after the field survey was completed. The extrapolation of vegetation types and vegetation condition was undertaken by the senior botanist whom undertook the survey. The extrapolation was undertaken using aerial imagery and knowledge of the site. Aerial imagery contains some inaccuracies due to year of publication (may not incorporate changes to vegetation i.e. clearing, a fire or seasonal change).
Timing/weather/season cycle	Minor	The field survey was conducted in April 2020. In the three months prior to the flora survey (January to March 2020) the Karratha weather station recorded a total of 341.8 mm of rainfall. The total rainfall is higher than the long-term average for the same period (Jan – March; 174 mm) (BoM 2020). The weather conditions recorded during the survey were considered unlikely to have impacted the survey results. The survey timings were considered appropriate for the flora and fauna field survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Minor	Some of the survey area has been subject to previous disturbances, including clearing for vehicle tracks, salt ponds and construction of existing power lines and power infrastructure. These disturbances did not limit the biological survey.

Aspect	Constraint	Comment
Resources	Nil	Adequate resources were employed during the field survey. The person days were spent undertaking the survey using a dedicated botanist and ecologist.
Access restrictions	Minor	Only one small section of the survey area could not be accessed due to land ownership (Rio Tinto governed area).
Experience levels	Nil	The ecologists who executed the survey were practitioners suitably qualified in their respective fields. Joel Collins and Sarah Flemington are botanists/ecologists with over 17 and 4 years experience undertaking ecological surveys in the Pilbara bioregion in WA, respectively.

3. Desktop assessment

3.1 Physical environment

3.1.1 Climate

The project is located in the Pilbara region of Western Australia and experiences a semi-arid climate. Temperatures are warm to hot all year and rainfall is generally low, mostly falling in the late summer months due to the influence of tropical cyclones and monsoon. The closest meteorological recording station is located in Karratha (No. 004083) approximately 1.4 km from the survey area. Climatic data from this station indicates that the mean maximum temperature ranges from 36.3 °C in March, to 26.4 °C in July. The mean minimum temperature ranges from 26.9 °C in January to 13.8 °C in July. The mean annual rainfall for all years is 292.4 mm. 2019 was a dry year, receiving only 110.4 mm (BoM 2020).

3.1.2 Geology, landforms and soils

The project is located in the Karratha Coast Zone of the Pilbara Province. The Pilbara Province lies over the Pilbara Craton, which consists of two different tectonic components. The two broad geologic sequences are the ancient Archaean granite-greenstone terrain and the younger volcano-sedimentary sequence of the Hamersley Basin (Tille 2006).

The Karratha Coast Zone is characterised by coastal mudflats with sandy coastal plains and some hills on marine deposits and some sedimentary and volcanic rocks of the Pilbara Craton. Soils include tidal soils with some calcareous loamy earths, salt lake soils and red/brown noncracking clays (Tille 2006).

3.1.3 Land systems

The Pilbara region has been surveyed for the purposes of land classification, mapping and resource evaluation. One hundred and two land systems which are grouped into 20 broad land types have been described for the region, which are distinguished on the basis of topography, geology, soils and vegetation (Van Vreeswyk et al. 2004). The survey area intersects six land systems; details of these land systems are presented in Table 4.

Table 4 Land systems within the study area

Land system	Description	Location
Granitic	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands. Geology: Archaean and Proterozoic granite, gneiss, granodiorite and porphyry. Geomorphology: Erosional surfaces; hill tracts and domes on granitic rocks with rough crests, associated rocky hill slopes, restricted lower stony plains; narrow, widely spaced tributary drainage floors and channels.	Intersects the north of the survey area, on the Burrup Peninsula.
Littoral	Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches. Geology: Quaternary mudflat deposits, clay, salt and sand; eolian sand. Geomorphology: Depositional surfaces; saline coastal flats; estuarine and littoral surfaces with extensive bare saline tidal flats subject to infrequent tidal inundation, slightly higher samphire flats and alluvial plains, mangrove seaward fringes with dense branching patterns of shallow tidal creeks, minor coastal dunes, limestone ridges, sandy plains and beaches.	Intersects the north and centre of the survey area.

Land system	Description	Location
Cheerawarra	Sandy coastal plains and saline clay plains supporting soft and hard spinifex grasslands and minor tussock grasslands. Geology: Quaternary eolian sand and alluvium. Geomorphology: Depositional surfaces; gently undulating, sandy surfaced coastal plains and level plains with saline clay soils and bare saline scalds with wind hummocks; very rare distributary drainage lines.	Intersects the north and centre of the survey area.
Horseflat	Gilgaied clay plains supporting tussock grasslands and minor grassy snakewood shrublands. Geology: Quaternary alluvium. Geomorphology: Depositional surfaces; gilgaied and nongilgaied clay plains, stony plains, narrow linear drainage depressions and dissected slopes marginal to the River land system; mostly internally drained, some through going trunk drainage channels.	Intersects majority of the survey area, in the centre and southernmost parts.
Calcrete	Low calcrete platforms and plains supporting shrubby hard spinifex grasslands. Geology: Calcrete, alluvium and sand Geomorphology: Calcrete platforms and calcrete plains.	Intersects a small section of the central survey area
Ruth	Hills and ridges of volcanic and other rocks supporting hard spinifex (occasionally soft spinifex) grasslands. Geology: Archaean and Proterozoic intermediate and basic volcanic rocks; also quartz, minor chert, jaspilite, shale and siltstone. Geomorphology: Erosional surfaces; rounded hills and ridges with restricted lower slopes and stony interfluves, moderately to widely spaced drainage patterns.	Intersects small sections of the southeast survey area.

3.1.4 Acid sulphate soils

Acid sulphate soils (ASS) risk mapping indicates the soils of the survey area have a ‘High to moderate’ and ‘Moderate to low’ risk of causing environmental damage, if those soils are disturbed. The ‘High to moderate’ risk rating suggests there is a high to moderate risk of ASS occurring within 3 m of the natural soil surface and could be disturbed by most land development activities, such as earthworks and dewatering. The ‘Moderate to low’ risk rating suggests a moderate to low risk of ASS occurring within 3 m of the soil surface, but a high to moderate risk of ASS below 3 m of the soil surface (DER 2015).

3.2 Land use

3.2.1 Conservation reserves and areas

The survey area minimally intersects one DBCA managed conservation area, the Murujuga National Park located on the Burrup Peninsula Figure 2, Appendix A. Majority of the survey area is located immediately adjacent the National Park.

3.2.2 Environmentally sensitive areas

No Environmentally Sensitive Areas (ESAs) intersect the survey area. The nearest ESA is the Dampier Archipelago and its offshore Islands, which are located approximately 8 km northwest of the northern point of the survey area.

3.3 Hydrology

Desktop searches of the GoWA data layers identified the water resource aspects present in the study area. These are detailed in Table 5 below.

Table 5 Hydrology aspects within the study area

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

3.3.1 Groundwater

The survey area lies within the proclaimed Pilbara Groundwater Area (Figure 2, Appendix A). The Water Information Reporting (DWER 2020) system found 94 registered groundwater bores within the study area. This does not include unregistered bores. Groundwater levels recorded from available bore data indicate that groundwater beneath the survey area lies at approximately 12-13 m below ground level. These groundwater levels are expected to vary seasonally and be influenced by tidal processes. The northern section of the survey area is adjacent to evaporation ponds, and groundwater is expected to sit much closer to the surface in this area.

3.3.2 Surface water and drainage

The survey area is located within the proclaimed Pilbara Surface Water Area (Figure 2, Appendix A) and is in close proximity to the ocean. Surface water in the broader area is largely reliant on weather, and surface water in waterways is generally only present or flowing for parts of the year, often in response to larger cyclonic, rainfall events. The City of Karratha Water Management Strategy (Essential Environment 2016) indicate that drainage issues arise from the high erosion tendencies of the red soils and the large volumes of stormwater that flow in the wet season.

3.3.3 Wetlands

No Internationally (Ramsar) or nationally important wetlands are located within 20 km of the survey area.

3.4 Vegetation and flora

3.4.1 Regional biogeography

The survey area is located in the Pilbara bioregion and Roebourne sub-region as described by IBRA.

The Roebourne sub-region is characterised by 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 (Kendrick and Stanley 2001).

3.4.2 Broad vegetation mapping and extent

Broad scale (1:250,000) pre-European vegetation mapping of the area was completed by Beard (1975) at an association level. Mapping indicates four vegetation associations are present within the survey area:

- Hummock grasslands, grass steppe; soft spinifex (association 117)
- Bare areas; mudflats (association 127
- Mosaic: Short bunch grassland – savannah / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex (association 589)
- Hummock grasslands, grass steppe, hard spinifex, *Triodia wiseana* (association 157).

The pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by DBCA (last updated April 2019 – GoWA 2020b). As shown in Table 6, the current extents remaining of all vegetation associations are greater than 77% of their calculated pre European extents at all scales (e.g. State, IBRA bioregion, IBRA subregion and Local Government Area (LGA)).

3.4.3 Conservation significant ecological communities

The EPBC Act PMST did not identify any TECs within the survey area. Searches of the DBCA TEC/PEC database identified four PECs within 20 km of the survey area, two of which intersect the survey area boundary (Figure 2, Appendix A). Details of these communities are provided in Table 7.

Table 6 Extent of pre-European vegetation associations mapped within the survey area (Beard 1975, GoWA 2020b)

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	%current extent in all DBCA managed land (proportion of current extent)
117	State: Western Australia	919,517.05	886,005.79	96.36	14.79
	IBRA bioregion: Pilbara	82,705.78	78,096.64	94.43	22.54
	IBRA subregion: Roebourne	50,962.94	46,901.57	92.03	37.53
	LGA: City of Karratha	41,173.74	31,921.58	77.53	58.03
127	State: Western Australia	737,724.05	697,871.38	94.60	12.30
	IBRA bioregion: Pilbara	177,749.75	159,595.04	89.79	2.32
	IBRA subregion: Roebourne	177,178.87	159,024.16	89.75	2.33
	LGA: City of Karratha	96,204.40	83,703.29	87.01	4.37
589	State: Western Australia	807,698.58	802,713.40	99.38	1.91
	IBRA bioregion: Pilbara	728,768.20	724,695.82	99.44	2.11
	IBRA subregion: Roebourne	675,391.80	671,327.48	99.40	2.14
	LGA: City of Karratha	312,813.64	310,512.32	99.26	0.78
157	State: Western Australia	502,728.56	499,311.84	99.32	18.24
	IBRA bioregion: Pilbara	199,832.17	198,409.23	99.29	5.80
	IBRA subregion: Roebourne	14,972.09	14,451.45	96.52	1.56
	LGA: City of Karratha	73,039.72	71,600.83	98.03	0.31

Table 7 Threatened and Priority Ecological Communities identified in the desktop searches

Community type	EPBC Act	DBCA	Description (DBCA 2020)
Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays (Roebourne Plains gilgai grasslands)	-	Priority 1	The Roebourne Plains coastal grasslands with gilgai micro-relief occur on deep cracking clays that are self-mulching and emerge on depositional surfaces. The Roebourne Plains gilgai grasslands occur on microrelief of deep cracking clays, surrounded by clay plains/flats and sandy coastal and alluvial plains. The gilgai depressions supports ephemeral and perennial tussock grasslands dominated by *Sorghum* sp. and *Eragrostis xerophila* along with other native species *including Astrebla pectinata, Eriachne benthamii, Chrysopogon fallax* and *Panicum decompositum*. Restricted to the Karratha area, this community differs from the surrounding clay flats of the Horseflat land system which are dominated by *Eragrostis xerophila* and other perennial tussock grass species (*Eragrostis* mostly).
Horseflat land system of the Roebourne Plains	-	Priority 3	The Horseflat Land System of the Roebourne Plains are extensive, weakly gilgaied clay plains dominated by tussock grasslands on mostly alluvial non-gilgaied, red clay loams or heavy clay loams. Perennial tussock grasses include *Eragrostis xerophila* and other *Eragrostis* spp., *Eriachne* spp. and *Dichanthium* spp. The community also supports a suite of annual grasses including Sorghum spp. and rare *Astrebela* spp. The community extends from Cape Preston to Balla Balla surrounding the towns of Karratha and Roebourne. This community does not include priority ecological communities 'Roebourne Plains gilgai grasslands' and the 'Chenopod association of the Roebourne Plains area.
Coastal dune native tussock grassland dominated by *Whiteochloa airoides*	-	Priority 3	Tussock grassland of *Whiteochloa airoides* occurs on the landward side of foredunes, hind dunes or remnant dunes with white or pinkish white medium sands with marine fragments. There may be occasional *Spinifex longifolius* tussock or *Triodia epactia* hummock grasses and scattered low shrubs of *Olearia dampieri* subsp. *dampieri*, *Scaevola spinescens*, S. *cunninghamii*, *Trianthema turgidifolia* and *Corchorus* species (*C. walcottii, C. laniflorus*). Occurs on Barrow Island, Tent Island and possibly some unaffected littoral areas in West Pilbara. Closest known occurrence is approximately 5.5 km north east of the southern half of the survey area.
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 endemics land snails. Know occurrences located less than 1 km northwest of the survey area.

3.4.4 Flora diversity

The *NatureMap* database identified 656 taxa previously recorded within 20 km of the survey area (Appendix C). This total comprised 36 naturalised (introduced) taxa and 620 native taxa. The most commonly recorded families were Fabaceae, Poaceae, Malvaceae and Chenopodiaceae.

3.4.5 Conservation significant flora

The EPBC Act PMST (Appendix C), *NatureMap* and DBCA (WA Herbarium and Threatened and Priority Flora) databases, identified the presence/potential presence of 11 conservation significant flora within the study area. The desktop search recorded:

- One Priority 2 taxon
- Nine Priority 3 taxa
- One Priority 4 taxon.

4. Field survey results

4.1 Vegetation

4.1.1 Vegetation types

Nineteen vegetation types were identified and described for the survey area, and additional areas were identified for cleared and/or highly degraded vegetation (92.85 ha). The survey area is mostly located along the existing power line corridor and some adjacent access tracks. The southernmost portion of the survey area, particularly the east-west stretch of the proposed corridor is less developed. Some additional areas were required to be mapped using extrapolation from aerial imagery, survey photographs and site knowledge. This was due to an extension of the survey area occurring after the survey was completed.

The vegetation within the survey area primarily consists of hummock grasslands of *Triodia epactia* and *T. wiseana* with scattered to open shrublands dominated by *Acacia, Hakea, Grevillea* and *Senna* species on rocky sandy loam plains and low undulating rocky rises and slopes. Minor drainage lines which dissect the plain and rocky slopes are lined by *Corymbia hamersleyana* and mostly *Eucalyptus victrix*.

A description of the vegetation types mapped across the survey area (and previously mapped in GHD 2019) and those vegetation types that were extrapolated have been provided in Table 7 and mapped in Figure 4, Appendix A.

Table 7 Vegetation types recorded within the survey area

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT01	*Brachychiton acuminatus* scattered low trees over *Grevillea pyramidalis* subsp. *pyramidalis*, *Terminalia supranitifolia* (P3) and *Flueggea virosa* subsp. *melanthesoides* scattered shrubs over *Triodia epactia* open hummock grassland over *Cymbopogon ambiguus* and **Cenchrus ciliaris* open tussock grassland and *Tinospora smilacina* and *Ipomoea costata* open vineland on rock piles. Associated species includes *Evolvulus alsinoides, Gomphrena cunninghamii, Triumfetta clementii* and *Abutilon lepidum.* Conservation listed species; *Rhynchosia bungarensis* (P4) and	HPKAR_02, HPKAR_09, HPKAR_10	4.67	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
	Vigna triodiophila (P3). Represents Priority 1 PEC Burrup Peninsula rock pile communities.					
VT02	*Corymbia hamersleyiana* open woodland over *Acacia bivenosa, Grevillea pyramidalis* subsp. *pyramidalis* and *Hakea lorea* subsp. *lorea* scattered shrubs over *Triodia epactia* open hummock grassland with **Cenchrus ciliaris* scattered grasss over over *Hybanthus aurantiacus, Cleome viscosa* and *Trichodesma zeylanicum* var. *zeylanicum* open forbland on brown sandy loam on elevated rocky plain. Associated species include *Chrysopogon fallax, Bonamia erecta, Euphorbia tamnesis* subsp.	HPKAR_01	2.74	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
	eremophila and *Sida fibulifera*.					
VT03	*Eucalyptus victrix* open woodland over *Terminalia circumalata* low open woodland over *Triodia wiseana* open hummock grassland with **Cenchrus ciliaris* and *Eriachne benthamii* scattered tussock grasslands over *Hybanthus aurantiacus, Indigofera trita* and *Gossypium australe* scattered herbs on rocky sandy loam on minor drainage lines. Associated species include *Cyperus vaginatus, Rhynchosia minima* and *Boerhavia coccinea*.	HPKAR_03, HPKAR_07, HPKAR_08, HPKAR_12, HPKAR_38	14.10	0.15	14.25	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT04	*Tecticornia ?indica* subsp. *leiostachya* and *Tecticornia ?pterygosperma* low chenopod shrubland with scattered *Avicennia marina* on saline flats with tidal inundation.	HPKAR_04	7.07	1.36	8.43	
VT05	**Cenchrus ciliaris* open grassland over *Trianthema turgidifolia* and *Neobassia astrocarpa* open chenopod shrubland on disturbed edges of saline flats.	HPKAR_05, HPKAR_06	7.12	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT06	*Grevillea pyramidalis* subsp. *pyramidalis* and **Vachellia farnesiana* scattered shrubs over *Ipomoea costata, Indigofera monophylla* and *Scaevola spinescens* open shrubland over *Triodia epactia* open hummock grassland over *Cleome viscosa, Rhynchosia minima* and *Hybanthus aurantiacus* scattered herbs on red/brown sandy loam on rocky slopes with frequent basalt outcropping. Associated species include *Abutilon lepidum, Gomphrena cunninghamii, Streptoglossa decurrens* and *Indigofera monophylla*	HPKAR_11, HPKAR_37	112.16	2.89	115.05	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT07	*Grevillea pyramidalis* subsp. *pyramidalis, Hakea lorea* subsp. *lorea, Acacia inaequilatera* and *Ehretia saligna* var. *saligna* open shrubland over *Solanum lasiophyllum, Diplopeltis eriocarpa* and *Solanum lasiophyllum* scattered shrubs over *Triodia epactia* sparse hummock grassland on flat sandy plains/dunes above saline flats. Associated species include *Indigofera monophylla, Triumfetta propinqua, Acacia orthocarpa, Trichodesma zeylanicum* var. *zeylanicum* and *Acacia ampliceps*.	HPKAR_13, HPKAR_14	5.38	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT08	*Acacia bivenosa, Acacia synchronicia* and *Acacia ancistrocarpa* (Fitzroy Wattle) open shrubland over *Triodia wiseana* open hummock grassland and **Cenchrus ciliaris* (Buffel Grass) sparse tussock grasses on disturbed sandy loam plains (GHD 2019).	KAR_18 (GHD 2019)	3.14	-	-	
VT09	*Acacia inaequilatera, Acacia bivenosa* and *Hakea lorea* subsp. *lorea* open shrubland with occasional scattered *Corymbia hamersleyiana* over *Eremophila longifolia, Senna glutinosa* subsp. *pruinosa* and *Solanum lasiophyllum* sparse shrubland over *Cymbopogon ambiguus* open tussock grassland over *Triodia wiseana* and *Triodia epactia*	HPKAR_15, HPKAR_29, HPKAR_31, HPKAR_32, SFRE_02, SFRE_04, KAR_05 (GHD 2019), KAR_06 (GHD 2019)	117.01	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
	hummock grassland over *Fimbristylis ?dichotoma* and *Bulbostylis barbata* scattered forbs on low undulating rocky rises and slopes. Other associated species include *Acacia stellaticeps.*					
VT10	*Acacia ancistrocarpa* (Fitzroy Wattle) open shrubland over *Triodia wiseana* open hummock grassland on red brown sandy plains.	HPKAR_16	13.51	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT11	*Eragrostis xerophila* and *Chrysopogon fallax* tussock grassland over *Streptoglossa decurrens, Rhynchosia minima* and *Portulaca oleracea* scattered herbs on gilgai light brown clay plains. Other species include *Operculia aequisepala, Ipomoea coptica, Dichanthium sericeum* subsp. *humilius, Heliotropium cunninghamii, Xerochloa ?laniflora, Panicum laevinode* and *Eriachne benthamii*. Conservation listed species; *Oldenlandia* sp. Hamersley Station (A.A. Mitchel PRP1479) P3. Represents Priority 3 PEC Horseflat land system of the Roebourne Plains.	HPKAR_17, HPKAR_18, HPKAR_20, HPKAR_23, HPKAR_25, HPKAR_26, SFRE_01, SFRE_03, HPKAR_33	173.47	51.0	224.47	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT12	*Acacia inaequilatera* and *Ehretia saligna* var. *saligna* open shrubland over *Solanum lasiophyllum, Corchorus incanus* subsp. *incanus* and Hybanthus aurantiacus low open shrubland over *Triodia epactia* and *Triodia wiseana* open hummock grassland with *Eragrostis xerophila* and *Chrysopogon fallax* scattered tussock grasses on brown sandy loam stony plain. Other associated species include *Acacia bivenosa*, *Cleome viscosa, Ptilotus calostachyus, Indigofera linifolia* and *Phyllanthus maderaspatensis*.	HPKAR_19, HPKAR_21	5.00	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT13	*Acacia inaequilatera* and *Acacia bivenosa* open shrubland over *Solanum lasiophyllum, Scaevola spinescens* and *Indigofera monophylla* low open shrubland over *Triodia wiseana* open hummock grassland with **Cenchrus ciliaris* tussock grasses. Other species include *Acacia ancistrocarpa, Diplopeltis eriocarpa, Tephrosia supina, Triumfetta clementii* and *Senna artemisioides*.	HPKAR_22, HPKAR_36	108.37	2.34	110.71	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT14	*Corymbia hamersleyana* and *Acacia coriacea* subsp. *coriacea* scattered trees over *Acacia inaequilatera* and *Hakea lorea* subsp. *lorea* over *Triodia wiseana* very open hummock grassland with **Cenchrus ciliaris* tussock grasses on brown sandy loam on minor drainage lines. Other species include *Acacia xiphophylla, *Vachellia farnesiana, Chrysopogon fallax, Portulaca oleracea* and **Aerva javanica*.	HPKAR24, HPKAR27	44.96	2.35	47.31	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT15	*Acacia xiphophylla*, *Acacia bivenosa* and *Acacia inaequilatera* open shrubland over *Triodia wiseana* scattered hummock grasses on brown sandy loam rocky plain. Other species include *Acacia ancistrocarpa, Cleome viscosa, Hakea lorea* subsp. *lorea* and *Senna artemisioides.*	HPKAR_30, HPKAR_28	3.94	-	-	
VT16	*Acacia pyrifolia* var. *pyrifolia* and *Acacia bivenosa* open shrubland over *Acacia arida, Senna glutinosa* subsp. *pruinosa* and *Indigofera monophylla* sparse shrubland over *Triodia wiseana* hummock grassland on rocky hill and slopes. Other species include *Acacia stellaticeps, Scaevola spinescens, Acacia*	KAR_07, KAR_08, KAR_21 (GHD 2019)	12.72	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
	maitlandii and *Triumfetta clementii.*					
VT17	*Eucalyptus victrix* open woodland over Triodia wiseana scattered hummock grasses and **Cenchrus ciliaris* (Buffel Grass) and *Chrysopogon fallax* tussock grasses over **Passiflora foetida* vines on brown alluvial drainage line. Other species include *Acacia coriacea* subsp. *coriacea, Santalum lanceolatum, Abutilon lepidum* and *Rhynchosia minima.*	HPKAR_34	4.13	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
VT18	*Eucalyptus camaldulensis* (planted) scattered trees over **Cenchrus ciliaris* (Buffel Grass) tussock grasses on brown sandy loam on disturbed road verge.	HPKAR_35	5.44	-	-	
VT19	**Tamarix aphylla* scattered trees over *Sesbania cannibina* herbland on brown loamy clay surrounding wetland.	Not described with quadrat or releve.	8.00	-	-	

Vegetation type code	Vegetation type description	Sample locations	Extent (ha)	Extrapolated extent (ha)	Total extent (ha)	Photograph
Cleared areas/road verge/salt pan	Cleared areas/road verge/salt pan	-	81.79	11.06	92.85	Photo not available

4.1.2 Vegetation condition

The vegetation condition throughout the survey area varied from Completely Degraded to Excellent condition.

Previously cleared and disturbed areas adjacent roads and access tracks and the presence of **Cenchrus cilliaris* (Buffel grass) and **Tamarix aphylla* (Athel pine) created areas of Completely Degraded to Poor condition. *Tamarix aphylla* is a Weed of National Significance (WoNS) and a declared pest under the *Biosecurity and Agricultural Management Act 2007.* It is described as a tree reaching 15 m in height and with leaves a dull greenish/grey similar to a true pine tree (Plate 1). *T. aphylla* was located around an artificial water body in the west of the survey area.

The majority of the survey area contained vegetation of Good to Very Good condition, considering historical clearing for development on the Burrup Peninsula and surrounds. Areas of Excellent condition vegetation were found in the southern portion of the survey area, which were completely undisturbed (i.e. no access tracks, existing power lines or exploration).

Fire history did not have a significant impact on the structure and condition of vegetation in the survey area, as the majority of the vegetation was long unburnt (6 years or longer) or of moderate age (3 to 5 years).

Plate 1 Artificial waterbody and *Tamarix aphylla*

The extent of the vegetation condition mapped within the survey area including the extrapolated condition for the extended survey area is provided in Table 8 and mapped in Figure 5, Appendix A

Table 8 Extent of vegetation condition mapped within the survey area

Vegetation Condition (EPA 2016)	Extent mapped (ha)	Extrapolated extent mapped (ha)	Total extent (ha)
Excellent	18.32		
Very Good	326.91	56.69	383.6
Good	182. 76	3.43	186.19
Poor	103.43		
Degraded	14.39		
Completely Degraded	9.44		

Vegetation Condition (EPA 2016)	Extent mapped (ha)	Extrapolated extent mapped (ha)	Total extent (ha)
Cleared	81.79	11.06	92.85

4.1.3 Conservation significant ecological communities

There are no TECs present within the survey area. The field assessment did identify the presence of two PEC's within the survey area:

- Burrup Peninsula rock pile communities (Priority 1) representated by vegetation type 1 (VT01) (4.67 ha)
- Horseflat land system of the Roebourne Plains (Priority 3) representated by vegetation type 11 (173.47 ha). VT11 coresponds to the Horseflat land system mapping.

The PEC mapping is provided in Figure 4, Appendix A.

4.2 Flora

4.2.1 Flora diversity

The survey recorded 131 flora taxa (including subspecies and varieties) representing 35 families and 86 genera within the survey area. This total comprised 126 native taxa and five introduced taxa, **Cenchrus ciliaris* (Buffel grass), **Aerva javanica* (Kapok), **Vachellia farnesiana* (Mimosa bush), **Passiflora foetida* (Passionflower) and **Tamarix aphylla* (Athel tree).

Buffel grass and Kapok have been rated as having 'high' potential ecological impact under the invasive plant prioritisation process. Buffel grass significantly alters environmental conditions when invading new habitats as it reduces soil fertility, increases soil erosion (which increases surface run-off) and creates unstable watersheds with degraded water quality. It also exudes chemicals that are toxic to other plats (DEC 2013). Buffel grass is most common in disturbed areas such as vehicle tracks, roadsides and other previously cleared areas.

Mimosa bush was present in the northern section of the survey area along the existing pipeline on the rocky slopes and drainage areas.

The list of flora recorded within the survey area is provided in Appendix D.

4.2.2 Conservation significant flora

No threatened flora species listed under the EPBC Act and/or BC Act was recorded within the survey area. Four priority species listed by the DBCA were recorded within the survey area, *Rhynchosia bungarensis* (Priority 4), *Terminalia supranitifolia* (Priority 3), *Vigna triodiophila* (Priority 3) and *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) (Priority 3).

The location of priority flora recorded within the survey area is provided in Appendix D and mapped on Figure 6, Appendix A

Rhynchosia bungarensis

Rhynchosia bungarensis (Plate 2) is listed Priority 4 and is a compact, prostrate shrub, to 0.5 m high with yellow flowers. It is known to occur on pebbly, shingly coarse sand amongst bouldersand banks of flow line in the mouth of a gully wall (Western Australian Herbarium 1998–).

According to *NatureMap* there are 110 records of this species, with a large number of records concentrated on the Burrup Peninsula.

This species was recorded inside the rockpiles on the Burrup Peninsula, in the cracks of the incised boulders. 78 individuals were recorded, some locations with up to five plants, and one area containing 20 plants.

Plate 2 *Rhynchosia bungarensis*

Terminalia supranitifolia

Terminalia supranitifolia (Plate 3) is a spreading, tangled shrub or tree, 1.5-3 m high with green-yellow flowers appearing in May, July or September. It is listed Priority 3. Habitat includes sandy areas among basalt rocks (Western Australian Herbarium 1998–).

This species was recorded inside the rockpiles on the Burrup Peninsula, and occasionally on rocky and grassy slopes leading to the rockpiles. 111 individuals were recorded in total, with eight collected just outside of the survey area. Some records were isolated plants, whilst most occurred in close proximity along the undulating rockpiles.

Plate 3 *Terminalia supranitifolia*

Vigna triodiophila

Vigna triodiophila (Plate 4) is a fine-stemmed prostrate or scrambling vine with small, ovate to elliptic leaves and known to flower and fruit between May and September. It is listed Priority 3. It is endemic to basalt rockpile habitats in shallow, red-brown or brown, clayey sand or loam.

This species was recorded within rockpiles on the Burrup Peninsula and was not common. 16 individuals were recorded in total from only three locations.

Plate 4 *Vigna triodiophila*

Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)

Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479) (Plate 5) is a spreading annual herb growing to 0.05-0.1 m high. It has blue flowers that appear in March. The species occurs in cracking clay and basalt land systems on gently undulating plains with large surface rocks or flat crabholed plains. It is listed Priority 3 by DBCA.

This species was recorded in the far southwest corner of the survey area in an area of Very Good to Excellent condition vegetation. The vegetation was open, flat grassland habitat over clay to cracking clay soils. Two individuals were recorded from two sites of the same general location (HPKAR17 and HPKAR23).

Plate 5 *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) dried specimen

Likelihood of occurrence

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment based on the desktop searches (provided in Appendix C). This assessment took into account previous records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and the cryptic nature of the species (Appendix D).

The likelihood of occurrence assessment post-field survey concluded there are four priority species known to occur within the survey area (*Vigna triodiophila, Terminalia supranitifolia*, *Rhynchosia bungarensis* and *Oldenlandia* sp. Hamersley Station) and the remaining priority flora are considered unlikely to occur.

5. Discussion

The results of the survey were expected given the seasonality and timing of the survey, and the drier than average year in 2019 prior to the survey. The traceability of four Priority flora, particularly *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) was considered a better than expected outcome due to the limited number of records that are from the Dampier Peninsula. No range extensions were identified for any of the priority and non-priority flora collected and recorded during the survey.

The flora diversity in the survey area was relatively high considering the historic clearing for development in the Burrup and Dampier areas. A high number of vegetation types were recorded mostly due to the distance across which the survey area was conducted and the variability of landforms that were encountered.

All common weed species that would be expected in this region of the Pilbara, were recorded. The species count was not particularly high and this could be due to parts of the survey area that traversed unoccupied and undeveloped areas far from roadsides.

The vegetation types identified as representing the two PEC communities (Burrup Peninsula rock pile communities and Horseflat land systems of the Roebourne Plains) should be avoided where possible as they each support Priority flora that are well represented in those areas. The density of records are high on the Burrup Peninsula for the three Priority flora recorded during the survey (*Rhynchosia bungarensis* (Priority 4), *Terminalia supranitifolia* (Priority 3) and *Vigna triodiophila* (Priority 3)) as they have adapted to the habitat-type that the rock piles provide. *Oldenlandia* sp. Hamersley Station (A.A. Mitchell PRP 1479) is not well represented in the Dampier region and as a whole in its known range. Clearing of this population should be avoided if possible.

6. References

Beard, JS 1975, Vegetation Survey of Western Australia: Pilbara, map and explanatory memoir 1:1,000,000 series, Nedlands, University of Western Australia Press

Bureau of Meteorology (BoM) 2020, Climate Data Online, retrieved May 2020, from http://www.bom.gov.au/climate/data/

Department of Biodiversity, Conservation and Attractions (DBCA) 2007–, NatureMap: Mapping Western Australia's Biodiversity, retrieved March 2020, from http://naturemap.dpaw.wa.gov.au/default.aspx/.

Department of Biodiversity, Conservation and Attractions (DBCA) 2020, Priority Ecological Communities for Western Australia Version 28. Species and Communities Program, DBCA, last updated 6 May 2020.

Department of Environment and Conservation (DEC) 2013, Murujuga National Park Management Plan 78, Department of Environment and Conservation, Perth

Department of Environment Regulation 2015, Acid Sulfate Soils Fact Sheet. Government of Western Australia.

Department of Agrigulture Water and the Environment (DAWE) 2020a, *Environmental Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool Results*, retrieved February 2019, from http://www.environment.gov.au/epbc/pmst/index.html

Department of Agrigulture Water and the Environment (DAWE) 2020b, *Environmental Protection and Biodiversity Conservation Act 1999* List of Threatened Flora, retrieved March 2020, from http://www.environment.gov.au/cgibin/sprat/public/publicthreatenedlist.pl?wanted=flora.

Department of Water and Environment Regulation (DWER) 2020, Water Information Reporting, retrieved May 2020, from http://wir.water.wa.gov.au/Pages/Water-Information- Reporting.aspx.

Environmental Protection Authority (EPA) 2016, Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, Perth, Environmental Protection Authority.

Essential Environment 2016, *City of Karratha Water Management Plan*, unpublished report prepared for the City of Karratha.

GHD 2019. Horizon Power 124-KRT-DMP 132kV Line Upgrade Project Flora and Fauna Survey. August 2019.

Government of Western Australia (GoWA) 2020a, *Data WA*, retrieved May 2020, from https://data.wa.gov.au/.

Government of Western Australia (GoWA) 2020b, 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report), Current as of April 2019, Perth, Australia, Department of Biodiversity, Conservation and Attractions, retrieved May 2020, from https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Kendrick, P & Stanley, F (2001). Pilbara 4 (PIL4 – Roebourne synopsis), *A biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002*. Keighery, BJ 1994, Bushland Plant Survey: A Guide to Plant Community Survey for the Community, Nedlands, Australia, Wildflower Society of Western Australia (Inc.).

NVIS Technical Working Group 2017, Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0, Department of the Environment and Energy, Canberra.

Shepherd, DP, Beeston, GR, and Hopkins, AJM 2002, Native Vegetation in Western Australia – Extent, Type and Status, Resource Management Technical Report 249, Department of Agriculture, Western Australia

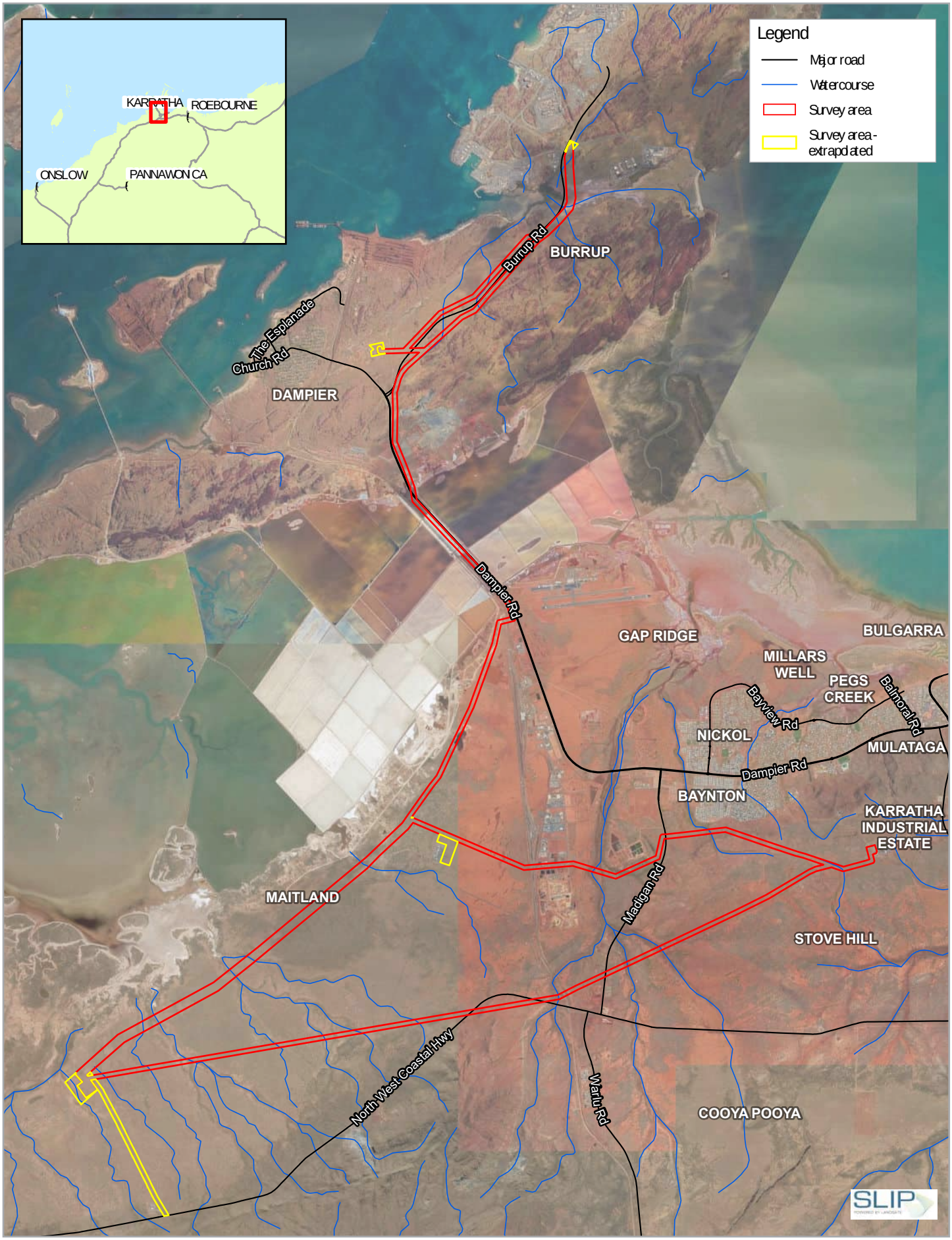
Tille, P 2006, Soil-landscapes of Western Australia's Rangelands and Arid Interior, Resource Management Technical Report 313, Perth, Department of Agriculture and Food.

Van Vreeswyk, AME, Payne, AL, Leighton, KA and Hennig, P 2004, An inventory and condition survey of the Pilbara region, Technical Bulletin No. 92, Western Australia, South Perth, Department of Agriculture.

Western Australian (WA) Herbarium 1998–, FloraBase–the Western Australian Flora, Biodiversity, Conservation and Attractions, retrieved March 2020, from http://florabase.dpaw.wa.gov.au/.

Appendices

Appendix A – Figures



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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Project Location and Survey Area

Project No. 12530473
Revision No. 0
Date 24 Jul 2020

FIGURE 1

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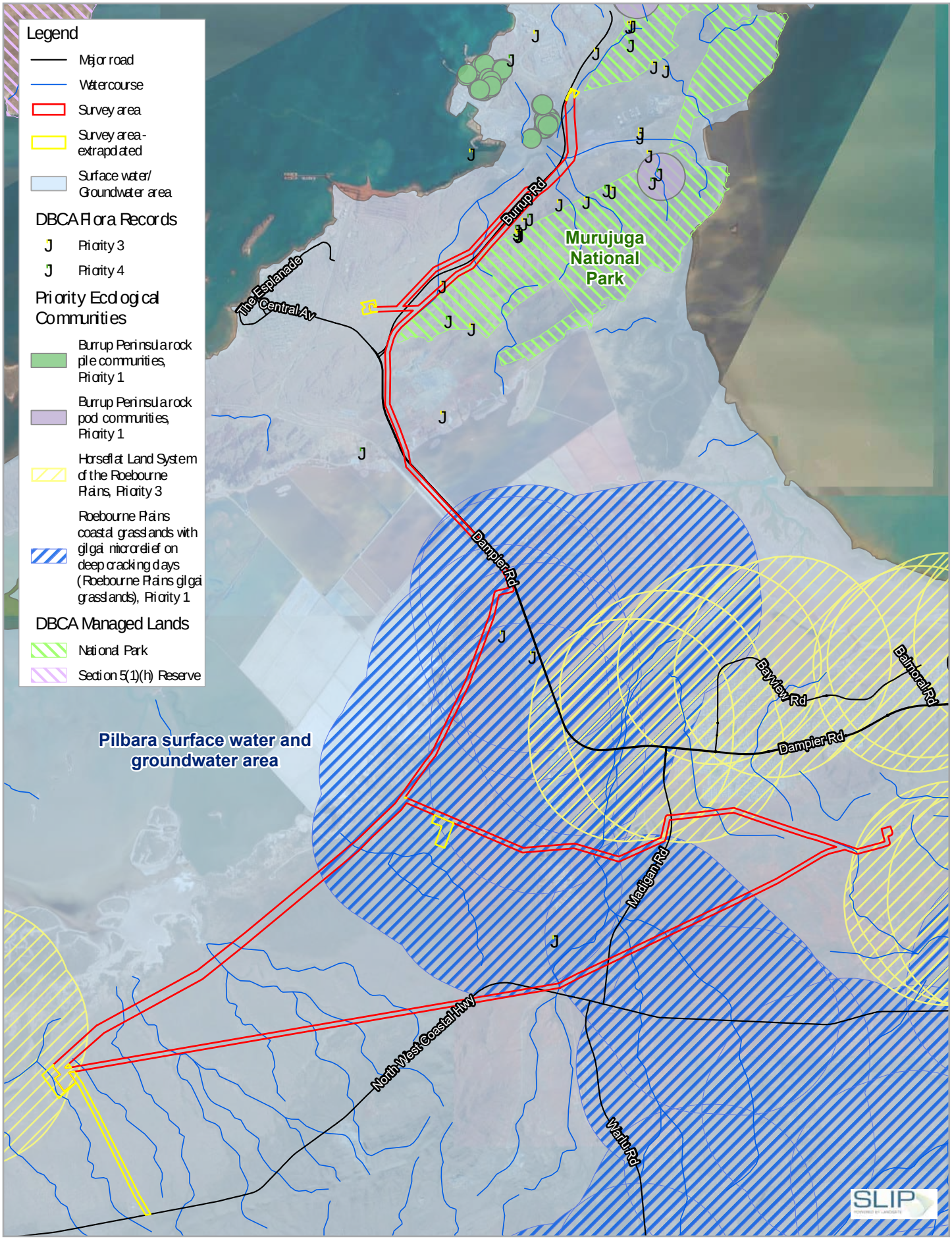

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Kilometres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

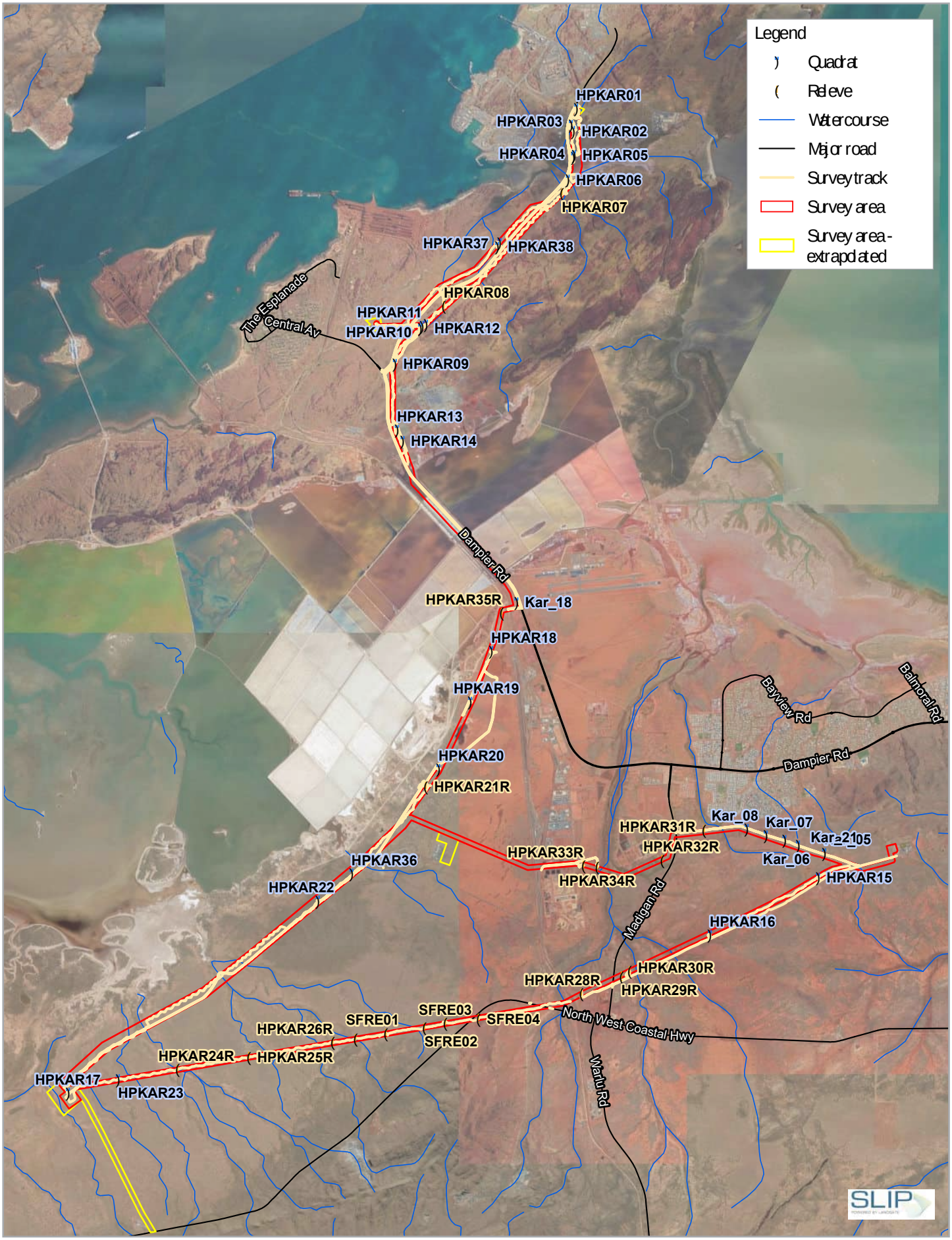
Environmental Constraints

Project No. 12530473
Revision No. 0
Date 24 Jul 2020

FIGURE 2

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_002_Environmental Constraints_RevB
Print date: 24 Jul 2020 - 15:43

Data source: GHD: Survey area; DBCA: Flora records, Priority ecological communities, Managed lands; DWER: Surface water areas, Groundwater areas; Landgate: Roads; Imagery - April 2018, Landgate_Subscription_Imagery\WANbw Landgate/ SLIP. Created by: mnikkonen



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Survey Sampling Effort

Project No. 12530473
Revision No. 0
Date 24 Jul 2020

FIGURE 3

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_003_SurveySamplingEffort_RevA
Print date: 24 Jul 2020 - 15:47

Data source: GHD Quadrats, Releves, Tracks - 20200511; DWER Watercourses; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANbw Landgate / SLIP. Created by: mnikkonen

Legend

- Major road
- Survey area
- PEC 1 Burrup Peninsula rock pile communities

Vegetation Type

- VT01
- VT02
- VT03
- VT04
- VT05
- VT06
- Cleared

Vegetation Type - extrapolated

- VT03
- VT04

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

O

GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

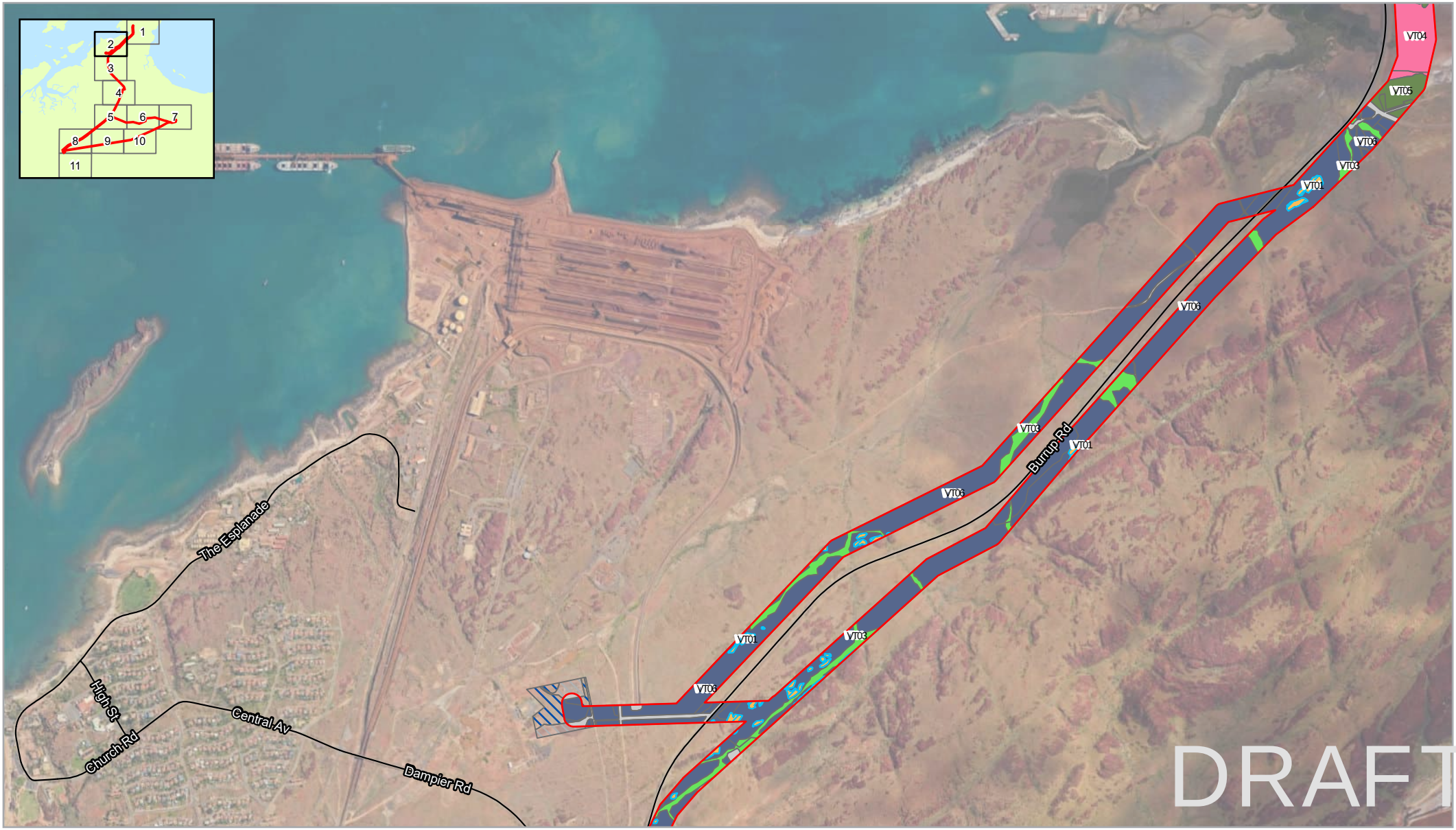
Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

Page 1 of 11
FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:16

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; VMS . Created by: mmikkonen



Legend

- Major road
- Survey area
- PEC 1 Burrup Peninsula rock pile communities

Vegetation Type

- VT01
- VT03
- VT04
- VT05
- VT06

- Cleared

Vegetation Type - extrapolated

- VT06
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
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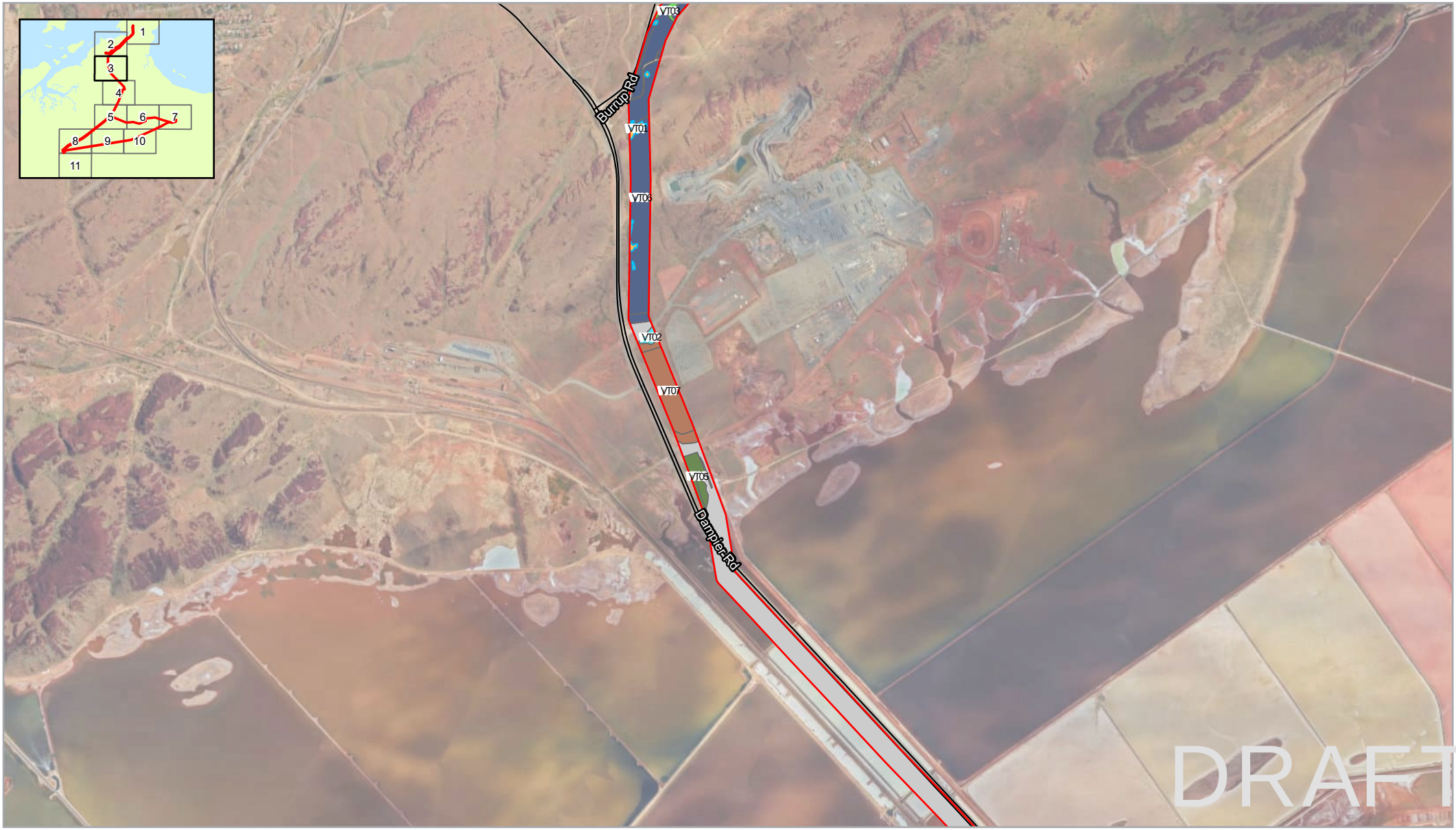
Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS. Created by: mmikkonen



Legend

- Major road
- Survey area
- PEC 1 Burrup Peninsula rock pile communities

Vegetation Type

- VT01
- VT02
- VT03
- VT05
- VT06
- VT07
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:16

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS. Created by: mmikkonen

Legend

- Major road
- Survey area
- PEC 3 Horseflat land system of the Roebourne Plains

Vegetation Type

- VT08
- VT11
- VT12
- VT18
- VT19
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:16

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS . Created by: mmikkonen

Legend

- Major road
- Survey area
- PEC 3 Horseflat land system of the Roebourne Plains

Vegetation Type
- VT06
- VT09
- VT11
- VT12
- VT13
- VT14
- VT19
- Cleared

Vegetation Type - extrapolated
- VT11
- VT13
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
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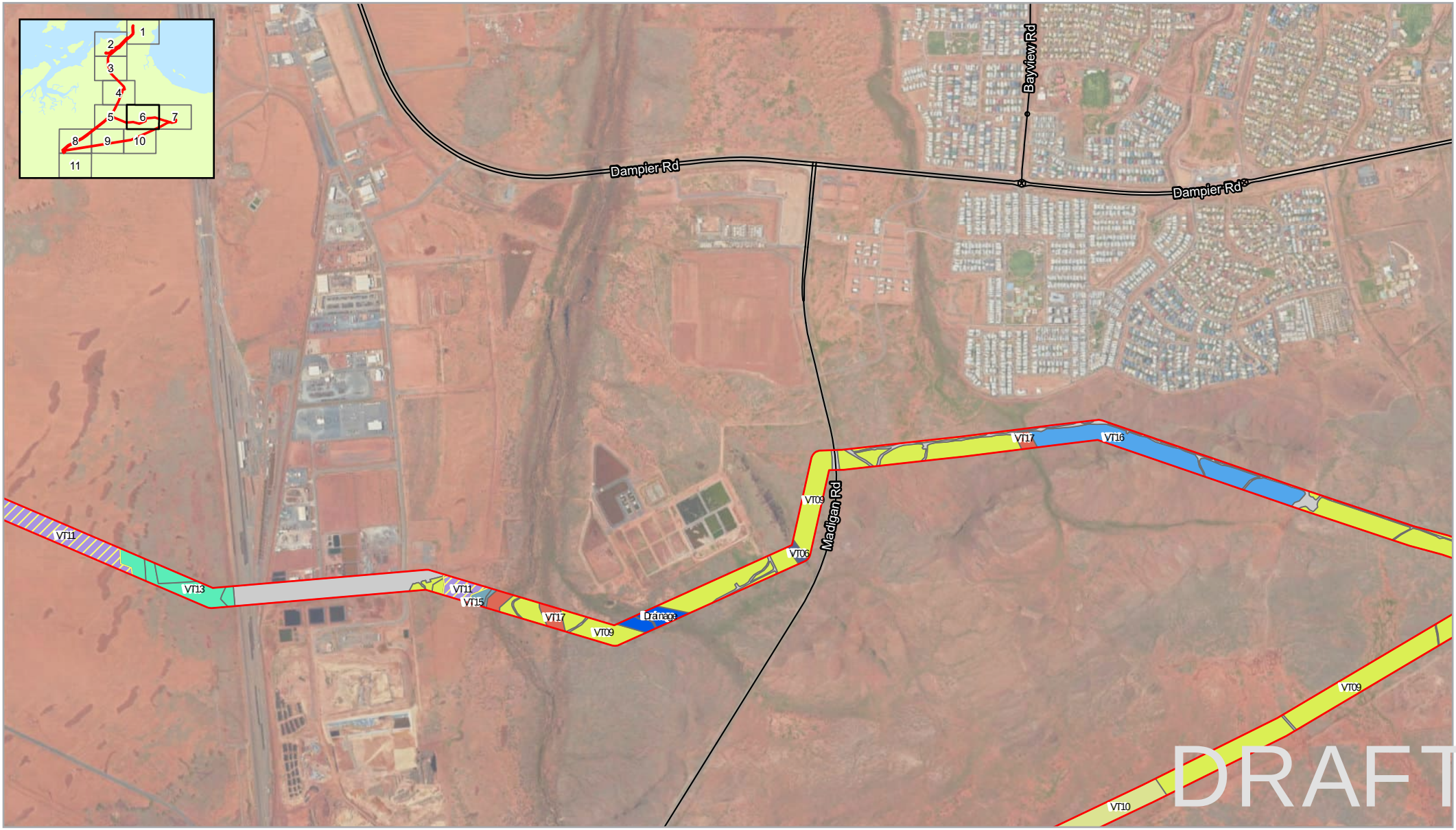
Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads; Imagery - April 2018; WMS . Created by: mmikkonen



Legend

- Major road
- Survey area
- PEC 3 Horseflat land system of the Roebourne Plains

Vegetation Type

- VT06
- VT09
- VT10
- VT11
- VT13
- VT15
- VT16
- VT17
- Drainage
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

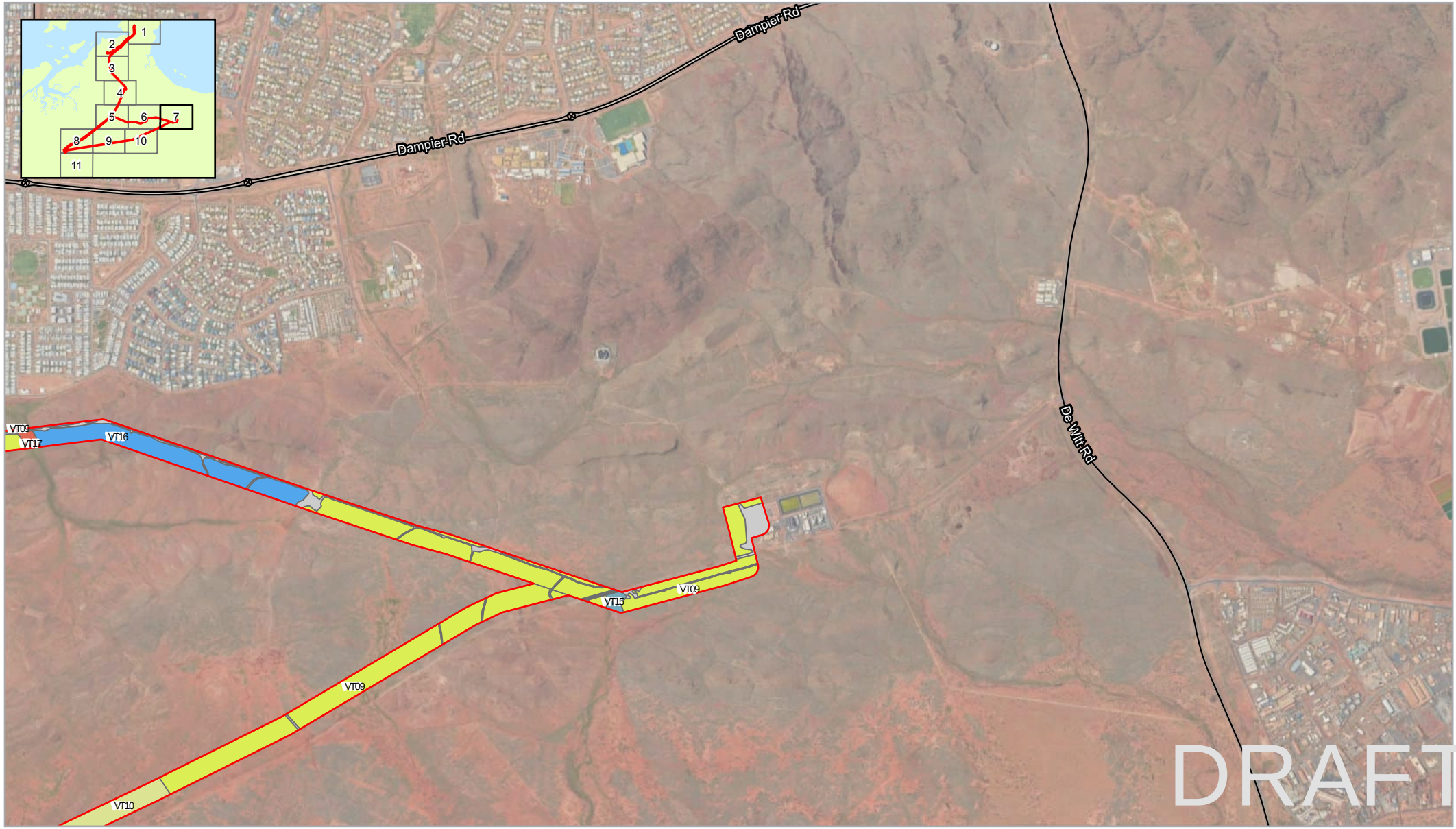
Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:17

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS. Created by: mmikkonen



Legend

- Major road
- Survey area

Vegetation Type

- VT09
- VT10
- VT15
- VT16
- VT17
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

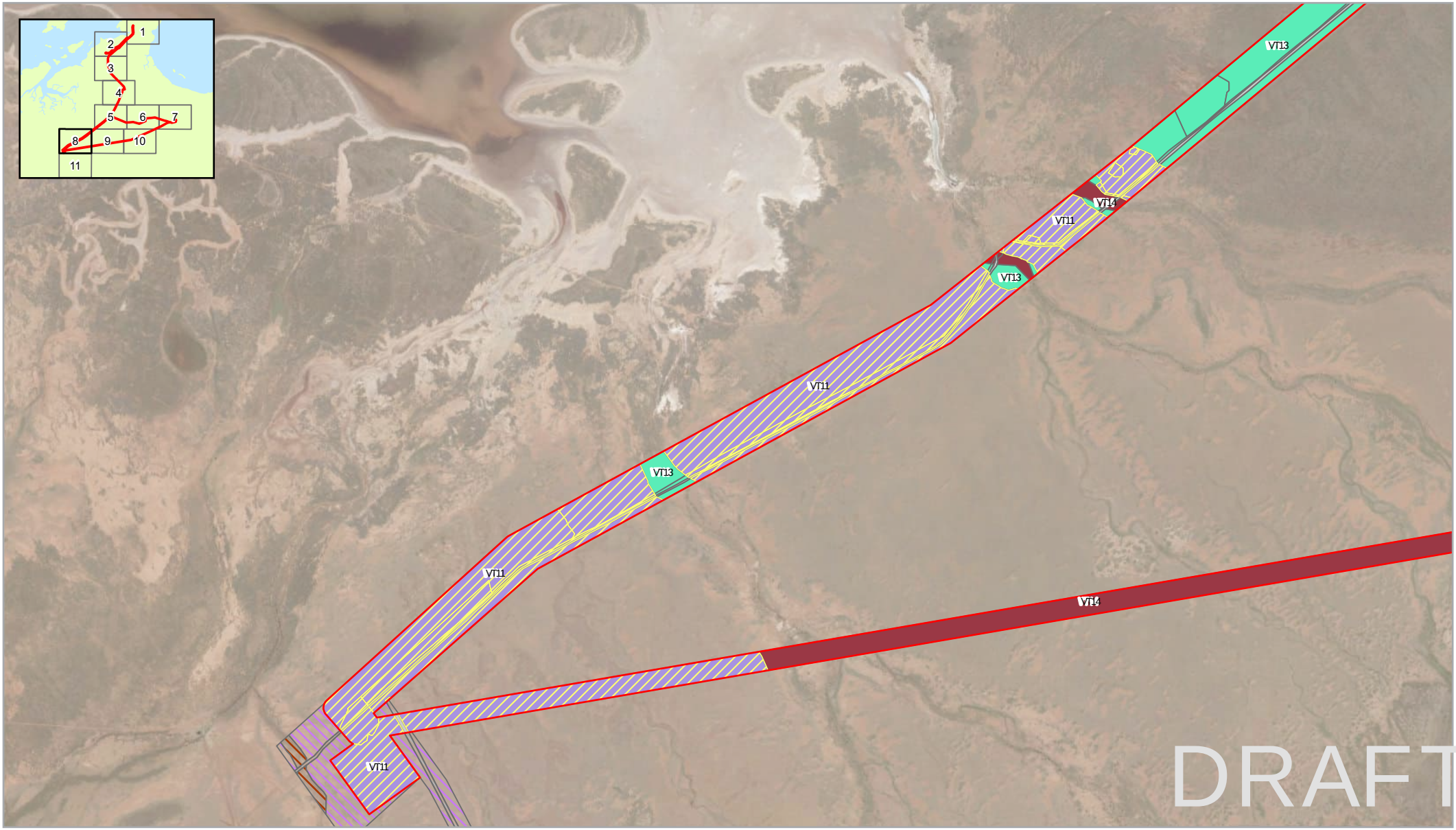
Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:17

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS. Created by: mmikkonen



Legend

Survey area

PEC 3 Horsefl at land system of the Roebourne Plains

Vegetation Type

VT11

VT13

VT14

Cleared

Vegetation Type - extrapolated

VT11

VT14

Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

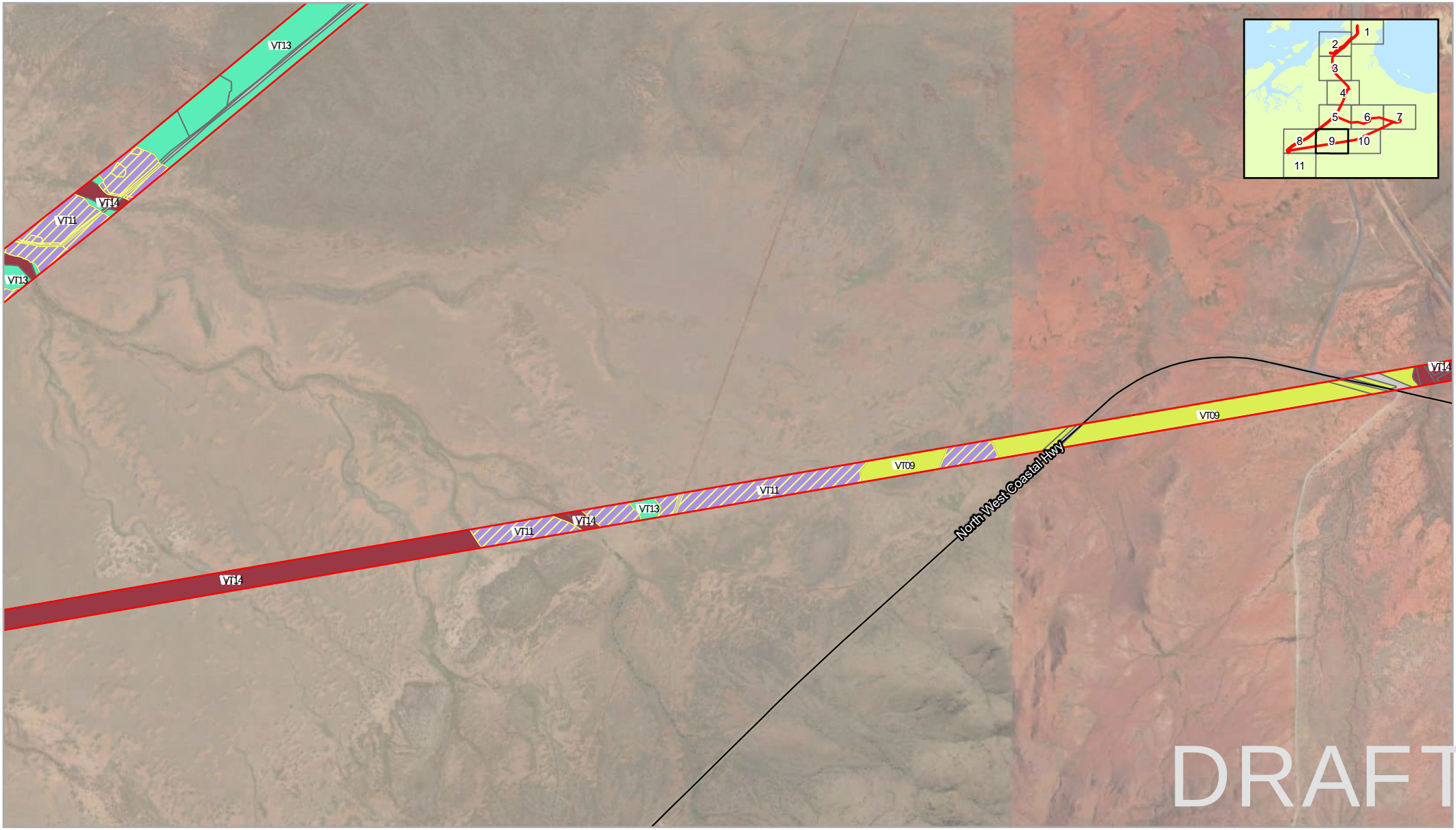
Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

Page 8 of 11
FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:17

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS . Created by: mmikkonen



Legend

- Major road
- Survey area
- PEC 3 Horseflat land system of the Roebourne Plains

Vegetation Type

- VT09
- VT11
- VT13
- VT14
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:21

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS. Created by: mmikkonen

Legend

- Major road
- Survey area
- PEC 3 Horseflat land system of the Roebourne Plains

Vegetation Type

- VT09
- VT10
- VT11
- VT14
- VT15
- VT17
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:17

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS . Created by: mmikkonen

Legend

- Major road
- Survey area
- PEC 3 Horseflat land system of the Roebourne Plains

Vegetation Type

- VT11

Vegetation Type - extrapolated

- VT11
- VT14
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Types

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 4

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_004_VegetationTypes_RevA
Print date: 21 Jul 2020 - 16:17

Data source: GHD Survey area, Vegetation types, PECs - 20200528; Landgate: Roads, Imagery - April 2018; WMS. Created by: mmikkonen

Legend

- Major road
- Survey area

Vegetation Condition
- Very Good
- Good
- Poor

- Cleared

Vegetation Condition - extrapolated
- Very Good

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANDow Landgate/ SLIP. Created by: mmikkonen

Legend

- Major road
- Survey area

Vegetation Condition

- Very Good
- Good
- Poor
- Completely Degraded
- Cleared

Vegetation Condition - extrapolated

- Good
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

Page 2 of 11
FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANdow Landgate/ SLIP. Created by: mmikkonen

Legend

Major road

Survey area

Vegetation Condition

Very Good

Good

Poor

Completely Degraded

Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANdow Landgate/ SLIP. Created by: mmikkonen

Legend

Major road

Survey area

Vegetation Condition

Good

Poor

Degraded

Completely Degraded

Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANdow Landgate/ SLIP. Created by: mmikkonen

Legend

- Major road
- Survey area

Vegetation Condition

- Very Good
- Good
- Poor
- Degraded
- Completely Degraded
- Cleared

Vegetation Condition - extrapolated

- Very Good
- Good
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

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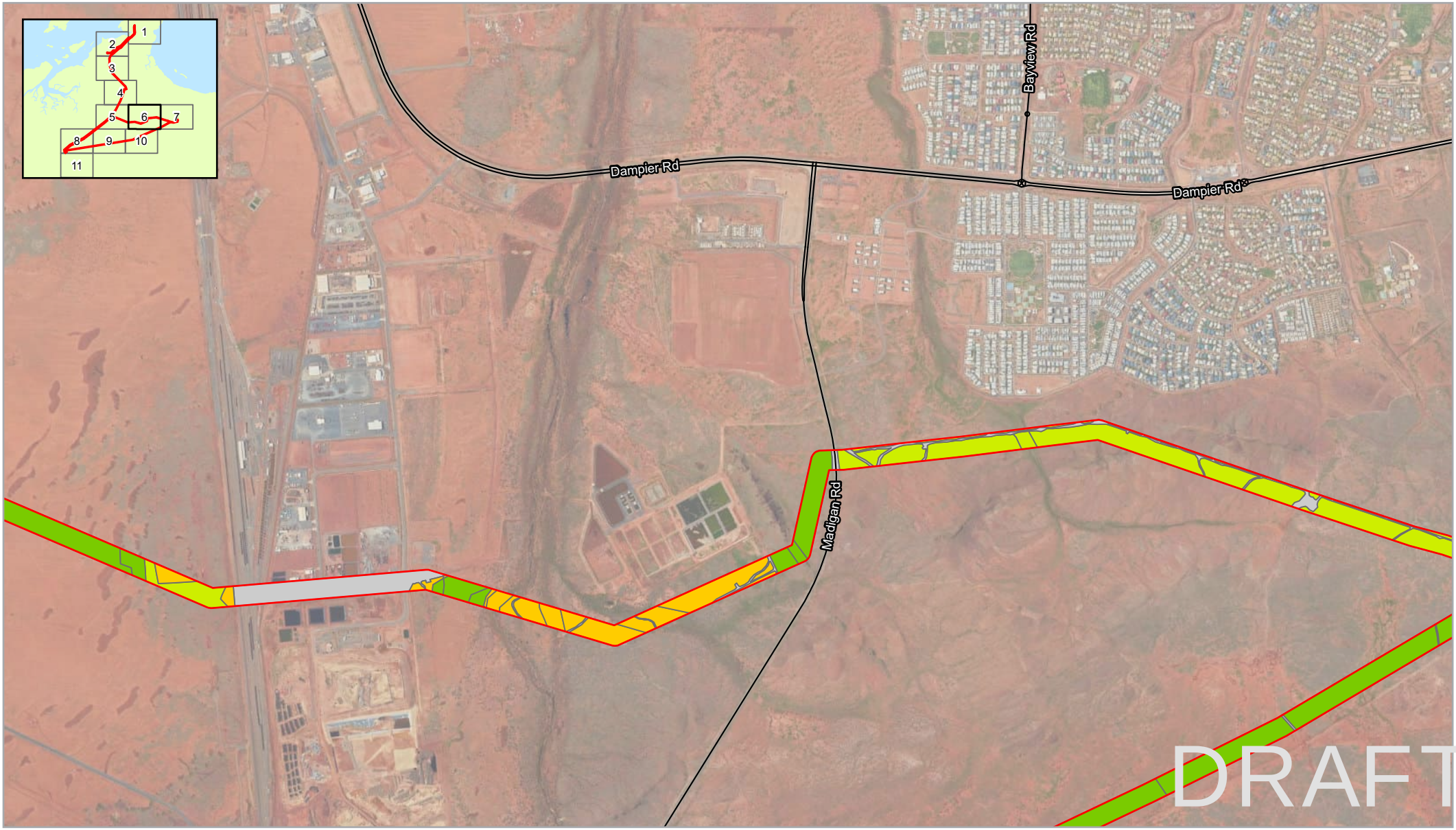


Legend

- Major road
- Survey area

Vegetation Condition

- Very Good
- Good
- Poor
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

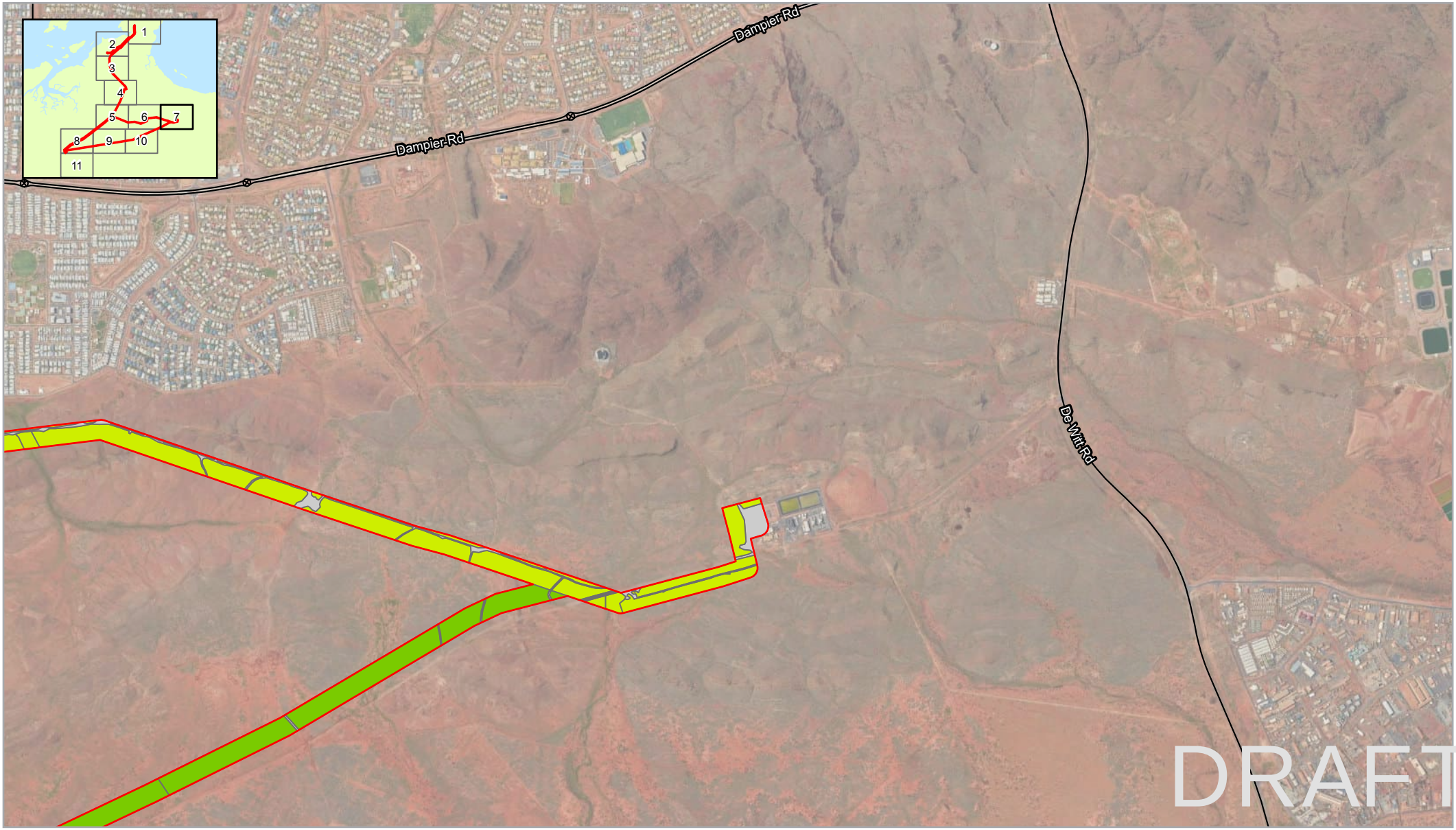
Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANdow Landgate/ SLIP. Created by: mmikkonen



Legend

- Major road
- Survey area

Vegetation Condition

- Very Good
- Good
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANdow Landgate/ SLIP. Created by: mmikkonen

Legend

- Survey area

Vegetation Condition

- Excellent
- Very Good
- Good
- Poor
- Degraded
- Cleared

Vegetation Condition - extrapolated

- Very Good
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
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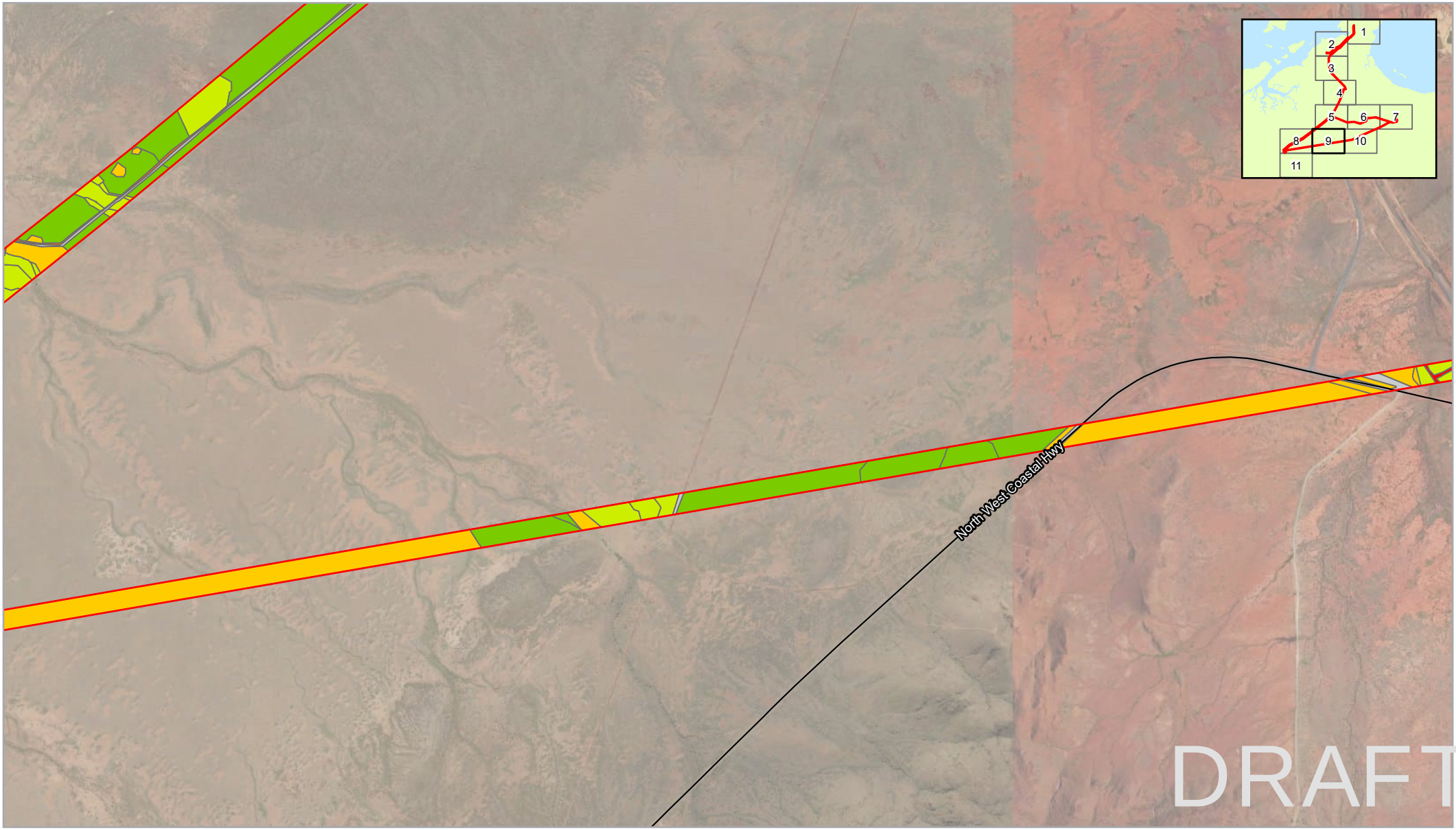

Legend

- Major road
- Survey area

Vegetation Condition

- Very Good
- Good
- Poor
- Degraded
- Completely Degraded
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
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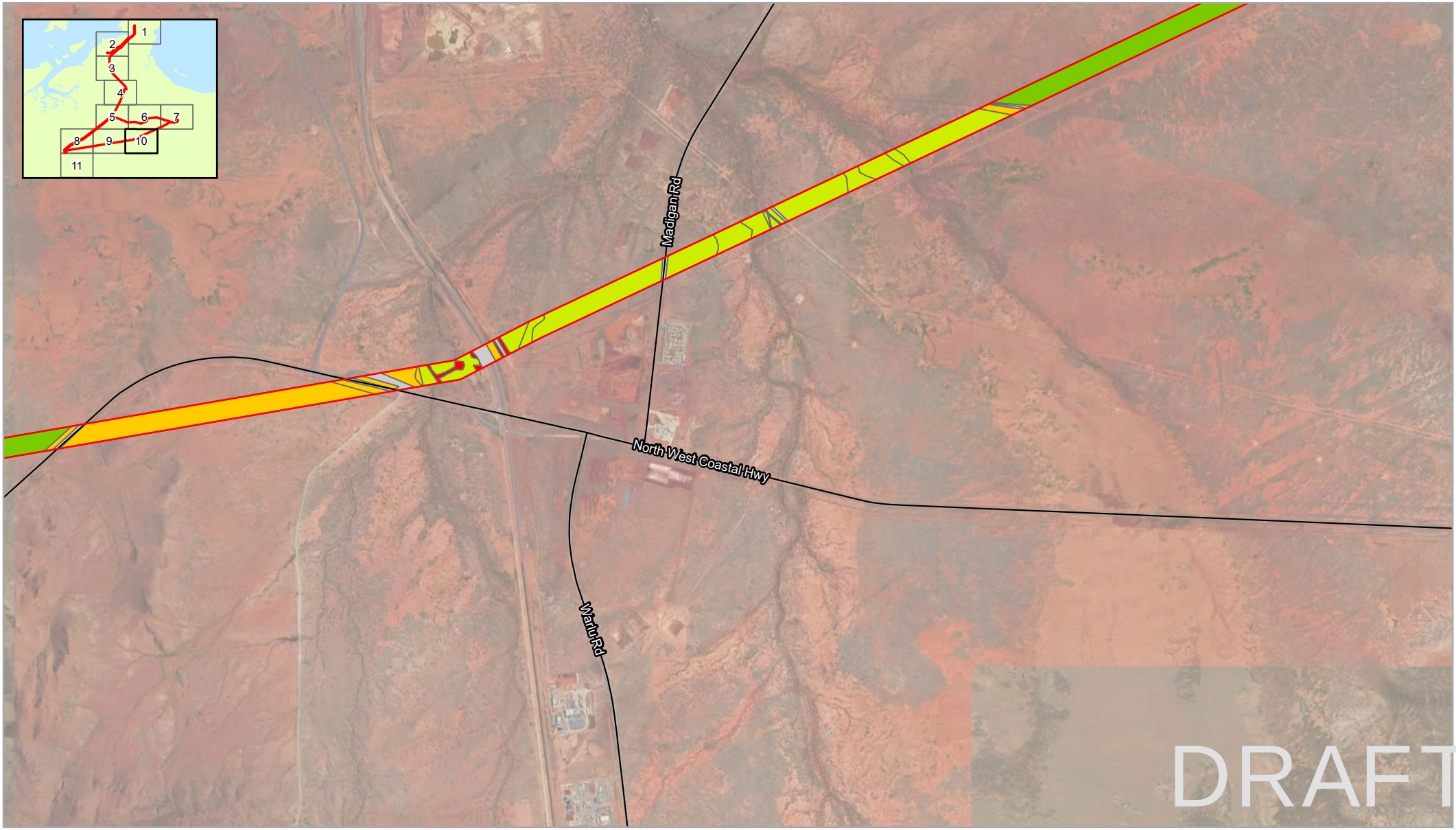
Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads; Imagery - April 2018; Landgate_Subscription_Imagery\WANdow Landgate/ SLIP. Created by: mmikkonen



Legend

- Major road
- Survey area

Vegetation Condition

- Very Good
- Good
- Poor
- Completely Degraded
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANdow Landgate/ SLIP. Created by: mmikkonen

Legend

- Major road
- Survey area

Vegetation Condition

- Very Good

Vegetation Condition - extrapolated

- Very Good
- Cleared

Paper Size ISO A4

0 200 400 600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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GHD

Horizon Power
287- Burrup Expansion Project
Flora & Vegetation Survey

Vegetation Condition

Project No. 12530473
Revision No. B
Date 21 Jul 2020

FIGURE 5

G:\61\12530473\GIS\Maps\Working\12530473_Figures\12530473_Figures.aprx\12530473_005_VegetationCondition_RevA
Print date: 21 Jul 2020 - 16:56

Data source: GHD Survey area, Vegetation condition - 20200528; Landgate Roads, Imagery - April 2018; Landgate_Subscription_Imagery\WANDow Landgate/ SLIP. Created by: mmikkonen

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Appendix B – Relevant legislation and background information

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

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

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

The EPBC Act is administered by the Department of Agriculture, Water and the Environment (DAWE).

State *Environmental Protection Act 1986*

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

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

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

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

State *Biodiversity and Conservation Act 2016*

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

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

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

State *Biosecurity and Agriculture Management Act 2007*

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

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

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

DPIRD Categories for Declared Pests under the BAM Act

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

Background information

Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared by the Minister for Environment under Section 51B of the EP Act. The Table below outlines the aspects of areas declared as ESA in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005.

Aspects of ESAs

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the EPBC Act.
An area that is included on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a Threatened Ecological Community.
A Bush Forever Site listed in "Bush Forever" Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission.
The areas covered by the *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.
The areas covered by the *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) applies.
Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

Reserves and conservation areas

Department of Biodiversity, Conservation and Attractions managed lands and waters

DBCA manages lands and waters throughout Western Australia to conserve ecosystems and species, and to provide for recreation and appreciation of the natural environment. DBCA managed lands and waters include national parks, conservation parks and reserves, marine parks and reserves, regional parks, nature reserves, State forest and timber reserves. DBCA managed conservation estate, is vested with the Conservation Commission of Western Australia. Access to, or through, some areas of DBCA managed lands may require a permit or could be restricted due to management activities. Proposed land use changes and development proposals that abut DBCA managed lands will generally be referred to DBCA throughout the assessment process.

Wetlands

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil.

Ramsar Listed Wetlands

The Convention of Wetlands of International Importance was signed in 1971 at the Iranian town of Ramsar. The Convention has since been referred to as the Ramsar Convention. Ramsar Listed wetlands are “sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity … because of their ecological, botanical, zoological, limnological or hydrological importance” (DAWE 2020b). Once a Ramsar Listed Wetland is designated, the country agrees to manage its conservation and ensure its wise use. Under the Convention, wise use is broadly defined as “maintaining the ecological character of a wetland” (DAWE 2020b).

Nationally important wetlands

Wetlands of national significance are listed under the Directory of Important Wetlands in Australia. Nationally important wetlands are wetlands which meet at least one of the following criteria (DAWE 2020a):

- It is a good example of a wetland type occurring within a biogeographic region in Australia
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail
- The wetland supports one percent or more of the national populations of any native plant or animal taxa
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level
- The wetland is of outstanding historical or cultural significance

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia’s biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia’s Biological Diversity (ANZECC 2000).

The extent of remnant native vegetation in WA has been assessed by Shepherd et al. (2002) and the GoWA (2018), based on broadscale vegetation association mapping by Beard (various publications). The GoWA produces Statewide Vegetation Statistics Reports that are used for a number of purposes including conservation planning, land use planning and when assessing development applications. The reports are updated at least every two years.

Vegetation condition

The vegetation condition can be assessed in accordance with the vegetation condition rating scale for the South West and Interzone Botanical Provinces (EPA 2016a). The scale recognises the intactness of vegetation and consists of six rating levels as outlined below.

Vegetation condition rating scale for the South West and Interzone Botanical Provinces

Condition	South West and Interzone Botanical Provinces description
Pristine	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State BC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Ecological communities

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act. The BC Act provides for the Minister to list an ecological community as a TEC (section 27), or as a collapsed ecological community (section 31) statutory listing of State TECs by the Minister. The legislation also describes statutory processes for preparing recovery plans for TECs, the registration of their critical habitat, and penalties for unauthorised modification of TECs.

Possible TECs that do not meet survey criteria are added to the DBCA Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in Priority 5. PECs are not listed under any formal Federal or State legislation, however, may be listed as TECs under the EPBC Act.

Conservation codes and definitions for TECs listed under the EPBC Act and/ or BC Act

Categories	Definition
Federal Government Conservation Categories (EPBC Act)	
Critically Endangered (CR)	An ecological community if, at that time, is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Endangered (EN)	An ecological community if, at that time: A) is not critically endangered; and B) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Vulnerable (VU)	An ecological community if, at that time: A) is not critically endangered or endangered; and B) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria (as outlined in Environment Protection and Biodiversity Conservation Regulations 2000)
Western Australia Conservation Categories (BC Act)	
Threatened Ecological Communities	

Categories	Definition
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.
Collapsed ecological communities	
An ecological community is eligible for listing as a collapsed ecological community at a particular time if, at that time – (a) there is no reasonable doubt that the last occurrence of the ecological community has collapsed); or (b) the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover – (i) its species composition or structure; or (ii) its species composition and structure. Section 33 of the BC Act provides for a collapsed ecological community to be regarded as a threatened ecological community if it is discovered in a state that no longer makes it eligible for listing as a collapsed ecological community.	

Conservation categories and definitions for PECS as listed by the DBCA

Category	Description
Priority 1	Poorly known ecological communities. Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2	Poorly known ecological communities. Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Category	Description
Priority 3	Poorly known ecological communities. (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
Priority 4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
Priority 5	Conservation Dependent ecological communities. Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Other significant vegetation

Vegetation may be significant for a range of reasons other than a statutory listing. The EPA (2016b) states that significant vegetation may include vegetation that includes the following:

- Restricted distribution
- Degree of historical impact from threatening processes
- Local endemism in restricted habitats
- Novel combinations of taxa
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of a vegetation unit in 'pristine' condition in a highly cleared landscape, recently discovered range extensions, or isolated outliers of the main range)
- Being poorly reserved.

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the BC Act can warrant referral to the DAWE and/or the EPA.

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

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

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

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

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna 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.

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

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

Conservation category	Definition
Threatened species	
Critically Endangered (CR)	Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.
Endangered (EN)	Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines
Vulnerable (VU)	Threatened species considered to be “facing a high risk of extinction in the wild in the medium term future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.

Conservation codes for DBCA listed Priority flora and fauna

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

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

Other significant flora

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than a statutory listing. The EPA (2016b) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened or Priority flora or fauna species, or large populations representing a considerable proportion of the local or regional total population of a species
- Relictual status, being representation of taxonomic or physiognomic groups that no longer occur widely in the broader landscape
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism (a restricted distribution) or association with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems)
- Being poorly reserved

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007.*

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty-two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012.

References

ANZECC 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.

Commonwealth of Australia 2001, *National Targets and Objectives for Biodiversity Conservation 2001–2005*, Canberra, AGPS.

Department of Agriculture, Water and the Environment (DAWE) 2020a, *Criteria for determining nationally important wetlands*, retrieved 2020, from http://www.environment.gov.au/topics/water/water-our-environment/wetlands/australian-wetlands-database/directory-important.

Department of Agriculture, Water and the Environment (DAWE) 2020b, *The Ramsar Convention on Wetlands*, retrieved 2020, from http://www.environment.gov.au/topics/water/water-our-environment/wetlands/ramsar-convention-wetlands.

English, V and Blyth, J 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, Perth, Department of Conservation and Land Management.

EPA 2010, *Technical Guide – Terrestrial Fauna Surveys*, EPA, Perth, WA.

EPA 2016a, *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment*, EPA, Perth, WA.

EPA 2016b, *Environmental Factor Guideline - Flora and Vegetation*, EPA, Perth, WA.

GoWA 2018, *Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report)*, Current as of December 2017, Perth Western Australia, Department of Environment and Conservation, from https://www2.landgate.wa.gov.au/web/guest/downloader.

Shepherd, DP, Beeston, GR & Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status, Resource Management Technical Report 249*, Perth, Department of Agriculture.

Appendix C – Desktop searches

EPBC Act PMST (10 km buffer)

NatureMap Flora Report (20 km buffer)

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 22/04/2020

Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 116° 45' 47" E,20° 40' 14" S
Buffer 20km
Group By Kingdom

Kingdom	Species	Records
Animalia	713	8527
Chromista	26	68
Fungi	8	9
Plantae	656	3902
TOTAL	**1403**	**12506**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Animalia					
1.		*? ?*			
2.		*Abudefduf bengalensis*			
3.		*Acanthopagrus latus*			
4.		*Acanthophis wellsei*			
5.	25332	*Acanthophis wellsi (Pilbara Death Adder)*			
6.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
7.	25536	*Accipiter fasciatus (Brown Goshawk)*			
8.		*Acentrogobius gracilis*			
9.		*Acentrogobius sp.*			
10.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
11.		*Actacarus pacificus*			
12.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
13.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
14.		*Agauopsis arborea*			Y
15.		*Agauopsis dasyderma*			Y
16.		*Agauopsis moorea*			Y
17.		*Agauopsis obtusa*			Y
18.		*Agraptocorixa parvipunctata*			
19.		*Alepes apercna*			
20.		*Alepes mate*			Y
21.		*Allodessus bistrigatus*			
22.		*Alluaudomyia sp.*			
23.		*Alona cf. verrucosa*			
24.		*Alona rigidicaudis*			
25.		*Ambassis vachellii*			
26.		*Amblyeleotris gymnocephala*			
27.		*Amblygobius bynoensis*			
28.		*Amblyomma triguttatum*			
29.		*Amniataba caudavittata*			
30.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
31.		*Aname mainae*			
32.		*Aname mellosa*			
33.	24312	*Anas gracilis (Grey Teal)*			
34.	24316	*Anas superciliosa (Pacific Black Duck)*			
35.		*Anax papuensis*			
36.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
37.	44628	*Anilios ammodytes*			
38.	44635	*Anilios grypus*			
39.		*Anisops canaliculatus*			
40.		*Anisops hackeri*			
41.		*Anisops nasutus*			
42.		*Anisops sp.*			
43.		*Anomalohalacarus dampierensis*			Y

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
44.		*Anopheles annulipes s.l.*			
45.	24505	*Anous stolidus subsp. pileatus (Common Noddy)*		IA	
46.	25317	*Antaresia childreni (Children's Python)*			
47.	25318	*Antaresia perthensis (Pygmy Python)*			
48.	25448	*Antaresia stimsoni (Stimson's Python)*			
49.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
50.	25670	*Anthus australis (Australian Pipit)*			
51.		*Apistus carinatus*			
52.		*Apogon brevicaudatus*			
53.		*Apogon cavitiensis*			
54.		*Apogon cookii*			
55.		*Apogon fasciatus*			
56.		*Apogon rueppellii*			
57.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
58.	24285	*Aquila audax (Wedge-tailed Eagle)*			
59.	25559	*Ardea intermedia (Intermediate Egret)*			
60.	41324	*Ardea modesta (great egret, white egret)*			
61.	24341	*Ardea pacifica (White-necked Heron)*			
62.	48573	*Ardenna pacifica (Wedge-tailed Shearwater)*		IA	
63.	24610	*Ardeotis australis (Australian Bustard)*			
64.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
65.		*Arius leptaspis*			Y
66.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
67.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
68.	24354	*Artamus leucorynchus subsp. leucopygialis (White-breasted Woodswallow)*			
69.	24355	*Artamus minor (Little Woodswallow)*			
70.	24356	*Artamus personatus (Masked Woodswallow)*			
71.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
72.		*Arthrorhabdus paucispinus*			
73.	25320	*Aspidites melanocephalus (Black-headed Python)*			
74.	25236	*Aspidites ramsayi (Woma)*			
75.		*Asterorhombus intermedius*			
76.		*Asterropteryx semipunctatus*			
77.		*Atule mate*			
78.		*Austrostrophus stictopygus*			
79.	24318	*Aythya australis (Hardhead)*			
80.		*Barnardius zonarius*			
81.		*Bathygobius fuscus*			
82.		*Bathygobius laddi*			
83.		*Batrachomoeus dahli*			
84.		*Bdelloidea sp. 2:2*			
85.		*Berosus pulchellus*			
86.		*Bostrychus sinensis*			Y
87.	25331	*Brachyurophis approximans (North-western Shovel-nosed Snake)*			
88.		*Bryaninops loki*			
89.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
90.	47897	*Butorides striata (Striated Heron, Mangrove Heron)*			
91.	25715	*Cacatua roseicapilla (Galah)*			
92.	25716	*Cacatua sanguinea (Little Corella)*			
93.	24727	*Cacatua sanguinea subsp. westralensis (Little Corella)*			
94.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
95.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
96.	24780	*Calidris alba (Sanderling)*		IA	
97.	25738	*Calidris canutus (Red Knot, knot)*		IA	
98.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
99.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
100.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
101.	24790	*Calidris tenuirostris (Great Knot)*		T	
102.		*Callionymus japonicus*			Y
103.		*Callionymus russelli*			
104.		*Callionymus sp.*			
105.	48920	*Canis familiaris (Dog, Dingo)*	Y		
106.	24253	*Capra hircus (Goat)*	Y		
107.		*Carangoides sp.*			
108.		*Caranx bucculentus*			
109.		*Carcharhinus brachyurus*			
110.		*Carenum pulchrum*			
111.		*Carenum subplanatum*			
112.		*Carenum venustum*			
113.	25015	*Carlia munda (Shaded-litter Rainbow Skink)*			

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114.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
115.		*Catadromus lacordairei*			
116.		*Centrogenys vaigiensis*			
117.	25600	*Centropus phasianinus (Pheasant Coucal)*			
118.		*Cephalopholis boenak*			
119.		*Ceriodaphnia cornuta*			
120.		*Ceriodaphnia n. sp. a (Berner sp.#3) (SAP)*			
121.		*Ceriodaphnia n. sp. c (Berner sp.#1) (SAP)*			
122.	24181	*Chaerephon jobensis (Greater Northern Freetail-bat, Northern Mastiff Bat)*			
123.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
124.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
125.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
126.	24378	*Charadrius veredus (Oriental Plover)*		IA	
127.		*Cheilopogon arcticeps*			
128.		*Chelmon marginalis*			
129.		*Chelmon muelleri*			
130.	25336	*Chelonia mydas (Green Turtle)*		T	
131.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
132.		*Cheumatopsyche wellsae*			
133.		*Chirocentrus dorab*			
134.		*Chironomus aff. alternans (V24) (CB)*			
135.		*Chlaenius australis*			
136.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
137.		*Choerodon cyanodus*			
138.		*Chroicocephalus novaehollandiae*			
139.		*Chromileptes altivelis*			
140.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
141.	24288	*Circus approximans (Swamp Harrier)*			
142.	24289	*Circus assimilis (Spotted Harrier)*			
143.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
144.		*Cloeon sp.*			
145.	24399	*Columba livia (Domestic Pigeon)*	Y		
146.		*Congrogadus subducens*			
147.		*Copidognathus lutarius*			Y
148.		*Copidognathus meridianus*			
149.		*Copidognathus piger*			Y
150.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
151.		*Coris sp.*			
152.	24416	*Corvus bennetti (Little Crow)*			
153.	25593	*Corvus orru (Torresian Crow)*			
154.	24419	*Corvus splendens (House Crow)*			
155.	25701	*Coturnix ypsilophora (Brown Quail)*			
156.	24673	*Coturnix ypsilophora subsp. australis (Brown Quail)*			
157.	24672	*Coturnix ypsilophora subsp. cervina (Brown Quail)*			
158.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
159.	25595	*Cracticus tibicen (Australian Magpie)*			
160.	25596	*Cracticus torquatus (Grey Butcherbird)*			
161.		*Craterocephalus pauciradiatus*			
162.	24919	*Crenadactylus ocellatus subsp. horni (Clawless Gecko)*			
163.	30893	*Cryptoblepharus buchananii*			
164.	25020	*Cryptoblepharus plagiocephalus*			
165.	30892	*Cryptoblepharus ustulatus*			
166.		*Cryptochironomus griseidorsum*			
167.		*Cryptoerithus halli*			
168.		*Cryptoerithus occultus*			
169.	25458	*Ctenophorus caudicinctus (Ring-tailed Dragon)*			
170.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
171.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
172.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
173.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
174.	24886	*Ctenophorus reticulatus (Western Netted Dragon)*			
175.		*Ctenotrypauchen microcephalus*			
176.	25024	*Ctenotus angusticeps (Airlie Island Ctenotus, Northwestern coastal Ctenotus)*		P3	
177.	25027	*Ctenotus australis*			
178.	25036	*Ctenotus duricola*			
179.	25462	*Ctenotus grandis*			
180.	25043	*Ctenotus grandis subsp. titan*			
181.	25045	*Ctenotus helenae*			
182.	25052	*Ctenotus leonhardii*			
183.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			

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184.	25060	*Ctenotus pantherinus subsp. acripes (Leopard Ctenotus)*			
185.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
186.	25072	*Ctenotus rubicundus*			
187.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
188.	25074	*Ctenotus schomburgkii*			
189.	25077	*Ctenotus serventyi*			
190.		*Culex crinicauda*			
191.		*Culex palpalis*			
192.		*Cybister tripunctatus*			
193.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
194.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
195.	25371	*Cyclorana australis (Giant Frog)*			
196.	25375	*Cyclorana maini (Sheep Frog)*			
197.	24322	*Cygnus atratus (Black Swan)*			
198.		*Cymbacephalus bosschei*			
199.		*Cynoglossus maculipinnis*			
200.		*Cynoglossus sp.*			
201.		*Cypretta sp PSW074*			
202.		*Cypricercus sp. 422 (CB)*			
203.		*Dasyheleinae sp. P2 (PSW)*			
204.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
205.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
206.	24996	*Delma borea*			
207.	25001	*Delma nasuta*			
208.	25002	*Delma pax*			
209.	25004	*Delma tincta*			
210.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
211.	25295	*Demansia psammophis subsp. cupreiceps (Yellow-faced Whipsnake)*			
212.	25297	*Demansia rufescens (Rufous Whipsnake)*			
213.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
214.		*Dexillus muelleri*			
215.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
216.		*Dicrotendipes P5 (=balciunasi?) (PSW)*			
217.		*Difflugia sp. P1*			
218.		*Dinematichthys sp.*			
219.		*Dineutus australis*			
220.		*Diplacodes bipunctata*			
221.		*Diplacodes haematodes*			
222.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
223.	41404	*Diplodactylus galaxias (Northern Pilbara Beak-faced Gecko)*			
224.	24937	*Diplodactylus mitchelli*			
225.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
226.		*Dischistodus darwiniensis*			
227.	24470	*Dromaius novaehollandiae (Emu)*			
228.		*Drombus sp.*			
229.	24084	*Dugong dugon (Dugong)*		S	
230.		*Ecnomus pilbarensis*			
231.	25092	*Egernia depressa (Southern Pygmy Spiny-tailed Skink)*			
232.	25101	*Egernia pilbarensis (Pilbara Skink)*			
233.		*Egretta garzetta*			
234.		*Egretta novaehollandiae*			
235.		*Elanus axillaris*			
236.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
237.		*Eleutheronema tetradactylum*			
238.		*Elops hawaiensis*			
239.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
240.	24631	*Emblema pictum (Painted Finch)*			
241.		*Encentridophorus sarasini*			
242.		*Enchytraeidae sp.*			
243.		*Engyprosopon sp.*			
244.		*Enneapterygius gracilis*			
245.		*Enneapterygius philippinus*			
246.		*Enneapterygius sp.*			
247.		*Enochrus deserticola*			
248.		*Eolophus roseicapillus*			
249.	24653	*Eopsaltria pulverulenta (Mangrove Robin)*			
250.	25362	*Ephalophis greyae*			
251.		*Ephemeroporus barroisi s.l.*			
252.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
253.		*Ephydridae sp. 12 (PSW)*			

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254.		*Epinephelus bilobatus*			
255.		*Epinephelus coioides*			
256.		*Epinephelus malabaricus*			
257.		*Epinephelus quoyanus*			
258.		*Epinephelus sexfasciatus*			
259.	24568	*Epthianura aurifrons (Orange Chat)*			
260.	24570	*Epthianura tricolor (Crimson Chat)*			
261.	42404	*Eremiascincus isolepis*			
262.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
263.	24837	*Eremiornis carteri (Spinifex-bird)*			
264.		*Eretes australis*			
265.	25473	*Eretmochelys imbricata (Hawksbill Turtle)*		T	
266.	25342	*Eretmochelys imbricata subsp. bissa (Hawksbill Turtle)*		T	
267.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
268.	47938	*Esacus magnirostris (Beach Stone-curlew, Beach Thick-knee)*			
269.		*Ethmostigmus curtipes*			
270.		*Euchlanis lyra*			
271.		*Euglypha sp.*			
272.		*Euristhmus microceps*			
273.		*Euristhmus sandrae*			Y
274.	24368	*Eurostopodus argus (Spotted Nightjar)*			
275.		*Eviota queenslandica*			
276.	25621	*Falco berigora (Brown Falcon)*			
277.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
278.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
279.	25623	*Falco longipennis (Australian Hobby)*			
280.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
281.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
282.	24476	*Falco subniger (Black Falcon)*			
283.		*Favonigobius melanobranchus*			
284.		*Favonigobius sp.*			
285.	24041	*Felis catus (Cat)*	Y		
286.		*Festucalex sp.*			
287.	25327	*Fordonia leucobalia (White-bellied Mangrove Snake)*			
288.		*Fowleria aurita*			
289.	24478	*Fregata ariel (Lesser Frigatebird)*		IA	
290.	25727	*Fulica atra (Eurasian Coot)*			
291.	25301	*Furina ornata (Moon Snake)*			
292.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
293.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
294.	42314	*Gavicalis virescens (Singing Honeyeater)*			
295.	24956	*Gehyra pilbara*			
296.	24958	*Gehyra punctata*			
297.	24959	*Gehyra variegata*			
298.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
299.	24401	*Geopelia cuneata (Diamond Dove)*			
300.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
301.	25585	*Geopelia striata (Zebra Dove)*			
302.	24403	*Geopelia striata subsp. placida (Peaceful Dove)*			
303.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
304.		*Geoscaptus laevissimus*			
305.		*Gerres filamentosus*			
306.		*Gerres subfasciatus*			
307.	25530	*Gerygone fusca (Western Gerygone)*			
308.		*Gerygone sp.*			
309.	24276	*Gerygone tenebrosa (Dusky Gerygone)*			
310.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
311.		*Glyptophysa sp*			
312.		*Gnatholepis argus*			
313.		*Gobiodon rivulatus*			
314.		*Gobiodon sp.*			
315.	24443	*Grallina cyanoleuca (Magpie-lark)*			
316.	24484	*Grus rubicunda (Brolga)*			
317.		*Gymnothorax pseudothyrsoideus*			
318.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
319.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
320.		*Haematopus ostralegus*			Y
321.		*Halacaridae sp.*			
322.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
323.	25541	*Haliastur indus (Brahminy Kite)*			

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324.	24294	*Haliastur indus subsp. girrenera (Brahminy Kite)*			
325.	24295	*Haliastur sphenurus (Whistling Kite)*			
326.		*Halichoeres nigrescens*			
327.		*Halichoeres sp.*			
328.		*Halieutaea brevicaudata?*			
329.		*Haliichthys taeniophorus*			
330.		*Halophryne diemensis*			
331.	24297	*Hamirostra melanosternon (Black-breasted Buzzard)*			
332.		*Hellyethira sp.*			
333.		*Hemicordulia sp.*			
334.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
335.		*Herklotsichthys koningsbergeri*			
336.		*Heterocypris tatei*			
337.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
338.	47965	*Hieraaetus morphnoides (Little Eagle)*			
339.	25734	*Himantopus himantopus (Black-winged Stilt)*			
340.		*Hippichthys penicillus*			
341.	24491	*Hirundo neoxena (Welcome Swallow)*			
342.	25630	*Hirundo rustica (Barn Swallow)*		IA	
343.		*Hogna crispipes*			
344.		*Hydraena sp.*			
345.	25363	*Hydrelaps darwiniensis*			
346.		*Hydrochus obscuroaeneus*			
347.		*Hydroglyphus grammopterus (=trilineatus)*			
348.		*Hydroglyphus leai*			
349.		*Hydroglyphus orthogrammus*			
350.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
351.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
352.		*Hyphydrus elegans*			
353.		*Hyphydrus lyratus*			
354.		*Hypopterus macropterus*			
355.		*Ilyocypris australiensis*			
356.		*Ilyodromus sp BOS25*			
357.		*Indolpium sp.*			
358.		*Inegocia japonica*			
359.		*Ischnura aurora aurora*			
360.		*Isidorella egraria*			
361.		*Isobactrus australiensis*			Y
362.		*Isobactrus obesus*			Y
363.		*Isopedella gibsandi*			
364.		*Isopedella tindalei*			
365.		*Istiblennius meleagris*			
366.		*Istigobius nigroocellatus*			
367.		*Istigobius ornatus*			
368.		*Keratella procurva*			
369.		*Laccophilus sharpi*			
370.	24367	*Lalage tricolor (White-winged Triller)*			
371.		*Lampona ampeinna*			
372.		*Lampona cylindrata*			
373.		*Lamponina scutata*			
374.		*Larsia albiceps*			
375.	25637	*Larus novaehollandiae (Silver Gull)*			
376.	25638	*Larus pacificus (Pacific Gull)*			
377.		*Latonopsis australis*			
378.		*Latrodectus geometricus*			
379.		*Leberis cf. diaphanus*			
380.		*Lecane bulla*			
381.		*Lecane luna*			
382.		*Lecane punctata*			
383.		*Lecane thalera*			
384.		*Lecane ungulata*			
385.	24217	*Leggadina lakedownensis (Northern Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga)*		P4	
386.		*Leiognathus sp.*			
387.		*Lepadella patella*			
388.		*Lepidotrigla sp.*			
389.	25125	*Lerista bipes*			
390.	30928	*Lerista clara*			
391.	30929	*Lerista jacksoni*			
392.	25155	*Lerista muelleri*			

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393.	30925	*Lerista verhmens*			
394.	25005	*Lialis burtonis*			
395.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
396.	25239	*Liasis olivaceus subsp. olivaceus (Olive Python)*			
397.	25661	*Lichmera indistincta (Brown Honeyeater)*			
398.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
399.		*Limbodessus compactus*			
400.	25739	*Limicola falcinellus (Broad-billed Sandpiper)*		IA	
401.		*Limnadopsis "pilbarensis" (ex P2)(PSW)*			Y
402.		*Limnocythere dorsosicula*			
403.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
404.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
405.		*Liocranium praepositum*			
406.		*Litarachna bartschae*			Y
407.	25392	*Litoria rubella (Little Red Tree Frog)*			
408.		*Liza alata*			
409.		*Liza subviridis*			
410.		*Liza vaigiensis*			
411.		*Lophiocharon trisignatus*			
412.	30933	*Lucasium stenodactylum*			
413.		*Lutjanus argentimaculatus*			
414.		*Lutjanus carponotatus*			
415.		*Lutjanus malabaricus*			
416.		*Lutjanus russellii*			
417.		*Lychas sp. 2*			
418.		*Macrochaetus sp.*			
419.	24180	*Macroderma gigas (Ghost Bat)*		T	
420.	25489	*Macropus robustus (Euro, Biggada)*			
421.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
422.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
423.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
424.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
425.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
426.	24583	*Manorina flavigula (Yellow-throated Miner)*			
427.		*Megacephala greyana*			
428.	24051	*Megaptera novaeangliae (Humpback Whale)*		S	
429.	24736	*Melopsittacus undulatus (Budgerigar)*			
430.	25184	*Menetia greyii*			
431.	25491	*Menetia surda*			
432.	25187	*Menetia surda subsp. surda*			
433.	24598	*Merops ornatus (Rainbow Bee-eater)*			
434.		*Mesocyclops brooksi*			
435.		*Mesovelia hungerfordi*			
436.		*Metacyclops sp. P2 (PSW)*			
437.		*Metavelifer multiradiatus*			
438.		*Microgнathus micronotopterus*			
439.		*Micronecta n. sp. P3 (PSW)*			
440.		*Microvelia (Austromicrovelia) peramoena*			
441.	25542	*Milvus migrans (Black Kite)*			
442.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
443.		*Monacanthus chinensis*			
444.		*Monodactylus argenteus*			
445.		*Monommata sp.*			
446.	25495	*Morethia ruficauda*			
447.	25193	*Morethia ruficauda subsp. exquisita*			
448.		*Mormopterus (Ozimops) cobourgianus*			
449.	24183	*Mormopterus loriae (Little Northern Freetail-bat)*			
450.		*Mugil cephalus*			
451.		*Muraenichthys sp.*			
452.	24223	*Mus musculus (House Mouse)*	Y		
453.		*Muscidae sp. P1*			
454.		*Naididae (ex Tubificidae)*			
455.	25344	*Natator depressus (Flatback Turtle)*		T	
456.		*Nebrius ferrugineus*			Y
457.		*Nematoda sp. P2/P4 (PSW)*			
458.		*Nemipterus celebicus*			
459.	25685	*Neochmia ruficauda (Star Finch)*			
460.		*Neopsephotus bourkii*			
461.		*Nephila edulis*			
462.		*Netuma proxima*			

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463.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
464.	48016	*Ninox boobook (Boobook Owl)*			
465.	25430	*Notaden nichollsi (Desert Spadefoot)*			
466.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
467.	25196	*Notoscincus butleri (lined soil-crevice skink (Dampier))*		P4	
468.	25197	*Notoscincus ornatus subsp. ornatus*			
469.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
470.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
471.	25742	*Numenius phaeopus (Whimbrel)*		IA	
472.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
473.	24192	*Nyctophilus arnhemensis (Arnhem Land Long-eared Bat)*			
474.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
475.		*Nyctophilus geoffroyi subsp. pallescens*			
476.	24742	*Nymphicus hollandicus (Cockatiel)*			
477.	24497	*Oceanites oceanicus (Wilson's Storm-petrel)*		IA	
478.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
479.	24976	*Oedura marmorata (Marbled Velvet Gecko)*			
480.		*Omobranchus punctatus*			
481.		*Omobranchus rotundiceps*			
482.		*Omobranchus sp.*			
483.		*Omoedus orbiculatus*			
484.		*Onigocia pedimacula*			
485.		*Onigocia pedimacula?*			
486.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
487.		*Ophichthus celebicus?*			
488.		*Opisthopora sp.*			
489.		*Opistognathus darwiniensis*			
490.		*Orthetrum caledonicum*			
491.		*Orthomorpha coarctata*			
492.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
493.	48034	*Osphranter robustus (Euro, Biggada)*			
494.		*Ostracoda (unident.)*			
495.	34016	*Ovis aries (Sheep)*			
496.		*Oxyopes variabilis*			
497.		*Oxyurichthys sp.*			
498.	24620	*Pachycephala lanioides (White-breasted Whistler)*			
499.	25678	*Pachycephala melanura (Mangrove Golden Whistler)*			
500.	24621	*Pachycephala melanura subsp. melanura (Mangrove Golden Whistler)*			
501.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
502.		*Pandaka lidwilli*			
503.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
504.		*Pantala flavescens*			
505.		*Parachaeturichthys sp.*			Y
506.		*Paracymus pygmaeus*			
507.		*Paracymus spenceri*			
508.		*Paraexocoetus brachypterus*			Y
509.		*Paramonacanthus choirocephalus*			
510.		*Parapercis diplospilus*			
511.		*Parascorpaena picta*			
512.		*Paratanytarsus sp. P2 (PSW)*			
513.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
514.	48053	*Pardalotus rubricatus subsp. rubricatus (Red-browed Pardalote)*			Y
515.	25682	*Pardalotus striatus (Striated Pardalote)*			
516.	25687	*Passer domesticus (House Sparrow)*	Y		
517.	24642	*Passer montanus (Eurasian Tree Sparrow)*	Y		
518.		*Pediana horni*			
519.		*Pediana tenuis*			
520.		*Pegasus volitans*			
521.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
522.		*Peneoenanthe pulverulenta*			
523.		*Pentapodus porosus*			
524.		*Pentapodus sp.*			
525.		*Periophthalmus argentilineatus*			
526.	48060	*Petrochelidon ariel (Fairy Martin)*			
527.	48061	*Petrochelidon nigricans (Tree Martin)*			
528.	24144	*Petrogale rothschildi (Rothschild's Rock-wallaby)*			
529.		*Petroscirtes mitratus*			
530.	25697	*Phalacrocorax carbo (Great Cormorant)*			
531.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
532.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			

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533.	25699	*Phalacrocorax varius (Pied Cormorant)*			
534.	24411	*Phaps histrionica (Flock Bronzewing, Flock Pigeon)*			
535.		*Phreodrilid with dissimilar ventral chaetae*			
536.		*Phreodrilid with similar ventral chaetae*			
537.		*Pilbarascutigera incola*			
538.		*Pilbarophreatoicus platyarthricus*			
539.		*Pisodonophis cancrivorus*			
540.	24677	*Pitta moluccensis (Blue-winged Pitta)*			
541.		*Planigale sp. nov.*			
542.	24842	*Platalea regia (Royal Spoonbill)*			
543.		*Platycephalus endrachtensis*			
544.		*Platycephalus sp.*			
545.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
546.		*Pleurosicya sp.*			
547.		*Plotosus lineatus*			
548.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
549.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
550.	25703	*Podargus strigoides (Tawny Frogmouth)*			
551.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
552.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
553.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
554.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
555.		*Polydactylus multiradiatus*			
556.		*Polypedilum nubifer*			
557.		*Pomadasys kaakan*			
558.		*Pomadasys maculatus*			
559.		*Pontarachne australis*			Y
560.		*Priacanthus hamrur*			
561.		*Priolepis nuchifasciata*			
562.		*Pristotis obtusirostris*			
563.		*Procladius paludicola*			
564.		*Protonibea diacanthus*			
565.		*Psettodes erumei*			
566.	24105	*Pseudantechinus roryi (Rory's Pseudantechinus)*			
567.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
568.	25261	*Pseudechis australis (Mulga Snake)*			
569.	24233	*Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)*		P4	
570.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
571.	24235	*Pseudomys desertor (Desert Mouse)*			
572.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
573.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
574.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
575.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
576.		*Pseudorhombus arsius*			
577.		*Pseudorhombus sp.*			
578.		*Pterapogon mirifica*			
579.		*Pterois volitans*			
580.	24172	*Pteropus alecto (Black Flying-fox)*			
581.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			
582.		*Ptilonorhynchus guttatus*			
583.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
584.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
585.		*Quistrachia legendrei*			
586.		*Rastrelliger kanagurta*			
587.	24245	*Rattus rattus (Black Rat)*	Y		
588.	24246	*Rattus tunneyi (Pale Field-rat)*			
589.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
590.		*Regimbartia attenuata*			
591.		*Repomucenus calcaratus*			
592.		*Rhagada angulata*			
593.		*Rhagada convicta*			
594.		*Rhagada dampierana*			
595.		*Rhagada minima*			
596.		*Rhagada perprima*			
597.		*Rheotanytarsus trivittatus*			
598.	48096	*Rhipidura albiscapa (Grey Fantail)*			
599.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
600.	24457	*Rhipidura phasiana (Mangrove Grey Fantail)*			
601.		*Rhombognathus dispar*			Y
602.		*Rhombognathus ocularis*			Y

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603.		*Rhombognathus scutulatus*			
604.		*Salarias sexfilum*			
605.		*Scaptognathides hawaiiensis*			Y
606.		*Scaptognathides ornatus*			Y
607.		*Scatophagus argus*			
608.		*Scirtidae sp.*			
609.		*Scolecenchelys macroptera*			
610.		*Scolopendra laeta*			
611.		*Scolopendra morsitans*			
612.		*Scolopsis taenioptera*			
613.		*Secutor insidiator*			
614.		*Selaroides leptolepis*			
615.		*Sillago burrus*			
616.		*Sillago lutea*			
617.		*Simaetha tenuior*			
618.		*Simognathus platyaspis*			Y
619.		*Simognathus salebrosus*			Y
620.		*Simognathus tener*			Y
621.		*Simulium ornatipes*			
622.	30948	*Smicrornis brevirostris (Weebill)*			
623.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
624.		*Soleichthys heterorhinos*			
625.		*Sorsogona tuberculata*			
626.		*Sphyraena barracuda*			
627.		*Sphyraena sp.*			
628.		*Spratelloides delicatulus*			
629.	48114	*Stenella longirostris (Spinner Dolphin)*		P4	
630.	24521	*Sterna bengalensis (Lesser Crested Tern)*			
631.	25640	*Sterna dougallii (Roseate Tern)*		IA	
632.	25642	*Sterna hirundo (Common Tern)*		IA	
633.		*Sternolophus australis*			
634.	48593	*Sternula albifrons (Little Tern)*		IA	
635.	48594	*Sternula nereis (Fairy Tern)*			
636.		*Stethojulis interrupta*			
637.	24329	*Stictonetta naevosa (Freckled Duck)*			
638.	24482	*Stiltia isabella (Australian Pratincole)*			
639.		*Stratiomyidae sp.*			
640.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
641.	24924	*Strophurus ciliaris subsp. aberrans*			
642.	24927	*Strophurus elderi*			
643.	24932	*Strophurus jeanae*			
644.	24949	*Strophurus wellingtonae*			
645.		*Suggrundus macracanthus*			
646.	25754	*Sula leucogaster (Brown Booby)*		IA	
647.		*Supunna picta*			
648.	25269	*Suta fasciata (Rosen's Snake)*			
649.	25307	*Suta punctata (Spotted Snake)*			
650.		*Synanceia horrida*			
651.		*Tabanidae sp.*			
652.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
653.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
654.	30870	*Taeniopygia guttata (Zebra Finch)*			
655.		*Tanytarsus sp. D (SAP)*			
656.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
657.		*Tasmanocoenis arcuata*			
658.		*Terapon jarbua*			
659.		*Testudinella patina*			
660.		*Thalasseus bengalensis*			
661.	48597	*Thalasseus bergii (Crested Tern)*		IA	
662.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
663.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
664.	25548	*Todiramphus chloris (Collared Kingfisher)*			
665.	24306	*Todiramphus chloris subsp. pilbara (Pilbara Collared Kingfisher)*			
666.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
667.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
668.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
669.		*Tramea stenoloba*			
670.		*Triacanthus sp.*			
671.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
672.		*Trichocyclus nigropunctatus*			

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673.		*Trichonotus setiger*			
674.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
675.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
676.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
677.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
678.	24851	*Turnix velox (Little Button-quail)*			
679.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
680.		*Tylosurus crocodilus*			
681.	30814	*Tympanocryptis cephalus (Pebble Dragon)*			
682.		*Tyto delicatula*			
683.		*Upeneus sulphureus*			
684.		*Urodacus armatus*			
685.		*Valamugil buchanani*			
686.		*Valamugil seheli*			
687.		*Valenciennea muralis*			
688.	25577	*Vanellus miles (Masked Lapwing)*			
689.	24386	*Vanellus tricolor (Banded Lapwing)*			
690.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
691.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
692.	25212	*Varanus eremius (Pygmy Desert Monitor)*			
693.	25216	*Varanus giganteus (Perentie)*			
694.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
695.	25524	*Varanus panoptes (Yellow-spotted Monitor)*			
696.	25223	*Varanus panoptes subsp. rubidus*			
697.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
698.	25526	*Varanus tristis (Racehorse Monitor)*			
699.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			
700.		*Venatrix arenaris*			
701.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
702.	24040	*Vulpes vulpes (Red Fox)*	Y		
703.		*Wesmaldra nixaut*			
704.		*Wydundra kennedy*			
705.		*Wydundra nixaut*			Y
706.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
707.		*Yirrkala sp.*			
708.		*Yongeichthys nebulosus*			
709.		*Zebrias quagga*			
710.		*Zenodorus orbiculatus*			
711.		*Zonocypretta kalimna*			
712.	24857	*Zosterops luteus (Yellow White-eye)*			
713.	24248	*Zyzomys argurus (Common Rock-rat)*			

Chromista

714.	35220	*Canistrocarpus cervicornis*			
715.	35910	*Canistrocarpus crispatus*			
716.	26694	*Colpomenia sinuosa*			
717.	26764	*Dictyopteris australis*			
718.	29954	*Dictyopteris woodwardia*			
719.	26775	*Dictyota ciliolata*			
720.	26778	*Dictyota furcellata*			
721.	26946	*Hormophysa cuneiformis*			
722.	26949	*Hydroclathrus clathratus*			
723.	27043	*Lobophora variegata*			
724.	27113	*Padina australis*			
725.	27115	*Padina boryana*			
726.	27116	*Padina elegans*			
727.	48304	*Padina tetrastromatica*			Y
728.	27245	*Sargassum ilicifolium*			
729.	27248	*Sargassum ligulatum*			
730.	27253	*Sargassum peronii*			
731.		*Sargassum siliquosum*			Y
732.	42785	*Sirophysalis trinodis*			
733.	27282	*Spatoglossum macrodontum*			
734.	27293	*Sphacelaria rigidula*			
735.	27321	*Stypopodium flabelliforme*			
736.	27345	*Turbinaria gracilis*			
737.		*Turbinaria mesenterina*			
738.	27346	*Turbinaria ornata*			
739.		*Turbinaria reniformis*			

Fungi

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740.	27576	*Acarospora nodulosa*			
741.	44918	*Caloplaca michelagoensis*			
742.		*Caloplaca sp.*			
743.	27715	*Diploschistes actinostomus*			
744.	27932	*Peltula bolanderi*			
745.		*Phellinus rimosus*			
746.	46616	*Triodiomyces altilis*			
747.	28194	*Xanthoria parietina*			
Plantae					
748.	4886	*Abutilon amplum*			
749.	9080	*Abutilon cunninghamii*			
750.	4891	*Abutilon fraseri (Lantern Bush)*			
751.	18120	*Abutilon fraseri subsp. fraseri*			
752.	4895	*Abutilon lepidum*			
753.	4899	*Abutilon malvifolium (Bastard Marshmallow)*			
754.	4902	*Abutilon oxycarpum (Flannel Weed)*			
755.	43020	*Abutilon oxycarpum subsp. Prostrate (A.A. Mitchell PRP 1266)*			
756.	3209	*Acacia ampliceps*			
757.	44580	*Acacia ampliceps x bivenosa*			
758.	44586	*Acacia ampliceps x sclerosperma subsp. sclerosperma*			
759.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
760.	3223	*Acacia arida*			
761.	3241	*Acacia bivenosa*			
762.	44588	*Acacia bivenosa x sclerosperma subsp. sclerosperma*			
763.	17013	*Acacia colei var. colei*			
764.	3270	*Acacia coriacea (Wirewood)*			
765.	13500	*Acacia coriacea subsp. coriacea*			
766.	13502	*Acacia coriacea subsp. pendens*			
767.	16174	*Acacia elachantha*			
768.	12673	*Acacia glaucocaesia*			
769.	3356	*Acacia gregorii (Gregory's Wattle)*			
770.	3372	*Acacia holosericea (Candelbra Wattle, Liringgin)*			
771.	3377	*Acacia inaequilatera (Baderi)*			
772.	3434	*Acacia maitlandii (Maitland's Wattle)*			
773.	3471	*Acacia orthocarpa (Needleleaf Wattle)*			
774.	3506	*Acacia pyrifolia (Ranji Bush, Kandji)*			
775.	29016	*Acacia pyrifolia var. morrisonii*			
776.	29015	*Acacia pyrifolia var. pyrifolia*			
777.	13078	*Acacia sclerosperma subsp. sclerosperma*			
778.	29135	*Acacia sericophylla*			
779.	3551	*Acacia sphaerostachya*			
780.	19456	*Acacia stellaticeps*			
781.	13070	*Acacia synchronicia*			
782.	3573	*Acacia tenuissima*			
783.	3579	*Acacia trachycarpa (Minni Ritchi, Balgali)*			
784.	3606	*Acacia xiphophylla*			
785.	26441	*Acanthophora spicifera*			
786.	48409	*Acetabularia caliculus*			
787.	2645	*Achyranthes aspera (Chaff Flower)*			
788.	172	*Acrachne racemosa*			
789.	4583	*Adriana tomentosa*			
790.	17422	*Adriana tomentosa var. tomentosa*			
791.	6486	*Aegialitis annulata (Club Mangrove)*			
792.	6478	*Aegiceras corniculatum (River Mangrove)*			
793.	2646	*Aerva javanica (Kapok Bush)*	Y		
794.	3680	*Aeschynomene indica (Budda Pea)*			
795.	3609	*Albizia lebbeck*			
796.	4739	*Alectryon oleifolius*			
797.	11487	*Alectryon oleifolius subsp. oleifolius*			
798.	2651	*Alternanthera nana (Hairy Joyweed)*			
799.	2652	*Alternanthera nodiflora (Common Joyweed)*			
800.	17147	*Alysicarpus muelleri*			
801.	20018	*Amaranthus undulatus*			
802.	5277	*Ammannia baccifera*			
803.	5278	*Ammannia multiflora*			
804.	26461	*Amphiroa foliacea*			
805.	26462	*Amphiroa fragilissima*			
806.	35872	*Anadyomene plicata*			
807.	7832	*Angianthus milnei (Cone-spike Angianthus)*			
808.	207	*Aristida contorta (Bunched Kerosene Grass)*			

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809.	215	*Aristida latifolia (Feathertop Wiregrass)*			
810.	217	*Aristida nitidula (Flat-awned Threeawn)*			
811.	226	*Arundo donax (Giant Reed)*	Y		
812.	6580	*Asclepias curassavica (Redhead Cottonbush)*	Y		
813.	26486	*Asparagopsis taxiformis*			
814.	36140	*Asteromenia exanimans*			
815.	229	*Astrebla pectinata (Barley Mitchell Grass)*			
816.	2450	*Atriplex amnicola (Swamp Saltbush)*			
817.	2451	*Atriplex bunburyana (Silver Saltbush)*			
818.	2453	*Atriplex codonocarpa (Flat-topped Saltbush)*			
819.	2463	*Atriplex isatidea (Coast Saltbush)*			
820.	2466	*Atriplex lindleyi*			
821.	2476	*Atriplex semilunaris (Annual Saltbush)*			
822.	6828	*Avicennia marina (White Mangrove)*			
823.	14555	*Avicennia marina subsp. marina*			
824.	26498	*Avrainvillea obscura*			
825.	7854	*Bidens bipinnata (Bipinnate Beggartick)*	Y		
826.	2769	*Boerhavia burbidgeana*			
827.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
828.	8357	*Boerhavia diffusa*			
829.	2772	*Boerhavia gardneri*			
830.	2773	*Boerhavia paludosa*			
831.	2774	*Boerhavia repleta*			
832.	2775	*Boerhavia schomburgkiana*			
833.		*Boerhavia sp.*			
834.	11167	*Bonamia erecta*			
835.	6606	*Bonamia media*			
836.	6608	*Bonamia pannosa*			
837.	44782	*Bonamia pilbarensis*			
838.	6609	*Bonamia rosea (Felty Bellflower)*			
839.	26508	*Boodlea composita*			
840.	26509	*Bornetella oligospora*			
841.	26510	*Bornetella sphaerica*			
842.	26516	*Botryocladia leptopoda*			
843.	12716	*Brachychiton acuminatus*			
844.	2995	*Brassica x napus*	Y		
845.	4603	*Bridelia tomentosa*			
846.	5291	*Bruguiera exaristata (Ribbed Mangrove)*			
847.	750	*Bulbostylis barbata*			
848.	752	*Bulbostylis turbinata*			
849.	11055	*Cajanus cinereus*			
850.	10972	*Cajanus marmoratus*			
851.	11150	*Cajanus pubescens*			
852.	2864	*Calandrinia ptychosperma*			
853.	7905	*Calotis multicaulis (Many-stemmed Burr-daisy)*			
854.	3749	*Canavalia rosea (Wild Jack Bean)*			
855.	2981	*Capparis spinosa*			
856.	48291	*Capparis spinosa subsp. nummularia*			
857.	6567	*Carissa lanceolata (Conkerberry, Marnuwiji)*			
858.	2949	*Cassytha capillaris*			
859.	2950	*Cassytha filiformis (Love Vine, Jirawan)*			
860.	26554	*Caulerpa brachypus*			
861.	42620	*Caulerpa chemnitzia*			
862.	35158	*Caulerpa corynephora*			
863.	26559	*Caulerpa cupressoides*			
864.	47053	*Caulerpa cupressoides var. cupressoides*			
865.	47054	*Caulerpa cupressoides var. elegans*			
866.	27378	*Caulerpa cupressoides var. lycopodium*			
867.	36368	*Caulerpa cupressoides var. mamillosa*			
868.	44539	*Caulerpa cylindracea*			
869.	44547	*Caulerpa lamourouxii*			
870.	26568	*Caulerpa lentillifera*			
871.	26573	*Caulerpa racemosa*			
872.	35122	*Caulerpa racemosa var. racemosa*			
873.	26576	*Caulerpa serrulata*			
874.	26577	*Caulerpa sertularioides*			
875.	26579	*Caulerpa taxifolia*			
876.	26582	*Caulerpa verticillata*			
877.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		
878.	259	*Cenchrus echinatus (Burrgrass)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
879.	41568	*Cenchrus setaceus (Fountain Grass)*	Y		
880.	29721	*Cenchrus setiger (Birdwood Grass)*	Y		
881.	6539	*Centaurium erythraea (Common Centaury)*	Y		
882.	19762	*Centipeda minima subsp. macrocephala*			
883.	26606	*Ceratodictyon spongiosum*			
884.	39680	*Ceriops australis*			
885.	26612	*Chaetomorpha melagonium*			
886.	26619	*Champia stipitata*			
887.	33	*Cheilanthes contigua*			
888.	266	*Chloris barbata (Purpletop Chloris)*	Y		
889.	269	*Chloris pectinata (Comb Chloris)*			
890.	270	*Chloris pumilio*			
891.	33516	*Chrysocephalum gilesii*			
892.	273	*Chrysopogon fallax (Golden Beard Grass)*			
893.	2985	*Cleome oxalidea*			
894.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
895.	6729	*Clerodendrum floribundum (Lollybush)*			
896.	6732	*Clerodendrum tomentosum*			
897.	13689	*Clerodendrum tomentosum var. lanceolatum*			
898.	3769	*Clitoria ternatea*	Y		
899.	35917	*Codium arabicum*			
900.	26673	*Codium geppiorum*			
901.		*Codium platyclados*			Y
902.	2778	*Codonocarpus cotinifolius (Native Poplar, Kundurangu)*			
903.	26686	*Coelarthrum opuntia*			
904.	1165	*Commelina ensifolia (Wandering Jew, Buargu)*			
905.	2776	*Commicarpus australis (Perennial Tar Vine)*			
906.	19880	*Convolvulus angustissimus*			
907.	6612	*Convolvulus clementii*			
908.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
909.	18411	*Corchorus congener*		P3	
910.	4857	*Corchorus elachocarpus*			
911.	17339	*Corchorus incanus*			
912.	25847	*Corchorus incanus subsp. incanus*			
913.	13659	*Corchorus laniflorus*			
914.	4862	*Corchorus parviflorus*			
915.	4865	*Corchorus tridens*			
916.	13467	*Corchorus trilocularis*			
917.	4867	*Corchorus walcottii (Woolly Corchorus)*			
918.	17093	*Corymbia hamersleyana*			
919.	17092	*Corymbia opaca*			
920.	19565	*Cressa australis*			
921.	3774	*Crotalaria cunninghamii (Green Birdflower, Bilbun)*			
922.	19378	*Crotalaria dissitiflora subsp. benthamiana*			
923.	20179	*Crotalaria medicaginea var. neglecta*			
924.	3785	*Crotalaria novae-hollandiae (New Holland Rattlepod)*			
925.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
926.	4809	*Cryptandra pungens*			
927.	41720	*Cucumis argenteus*			
928.	7371	*Cucumis melo (Ulcardo Melon)*			
929.	41721	*Cucumis variabilis*			
930.	17439	*Cullen lachnostachys*			
931.	17118	*Cullen leucanthum*			
932.	17119	*Cullen leucochaites*			
933.	17120	*Cullen pogonocarpum*			
934.	13733	*Cuscuta victoriana*			
935.	279	*Cymbopogon ambiguus (Scentgrass)*			
936.	280	*Cymbopogon bombycinus (Silky Oilgrass)*			
937.	6584	*Cynanchum floribundum (Dumara Bush, Tjipa)*			
938.	48280	*Cynanchum viminale subsp. australe*			
939.	46558	*Cynodon convergens*			
940.	46555	*Cynodon prostratus*			
941.	774	*Cyperus bifax (Downs Nutgrass)*			
942.	12801	*Cyperus blakeanus*			
943.	777	*Cyperus bulbosus (Bush Onion, Tjanmata)*			
944.	786	*Cyperus cunninghamii*			
945.	12811	*Cyperus cunninghamii subsp. cunninghamii*			
946.	798	*Cyperus iria*			
947.	804	*Cyperus nervulosus*			
948.	814	*Cyperus squarrosus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
949.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
950.	290	*Dactyloctenium radulans (Button Grass)*			
951.	26740	*Dasya frutescens*			
952.	6963	*Datura metel (Downy Thornapple)*	Y		
953.	7317	*Dentella asperata*			
954.	7318	*Dentella minutissima*			
955.	3852	*Desmodium campylocaulon*			
956.	3853	*Desmodium filiforme*			
957.	3856	*Desmodium muelleri*			
958.	303	*Dichanthium fecundum (Curly Bluegrass)*			
959.	13741	*Dichanthium sericeum subsp. humilius*			
960.	3612	*Dichrostachys spicata (Pied Piper Bush)*			
961.	7166	*Dicliptera armata*			
962.	26769	*Dictyosphaeria cavernosa*			
963.	26782	*Digenea simplex*			
964.	310	*Digitaria brownii (Cotton Panic Grass)*			
965.	313	*Digitaria ctenantha (Comb Finger Grass)*			
966.	4745	*Diplopeltis eriocarpa (Hairy Pepperflower)*			
967.	48738	*Distimake dissectus var. dissectus*	Y		
968.	4759	*Dodonaea coriacea*			
969.	48390	*Dolichandrone occidentalis*			
970.	2504	*Dysphania plantaginella*			
971.	2506	*Dysphania rhadinostachya*			
972.	11653	*Dysphania rhadinostachya subsp. inflata*			
973.	11890	*Dysphania rhadinostachya subsp. rhadinostachya*			
974.	32348	*Eccremidium arcuatum*			
975.	328	*Echinochloa colona (Awnless Barnyard Grass)*	Y		
976.	343	*Ectrosia leporina (Hare's-foot Grass)*			
977.	6682	*Ehretia saligna (False Cedar)*			
978.	14301	*Ehretia saligna var. saligna*			
979.	827	*Eleocharis geniculata*			
980.	2511	*Enchylaena tomentosa (Barrier Saltbush)*			
981.	12064	*Enchylaena tomentosa var. tomentosa (Barrier Saltbush)*			
982.	357	*Enneapogon caerulescens (Limestone Grass)*			
983.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
984.	363	*Enneapogon pallidus (Conetop Nineawn)*			
985.	365	*Enneapogon polyphyllus (Leafy Nineawn)*			
986.	368	*Enteropogon ramosus (Windmill Grass, Curly Windmill Grass)*			
987.	378	*Eragrostis dielsii (Mallee Lovegrass)*			
988.	380	*Eragrostis eriopoda (Woollybutt Grass, Wangurnu)*			
989.	16731	*Eragrostis exigua*			
990.	381	*Eragrostis falcata (Sickle Lovegrass)*			
991.	38505	*Eragrostis surreyana*		P3	
992.	399	*Eragrostis xerophila (Knotty-butt Neverfail)*			
993.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
994.	16363	*Eremophila maculata subsp. brevifolia (Native Fuchsia)*			
995.	400	*Eriachne aristidea*			
996.	403	*Eriachne benthamii (Swamp Wanderrie)*			
997.	413	*Eriachne mucronata (Mountain Wanderrie Grass)*			
998.	414	*Eriachne obtusa (Northern Wandarrie Grass)*			
999.	417	*Eriachne pulchella (Pretty Wanderrie)*			
1000.	16485	*Eriachne pulchella subsp. dominii*			
1001.	16486	*Eriachne pulchella subsp. pulchella*			
1002.	421	*Eriachne tenuiculmis*			
1003.	425	*Eriochloa procera (Cupgrass)*			
1004.	4335	*Erodium cygnorum (Blue Heronsbill)*			
1005.	3871	*Erythrina vespertilio (Yulbah)*			
1006.	5714	*Eucalyptus microtheca (Coolibah)*			
1007.	5752	*Eucalyptus prominens*			
1008.	14548	*Eucalyptus victrix*			
1009.	11011	*Eulalia aurea*			
1010.	4617	*Euphorbia australis (Namana)*			
1011.	35307	*Euphorbia australis var. australis*			
1012.	35303	*Euphorbia australis var. subtomentosa*			
1013.	4619	*Euphorbia biconvexa*			
1014.	4620	*Euphorbia boophthona (Gascoyne Spurge)*			
1015.	9048	*Euphorbia careyi*			
1016.	4623	*Euphorbia coghlanii (Namana)*			
1017.	4626	*Euphorbia drummondii (Caustic Weed, Piwi)*			
1018.	4629	*Euphorbia hirta (Asthma Plant)*	Y		

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1019.	4635	*Euphorbia myrtoides*			
1020.	4647	*Euphorbia tannensis*			
1021.	12097	*Euphorbia tannensis subsp. eremophila (Desert Spurge)*			
1022.	42879	*Euphorbia trigonosperma*			
1023.	13281	*Euphorbia vaccaria*			
1024.	42876	*Euphorbia vaccaria var. vaccaria*			
1025.	6617	*Evolvulus alsinoides (Tropical Speedwell)*			
1026.	11200	*Evolvulus alsinoides var. villosicalyx*			
1027.	25811	*Ficus aculeata*			
1028.	31578	*Ficus aculeata var. indecora (Ranji)*			
1029.	19648	*Ficus brachypoda*			
1030.	1753	*Ficus platypoda (Native Fig, Makartu)*			
1031.	1759	*Ficus virens (Albayi)*			
1032.	12096	*Ficus virens var. virens*			
1033.	851	*Fimbristylis dichotoma (Eight Day Grass)*			
1034.	878	*Fimbristylis rara*			
1035.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
1036.	4654	*Flueggea virosa*			
1037.	12013	*Flueggea virosa subsp. melanthesoides (Dogwood, Guwal)*			
1038.	5188	*Frankenia ambita*			
1039.	5209	*Frankenia pauciflora (Seaheath)*			
1040.	26835	*Galaxaura rugosa*			
1041.	26848	*Gelidium crinale*			
1042.	3938	*Glycine canescens (Silky Glycine)*			
1043.	2674	*Gomphrena affinis*			
1044.	18361	*Gomphrena affinis subsp. pilbarensis*			
1045.	2676	*Gomphrena canescens (Batchelors Buttons)*			
1046.	18363	*Gomphrena canescens subsp. canescens*			
1047.	2680	*Gomphrena cunninghamii*			
1048.	2682	*Gomphrena flaccida (Gomphrena Weed)*			
1049.	18367	*Gomphrena kanisii*			
1050.	11131	*Gomphrena sordida*			
1051.	31074	*Gomphrena sp. Martins Well (K.F. Kenneally 6116)*			Y
1052.	7509	*Goodenia forrestii*			
1053.	7515	*Goodenia heterochila*			
1054.	7521	*Goodenia lamprosperma*			
1055.	7526	*Goodenia microptera*			
1056.	12552	*Goodenia muelleriana*			
1057.	10982	*Goodenia stobbsiana*			
1058.	7556	*Goodenia tenuiloba*			
1059.	4910	*Gossypium australe (Native Cotton)*			
1060.	4913	*Gossypium hirsutum (Upland Cotton)*	Y		
1061.	26873	*Gracilaria salicornia*			
1062.	2079	*Grevillea pyramidalis (Caustic Bush, Tjungu)*			
1063.	19570	*Grevillea pyramidalis subsp. leucadendron*			
1064.	15975	*Grevillea pyramidalis subsp. pyramidalis*			
1065.	13440	*Grevillea wickhamii subsp. aprica*			
1066.	12832	*Gymnanthera cunninghamii*		P3	
1067.	2177	*Hakea lorea (Witinti)*			
1068.	19137	*Hakea lorea subsp. lorea*			
1069.	47313	*Halimeda borneensis*			
1070.	26891	*Halimeda cylindracea*			
1071.	26892	*Halimeda discoidea*			
1072.	26894	*Halimeda macroloba*			
1073.	47213	*Halimeda versatilis*			
1074.	131	*Halodule uninervis*			
1075.	162	*Halophila decipiens*			
1076.	163	*Halophila minor*			
1077.	164	*Halophila ovalis (Sea Wrack)*			
1078.	165	*Halophila spinulosa*			
1079.	37642	*Halymenia durvillei*			
1080.	37640	*Halymenia floresii*			
1081.	17301	*Heliotropium chrysocarpum*			
1082.	6704	*Heliotropium conocarpum*			
1083.	6706	*Heliotropium cunninghamii*			
1084.	6707	*Heliotropium curassavicum (Smooth Heliotrope)*			
1085.	6712	*Heliotropium heteranthum*			
1086.	17307	*Heliotropium inexplicitum*			
1087.	17315	*Heliotropium tanythrix*			
1088.	6718	*Heliotropium tenuifolium (Mamukata)*			

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1089.	26930	*Heterosiphonia crassipes*			
1090.	29316	*Hibiscus austrinus*			
1091.	29317	*Hibiscus austrinus var. austrinus*			
1092.	4923	*Hibiscus brachysiphonius*			
1093.	4925	*Hibiscus coatesii*			
1094.	4933	*Hibiscus leptocladus*			
1095.	4942	*Hibiscus sturtii (Sturt's Hibiscus)*			
1096.	5215	*Hybanthus aurantiacus*			
1097.	5219	*Hybanthus enneaspermus*			
1098.	14587	*Indigastrum parviflorum*			
1099.	3973	*Indigofera colutea (Sticky Indigo)*			
1100.	3980	*Indigofera linifolia*			
1101.	3981	*Indigofera linnaei (Birdsville Indigo)*			
1102.	3982	*Indigofera monophylla*			
1103.	3987	*Indigofera trita*			
1104.	6623	*Ipomoea coptica*			
1105.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
1106.	6631	*Ipomoea lonchophylla (Cowvine)*			
1107.	6633	*Ipomoea muelleri (Poison Morning Glory, Yumbu)*			
1108.	6635	*Ipomoea pes-caprae*			
1109.	11312	*Ipomoea pes-caprae subsp. brasiliensis*			
1110.	6637	*Ipomoea polymorpha*			
1111.	458	*Iseilema dolichotrichum*			
1112.	459	*Iseilema eremaeum*			
1113.	465	*Iseilema vaginiflorum (Red Flinders Grass)*			
1114.	8088	*Ixiochlamys cuneifolia*			
1115.	6501	*Jasminum didymum*			
1116.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
1117.	8095	*Lactuca saligna (Wild Lettuce, Willow-leaf Lettuce)*	Y		
1118.	4960	*Lawrencia viridigrisea*			
1119.		*Lawsonia inermis*			
1120.	3035	*Lepidium pedicellosum*			
1121.	3038	*Lepidium pholidogynum*			
1122.	3613	*Leucaena leucocephala (Leucaena)*	Y		
1123.	27037	*Lithophyllum kotschyanum*			
1124.	4060	*Lotus australis (Austral Trefoil)*			
1125.	4061	*Lotus cruentus (Redflower Lotus)*			
1126.	2544	*Maireana georgei (Satiny Bluebush)*			
1127.	2556	*Maireana planifolia (Low Bluebush)*			
1128.	2564	*Maireana stipitata*			
1129.	11662	*Maireana tomentosa subsp. tomentosa*			
1130.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
1131.	27056	*Martensia elegans*			
1132.	5051	*Melhania oblongifolia*			
1133.	7082	*Mimulus gracilis*			
1134.	8109	*Minuria integerrima (Smooth Minuria)*			
1135.	8110	*Minuria leptophylla (Minnie Daisy)*			
1136.	6490	*Muellerolimon salicorniaceum*			
1137.	27079	*Mychodea carnosa*			
1138.	17158	*Myoporum montanum (Native Myrtle)*			
1139.	139	*Najas tenuifolia (Water Nymph)*			
1140.	2573	*Neobassia astrocarpa*			
1141.	44548	*Neomeris bilimbata*			
1142.	3614	*Neptunia dimorphantha (Sensitive Plant)*			
1143.	6971	*Nicotiana benthamiana (Tjuntiwari)*			
1144.	6976	*Nicotiana occidentalis (Native Tobacco)*			
1145.	11331	*Nicotiana occidentalis subsp. obliqua*			
1146.	11856	*Nicotiana occidentalis subsp. occidentalis*			
1147.	38421	*Notoleptopus decaisnei*			
1148.	38422	*Notoleptopus decaisnei var. decaisnei*			
1149.	7338	*Oldenlandia crouchiana*			
1150.	19640	*Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)*		P3	
1151.	6651	*Operculina aequisepala*			
1152.	6652	*Operculina brownii (Potato Vine, Bara)*			
1153.	5227	*Opuntia stricta (Common Prickly Pear)*	Y		
1154.	36400	*Palisada perforata*			
1155.	503	*Panicum decompositum (Native Millet, Kaltu-kaltu)*			
1156.	504	*Panicum effusum (Hairy Panic Grass)*			
1157.	505	*Panicum laevinode*			
1158.	515	*Paraneurachne muelleri (Northern Mulga Grass)*			

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1159.	10975	*Paspalidium basicladum*			
1160.	518	*Paspalidium clementii (Clements Paspalidium)*			
1161.	523	*Paspalidium rarum (Rare Paspalidium)*			
1162.	525	*Paspalidium tabulatum*			
1163.	5226	*Passiflora foetida (Stinking Passion Flower)*	Y		
1164.	27121	*Penicillus nodulosus*			
1165.	13494	*Pentalepis trichodesmoides*			
1166.	42160	*Pentalepis trichodesmoides subsp. trichodesmoides*			
1167.	18462	*Peplidium sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768)*			
1168.	3675	*Petalostylis labicheoides (Slender Petalostylis)*			
1169.	4673	*Phyllanthus amarus*	Y		
1170.	9056	*Phyllanthus baccatus*			
1171.	17626	*Phyllanthus erwinii*			
1172.	4680	*Phyllanthus maderaspatensis*			
1173.	20652	*Physalis angulata*	Y		
1174.	5230	*Pimelea ammocharis*			
1175.	41300	*Pittosporum phillyreoides (Weeping Pittosporum, Yaliti)*			
1176.	8167	*Pluchea dentex*			
1177.	17816	*Pluchea ferdinandi-muelleri*			
1178.	43944	*Pluchea longiseta*			
1179.	8168	*Pluchea rubelliflora*			
1180.	8170	*Pluchea tetranthera*			
1181.	6491	*Plumbago zeylanica (Native Plumbago)*			
1182.	2901	*Polycarpaea holtzei*			
1183.	2903	*Polycarpaea longiflora*			
1184.	41365	*Polygala glaucifolia*			
1185.	4572	*Polygala isingii*			
1186.	6653	*Polymeria ambigua (Morning Glory)*			
1187.	6655	*Polymeria calycina*			
1188.	17513	*Polymeria lanata*			
1189.		*Polymeria sp.*			
1190.		*Pomax Desert (A.S. George 11968)*			Y
1191.	2878	*Portulaca conspicua*			
1192.	2879	*Portulaca cyclophylla*			
1193.	43981	*Portulaca decipiens*			
1194.	2882	*Portulaca intraterranea*			
1195.	2884	*Portulaca oleracea (Purslane, Wakati)*			
1196.	8189	*Pseudognaphalium luteoalbum (Jersey Cudweed)*			
1197.		*Pterocaulon sp.*			
1198.	8192	*Pterocaulon sphacelatum (Apple Bush, Fruit Salad Plant)*			
1199.	8193	*Pterocaulon sphaeranthoides*			
1200.	2690	*Ptilotus aervoides*			
1201.	2696	*Ptilotus astrolasius*			
1202.	2698	*Ptilotus auriculifolius*			
1203.	2699	*Ptilotus axillaris (Mat Mulla Mulla)*			
1204.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
1205.	2706	*Ptilotus carinatus*			
1206.	2711	*Ptilotus clementii (Tassel Top)*			
1207.	2717	*Ptilotus divaricatus (Climbing Mulla Mulla)*			
1208.	2721	*Ptilotus exaltatus (Tall Mulla Mulla)*			
1209.	2725	*Ptilotus fusiformis*			
1210.	2728	*Ptilotus gomphrenoides*			
1211.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
1212.	2745	*Ptilotus murrayi*			
1213.	2746	*Ptilotus nobilis (Tall Mulla Mulla)*			
1214.	2747	*Ptilotus obovatus (Cotton Bush)*			
1215.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
1216.	2766	*Ptilotus villosiflorus*			
1217.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
1218.	2584	*Rhagodia preissii*			
1219.	11240	*Rhagodia preissii subsp. obovata*			
1220.	5295	*Rhizophora stylosa (Spotted-leaved Red Mangrove)*			
1221.	13301	*Rhodanthe floribunda*			
1222.	13246	*Rhodanthe humboldtiana*			
1223.	13310	*Rhodanthe margarethae*			
1224.	4190	*Rhynchosia australis (Rhynchosia)*			
1225.	20862	*Rhynchosia bungarensis*		P4	
1226.	4191	*Rhynchosia minima (Rhynchosia)*			
1227.		*Riccia albida*			
1228.	48900	*Roepera retivalvis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1229.	2443	*Rumex vesicarius (Ruby Dock)*	Y		
1230.	30434	*Salsola australis*			
1231.	2357	*Santalum lanceolatum (Northern Sandalwood, Yarnguli)*			
1232.	12578	*Scaevola acacioides*			
1233.	12723	*Scaevola amblyanthera*			
1234.	7606	*Scaevola crassifolia (Thick-leaved Fan-flower)*			
1235.	7608	*Scaevola cunninghamii*			
1236.	7614	*Scaevola globulifera*			
1237.	7644	*Scaevola spinescens (Currant Bush, Maroon)*			
1238.	41660	*Schenkia australis*			
1239.	41646	*Schenkia clementii*			
1240.	16257	*Schoenoplectus subulatus*			
1241.	1010	*Schoenus punctatus*		P3	
1242.	2604	*Sclerolaena costata*			
1243.	2607	*Sclerolaena densiflora*			
1244.	2609	*Sclerolaena diacantha (Grey Copperburr)*			
1245.	8877	*Sclerolaena gardneri*			
1246.	2633	*Sclerolaena uniflora (Two-spined Saltbush)*			
1247.	27274	*Sebdenia flabellata*			
1248.	12279	*Senna artemisioides subsp. helmsii*			
1249.	12280	*Senna artemisioides subsp. oligophylla*			
1250.	18444	*Senna charlesiana*			
1251.	12303	*Senna costata*			
1252.	18443	*Senna ferraria*			
1253.	18346	*Senna glutinosa*			
1254.	12305	*Senna glutinosa subsp. chatelainiana*			
1255.	12307	*Senna glutinosa subsp. glutinosa*			
1256.	12309	*Senna glutinosa subsp. pruinosa*			
1257.	12308	*Senna glutinosa subsp. x luerssenii*			
1258.	18451	*Senna hamersleyensis*			
1259.	12312	*Senna notabilis*			
1260.	18450	*Senna symonii*			
1261.	12319	*Senna venusta*			
1262.	4196	*Sesbania cannabina (Sesbania Pea)*			
1263.	2818	*Sesuvium portulacastrum*			
1264.	606	*Setaria dielsii (Diels' Pigeon Grass)*			
1265.	613	*Setaria verticillata (Whorled Pigeon Grass)*	Y		
1266.		*Sida Excedentifolia (J.L. Egan 1925)*			
1267.	31758	*Sida arsiniata*			
1268.	4971	*Sida cardiophylla*			
1269.	4976	*Sida echinocarpa*			
1270.	4977	*Sida fibulifera (Silver Sida)*			
1271.	4988	*Sida rohlenae*			
1272.	33698	*Sida sp. Pilbara (A.A. Mitchell PRP 1543)*			
1273.	16617	*Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)*			
1274.	4989	*Sida spinosa (Spiny Sida)*			
1275.	6998	*Solanum cleistogamum*			
1276.	7002	*Solanum diversiflorum*			
1277.	7007	*Solanum esuriale (Quena)*			
1278.	7009	*Solanum gabrielae*			
1279.	7014	*Solanum horridum*			
1280.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
1281.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
1282.	7029	*Solanum phlomoides*			
1283.	7036	*Solanum sturtianum (Thargomindah Nightshade)*			
1284.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
1285.	619	*Sorghum plumosum (Plume Canegrass)*			
1286.	12919	*Sorghum plumosum var. plumosum*			
1287.	622	*Sorghum timorense*			
1288.	625	*Spinifex longifolius (Beach Spinifex)*			
1289.	44523	*Spongophloea tissotii*			
1290.	629	*Sporobolus australasicus (Fairy Grass)*			
1291.	635	*Sporobolus virginicus (Marine Couch)*			
1292.	27310	*Spyridia filamentosa*			
1293.	4729	*Stackhousia clementii*		P3	
1294.	4731	*Stackhousia intermedia*			
1295.	19555	*Stackhousia muricata subsp. annual (W.R. Barker 2172)*			
1296.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
1297.	7099	*Stemodia kingii*			
1298.	8234	*Streptoglossa adscendens*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1299.	8235	*Streptoglossa bubakii*			
1300.	8236	*Streptoglossa cylindriceps*			
1301.	8237	*Streptoglossa decurrens*			
1302.	8238	*Streptoglossa liatroides*			
1303.	8240	*Streptoglossa odora*			
1304.	8241	*Streptoglossa tenuiflora*			
1305.	7729	*Stylidium fluminense*			
1306.	3182	*Stylobasium spathulatum (Pebble Bush)*			
1307.	12353	*Stylosanthes hamata (Verano Stylo)*	Y		
1308.	2638	*Suaeda arbusculoides*			
1309.	43203	*Surreya diandra*			
1310.	12356	*Swainsona formosa*			
1311.	4231	*Swainsona kingii*			
1312.	4233	*Swainsona leeana*			
1313.	4234	*Swainsona maccullochiana (Ashburton Pea)*			
1314.	4242	*Swainsona pterostylis*			
1315.	7363	*Synaptantha tillaeacea*			
1316.	13339	*Synaptantha tillaeacea var. tillaeacea*			
1317.	132	*Syringodium isoetifolium*			
1318.	31616	*Tecticornia auriculata*			
1319.	33236	*Tecticornia halocnemoides (Shrubby Samphire)*			
1320.	33240	*Tecticornia halocnemoides subsp. longispicata*			
1321.	33238	*Tecticornia halocnemoides subsp. tenuis*			
1322.	33317	*Tecticornia indica*			
1323.	33319	*Tecticornia indica subsp. bidens*			
1324.	33356	*Tecticornia indica subsp. indica*			
1325.	33357	*Tecticornia indica subsp. julacea*			
1326.	33318	*Tecticornia indica subsp. leiostachya (Samphire)*			
1327.	33299	*Tecticornia pergranulata subsp. elongata*			
1328.	31618	*Tecticornia pruinosa*			
1329.	33220	*Tecticornia pterygosperma subsp. denticulata*			
1330.		*Tephrosia Fortescue (A.A. Mitchell 606)*			Y
1331.	4263	*Tephrosia clementii*			
1332.	49016	*Tephrosia densa*			
1333.	4272	*Tephrosia leptoclada*			
1334.	4280	*Tephrosia rosea (Flinders River Poison, Bungoo'dah)*			
1335.	19531	*Tephrosia rosea var. clementii*			
1336.	15947	*Tephrosia sp. B Kimberley Flora (C.A. Gardner 7300)*			
1337.	17768	*Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)*			
1338.	15949	*Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)*			
1339.	42442	*Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)*			
1340.	40060	*Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)*			
1341.	4285	*Tephrosia supina*			
1342.	5300	*Terminalia canescens (Joolal)*			
1343.	45698	*Terminalia circumalata*			
1344.	5310	*Terminalia platyphylla (Wild Plum, Durin)*			
1345.	5313	*Terminalia supranitifolia*		P3	
1346.	169	*Thalassia hemprichii*			
1347.	672	*Themeda avenacea (Native Oatgrass)*			
1348.	17820	*Themeda sp. Hamersley Station (M.E. Trudgen 11431)*		P3	
1349.	17819	*Themeda sp. Mt Barricade (M.E. Trudgen 2471)*			
1350.	673	*Themeda triandra*			
1351.	2644	*Threlkeldia diffusa (Coast Bonefruit)*			
1352.	2942	*Tinospora smilacina (Snakevine, Oondala)*			
1353.	27335	*Tolypiocladia calodictyon*			
1354.	27336	*Tolypiocladia glomerulata*			
1355.	6270	*Trachymene didiscoides*			
1356.	6273	*Trachymene glaucifolia (Wild Carrot)*			
1357.	6278	*Trachymene oleracea*			
1358.	19043	*Trachymene oleracea subsp. oleracea*			
1359.	2830	*Trianthema portulacastrum (Giant Pigweed)*	Y		
1360.	44362	*Trianthema triquetrum*			
1361.	44360	*Trianthema turgidifolium*			
1362.	4375	*Tribulus cistoides*			
1363.	4377	*Tribulus hirsutus*			
1364.	4379	*Tribulus macrocarpus*			
1365.	4380	*Tribulus occidentalis (Perennial Caltrop)*			
1366.	4381	*Tribulus platypterus (Cork Hopbush)*			
1367.	4383	*Tribulus terrestris (Caltrop)*	Y		
1368.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
1369.	11750	*Trichodesma zeylanicum var. zeylanicum*			
1370.	7381	*Trichosanthes cucumerina*			
1371.	12032	*Trichosanthes cucumerina var. cucumerina*			
1372.	8252	*Tridax procumbens (Tridax, Tridax Daisy)*	Y		
1373.	48201	*Trigastrotheca molluginea*			
1374.	679	*Triodia angusta*			
1375.	13131	*Triodia epactia*			
1376.	696	*Triodia pungens (Soft Spinifex)*			
1377.	704	*Triodia wiseana (Limestone Spinifex)*			
1378.	706	*Triraphis mollis (Needle Grass)*			
1379.	4873	*Triumfetta appendiculata*			
1380.	14694	*Triumfetta clementii*			
1381.	14942	*Triumfetta maconochieana*			
1382.	27348	*Udotea argentea*			
1383.	27349	*Udotea flabellum*			
1384.	35302	*Udotea glaucescens*			
1385.	30716	*Vachellia farnesiana (Mimosa Bush)*	Y		
1386.	27357	*Valoniopsis pachynema*			
1387.	7660	*Velleia glabrata (Pee the Bed)*			
1388.	4846	*Ventilago viminalis (Supplejack, Barndaragu)*			
1389.	4323	*Vigna lanceolata (Maloga Vigna, Wega)*			
1390.	31391	*Vigna sp. Hamersley Clay (A.A. Mitchell PRP 113)*			
1391.	46577	*Vigna triodiophila*		P3	
1392.	5106	*Waltheria indica*			
1393.	17910	*Washingtonia filifera*	Y		
1394.	725	*Whiteochloa airoides*			
1395.	728	*Whiteochloa cymbiformis*			
1396.	6578	*Wrightia saligna*			
1397.	729	*Xerochloa barbata (Rice Grass)*			
1398.	731	*Xerochloa laniflora (Rice Grass)*			
1399.	732	*Yakirra australiensis*			
1400.	2834	*Zaleya galericulata (Hogweed)*			
1401.	29095	*Zaleya galericulata subsp. galericulata*			
1402.	4326	*Zornia albiflora*			
1403.	12679	*Zornia muelleriana subsp. congesta*			

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

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

Australian Government
Department of the Environment and Energy

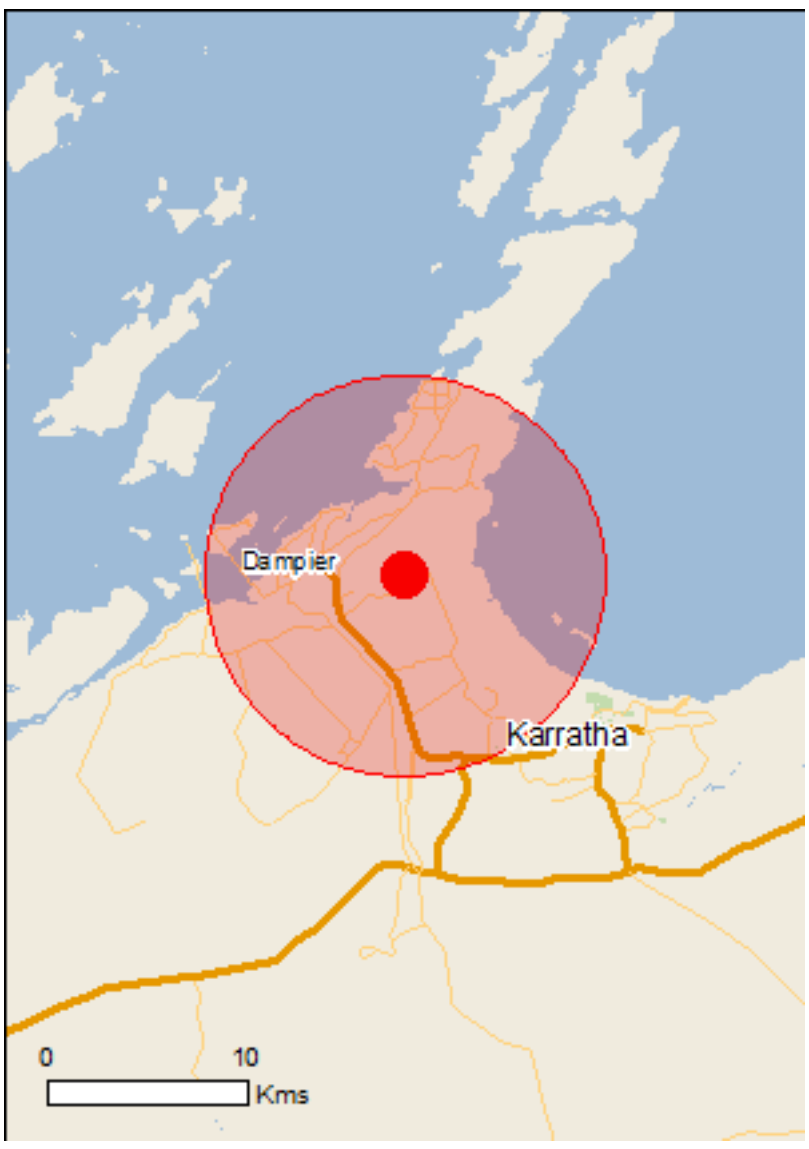
EPBC Act Protected Matters Report

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: 22/04/20 13:01:03



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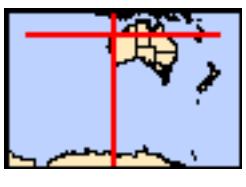

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	29
Listed Migratory Species:	56

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	96
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		

Name	Threatened	Type of Presence
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Manta alfredi 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
Manta birostris 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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area

Name	Threatened	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding likely to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Xenus cinereus		
Terek Sandpiper [59300]		Species or species 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 -

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

Name	Threatened	Type of Presence within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Bulbonaricus brauni Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
Campichthys tricarinatus Three-keel Pipefish [66192]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Doryrhamphus janssi Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
Doryrhamphus negrosensis Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. 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
Birds		
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
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
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
Plants		
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
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
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 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

-20.67067 116.76301

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact Us page.

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Appendix D – Flora data

Flora species list

Flora species matrix

Site landform and environmental data

Quadrat and releve data

Conservation significant flora locations

Flora likelihood of occurrence assessment

Flora species recorded within the survey area

Family	Taxon	Status
Acanthaceae	*Avicennia marina*	
Aizoaceae	*Trianthema triquetrum*	
Aizoaceae	*Trianthema turgidifolia*	
Amaranthaceae	**Aerva javanica*	*
Amaranthaceae	*Amaranthus undulates*	
Amaranthaceae	*Gomphrena ?sordida*	
Amaranthaceae	*Gomphrena cunninghamii*	
Amaranthaceae	*Ptilotus astrolasius*	
Amaranthaceae	*Ptilotus auriculifolius*	
Amaranthaceae	*Ptilotus calostachyus*	
Amaranthaceae	*Ptilotus carinatus*	
Amaranthaceae	*Ptilotus helipteroides*	
Amaranthaceae	*Ptilotus nobils*	
Araliaceae	*Trachymene oleracea subsp. oleracea*	
Asteraceae	*?*Flaveria trinervia*	*
Asteraceae	*Pluchea rubelliflora*	
Asteraceae	*Streptoglossa decurrens*	
Boraginaceae	*Ehretia saligna var. saligna*	
Boraginaceae	*Heliotropium chrysocarpum*	
Boraginaceae	*Heliotropium cunninghamii*	
Boraginaceae	*Trichodesma zeylanicum var. zeylanicum*	
Chenopodiaceae	*Enchylaena tomentosa var. tomentosa*	
Chenopodiaceae	*Neobassia astrocarpa*	
Chenopodiaceae	*Salsola australis*	
Chenopodiaceae	*Tecticornia ?indica subsp. leiostachya*	
Chenopodiaceae	*Tecticornia ?pterygosperma*	
Cleomaceae	*Cleome viscosa*	
Combretaceae	*Terminalia circumalata*	
Combretaceae	*Terminalia supranitifolia*	P3
Commelinaceae	*Commelina ensifolia*	
Concolvulaceae	*Evolvulus alsinoides*	
Convolculaceae	*Operculina aequisepala*	
Convolvulaceae	*Bonamia erecta*	
Convolvulaceae	*Ipomoea coptica*	
Convolvulaceae	*Ipomoea costata*	
Convolvulaceae	*Polymeria ambigua*	
Cucurbitaceae	*Cucumis variabilis*	
Cyperaceae	*Cyperus bifax*	
Cyperaceae	*Cyperus vaginatus*	
Euphorbiaceae	*Adriana tomentosa var. tomentosa*	
Euphorbiaceae	*Euphorbia australis*	
Euphorbiaceae	*Euphorbia biconvexa*	
Euphorbiaceae	*Euphorbia coghlanii*	
Euphorbiaceae	*Euphorbia tamnesis subsp. eremophila*	

Family	Taxon	Status
Fabaceae	**Vachellia farnesiana*	*
Fabaceae	*Acacia ancistrocarpa*	
Fabaceae	*Acacia arida*	
Fabaceae	*Acacia bivenosa*	
Fabaceae	*Acacia coriacea subsp. coriacea*	
Fabaceae	*Acacia inaequilatera*	
Fabaceae	*Acacia pyrifolia var. pyrifolia*	
Fabaceae	*Acacia sclerophylla*	
Fabaceae	*Acacia stellaticeps*	
Fabaceae	*Acacia tumida var. pilbarensis*	
Fabaceae	*Acacia xiphophylla*	
Fabaceae	*Alysicarpus muelleri*	
Fabaceae	*Crotalaria medicaginea var. neglecta*	
Fabaceae	*Indigofera colutea*	
Fabaceae	*Indigofera linifolia*	
Fabaceae	*Indigofera monophylla*	
Fabaceae	*Indigofera trita*	
Fabaceae	*Neptunia dimorphantha*	
Fabaceae	*Rhynchosia minima*	
Fabaceae	*Rynchosia bungarensis*	P4
Fabaceae	*Senna artemisioides*	
Fabaceae	*Senna artemisioides subsp. oligophylla*	
Fabaceae	*Senna glutinosa subsp. pruinosa*	
Fabaceae	*Senna notablis*	
Fabaceae	*Sesbania cannabina*	
Fabaceae	*Swainsona Formosa*	
Fabaceae	*Tephrosia sp*	
Fabaceae	*Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)*	
Fabaceae	*Tephrosia supine*	
Fabaceae	*Vigna triodiophila*	P3
Gentianaceae	*Schenkia australis*	
Goodeniaceae	*Goodenia microptera*	
Goodeniaceae	*Scaevola spinescens*	
Lauraceae	*Cassytha capillaris*	
Malvaceae	*Abutilon lepidum*	
Malvaceae	*Brachychiton acuminatus*	
Malvaceae	*Corchorus incanus subsp. incanus*	
Malvaceae	*Corchorus walcottii*	
Malvaceae	*Gossypium australe*	
Malvaceae	*Hibiscus sturtii var. ?platychlamys*	
Malvaceae	*Sida fibulifera*	
Malvaceae	*Sida rohlenae subsp. rohlenae*	
Malvaceae	*Triumfetta clementii*	
Malvaceae	*Triumfetta propinqua*	
Menispermaceae	*Tinospora smilacina*	

Family	Taxon	Status
Myrtaceae	*Corymbia hamersleyana*	
Myrtaceae	*Eucalyptus camaldulensis (planted)*	
Myrtaceae	*Eucalyptus victrix*	
Nyctaginaceae	*Boerhavia coccinea*	
Oleaceae	*Jasminum didymum subsp. lineare*	
Passifloraceae	**Passiflora foetida*	*
Phyllanthaceae	*Flueggea virosa subsp. melanthesoides*	
Phyllanthaceae	*Notoleptopus decaisnei*	
Phyllanthaceae	*Phyllanthus maderaspatensis*	
Poaceae	*Aristida contorta*	
Poaceae	*Aristida latifolia*	
Poaceae	**Cenchrus ciliaris*	*
Poaceae	*Cenchrus setiger*	
Poaceae	*Chrysopogon fallax*	
Poaceae	*Dactyloctenium radulans*	
Poaceae	*Dichanthium sericeum subsp. humilius*	
Poaceae	*Eragrostis desertorum*	
Poaceae	*Eragrostis xerophila*	
Poaceae	*Eriachne benthamii*	
Poaceae	*Eriachne pulchella*	
Poaceae	*Iseilema dolichotrichum*	
Poaceae	*Panicum decompositum*	
Poaceae	*Panicum laevinode*	
Poaceae	*Paraneurachne muelleri*	
Poaceae	*Paspalidium clementii*	
Poaceae	*Triodia epactia*	
Poaceae	*Triodia wiseana*	
Poaceae	*Xerochloa ?laniflora*	
Portulacaceae	*Portulaca oleracea*	
Proteaceae	*Grevillea pyramidalis subsp. pyramidalis*	
Proteaceae	*Hakea lorea subsp. lorea*	
Rubiaceae	*Dentella minutissima*	
Rubiaceae	*Oldenlandia* sp. Hamersley Station (A.A. Mitchel PRP1479)	P3
Santalaceae	*Santalum lanceolatum*	
Sapindaceae	*Alectryon oleifolius subsp. oleifolius*	
Sapindaceae	*Diplopeltis eriocarpa*	
Solanaceae	*Solanum diversiflorum*	
Solanaceae	*Solanum lasiophyllum*	
Tamaricaceae	**Tamarix aphylla*	*
Violaceae	*Hybanthus aurantiacus*	
Zygophyllaceae	*Tribulus hirsutus*	
Zygophyllaceae	*Tribulus occidentalis*	

Flora species by site matrix

Species	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
*Cenchrus ciliaris	1	1	1		1	1	1		1	1	1		1	1	1			1	1		1	1		1			1	1	1		1	1		1	1	1	1					1
*Passiflora foetida																	1								1																		
*Vachellia farnesiana			1													1																										
?*Flaveria trinervia		1							1	1	1																					1			1						
Abutilon lepidum															1	1						1					1	1					1	1						
Acacia ancistrocarpa													1	1	1	1					1	1					1	1	1		1	1			1					1
Acacia bivenosa	1																							1			1						1								

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Acacia coriacea subsp. coriacea															1	1			1		1	1		1			1	1	1		1	1				1				1	1	1
Acacia inaequilatera			1																																							
Acacia pyrifolia var. pyrifolia			1									1																														
Acacia sclerophylla	1												1	1																												
Acacia stellaticeps													1																													
Acacia tumida var. pilbarensis																1								1		1	1	1		1												
Acacia xiphophylla																																										

S p e c	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Adriana tomentosa var. tomentosa	1				1																						1															
Aerva javanica		1								1																																
Alectryon oleifolius subsp. oleifolius																			1																							
Alysicarpus muelleri		1							1	1	1																															
Amaranthus undulatus															1	1				1	1	1														1						
Aristida contorta																				1																						
Aristida latifolia				1																																						

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Avicennia marina		1	1						1	1	1	1							1																		1	1				
Boerhavia coccinea											1				1	1																					1					
Bonamia erecta	1	1								1																																
Brachychiton acuminatus												1	1	1	1	1						1														1		1				
Cassytha capillaris																								1			1															
Cenchrus setiger	1																																									
Chrysopogon fallax	1									1								1	1	1	1		1	1									1	1	1						1	

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Cleome viscosa	1	1							1	1	1								1	1				1			1	1									1			1	1	1
Commelina ensifolia		1																																								
Corchorus incanus subsp. incanus	1												1	1	1	1			1		1	1														1					1	1
Corchorus walcottii											1																				1						1					
Corymbia hamersleyana	1		1									1			1									1			1		1					1								
Crotalaria medicaginea var. neglecta	1																																									
Cucumis variabilis	1														1						1																					

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Cyperus bifax			1			1	1	1				1																										1				
Cyperus vaginatus			1									1																										1				
Dactyloctenium radulans	1	1			1	1												1	1																							
Dichanthium sericeum subsp. humilius																	1						1		1																	
Diplopeltis eriocarpa													1	1	1							1							1													
Ehretia saligna var. saligna													1	1					1																							
Enchylaena tomentosa var. tomentosa		1																																								

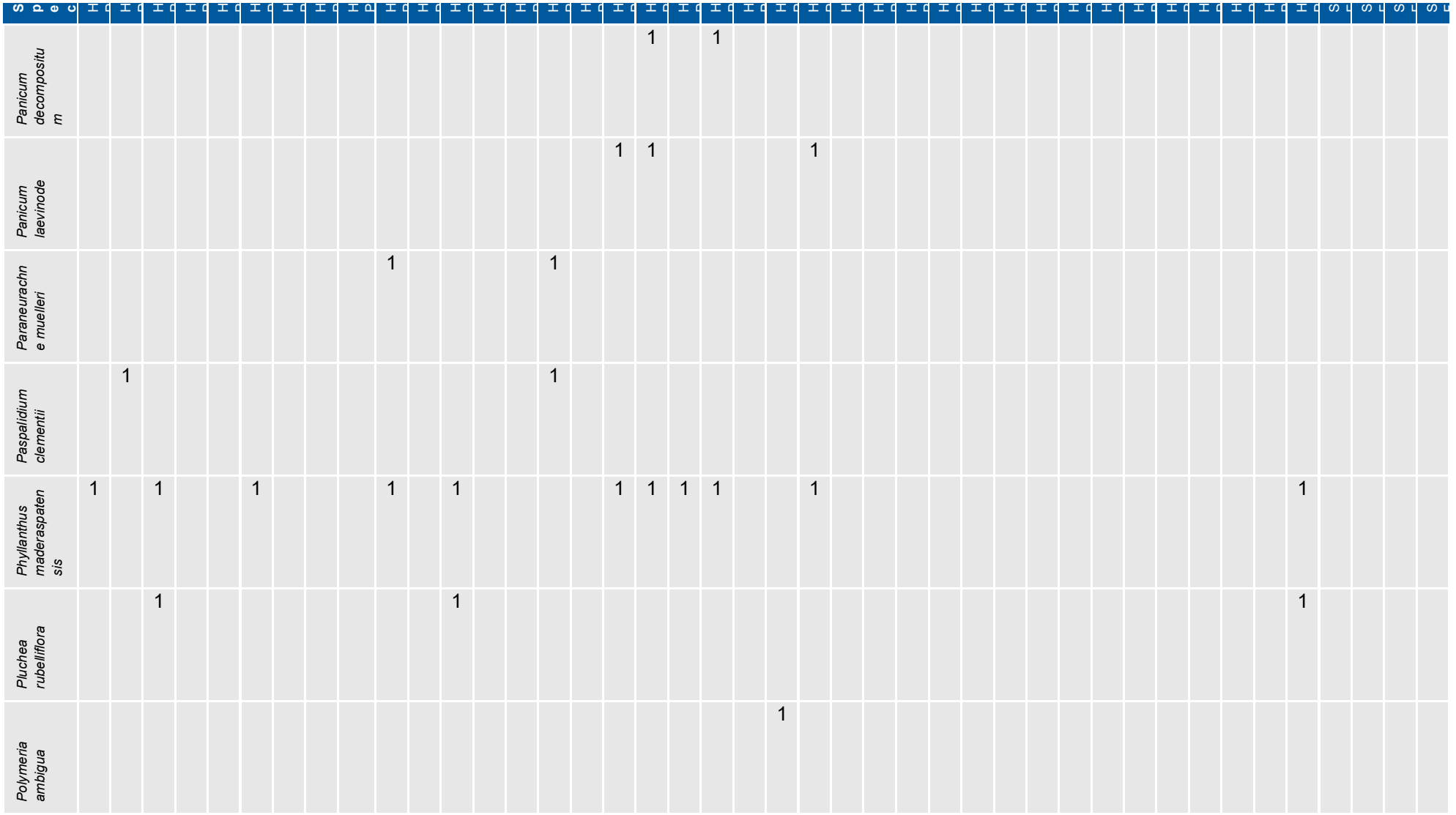
Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Eragrostis desertorum					1	1																																				
Eragrostis xerophila																	1	1	1	1			1		1	1							1						1		1	
Eriachne benthamii						1	1	1				1	1	1			1																					1				
Eriachne pulchella																1																										
Eucalyptus camaldulensis (planted)																																			1							
Eucalyptus victrix			1			1	1	1				1																						1				1				
Euphorbia australis																					1	1		1			1									1						

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Euphorbia biconvexa	1														1							1														1						
Euphorbia coghlanii																	1	1		1			1		1								1									
Euphorbia tamnesis subsp. eremophila	1														1																											
Evolvulus alsinoides		1							1	1	1								1																		1					
Flueggea virosa subsp. melanthesoides									1																																	
Gomphrena ?sordida																		1																								
Gomphrena cunninghamii		1								1	1																													1		1

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Goodenia microptera															1	1			1																							
Gossypium australe			1																																							
Grevillea pyramidalis subsp. pyramidalis	1	1								1	1		1																								1					1
Hakea lorea subsp. lorea	1														1									1				1			1	1									1	
Heliotropium chrysocarpum																						1																				
Heliotropium cunninghamii																	1			1			1		1								1									
Hibiscus sturtii var. ?platychlamys																1			1																							

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Hybanthus aurantiacus	1	1	1			1	1	1	1	1	1	1	1	1	1	1					1	1							1		1	1				1	1	1				
Indigofera colutea	1										1																															
Indigofera linifolia																	1	1	1	1			1				1						1									
Indigofera monophylla	1										1		1	1	1	1						1														1	1					
Indigofera trita			1									1							1																			1				
Ipomoea coptica												1					1						1										1					1				
Ipomoea costata									1	1	1																															

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Iseilema dolichotrichum																	1	1					1																			
Jasminum didymum subsp. lineare									1	1																																
Neobassia astrocarpa					1	1																																				
Neptunia dimorphantha	1		1															1					1																1	1		
Notoleptopus decaisnei			1													1			1																							
Oldenlandia sp. Hamersley Station (A.A. Mitchel																	1						1																			
Operculia aequisepala	1																1			1			1		1								1									



Species	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	Su	Su	Su	Su
Panicum decompositum																			1		1																						
Panicum laevinode																		1	1					1																			
Paraneurachne muelleri											1						1																										
Paspalidium clementii		1															1																										
Phyllanthus maderaspatensis	1		1			1				1		1					1	1	1	1			1																1				
Pluchea rubelliflora			1									1																											1				
Polymeria ambigua																						1																					

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Portulaca oleracea		1								1						1	1	1	1				1	1		1																
Ptilotus astrolasius		1														1						1														1						
Ptilotus auriculifolius															1																1	1										
Ptilotus calostachyus																			1																							
Ptilotus carinatus																							1		1								1									
Ptilotus helipteroides																					1	1														1						
Ptilotus nobilis														1	1	1		1		1			1										1							1		1

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Rhynchosia minima	1	1	1			1	1	1	1	1	1	1					1	1	1	1		1	1		1								1	1		1	1	1				
Salsola australis																		1																								
Santalum lanceolatum																																		1								
Scaevola spinescens													1	1		1		1				1															1					
Schenkia australis																		1																								
Senna artemisioides																1						1						1	1		1	1				1						
Senna artemisioides subsp. oligophylla																1																										

S p e c	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Senna glutinosa subsp. pruinosa															1																											
Senna notabilis																					1																				1	1
Sesbania cannabina	1		1			1						1																										1				
Sida fibulifera	1				1	1				1							1	1		1			1		1																	
Sida rohlenae subsp. rohlenae																		1		1																						
Solanum diversiflorum															1																											
Solanum lasiophyllum																			1		1	1														1						

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Streptoglossa decurrens	1								1	1	1						1	1		1			1		1	1							1				1					
Swainsona formosa	1		1												1																							1				
Tecticornia ?indica subsp. leiostachya				1		1																																				
Tecticornia ?pterygosperma				1		1																																				
Tephrosia sp																	1																									
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)		1							1	1	1																															
Tephrosia supina										1	1										1	1														1	1					

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Terminalia circumalata			1			1	1	1																														1				
Terminalia supranitifolia (P3)									1	1																																
Tinospora smilacina		1							1																																	
Trachymene oleracea subsp. *oleracea*		1							1	1	1	1																									1	1				
Trianthema triquetrum	1	1																1																								
Trianthema turgidifolia					1	1																																				
Tribulus hirsutus															1							1							1		1											

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Tribulus occidentalis																	1	1					1																			
Trichodesma zeylanicum var. zeylanicum	1		1			1	1	1	1	1	1	1	1	1	1	1			1			1														1	1	1				
Triodia epactia	1	1							1	1	1		1	1					1		1																			1		1
Triodia wiseana			1			1	1	1				1			1	1					1	1		1		1	1	1	1	1	1	1		1		1	1	1				
Triumfetta clementii		2										1										1														1		1				
Triumfetta propinqua															1	1																										
Vachellia farnesiana	1								1		1																															

Spec	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	S	S	S	S
Xerochloa ?laniflora																	1						1			1																

Site landform and environmental data

SiteName	Landform	Vegetation Condition	Aspect	Slope	Soil Type	Soil Colour	Drainage	Bare Ground Cover	Litter Cover	Time Since Last Fire
HPKAR01	Stony Plain	Very Good	North/ West	Negligible	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR02	Boulders/ Rockpiles	Good	North/ West	Moderate	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR03	Drainage Line	Good	North/ West	Negligible	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR04	Saline Flats and Marsh	Very Good	Flat	Negligible	Clay	brown	Permanent wet	31-70%	<2%	Old (6+ yr)
HPKAR05	Drainage Area/ Floodplain	Poor	South	Gentle	Sandy Loam	brown	Good	11-30%	<2%	Old (6+ yr)
HPKAR06	Drainage Area/ Floodplain	Good	Flat	Negligible	Clay	brown	Seasonal wet	11-30%		Old (6+ yr)
HPKAR07	Drainage Line	Good	Flat	Negligible	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR08	Drainage Line	Very Good	Flat	Negligible	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR09	Boulders/ Rockpiles	Good	North	Steep	Sandy Loam	brown	Good	31-70%	2-10%	Old (6+ yr)
HPKAR10	Boulders/ Rockpiles	Very Good	North	Steep	Sandy Loam	brown	Good	31-70%	2-10%	Old (6+ yr)
HPKAR11	Footslope	Very Good	North	Moderate	Sandy Loam	brown	Good	2-10%	2-10%	Old (6+ yr)
HPKAR12	Drainage Line	Very Good	North	Negligible	Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR13	Sand Plain	Very Good	North	Gentle	Sandy Loam	brown	Good	2-10%	2-10%	Old (6+ yr)
HPKAR14	Sand Plain	Very Good	North	Gentle	Sandy Loam	brown	Good	2-10%	2-10%	Old (6+ yr)
HPKAR15	Undulating Low Hills	Very Good	North	Gentle	Sandy Loam	brown	Good	2-10%	2-10%	Old (6+ yr)

SiteName	Landform	Vegetation Condition	Aspect	Slope	Soil Type	Soil Colour	Drainage	Bare Ground Cover	Litter Cover	Time Since Last Fire
HPKAR16	Sand Plain	Very Good	Flat	Negligible	Sand	red brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR17	Claypan	Very Good	Flat	Negligible	Clay	brown	Poor	11-30%	<2%	Old (6+ yr)
HPKAR18	Claypan	Good	Flat	Negligible	Clay	brown	Poor	11-30%	<2%	Old (6+ yr)
HPKAR19	Stony Plain	Good	Flat	Negligible	Sandy Loam	brown	Good	11-30%	<2%	Old (6+ yr)
HPKAR20	Claypan	Very Good	Flat	Negligible	Clay	brown	Poor	11-30%	<2%	Old (6+ yr)
HPKAR21R	Stony Plain	Very Good	Flat	Negligible	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR22	Stony Plain	Very Good	Flat	Negligible	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR23	Claypan	Excellent	Flat	Negligible	Clay	brown	Poor	11-30%	<2%	Old (6+ yr)
HPKAR24R	Drainage Line	Poor	North/ East	Gentle	Sandy Loam	brown	Good	11-30%	<2%	Old (6+ yr)
HPKAR25R	Claypan	Excellent	Flat	Negligible	Clay	brown	Poor	11-30%	<2%	Old (6+ yr)
HPKAR26R	Sandy/Stony Plain	Very Good	Flat	Negligible	Sandy Loam	brown	Good	31-70%	<2%	Old (6+ yr)
HPKAR27R	Drainage Line	Poor	North/ East	Gentle	Sandy Loam	brown	Good	11-30%	<2%	Old (6+ yr)
HPKAR28R	Stony Plain	Good	North/ East	Negligible	Sandy Loam	brown	Good	31-70%	<2%	Old (6+ yr)
HPKAR29R	Stony Plain	Good	North/ East	Negligible	Sandy Loam	brown	Good	11-30%	<2%	Old (6+ yr)
HPKAR30R	Stony Plain	Good	East	Gentle	Sandy Loam	brown	Good	31-70%	2-10%	Old (6+ yr)
HPKAR31R	Stony Plain	Good	East	Gentle	Sandy Loam	brown	Good	31-70%	2-10%	Old (6+ yr)
HPKAR32R	Footslope	Very Good	East	Gentle	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)

SiteName	Landform	Vegetation Condition	Aspect	Slope	Soil Type	Soil Colour	Drainage	Bare Ground Cover	Litter Cover	Time Since Last Fire
HPKAR33R	Claypan	Very Good	Flat	Negligible	Clay	brown	Poor	11-30%	<2%	Old (6+ yr)
HPKAR34R	Drainage Line	Poor	Flat	Negligible	Sandy Loam	brown	Good	2-10%	11-30%	Old (6+ yr)
HPKAR35R	Sand Plain	Completely Degraded	Flat	Negligible	Sandy Loam	brown	Good	2-10%	2-10%	Old (6+ yr)
HPKAR36	Stony Plain	Good	Flat	Negligible	Sandy Loam	brown	Good	11-30%	2-10%	Old (6+ yr)
HPKAR37	Stony Plain	Very Good	North	Negligible	Sandy Loam	brown	Good	2-10%	2-10%	Old (6+ yr)
HPKAR38	Drainage Line	Very Good	North	Negligible	Loam	brown	Good	31-70%	11-30%	Old (6+ yr)
SFRE01	Claypan	Very Good	Flat	Negligible	Clay	orange	Poor	2-10%		Old (6+ yr)
SFRE02	Hillslope	Very Good	North/ West	Gentle	Clay	orange	Poor	<2%		Old (6+ yr)
SFRE03	Claypan	Very Good	Flat	Negligible	Clay	orange	Seasonal wet	31-70%		Old (6+ yr)
SFRE04	Boulders/ Rockpiles	Very Good	North/ West	Gentle	Sandy Loam	Orange	Good	31-70%		Old (6+ yr)

Quadrat and releve data

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
HPKAR01 	*Corymbia hamersleyana*	2	4.5	Tree, palm (U)	Quadrat
	Acacia bivenosa	2	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Grevillea pyramidalis subsp. pyramidalis	2	4	Tree, palm (U)	
	Hakea lorea subsp. lorea	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Vachellia farnesiana	0.1	0.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Chrysopogon fallax	0.5	0.75	Tussock grass (G)	
	Triodia epactia	40	0.5	Hummock grass (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Cleome viscosa	0.5	0.25	Forb (G)	
	Hybanthus aurantiacus	15	0.25	Forb (G)	
	Indigofera monophylla	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Cenchrus ciliaris	3	0.5	Other grass (G)	
	Corchorus incanus subsp. incanus	0.1	0.25	Forb (G)	
	Cenchrus setiger	0.5	0.5	Other grass (G)	
	Swainsona formosa	0.1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Bonamia erecta	0.1	0.25	Forb (G)	
	Euphorbia tamnesis subsp. eremophila	0.1	0.25	Forb (G)	
	Streptoglossa decurrens	0.1	0.25	Forb (G)	
	Dactyloctenium radulans	0.1	0.25	Other grass (G)	
	Acacia sclerophylla	2	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Operculia aequisepala	0.5	0.25	Vine (G)	
	Sida fibulifera	0.1	0.25	Forb (G)	
	Euphorbia biconvexa	0.1	0.25	Forb (G)	
	Sesbania cannabina	0.1	0.5	Forb (G)	
	Indigofera colutea	0.1	0.25	Forb (G)	
	Phyllanthus maderaspatensis	0.1	0.25	Forb (G)	
	Trianthema triquetrum	0.1	0.1	Forb (G)	
	Cucumis variabilis	0.1	0.25	Forb (G)	
	Adriana tomentosa var. tomentosa	0.1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Neptunia dimorphantha	0.1	0.25	Forb (G)	
	Crotalaria medicaginea var. neglecta	0.1	0.25	Forb (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
HPKAR02	*Brachychiton acuminatus*	2	3.5	Tree, palm (U)	Quadrat

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Grevillea pyramidalis subsp. pyramidalis*	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Cleome viscosa	2	0.25	Forb (G)	
	Cenchrus ciliaris	20	0.25	Tussock grass (G)	
	Triodia epactia	10	0.5	Hummock grass (G)	
	Rhynchosia minima	1	0.25	Forb (G)	
	Evolvulus alsinoides	0.1	0.1	Forb (G)	
	Portulaca oleracea	0.1	0.1	Forb (G)	
	Gomphrena cunninghamii	0.1	0.1	Forb (G)	
	Triumfetta clementii	0.1	0.1	Forb (G)	
	Paspalidium clementii	0.1	0.25	Other grass (G)	
	Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0.1	0.25	Forb (G)	
	Trianthema triquetrum	0.5	0.1	Forb (G)	
	Boerhavia coccinea	1	0.25	Forb (G)	
	Dactyloctenium radulans	0.1	0.25	Other grass (G)	
	Hybanthus aurantiacus	2	0.25	Forb (G)	
	Trachymene oleracea subsp. oleracea	0.1	0.25	Forb (G)	
	Abutilon lepidum	0.1	0.25	Forb (G)	
	Alectryon oleifolius subsp. oleifolius	0.1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Enchylaena tomentosa var. tomentosa	2	0.25	Chenopod shrub (M)	
	Commelina ensifolia	0.1	0.1	Forb (G)	
	Amaranthus undulatus	0.1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Tinospora smilacina	0.1	0.5	Vine (G)	
	Triumfetta clementii	0.1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Ptilotus astrolasius	0.1	0.25	Forb (G)	
HPKAR03 	*Eucalyptus victrix*	15	7	Tree, palm (U)	Quadrat
	Terminalia circumalata	10	4	Tree, palm (U)	
	Sesbania cannabina	20	1.5	Forb (G)	
	Cenchrus ciliaris	20	0.25	Tussock grass (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Rhynchosia minima	0.2	0.25	Forb (G)	
	Swainsona formosa	0.1	0.25	Forb (G)	
	Triodia wiseana	30	0.5	Hummock grass (G)	
	Hybanthus aurantiacus	1	0.25	Forb (G)	
	Cyperus bifax	2	0.75	Sedge (G)	
	Phyllanthus maderaspatensis	0.1	0.25	Forb (G)	
	Indigofera trita	0.1	0.25	Forb (G)	
	Pluchea rubelliflora	0.1	0.25	Forb (G)	
	Gossypium australe	0.1	0.1	Forb (G)	
	*?*Flaveria trinervia*	0.4	0.5	Forb (G)	
	Corymbia hamersleyana	0.5	4.5	Tree, palm (U)	
	Boerhavia coccinea	1	0.25	Forb (G)	
	Indigofera trita	0.1	0.25	Forb (G)	
	Cyperus vaginatus	0.5	1	Sedge (G)	
	Notoleptopus decaisnei	0.1	0.1	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Acacia pyrifolia var. pyrifolia	0.1	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia sclerophylla	0.5	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Neptunia dimorphantha	0.5	0.1	Forb (G)	
HPKAR04 	*Tecticornia ?indica subsp. leiostachya*	15	0.25	Chenopod shrub (M)	Quadrat
	Tecticornia ?pterygosperma	5	0.25	Chenopod shrub (M)	
	Avicennia marina	5	2	Tree, palm (U)	
HPKAR05	**Cenchrus ciliaris*	25	0.5	Other grass (G)	Quadrat
	Trianthema turgidifolia	5	0.25	Chenopod shrub (M)	
	Neobassia astrocarpa	1	0.25	Chenopod shrub (M)	
	Dactyloctenium radulans	0.1	0.25	Other grass (G)	
	Aerva javanica	1	0.5	Forb (G)	
	Eragrostis desertorum	0.1	0.5	Tussock grass (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Sida fibulifera*	0.1	0.25	Forb (G)	
HPKAR06 	**Cenchrus ciliaris*	10	0.5	Other grass (G)	Cenchrus ciliaris
	Trianthema turgidifolia	5	0.25	Chenopod shrub (M)	Trianthema turgidifolia
	Neobassia astrocarpa	1	0.25	Chenopod shrub (M)	Neobassia astrocarpa
	Dactyloctenium radulans	0.1	0.25	Other grass (G)	Dactyloctenium radulans
	Eragrostis desertorum	1	0.5	Tussock grass (G)	Eragrostis desertorum
	Sida fibulifera	0.1	0.25	Forb (G)	Sida fibulifera
	Sesbania cannabina	2	0.5	Forb (G)	Sesbania cannabina
	Tecticornia ?indica subsp. leiostachya	15	0.25	Chenopod shrub (M)	Tecticornia ?indica subsp. leiostachya
	Tecticornia ?pterygosperma	5	0.25	Chenopod shrub (M)	Tecticornia ?pterygosperma

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Phyllanthus maderaspatensis	0.1	0.25	Forb (G)	Phyllanthus maderaspatensis
HPKAR07 	*Eucalyptus victrix*	5	7	Tree, palm (U)	Releve
	Terminalia circumalata	10	4	Tree, palm (U)	
	**Cenchrus ciliaris*	20	0.25	Tussock grass (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Rhynchosia minima	0.2	0.25	Forb (G)	
	Triodia wiseana	25	0.5	Hummock grass (G)	
	Hybanthus aurantiacus	1	0.25	Forb (G)	
	Cyperus bifax	2	0.75	Sedge (G)	
	Eriachne benthamii	5	0.5	Tussock grass (G)	
HPKAR08 	*Eucalyptus victrix*	5	7	Tree, palm (U)	Releve
	Terminalia circumalata	10	4	Tree, palm (U)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Rhynchosia minima	0.2	0.25	Forb (G)	
	Triodia wiseana	35	0.5	Hummock grass (G)	
	Hybanthus aurantiacus	1	0.25	Forb (G)	
	Cyperus bifax	2	0.75	Sedge (G)	
	Eriachne benthamii	5	0.5	Tussock grass (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
HPKAR09 	**Cleome viscosa*	2	0.25	Forb (G)	Quadrat
	**Cenchrus ciliaris*	20	0.25	Tussock grass (G)	
	Triodia epactia	5	0.5	Hummock grass (G)	
	Rhynchosia minima	1	0.25	Forb (G)	
	Evolvulus alsinoides	0.1	0.1	Forb (G)	
	Terminalia supranitifolia	0.5	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0.2	0.5	Forb (G)	
	Ipomoea costata	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Jasminum didymum subsp. lineare	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Vachellia farnesiana	0.5	0.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Boerhavia coccinea	0.5	0.5	Forb (G)	
	Trachymene oleracea subsp. oleracea	0.1	0.25	Forb (G)	
	Abutilon lepidum	0.1	0.25	Forb (G)	
	Amaranthus undulatus	0.1	0.25	Forb (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Flueggea virosa subsp. melanthesoides	0.4	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Tinospora smilacina	0.1	0.5	Vine (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Hybanthus aurantiacus	0.5	0.25	Forb (G)	
	Streptoglossa decurrens	0.1	0.25	Forb (G)	
HPKAR10 	*Cleome viscosa*	2	0.25	Forb (G)	Quadrat
	Chrysopogon fallax	0.5	1	Tussock grass (G)	
	Triodia epactia	20	0.5	Hummock grass (G)	
	Rhynchosia minima	1	0.25	Forb (G)	
	Evolvulus alsinoides	0.1	0.1	Forb (G)	
	Ipomoea costata	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Jasminum didymum subsp. lineare	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Boerhavia coccinea	0.5	0.5	Forb (G)	
	Trachymene oleracea subsp. oleracea	0.1	0.25	Forb (G)	
	Abutilon lepidum	0.1	0.25	Forb (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Hybanthus aurantiacus	0.5	0.25	Forb (G)	
	Streptoglossa decurrens	0.1	0.25	Forb (G)	
	Alectryon oleifolius subsp. oleifolius	1	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Grevillea pyramidalis subsp. pyramidalis	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Brachychiton acuminatus	2	1.75	Tree, palm (U)	
	Phyllanthus maderaspatensis	0.1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Abutilon lepidum	0.1	0.25	Forb (G)	
	Cenchrus ciliaris	0.5	0.25	Tussock grass (G)	
	Amaranthus undulatus	0.1	0.25	Forb (G)	
	Portulaca oleracea	0.1	0.1	Forb (G)	
	Sida fibulifera	0.1	0.25	Forb (G)	
	Terminalia supranitifolia (P3)	0.5	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Gomphrena cunninghamii	0.1	0.1	Forb (G)	
	Tephrosia supina	0.1	0.25	Forb (G)	
	Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0.2	0.5	Forb (G)	
	Paraneurachne muelleri	0.1	0.25	Other grass (G)	
HPKAR11 	*Cleome viscosa*	2	0.25	Forb (G)	Quadrat
	Triodia epactia	40	0.5	Hummock grass (G)	
	Rhynchosia minima	1	0.25	Forb (G)	
	Evolvulus alsinoides	0.1	0.1	Forb (G)	
	Ipomoea costata	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Tephrosia supina	0.1	0.25	Forb (G)	
	Boerhavia coccinea	0.5	0.5	Forb (G)	
	Trachymene oleracea subsp. oleracea	0.1	0.25	Forb (G)	
	Abutilon lepidum	0.1	0.25	Forb (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Hybanthus aurantiacus	1	1.25	Forb (G)	
	Grevillea pyramidalis subsp. pyramidalis	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Cenchrus ciliaris	0.5	0.25	Tussock grass (G)	
	Gomphrena cunninghamii	0.1	0.1	Forb (G)	
	Grevillea pyramidalis subsp. pyramidalis	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0.2	0.5	Forb (G)	
	Streptoglossa decurrens	0.1	0.25	Forb (G)	
	Vachellia farnesiana	0.5	0.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Indigofera monophylla	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Amaranthus undulatus	0.1	0.25	Forb (G)	
	Indigofera colutea	0.1	0.25	Forb (G)	
	Corchrus walcottii	0.5	0.5	Forb (G)	
	Bonamia erecta	0.1	0.25	Forb (G)	
HPKAR12	*Eucalyptus victrix*	10	7	Tree, palm (U)	Quadrat
	Triodia wiseana	30	0.5	Hummock grass (G)	
	Cyperus bifax	2	0.75	Sedge (G)	
	Phyllanthus maderaspatensis	0.1	0.25	Forb (G)	
	Corymbia hamersleyana	0.5	4.5	Tree, palm (U)	
	Boerhavia coccinea	1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Indigofera trita*	0.1	0.25	Forb (G)	
	Cyperus vaginatus	0.5	1	Sedge (G)	
	Triumfetta clementii	0.5	0.5	Forb (G)	
	Cassytha capillaris	0.1	0.25	Vine (G)	
	Acacia sclerophylla	2	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Sesbania cannabina	20	1.5	Forb (G)	
	Rhynchosia minima	0.2	0.25	Forb (G)	
	Pluchea rubelliflora	0.1	0.25	Forb (G)	
	Trachymene oleracea subsp. oleracea	0.1	0.25	Forb (G)	
	Eriachne benthamii	0.5	0.5	Tussock grass (G)	
	Hybanthus aurantiacus	0.5	1.25	Forb (G)	
	Ipomoea coptica	0.1	0.25	Vine (G)	
HPKAR13	*Ehretia saligna var. saligna*	15	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
	Acacia bivenosa	10	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Grevillea pyramidalis subsp. pyramidalis	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Diplopeltis eriocarpa	20	0.25	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Triodia epactia*	35	0.25	Hummock grass (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Indigofera monophylla	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	0.5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Eriachne benthamii	5	0.5	Tussock grass (G)	
	Cenchrus ciliaris	0.5	0.25	Tussock grass (G)	
	Cassytha capillaris	0.1	0.25	Vine (G)	
	Scaevola spinescens	0.5	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
	Acacia tumida var. pilbarensis	0.5	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia stellaticeps	outside	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
HPKAR14	*Ehretia saligna var. saligna*	15	2	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
	Acacia bivenosa	10	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia stellaticeps	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Diplopeltis eriocarpa*	20	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia epactia	35	0.25	Hummock grass (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Indigofera monophylla	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	0.5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Eriachne benthamii	5	0.5	Tussock grass (G)	
	Cenchrus ciliaris	0.5	0.25	Tussock grass (G)	
	Cassytha capillaris	0.1	0.25	Vine (G)	
	Scaevola spinescens	0.5	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
	Ptilotus nobilis	0.1	0.25	Forb (G)	
KAR_18 (GHD 2019)	*Acacia bivenosa*	15	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
	Acacia synchronicia	2	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Aristida contorta	5	0.1	Tussock grass (G)	
	Acacia ancistrocarpa	2	1.75	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	**Cenchrus ciliaris*	2	0.25	Tussock grass (G)	
	Solanum lasiophyllum	1	0.25	Forb (G)	
	Ptilotus helipteroides	1	0.1	Forb (G)	
KAR_05 (GHD 2019)	*Acacia inaequilatera*	1	3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
	Hak ea lorea subsp. lorea	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia bivenosa	5	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Indigofera monophylla	2	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia wiseana	20	0.5	Hummock grass (G)	
	Triodia epactia	30	0.5	Hummock grass (G)	
	Fimbristylis ?dichotoma	2	0.1	Sedge (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Solanum diversiflorum	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Gossypium australe	2	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Diplopeltis eriocarpa	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Eremophila longifolia	1	1	Shrub, cycad, grass-tree, tree-fern (M)	
KAR_06 (GHD 2019)	*Acacia inaequilatera*	1	3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
	Hak ea lorea subsp. lorea	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia bivenosa	5	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia stellaticeps	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia wiseana	60	0.5	Hummock grass (G)	
	Fimbristylis ?dichotoma	2	0.1	Sedge (G)	
	Diplopeltis eriocarpa	2	0.25	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Eremophila longifolia	1	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Indigofera monophylla	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia ancistrocarpa	1	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
HPKAR15 	*Triodia wiseana*	55	0.5	Hummock grass (G)	Quadrat
	Hakea lorea subsp. lorea	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia ancistrocarpa	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Corymbia hamersleyana	1	3	Tree, palm (U)	
	Cucumis variabilis	0.1	0.5	Vine (G)	
	Indigofera monophylla	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Diplopeltis eriocarpa	5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Ptilotus auriculifolius	2	0.25	Forb (G)	
	Goodenia microptera	0.1	0.25	Forb (G)	
	Ptilotus nobils	0.1	0.25	Forb (G)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
	Swainsona formosa	0.1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Senna glutinosa subsp. pruinosa	0.1	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Triumfetta propinqua	0.5	0.25	Forb (G)	
	Euphorbia biconvexa	0.1	0.1	Forb (G)	
	Acacia inaequilatera	0.2	0.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia bivenosa	0.5	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Bonamia erecta	0.1	0.1	Forb (G)	
	Solanum diversiflorum	0.1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Cenchrus ciliaris	0.5	0.25	Tussock grass (G)	
	Euphorbia tamnesis subsp. eremophila	0.1	0.25	Forb (G)	
	Corchorus incanus subsp. incanus	0.1	0.25	Forb (G)	
	Tribulus hirsutus	1	0.25	Forb (G)	
	Paraneurachne muelleri	0.1	0.25	Other grass (G)	
	Aristida contorta	0.1	0.25	Tussock grass (G)	
	Paspalidium clementii	0.1	0.25	Tussock grass (G)	
	Cassytha capillaris	0.1	0.25	Vine (G)	
HPKAR16	*Triodia wiseana*	30	0.5	Hummock grass (G)	Quadrat

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Acacia ancistrocarpa*	20	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Indigofera monophylla	5	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Acacia bivenosa	3	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	0.1	0.25	Forb (G)	
	Portulaca oleracea	0.1	0.1	Forb (G)	
	Senna artemisioides	0.5	0.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Notoleptopus decaisnei	0.1	0.1	Forb (G)	
	Scaevola spinescens	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Cassytha capillaris	0.1	0.25	Vine (G)	
	Acacia inaequilatera	0.2	0.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Ptilotus nobils	0.1	0.25	Forb (G)	
	Triumfetta propinqua	0.5	0.25	Forb (G)	
	Goodenia microptera	0.1	0.25	Forb (G)	
	Aristida contorta	0.5	0.25	Tussock grass (G)	
	Bonamia erecta	1	0.1	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Acacia xiphophylla	outside	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Ptilotus astrolasius	0.1	0.25	Forb (G)	
	Senna artemisioides subsp. oligophylla	0.1	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Eriachne pulchella	0.1	0.1	Other grass (G)	
	Hibiscus sturtii var. ?platychlamys	0.1	0.25	Forb (G)	
HPKAR17 	*Eragrostis xerophila*	35	0.5	Tussock grass (G)	Quadrat
	Streptoglossa decurrens	4	0.25	Forb (G)	
	Portulaca oleracea	0.5	0.1	Forb (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Operculia aequisepala	0.1	0.25	Forb (G)	
	*?*Flaveria trinervia*	0.1	0.25	Forb (G)	
	Ipomoea coptica	0.5	0.25	Forb (G)	
	Sida fibulifera	0.5	0.25	Forb (G)	
	Dichanthium sericeum subsp. humilius	0.1	0.1	Other grass (G)	
	Heliotropium cunninghamii	4	0.25	Forb (G)	
	Oldenlandia sp. Hamersley Station (A.A. Mitchel PRP1479)	0.1	0.1	Forb (G)	
	Indigofera linifolia	5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Iseilema dolichotrichum	0.5	0.1	Other grass (G)	
	Euphorbia coghlanii	0.1	0.1	Forb (G)	
	Xerochloa ?laniflora	0.5	0.1	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Phyllanthus maderaspatensis	1	0.25	Forb (G)	
	Tribulus occidentalis	0.1	0.1	Forb (G)	
	Panicum laevinode	0.1	0.5	Other grass (G)	
	Eriachne benthamii	1	0.5	Tussock grass (G)	
	Tephrosia sp.	0.1	0.25	Forb (G)	
HPKAR18 	*Eragrostis xerophila*	35	0.5	Tussock grass (G)	Quadrat
	Streptoglossa decurrens	1	0.25	Forb (G)	
	Portulaca oleracea	0.5	0.1	Forb (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Neptunia dimorphantha	0.1	0.25	Forb (G)	
	Cenchrus ciliaris	3	0.5	Tussock grass (G)	
	Iseilema dolichotrichum	0.1	0.1	Other grass (G)	
	Panicum decompositum	0.1	0.5	Tussock grass (G)	
	Ptilotus nobils	0.1	0.1	Forb (G)	
	Salsola australis	0.1	0.25	Forb (G)	
	Scaevola spinescens	0.5	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Gomphrena ?sordida	0.1	0.25	Forb (G)	
	Trianthema triquetrum	4	0.25	Forb (G)	
	Dactyloctenium radulans	0.1	0.1	Other grass (G)	
	Sida rohlenae subsp. rohlenae	1	0.25	Forb (G)	
	Schenkia australis	1	0.25	Forb (G)	
	Panicum laevinode	2	0.5	Tussock grass (G)	
	Chrysopogon fallax	2	1	Tussock grass (G)	
	Indigofera linifolia	4	0.5	Forb (G)	
	Phyllanthus maderaspatensis	1	0.25	Forb (G)	
	Euphorbia coghlanii	0.1	0.1	Forb (G)	

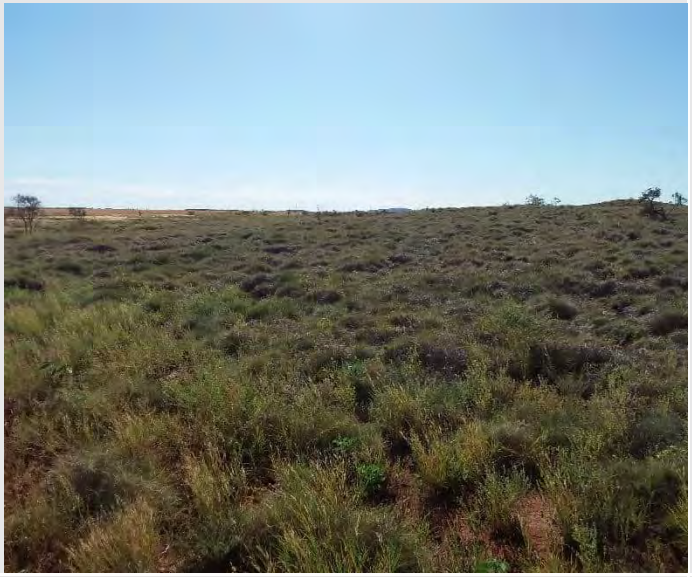
Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Sida fibulifera	0.5	0.25	Forb (G)	
	Tribulus occidentalis	0.1	0.1	Forb (G)	
HPKAR19 	*Acacia inaequilatera*	15	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
	Solanum lasiophyllum	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia epactia	30	0.25	Hummock grass (G)	
	Ehretia saligna var. saligna	3	2.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Boerhavia coccinea	0.5	0.25	Forb (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Phyllanthus maderaspatensis	1	0.25	Forb (G)	
	Cenchrus ciliaris	2	0.25	Tussock grass (G)	
	Indigofera linifolia	0.5	0.5	Forb (G)	
	Portulaca oleracea	0.5	0.1	Forb (G)	
	Ptilotus calostachyus	0.5	0.5	Forb (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Goodenia microptera	0.1	0.25	Forb (G)	
	Notoleptopus decaisnei	0.1	0.25	Forb (G)	
	Evolvulus alsinoides	0.1	0.1	Forb (G)	
	Chrysopogon fallax	2	1	Tussock grass (G)	
	Eragrostis xerophila	8	0.5	Tussock grass (G)	
	Cleome viscosa	2	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Hibiscus sturtii var. ?platychlamys	0.1	0.25	Forb (G)	
	Corchorus incanus subsp. incanus	0.5	0.25	Forb (G)	
	Dactyloctenium radulans	0.1	0.1	Other grass (G)	
	Alysicarpus muelleri	0.1	0.25	Forb (G)	
	Indigofera trita	0.1	0.1	Forb (G)	
HPKAR20 	*Eragrostis xerophila*	35	0.5	Tussock grass (G)	Quadrat
	Streptoglossa decurrens	4	0.25	Forb (G)	
	Chrysopogon fallax	4	0.75	Tussock grass (G)	
	Operculia aequisepala	0.1	0.25	Forb (G)	
	Aristida contorta	0.1	0.25	Tussock grass (G)	
	Euphorbia coghlanii	0.1	0.1	Forb (G)	
	Heliotropium cunninghamii	3	0.25	Forb (G)	
	Sida fibulifera	0.5	0.25	Forb (G)	
	Panicum decompositum	0.1	0.5	Tussock grass (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Phyllanthus maderaspatensis	1	0.25	Forb (G)	
	Indigofera linifolia	3	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Ptilotus nobils	0.1	0.1	Forb (G)	
	Cleome viscosa	0.1	0.25	Forb (G)	
	Aristida latifolia	4	1	Tussock grass (G)	
	Sida rohlenae subsp. rohlenae	0.1	0.25	Forb (G)	
HPKAR21R	*Triodia wiseana*	35	0.5	Hummock grass (G)	Releve
	Triodia epactia	3	0.5	Hummock grass (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Acacia inaequilatera*	15	3	Shrub, cycad, grass-tree, tree-fern (M)	
	Solanum lasiophyllum	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	0.5	0.25	Forb (G)	
	Acacia bivenosa	1	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Aristida contorta	0.1	0.25	Tussock grass (G)	
	Chrysopogon fallax	1	0.75	Tussock grass (G)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
	Ptilotus helipteroides	0.1	0.1	Forb (G)	
	Tephrosia supina	0.5	0.25	Forb (G)	
	Cucumis variabilis	0.1	0.75	Vine (G)	
	Senna notablis	0.1	0.25	Forb (G)	
	Euphorbia australis	0.1	0.1	Forb (G)	
	**Cenchrus ciliaris*	2	0.25	Tussock grass (G)	
HPKAR22	*Triodia wiseana*	30	0.5	Hummock grass (G)	Quadrat
	Acacia inaequilatera	2	3	Shrub, cycad, grass-tree, tree-fern (M)	
	Solanum lasiophyllum	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	0.5	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Acacia bivenosa*	15	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Aristida contorta	0.1	0.25	Tussock grass (G)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
	Ptilotus helipteroides	0.1	0.1	Forb (G)	
	Euphorbia australis	0.1	0.1	Forb (G)	
	Cenchrus ciliaris	2	0.25	Tussock grass (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Scaevola spinescens	0.5	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Indigofera monophylla	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Diplopeltis eriocarpa	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Cassytha capillaris	0.1	0.5	Vine (G)	
	Ptilotus astrolasius	0.1	0.25	Forb (G)	
	Tephrosia supina	0.5	0.25	Forb (G)	
	Triumfetta clementii	0.5	0.25	Forb (G)	
	Heliotropium chrysocarpum	0.1	0.25	Forb (G)	
	Acacia ancistrocarpa	2	2	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Senna artemisioides	0.5	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Polymeria ambigua	0.1	0.25	Forb (G)	
	Tribulus hirsutus	0.1	0.1	Forb (G)	
	Euphorbia biconvexa	0.1	0.1	Forb (G)	
SFRE01 	*Eragrostis xerophila*	40	0.25	Tussock grass (G)	Releve
	Heliotropium cunninghamii	5	0.25	Forb	
	Indigofera linifolia	1	0.1	Shrub, cycad, grass-tree, tree-fern (M)	
	Neptunia dimorphantha	1	0.1	Forb	
	?Dichrostachys spicata	1	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
SFRE02	*Cleome viscosa*	2	0.5	Forb	Releve
	Triodia epactia	50	0.75	Hummock grass	
	Ptilotus nobilis	1	0.25	Forb	
	Neptunia dimophantha	2	0.1	Forb	
	Gomphrena cunninghamii	1	0.25	Forb	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Acacia inaequilatera*	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
SFRE03	*Eragrostis xerophila*	10	0.25	Tussock grass	Releve
	Indigofera linifolia	5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Chrysopogon fallax	5	1	Tussock grass	
	Cleome viscosa	2	0.75	Forb	
	Heliotropium cunninghamii	2	0.25	Forb	
	Senna notabilis	1	0.25	Forb	
	Acacia inaequilatera	1	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	3	0.5	Forb	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Hakea lorea subsp. lorea*	1	2	Shrub, cycad, grass-tree, tree-fern (M)	
SFRE04	*Cleome viscosa*	2	0.25	Forb	Releve
	Triodia epactia	40	0.5	Hummock grass	
	Acacia inaequilatera	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Gomphrena cunninghamii	1	0.1	Forb	
	Ptilotus nobilis	1	0.1	Forb	
	Senna notabilis	1	0.1	Forb	
	Corchorus incanus subsp. incanus	2	0.2	Forb	
	Grevillea pyramidalis subsp. pyramidalis	1	2	Shrub, cycad, grass-tree, tree-fern (M)	
	**Cenchrus cilliaris*	1	0.5	Tussock grass	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Acacia bivenosa*	1	1	Shrub, cycad, grass-tree, tree-fern (M)	
HPKAR23	*Eragrostis xerophila*	35	0.5	Tussock grass (G)	Quadrat
	Streptoglossa decurrens	4	0.25	Forb (G)	
	Portulaca oleracea	0.5	0.1	Forb (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Operculia aequisepala	0.1	0.25	Forb (G)	
	Sida fibulifera	0.5	0.25	Forb (G)	
	Dichanthium sericeum subsp. humilius	0.1	0.1	Other grass (G)	
	Heliotropium cunninghamii	4	0.25	Forb (G)	
	Oldenlandia sp. Hamersley Station (A.A. Mitchel PRP1479)	0.1	0.1	Forb (G)	
	Indigofera linifolia	5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Iseilema dolichotrichum	0.5	0.1	Other grass (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Euphorbia coghlanii*	0.1	0.1	Forb (G)	
	Xerochloa ?laniflora	0.5	0.1	Forb (G)	
	Phyllanthus maderaspatensis	1	0.25	Forb (G)	
	Tribulus occidentalis	0.1	0.1	Forb (G)	
	Panicum laevinode	0.1	0.5	Other grass (G)	
	Chrysopogon fallax	10	1.25	Tussock grass (G)	
	Neptunia dimorphantha	0.1	0.1	Forb (G)	
	Ptilotus nobils	0.1	0.1	Forb (G)	
	Ptilotus carinatus	0.5	0.25	Forb (G)	
	Ipomoea coptica	0.5	0.25	Forb (G)	
HPKAR24R	*Triodia wiseana*	20	0.5	Hummock grass (G)	Releve
	Acacia inaequilatera	10	3	Shrub, cycad, grass-tree, tree-fern (M)	
	Cenchrus ciliaris	20	0.5	Tussock grass (G)	
	Chrysopogon fallax	1	1.5	Tussock grass (G)	
	Hakea lorea subsp. lorea	1	3	Tree, palm (U)	
	Corymbia hamersleyana	2	7	Tree, palm (U)	
	Acacia coriacea subsp. coriacea	5	6	Tree, palm (U)	
	**Vachellia farnesiana*	2	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Cleome viscosa	2	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Acacia xiphophylla*	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Euphorbia australis	0.1	0.1	Forb (G)	
	Portulaca oleracea	0.5	0.1	Forb (G)	
HPKAR25R	*Eragrostis xerophila*	35	0.5	Tussock grass (G)	Releve
	Streptoglossa decurrens	2	0.25	Forb (G)	
	Rhynchosia minima	0.5	0.25	Forb (G)	
	Heliotropium cunninghamii	4	0.25	Forb (G)	
	Euphorbia coghlanii	2	0.1	Forb (G)	
	Sida fibulifera	0.5	0.25	Forb (G)	
	Dichanthium sericeum subsp. humilius	0.1	0.1	Other grass (G)	
	Ptilotus carinatus	0.5	0.1	Forb (G)	
	Operculia aequisepala	0.1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
					
HPKAR26R	*Acacia xiphophylla*	2	1.5	Shrub, cycad, grass-tree, tree-fern (M)	Releve
	Eragrostis xerophila	25	0.5	Tussock grass (G)	
	Streptoglossa decurrens	2	0.25	Forb (G)	
	Xerochloa ?laniflora	0.1	0.1	Forb (G)	
	Portulaca oleracea	0.5	0.1	Forb (G)	
	Triodia wiseana	2	0.5	Hummock grass (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
					
HPKAR27R	*Triodia wiseana*	5	0.5	Hummock grass (G)	Releve
	Acacia inaequilatera	1	3	Shrub, cycad, grass-tree, tree-fern (M)	
	Cenchrus ciliaris	40	0.5	Tussock grass (G)	
	Corymbia hamersleyana	2	7	Tree, palm (U)	
	Acacia coriacea subsp. coriacea	5	6	Tree, palm (U)	
	**Vachellia farnesiana*	5	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Cleome viscosa	2	0.25	Forb (G)	
	Aerva javanica	2	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Acacia xiphophylla*	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Euphorbia australis	0.1	0.1	Forb (G)	
	Acacia bivenosa	2	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Indigofera linifolia	5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
HPKAR28R	*Triodia wiseana*	30	0.5	Hummock grass (G)	Releve
	Cenchrus ciliaris	2	0.5	Tussock grass (G)	
	Cleome viscosa	2	0.25	Forb (G)	
	Acacia xiphophylla	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia bivenosa	10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia inaequilatera	2	3	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Senna artemisioides*	0.5	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia ancistrocarpa	4	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Hakea lorea subsp. lorea	0.1	2.25	Shrub, cycad, grass-tree, tree-fern (M)	
HPKAR29R	*Triodia wiseana*	30	0.5	Hummock grass (G)	Releve
	Cenchrus ciliaris	5	0.5	Tussock grass (G)	
	Acacia bivenosa	10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia inaequilatera	2	3	Shrub, cycad, grass-tree, tree-fern (M)	
	Senna artemisioides	0.5	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia ancistrocarpa	4	1.75	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Corymbia hamersleyana*	2	6	Tree, palm (U)	
	Diplopeltis eriocarpa	4	0.25	Forb (G)	
	Tribulus hirsutus	2	0.25	Forb (G)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
HPKAR30R	*Triodia wiseana*	5	0.5	Hummock grass (G)	Releve
	Acacia xiphophylla	25	1.5	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
					
KAR_07	*Acacia pyrifolia* var. *pyrifolia*	1	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
	Acacia bivenosa	1	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia arida	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia wiseana	60	0.5	Hummock grass (G)	
	Indigofera monophylla	11	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Fimbristylis ?dichotoma	1	0.1	Sedge (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Senna glutinosa subsp. pruinosa	1	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Bulbostylis barbata	1	0.1	Sedge (G)	
	Hybanthus aurantiacus	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Scaevola spinescens	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia maitlandii	1	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Triumfetta clementii	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Ptilotus calostachyus	1	0.5	Forb (G)	
KAR_08	*Acacia inaequilatera*	1	3	Shrub, cycad, grass-tree, tree-fern (M)	Quadrat
	Acacia bivenosa	1	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia arida	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia wiseana	70	0.5	Hummock grass (G)	
	Indigofera monophylla	1	0.25	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Senna glutinosa subsp. pruinosa	1	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Scaevola spinescens	1	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia ancistrocarpa	1	1	Shrub, cycad, grass-tree, tree-fern (M)	
KAR_21 (GHD 2019)	*Acacia stellaticeps*	10	1.3	Shrub, cycad, grass-tree, tree-fern (M)	Releve
	Senna glutinosa subsp. pruinosa	1	0.9	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia pyrifolia var. pyrifolia	1	1.6	Shrub, cycad, grass-tree, tree-fern (M)	
	Cymbopogon ambiguus	1	1	Tussock grass	
	Bonamia erecta	5	0.2	Forb	
	Ptilotus exaltatus	1	0.1	Forb	
	Diplopeltis eriocarpa	4	0.2	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	1	0.2	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia wiseana	70	0.8	Hummock grass	
	Indigofera monophylla	1	0.3	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	Scaevola spinescens	1	0.4	Shrub, cycad, grass-tree, tree-fern (M)	
	Cassytha capillaris	1		Forb	
	Acacia inaequilatera	1	1.7	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia sclerosperma subsp. sclerosperma	1	1.7	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia arida	5	1	Shrub, cycad, grass-tree, tree-fern (M)	
	Triodia epactia	5	0.5	Hummock grass	
	Grevillea pyramidalis subsp. pyramidalis	1	1.8	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia bivenosa	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Trigastrotheca molluginea	1	0.2	Forb	
HPKAR31R	*Triodia wiseana*	30	0.5	Hummock grass (G)	Releve
	Cenchrus ciliaris	5	0.5	Tussock grass (G)	
	Acacia bivenosa	10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia inaequilatera	2	3	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Senna artemisioides*	0.5	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Hakea lorea subsp. lorea	2	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Tribulus hirsutus	2	0.25	Forb (G)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	
	Ptilotus auriculifolius	0.1	0.5	Forb (G)	
	Corchorus walcottii	0.1	0.25	Forb (G)	
HPKAR32R	*Triodia wiseana*	55	0.5	Hummock grass (G)	Releve
	Cenchrus ciliaris	0.1	0.5	Tussock grass (G)	
	Acacia bivenosa	10	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Acacia inaequilatera	5	3	Shrub, cycad, grass-tree, tree-fern (M)	
	Senna artemisioides	0.5	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Hakea lorea subsp. lorea	2	1.75	Shrub, cycad, grass-tree, tree-fern (M)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Ptilotus auriculifolius*	0.1	0.5	Forb (G)	
HPKAR33R	*Eragrostis xerophila*	35	0.5	Tussock grass (G)	Releve
	Streptoglossa decurrens	4	0.25	Forb (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Operculia aequisepala	0.1	0.25	Forb (G)	
	Heliotropium cunninghamii	4	0.25	Forb (G)	
	Indigofera linifolia	5	0.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Euphorbia coghlanii	0.1	0.1	Forb (G)	
	Chrysopogon fallax	10	1.25	Tussock grass (G)	
	Ptilotus nobils	0.1	0.1	Forb (G)	
	Ptilotus carinatus	0.5	0.25	Forb (G)	
	Ipomoea coptica	0.5	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
					
HPKAR34R	*Rhynchosia minima*	0.1	0.25	Forb (G)	Releve
	Chrysopogon fallax	15	1.25	Tussock grass (G)	
	Eucalyptus victrix	12	8	Tree, palm (U)	
	Acacia coriacea subsp. coriacea	5	5	Tree, palm (U)	
	**Passiflora foetida*	20	1.5	Vine (G)	
	Santalum lanceolatum	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Cenchrus ciliaris	20	0.5	Tussock grass (G)	
	Abutilon lepidum	5	1	Forb (G)	
	Corymbia hamersleyana	2	6	Tree, palm (U)	
	Triodia wiseana	5	0.5	Hummock grass (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
					
HPKAR35R	*Chrysopogon fallax*	15	1.25	Tussock grass (G)	Releve
	**Cenchrus ciliaris*	50	0.5	Tussock grass (G)	
	Eucalyptus camaldulensis (planted)	2	7	Tree, palm (U)	
	Acacia ancistrocarpa	1	2	Shrub, cycad, grass-tree, tree-fern (M)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
					
HPKAR36	*Triodia wiseana*	30	0.5	Hummock grass (G)	Quadrat
	Acacia inaequilatera	2	3	Shrub, cycad, grass-tree, tree-fern (M)	
	Solanum lasiophyllum	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchorus incanus subsp. incanus	0.5	0.25	Forb (G)	
	Acacia bivenosa	15	1.25	Shrub, cycad, grass-tree, tree-fern (M)	
	Aristida contorta	0.1	0.25	Tussock grass (G)	
	Hybanthus aurantiacus	0.1	1.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Ptilotus helipteroides*	0.1	0.1	Forb (G)	
	Euphorbia australis	0.1	0.1	Forb (G)	
	Cenchrus ciliaris	20	0.25	Tussock grass (G)	
	Rhynchosia minima	0.1	0.25	Forb (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Indigofera monophylla	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Cassytha capillaris	0.1	0.5	Vine (G)	
	Ptilotus astrolasius	0.1	0.25	Forb (G)	
	Tephrosia supina	0.5	0.25	Forb (G)	
	Triumfetta clementii	0.5	0.25	Forb (G)	
	Acacia ancistrocarpa	2	2	Shrub, cycad, grass-tree, tree-fern (M)	
	Senna artemisioides	0.5	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Euphorbia biconvexa	0.1	0.1	Forb (G)	
HPKAR37	*Cleome viscosa*	2	0.25	Forb (G)	Quadrat
	Triodia wiseana	50	0.5	Hummock grass (G)	
	Rhynchosia minima	1	0.25	Forb (G)	
	Evolvulus alsinoides	0.1	0.1	Forb (G)	
	Tephrosia supina	0.1	0.25	Forb (G)	
	Boerhavia coccinea	0.5	0.5	Forb (G)	
	Abutilon lepidum	0.1	0.25	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Trichodesma zeylanicum var. zeylanicum*	0.1	0.25	Forb (G)	
	Hybanthus aurantiacus	1	1.25	Forb (G)	
	Grevillea pyramidalis subsp. pyramidalis	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Cenchrus ciliaris	0.5	0.25	Tussock grass (G)	
	Scaevola spinescens	1	0.1	Shrub, cycad, grass-tree, tree-fern (M)	
	Grevillea pyramidalis subsp. pyramidalis	1	1.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Streptoglossa decurrens	0.1	0.25	Forb (G)	
	Indigofera monophylla	2	0.5	Shrub, cycad, grass-tree, tree-fern (M)	
	Corchrus walcottii	0.5	0.5	Forb (G)	
	Bonamia erecta	0.1	0.25	Forb (G)	
	Trachymene oleracea subsp. oleracea	0.1	0.1	Forb (G)	
HPKAR38	*Eucalyptus victrix*	5	7	Tree, palm (U)	Quadrat
	Triodia wiseana	35	0.5	Hummock grass (G)	
	Cyperus bifax	2	0.75	Sedge (G)	
	Phyllanthus maderaspatensis	0.1	0.25	Forb (G)	
	Boerhavia coccinea	1	0.25	Forb (G)	
	Indigofera trita	0.1	0.25	Forb (G)	
	Cyperus vaginatus	0.5	1	Sedge (G)	
	Triumfetta clementii	0.5	0.5	Forb (G)	

Site Name and photograph	Taxa	Cover (%)	Height (m)	Form/stratum	Site type
	*Cassytha capillaris*	0.1	0.25	Vine (G)	
	Trichodesma zeylanicum var. zeylanicum	0.1	0.25	Forb (G)	
	Sesbania cannabina	20	1.5	Forb (G)	
	Rhynchosia minima	0.2	0.25	Forb (G)	
	Pluchea rubelliflora	0.1	0.25	Forb (G)	
	Trachymene oleracea subsp. oleracea	0.1	0.25	Forb (G)	
	Eriachne benthamii	0.5	0.5	Tussock grass (G)	
	Hybanthus aurantiacus	0.5	1.25	Forb (G)	
	Ipomoea coptica	0.1	0.25	Vine (G)	
	Terminalia circumalata	4	3	Tree, palm (U)	
	Triumfetta clementii	0.1	0.25	Forb (G)	
	Swainsona formosa	0.1	0.25	Forb (G)	

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Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species recorded within survey area from field survey results.
Likely	Species previously recorded within 20 km and large areas of suitable habitat occur in the survey area.
Possible	Species previously recorded within 20 km and areas of suitable habitat occur/may occur in the survey area.
Unlikely	Species previously recorded within 20 km, but suitable habitat does not occur in the survey area.
Highly unlikely	Species not previously recorded within 20 km, suitable habitat does not occur in the survey area and/or the survey area is outside the natural distribution of the species.
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times

Flora likelihood of occurrence assessment

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Aizoaceae	*Trianthema* sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)		P2	Prostrate to near prostrate annual herb. Flowers pink. Clayey-sand, clayey-loam. Plains, low undulating hills.	**Unlikely –** the closest known record is located approximately 20 km south of the survey area. It has not been previously recorded in the survey area (GHD 2019).	WAHerb
Apocynaceae	*Gymnanthera cunninghamii*		P3	Erect shrub, 1-2 m high. Flowers cream-yellow-green, January to December. Sandy soils.	**Unlikely** – no suitable habitat is present within the survey area.	NatureMap

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Celastraceae	*Stackhousia clementii*		P3	Dense broom-like perennial, herb, to 0.45 m high. Flowers green/yellow/brown. Skeletal soils. Sandstone hills.	**Unlikely –** the species has been recorded within 500 m of the survey area. Suitable habitat is present however given survey effort this species is considered unlikely to occur within the survey area.	NatureMap, TPFL, WAHerb
Combretaceae	*Terminalia supranitifolia*		P3	Spreading, tangled shrub or tree, 1.5-3 m high. Flowers green-yellow, May or July or December. Sand. Among basalt rocks.	**Known** – this species was recorded atop rockpiles on the Burrup Peninsula, and on the slopes adjacent the major rockpile formations.	NatureMap, TPFL, WAHerb
Cyperaceae	*Schoenus punctatus*		P3	Shortly rhizomatous, tufted perennial, grass-like or herb (sedge), ca 0.6 m high. Flowers brown, August. Watercourses.	**Unlikely** – there are no records of the species in close proximity to the survey area. Limited suitable habitat is present however given the survey effort this species is considered unlikely to occur within the survey area.	NatureMap
Fabaceae	*Rhynchosia bungarensis*		P4	Compact, prostrate shrub, to 0.5 m high. Flowers yellow. Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	**Known**– the species was recorded in the northern section of the survey area on the Burrup Peninsula, inside large rock piles and also aside a flow line around a section of pipeline development. .	NatureMap, WAHerb

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Fabaceae	*Vigna triodiophila*		P3	Fine-stemmed prostrate or scrambling vine, small, ovate to elliptic leaves. Known to flower and fruit between May and September. Endemic to basalt rockpile habitats in shallow, red-brown or brown, clayey sand or loam.	**Known** – The species was recorded atop the rockpiles on the Burrup Peninsula.	NatureMap, WAHerb
Malvaceae	*Corchorus congener*		P3	Spreading shrub, to 0.6 m high. Flowers yellow, April to June or August to November. Sand, red sandy loam with limestone. Sand dunes, plains	**Unlikely –** limited suitable habitat present. Given survey effort this species is unlikely to occur within the survey area.	NatureMap
Poaceae	*Eragrostis surreyana*		P3	Annual tufted grass growing to 0.02 m tall. Occurs in drainage soaks, adjacent river beds and plains bordered by steep hills. Occurs on red-brown clay soils.	**Unlikely** – the species has not been recorded within 10 km of the survey area. No soaks of standing water were located within the survey area.	NatureMap
Poaceae	*Themeda* sp. *Hamersley Station* (M.E. Trudgen 11431)		P3	Tussocky perennial, grass-like or herb, 0.9-1.8 m high. Flowers August. Red clay. Clay pan, grass plain.	**Unlikely** – there is one record immediately adjacent to the survey area (1992). This area was thoroughly searched in the 2019 survey (GHD 2019) and no specimens were identified. The area was also disturbed. Given survey effort this species is unlikely to occur within the survey area.	NatureMap, WAHerb

Family	Taxon	Status		Description (if available) (WA Herbarium 1998–)	Likelihood of occurrence	Source
		EPBC Act	BC Act / DBCA			
Rubiaceae	*Oldenlandia* sp. *Hamersley Station* (A.A. Mitchell PRP 1479)		P3	Spreading annual, herb, 0.05-0.1 m high. Flowers blue, March. Cracking clay, basalt. Gently undulating plain with large surface rocks, flat crabholed plain.	**Unlikely** – the species has been recorded within 5 km of the survey area. Limited suitable habitat is present.	NatureMap

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GHD, 2020b. Hybrid Renewable Power Plant – Fauna Survey.

Woodside Power Pty Ltd

Hybrid Renewable Power Plant

Fauna Survey

January 2020

Executive summary

Introduction

Woodside Power Pty Ltd (Woodside) engaged GHD to undertake a Level 1 single season vertebrate fauna survey covering a proposed Power Plant, Solar PV farm and Transmission Corridor Development Envelopes in the Maitland Strategic Industrial Area extending onto the Burrup Peninsula (the survey area). The survey area is located approximately 15 km south-west of Karratha, Western Australia (WA). The results of the fauna survey will be used to the environmental approvals required for the construction and operation of the Power Plant and associated infrastructure.

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

Survey effort

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

Key results

- Nine broad fauna habitat types (excluding disturbed areas) were recorded during the field survey. These habitat types closely align with the different vegetation types and landforms within the survey area. The fauna habitat present include Mudflat with tidal inundation, Mangroves and supportive scattered Samphire, Rocky Hills with exposed boulder piles, Minor Drainage lines, Hummock Grassland on Rocky Plain, Hummock Grassland on Sandy Plain, Hummock Grassland on Low Rocky Hills, Tussock Grasslands on Cracking Clays, Low Chenopod Shrublands and Waterbodies. Some disturbed areas are also present
- The survey area is largely intact, contiguous with disturbed areas consisting of linear infrastructure, industry, land modifications, cattle grazing and mineral resource extraction the main disturbances observed
- The Level 1 survey identified 101 species from within the survey area, consisting of 68 birds, 17 reptiles and 16 mammals. Off these species, four were introduced and comprise Dog, Cat, Cattle and Black Rat.
- Six species of Conservation significance were recorded;
  - North-western Free-tail Bat (*Mormopterus (Ozimops) cobourgianus*), listed a Priority 1 under DBCA.
  - Western Pebble-mound Mouse (*Pseudomys chapmani*), listed a Priority 4 under DBCA.
  - Whimbrel (*Numenius phaeopus*), Migratory under the EPBC Act and International Agreement under the BC Act.
  - Gull-billed Tern (*Gelochelidon nilotica*), Migratory under the EPBC Act and International Agreement under the BC Act.
  - Caspian Tern (*Hydroprogne caspia*), Migratory under the EPBC Act and International Agreement under the BC Act.

– Crested Tern (*Thalasseus bergii*), Migratory under the EPBC Act and International Agreement under the BC Act.

These species were recorded in and around the habitat; Mudflats with tidal inundation, mangroves and supportive scattered Chenopods habitats. However the Western Pebble-mound mouse was recorded via an old mound observed.

Table of contents

Table index

Appendices

1. Introduction

1.1 Background

Woodside Power Pty Ltd (Woodside) is proposing to establish a Hybrid Renewable Power Plant (the Proposal), located approximately 15 km south-west of Karratha, Western Australia (WA). The Proposal will generate electricity from a large scale solar photovoltaic farm (Solar PV Farm), complemented by a high efficiency gas-fired power plant (Gas Power Plant). This hybrid power station will supply clean, efficient and reliable electricity for industrial customers on the Burrup Peninsula.

The Gas Power Plant is proposed to be located at the Maitland Strategic Industrial Area (MSIA) with the Solar PV Farm located on the adjacent MSIA Industrial Buffer Area (Buffer Area). The electricity generated will be transported along a 31 km transmission corridor, via overhead transmission lines to between one to three interposing substations on the Burrup Peninsula (Burrup Substation) for distribution to third party industrial customers. The substations will include a Battery Energy Storage System (BESS) to provide increased electrical system stability as a spinning reserve.

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

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by Woodside to undertake a Level 1 fauna assessment of the survey area. The purpose of the assessment is to delineate key fauna values within the survey area and the potential impact to areas of sensitivity. The outcomes of the assessment will be used in the environmental assessment and approvals process.

1.3 Scope of Works

For the purposes of undertaking this desktop assessment, the survey area refers to the proposed Power Plant, Solar PV farm and Transmission Corridor Development Envelopes, where a 20 km buffer has been applied for database searches the search area is known as the study area.

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

- Desktop assessment of the study area was completed prior to the field survey work to identify significant fauna values which may be in, or nearby the survey area. This included a likelihood of occurrence assessment
- Review of existing and relevant environmental reports
- Field survey to verify / ground truth the desktop assessment findings
- Fauna habitat assessment across the Development Envelope
- Determination of the presence and distribution of fauna species within the survey area using motion cameras
- Determination of the presence of conservation significant bat species using bat detectors

- Series of environmental constraints maps using Geographic Information Systems (GIS) mapping software
- Concise report (this document) on the findings of the fauna survey was provided

1.4 Limitations

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

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

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

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

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

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

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

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

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

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

2. Methods

2.1 Desktop

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

This assessment is restricted to vertebrate terrestrial fauna within the survey area. The Burrup substation (located on the Southern Expansion Lease directly adjacent to the NWS Project Karratha Gas Plant) is devoid of native vegetation and fauna habitats and was not assessed. The desktop assessment includes:

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

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

Table 1 Database searches undertaken for this study

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

2.2 Field survey

A Level 1 fauna survey was undertaken over two periods the 10th to 13th of June and 22nd to 24th July 2019. Where access permitted, the area was ground truthed by senior zoologist Glen Gaikhorst, with the Burrup section completed over the first period and remainder of the survey area over the second. The agreed exclusion areas were maintained, otherwise all areas within the survey area were traversed and visually assessed.

The fauna survey was undertaken with reference to Technical Guide – Terrestrial Fauna Surveys (EPA 2016b). The purpose of the reconnaissance survey was to verify the accuracy of the desktop study, and characterise the fauna and faunal assemblages present in the survey area.

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

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

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

Habitat assessment

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

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

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

Opportunistic fauna searches

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

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

Camera trapping

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

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

Table 2 Remote Camera information

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

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

Bat survey

A Songmeter SM4BAT+ recorder (Wildlife Acoustics Inc., USA) was deployed at three locations (see Figure 3) for a total of three nights to record ultrasonic echolocation calls emitted by microchiropteran bats. The detector locations for the survey area are displayed in Figure 3.

Table 3 Bat Detector Information

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

Call analysis

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

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

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

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

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

Due to variability in the quality of calls, the lack of published information regarding non-search phase calls and the difficulty in distinguishing some species the identification of each call was

assigned a confidence rating (see Mills *et al.* 1996 and Duffy *et al.* 2000) as summarised in Table 4. Due to the absence of reference calls from the study area and the poor quality of some the recordings and known overlap in call characteristics between some species, a conservative approach was taken when analysing calls.

Table 4 Confidence ratings applied to calls

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

Fauna Species Identification

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

2.3 Limitations

2.3.1 Desktop limitations

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

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

2.3.2 Field survey limitations

The EPA (2016a) Technical Guidance states survey reports for environmental impact assessment in Western Australia should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 5. Based on this assessment, the present survey effort is not subject to any constraints which affect the thoroughness of the assessment and the conclusions that have been formed.

Table 5 Field Survey Limitations

Aspect	Constraint	Comment
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Minor	The majority of the survey area was accessed by vehicle and on foot. Information gained from the survey was extrapolated across those sections of the survey area not accessed on foot during the field survey to assist with determining the vegetation and habitat types for the entire survey area.
Mapping reliability	Nil	Data were recorded in the field using a hand-held GPS tool. Certain atmospheric factors and other sources of error can affect the accuracy of such GPS receivers. On average, the GPS units used during this field survey (Garmin GPS, Samsung Tablet units) have an accuracy to approximately ± 5 m. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/ season/cycle	Moderate	The survey was conducted in June and July 2019 which was relatively late in the season for assessing migratory birds. Typically migratory bird surveys are undertaken in the summer period (Dutsun *et al* 2009) between October to March. Due to the habitats present in the survey area migratory species may not have been identified from the survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Minor	A number of disturbances were observed that impacted the survey. These included current and historic vegetation clearing pipelines and tracks, as well as some historic grazing. No evidence of recent fire was observed.
Intensity (in retrospect, was the intensity adequate)	Nil	The terrestrial fauna was sampled in accordance with the EPA (2016b) Level 1 assessment. The survey area was sufficiently covered by GHD zoologist during the survey.
Access restrictions	Minor	Some areas had restricted access during the survey, however these could be visually assessed from a distance to determine habitats present. The majority of the survey area was accessed by vehicle and/or on foot.
Experience Levels	Nil	The survey zoologist is suitably qualified and experienced in his field. Glen Gaikhorst is a Senior Zoologist with over 20 years' experience in undertaking ecological surveys in Western Australia.

3. Results

3.1 Desktop

3.1.1 Fauna diversity

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

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

A number of Short Range Endemic (SRE) invertebrates were also recorded; however, the habitat present in the proposed Power Plant, Solar PV farm and Transmission Corridor Development Envelope (excluding the section on the Burrup Peninsula) are not conducive as SRE environments. While the Transmission Corridor Development Envelope on the Burrup Peninsula may have some habitat present, based on the limited disturbance to construct the transmission towers any impacts would be small and highly-localised.

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

3.1.2 DBCA Database

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

3.1.3 Conservation significant fauna

Searches of the EPBC Act PMST identified the presence/potential presence of 47 conservation significant fauna, including 41 birds, four mammals and two reptiles (Appendix E). The EPBC Act PMST indicated the potential presence of nine additional introduced fauna taxa within 20 km of the survey area. Species identified by the PMST as marine or pelagic were excluded from this assessment as marine habitats are not present within the survey area; however, species identified by the PMST as migratory, migratory terrestrial or migratory wetland were considered as part of this assessment due to habitats present (saltworks).

3.1.4 Previous Report for the Maitland Industrial Estate

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

- Three main fauna habitats (from the most recent survey) have previously been recorded in the Maitland Industrial Estate including Paddock grassland consisting of **Cenchrus ciliaris, Eragrostis xerophila* and *Eriachne aristidea* tussock grassland with *Alternanthera nudiflora,*

Hybanthus auranticatus and *Heliotropium conocarpum* mixed herbs, Creekline community of *Grevillea wickhamii* and *Acacia coriace* tall open shrubland over *Triodia wiseana, Triodia pungens* hummock grassland with patches of *Chrysopogon fallax* and Hummock grassland of *Triodia wiseana* and *Triodia pungens* with **Cenchrus ciliaris* and *Eragrostis xerophila* tussock grassland.

- Previous surveys had identified 24 birds, 3 mammals and 10 reptiles and frogs (Aecom 2013).
- Peregrine and Grey Falcon were recorded as potential 'fly over' the site while Northern Quoll, Pilbara Olive Python, Short-tailed Mouse, Bar-tailed Godwit, Common Greenshank, Curlew Sandpiper and Pin-tailed Snipe are possible to occur. The Lined Soil Crevice Skink and Bridled Tern are known to breed in the area. Note: A number of other species were listed as possible however these species no longer have a conservation listing.
- An assessment of likelihood determined that no EPBC Act listed species were likely to be present, with the exception of 31 migratory, marine species that are known or likely to occur.

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

3.1.5 Conservation Managed Lands

The proposed Power Plant and proposed Solar PV farm do not have any DBCA managed conservation estates or reserves within the vicinity. The proposed Transmission Corridor on the Burrup Peninsula is positioned next to a small portion of the Murujuga National Park. No further conservation estates or reserves are identified along the proposed transmission route.

3.2 Field Survey

3.2.1 Fauna Habitats

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

- Mudflat with tidal inundation, Mangroves and supportive scattered Samphire.
- Rocky Hills with exposed boulder piles
- Minor Drainage lines
- Hummock Grassland on Rocky Plain
- Hummock Grassland on Sandy Plain
- Hummock Grassland on Low Rocky Hills
- Tussock Grasslands on Cracking Clays
- Low Chenopod Shrublands
- Waterbodies

Disturbed areas also formed portions of the survey area and although not always considered as fauna habitat areas these areas may be utilised by fauna.

The topography of the survey area varied from rocky hills, low rocky hills, stony and sandy plains to minor drainage lines, cracking clays and intertidal mudflats. Minor drainage systems occur within the survey area which drain from the surrounding hills to the coast or across plain. Flow varies in direction through the survey area however always drains to the coast. Waterbodies were present within the minor drainages as a series of two pools at the time of the

survey. Soils varied greatly over the survey area and included red-brown stony or sandy loams, cracking clays on the plain, with areas of rocky hills and exposed boulder piles on hills. The habitat types for the survey area are described in Table 6.

Habitat connectivity

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

Disturbance

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

Habitat value

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

Table 6 Fauna habitats recorded in the survey area

Habitat	Image
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire. A small portion of tidal mudflats occur in western part of the survey area on the Burrup Peninsular. Vegetation is minimal except where the mudflats fringe mangroves and samphire. Vegetation was generally sparse and scattered however in areas clustered to form low samphire shrublands. Areas were inundated with water during high tides and retracts to several small pools and a minor drainage line during the low period. Crabs and burrow were recorded on mudflat and generally restricted to those areas regularly influenced by tidal surge. Few areas of debris build up was present however dead branched and some logs were present around the mangrove stand. Scattered large rocks and shell were recorded. The samphire habitat was considered suitable for the Arlie Island Skink however no specimens were recorded during the survey despite four assessments undertaken (walking transects) looking for active skinks. It is likely that the area of available habitat is too small for the skink to persist. No fire evidence was recorded in this area. This habitat type recorded species associated with marine environment included Terns and the Whimbrel (*Numenius phaeopus*). Additionally mangrove specialist birds were recorded including the Yellow White-eye (*Zosterops luteus*) and Dusky Gerygone (*Gerygone tenebrosa*). **Habitat value for fauna species of conservation significance** Four conservation significant species were recorded in this habitat type and include Whimbrel (*Numenius phaeopus*), Gull-billed Tern (*Gelochelidon nilotica*), Caspian Tern (*Hydroprogne caspia*), and Crested Tern (*Thalasseus bergii*). The terns appeared to be following the water courses looking for food while the Whimbrel was recorded on the mudflat foraging. All birds when disturbed fly west into Hearson's Cove. The habitat within the survey area is likely linking habitats from King Bay to Hearsons' Cove. Other migratory species may also utilise the habitat opportunistically and include the Common Sandpiper (*Actitis hypoleucos*), Bridled Tern (*Onychoprion anaethetus)*, Common Greenshank (*Tringa nebularia)* and Wood Sandpiper (*Tringa glareola*). A bat detector at this location recorded the North-western Free-tail Bat (*Mormopterus (Ozimops) cobourgianus*), the record was a probably assessment of this species due to the overlap in call frequencies among species in the region. However due to the habitats present it is highly probable that the calls were of the North-western Free-tailed Bat, particularly that the species is known from the area also. The Peregrine Falcon (*Falco peregrinus*) may also utilise the area for foraging only. **High value** Foraging habitat for migratory birds, North-western Free-tailed Bat and Peregrine Falcon	 

Habitat	Image
Rocky Hills with exposed boulder piles Rocky hills occur in the Burrup portion of the survey area. This habitat type is mostly dominated by a Triodia hummock grassland however does support tussock grasses and scattered Acacia shrubs. However the boulder rock piles are typically devoid of ground cover. The crests of hills contain extensive rock outcropping or boulder piles and support scattered *Ficus platypoda* and *Brachychiton sp.*. The Ficus, Brachychiton and Acacia provided litter and scattered woody debris, however the boulder piles provide extensive cover via crevices, small caves and cavities. No evidence of recent fire was recorded in the survey area. Evidence of old fire scars were present and determined based on the age of the vegetation. The rocky habitats are known to support a range of saxicoline (rock inhabiting) fauna species including Rothchild's Rock Wallaby (*Petrogale rothchildi*) and Woolley's Pseudantechinus (*Pseudantechinus woolleyae*). **Habitat value for fauna species of conservation significance** A large area of habitat that joins to or is part of a contiguous remnant environment extending beyond the survey area on the Burrup Peninsular. This habitat provides resources for the Northern Quoll (*Dasyurus hallucatus*) and Pilbara Olive Python (*Lialis olivaceus barroni*) and potential hunting and foraging opportunities for the Peregrine Falcon. No large cliffs were present in the survey area for Peregrine Falcon to utilise for breeding however looked to be present outside of the survey area particularly along the coastal cliffs and larger boulder piles surrounding the survey area. Northern Quoll and Pilbara Olive Python would utilise the boulder piles for denning/shelter and feeding and would be considered core habitat (DotE 2016 and Tutt et al 2002) for these species. The Western Pebble-mound Mouse would have utilised this habitat but the species appears to be now extinct on the Burrup Peninsular. **High value** Core habitat for Northern Quoll and Pilbara Olive Python, foraging habitat for the Peregrine Falcon	 

Habitat	Image
Minor Drainage lines This habitat type is limited to the linear drainage systems which flow randomly amongst the rocky hills or on the plains. They primarily consist of a thin, linear corridor of denser vegetation which drain into the intertidal mudflats and coastline. This habitat type is mostly dominated by Eucalypt Woodland (on the Burrup Peninsular) and *Acacia* species on the plain. Understorey includes Triodia hummock grassland and Buffel Grass (*Cenchrus spp*.) and mixed small shrub species. Litter, woody debris and logs were present along drainage line edges or were water flow created build up. No recent fire scaring was present in the survey area but historical evidence was obvious via the age of vegetation present. This habitat, particularly on the plain provides a habitat corridor from the coastal tidal zone to the rocky hills in the east in a predominantly open plain over the cracking clays. The taller, mature Eucalypt trees provide roosting and breeding opportunities for a range of fauna via tall canopy or hollows large trees provide. The Black-shouldered Kite was recorded breeding within a Eucalypt and a number of fauna species favouring riparian vegetation were also recorded including White-plumed Honeyeater (*Lichenostomus penicillatus*), Bush Stone Curlew (*Burhinus grallarius*), Budgerigar (*Melopsittacus undulatus*), Red Kangaroo (*Macropus rufus*) and Long-snouted Water Dragon (*Gowidon longirostris*). **Habitat value for fauna species of conservation significance** Patchy and typically linear in the landscape but part of a larger area of contiguous remnant vegetation extending beyond the survey area. This habitat was present within the entire survey area and provides potential hunting and foraging opportunities for the Peregrine Falcon. Northern Quoll and Pilbara Olive Python have also been recorded in drainage lines particularly in association to rocky hills on the Burrup Peninsular. Minor drainage lines on the plain would not be suitable. On the plain the Northern Short-tailed Mouse (*Leggadina lakedowniensis*) and Lined Crevice Skink (*Notoscincus butleri*) would utilise this habitat on the plain. **High value** Linear corridor of habitat utilised by Northern Quoll, Pilbara Olive Python and Peregrine Falcon (in rocky environments) and Northern Short-tailed Mouse and Lined Crevice Skink on the plain. A fauna corridor for all other species on the plain.	  

Habitat	Image
	Exposed granite along a minor drainage line
Hummock Grassland on Rocky Plain This habitat type occurs across the survey area on the Burrup Peninsular and plain often associated with slight undulation where there is association to low hills or rocky substrates. This habitat type is mostly dominated by a Triodia hummock grassland with heavy loam stony soils. The vegetation is a mosaic of shrubs however is dominated by Acacia, Hakea and Grevillia over hummock grasses. Litter, woody debris and branches were present in areas where shrubs were present. No logs or hollows were observed due to the vegetation structure present. No recent fire scaring was present in the survey area but historical evidence was obvious via the age of vegetation present. The grasslands provide good foraging and breeding opportunities for small native ground mammals, ground dwelling birds and reptiles. Several ground dwelling birds, small skinks and dragons were observed active during the survey (Little Button-quail (*Turnix velox*), Brown Songlark (*Cincloramphus cruralis*), Spinifexbird (*Eremiornis carteri*)) and several raptor species were observed foraging over the grasslands (Black-shouldered Kite (*Elanus axilaris*), Spotted Harrier (*Circus assimilis*), Australian Kestrel (*Falco cenchroides*)). **Habitat value for fauna species of conservation significance** Part of a larger area of contiguous remnant vegetation extending beyond the survey area. This habitat provides potential hunting and foraging opportunities for the Peregrine Falcon. Where sand incursion and in association with drainage lines is present within this habitat the Northern Short-tailed Mouse and Lined Crevice Skink maybe present. **Moderate to High value** Habitat that typically supports high diversity of small vertebrate fauna and provides foraging habitat to Peregrine Falcon. The Northern Short-tailed Mouse and Lined Crevice Skink may also utilise this habitat.	

Habitat	Image
Hummock Grassland on Sandy Plain Sandy Plain is present between the causeway and start of the Burrup rocky hills and down the transmission line corridor. This area comprises mixed shrublands over Triodia sp. and Buffel on sand plain. The vegetation comprises shrubs of Acacia, Hakea and Grevillia over Triodia hummock grasses. Litter, woody debris and branches were present in areas where shrubs were present. No logs or hollows were observed due to the vegetation structure present. No recent fire scaring was present in the survey area. This habitat currently supports a range of small fauna species including Ridge-tailed Monitor (*Varanus accanthurus*), Onslow Broad-striped Slider (*Lerista onsloviana*) and the Central Military Dragon (*Ctenophorus isolepis*). Triodia species on sandy soils are known to have high fauna diversity particularly in small mammals and skinks. **Habitat value for fauna species of conservation significance** In this region a patchy habitat situated between rocky hills and cracking clays. This habitat provides potential hunting and foraging opportunities for the Peregrine Falcon. Where sandy and associated to drainage lines the Northern Short-tailed Mouse and Lined Crevice Skink maybe present. **Moderate to High value** Habitat that typically supports high diversity of small vertebrate fauna and provides foraging habitat to Peregrine Falcon. The Northern Short-tailed Mouse and Lined Crevice Skink may also utilise this habitat.	
Hummock Grassland on Low Rocky Hills Low rocky hills occur in limited extent on the Burrup portion of the survey area, often adjacent to rocky hills with exposed boulder piles. This habitat type is mostly dominated by a Triodia hummock grassland however does support tussock grasses and scattered Acacia shrubs. The crests of the low hills contain rocky substrates but lacks the extensive boulder piles in the surrounding taller hills. Limited litter and woody debris is present and no logs, branches or hollows are available. Typically this habitat is very open with a heavy rocky substrate, providing limited hiding ability for fauna. Few fauna species were recorded in this habitat however the sun loving Ringtail Dragon (*Ctenophorus caudicinctus caudicinctus*) and Rock Ctenotus (*Ctenotus saxatilis*) were observed. **Habitat value for fauna species of conservation significance** This habitat would support foraging and the disbursal of the Northern Quoll and Pilbara Olive Python particularly in area close to or in between boulder piles and minor drainage lines. This environment may provide foraging habitat for the Peregrine Falcon. The Western Pebble-mound Mouse would have utilised this habitat but the species appears to be now extinct on the Burrup Peninsular.	

Habitat	Image
Moderate to High value Supportive habitat for species foraging and disbursal particularly the Northern Quoll and Pilbara Olive Python.	
Tussock Grasslands on Cracking Clays This habitat type occurs over much of the southern parts of the survey area (Solar PV and Gas Power Plant areas), and intergrades with smaller areas or scattered Triodia hummock grasslands on stony soils. Overstorey is minimal and includes scattered shrub species. The grasslands provide good foraging and breeding opportunities for grassland and cracking clay specialists such as small native ground mammals, ground dwelling birds and reptiles. Several ground dwelling birds were observed active during the survey (Rufous Songlark (*Cincloramphus mathewsi*), Brown Songlark (*Cincloramphus cruralis*), Horsfield's Bushlark (Mirafra javanica)) and several raptor species were observed foraging over the grasslands (Black-shouldered Kite, Spotted Harrier, Australian Kestrel). Old nests were recorded for songlarks and bushlarks suggesting the species breed in the area. Animal tracks, digs and occasional small burrows were recorded in this habitat type, most of which were kangaroos and other small mammals. Logs, branches and debris were very sparse in this habitat type-which is an artefact of the lack of over storey. Leaf-litter and other forms of non-vascular (ground cover of dead plant material) was localised beneath small clumps of trees but was uncommon. **Habitat value for fauna species of conservation significance** No conservation significant species were recorded in this habitat at the time of the survey. Typically this habitat is utilised in the wet period (December to April) when migratory species are present and grasses flourishing. The migratory species previously recorded in this habitat are the Oriental Plover (*Charadrius veredus)*, Oriental Pratincole (*Glareola maldivarum*), Bridled Tern (*Onychoprion anaethetus*) (which has been recorded breeding just to the west) and any other migratory species that may temporarily and opportunistically utilise open plains. The Northern Short-tailed Mouse and Lined Crevice Skink would utilise this habitat. **Moderate value** Seasonal opportunistic use of habitat by migratory species. The Northern Short-tailed Mouse and Lined Crevice Skink may also utilise this habitat.	 

Habitat	Image
Low Chenopod Shrublands Low lying samphire shrublands occur in a very small portion of the survey area where a modified small drainage line with minor drainage lines adjacent to the plains. This environment is mostly dominated by low chenopods but also includes scattered tussock grasses. Logs, branches and debris were very sparse in this habitat type-which is an artefact of the lack of over storey. Leaf-litter and other forms of non-vascular (ground cover of dead plant material) was localised beneath small clumps of trees but was uncommon. **Habitat value for fauna species of conservation significance** Habitat value is generally low value however some migratory species may utilise the area seasonally. The Chenopod habitat was searched for signs of Arlie Island Skink (*Ctenotus angusticeps*). None were recorded and due to minimal extent of habitat and dissimilarities with the known habitat near Karratha (large areas and lack of mangroves and crab holes) it is unknown but considered unlikely that the species occurs in the survey area. Potentially habitat exists for migratory species such as Wood Sandpiper, Common Greenshank and Common Sandpiper, Oriental Pratincole and Oriental Plover. **Moderate value** Opportunistic use of habitat by migratory species. The Northern Short-tailed Mouse and Lined Crevice Skink may also utilise this habitat.	
Water Bodies This habitat type occurs in small areas within the minor drainage lines and a modified drainage line. Two water bodies are present along the transmission corridor on the plain. The habitat consists of water bodies surrounded by either Acacia, sedges, samphire or the introduced tree Tamarix. The waterbodies are seasonally or tidal filled and both appeared brackish. No fish were present and from the lack of visible prints around the water by birds or kangaroos would suggest to salty as a water source. Logs, branches and debris were very sparse in this habitat type-which is an artefact of the lack of over storey. Leaf-litter and other forms of non-vascular (ground cover of dead plant material) was localised beneath small clumps of trees. **Habitat value for fauna species of conservation significance** Habitat value would be high value to migratory birds however use would be seasonal and opportunistic. Both water bodies are very small, modified and temporary. **Moderate value** Opportunistic use of habitat by migratory species.	

Habitat	Image
Disturbed areas This environment occurs across small cleared areas or comprise of corridors within the survey area. These include minor roads and supportive infrastructure. Most of the disturbed area have very little value to fauna. Vegetation in these areas varied depending on the location of the disturbance.	

3.2.2 Species Diversity

During the survey 101 species were identified from within the survey area, consisting of 68 birds, 17 reptiles and 16 mammals. Off these species, four were introduced and comprise Dog, Cat, Cattle and Black Rat. The remaining species were all native and are known from the region. The full list of species identified can be seen in Appendix C.

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

Plate 1 Woolley's Pseudantechinus (zoomed in)

Plate 2 Rothchild's Rock Wallaby

Conservation Significant Fauna

Six species of Conservation significance were recorded:

- North-western Free-tail Bat (*Mormopterus (Ozimops) cobourgianus*), listed a Priority 1 under DBCA.
- Western Pebble-mound Mouse (*Pseudomys chapmani*), listed a Priority 4 under DBCA.
- Whimbrel (*Numenius phaeopus*), Migratory under the EPBC Act and International Agreement under the BC Act.
- Gull-billed Tern (*Gelochelidon nilotica*), Migratory under the EPBC Act and International Agreement under the BC Act.
- Caspian Tern (*Hydroprogne caspia*), Migratory under the EPBC Act and International Agreement under the BC Act.
- Crested Tern (*Thalasseus bergii*), Migratory under the EPBC Act and International Agreement under the BC Act.

These species were recorded in and around the habitat; Mudflats with tidal inundation, mangroves and supportive scattered Chenopods habitats. However the Western Pebble-mound mouse was recorded via an old mound observed. These species are discussed in greater detail below and conservation categories/codes are defined in Appendix B.

North-western Free-tail Bat (Mormopterus (Ozimops) cobourgianus)

The North-western Free-tail Bat is listed as P1 under DBCA priority listed fauna. The North-western Free-tail Bat is known from 12 locations in Western Australia (DBCA 2007–) and four in the Northern Territory. The species appears to be restricted in distribution to a few localised habitats. The species can appear to be locally common because it aggregates, however over a landscape is localised and restricted. In Western Australia, this species inhabits mangrove stands, and has been recorded roosting in hollows and or crevices in mangroves (van Dyck et al. 2013).

The North-western Free-tail Bat was recorded in the survey area from calls classified as probable. Given the lack of mangrove within the survey area, it is likely this species opportunistically forages in the survey area and roosts in the mangroves to the west (in King Bay) or to the east in the northern portion of Hearson's Cove. There is only a small amount of habitat within the survey area for these species to utilise and any impacts are likely to be negligible.

Western Pebble-mound Mouse (Pseudomys chapmani)

The Western Pebble-mound Mouse is listed Priority 4 under DPaW Priority fauna listing.

The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the species can be found on stony hillsides with hummock grasslands. It constructs large mounds of pebbles on stony slopes which cover an area of 0.5-9.0 square metres. 'Active' mounds are characterized by volcano-like cones capped by 'craters' that mark occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck and Strahan, 2008).

Evidence of the species was recorded in one location within the survey area (as shown in Figure 5, Appendix A). This mound was considered an inactive mound and was recorded on the rocky hills. From recent surveys few active mounds have been recorded on the Burrup Peninsular and the species considered locally extinct (Start 1996). The species is known to be sensitive to external impacts and populations are known to decline in areas where disturbance has occurred.

Whimbrel (Numenius phaeopus)

The whimbrel is listed as migratory under the EPBC Act and International Agreement under the BC Act.

The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields (Higgins & Davies 1996).

One individual Whimbrel was recorded foraging in the intertidal drainage line alongside the survey area. This individual once disturbed flew towards Hearsons Cove on the eastern side of the Burrup Peninsular. There is only a small amount of habitat within the survey area for this species to utilise and any impacts are likely to be negligible. There is habitat (tidal mudflats) available in King Bay and within Hearsons Cove of much larger real estate for wading species to utilise in the region.

Tern Species

The terns recorded are listed as migratory under the EPBC Act and International Agreement under the BC Act.

Three Migratory tern species were observed flying through and around the survey area, these being the Gull-billed Tern (*Gelochelidon nilotica*), Caspian Tern (*Hydroprogne caspia*) and Crested Tern (*Thalasseus bergii*). These species were observed flying to and from King Bay into the tidal portion of the survey area. Additionally one species was recorded flying towards Hearson's Cove to the east. This area is likely a regular in fly over location for these species moving between King Bay and Hearson's Cove. There is only a small amount of habitat within the survey area for these species to utilise and any impacts are likely to be negligible. All species are considered relatively common and to opportunistically use the area.

3.2.3 Likelihood of Occurrence

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

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

This assessment found (post survey) that 11 species were identified as likely to occur within the survey area, based on species records and habitat identified and review of previous works undertaken in the region. These species can be seen in Table 7.

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

Species and status (EPBC, WC Act)	Justification for Likelihood of Occurrence
Northern Quoll (*Dasyurus hallucatus*) En, En	**Likely – species is known from the Burrup Peninsular and habitat is present** The species was not recorded during the field survey however the species is known from the Burrup Peninsular in low numbers. The preferred habitat for the species is rocky hills with exposed boulder piles, rocky hills and minor drainage lines in close proximity to boulder piles. The most recent records is 2015 for this species on the Burrup peninsular and a plant near to the salt works, however the indigenous rangers present during the survey indicated more recent remote camera records from the Burrup.
Pilbara Olive Python (*Liasis olivaceus barroni*) Vu, Vu	**Likely – resident/regular visitor, opportunistic use in/to the survey area** The survey area provides suitable habitat for the species. The rocky hills with exposed boulder piles and associated minor drainage lines habitats (on the Burrup Peninsular) would be regarded as important habitat for the species. The remainder of the habitat in the survey area is supportive only and the plain habitat off the Burrup is not habitat for Pilbara Olive Python. There are numerous recent records adjacent to the survey area, from the Burrup Peninsular with at least 5 records since 2016.
Peregrine Falcon (*Falco peregrinus*) OS	**Likely – regular visitor or resident to survey area** The survey area provides suitable hunting habitat. The survey area is probably part of the species broader home range, limited breeding habitat occurs within the survey area. Important breeding habitat (e.g. steep cliffs) may be found in nearby ranges and coastal cliffs outside of the survey area but within the study area. There are five records within the study area.
Northern Short-tailed Mouse (*Leggadina lakedownensis*) P4	**Likely –resident to survey area, restricted to the cracking clays and minor drainage lines** The survey area provides suitable habitat for the species particularly in minor drainage line associated to cracking clays on plain habitats. The species has been recorded within the study area and the species likely present. There is three historical records within 2 km of the survey area.
Lined Soil-crevice Skink (*Notoscincus butleri*) P4	**Likely – resident in/to the survey area** The survey area provides suitable habitat for the species particularly in minor drainage line associated to cracking clays or stony soils on plain habitats. The species has been recorded within the study area and the species likely present. There is five historical records within the study area.
Bridled Tern (*Onychoprion anaethetus*) Mi, IA	**Likely – regular visitor or resident to survey area** Most records for this species are on or around the off shore islands, however the species has been recorded breeding on the mainland adjacent to the Maitland Industrial Estate survey area (AECOM 2003) (exact location unknown). A small amount of habitat is present for this species particularly within the intertidal mudflats and minor drainage lines. However use would be irregular and opportunistic.
Wood Sandpiper (*Tringa glareola*) Mi, IA	**Likely –seasonal visitor, opportunistic use in/to the survey area** This species has been recorded in the survey area and within the vicinity of the survey area previously and habitat is present for the species. This

Species and status (EPBC, WC Act)	Justification for Likelihood of Occurrence
	species is known to utilise habitats in the Pilbara, including mudflats, plain and minor drainage lines. The species is known from the area with one record from the plain along the infrastructure corridor and three other records within 2 km of the survey area.
Common Greenshank (*Tringa nebularia*) Mi, IA	**Likely –seasonal visitor, opportunistic use in/to the survey area** This species has been recorded in the survey area and within the vicinity of the survey area previously and habitat is present for the species. This species is known to utilise habitats in the Pilbara, including mudflats, plain and minor drainage lines. The species is known from the area with one record from the plain along the infrastructure corridor and 10 other records within 2 km of the survey area.
Oriental Pratincole (*Glareola maldivarum*) Mi, IA	**Likely –seasonal visitor, opportunistic use in/to the survey area** This species has been recorded in the survey area and within the vicinity of the survey area previously and habitat is present for the species. This species is known to utilise habitats in the Pilbara, including mudflats, plain and minor drainage lines. The species is known from the area with one record from the plain along the infrastructure corridor and another record within 2 km of the survey area.
Oriental Plover (Charadrius veredus) Mi, IA	**Likely –seasonal visitor, opportunistic use in/to the survey area** This species has been recorded in the vicinity of the survey area previously and habitat is present for the species. This species is known to utilise habitats in the Pilbara, including mudflat and plain. The species is known from the area with three records from within 2 km of the survey area.
Common Sandpiper (*Actitis hypoleucos*) Mi, IA	**Likely –seasonal visitor, opportunistic use in/to the survey area** This species has been recorded in the survey area and within the vicinity of the survey area previously and habitat is present for the species. This species is known to utilise habitats in the Pilbara, including mudflats, plain and minor drainage lines. The species is known from the area with two records from the plain along the infrastructure corridor and seven other records within 2 km of the survey area.

Table note:

Status (see Appendix B for full explanation)

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

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

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

4. Conclusion

Four migratory species listed under the EPBC Act and BC Act were recorded including Whimbrel (*Numenius phaeopus*), Gull-billed Tern (*Gelochelidon nilotica*), Caspian Tern (*Hydroprogne caspia*), and Crested Tern (*Thalasseus bergii*). Two priority listed species (under DBCA) the Western Pebble-mound Mouse (*Pseudomys chapmani*) and North-western Free-tail Bat (*Mormopterus (Ozimops) cobourgianus*) were also recorded.

The four migratory bird species and North-western Free-tailed Bat were all recorded within the same area and included the habitat Mudflat with tidal inundation, Mangroves and supportive scattered Samphire. This habitat comprises a very small portion of the survey area however the tidal area appears to be linking habitat from King Bay to Hearson's Cove (east west connection) and may comprise an important flyway between these areas.

The Western Pebble-mound Mouse was identified via an old mound still present in the landscape. This species is thought to be in decline from coastal areas and is now considered extinct from the Burrup Peninsular (Start 1996). The proposed project would not impact on this species.

Eleven additional species are likely to occur in the survey area and include Northern Quoll (*Dasyurus hallucatus*), Pilbara Olive Python (*Liasis olivaceus barroni*), Peregrine Falcon (*Falco peregrinus*), Northern Short-tailed Mouse (*Leggadina lakedownensis*), Lined Soil-crevice Skink (*Notoscincus butleri*), Bridled Tern (*Onychoprion anaethetus*), Wood Sandpiper (*Tringa glareola*), Common Greenshank (*Tringa nebularia*), Oriental Pratincole (*Glareola maldivarum*), Oriental Plover (*Charadrius veredus*) and Common Sandpiper (*Actitis hypoleucos*).

The Northern Quoll and Pilbara Olive Python would be restricted to the Burrup Peninsular on the rocky hills with exposed boulder piles and minor drainage lines in association to rocky hills. Both species are not considered common on the Burrup and by excluding these habitats (particularly the boulder piles) will reduce any impacts to these species during construction.

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

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

The Bridled Tern, Wood Sandpiper, Common Greenshank, Oriental Plover and Common Sandpiper have previously been recorded within 2 km of the survey area and habitats are present in the survey area. All of these species may utilise the habitats present in the Mudflat with tidal inundation, Mangroves and supportive scattered Samphire, low chenopod shrublands

and minor drainage line environments but impacts likely minimal to the species. This is due to the opportunistic use of the survey area by the species. As for the migratory birds recorded previously the King Bay to Hearson's Cove areas could be used as a flyway for these species.

5. References

Aecom 2013. Environmental Due Diligence, Maitland Industrial Estate. Unpublished report. Unpublished Report for LandCorp, Western Australia.

Armstrong, K. N., and Coles, R. B. 2007. Echolocation call frequency differences between geographic isolates of *Rhinonicteris aurantia* (Chiroptera: Hipposideridae): implications of nasal chamber size. *Journal of Mammalogy* **88**, 94-104.

Armstrong, K N 2011. The current status of bats in Western Australia. **In:** 'The biology and conservation of Australasian bats.' (Eds B Law, P Eby, D Lunney and L Lumsden) pp. 257–269. (Royal Zoological Society of New South Wales: Mosman.)

Bamford, M.J. 1988. Kakadu National Park: a preliminary survey of migratory waders October/November 1987. RAOU Report No. 60. Royal Australasian Ornithologists Union, Melbourne, Australia.

Boles, W.E., N.W. Longmore & M.C. Thompson 1994. A recent specimen of the Night Parrot, Geopsittacus occidentalis. Emu. 94:37-40

Christidis, L and Boles, WE 2008, *Systematics and Taxonomy of Australian Birds*, Melbourne, Australia, CSIRO Publishing.

Collins, P., A. Boyle, C. Minton & R. Jessop 2001. The importance of inland claypans for waders in Roebuck Bay, Broome, NW Australia. Stilt. 38:4--8.

Corben, C 2015. *AnalookW for bat call analysis using ZCA; Version 4.1z*; 20 September 2015.

Cramp, S 1985. The birds of the Western Palearctic.Vol. IV. Oxford University Press, Oxford.

Department of the Environment (DotE) 2016. Numerous migratory bird searches in Species Profile and Threats Database, Department of the Environment, Canberra.

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) 2013. Species Profile and Threats Database (SPRAT), Department of Sustainability, Environment, Water, Population and Communities, Canberra, Australian Government.

Department of Biodiversity, Conservation and Attractions (DBCA) 2007–. NatureMap: Mapping Western Australia's Biodiversity, retrieved March 2019, from http://naturemap.dpaw.wa.gov.au/default.aspx/.

Department of the Environment and Energy (DEE) 2019, Species Profile and Threats Database (SPRAT), retrieved March 2019, from http://www.environment.gov.au/cgi-bin/sprat/public/.

Duffy, AM, Lumsden, LF, Caddle, CR, Chick, RR & Newell, GR 2000. The efficacy of Anabat ultrasonic detectors and harp traps for surveying microchiropterans in southeastern Australia, Acta Chiropterologica 2: 127-144.

Dutson, G., Garnett, S and Gole, C. 2009. Australia's Important Bird Areas- Key sites for bird conservation. Bird Australia (RAOU) Conservation Statement No. 15.

EPA 2016a. Technical Guidance – Sampling methods for terrestrial vertebrate fauna, Perth, Environmental Protection Authority.

EPA 2016b. Technical Guidance, Terrestrial Fauna Surveys, Perth, Environmental Protection Authority.

Geering, A., L. Agnew & S. Harding, 2007, eds. Shorebirds of Australia. Page(s) 75-196. Melbourne: CSIRO Publishing.

Higgins, PJ and Davies, SJJF (eds.) 1996. Handbook of Australian, New Zealand & Antarctic birds, Volume 3: Snipe to Pigeons, South Melbourne, Australia, Oxford University Press.

Jarman, H, 1978. An inland record of the Whimbrel. Australian Bird Watcher. 7:170.

Lloyd, RL and Lloyd, HJ 1991. An Oriental Pratincole at the Dry Creek Saltfields, South Australian Ornithologist, vol. 31, pp 74.

Marchant, S and Higgins, PJ (eds.) 1993. Handbook of Australian, New Zealand and Antarctic Birds, Volume 2 – Raptors to Lapwings, Melbourne, Victoria, Oxford University Press.

McKenzie, NL, and Bullen, R D 2009. The echolocation calls, habitat relationships, foraging niches and communities of Pilbara microbats. *Records of the Western Australian Museum* Supplement **78**: 123–155.

Mills, DJ, Norton, TW, Parnaby, HE, Cunningham, RB & Nix, HA 1996. Designing surveys for microchiropteran bats in complex forest landscapes – a pilot study from south-east Australia. Forest Ecology and management 85(1-3):149-161.

Minton, C., & J. Whitelaw 2000. Waders roosting on mangroves. Stilt. 37:23-24.

Morcombe, M 2004. Field Guide to Australian Birds, Queensland, Australia, Steve Parish Publishing Archer Field.

Parker, S.A. 1980. Birds and conservation parks in the north-east of South Australia. South Australian Parks and Conservation. 3:11-18.

Pavey, C 2006. National Recovery Plan for the Greater Bilby Macrotis lagotis. Northern Territory Department of Natural Resources, Environment and the Arts.

Rogers, D. 1999b. Roost choice in the waders of Roebuck Bay: is avoiding heat stress their main consideration?. Stilt. 35:65.

Rogers, D. 2001. Conservation and ecology of migratory shorebirds in Roebuck Bay, north-western Australia. Wetlands Unit, Environment Australia.

Schodde, R. & I.J. Mason 1999. The Directory of Australian Birds: Passerines. Melbourne, Victoria: CSIRO

Southgate, R., R. Paltridge, P. Masters & S. Carthew 2007. Bilby distribution and fire: A test of alternative models of habitat suitability in the Tanami Desert, Australia. Ecography. 30:759-776.

Smith, L. E and Chafer, C. J 1987. The avifauna of Bass Point, New South Wales. Australian Birds. 21:1-18.

Start, A. N. 1996. A Review of the Conservation status of the Ngadji (Western Pebble-mound Mouse) Pseudomys chapmani. Kitchener, 1980 (Rodentia Muridae). Department of Conservation and Land Management Science and Information Division.

Stewart, D., A. Rogers & D.I. Rogers 2007. Species description. In: Geering, A., L. Agnew & S. Harding, eds. Shorebirds of Australia. Page(s) 75-196. Melbourne: CSIRO Publishing.

Storr, GM 1980. Birds of the Kimberley Division, Western Australia, Special Publications of the Western Australian Museum, No. 11, pp 1-117, Perth, Western Australia, Western Australian Museum.

Tutt, M. S. Mitchell, P. Brace & D. Pearson 2002. Conserving Pilbara olive pythons on the Burrup. Threatened Species Network community grants annual report, Project WA04/100. Karratha: Nickol Bay Naturalists' Club/WA CALM.

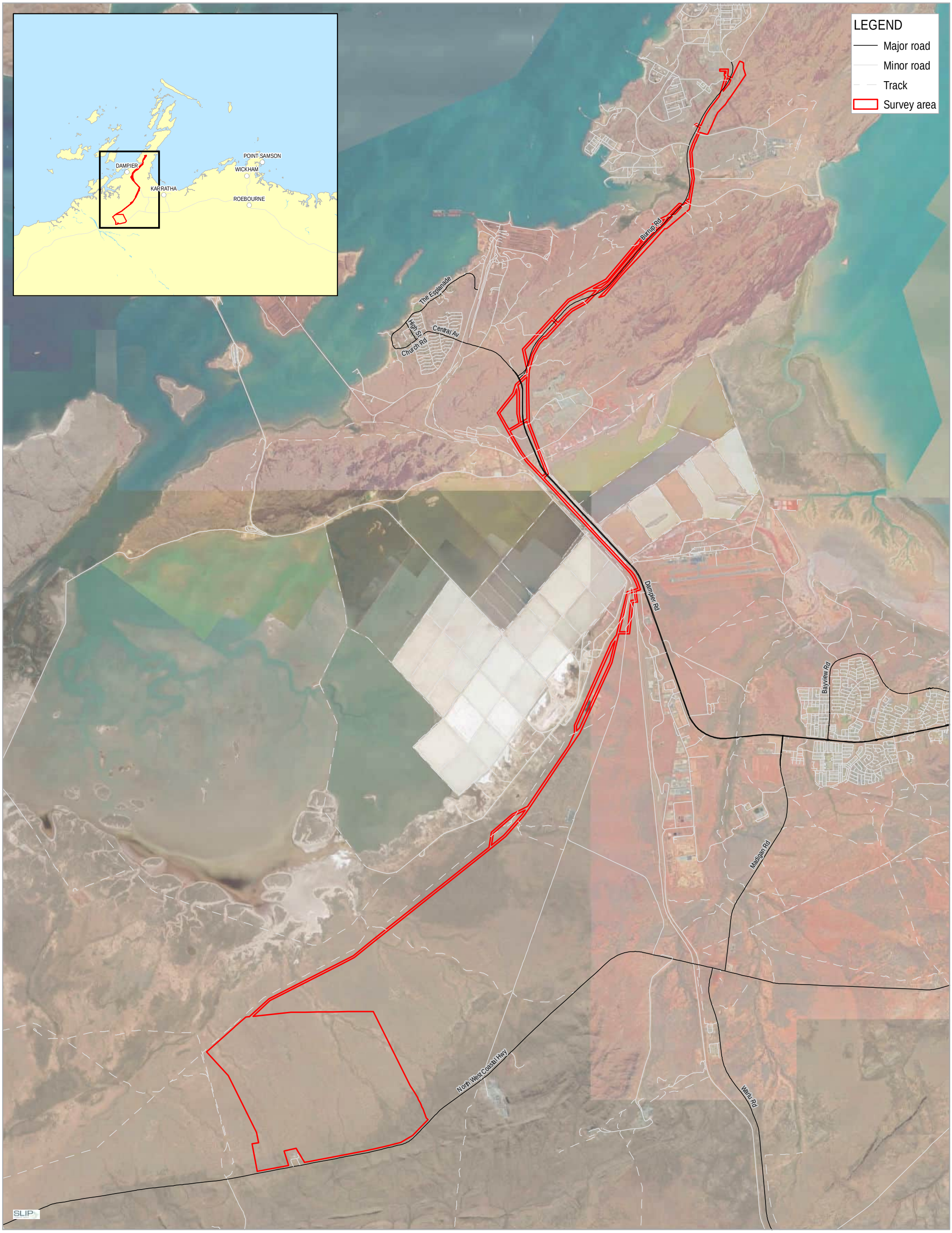
Wilson, S and Swan, G 2017. A Complete Guide to Reptiles of Australia, 5th Edition, Sydney Australia, New Holland Press

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

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

Appendices

Appendix A - (Figures)



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Woodside **Power Pty** Ltd
Hybrid Renewable Power Plant
Fauna Survey

Project Location

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 1

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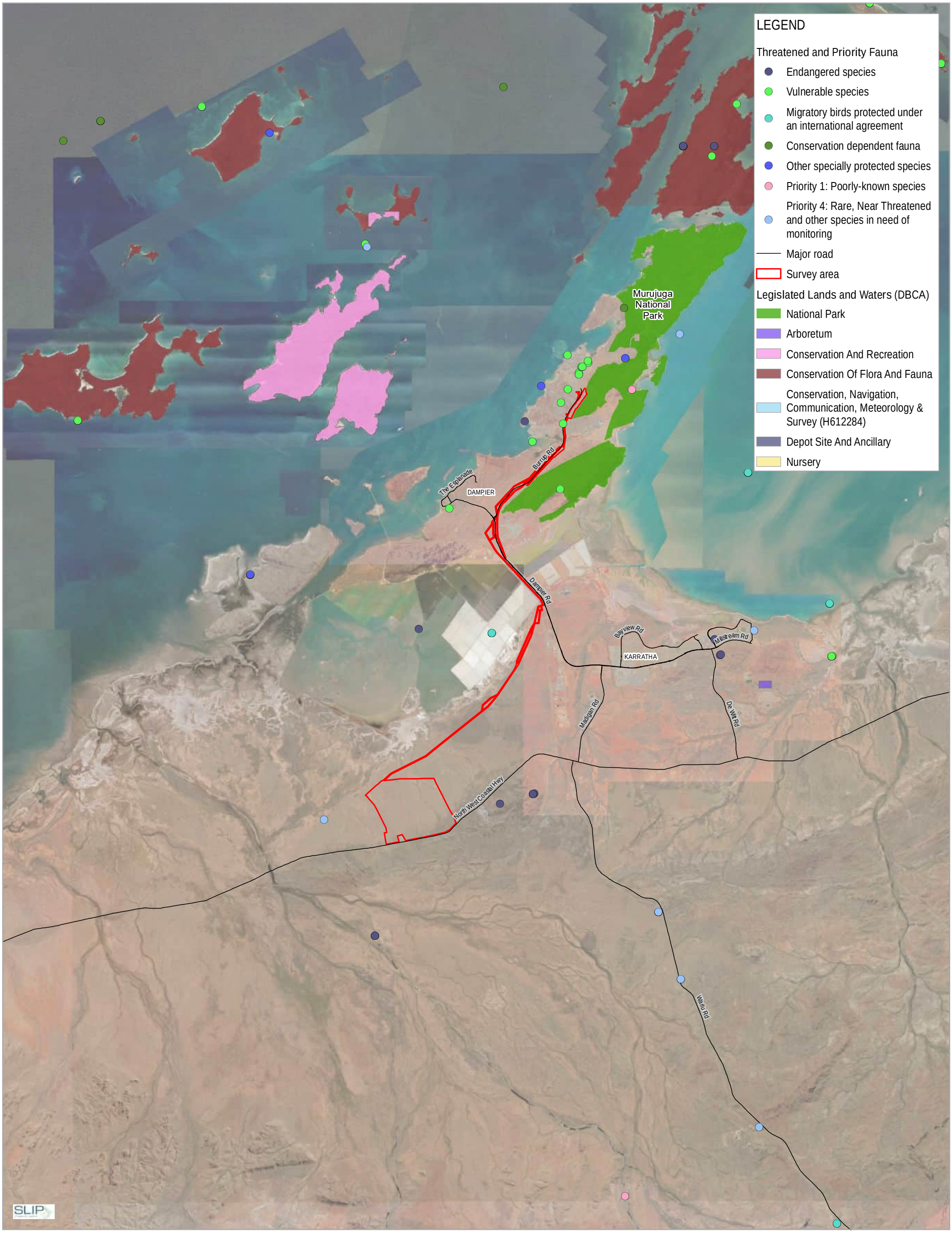

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Woodside **Power Pty** Ltd
H**ybrid Renewable Power Plant**
Fauna Survey

Biological Constraints

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 2

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LEGEND

Fauna Methods

- Bat detector
- Remote camera
- Major road
- Survey area

DAMPIER

The Esplanade

High St

Central Av

Church Rd

Burrup Rd

Dampier Rd

KARRATHA

Bayview Rd

Balmoral Rd

Madigan Rd

North West Coastal Hwy

Wanlu Rd

SLIP

Paper Size ISO A3

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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GHD

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Fauna Survey

Fauna Methods

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 3

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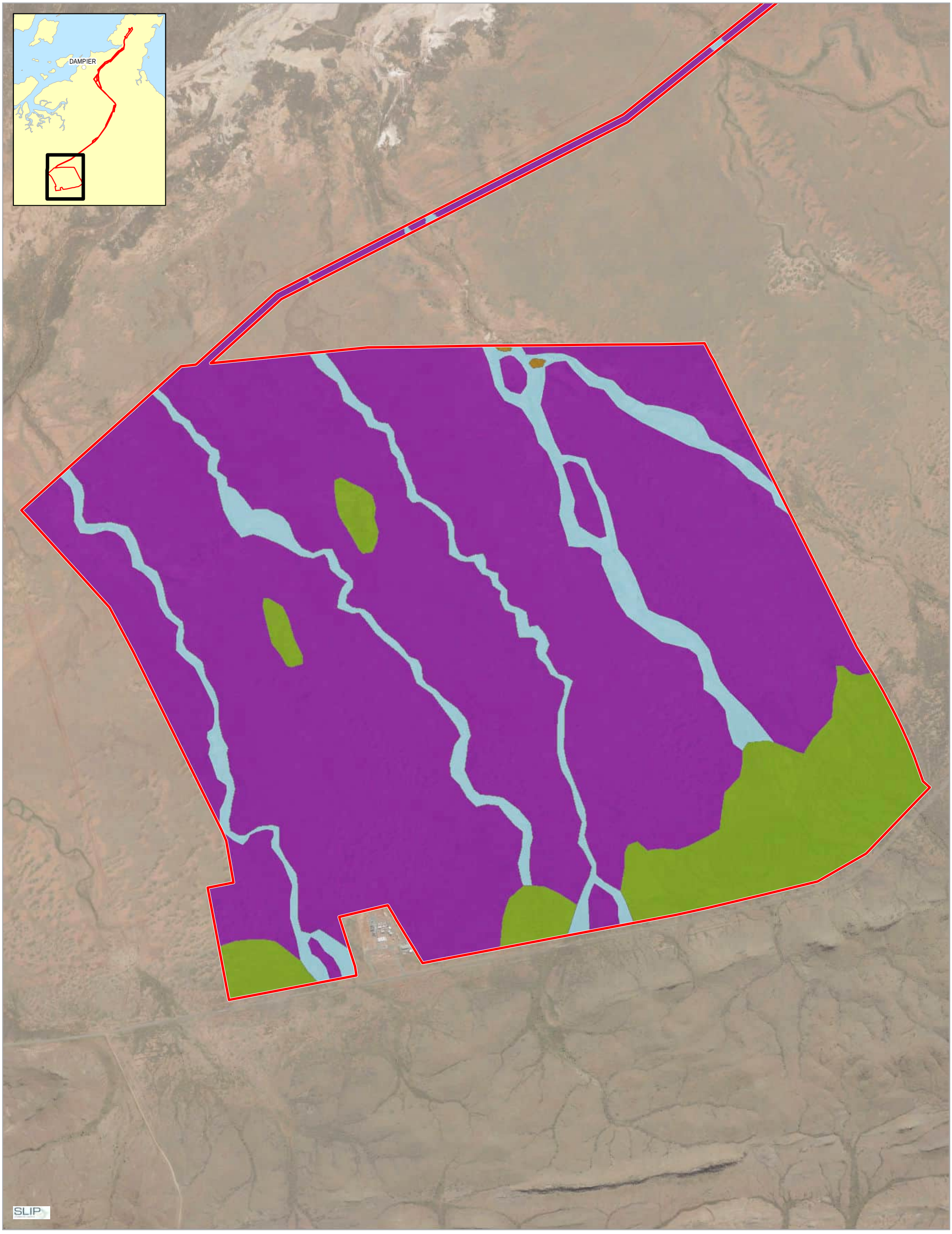

LEGEND

Survey area

Fauna Habitat

Granite

Minor drainage

Triodia on stony soils

Tussock grasslands on cracking clays

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Woodside **Power Pty** Ltd
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Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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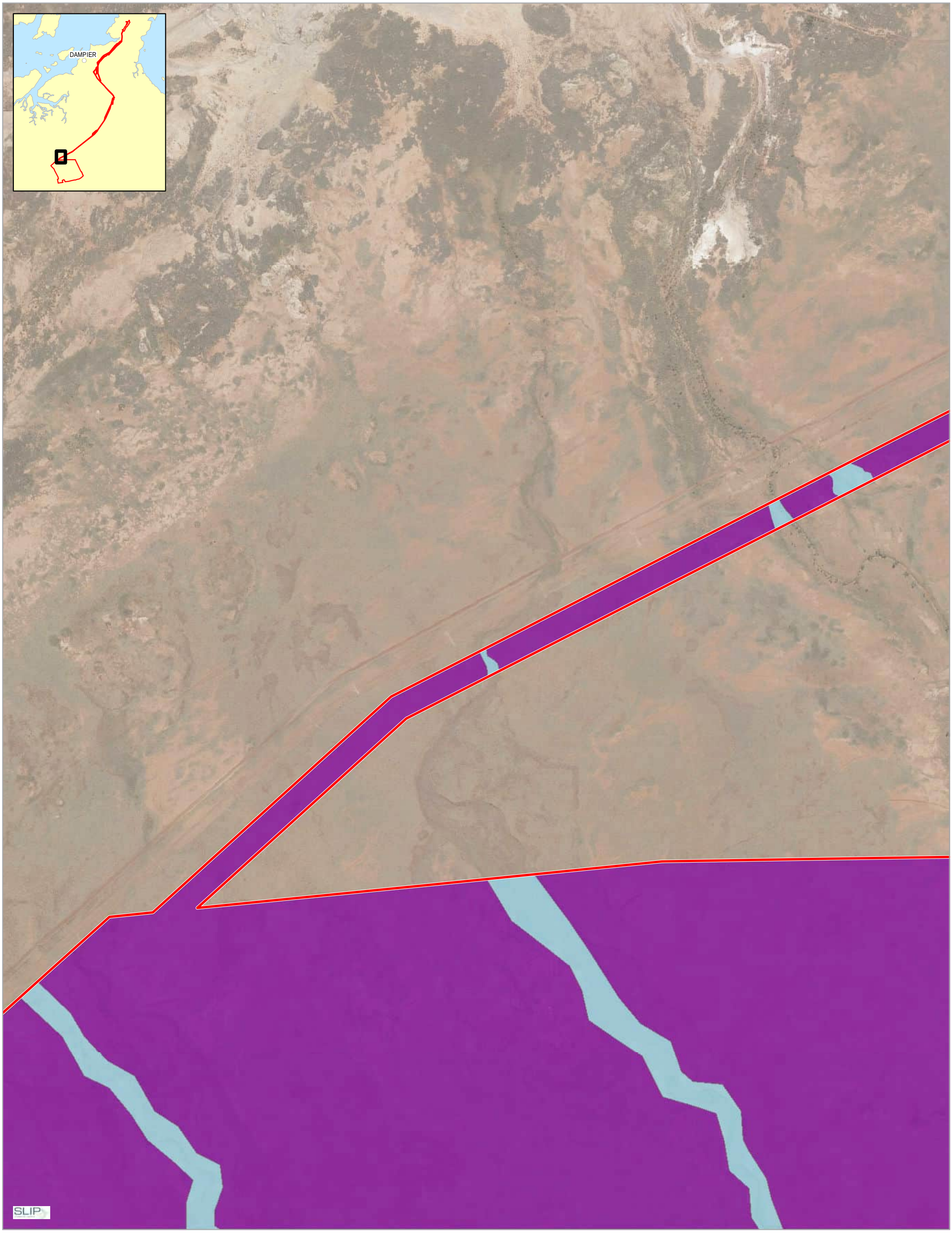

LEGEND

Fauna Habitat

Minor drainage

Tussock grasslands on cracking clays

Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside **Power Pty** Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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LEGEND

Fauna Habitat
Granite
Minor drainage
Tussock grasslands on cracking clays
Survey area

Paper Size ISO A3
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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
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FIGURE 4

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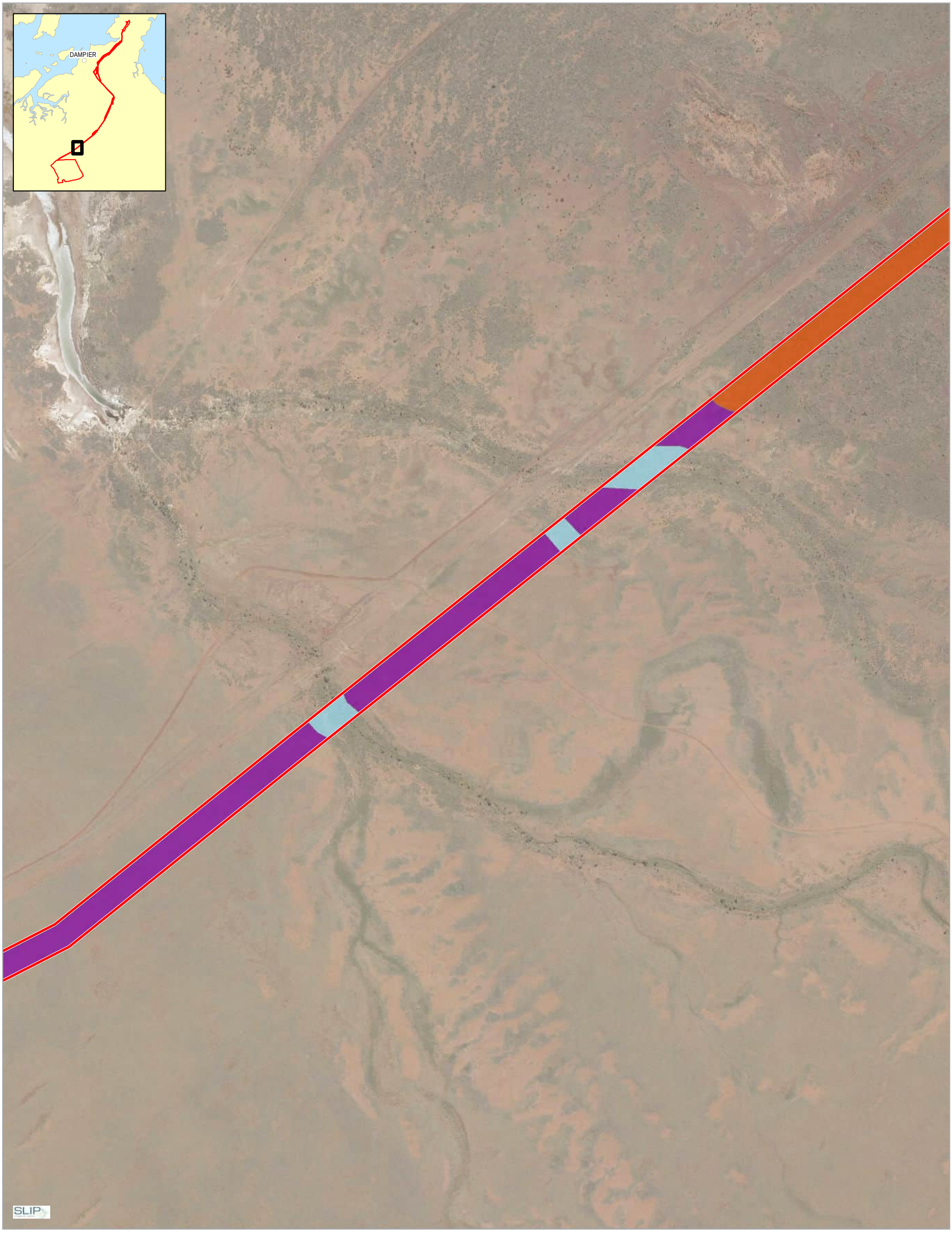

LEGEND

Fauna Habitat

- Hummock grassland on rocky plain
- Minor drainage
- Tussock grasslands on cracking clays
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

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Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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Data source: GHD: Survey area - 20190719, Fauna habitats; Landgate: Roads - 20190128, Imagery: 20180408 (accessed: 20190730). Created by: afeeney

LEGEND

Fauna Habitat

Hummock grassland on rocky plain

Tussock grasslands on cracking clays

Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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LEGEND

Fauna Habitat

Disturbed

Hummock grassland on rocky plain

Minor drainage

Water body

Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

G:\61\3780805\GIS\Maps\Working\Report Figures\Fauna\613780805_Fig4_FaunaHabitats_Rev0.mxd
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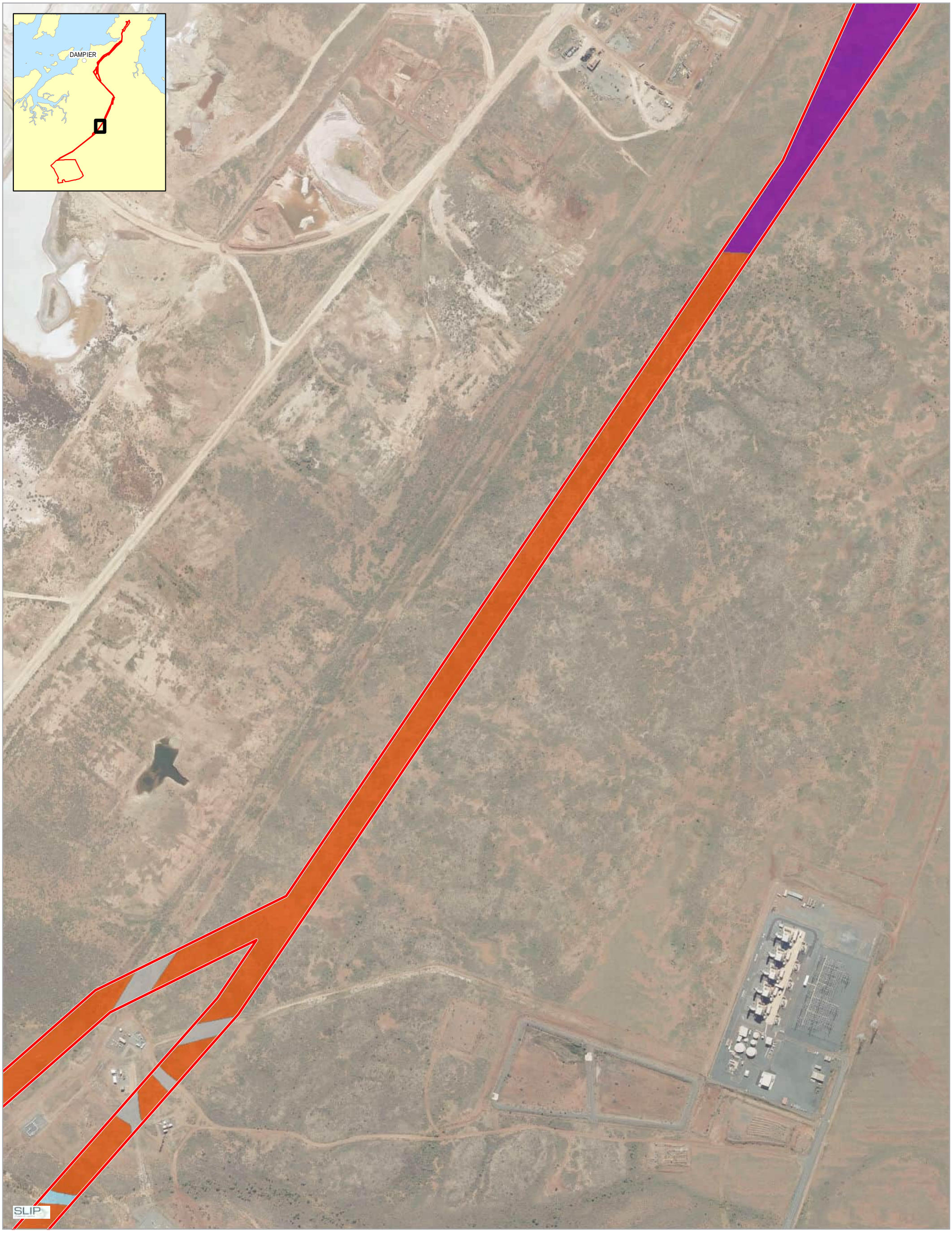

LEGEND

Fauna Habitat
- Disturbed
- Hummock grassland on rocky plain
- Minor drainage
- Tussock grasslands on cracking clays
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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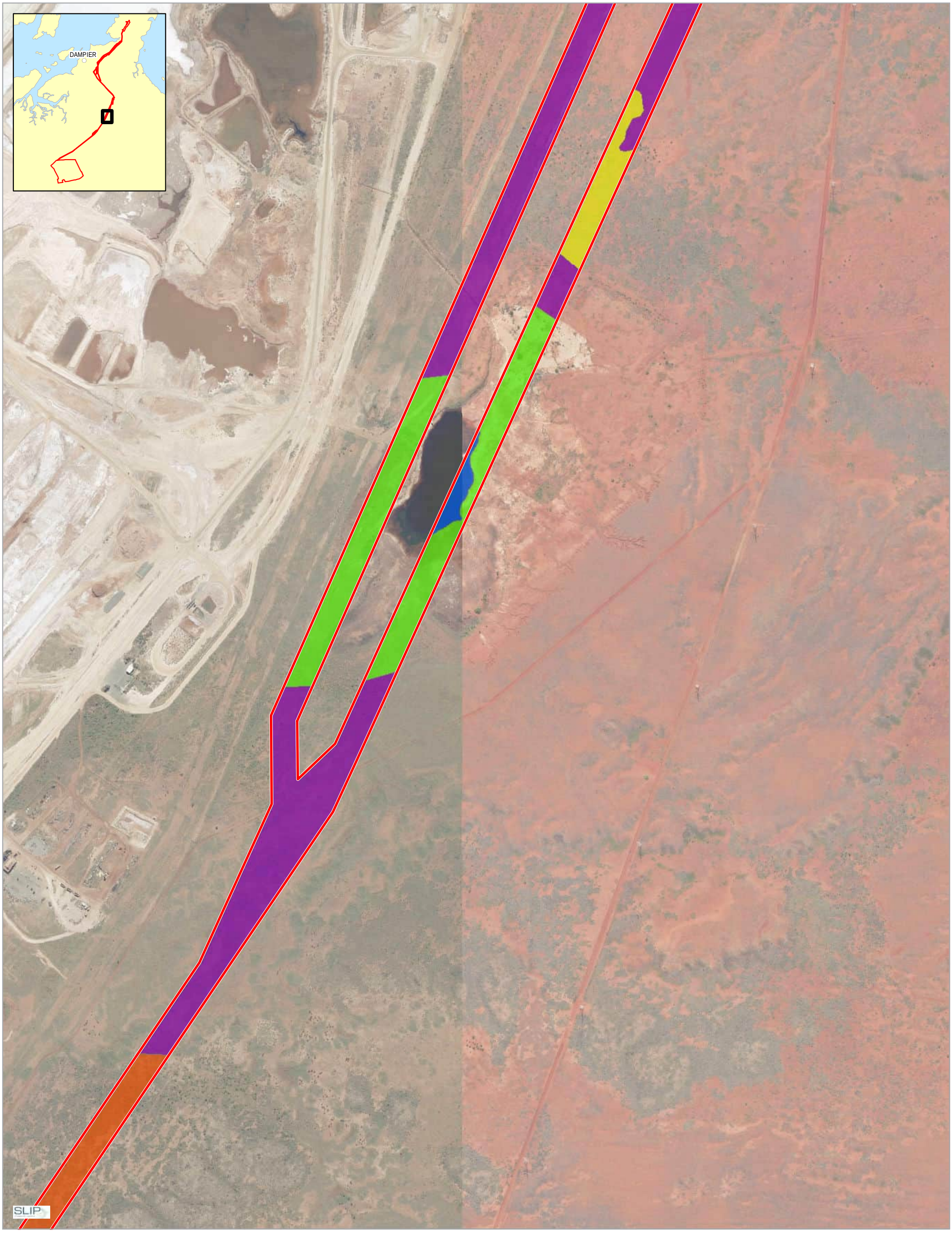

LEGEND

Fauna Habitat

- Hummock grassland on rocky plain
- Hummock grassland on sandy plain
- Low chenopod shrublands
- Tussock grasslands on cracking clays
- Water body
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

G:\61\3780805\GIS\Maps\Working\Report Figures\Fauna\613780805_Fig4_FaunaHabitats_Rev0.mxd
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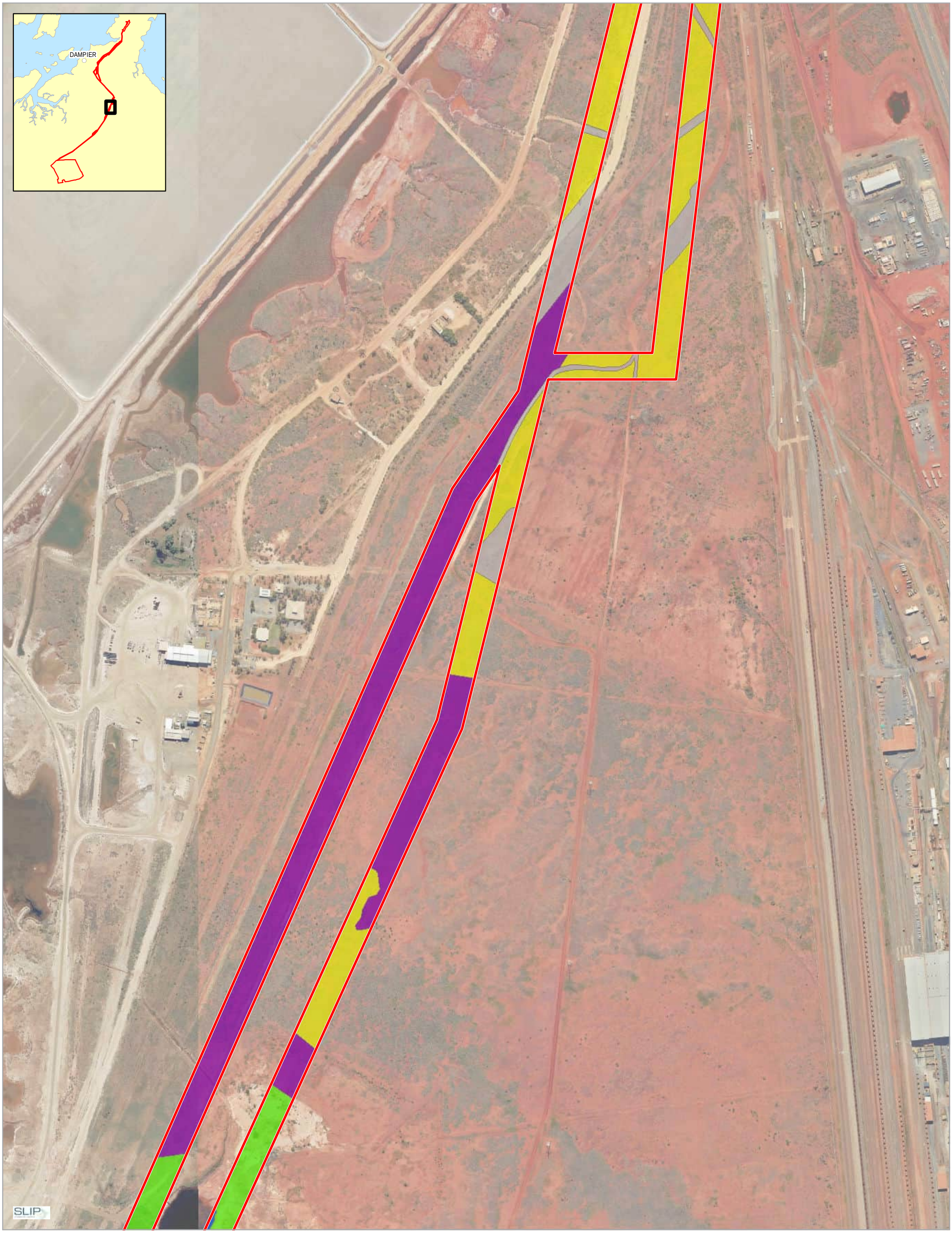

LEGEND

Fauna Habitat

- Disturbed
- Hummock grassland on sandy plain
- Low chenopod shrublands
- Tussock grasslands on cracking clays
- Water body
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

G:\61\3780805\GIS\Maps\Working\Report Figures\Fauna\613780805_Fig4_FaunaHabitats_Rev0.mxd
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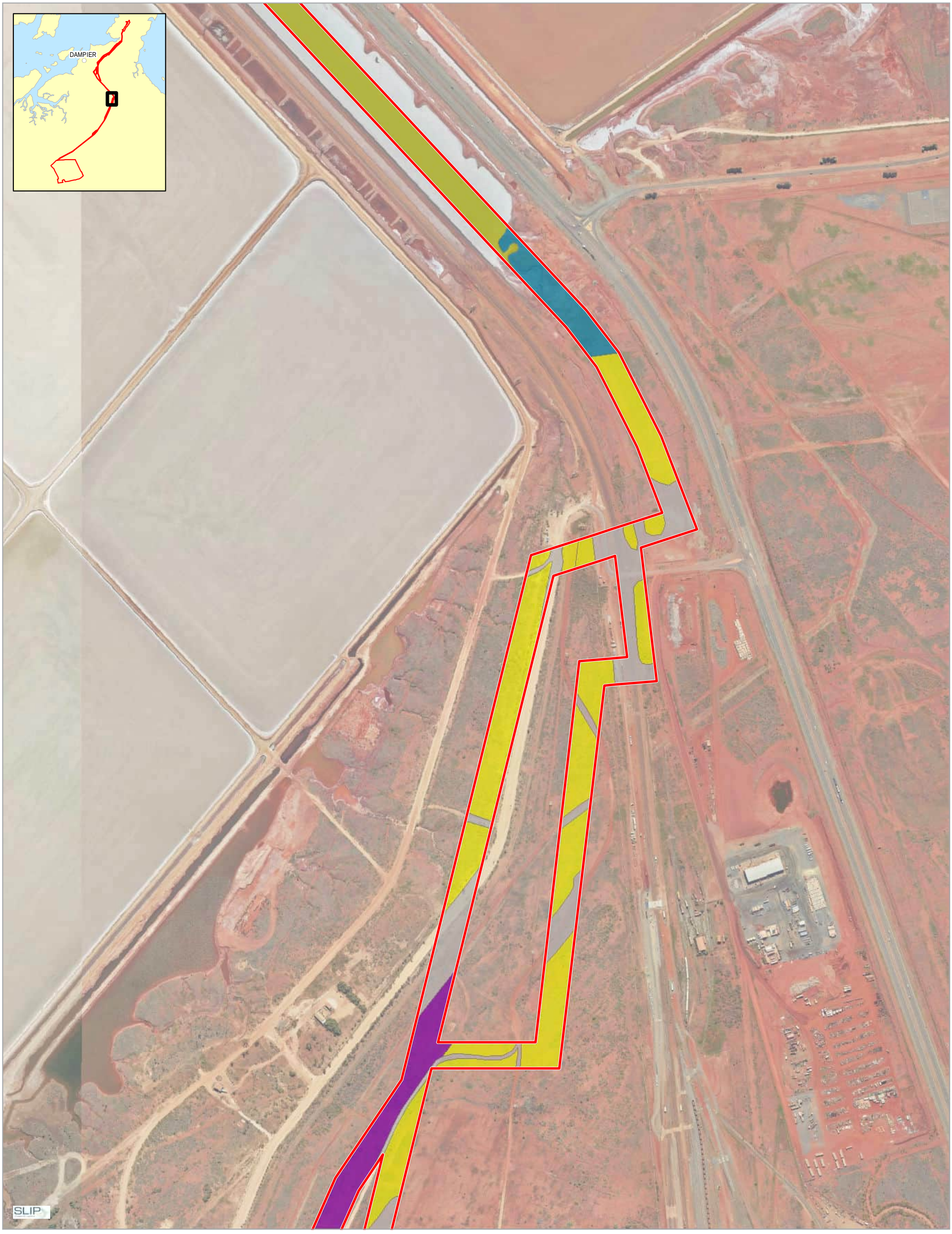

LEGEND

Fauna Habitat
- Disturbed
- Hummock grassland on sandy plain
- Salt works
- Tidal mud flats
- Tussock grasslands on cracking clays
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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Data source: GHD: Survey area - 20190719, Fauna habitats; Landgate: Roads - 20190128, Imagery: 20180408 (accessed: 20190730). Created by: afeeney

LEGEND

Fauna Habitat

- Hummock grassland on sandy plain
- Salt works
- Tidal mud flats
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

G:\61\3780805\GIS\Maps\Working\Report Figures\Fauna\613780805_Fig4_FaunaHabitats_Rev0.mxd
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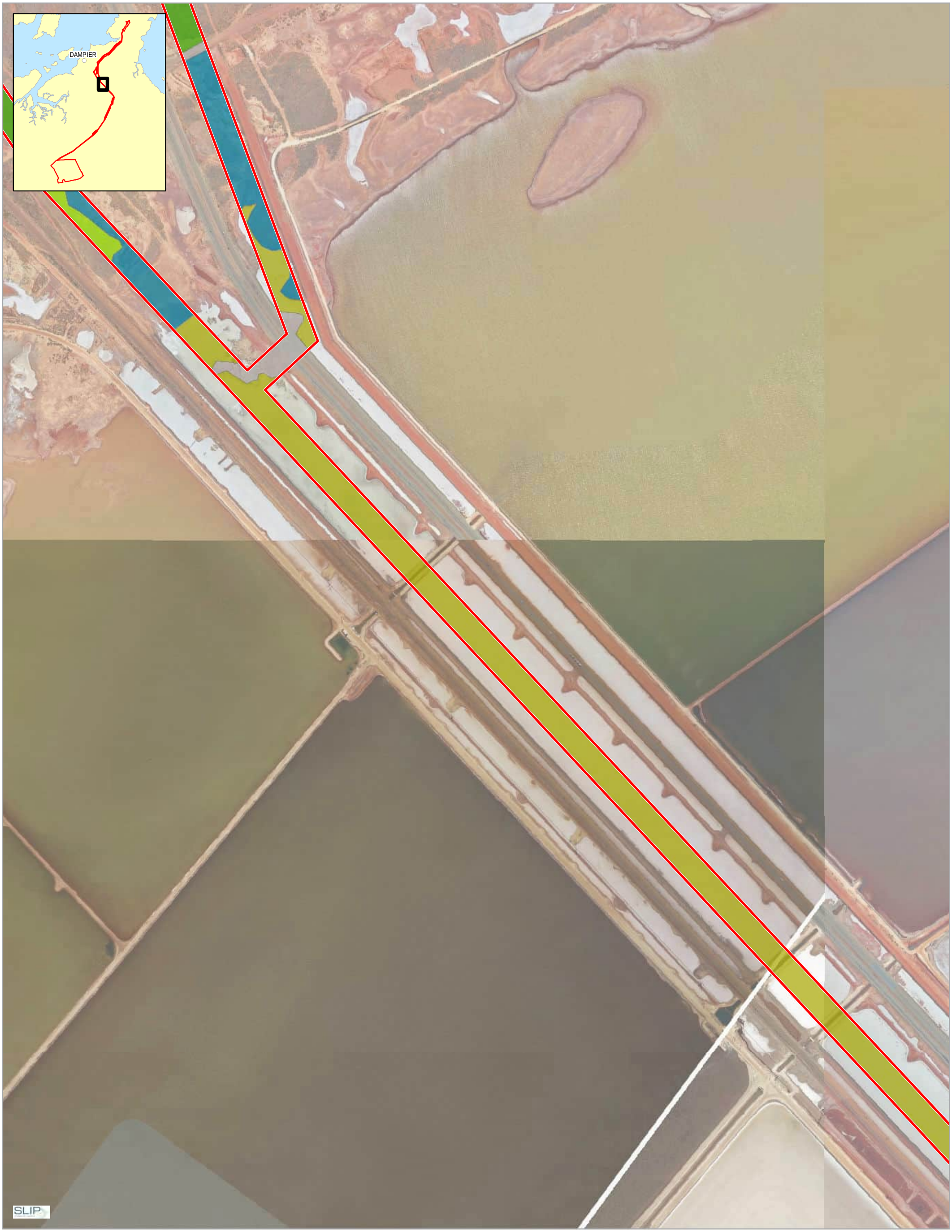

LEGEND

Fauna Habitat
- Disturbed
- Plain
- Salt works
- Sand plain
- Tidal mud flats
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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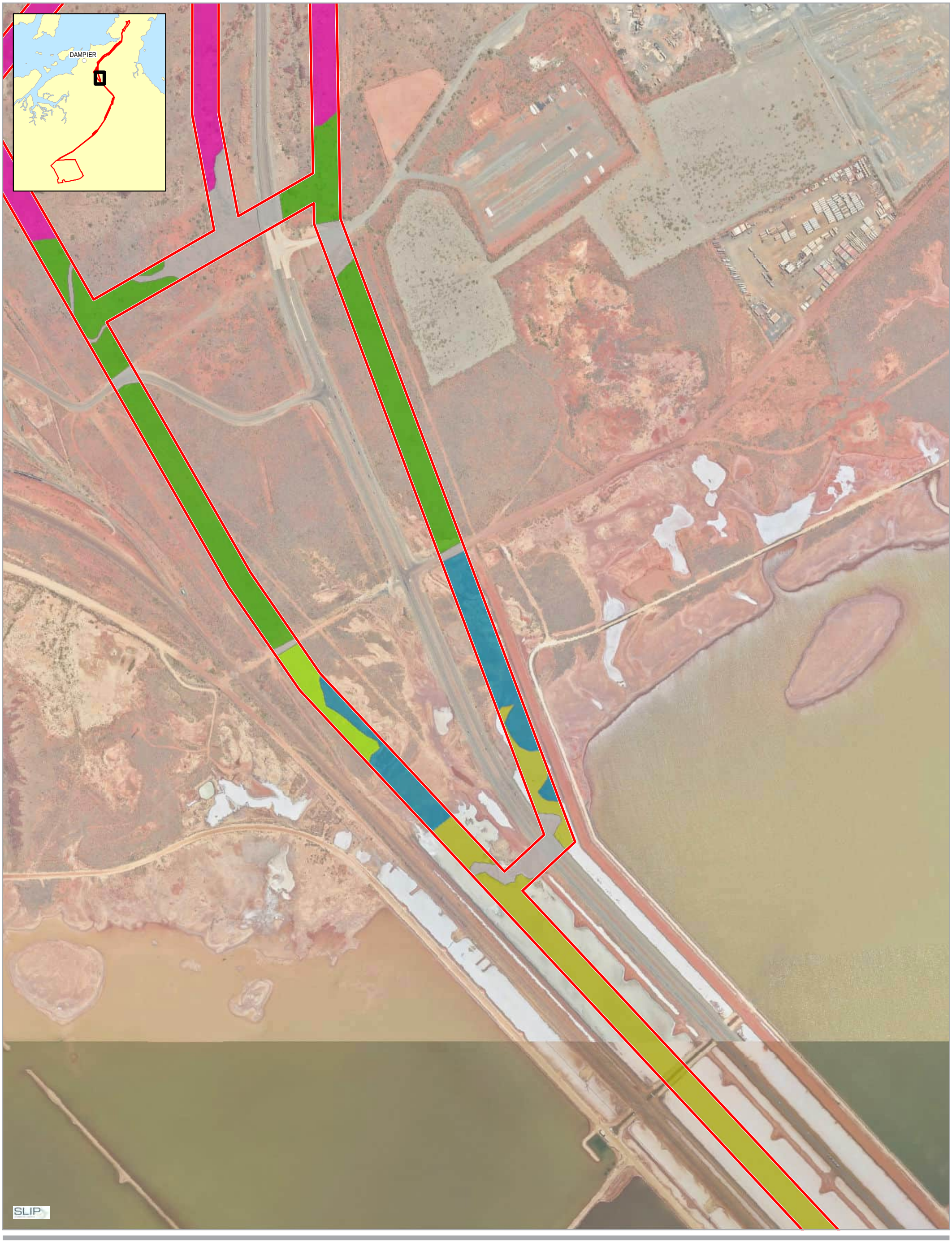

LEGEND

Fauna Habitat
Disturbed
Plain
Rocky hills with exposed boulder piles
Salt works
Sand plain
Tidal mud flats
Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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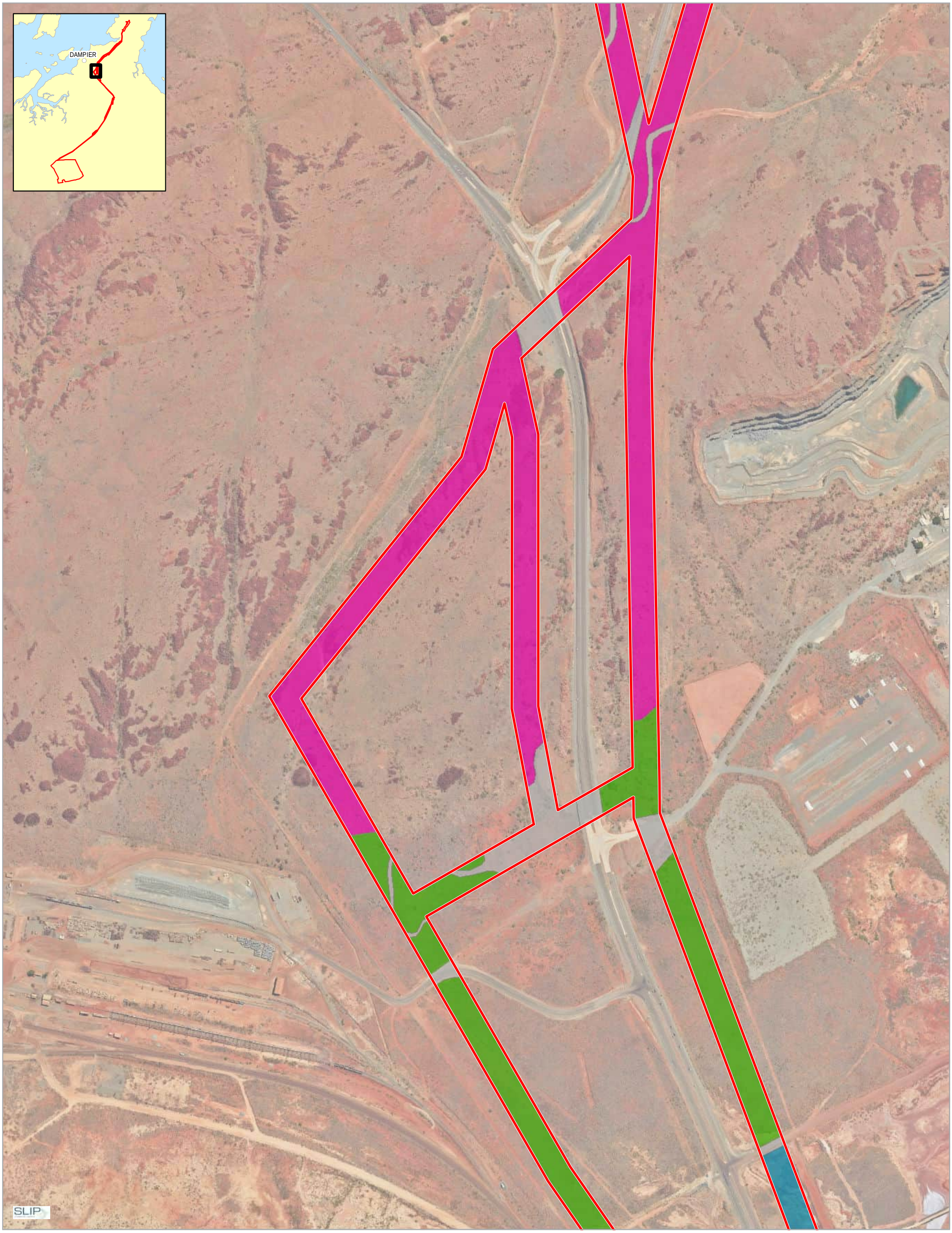

LEGEND

Fauna Habitat

Disturbed

Rocky hills with exposed boulder piles

Sand plain

Tidal mud flats

Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

G:\61\3780805\GIS\Maps\Working\Report Figures\Fauna\613780805_Fig4_FaunaHabitats_Rev0.mxd
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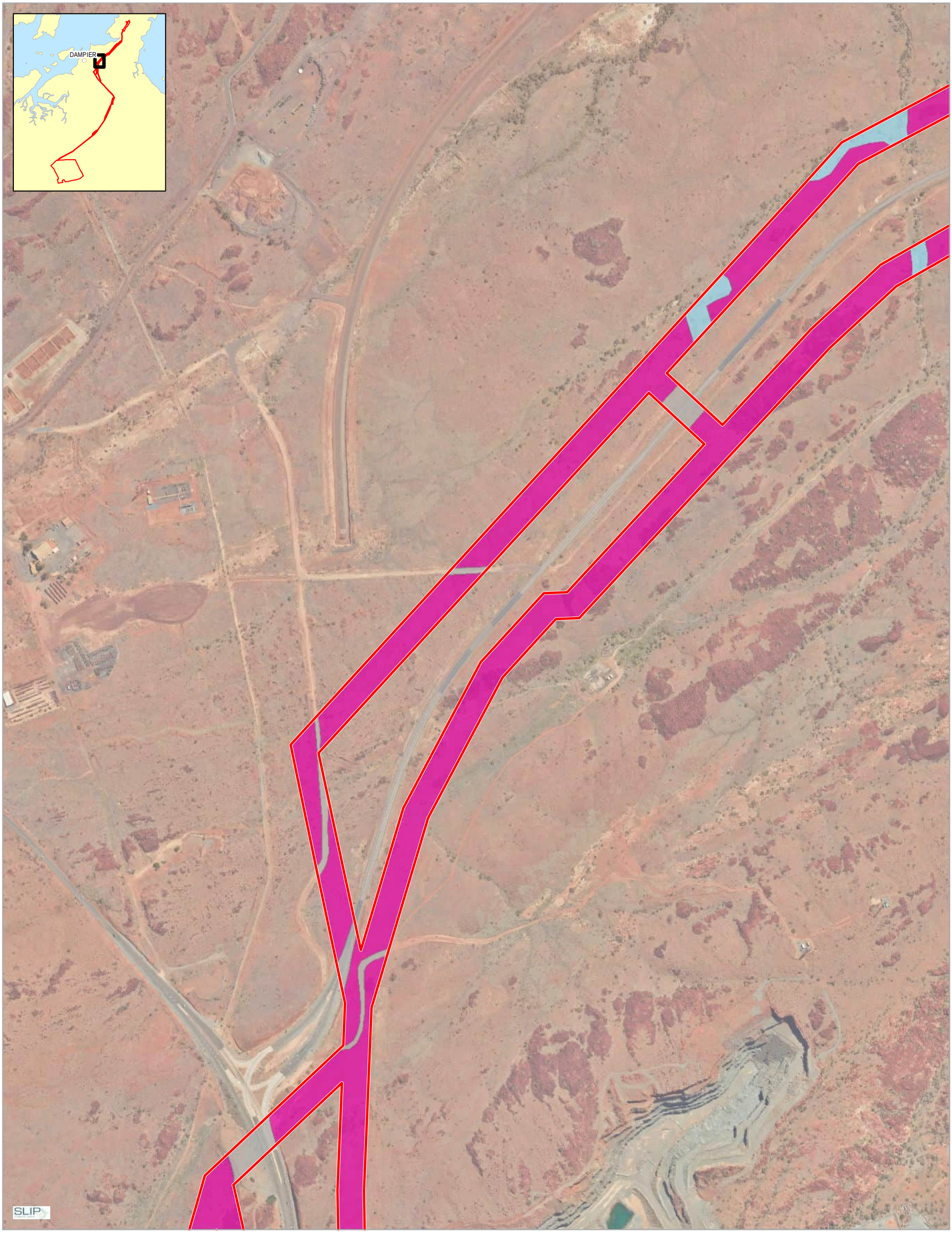

LEGEND

Fauna Habitat
Disturbed
Minor drainage
Rocky hills with exposed boulder piles
Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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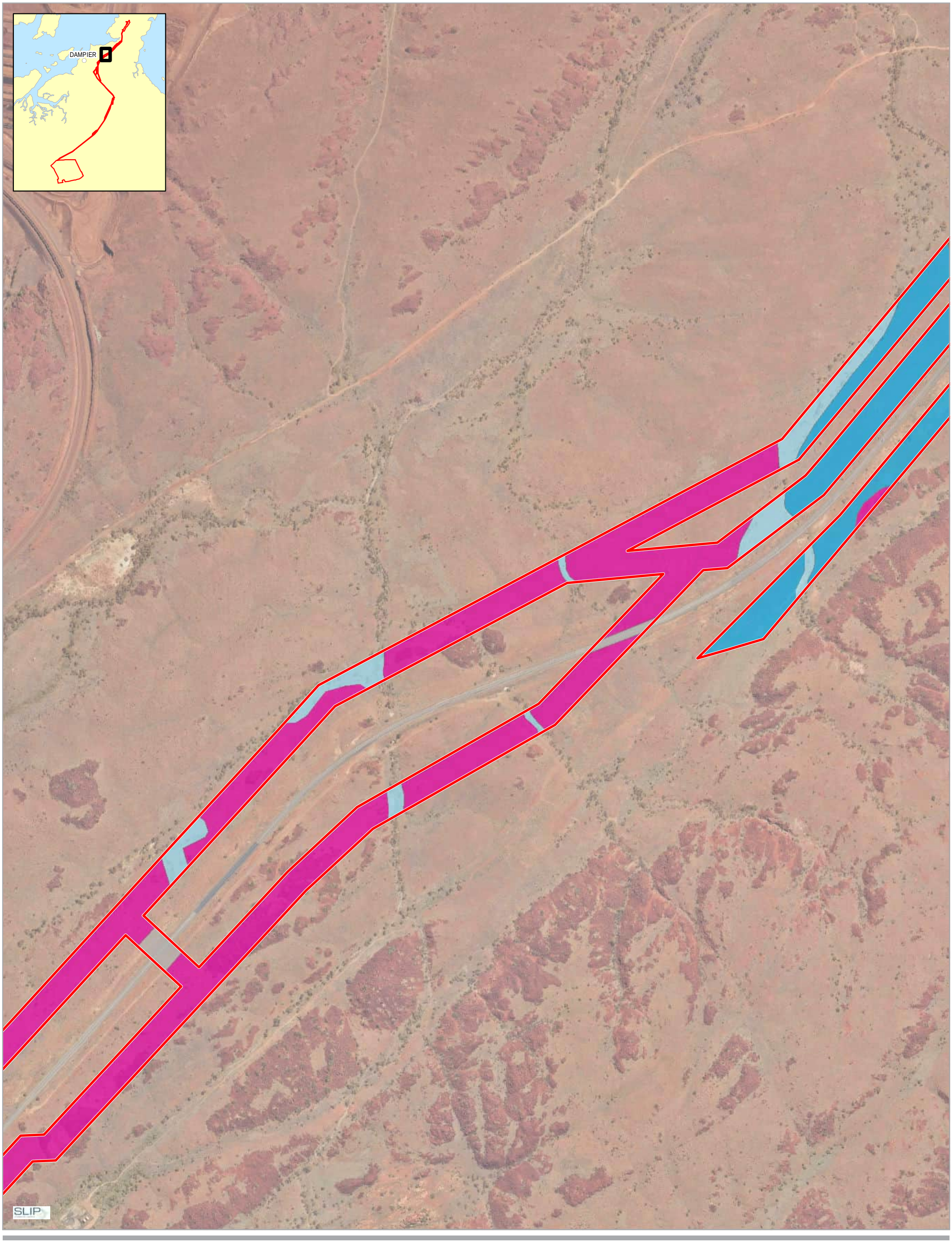

LEGEND

Fauna Habitat

- Disturbed
- Low rocky hills
- Minor drainage
- Rocky hills with exposed boulder piles
- Rocky plain
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

GHD

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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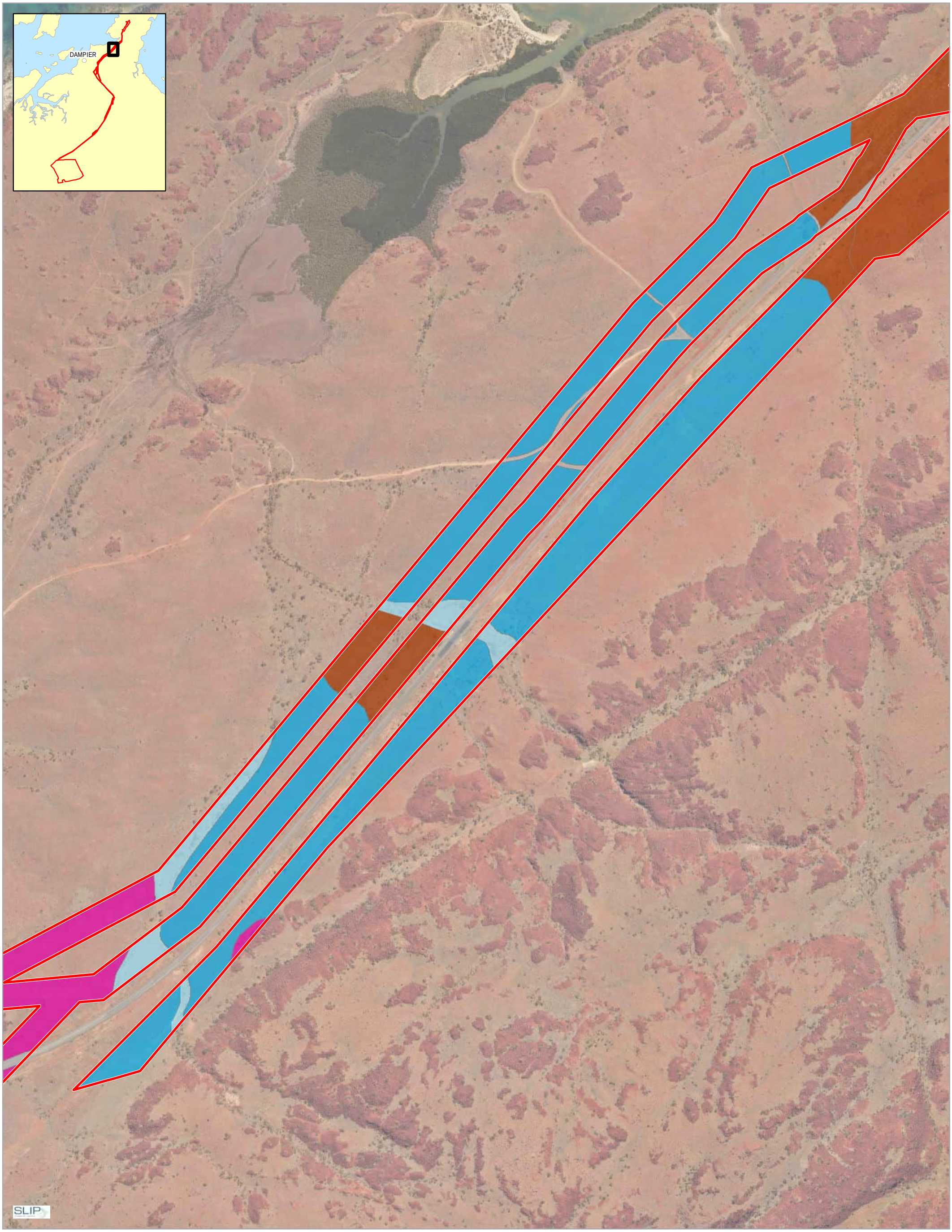

LEGEND

Fauna Habitat

- Disturbed
- Low rocky hills
- Minor drainage
- Rocky hills with exposed boulder piles
- Rocky plain
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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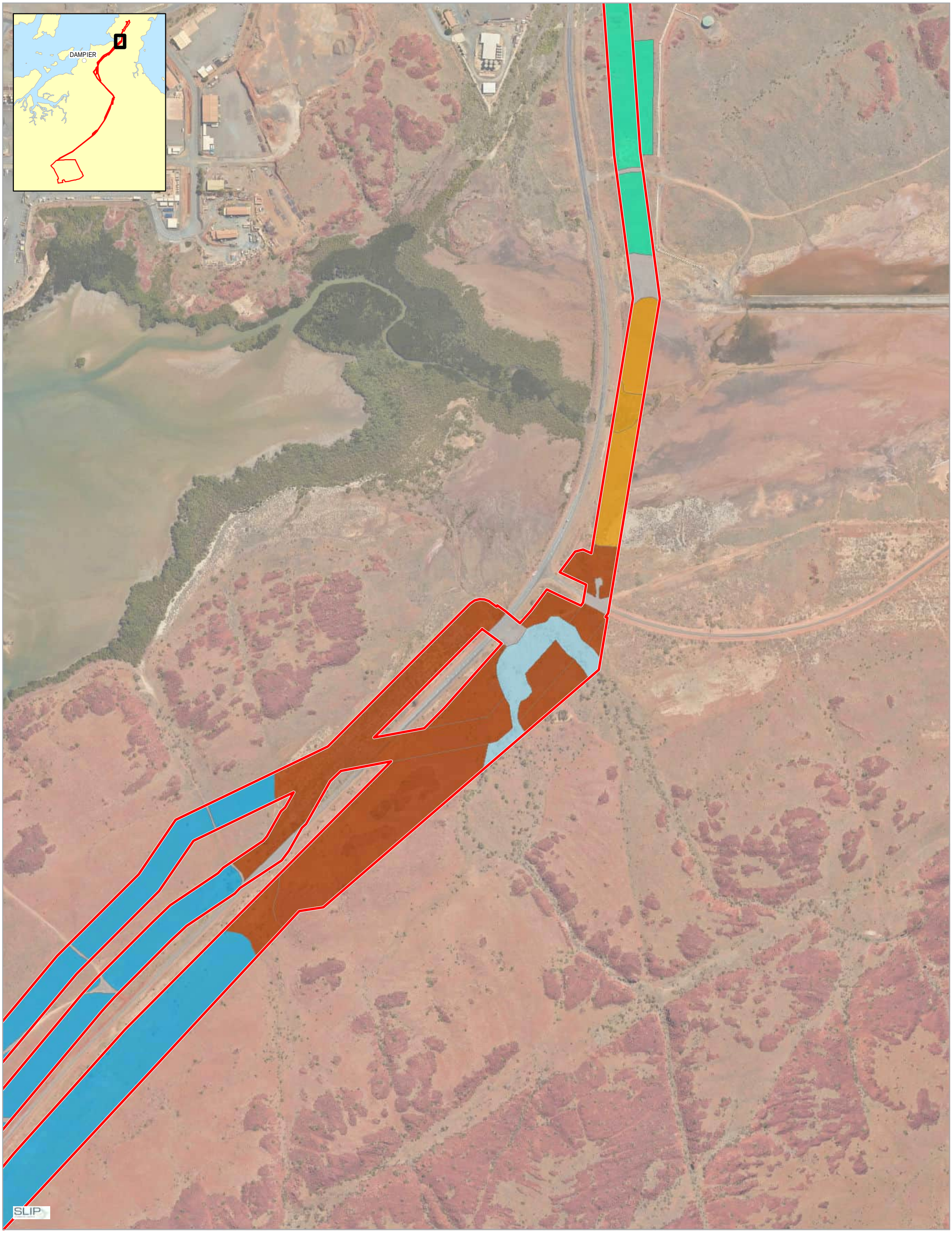

LEGEND

Fauna Habitat
- Disturbed
- Low rocky hills
- Minor drainage
- Mudflat with tidal inundation, mangroves and supportive scattered Samphire
- Rocky hills
- Rocky plain
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

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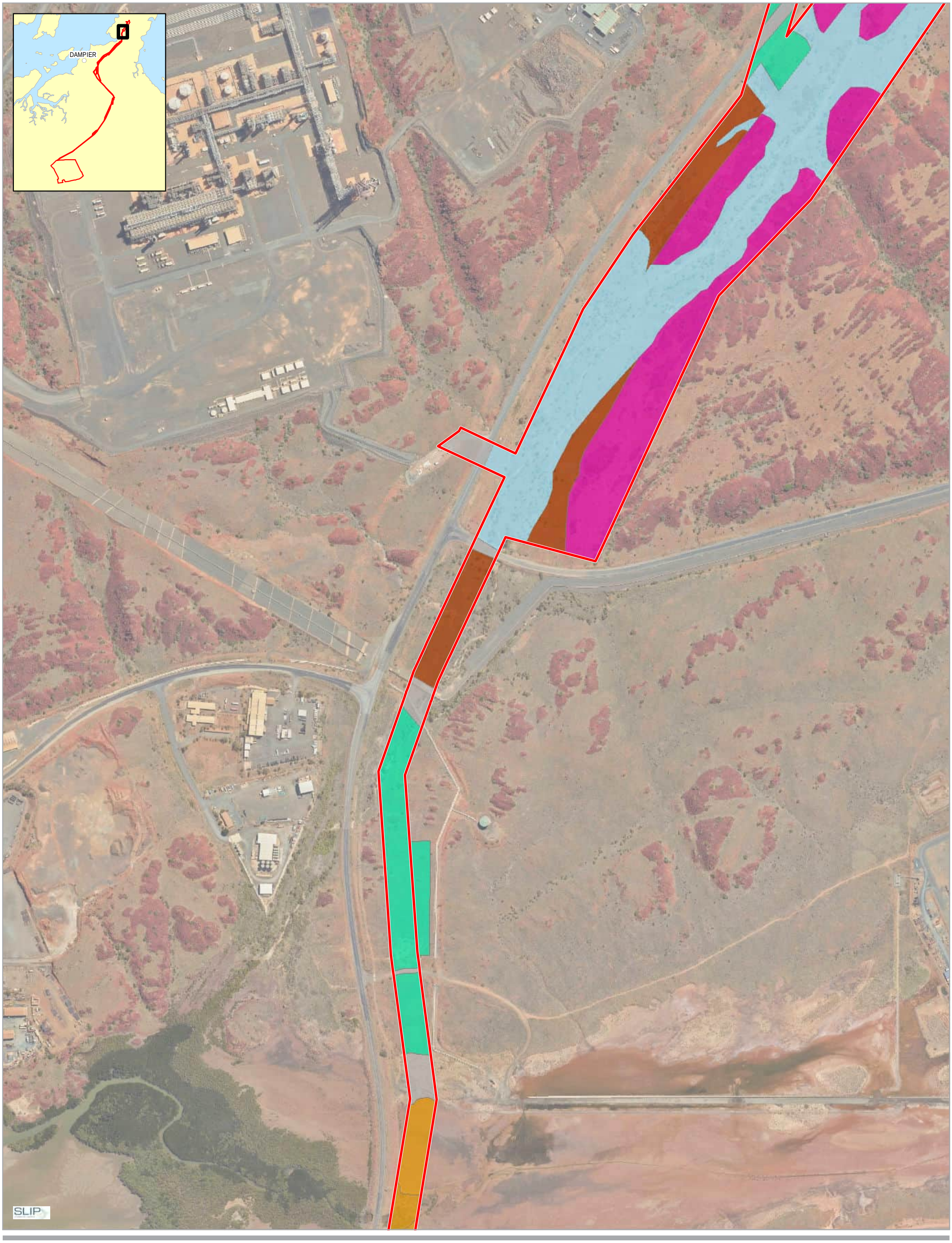

LEGEND

Fauna Habitat
- Disturbed
- Minor drainage
- Mudflat with tidal inundation, mangroves and supportive scattered Samphire
- Rocky hills
- Rocky hills with exposed boulder piles
- Rocky plain
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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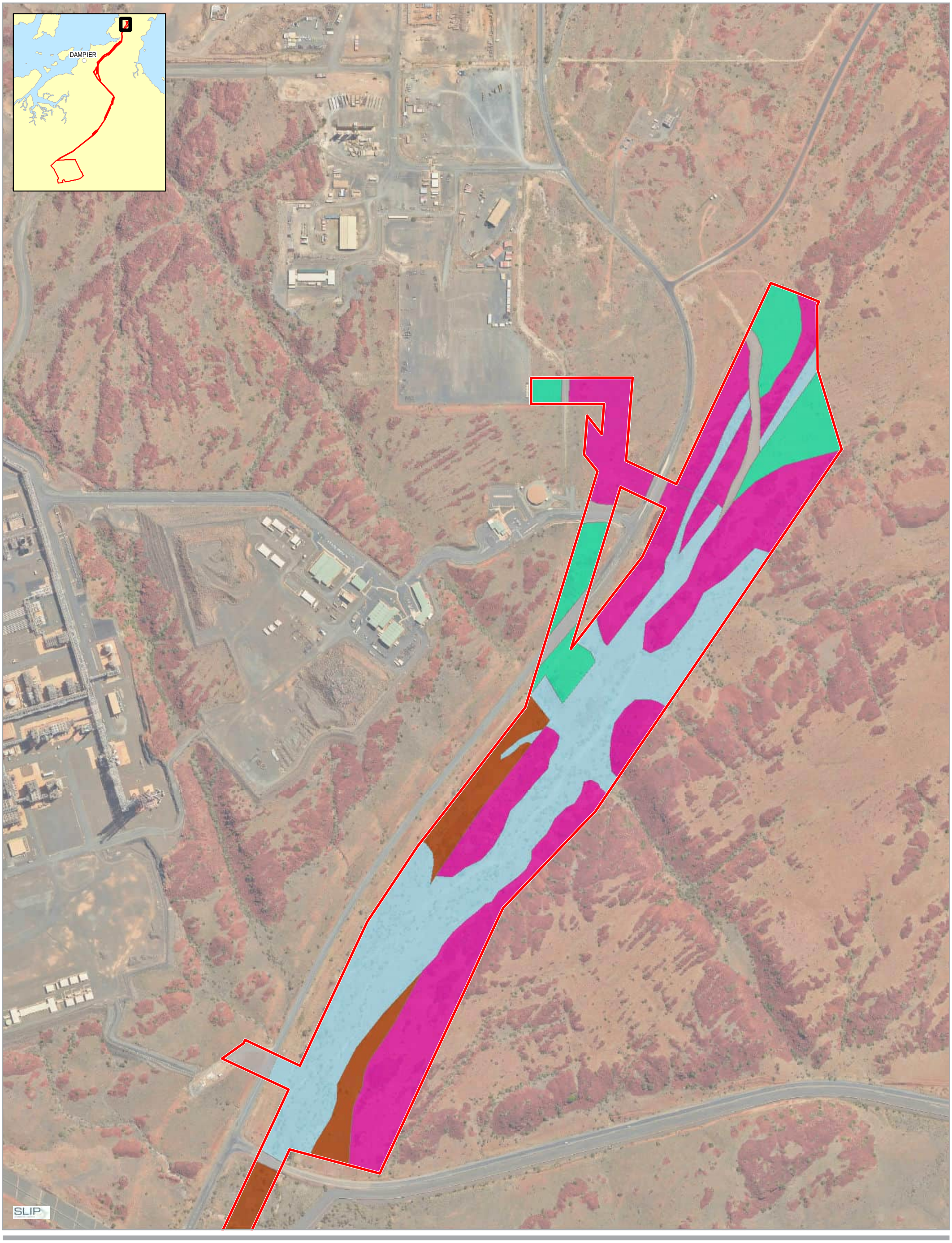

LEGEND

Fauna Habitat

- Disturbed
- Minor drainage
- Rocky hills
- Rocky hills with exposed boulder piles
- Rocky plain
- Survey area

Paper Size ISO A3

0 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Habitats

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 4

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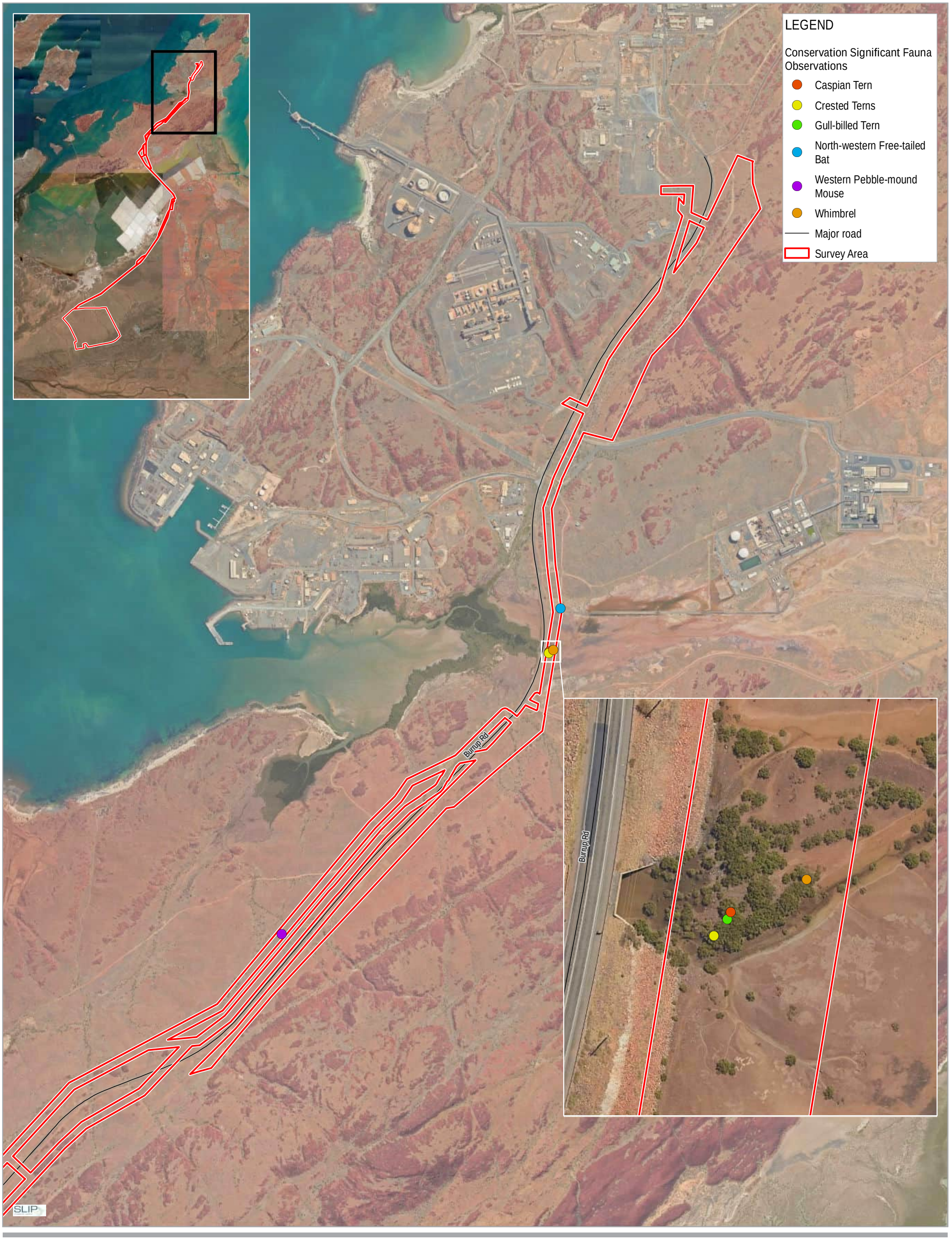

Paper Size ISO A3

0 100 200 300 400 500

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

Woodside Power Pty Ltd
Hybrid Renewable Power Plant
Fauna Survey

Fauna Results

Project No. 61-3780805
Revision No. 0
Date 27 Nov 2019

FIGURE 5

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Print date: 27 Nov 2019 - 14:15

Data source: GHD: Survey area - 20190719, Fauna results; Landgate: Roads - 20190128, Imagery: 20180408 (accessed: 20190730). Created by: afeeney

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

Relevant legislation to Fauna

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

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

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

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

State *Environmental Protection Act 1986*

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

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

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

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

State *Biodiversity and Conservation Act 2016*

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

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

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

State *Biosecurity and Agriculture Management Act 2007*

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

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

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

DPIRD Categories for Declared Pests under the BAM Act

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

Fauna Conservation codes

Conservation significant fauna

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

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

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

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

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna List under Priorities 1, 2 or 3. These three categories are ranked in order

of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

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

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

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

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

Conservation category	Definition
Threatened species	
Critically Endangered (CR)	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines.
Endangered (EN)	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines
Vulnerable (VU)	Threatened species considered to be "facing a high risk of extinction in the wild in the medium term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.
Extinct species	
Extinct (EX)	Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
Extinct in the Wild (EW)	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).
Specially protected species	

Conservation category	Definition
Migratory (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species
Species of special conservation interest (conservation dependent fauna) (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other specially protected fauna (OS)	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Conservation codes for DBCA listed Priority fauna

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

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

Other significant fauna

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

References

ANZECC 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.

Commonwealth of Australia 2001, *National Targets and Objectives for Biodiversity Conservation 2001–2005*, Canberra, AGPS.

EPA 2010, *Technical Guide – Terrestrial Fauna Surveys*, EPA, Perth, WA.

Appendix C - (Species Recorded)

Species recorded from the survey area

Family	Genus	Species	Common Name	Status	Observed	Observed
Birds					10-13 June	22-24 July
Acanthizidae	*Smicrornis*	*brevirostris*	Weebill		8	
Acanthizidae	*Gerygone*	*tenebrosa*	Dusky Gerygone		2	
Accipitridae	*Aquila*	*audax*	Wedge-tailed Eagle		2	1
Accipitridae	*Circus*	*assimilis*	Spotted Harrier		1	1
Accipitridae	*Elanus*	*axilaris*	Black-shouldered Kite		2	1
Accipitridae	*Haliaeetus*	*leucogaster*	White-bellied Sea Eagle		4	1
Accipitridae	*Haliastur*	*indus*	Brahminy Kite		1	1
Accipitridae	*Haliastur*	*sphenurus*	Whistling Kite		3	2
Accipitridae	*Milvus*	*migrans*	Black Kite		23	5
Aegothelidae	*Aegotheles*	*cristatus*	Australian Owlet-nightjar		1	
Alaudidae	*Mirafra*	*javanica*	Horsefield's Bushlark			2
Ardeidae	*Egretta*	*novaehollandiae*	White-faced Heron		1	
Artamidae	*Artamus*	*cinereus*	Black-faced Woodswallow		8	2
Artamidae	*Artamus*	*leucorynchus*	White-breasted Woodswallow		2	
Artamidae	*Artamus*	*minor*	Little Woodswallow		2	
Artamidae	*Cracticus*	*nigrogularis*	Pied Butcherbird		2	3
Burhinidae	*Burhinus*	*grallarius*	Bush Stone-curlew		3	3
Cacatuidae	*Cacatua*	*sanguinea*	Little Corella		24	12
Cacatuidae	*Eolophus*	*roseicapilla*	Galah		60	26
Cacatuidae	*Nymphicus*	*hollandicus*	Cockatiel		8	6
Campephagidae	*Coracina*	*novaehollandiae*	Black-faced Cuckoo-Shrike		3	1
Campephagidae	*Lalage*	*sueurii*	White-winged Triller		4	
Charadriidae	*Charadrius*	*ruficapillus*	Red-capped Plover		2	
Columbidae	*Phaps*	*chalcoptera*	Common Bronzewing			1
Columbidae	*Geophaps*	*plumifera*	Spinifex Pigeon		12	7
Columbidae	*Geopelia*	*cuneata*	Diamond Dove		4	
Columbidae	*Geopelia*	*striata*	Peaceful Dove		2	

Family	Genus	Species	Common Name	Status	Observed	Observed
Columbidae	*Ocyphaps*	*lophotes*	Crested Pigeon		4	6
Corvidae	*Corvus*	*orru*	Torresian Crow		4	6
Cuculidae	*Chalcites*	*basilis*	Horsefield's Bronze-cuckoo			1
Cuculidae	*Cacomantis*	*pallidus*	Pallid Cuckoo		1	
Estrildidae	*Emblema*	*pictum*	Painted Finch		4	
Estrildidae	*Taeniopygia*	*guttata*	Zebra Finch		52	18
Falconidae	*Falco*	*cenchroides*	Nankeen Kestrel		2	5
Falconidae	*Falco*	*berigora*	Brown Falcon		2	3
Falconidae	*Falco*	*longipennis*	Hobby Falcon		1	
Haematopodidae	*Haematopus*	*longirostris*	Australian Pied Oystercatcher		2	
Halcyonidae	*Todiramphus*	*pyrrhopygius*	Red-backed Kingfisher		6	1
Hirundinidae	*Hirundo*	*neoxena*	Welcome Swallow		5	
Hirundinidae	*Petrochelidon*	*nigricans*	Tree Martin		3	6
Laridae	*Chroicocephalus*	*novaehollandiae*	Silver Gull		4	
Laridae	*Gelochelidon*	*nilotica*	Gull-billed Tern	Mi, IA	1	
Laridae	*Hydroprogne*	*caspia*	Caspian Tern	Mi, IA	1	
Laridae	*Thalasseus*	*bergii*	Crested Tern	Mi, IA	4	
Maluridae	*Malurus*	*lamberti*	Variegated Fairy-wren			4
Maluridae	*Malurus*	*leucopterus*	White-winged Fairy-wren			6
Megaluridae	*Cincloramphus*	*cruralis*	Brown Songlark		5	1
Megaluridae	*Cincloramphus*	*mathewsi*	Rufous Songlark		13	5
Megaluridae	*Eremiornis*	*carteri*	Spinifexbird			2
Meliphagidae	*Epthianura*	*tricolor*	Crimson Chat		8	6
Meliphagidae	*Lichenostomus*	*penicillatus*	White-plumed Honeyeater		14	2
Meliphagidae	*Lichenostomus*	*virescens*	Singing Honeyeater		5	4
Meliphagidae	*Lichmera*	*indistincta*	Brown Honeyeater		1	
Meliphagidae	*Manorina*	*flavigula*	Yellow-throated Miner		16	4
Meropidae	*Merops*	*ornatus*	Rainbow Bee-eater		4	4
Monarchidae	*Grallina*	*cyanoleuca*	Magpie-lark		4	1
Motacillidae	*Anthus*	*novaeseelandiae*	Australasian Pipit		3	2

Family	Genus	Species	Common Name	Status	Observed	Observed
Otididae	*Ardeotis*	*australis*	Australian Bustard			prints
Pachycephalidae	*Colluricincla*	*harmonica*	Grey Shrike-thrush		1	
Psittacidae	*Barnardius*	*zonarius*	Port Lincoln Parrot		2	
Psittacidae	*Melopsittacus*	*undulatus*	Budgerigar		18	24
Ptilonorhynchidae	*Ptilonorhynchus*	*guttatus*	Western Bowerbird		1	
Recurvirostridae	*Himantopus*	*himantopus*	Black-winged Stilt		5	
Rhipiduridae	*Rhipidura*	*leucophrys*	Willie Wagtail		4	6
Scolopacidae	*Numenius*	*phaeopus*	Whimbrel	Mi, IA	1	
Threskiornithidae	*Threskiornis*	*spinicollis*	Straw-necked Ibis		6	
Tunicidae	*Turnix*	*velox*	Little Button-quail		2	
Zosteropidae	*Zosterops*	*luteus*	Yellow White-eye		6	
Reptiles						
Agamidae	*Gowidon*	*longirostris*	Long-snouted Water Dragon		1	
Agamidae	*Ctenophorus*	*caudicinctus caudicinctus*	Ringtail Dragon		4	
Agamidae	*Ctenophorus*	*isolepis isolepis*	Central Military Dragon		6	
Gekkonidae	*Gehyra*	*peninsularis*	Burrup Peninsular Dtella		1	
Gekkonidae	*Gehyra*	*punctata*	Spotted Dtella		3	
Gekkonidae	*Gehyra*	*variegata or crypta*	Dtella		1	3
Gekkonidae	*Gehyra*	*variegata*	Tree Dtella			1
Gekkonidae	*Heteronotia*	*binoei*	Bynoe's Gecko		2	5
Scincidae	*Cryptoblepharus*	*ustulatus*	Russet Snake-eyed Skink		1	
Scincidae	*Ctenotus*	*pantherinus occellifer*	Panther's Skink		3	1
Scincidae	*Ctenotus*	*saxatilis*	Rock Ctenotus		7	1
Scincidae	*Lerista*	*clara*	Sharp-blazed Three-toed Skink		3	
Scincidae	*Lerista*	*onsloviana*	Onslow Broad-striped Slider		4	
Scincidae	*Menetia*	*surda surda*	Surd's Dwarf Skink		1	
Scincidae	*Morethia*	*ruficauda exquisita*	Fire-tailed Skink		1	
Varanidae	*Vananus*	*acanthurus*	Ridge-tailed Monitor		1	
Varanidae	*Varanus*	*panoptes rubidus*	Yellow spotted Monitor		1	1
Mammals						

Family	Genus	Species	Common Name	Status	Observed	Observed
Bovidae	*Bos*	*taurus*	Cow	intro		scats
Canidae	*Canus*	*lupis domesticus*	Dog	intro	1	scats
Dasyuridae	*Pseudantechinus*	*woolleyae*	Woolley's Pseudantechinus		camera	
Emballonuridae	*Taphozous*	*georgianus*	Common Sheathtail-bat		D	
Felidae	*Felis*	*catus*	Cat	intro	camera, 1	prints
Macropodidae	*Macropus*	*robustus*	Euro		14	2
Macropodidae	*Macropus*	*rufus*	Red Kangaroo			12
Macropodidae	*Petrogale*	*rothchildi*	Rothchilds Rock Wallaby		camera	
Molossidae	*Austronomus*	*australis*	White-striped freetail Bat		D	X
Molossidae	*Chaerephon*	*jobensis*	Northern Freetail Bat		PR	
Molossidae	*Mormopetrus*	*Ozimops cobourgianus*	North-western Free-tail Bat	P1	PR	
Molossidae	*Mormopetrus*	*Ozimops lumsdenae*	Northern Free-tail Bat		PR	
Muridae	*Pseudomys*	*chapmani*	Pilbara Pebble-mound Mouse	P4	mound	
Muridae	*Rattus*	*rattus*	Black Rat	intro	camera	
Tachyglossidae	*Tachyglossus*	*aculeatus*	Echidna		X	digs
Vespertilionidae	*Vespadelus*	*finlaysoni*	Inland Cave Bat		D	

Key

3, numbers recorded

intro, introduced species

camera, identified via remote camera

X, Present, identified from echolocation

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

Mi, Migratory under EPBC Act

IA, International Agreement under BC Act

P1, 4, Priority species under DBCA

Appendix D - (Likelihood of Occurrence)

Parameters of fauna likelihood of occurrence assessment

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

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

Source information - desktop searches

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

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

NM – DBCA NatureMap (accessed March 2019)

Table 8 Fauna likelihood of occurrence assessment

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Birds								
Common Sandpiper *(Actitis hypoleucos)*	IA	Mi	X	X	X	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (Geering et al. 2007; Higgins & Davies 1996). Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area, habitat is present for the species adjacent to the survey area.	**Likely – habitat present and previously recorded in the area, however use is opportunistic.**
Ruddy Turnstone *(Arenaria interpres)*	IA	Mi	X		X	In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. In north Australia it is known to occur in a wide variety of habitats, and may prefer wide mudflats. Surveys demonstrate that the species can live away from coastal areas in habitats such river beds, and on inland lakes and adjacent farmland (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area, habitat is present for the species adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Curlew Sandpiper *(Calidris ferruginea*)	Cr	Cr	X	X	X	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area, habitat is present for the species adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Red Knot *(Caladris canutus*)	IA	EN	X	X	X	In Australasia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps. They rarely use inland lakes or swamps (Higgins & Davies 1996).	This species has been recorded within 20 km of the survey area, habitat is present for the species adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**

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

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

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

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

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Osprey (*Pandion haliaetus*)	IA	Mi	X	X	X	Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993). They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches, estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes. They exhibit a preference for coastal cliffs and elevated islands in some parts of their range, but may also occur on low sandy, muddy or rocky shores and over coral cays. Often nests in elevated artificial structures.	This species has been recorded within 20 km of the survey area, habitat is present for the species adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Red-necked Phalarope (*Phalaropus lobatus*)	IA	Mi		X		During the non-breeding period the Red-necked Phalarope occurs mainly at sea. It is commonly sighted in Australia from mid-October to early-April, where it is recorded at both inland and coastal lakes/swamps, including highly saline waters and artificial wetlands notably saltworks. In WA the species has been seen on Rottnest Island, Pelican Point, the Swan River, Port Hedland Saltworks, the Eyre Bird Observatory and Hinds Lake Nature Reserve (DotE 2016).	The species has not been recorded within 20 km of the survey area. Although some habitat is present the species is irregularly observed and utilises available habitats opportunistically.	**Unlikely –rare and opportunistic visitor/some habitat for the species in the survey area**

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

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

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Night Parrot *(Pezoporus occidentalis*)	Cr	En		X		The Night Parrot inhabits arid and semi-arid inland areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of *Triodia* grasslands in stony or sandy environments and of samphire and chenopod shrublands, including genera such as Atriplex, Bassia and Maireana, on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (Parker, 1980). It has also been observed to enter dense Muehlenbecki growth when flushed from a more typical habitat (Boles et al. 1994).	Some habitat present with the Power Plant and Solar PV, however the species has not been recorded in the region. Also this area is outside of the modelled distribution for the species.	**Unlikely – Not known from the region.**
Australian Painted Snipe (*Rostratula australis*)	En	En		X		The Australian Painted Snipe is rarely seen as it is extremely secretive, keeping to dense vegetation of swamps, emerging only in subdued light of dawn and dusk. The preferred habitat of this species includes surrounds and shallows of wetlands that are well vegetated with dense low cover (Morcombe 2004).	Some habitat is present around the saltworks area however this area lacks dese cover in which this species prefers.	**Unlikely – Some habitat present, not typical for this species.**
Gull-billed Tern *(Gelochelidon nilotica)*	IA	Mi	X		X	The Gull-billed Tern is nomadic or migratory species in Australia. Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands, where resources are favourable (Morcombe 2004). They are only rarely found over the ocean. The Gull-billed Tern. Although essentially an inland species, outside breeding season it shows a distinct preference for saltmarshes and lagoons near the coast. Movements are not fully understood but it is common and widespread in Australia (Morcombe 2004).	Some habitat is present around the saltworks area however the species prefers coastal fringe or open waters, opportunistic use may occur.	**Present – however use is opportunistic, limited and irregular with limited habitat present.**

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White-winged Black Tern (*Chlidonias leucopterus*)	IA		X		X	In Australia, the White-Winged Tern mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. They frequent tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats. Terrestrial wetlands, including swamps, lakes, billabongs, rivers, floodplains, reservoirs, saltworks, sewage ponds and outfalls are also inhabited. Wetlands may be open, or with floating emergent or marginal vegetation. Most breeding is on vegetated, freshwater inland wetlands. The species is widespread on the southern west coast, north to Mongers Lake, and also on coasts of the Pilbara region and Kimberley Division, with occasional records farther inland, mainly along major river systems, such as the Ord. The species only rarely occurs in the Gascoyne Region of the central-western coast, and is occasionally recorded along the southern coast (DotE 2016).	Some habitat is present around the saltworks area however the species prefers coastal fringe or open waters, opportunistic use may occur.	**Unlikely – Some habitat present, not typical for this species.**
Bridled Tern (*Onychoprion anaethetus*)	IA	Ma	X	X	X	Bridled Terns occupy tropical and subtropical seas, breeding on islands, including vegetated coral cays, rocky continental islands and rock stacks. They are only rarely found in inshore continental waters and along mainland coastlines, though the species is reported to breed on the mainland of far southern WA. In WA, breeding is widespread from islands off Cape Leeuwin north to Shark Bay and in Pilbara region and Kimberley Division. At sea, distribution extends from Cape Leeuwin north to Dirk Hartog Island, with isolated mainland coastal records at Point Maud and Ningaloo, and from Barrow Island to the Dampier Archipelago, and at sea off the Kimberley coast from waters west of the Dampier Peninsula to Ashmore Reef and Joseph Bonaparte Gulf (DotE 2016).	This species has been recorded within 1 km of the survey area in the saltworks and breeding recorded within the Maitland Industrial Estate, however limited habitat is present for the species in the survey area.	**Likely –however use is opportunistic, limited and irregular.**

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	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Roseate Tern (*Sterna dougallii*)	IA	Ma	X	X	X	The Roseate Tern occurs in coastal and marine areas in subtropical and tropical seas. The species inhabits rocky and sandy beaches, coral reefs, sand cays and offshore islands. Birds rarely occur in inshore waters or near the mainland, usually venturing into these areas only accidentally, when nesting islands are nearby. In WA, the subspecies is regularly recorded north from Mandurah to around Eighty Mile Beach. Around the Kimberley coastline, the subspecies occurs at scattered sites, north to the Bonaparte Archipelago and possibly further. The subspecies used to be a sporadic visitor to the southwest, but occurs regularly at present. In addition, breeding colonies have been established on Lancelin Island and Second Rock (DotE 2016).	This species has been recorded within 1 km of the survey area in the saltworks, however limited habitat is present for the species in the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Common Tern (*Sterna hirundo*)	IA	Mi	X		X	Common Terns are marine, pelagic and coastal. In Australia, they are recorded in all marine zones, but are commonly observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters, such as bays, harbours and estuaries with muddy, sandy or rocky shores. Occasionally they are recorded in coastal and near-coastal wetlands, either saline or freshwater, including lagoons, rivers, lakes, swamps and saltworks. Sometimes they occur in mangroves or saltmarsh and, in bad weather, in coastal sand-dunes or coastal embayments. In WA, the species is rarely recorded south of approximately 30° S, with only scattered records north of there to the Kimberley Division (DotE 2016).	This species has been recorded within 1 km of the survey area in the saltworks, however limited habitat is present for the species in the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**

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	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Little Tern (*Sternula albifrons*)	IA	Mi	X		X	In Australia, Little Terns inhabit sheltered coastal environments, including lagoons, estuaries, river mouths and deltas, lakes, bays, harbours and inlets, especially those with exposed sandbanks or sand-spits, and also on exposed ocean beaches. One of its breeding populations is found across northern Australia, from about Broome to the Gulf of Carpentaria and eastern Cape York Peninsula. Non-breeding birds extend farther around the Australian coast than known breeding colonies. In WA the species regularly occurs south to approximately 20° S, with occasional records south of there (e.g. Shark Bay) (DotE 2016).	This species has been recorded within 2 km of the survey area in the saltworks, however limited habitat is present for the species in the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Caspian Tern *(Sterna caspia*)	IA	Mi	X	X	X	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially, waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs (Higgins & Davis 1996). The Caspian Tern usually forages in open wetlands, including lakes and rivers. They often prefer sheltered shallow water near the margins, but can also be found in open coastal waters. In coastal inlets they may prefer to forage in tidal channels, or over submerged mudbanks (Higgins & Davis 1996).	This species has been recorded within 1 km of the survey area in the saltworks, however limited habitat is present for the species in the survey area.	**Present – however use is opportunistic, limited and irregular with limited habitat present.**

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Crested Tern (*Thalasseus bergii*)	IA	Ma	X	X	X	A common tern to coastal regions of Australia. A large species with a large straw yellow bill, white body and black legs. The black cap and slight crest is also evident. The species preferred habitat is primarily coastal and off shore waters including beaches, bays, inlets, tidal rivers, swamps, lakes and large rivers (Higgins & Davis 1996).	This species has been recorded within 1 km of the survey area in the saltworks, however limited habitat is present for the species in the survey area.	**Present – however use is opportunistic, limited and irregular with limited habitat present.**
Australian Fairy Tern *(Sternula nereis subsp. nereis*)	VU	VU	X	X	X	The habitat of the fairy tern is essentially marine, including sheltered coasts, bays, inlets, estuaries, coastal lagoons, ocean beaches but rarely out to sea or out of sight of land. They also inhabit wetlands near the coast including salt ponds and lakes. This species favours sites with sand spits and small sand islets in river mouth channels (Morcombe 2004).	This species has been recorded within 1 km of the survey area in the saltworks, however limited habitat is present for the species in the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Grey-tailed Tattler *(Tringa brevipes*)	P4, IA	Ma, Mi,	X	X	X	The Grey-tailed Tattler is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. It can also be found at intertidal rocky, coral or stony reefs as well as platforms and islets that are exposed at low tide. It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves. It is less often on open flat sandy beaches or sandbanks, especially around accumulated seaweed or isolated clumps of dead coral. It is occasionally found around near-coastal wetlands, such as lagoons and lakes and ponds in sewage farms and saltworks. Inland records for the species are rare with sightings on river banks and the edges of rock pools (Higgins & Davies 1996).	This species has been recorded within 1 km of the survey area, habitat is present for the species adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**

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	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Marsh Sandpiper (*Tringa stagnatilis*)	IA	Mi	X	X	X	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats (Higgins & Davies 1996), although surveys in Kakadu recorded more birds around shallow freshwater lakes than in areas influenced by tide (Bamford 1988). Three of the five sites with highest recorded numbers are saltwater habitats (Hunter Estuary, NSW; Port Hedland Saltworks, Western Australia; Tullakool Evaporation Ponds, NSW) (Watkins 1993). In Western Australia they prefer freshwater to marine environments. In south-east Australia they prefer inland saline lakes and coastal saltworks. They are found infrequently around mangroves (Higgins & Davies 1996).	This species has been recorded within 1 km of the survey area, habitat is present for the species adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Common Redshank (*Tringa totanus)*	IA	Mi		X		The Common Redshank is found at sheltered coastal wetlands such as bays, river estuaries, lagoons, inlets and saltmarsh (with bare open flats and banks of mud or sand). They are also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms (Higgins & Davies 1996). The Common Redshank has been observed feeding in shallow water, on wet bare mud or sand, or on algal deposits, round the edges of wetlands, near rocks or samphire (Higgins & Davies 1996). They have been recorded roosting on small elevated areas such as estuarine sandbars and muddy islets surrounded by water (Higgins & Davies 1996).	Some habitat present however no records of the species are present in the region	**Unlikely – Limited habitat present, opportunistically use of the area**

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	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Broad-billed Sandpiper (*Limicola falcinellus*)	IA	Mi	X		X	The Broad-billed Sandpiper occurs in sheltered parts of the coast, favouring estuarine mudflats but also occasionally occur on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms, and in areas with large soft intertidal mudflats, which may have shell or sandbanks nearby. Occasionally they occur on reefs or rocky platforms. They have also been recorded in creeks, swamps and lakes near the coast, particularly those with bare mudflats or sand exposed by receding water. They often favour mud among, or fringed by, mangroves, particularly on the seaward side and sometimes occur in estuaries edged by saltmarsh. They are rarely recorded inland. Foraging occurs on exposed flats of soft mud or wet sand at edges of coastal and near-coastal wetlands, often around channels on mudflats or in accumulated mud in swales between shell banks. In northern Australia, they forage in soft mud near mangroves, but may remain on same muddy section, even though fresher substrate may be exposed by the receding tide. They also forage in shallow water on muddy edges of ponds. They roost on the banks of sheltered sandy, shelly or shingly beaches (Higgins & Davies 1996). They nest on the ground, frequently in the top of a tussock (Cramp 1985).	This species has been recorded within 2 km of the survey area, habitat is present for the species in and adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**

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	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Peregrine Falcon (*Falco peregrinus*)	OS		X		X	The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, from coastal heath to alpine. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2004).	The survey area provides suitable hunting habitat. The survey area is probably part of the species broader home range, no breeding habitat occurs within the survey area. Numerous records are present (particularly Burrup Peninsula).	**Likely – regular visitor or resident to survey area, foraging habitat only**
Sharp-tailed Sandpiper *(Calidris acuminata)*	IA	Mi	X	X	X	In WA, scattered records occur along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are widespread from Cape Arid to Carnarvon, around coastal and subcoastal plains of Pilbara Region to south-west and east Kimberley Division. Inland records indicate the species is widespread and scattered from Newman, east to Lake Cohen, south to Boulder and west to Meekatharra (Higgins & Davies 1996). The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation including lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They tend to occupy coastal mudflats mainly after ephemeral. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996). They have also been recorded roosting in mangroves (Minton & Whitelaw 2000).	This species has been recorded within and adjacent to the survey area, habitat is present for the species adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**

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	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Grey Plover (*Pluvialis squatarola*)	IA	Mi	X	X	X	In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt-lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes (Marchant & Higgins 1993).	This species has been recorded within 1 km of the survey area, habitat is present for the species in and adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Pacific Golden Plover (*Pluvialis fulva*)	IA	Mi	X	X	X	In Australia the Pacific Golden Plover usually inhabits coastal habitats, on beaches, mudflats and sandflats (sometimes in vegetation such as mangroves, low saltmarsh such as Sarcocornia, or beds of seagrass) in sheltered areas including harbours, estuaries and lagoons, and also in saltworks. It is sometimes recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, but can be seen in habitats with short grass in paddocks, crops or airstrips, or ploughed or recently burnt areas. In WA, the species is seldom recorded along the southern or south-western coasts (DotE 2016).	This species has been recorded within 2 km of the survey area, habitat is present for the species in and adjacent to the survey area.	**Unlikely – however use is opportunistic, limited and irregular.**
Oriental Plover (*Charadrius veredus)*	IA	Mi	X	X	X	Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland. Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps or open areas that have been recently burnt (Storr, 1980).	This species has been recorded within 2 km of the survey area, habitat is present for the species in and adjacent to the survey area.	**Likely –however use is opportunistic, limited and irregular.**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Fork-tailed Swift (*Apus pacificus*)	IA	Mi	X	X	X	In WA there are sparsely scattered records along the south coast, ranging from the Eyre Bird Observatory and west to Denmark. They are widespread in coastal and sub-coastal areas between Augusta and Port Hedland, including some on nearshore and offshore islands. This species is almost exclusively aerial, flying less than 1 m to at least 300 m above ground. This species is considered rare in the south-west region (DSEWPaC 2013).	No habitat present and the species is predominantly areal utilising terrestrial environments rarely.	**Unlikely – No habitat present, not known from the survey area. Use would be very opportunistic and rare.**
Oriental Pratincole (*Glareola maldivarum*)	IA	Mi	X	X	X	In non-breeding grounds in Australia, the Oriental Pratincole usually inhabits open plains, floodplains or short grassland (including farmland or airstrips), often with extensive bare areas. They often occur near terrestrial wetlands, such as billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins. The species also occurs along the coast, inhabiting beaches, mudflats and islands, or around coastal lagoons (Lloyd and Lloyd, 1991).	This species has been recorded within 20 km of the survey area, habitat is present for the species in and adjacent to the survey area.	**Likely –however use is opportunistic, limited and irregular.**
Common Greenshank (*Tringa nebularia*)	IA	Mi	X	X	X	The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetland and has the widest distribution of any shorebird in Australia (DSEWPaC 2013).	This species has been recorded within 20 km of the survey area and some habitat is present for the species. This species is known to utilise habitats in the Pilbara. Numerous records occur at Karratha and region.	**Likely – opportunistic visitor/use in/to the survey area**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Pectoral Sandpiper (*Calidris melanotos*)	IA	MI		X		In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies 1996).	Some habitat present however the habitat present is associated with salt works operations. No records of the species are present in the region	**Unlikely – Limited habitat present, opportunistically use of the area**
Terek Sandpiper (*Xenus cinereus*)	IA	Mi	X	X	X	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (Halosarcia spp.). Birds are seldom near the edge of water, however, birds may wade into the water (Marchant & Higgins 1993). Less often seen on sandy or shingle beaches, or on rock or coral reefs or platforms, Terek Sandpipers are occasionally sighted around drying sewage ponds and saltpans if surrounded by mudflats. The species is also found around brackish coastal swamps, lagoons and dune-lakes; and also on gravel or rocky edges of estuarine pools and freshwater river-pools (Marchant & Higgins 1993). Very occasionally, birds use swampy, grassy or cultivated paddocks near the coast (Marchant & Higgins 1993). Preferring to roost in or among mangroves, birds may perch in branches or roots up to 2 m from the ground, or beneath them in the shade on hot days. Occasionally, they roost in dead trees or among tangled driftwood. Elsewhere, they may roost with other waders on flat shores, on muddy spits, islets or banks, and sometimes on sandy and pebbly beaches (Marchant & Higgins 1993).	Some habitat present however the habitat present is associated with salt works operations. No records of the species are present in the salt works. Several records are present in surrounding coastal habitats.	**Unlikely – Limited habitat present, opportunistically use of the area**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Wood Sandpiper (*Tringa glareola*)	IA	Mi	X		X	The Wood Sandpiper is a seasonal visitor to Australia and has its largest numbers recorded in north-west Australia (Roebuck Bay near to Broome). Off the Tringa group (like the Common Greenshank) the Wood Sandpiper utilises a broad range of habitat types throughout Western Australia. Typical habitat includes well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. This species does not breed in Australia (DSEWPaC 2013).	This species has been recorded within 20 km of the survey area and habitat is present for the species. This species is known to persist in the Pilbara. Numerous records occur at Karratha and Cape Lambert.	**Likely – opportunistic visitor/use in/to the survey area**
Barn Swallow *(Hirundo rustica*)	IA	Mi	X	X	X	In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland, mesophyll shrub thickets and tussock grassland (Schodde et al 1999).	No habitat present and the species has not been recorded in the survey area. Four records are present and associated to the estuary side of the saltworks	**Unlikely – No habitat present, not known from the survey area.**
Glossy Ibis (*Plegadis falcinellus*)	IA	Mi	X		X	The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat is inland and northern floodplains (Marchant & Higgins 1993).	No habitat present and the species has not been recorded in the immediate area.	**Unlikely – No habitat present, not known from the area.**
Grey Wagtail (*Motacilla cinerea*)	IA	Mi		X		A migratory species that regularly visits northern Australia particularly the area from Broome to Darwin (Morcombe 2004). The species prefers coastal habitat near to water where it prefers	Some habitat present and the species has not	**Unlikely – Limited habitat present, not known from the**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
						to forage. However the species has been recorded further inland feeding on plains (Morcombe 2004).	been recorded in the immediate area.	**area. Can opportunistically use and area**
Yellow Wagtail (*Motacilla cinerea*)	IA	Mi		X		A migratory species that regularly visits northern Australia particularly the area from Broome to Darwin (Morcombe 2004). The species prefers coastal habitat near to water where it prefers to forage. However the species has been recorded further inland feeding on plains (Morcombe 2004).	Some habitat present and the species has not been recorded in the immediate area.	**Unlikely – Limited habitat present, not known from the area. Can opportunistically use and area**
Reptiles								
Airlie Island Skink (*Ctenotus angusticeps*)	P3	VU	X	X	X	This species was formerly known from only two widely separated localities in Western Australia: Airlie Island, off the north-west coast and Roebuck Bay, just south of Broome. On Airlie Island it inhabits Acacia shrublands, coastal spinifex and tussock grasses. On the mainland, the Airlie Island Ctenotus generally inhabits samphire shrubland in the intertidal zone along mangrove (Grey Mangrove (*Avicennia marina*) with occasional Red Mangrove (*Rhizophora stylosa*) margins, however, subtle differences in vegetation/topography exist among sites where the species has been recorded. The Roebuck Bay lizards have been observed on coastal mudflats vegetated with samphire (Wilson and Swan 2017). Recent surveys determined the species' distribution between Karratha and Broome therefore showing the distribution of this species is more widespread than previously thought.	The survey area provides no habitat for the species as it is associated with samphire and mudflats typically fringing mangroves and where crab holes are present. The species has been recorded 3 km west of the survey area in the samphire areas fringing the coastal mudflats.	**Unlikely– small amount of habitat present within survey area, but no specimens recorded**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Lined Soil-crevice Skink *(Notoscincus butleri)*	P4		X		X	*Notoscincus butleri* is a pale coppery-brown skink with bold black vertebral and dorsal stripes, broad black upper lateral stripes, white mid-lateral stripes and a narrow dark ventrolateral stripe. This species range is restricted to arid, rocky areas of near-coastal Pilbara region. Habitat is found in spinifex dominated areas near creek and river margins (Wilson and Swan 2017).	The survey area provides extensive suitable habitat for the species (hummock and tussock grasslands near drainage lines). There are historical records near to the survey area and numerous records occur within 20 km (particularly Karratha).	**Likely – resident within the survey area**
Pilbara Olive Python *(Liasis olivaceus subsp. barroni)*	VU	VU	X	X	X	The Olive Python (Pilbara subspecies) is a dull olive-brown to pale fawn or rich-brown python with a white underside and pale finely dotted lips. This species reaches an average size of 2.5 m but can grow up to 4 m long. The Olive Python's range is restricted to the Pilbara region, north Western Australia, and the Dampier Archipelago. Habitat consists of rocky escarpments, gorges and waterholes within the Pilbara region. The preferred microhabitats for this species are under rock piles, on top of rocks, and under spinifex as well as in man-made features such as overburden heaps, railway embankments and sewerage treatment ponds. The species' breeding season occurs from June to August, with males moving long distances in search of breeding females (Wilson and Swan 2017).	The survey area provides some habitat for the species. The minor drainage lines would be regarded as limited habitat for the species. The remainder of the habitat in the survey area is supportive only. There are records close to the survey area on the Burrup Peninsula.	**Likely – However irregular visitor, opportunistic use along minor drainage lines and rock piles**
Mammals								

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Northern Quoll *(Dasyurus hallucatus*)	En	En	X	X	X	The Northern Quoll once occurred across the majority of northern Australia but its range has significantly contracted. It occurs in the Pilbara region but in disjunct populations. The Northern Quoll inhabits a range of vegetation associations but is especially abundant on dissected rocky escarpment and eucalypt woodland within 200 km of the coast. It is known to den in rock crevices and rock piles and favours rocky areas. They are predominantly nocturnal but are occasionally active during the day, particularly during the mating season and are known to have a large home range (Van Dyck and Strahan 2008).	The species is known from the region, particularly from rocky areas or along drainage lines with wooded areas. Very limited habitat appears to be present for this species.	**Likely – habitat present opportunistic use along minor drainage lines and rock piles**
Northern Short-tailed Mouse *(Leggadina lakedownensis*)	P4		X		X	The Lakeland Downs Mouse occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, Acacia shrublands, tropical Eucalyptus and Melaleuca woodlands and stony ranges. Most habitats, however, are seasonally inundated on red or white sandy-clay soils. They are nocturnal, largely solitary, and individuals spend the day in simple, single-chambered burrows (Van Dyck and Strahan 2008).	The survey area provides extensive suitable habitat for the species (hummock and tussock grasslands on clay plains). There are historical records near to the survey area and numerous records occur within 20 km (particularly Karratha).	**Likely – resident within the survey area on the plain and in minor drainage lines**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Western Pebble-mound Mouse *(Pseudomys chapmani)*	P4		X		X	The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the Western Pebble-mound Mouse can be found on stony hillsides with hummocky grasslands and little or no soil. It constructs large mounds of pebbles on stony slopes which cover an area of 0.5-9.0 square metres. 'Active' mounds are characterized by volcano-like cones capped by 'craters' that mark occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck and Strahan 2008).	The survey area provides minimal habitat for the species as it is associated with rocky ranges and associated rocky habitats. Numerous records occur within 20 km (particularly Burrup Peninsula, hills behind Karratha and Cape Lambert areas). The populations on Burrup and around Karratha are presumed locally extinct.	**Present –An old mound was recorded within survey area, restricted to the rocky ranges. The species maybe locally extinct on the Burrup Peninsular**
Water Rat (*Hydromys chrysogaster*)	P4		X		X	The Water Rat lives in the vicinity of permanent bodies of fresh or brackish water, from sub-alpine streams to lakes and farm dams, and on sheltered coastal beaches, mangroves and offshore islands. It can travel considerable distance overland and is an occasional vagrant to temporary waters. Water Rat's dens are made at the end of tunnels in banks and occasionally in logs (Van Dyck and Strahan 2008).	The survey area provides minimal habitat for the species as it is associated with permanent water bodies in a range of environments. Records occur within 20 km (particularly Burrup Peninsula)	**Unlikely – unlikely resident within survey area, restricted to coastal water bodies in this area**

Common name (species name)	Status (BC Act/DBCA, EPBC Act)		Search			Description and habitat requirements	Habitat within survey area	Likelihood of Occurrence
	BC Act	EPBC Act	NM	EPBC PMST	DBCA			
Ghost Bat *(Macroderma gigas*)	VU	VU	X	X	X	The Ghost Bat occurs in a wide range of habitats, and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia, and is sensitive to disturbance (Van Dyck and Strahan 2008).	The species is known from the region, however are restricted to caves, adits and old mine shafts. There are none of these recorded in the survey area. Foraging may occur across the survey area opportunistically.	**Unlikely – unlikely a resident within survey area, may opportunistically utilise to survey area for foraging.**
North-western Free-tail Bat (*Mormopterus (Ozimops) cobourgianus*)	P1				X	The Little North-western Freetail Bat occurs along the Western Australian coast from Lake McLeod to Point Torment, occurring sparsely across its range. The Western Australian populations have only been recorded from mangrove stands, particularly those that include mature mangroves (Van Dyck and Strahan 2008). It roosts in crevices and sprouts of the dead upper branches of the mangrove Avicennia marina. The genus for this species is in the process of being renamed in a taxonomic review of molossids by Terry Reardon, which has shown the genus Mormopterus does not occur in Australia (Churchill 2008).	The species is known from the region, however are restricted to mangroves. There are none of these recorded in the survey area. Foraging may occur across the survey area opportunistically.	**Present – recorded on bat detector, unlikely a resident within survey area, may utilise to survey area for foraging.**

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

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

Appendix E - (Database Searches)

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 14/03/2019

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Species Group All Animals
Method 'By Line'
Vertices 20° 36' 04" S,116° 46' 50" E 20° 48' 29" S,116° 40' 10" E 20° 48' 29" S,116° 40' 10" E
Group By Family

Family	Species	Records
Acanthizidae	4	36
Accipitridae	15	653
Aegothelidae	1	10
Aeshnidae	2	4
Agamidae	11	162
Alaudidae	2	51
Ambassidae	1	2
Anatidae	10	266
Anhingidae	1	43
Antennariidae	2	2
Apistidae	1	2
Apodidae	1	2
Apogonidae	15	29
Araneidae	1	3
Arcellidae	1	1
Ardeidae	8	161
Ariidae	3	3
Artamidae	6	219
Atherinidae	3	3
Baetidae	2	7
Balaenopteridae	1	2
Batrachoididae	3	5
Bdelloidea	2	3
Belonidae	1	1
Belostomatidae	1	1
Blenniidae	9	21
Boidae	8	61
Bolboceratidae	1	1
Bothidae	3	4
Bovidae	2	10
Brachionidae	4	4
Burhinidae	2	30
Buthidae	1	3
Bythitidae	3	3
Cacatuidae	1	42
Caenidae	2	5
Callionymidae	4	7
Camaenidae	7	71
Campephagidae	2	222
Canidae	2	108
Caprimulgidae	1	3
Carabidae	9	19
Carangidae	7	8
Carcharhinidae	1	1
Carphodactylidae	1	2
Casuariidae	1	1
Centriscidae	1	1
Centrogeniidae	1	1
Centropagidae	1	1
Centropodidae	1	30
Centropomidae	1	1
Ceratopogonidae	3	7
Chaetodontidae	3	4
Chanidae	1	1
Charadriidae	11	340
Cheloniidae	4	64
Chirocentridae	1	2
Chironomidae	14	30
Chydoridae	6	8
Ciconiidae	1	12
Clupeidae	4	7
Coenagrionidae	2	6
Colubridae	1	3
Columbidae	10	597
Congridae	1	1
Corinnidae	1	7
Corixidae	5	8
Corvidae	3	95
Cracticidae	3	194
Cuculidae	3	20
Culicidae	6	13
Cyclopidae	4	7
Cynoglossidae	3	10
Cyprididae	13	18
Cyzicidae	1	1

Daphniidae	3	3
Dasyuridae	7	488
Delphinidae	3	4
Diatom Family	12	12
Dicaeidae	1	4
Dicruridae	5	541
Difflugiidae	1	1
Diplodactylidae	13	274
Dugongidae	1	2
Dytiscidae	12	27
Ecnomidae	2	4
Elapidae	17	91
Eleotridae	1	1
Elopidae	1	1
Emballonuridae	1	9
Enchytraeidae	1	1
Ephydridae	2	2
Epistylididae	1	1
Estrilidae	5	336
Euchlanidae	2	3
Euglyphidae	1	1
Exocoetidae	2	2
Falconidae	7	208
Felidae	1	38
Floscullariidae	1	1
Fregatidae	1	18
Gallieniellidae	1	1
Gekkonidae	5	373
Gerreidae	2	4
Ginglymostomatidae	1	1
Glareolidae	2	13
Gobiesocidae	3	3
Gobiidae	34	73
Gobioididae	1	1
Gomphidae	1	1
Gruidae	1	3
Gyrinidae	1	1
Haematopodidae	3	272
Haemulidae	2	2
Halacaridae	20	53
Halcyonidae	6	187
Hebridae	1	1
Hemicorduliidae	1	1
Hemiramphidae	1	1
Hexarthridae	2	2
Hipposideridae	1	1
Hirundinidae	4	195
Holocentridae	3	4
Hydrachnidae	1	1
Hydraenidae	2	4
Hydrobatidae	1	7
Hydrobiidae	1	1
Hydrometridae	1	1
Hydrophilidae	9	17
Hydropsychidae	1	1
Hydroptilidae	2	2
Hylidae	4	82
Hypsimetopodidae	1	1
Ilyocyprididae	1	2
Ixodidae	1	1
Labridae	9	20
Lamponidae	3	17
Laridae	15	414
Latidae	1	1
Lecanidae	9	14
Leiognathidae	2	2
Lepadellidae	1	2
Leporidae	1	1
Leptoceridae	1	3
Libellulidae	6	13
Limnadiidae	4	4
Limnocytheridae	1	1
Limnodynastidae	2	5
Lutjanidae	5	12
Lycosidae	3	13
Lymnaeidae	1	1
Macropodidae	5	209
Macrotrichidae	1	1
Maluridae	2	75
Megadermatidae	1	4
Melanotaeniidae	1	2
Meliphagidae	8	324
Meropidae	1	150
Mesoveliidae	2	2
Moinidae	1	1
Molossidae	3	5
Monacanthidae	2	10
Monodactylidae	1	1
Motacillidae	2	27
Mugilidae	7	10
Mullidae	1	1
Muraenidae	4	7
Muridae	10	290
Muscidae	1	1
Myobatrachidae	1	1
Naididae	1	1
Nematoda	1	4
Nemesiidae	2	4
Nemipteridae	6	6
Nepidae	1	1
Notommatidae	4	4
Notonectidae	5	8
Ogcocephalidae	1	1
Oligochaeta	1	1
Olpiidae	1	1

Ophichthidae	6	8
Ophiclinidae	1	5
Opisthopora	1	1
Opistognathidae	1	3
Ostracoda	1	3
Otididae	1	4
Oxyopidae	1	1
Pachycephalidae	4	60
Paradoxosomatidae	2	4
Paralichthyidae	4	4
Pardalotidae	3	16
Passeridae	2	5
Pegasidae	1	1
Pelecanidae	1	93
Pempheridae	1	1
Petroicidae	2	23
Phalacrocoracidae	5	127
Phasianidae	3	36
Pholcidae	1	3
Phreodrilidae	2	4
Pinguipedidae	1	1
Pittidae	1	1
Planorbidae	3	6
Platycephalidae	9	19
Pleidae	1	2
Plotosidae	7	15
Podargidae	2	12
Podicipedidae	2	50
Polynemidae	2	3
Pomacanthidae	1	1
Pomacentridae	9	20
Pomatostomidae	2	29
Pontarachnidae	2	4
Priacanthidae	1	1
Pristinidae	1	1
Procellariidae	2	33
Prodidomidae	6	20
Psettodidae	1	1
Pseudochromidae	4	6
Psittacidae	8	355
Pteropodidae	2	3
Ptilonorhynchidae	2	9
Pygopodidae	5	55
Pyralidae	1	1
Rallidae	7	62
Recurvirostridae	3	129
Salticidae	4	6
Scarabaeidae	2	5
Scatophagidae	3	3
Sciaenidae	1	1
Scincidae	42	867
Scirtidae	1	1
Scolopacidae	21	807
Scolopendridae	4	24
Scombridae	1	1
Scorpaenidae	2	3
Scutigeridae	1	19
Serranidae	9	21
Sididae	2	3
Sillaginidae	2	4
Simuliidae	1	1
Soleidae	3	6
Sparassidae	4	4
Sparidae	1	2
Sphyraenidae	2	2
Stratiomyidae	1	3
Strigidae	2	5
Sturnidae	1	9
Sulidae	1	4
Sylviidae	2	61
Synanceiidae	2	2
Synchaetidae	1	2
Syngnathidae	5	5
Tabanidae	1	3
Tachyglossidae	1	6
Terapontidae	4	11
Testudinellidae	1	3
Tetraodontidae	1	1
Tetrarogidae	3	5
Tettigoniidae	1	1
Theridiidae	1	2
Thiaridae	1	2
Threskiornithidae	3	42
Triacanthidae	1	1
Trichocercidae	1	1
Trichonotidae	1	1
Trichotriidae	1	1
Triglidae	1	1
Trigoniulidae	1	3
Triopsidae	2	2
Tripterygiidae	7	13
Trombidiformes	1	4
Turbellaria	1	1
Turnicidae	1	18
Tytonidae	1	4
Unionicolidae	1	1
Urodacidae	1	2
Varanidae	10	65
Veliferidae	1	1
Veliidae	2	2
Vespertilionidae	5	26
Zodariidae	1	1
Zosteropidae	1	108
TOTAL	**951**	**12291**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Acanthizidae					
1.	25530	*Gerygone fusca (Western Gerygone)*			
2.		*Gerygone sp.*			
3.	24276	*Gerygone tenebrosa (Dusky Gerygone)*			
4.	30948	*Smicrornis brevirostris (Weebill)*			
Accipitridae					
5.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
6.	25536	*Accipiter fasciatus (Brown Goshawk)*			
7.	24285	*Aquila audax (Wedge-tailed Eagle)*			
8.	24288	*Circus approximans (Swamp Harrier)*			
9.	24289	*Circus assimilis (Spotted Harrier)*			
10.		*Elanus axillaris*			
11.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
12.	24293	*Haliaeetus leucogaster (White-bellied Sea-Eagle)*			
13.	25541	*Haliastur indus (Brahminy Kite)*			
14.	24294	*Haliastur indus subsp. girrenera (Brahminy Kite)*			
15.	24295	*Haliastur sphenurus (Whistling Kite)*			
16.	24297	*Hamirostra melanosternon (Black-breasted Buzzard)*			
17.	47965	*Hieraaetus morphnoides (Little Eagle)*			
18.	25542	*Milvus migrans (Black Kite)*			
19.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
Aegothelidae					
20.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
Aeshnidae					
21.		*Aeshnidae sp.*			
22.		*Anax papuensis*			
Agamidae					
23.	30831	*Amphibolurus gilberti (Ta-ta, Gilbert's Dragon)*			
24.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
25.	25458	*Ctenophorus caudicinctus (Ring-tailed Dragon)*			
26.	24865	*Ctenophorus caudicinctus subsp. caudicinctus (Ring-tailed Dragon)*			
27.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
28.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			
29.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
30.	24886	*Ctenophorus reticulatus (Western Netted Dragon)*			
31.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
32.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
33.	30814	*Tympanocryptis cephalus (Pebble Dragon)*			
Alaudidae					
34.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
35.	24302	*Mirafra javanica subsp. horsfieldii (Horsfield's Bushlark, Singing Bushlark)*			
Ambassidae					
36.		*Ambassis vachellii*			
Anatidae					
37.	24312	*Anas gracilis (Grey Teal)*			
38.	24316	*Anas superciliosa (Pacific Black Duck)*			
39.	24318	*Aythya australis (Hardhead)*			
40.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
41.	24322	*Cygnus atratus (Black Swan)*			
42.	24324	*Dendrocygna arcuata (Wandering Whistling Duck, Chestnut Whistling Duck)*			
43.	24325	*Dendrocygna eytoni (Plumed Whistling Duck)*			
44.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
45.	24327	*Nettapus pulchellus (Green Pygmy-goose)*			
46.	24329	*Stictonetta naevosa (Freckled Duck)*			
Anhingidae					
47.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
Antennariidae					
48.		*Lophiocharon hutchinsi*			
49.		*Lophiocharon trisignatus*			
Apistidae					
50.		*Apistus carinatus*			
Apodidae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
51.	25554	*Apus pacificus (Fork-tailed Swift, Pacific Swift)*		IA	
Apogonidae					
52.		*Apogon brevicaudatus*			
53.		*Apogon cavitiensis*			
54.		*Apogon cookii*			
55.		*Apogon dianthus*			
56.		*Apogon doederleini*			
57.		*Apogon fasciatus*			
58.		*Apogon nigripinnis*			
59.		*Apogon pallidofasciatus*			
60.		*Apogon rueppellii*			
61.		*Apogon talboti*			
62.		*Apogon trimaculatus*			
63.		*Foa brachygramma*			
64.		*Fowleria aurita*			
65.		*Pterapogon mirifica*			
66.		*Siphamia majimae*			
Araneidae					
67.		*Nephila edulis*			
Arcellidae					
68.		*Arcella sp.*			
Ardeidae					
69.	25559	*Ardea intermedia (Intermediate Egret)*			
70.	41324	*Ardea modesta (great egret, white egret)*			
71.	24341	*Ardea pacifica (White-necked Heron)*			
72.	47897	*Butorides striata (Striated Heron, Mangrove Heron)*			
73.		*Egretta garzetta*			
74.		*Egretta novaehollandiae*			
75.	25562	*Ixobrychus flavicollis (Black Bittern)*			
76.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
Ariidae					
77.		*Arius leptaspis*			Y
78.		*Netuma bilineata*			
79.		*Netuma proxima*			
Artamidae					
80.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
81.	25567	*Artamus leucorynchus (White-breasted Woodswallow)*			
82.	24354	*Artamus leucorynchus subsp. leucopygialis (White-breasted Woodswallow)*			
83.	24355	*Artamus minor (Little Woodswallow)*			
84.	24356	*Artamus personatus (Masked Woodswallow)*			
85.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
Atherinidae					
86.		*Atherinid sp.*			
87.		*Atherinomorus endrachtensis*			
88.		*Craterocephalus pauciradiatus*			
Baetidae					
89.		*Baetidae sp.*			
90.		*Cloeon sp.*			
Balaenopteridae					
91.	24051	*Megaptera novaeangliae (Humpback Whale)*		S	
Batrachoididae					
92.		*Batrachomoeus dahli*			
93.		*Batrachomoeus trispinosus*			
94.		*Halophryne diemensis*			
Bdelloidea					
95.		*Bdelloidea sp. 2:2*			
96.		*Bdelloidea sp. 3:3*			
Belonidae					
97.		*Tylosurus crocodilus*			
Belostomatidae					
98.		*Belostomatidae sp.*			
Blenniidae					
99.		*Cirripectes filamentosus*			

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100.		*Ecsenius yaeyamaensis*			
101.		*Istiblennius meleagris*			
102.		*Laiphognathus multimaculatus*			
103.		*Omobranchus punctatus*			
104.		*Omobranchus rotundiceps*			
105.		*Omobranchus sp.*			
106.		*Petroscirtes mitratus*			
107.		*Salarias sexfilum*			
Boidae					
108.	25317	*Antaresia childreni (Children's Python)*			
109.	25318	*Antaresia perthensis (Pygmy Python)*			
110.	25448	*Antaresia stimsoni (Stimson's Python)*			
111.	25241	*Antaresia stimsoni subsp. stimsoni (Stimson's Python)*			
112.	25320	*Aspidites melanocephalus (Black-headed Python)*			
113.	25236	*Aspidites ramsayi (Woma)*			
114.	25238	*Liasis olivaceus subsp. barroni (Pilbara Olive Python)*		T	
115.	25239	*Liasis olivaceus subsp. olivaceus (Olive Python)*			
Bolboceratidae					
116.		*Bolboleaus truncatus*			
Bothidae					
117.		*Arnoglossus waitei*			Y
118.		*Asterorhombus intermedius*			
119.		*Engyprosopon sp.*			
Bovidae					
120.	24253	*Capra hircus (Goat)*	Y		
121.	34016	*Ovis aries (Sheep)*			
Brachionidae					
122.		*Anuraeopsis navicula*			
123.		*Brachionus n sp P2 (PSW)*			
124.		*Brachionus quadridentatus*			
125.		*Keratella procurva*			
Burhinidae					
126.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
127.	47938	*Esacus magnirostris (Beach Stone-curlew, Beach Thick-knee)*			
Buthidae					
128.		*Lychas sp. 2*			
Bythitidae					
129.		*Didymothallus mizolepis*			
130.		*Dinematichthys sp.*			
131.		*Eusurculus pistillum*			
Cacatuidae					
132.		*Eolophus roseicapillus*			
Caenidae					
133.		*Caenidae sp.*			
134.		*Tasmanocoenis arcuata*			
Callionymidae					
135.		*Callionymus japonicus*			Y
136.		*Callionymus russelli*			
137.		*Callionymus sp.*			
138.		*Repomucenus calcaratus*			
Camaenidae					
139.		*Quistrachia legendrei*			
140.		*Rhagada angulata*			
141.		*Rhagada convicta*			
142.		*Rhagada dampierana*			
143.		*Rhagada intermedia*			
144.		*Rhagada minima*			
145.		*Rhagada perprima*			
Campephagidae					
146.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
147.	24367	*Lalage tricolor (White-winged Triller)*			
Canidae					
148.	48920	*Canis familiaris (Dog, Dingo)*	Y		

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149.	24040	*Vulpes vulpes (Red Fox)*	Y		
Caprimulgidae					
150.	24368	*Eurostopodus argus (Spotted Nightjar)*			
Carabidae					
151.		*Carenum pulchrum*			
152.		*Carenum subplanatum*			
153.		*Carenum venustum*			
154.		*Catadromus lacordairei*			
155.		*Chlaenius australis*			
156.		*Geoscaptus laevissimus*			
157.		*Loxandrus micantior*			
158.		*Megacephala greyana*			
159.		*Pheropsophus verticalis*			
Carangidae					
160.		*Alepes apercna*			
161.		*Alepes mate*			Y
162.		*Atule mate*			
163.		*Carangoides sp.*			
164.		*Caranx bucculentus*			
165.		*Caranx sexfasciatus*			
166.		*Selaroides leptolepis*			
Carcharhinidae					
167.		*Carcharhinus brachyurus*			
Carphodactylidae					
168.	24969	*Nephrurus levis subsp. pilbarensis*			
Casuariidae					
169.	24470	*Dromaius novaehollandiae (Emu)*			
Centriscidae					
170.		*Centriscus scutatus*			
Centrogeniidae					
171.		*Centrogenys vaigiensis*			
Centropagidae					
172.		*Boeckella triarticulata*			
Centropodidae					
173.	25600	*Centropus phasianinus (Pheasant Coucal)*			
Centropomidae					
174.		*Hypopterus macropterus*			
Ceratopogonidae					
175.		*Alluaudomyia sp.*			
176.		*Ceratopogonidae sp.*			
177.		*Dasyheleinae sp. P2 (PSW)*			
Chaetodontidae					
178.		*Chaetodon aureofasciatus*			
179.		*Chelmon marginalis*			
180.		*Chelmon muelleri*			
Chanidae					
181.		*Chanos chanos*			
Charadriidae					
182.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
183.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
184.	24375	*Charadrius mongolus subsp. mongolus (Lesser Sand Plover)*		T	
185.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
186.	24378	*Charadrius veredus (Oriental Plover)*		IA	
187.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
188.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
189.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
190.	24383	*Pluvialis squatarola (Grey Plover)*		IA	
191.	25577	*Vanellus miles (Masked Lapwing)*			
192.	24386	*Vanellus tricolor (Banded Lapwing)*			
Cheloniidae					
193.	25336	*Chelonia mydas (Green Turtle)*		T	
194.	25473	*Eretmochelys imbricata (Hawksbill Turtle)*		T	

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195.	25342	*Eretmochelys imbricata subsp. bissa (Hawksbill Turtle)*		T	
196.	25344	*Natator depressus (Flatback Turtle)*		T	
Chirocentridae					
197.		*Chirocentrus dorab*			
Chironomidae					
198.		*Chironominae sp.*			
199.		*Chironomus aff. alternans (V24) (CB)*			
200.		*Cryptochironomus griseidorsum*			
201.		*Dicrotendipes P5 (=balciunasi?) (PSW)*			
202.		*Larsia albiceps*			
203.		*Orthocladiinae sp.*			
204.		*Paratanytarsus sp. P2 (PSW)*			
205.		*Polypedilum nubifer*			
206.		*Procladius paludicola*			
207.		*Rheotanytarsus trivittatus*			
208.		*Tanypodinae sp.*			
209.		*Tanytarsus fuscithorax/semibarbitarsus*			
210.		*Tanytarsus sp. D (SAP)*			
211.		*Tanytarsus sp. P8 (PSW)*			
Chydoridae					
212.		*Alona anodonta*			
213.		*Alona cf. verrucosa*			
214.		*Alona rigidicaudis*			
215.		*Ephemeroporus barroisi s.l.*			
216.		*Leberis cf. diaphanus*			
217.		*Ovatalona cf. cambouei*			
Ciconiidae					
218.	25578	*Ephippiorhynchus asiaticus (Black-necked Stork)*			
Clupeidae					
219.		*Clupeid sp.*			
220.		*Herklotsichthys koningsbergeri*			
221.		*Nematalosa erebi*			
222.		*Spratelloides delicatulus*			
Coenagrionidae					
223.		*Coenagrionidae sp.*			
224.		*Ischnura aurora aurora*			
Colubridae					
225.	25327	*Fordonia leucobalia (White-bellied Mangrove Snake)*			
Columbidae					
226.	24399	*Columba livia (Domestic Pigeon)*	Y		
227.	24401	*Geopelia cuneata (Diamond Dove)*			
228.	24402	*Geopelia humeralis (Bar-shouldered Dove)*			
229.	25585	*Geopelia striata (Zebra Dove)*			
230.	24403	*Geopelia striata subsp. placida (Peaceful Dove)*			
231.	24404	*Geophaps plumifera (Spinifex Pigeon)*			
232.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
233.	24409	*Phaps chalcoptera (Common Bronzewing)*			
234.	24411	*Phaps histrionica (Flock Bronzewing, Flock Pigeon)*			
235.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
Congridae					
236.		*Conger cinereus*			
Corinnidae					
237.		*Supunna picta*			
Corixidae					
238.		*Agraptocorixa parvipunctata*			
239.		*Corixidae sp.*			
240.		*Micronecta gracilis*			
241.		*Micronecta n. sp. P3 (PSW)*			
242.		*Micronecta sp.*			
Corvidae					
243.	24416	*Corvus bennetti (Little Crow)*			
244.	25593	*Corvus orru (Torresian Crow)*			
245.	24419	*Corvus splendens (House Crow)*			

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Cracticidae					
246.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
247.	25595	*Cracticus tibicen (Australian Magpie)*			
248.	25596	*Cracticus torquatus (Grey Butcherbird)*			
Cuculidae					
249.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
250.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
251.	24434	*Chrysococcyx osculans (Black-eared Cuckoo)*			
Culicidae					
252.		*Anopheles annulipes s.l.*			
253.		*Culex (Culex) annulirostris*			
254.		*Culex crinicauda*			
255.		*Culex nr. crinicauda (PSW)*			
256.		*Culex palpalis*			
257.		*Culicidae sp.*			
Cyclopidae					
258.		*Mesocyclops brooksi*			
259.		*Metacyclops sp. P2 (PSW)*			
260.		*Microcyclops varicans*			
261.		*Thermocyclops decipiens*			
Cynoglossidae					
262.		*Cynoglossus maculipinnis*			
263.		*Cynoglossus sp.*			
264.		*Paraplagusia guttata*			Y
Cyprididae					
265.		*Bennelongia minimus*			
266.		*Cypretta ?lutea*			
267.		*Cypretta seurati*			
268.		*Cypretta sp PSW074*			
269.		*Cypricercus salinus*			
270.		*Cypricercus sp. 422 (CB)*			
271.		*Hemicypris megalops*			
272.		*Heterocypris sp.*			
273.		*Heterocypris tatei*			
274.		*Ilyodromus sp BOS25*			
275.		*Ilyodromus sp. PB*			
276.		*Isocypris williamsi (ex Ilyodromus sp. 413)*			
277.		*Zonocypretta kalimna*			
Cyzicidae					
278.		*Ozestheria packardi*			
Daphniidae					
279.		*Ceriodaphnia cornuta*			
280.		*Ceriodaphnia n. sp. a (Berner sp.#3) (SAP)*			
281.		*Ceriodaphnia n. sp. c (Berner sp.#1) (SAP)*			
Dasyuridae					
282.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
283.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
284.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
285.		*Planigale sp. nov.*			
286.	24105	*Pseudantechinus roryi (Rory's Pseudantechinus)*			
287.	24106	*Pseudantechinus woolleyae (Woolley's Pseudantechinus)*			
288.	24116	*Sminthopsis macroura (Stripe-faced Dunnart)*			
Delphinidae					
289.	24057	*Lagenodelphis hosei (Fraser's Dolphin)*			
290.	48114	*Stenella longirostris (Spinner Dolphin)*		P4	
291.	30954	*Tursiops aduncus (Indo-Pacific Bottlenose Dolphin)*			
Diatom Family					
292.		*Achnanthidium minutissima (Kütz.) Czarnecki*			
293.		*Caloneis silicula (Ehr.) Cl.*			
294.		*Cymbella delicatula Kütz.*			
295.		*Hantzschia amphioxys (Ehr.) Grun.*			
296.		*Luticola mutica (Kütz.) Mann*			
297.		*Nitzschia microcephala Grun.*			
298.		*Nitzschia perminuta (Grun.) M. Peragallo*			
299.		*Nitzschia sigma (Kütz.) W. Sm.*			

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300.		*Pinnularia divergens W. Sm.*			
301.		*Pinnularia subrostrata (A. Cl.) Cl.-Euler*			
302.		*Stauroneis anceps Ehr.*			
303.		*Stauroneis phoenicenteron (Nitz.) Ehr.*			
Dicaeidae					
304.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
Dicruridae					
305.	24443	*Grallina cyanoleuca (Magpie-lark)*			
306.	48096	*Rhipidura albiscapa (Grey Fantail)*			
307.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
308.	24454	*Rhipidura leucophrys subsp. leucophrys (Willie Wagtail)*			
309.	24457	*Rhipidura phasiana (Mangrove Grey Fantail)*			
Difflugiidae					
310.		*Difflugia sp. P1*			
Diplodactylidae					
311.	25456	*Crenadactylus ocellatus (Clawless Gecko)*			
312.	24919	*Crenadactylus ocellatus subsp. horni (Clawless Gecko)*			
313.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
314.	41404	*Diplodactylus galaxias (Northern Pilbara Beak-faced Gecko)*			
315.	24937	*Diplodactylus mitchelli*			
316.	24944	*Diplodactylus savagei (Southern Pilbara Beak-faced Gecko)*			
317.	30933	*Lucasium stenodactylum*			
318.	24976	*Oedura marmorata (Marbled Velvet Gecko)*			
319.	24982	*Rhynchoedura ornata (Western Beaked Gecko)*			
320.	24924	*Strophurus ciliaris subsp. aberrans*			
321.	24927	*Strophurus elderi*			
322.	24932	*Strophurus jeanae*			
323.	24949	*Strophurus wellingtonae*			
Dugongidae					
324.	24084	*Dugong dugon (Dugong)*		S	
Dytiscidae					
325.		*Allodessus bistrigatus*			
326.		*Cybister tripunctatus*			
327.		*Dytiscidae sp.*			
328.		*Eretes australis*			
329.		*Hydroglyphus grammopterus (=trilineatus)*			
330.		*Hydroglyphus leai*			
331.		*Hydroglyphus orthogrammus*			
332.		*Hyphydrus elegans*			
333.		*Hyphydrus lyratus*			
334.		*Hyphydrus sp.*			
335.		*Laccophilus sharpi*			
336.		*Limbodessus compactus*			
Ecnomidae					
337.		*Ecnomidae sp.*			
338.		*Ecnomus pilbarensis*			
Elapidae					
339.		*Acanthophis wellsei*			
340.	25332	*Acanthophis wellsi (Pilbara Death Adder)*			
341.	25355	*Aipysurus laevis (Olive Seasnake)*			
342.	25331	*Brachyurophis approximans (North-western Shovel-nosed Snake)*			
343.	25468	*Demansia psammophis (Yellow-faced Whipsnake)*			
344.	25295	*Demansia psammophis subsp. cupreiceps (Yellow-faced Whipsnake)*			
345.	25296	*Demansia psammophis subsp. reticulata (Yellow-faced Whipsnake)*			
346.	25297	*Demansia rufescens (Rufous Whipsnake)*			
347.	25362	*Ephalophis greyae*			
348.	25301	*Furina ornata (Moon Snake)*			
349.	25363	*Hydrelaps darwiniensis*			
350.	25261	*Pseudechis australis (Mulga Snake)*			
351.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
352.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
353.	25264	*Pseudonaja nuchalis (Gwardar, Northern Brown Snake)*			
354.	25269	*Suta fasciata (Rosen's Snake)*			
355.	25307	*Suta punctata (Spotted Snake)*			
Eleotridae					
356.		*Bostrychus sinensis*			

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					Y
Elopidae					
357.		*Elops hawaiensis*			
Emballonuridae					
358.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
Enchytraeidae					
359.		*Enchytraeidae sp.*			
Ephydridae					
360.		*Ephydridae sp.*			
361.		*Ephydridae sp. 12 (PSW)*			
Epistylididae					
362.		*Epistylis sp*			
Estrilidae					
363.	24631	*Emblema pictum (Painted Finch)*			
364.	24633	*Heteromunia pectoralis (Pictorella Mannikin)*			
365.	25685	*Neochmia ruficauda (Star Finch)*			
366.		*Taeniopygia castanotis*			
367.	30870	*Taeniopygia guttata (Zebra Finch)*			
Euchlanidae					
368.		*Euchlanis dilatata*			
369.		*Euchlanis lyra*			
Euglyphidae					
370.		*Euglypha sp.*			
Exocoetidae					
371.		*Cheilopogon arcticeps*			
372.		*Paraexocoetus brachypterus*			Y
Falconidae					
373.	25621	*Falco berigora (Brown Falcon)*			
374.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
375.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
376.	25623	*Falco longipennis (Australian Hobby)*			
377.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
378.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
379.	24476	*Falco subniger (Black Falcon)*			
Felidae					
380.	24041	*Felis catus (Cat)*	Y		
Flosculariidae					
381.		*Lacinularia flosculosa*			
Fregatidae					
382.	24478	*Fregata ariel (Lesser Frigatebird)*		IA	
Gallieniellidae					
383.		*Meedo houstoni*			
Gekkonidae					
384.	24956	*Gehyra pilbara*			
385.	24958	*Gehyra punctata*			
386.	24959	*Gehyra variegata*			
387.	25232	*Hemidactylus frenatus (Asian House Gecko)*	Y		
388.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
Gerreidae					
389.		*Gerres filamentosus*			
390.		*Gerres subfasciatus*			
Ginglymostomatidae					
391.		*Nebrius ferrugineus*			Y
Glareolidae					
392.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
393.	24482	*Stiltia isabella (Australian Pratincole)*			
Gobiesocidae					
394.		*Diademichthys lineatus*			
395.		*Discotrema lineata*			Y
396.		*Lepadichthys sandaracatus*			

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Gobiidae					
397.		*Acentrogobius gracilis*			
398.		*Acentrogobius sp.*			
399.		*Amblyeleotris gymnocephala*			
400.		*Amblygobius bynoensis*			
401.		*Asterropteryx semipunctatus*			
402.		*Bathygobius cocosensis*			
403.		*Bathygobius fuscus*			
404.		*Bathygobius laddi*			
405.		*Bathygobius sp.*			
406.		*Bryaninops loki*			
407.		*Callogobius sp. 2*			Y
408.		*Drombus sp.*			
409.		*Eviota queenslandica*			
410.		*Eviota sp.*			
411.		*Eviota zebrina*			
412.		*Favonigobius melanobranchus*			
413.		*Favonigobius sp.*			
414.		*Glossogobius giuris*			
415.		*Glossogobius sp.*			
416.		*Gnatholepis argus*			
417.		*Gobiodon histrio*			
418.		*Gobiodon quinquestrigatus*			
419.		*Gobiodon rivulatus*			
420.		*Gobiodon sp.*			
421.		*Istigobius nigroocellatus*			
422.		*Istigobius ornatus*			
423.		*Oxyurichthys sp.*			
424.		*Pandaka lidwilli*			
425.		*Parachaeturichthys sp.*			Y
426.		*Periophthalmus argentilineatus*			
427.		*Pleurosicya sp.*			
428.		*Priolepis nuchifasciata*			
429.		*Valenciennea muralis*			
430.		*Yongeichthys nebulosus*			
Gobioididae					
431.		*Ctenotrypauchen microcephalus*			
Gomphidae					
432.		*Gomphidae sp.*			
Gruidae					
433.	24484	*Grus rubicunda (Brolga)*			
Gyrinidae					
434.		*Dineutus australis*			
Haematopodidae					
435.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
436.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
437.		*Haematopus ostralegus*			Y
Haemulidae					
438.		*Pomadasys kaakan*			
439.		*Pomadasys maculatus*			
Halacaridae					
440.		*Actacarus pacificus*			
441.		*Agauopsis arborea*			Y
442.		*Agauopsis dasyderma*			Y
443.		*Agauopsis moorea*			Y
444.		*Agauopsis obtusa*			Y
445.		*Anomalohalacarus dampierensis*			Y
446.		*Copidognathus lutarius*			Y
447.		*Copidognathus meridianus*			
448.		*Copidognathus piger*			Y
449.		*Halacaridae sp.*			
450.		*Isobactrus australiensis*			Y
451.		*Isobactrus obesus*			Y
452.		*Rhombognathus dispar*			Y
453.		*Rhombognathus ocularis*			Y
454.		*Rhombognathus scutulatus*			
455.		*Scaptognathides hawaiiensis*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
					Y
456.		*Scaptognathides ornatus*			Y
457.		*Simognathus platyaspis*			Y
458.		*Simognathus salebrosus*			Y
459.		*Simognathus tener*			Y
Halcyonidae					
460.	25547	*Dacelo leachii (Blue-winged Kookaburra)*			
461.	25548	*Todiramphus chloris (Collared Kingfisher)*			
462.	24306	*Todiramphus chloris subsp. pilbara (Pilbara Collared Kingfisher)*			
463.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
464.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
465.	24309	*Todiramphus sanctus subsp. sanctus (Sacred Kingfisher)*			
Hebridae					
466.		*Hebridae sp.*			
Hemicorduliidae					
467.		*Hemicordulia sp.*			
Hemiramphidae					
468.		*Hemiramphus sp.*			
Hexarthridae					
469.		*Hexarthra cf brandorffi (PSW)*			
470.		*Hexarthra sp P3 5-2/5-2 (PSW)*			Y
Hipposideridae					
471.	43368	*Rhinonicteris aurantia (Orange Leaf-nosed bat)*		P4	
Hirundinidae					
472.	24491	*Hirundo neoxena (Welcome Swallow)*			
473.	25630	*Hirundo rustica (Barn Swallow)*		IA	
474.	48060	*Petrochelidon ariel (Fairy Martin)*			
475.	48061	*Petrochelidon nigricans (Tree Martin)*			
Holocentridae					
476.		*Myripristis berndti*			
477.		*Myripristis hexagona*			
478.		*Sargocentron rubrum*			
Hydrachnidae					
479.		*Hydrachna sp. 4/5 (PSW)*			
Hydraenidae					
480.		*Hydraena sp.*			
481.		*Hydraenidae sp.*			
Hydrobatidae					
482.	24497	*Oceanites oceanicus (Wilson's Storm-petrel)*		IA	
Hydrobiidae					
483.		*Hydrobiidae sp P1 (not assimineid) (PSW)*			
Hydrometridae					
484.		*Hydrometridae sp.*			
Hydrophilidae					
485.		*Berosus pulchellus*			
486.		*Enochrus deserticola*			
487.		*Enochrus sp.*			
488.		*Hydrochus obscuroaeneus*			
489.		*Hydrophilidae sp.*			
490.		*Paracymus pygmaeus*			
491.		*Paracymus spenceri*			
492.		*Regimbartia attenuata*			
493.		*Sternolophus australis*			
Hydropsychidae					
494.		*Cheumatopsyche wellsae*			
Hydroptilidae					
495.		*Hellyethira sp.*			
496.		*Hydroptilidae sp.*			
Hylidae					
497.	25371	*Cyclorana australis (Giant Frog)*			
498.	25373	*Cyclorana cultripes (Knife-footed Frog)*			
499.	25375	*Cyclorana maini (Sheep Frog)*			

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500.	25392	*Litoria rubella (Little Red Tree Frog)*			
Hypsimetopodidae					
501.		*Pilbarophreatoicus platyarthricus*			
Ilyocyprididae					
502.		*Ilyocypris australiensis*			
Ixodidae					
503.		*Amblyomma triguttatum*			
Labridae					
504.		*Choerodon cyanodus*			
505.		*Choerodon vitta*			
506.		*Coris sp.*			
507.		*Halichoeres melanochir*			
508.		*Halichoeres nigrescens*			
509.		*Halichoeres sp.*			
510.		*Labroides dimidiatus*			
511.		*Scarus ghobban*			
512.		*Stethojulis interrupta*			
Lamponidae					
513.		*Lampona ampeinna*			
514.		*Lampona cylindrata*			
515.		*Lamponina scutata*			
Laridae					
516.	24505	*Anous stolidus subsp. pileatus (Common Noddy)*		IA	
517.	41332	*Chlidonias leucopterus (White-winged Black Tern, white-winged tern)*		IA	
518.		*Chroicocephalus novaehollandiae*			
519.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
520.	25637	*Larus novaehollandiae (Silver Gull)*			
521.	25638	*Larus pacificus (Pacific Gull)*			
522.	41347	*Onychoprion anaethetus (Bridled Tern)*		IA	
523.	24521	*Sterna bengalensis (Lesser Crested Tern)*			
524.	25640	*Sterna dougallii (Roseate Tern)*		IA	
525.	25642	*Sterna hirundo (Common Tern)*		IA	
526.	25643	*Sterna hybrida (Whiskered Tern)*			
527.	48593	*Sternula albifrons (Little Tern)*		IA	
528.	48594	*Sternula nereis (Fairy Tern)*			
529.		*Thalasseus bengalensis*			
530.	48597	*Thalasseus bergii (Crested Tern)*		IA	
Latidae					
531.		*Psammoperca waigiensis*			
Lecanidae					
532.		*Lecane bifastigata*			Y
533.		*Lecane bulla*			
534.		*Lecane cf. ludwigii (PSW)*			
535.		*Lecane cf. rhenana (SAP)*			
536.		*Lecane luna*			
537.		*Lecane papuana*			
538.		*Lecane punctata*			
539.		*Lecane thalera*			
540.		*Lecane ungulata*			
Leiognathidae					
541.		*Leiognathus sp.*			
542.		*Secutor insidiator*			
Lepadellidae					
543.		*Lepadella patella*			
Leporidae					
544.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
Leptoceridae					
545.		*Leptoceridae sp.*			
Libellulidae					
546.		*Diplacodes bipunctata*			
547.		*Diplacodes haematodes*			
548.		*Libellulidae sp.*			
549.		*Orthetrum caledonicum*			
550.		*Pantala flavescens*			

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551.		*Tramea stenoloba*			
Limnadiidae					
552.		*Eulimnadia dahli*			Y
553.		*Eulimnadia sp. P1 (PSW)*			Y
554.		*Limnadopsis "pilbarensis" (ex P2)(PSW)*			Y
555.		*Limnadopsis birchii*			
Limnocytheridae					
556.		*Limnocythere dorsosicula*			
Limnodynastidae					
557.	25422	*Neobatrachus aquilonius (Northern Burrowing Frog)*			
558.	25430	*Notaden nichollsi (Desert Spadefoot)*			
Lutjanidae					
559.		*Lutjanus argentimaculatus*			
560.		*Lutjanus carponotatus*			
561.		*Lutjanus fulviflamma*			
562.		*Lutjanus malabaricus*			
563.		*Lutjanus russellii*			
Lycosidae					
564.		*Hogna crispipes*			
565.		*Knoelle clara*			
566.		*Venatrix arenaris*			
Lymnaeidae					
567.		*Lymnaeidae sp.*			
Macropodidae					
568.	25489	*Macropus robustus (Euro, Biggada)*			
569.	24135	*Macropus robustus subsp. erubescens (Euro, Biggada)*			
570.	24136	*Macropus rufus (Red Kangaroo, Marlu)*			
571.	48034	*Osphranter robustus (Euro, Biggada)*			
572.	24144	*Petrogale rothschildi (Rothschild's Rock-wallaby)*			
Macrotrichidae					
573.		*Macrothrix sp.*			
Maluridae					
574.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
575.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
Megadermatidae					
576.	24180	*Macroderma gigas (Ghost Bat)*		T	
Melanotaeniidae					
577.		*Melanotaenia australis*			
Meliphagidae					
578.	24568	*Epthianura aurifrons (Orange Chat)*			
579.	24570	*Epthianura tricolor (Crimson Chat)*			
580.	42314	*Gavicalis virescens (Singing Honeyeater)*			
581.	25661	*Lichmera indistincta (Brown Honeyeater)*			
582.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
583.	24583	*Manorina flavigula (Yellow-throated Miner)*			
584.	24589	*Melithreptus gularis subsp. laetior (Black-chinned Honeyeater)*			
585.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
Meropidae					
586.	24598	*Merops ornatus (Rainbow Bee-eater)*			
Mesoveliidae					
587.		*Mesovelia hungerfordi*			
588.		*Mesoveliidae sp.*			
Moinidae					
589.		*Moina micrura s.l.*			
Molossidae					
590.	24181	*Chaerephon jobensis (Greater Northern Freetail-bat, Northern Mastiff Bat)*			
591.		*Mormopterus (Ozimops) cobourgianus*			
592.	24183	*Mormopterus loriae (Little Northern Freetail-bat)*			
Monacanthidae					
593.		*Monacanthus chinensis*			
594.		*Paramonacanthus choirocephalus*			

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Monodactylidae					
595.		*Monodactylus argenteus*			
Motacillidae					
596.	25670	*Anthus australis (Australian Pipit)*			
597.	24599	*Anthus australis subsp. australis (Australian Pipit)*			
Mugilidae					
598.		*Liza alata*			
599.		*Liza subviridis*			
600.		*Liza vaigiensis*			
601.		*Mugil cephalus*			
602.		*Mugilid sp.*			
603.		*Valamugil buchanani*			
604.		*Valamugil seheli*			
Mullidae					
605.		*Upeneus sulphureus*			
Muraenidae					
606.		*Gymnothorax pseudothrysoideus*			
607.		*Gymnothorax pseudothyrsoideus*			
608.		*Gymnothorax thrysoideus*			
609.		*Gymnothorax undulatus*			
Muridae					
610.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
611.	24217	*Leggadina lakedownensis (Northern Short-tailed Mouse, Lakeland Downs Mouse, Kerakenga)*		P4	
612.	24223	*Mus musculus (House Mouse)*	Y		
613.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
614.	24233	*Pseudomys chapmani (Western Pebble-mound Mouse, Ngadji)*		P4	
615.	24234	*Pseudomys delicatulus (Delicate Mouse)*			
616.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
617.	24245	*Rattus rattus (Black Rat)*	Y		
618.	24246	*Rattus tunneyi (Pale Field-rat)*			
619.	24248	*Zyzomys argurus (Common Rock-rat)*			
Muscidae					
620.		*Muscidae sp. P1*			
Myobatrachidae					
621.	41428	*Uperoleia saxatilis (Pilbara Toadlet)*			
Naididae					
622.		*Naididae (ex Tubificidae)*			
Nematoda					
623.		*Nematoda sp. P2/P4 (PSW)*			
Nemesiidae					
624.		*Aname mainae*			
625.		*Aname mellosa*			
Nemipteridae					
626.		*Nemipterus celebicus*			
627.		*Pentapodus porosus*			
628.		*Pentapodus sp.*			
629.		*Pentapodus vitta*			
630.		*Scolopsis bilineatus*			
631.		*Scolopsis taenioptera*			
Nepidae					
632.		*Nepidae sp.*			
Notommatidae					
633.		*Cephalodella biungulata*			
634.		*Cephalodella cf forficula*			
635.		*Cephalodella gibba*			
636.		*Monommata sp.*			
Notonectidae					
637.		*Anisops canaliculatus*			
638.		*Anisops hackeri*			
639.		*Anisops nasutus*			
640.		*Anisops sp.*			
641.		*Notonectidae sp.*			

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Ogcocephalidae					
642.		*Halieutaea brevicaudata?*			
Oligochaeta					
643.		*Oligochaeta sp.*			
Olpiidae					
644.		*Indolpium sp.*			
Ophichthidae					
645.		*Muraenichthys sp.*			
646.		*Ophichthus celebicus?*			
647.		*Pisodonophis cancrivorus*			
648.		*Scolecenchelys macroptera*			
649.		*Yirrkala lumbricoides*			
650.		*Yirrkala sp.*			
Ophiclinidae					
651.		*? ?*			
Opisthopora					
652.		*Opisthopora sp.*			
Opistognathidae					
653.		*Opistognathus darwiniensis*			
Ostracoda					
654.		*Ostracoda (unident.)*			
Otididae					
655.	24610	*Ardeotis australis (Australian Bustard)*			
Oxyopidae					
656.		*Oxyopes variabilis*			
Pachycephalidae					
657.	24620	*Pachycephala lanioides (White-breasted Whistler)*			
658.	25678	*Pachycephala melanura (Mangrove Golden Whistler)*			
659.	24621	*Pachycephala melanura subsp. melanura (Mangrove Golden Whistler)*			
660.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
Paradoxosomatidae					
661.		*Boreohesperus undulatus*			
662.		*Orthomorpha coarctata*			
Paralichthyidae					
663.		*Pseudorhombus argus*			
664.		*Pseudorhombus arsius*			
665.		*Pseudorhombus elevatus*			
666.		*Pseudorhombus sp.*			
Pardalotidae					
667.	24627	*Pardalotus rubricatus (Red-browed Pardalote)*			
668.	48053	*Pardalotus rubricatus subsp. rubricatus (Red-browed Pardalote)*			Y
669.	25682	*Pardalotus striatus (Striated Pardalote)*			
Passeridae					
670.	25687	*Passer domesticus (House Sparrow)*	Y		
671.	24642	*Passer montanus (Eurasian Tree Sparrow)*	Y		
Pegasidae					
672.		*Pegasus volitans*			
Pelecanidae					
673.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
Pempheridae					
674.		*Pempheris ypsilychnus*			
Petroicidae					
675.	24653	*Eopsaltria pulverulenta (Mangrove Robin)*			
676.		*Peneoenanthe pulverulenta*			
Phalacrocoracidae					
677.		*Microcarbo melanoleucos*			
678.	25697	*Phalacrocorax carbo (Great Cormorant)*			
679.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
680.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
681.	25699	*Phalacrocorax varius (Pied Cormorant)*			

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Phasianidae					
682.	25701	*Coturnix ypsilophora (Brown Quail)*			
683.	24673	*Coturnix ypsilophora subsp. australis (Brown Quail)*			
684.	24672	*Coturnix ypsilophora subsp. cervina (Brown Quail)*			
Pholcidae					
685.		*Trichocyclus nigropunctatus*			
Phreodrilidae					
686.		*Phreodrilid with dissimilar ventral chaetae*			
687.		*Phreodrilid with similar ventral chaetae*			
Pinguipedidae					
688.		*Parapercis diplospilus*			
Pittidae					
689.	24677	*Pitta moluccensis (Blue-winged Pitta)*			
Planorbidae					
690.		*Glyptophysa sp*			
691.		*Isidorella egraria*			
692.		*Planorbidae sp.*			
Platycephalidae					
693.		*Cymbacephalus bosschei*			
694.		*Cymbacephalus nematophthalmus*			
695.		*Inegocia japonica*			
696.		*Onigocia pedimacula*			
697.		*Onigocia pedimacula?*			
698.		*Platycephalus endrachtensis*			
699.		*Platycephalus sp.*			
700.		*Sorsogona tuberculata*			
701.		*Suggrundus macracanthus*			
Pleidae					
702.		*Pleidae sp.*			
Plotosidae					
703.		*Euristhmus microceps*			
704.		*Euristhmus sandrae*			Y
705.		*Neosilurus hyrtlii*			
706.		*Paraplotosus albilabris*			
707.		*Paraplotosus butleri*			
708.		*Paraplotosus muelleri*			
709.		*Plotosus lineatus*			
Podargidae					
710.	25703	*Podargus strigoides (Tawny Frogmouth)*			
711.	24679	*Podargus strigoides subsp. brachypterus (Tawny Frogmouth)*			
Podicipedidae					
712.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
713.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
Polynemidae					
714.		*Eleutheronema tetradactylum*			
715.		*Polydactylus multiradiatus*			
Pomacanthidae					
716.		*Pomacanthus sexstriatus*			
Pomacentridae					
717.		*Abudefduf bengalensis*			
718.		*Chromis fumea*			
719.		*Dischistodus darwiniensis*			
720.		*Neoglyphidodon nigroris*			
721.		*Neopomacentrus azysron*			
722.		*Neopomacentrus cyanomos*			
723.		*Neopomacentrus filamentosus*			
724.		*Pomacentrus milleri*			
725.		*Pristotis obtusirostris*			
Pomatostomidae					
726.	25706	*Pomatostomus temporalis (Grey-crowned Babbler)*			
727.	24684	*Pomatostomus temporalis subsp. rubeculus (Grey-crowned Babbler)*			
Pontarachnidae					

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728.		*Litarachna bartschae*			Y
729.		*Pontarachne australis*			Y
Priacanthidae					
730.		*Priacanthus hamrur*			
Pristinidae					
731.		*Pristina longiseta*			
Procellariidae					
732.	48573	*Ardenna pacifica (Wedge-tailed Shearwater)*		IA	
733.	24716	*Puffinus pacificus (Wedge-tailed Shearwater)*		IA	
Prodidomidae					
734.		*Cryptoerithus halli*			
735.		*Cryptoerithus occultus*			
736.		*Prodidomus woodleigh*			
737.		*Wesmaldra nixaut*			
738.		*Wydundra kennedy*			
739.		*Wydundra nixaut*			Y
Psettodidae					
740.		*Psettodes erumei*			
Pseudochromidae					
741.		*Blennodesmus scapularis*			
742.		*Congrogadus spinifer*			
743.		*Congrogadus subducens*			
744.		*Pseudochromis wilsoni*			
Psittacidae					
745.		*Barnardius zonarius*			
746.	25715	*Cacatua roseicapilla (Galah)*			
747.	25716	*Cacatua sanguinea (Little Corella)*			
748.	24727	*Cacatua sanguinea subsp. westralensis (Little Corella)*			
749.	24736	*Melopsittacus undulatus (Budgerigar)*			
750.		*Neopsephotus bourkii*			
751.	24742	*Nymphicus hollandicus (Cockatiel)*			
752.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
Pteropodidae					
753.	24172	*Pteropus alecto (Black Flying-fox)*			
754.	24173	*Pteropus scapulatus (Little Red Flying-fox)*			
Ptilonorhynchidae					
755.		*Chlamydera guttatus*			Y
756.		*Ptilonorhynchus guttatus*			
Pygopodidae					
757.	24996	*Delma borea*			
758.	25001	*Delma nasuta*			
759.	25002	*Delma pax*			
760.	25004	*Delma tincta*			
761.	25005	*Lialis burtonis*			
Pyralidae					
762.		*Pyralidae sp.*			
Rallidae					
763.	25727	*Fulica atra (Eurasian Coot)*			
764.	25730	*Gallirallus philippensis (Buff-banded Rail)*			
765.	24765	*Gallirallus philippensis subsp. mellori (Buff-banded Rail)*			
766.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
767.	25732	*Porzana pusilla (Baillon's Crake)*			
768.	24771	*Porzana tabuensis (Spotless Crake)*			
769.	48141	*Tribonyx ventralis (Black-tailed Native-hen)*			
Recurvirostridae					
770.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
771.	25734	*Himantopus himantopus (Black-winged Stilt)*			
772.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
Salticidae					
773.		*Grayenulla waldockae*			
774.		*Omoedus orbiculatus*			
775.		*Simaetha tenuior*			
776.		*Zenodorus orbiculatus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Scarabaeidae					
777.		*Heteronyx mimus*			
778.		*Heteronyx tepperi*			
Scatophagidae					
779.		*Scatophagus argus*			
780.		*Selenotoca multifasciata*			
781.		*Selenotoca sp.*			Y
Sciaenidae					
782.		*Protonibea diacanthus*			
Scincidae					
783.	25015	*Carlia munda (Shaded-litter Rainbow Skink)*			
784.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
785.	30893	*Cryptoblepharus buchananii*			
786.	25020	*Cryptoblepharus plagiocephalus*			
787.	30892	*Cryptoblepharus ustulatus*			
788.	25024	*Ctenotus angusticeps (Airlie Island Ctenotus, Northwestern coastal Ctenotus)*		P3	
789.	25027	*Ctenotus australis*			
790.	25036	*Ctenotus duricola*			
791.	25039	*Ctenotus fallens*			
792.	25462	*Ctenotus grandis*			
793.	25043	*Ctenotus grandis subsp. titan*			
794.	25045	*Ctenotus helenae*			
795.	25052	*Ctenotus leonhardii*			
796.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
797.	25060	*Ctenotus pantherinus subsp. acripes (Leopard Ctenotus)*			
798.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
799.	25070	*Ctenotus robustus*			
800.	25072	*Ctenotus rubicundus*			
801.	25073	*Ctenotus saxatilis (Rock Ctenotus)*			
802.	25074	*Ctenotus schomburgkii*			
803.	25077	*Ctenotus serventyi*			
804.	25466	*Cyclodomorphus melanops (Slender Blue-tongue)*			
805.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
806.	41406	*Egernia cygnitos (Western Pilbara Spiny-tailed Skink)*			
807.	25092	*Egernia depressa (Southern Pygmy Spiny-tailed Skink)*			
808.	25101	*Egernia pilbarensis (Pilbara Skink)*			
809.	42404	*Eremiascincus isolepis*			
810.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
811.	25125	*Lerista bipes*			
812.	30928	*Lerista clara*			
813.	30929	*Lerista jacksoni*			
814.	25155	*Lerista muelleri*			
815.	30925	*Lerista verhmens*			
816.	41417	*Liopholis striata (Night Skink)*			
817.	25184	*Menetia greyii*			
818.	25491	*Menetia surda*			
819.	25187	*Menetia surda subsp. surda*			
820.	25495	*Morethia ruficauda*			
821.	25193	*Morethia ruficauda subsp. exquisita*			
822.	25196	*Notoscincus butleri (lined soil-crevice skink (Dampier))*		P4	
823.	25197	*Notoscincus ornatus subsp. ornatus*			
824.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
Scirtidae					
825.		*Scirtidae sp.*			
Scolopacidae					
826.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
827.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
828.	24779	*Calidris acuminata (Sharp-tailed Sandpiper)*		IA	
829.	24780	*Calidris alba (Sanderling)*		IA	
830.	25738	*Calidris canutus (Red Knot, knot)*		IA	
831.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
832.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
833.	24789	*Calidris subminuta (Long-toed Stint)*		IA	
834.	24790	*Calidris tenuirostris (Great Knot)*		T	
835.	24793	*Gallinago stenura (Pin-tailed Snipe)*		IA	
836.	25739	*Limicola falcinellus (Broad-billed Sandpiper)*		IA	
837.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
838.	25741	*Limosa limosa (Black-tailed Godwit)*		IA	
839.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
840.	24799	*Numenius minutus (Little Curlew, Little Whimbrel)*		IA	
841.	25742	*Numenius phaeopus (Whimbrel)*		IA	
842.	24803	*Tringa brevipes (Grey-tailed Tattler)*		P4	
843.	24806	*Tringa glareola (Wood Sandpiper)*		IA	
844.	24808	*Tringa nebularia (Common Greenshank, greenshank)*		IA	
845.	24809	*Tringa stagnatilis (Marsh Sandpiper, little greenshank)*		IA	
846.	41351	*Xenus cinereus (Terek Sandpiper)*		IA	
Scolopendridae					
847.		*Arthrorhabdus paucispinus*			
848.		*Ethmostigmus curtipes*			
849.		*Scolopendra laeta*			
850.		*Scolopendra morsitans*			
Scombridae					
851.		*Rastrelliger kanagurta*			
Scorpaenidae					
852.		*Parascorpaena picta*			
853.		*Pterois volitans*			
Scutigeridae					
854.		*Pilbarascutigera incola*			
Serranidae					
855.		*Cephalopholis boenak*			
856.		*Chromileptes altivelis*			
857.		*Epinephelus bilobatus*			
858.		*Epinephelus coioides*			
859.		*Epinephelus corallicola*			
860.		*Epinephelus fasciatus*			
861.		*Epinephelus malabaricus*			
862.		*Epinephelus quoyanus*			
863.		*Epinephelus sexfasciatus*			
Sididae					
864.		*Diaphanosoma excisum*			
865.		*Latonopsis australis*			
Sillaginidae					
866.		*Sillago burrus*			
867.		*Sillago lutea*			
Simuliidae					
868.		*Simulium ornatipes*			
Soleidae					
869.		*Dexillus muelleri*			
870.		*Soleichthys heterorhinos*			
871.		*Zebrias quagga*			
Sparassidae					
872.		*Isopedella gibsandi*			
873.		*Isopedella tindalei*			
874.		*Pediana horni*			
875.		*Pediana tenuis*			
Sparidae					
876.		*Acanthopagrus latus*			
Sphyraenidae					
877.		*Sphyraena barracuda*			
878.		*Sphyraena sp.*			
Stratiomyidae					
879.		*Stratiomyidae sp.*			
Strigidae					
880.	48016	*Ninox boobook (Boobook Owl)*			
881.	25747	*Ninox connivens (Barking Owl)*			
Sturnidae					
882.	47954	*Gelochelidon nilotica (Gull-billed Tern)*		IA	
Sulidae					
883.	25754	*Sula leucogaster (Brown Booby)*		IA	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Sylviidae					
884.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
885.	24837	*Eremiornis carteri (Spinifex-bird)*			
Synanceiidae					
886.		*Minous versicolor*			
887.		*Synanceia horrida*			
Synchaetidae					
888.		*Polyarthra dolichoptera*			
Syngnathidae					
889.		*Festucalex sp.*			
890.		*Haliichthys taeniophorus*			
891.		*Hippichthys penicillus*			
892.		*Hippocampus sp.*			
893.		*Micrognathus micronotopterus*			
Tabanidae					
894.		*Tabanidae sp.*			
Tachyglossidae					
895.	24207	*Tachyglossus aculeatus (Short-beaked Echidna)*			
Terapontidae					
896.		*Amniataba caudavittata*			
897.		*Amniataba percoides*			
898.		*Leiopotherapon unicolor*			
899.		*Terapon jarbua*			
Testudinellidae					
900.		*Testudinella patina*			
Tetraodontidae					
901.		*Chelonodon patoca*			
Tetrarogidae					
902.		*Cottapistus cottoides*			
903.		*Liocranium praepositum*			
904.		*Paracentropogon vespa*			
Tettigoniidae					
905.		*Antipodectes bituberculatus*			Y
Theridiidae					
906.		*Latrodectus geometricus*			
Thiaridae					
907.		*Thiaridae sp.*			
Threskiornithidae					
908.	24842	*Platalea regia (Royal Spoonbill)*			
909.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
910.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
Triacanthidae					
911.		*Triacanthus sp.*			
Trichocercidae					
912.		*Trichocerca similis*			
Trichonotidae					
913.		*Trichonotus setiger*			
Trichotriidae					
914.		*Macrochaetus sp.*			
Triglidae					
915.		*Lepidotrigla sp.*			
Trigoniulidae					
916.		*Austrostrophus stictopygus*			
Triopsidae					
917.		*Triops australiensis australiensis*			
918.		*Triops nr australiensis (PSW) (?nsp BVT)*			Y
Tripterygiidae					
919.		*Enneapterygius gracilis*			
920.		*Enneapterygius larsonae*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
921.		*Enneapterygius philippinus*			
922.		*Enneapterygius sp.*			
923.		*Enneapterygius tutuilae*			
924.		*Helcogramma striata*			
925.		*Norfolkia brachylepis*			
Trombidiformes					
926.		*Acariformes sp.*			
Turbellaria					
927.		*Turbellaria sp.*			
Turnicidae					
928.	24851	*Turnix velox (Little Button-quail)*			
Tytonidae					
929.		*Tyto delicatula*			
Unionicolidae					
930.		*Encentridophorus sarasini*			
Urodacidae					
931.		*Urodacus armatus*			
Varanidae					
932.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
933.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
934.	25212	*Varanus eremius (Pygmy Desert Monitor)*			
935.	25216	*Varanus giganteus (Perentie)*			
936.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
937.	25524	*Varanus panoptes (Yellow-spotted Monitor)*			
938.	25223	*Varanus panoptes subsp. rubidus*			
939.	25224	*Varanus pilbarensis (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)*			
940.	25526	*Varanus tristis (Racehorse Monitor)*			
941.	25227	*Varanus tristis subsp. tristis (Racehorse Monitor)*			
Veliferidae					
942.		*Metavelifer multiradiatus*			
Veliidae					
943.		*Microvelia (Austromicrovelia) peramoena*			
944.		*Veliidae sp.*			
Vespertilionidae					
945.	24192	*Nyctophilus arnhemensis (Arnhem Land Long-eared Bat)*			
946.	42365	*Nyctophilus daedalus (Northwestern Long-eared Bat, Pallid Long-eared Bat)*			
947.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
948.		*Nyctophilus geoffroyi subsp. pallescens*			
949.	24205	*Vespadelus finlaysoni (Finlayson's Cave Bat)*			
Zodariidae					
950.		*Minasteron minusculum*			
Zosteropidae					
951.	24857	*Zosterops luteus (Yellow White-eye)*			

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

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

Australian Government
Department of the Environment and Energy

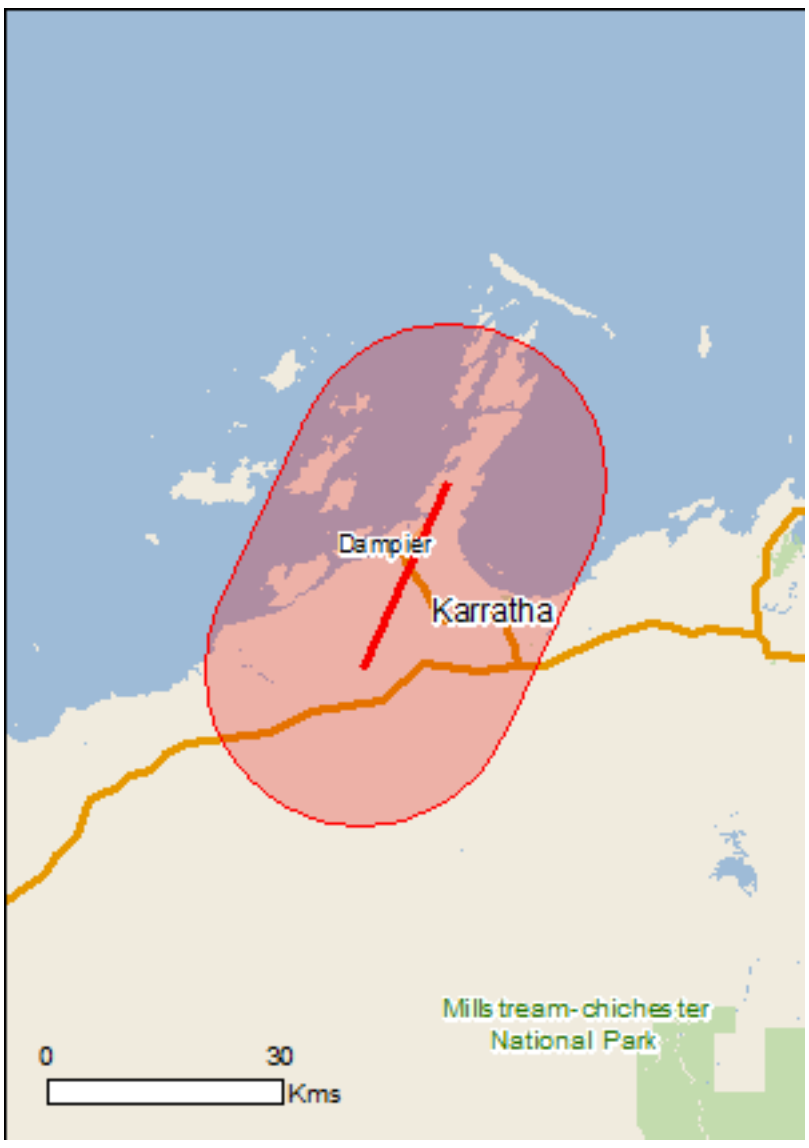
EPBC Act Protected Matters Report

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.

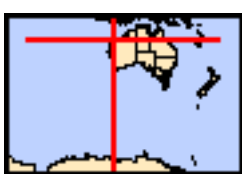
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 14/03/19 17:12:27



Coordinates

Buffer: 20.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	31
Listed Migratory Species:	60

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	101
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	6
Regional Forest Agreements:	None
Invasive Species:	17
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Indigenous		
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area

Name	Status	Type of Presence
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Ctenotus angusticeps Northwestern Coastal Ctenotus, Airlie Island Ctenotus [25937]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat may occur within area

Listed Migratory Species [Resource Information]

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

Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna pacifica Wedge-tailed Shearwater [84292]		Breeding known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Onychoprion anaethetus Bridled Tern [82845]		Breeding known to occur within area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area

Name	Threatened	Type of Presence
Manta alfredi 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
Manta birostris 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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Thalasseus bergii Crested Tern [83000]		Breeding known to occur

Name	Threatened	Type of Presence
		within area
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species 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
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Larus novaehollandiae Silver Gull [810]		Breeding known to occur

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

Name	Threatened	Type of Presence
[Sterna dougallii](#) Roseate Tern [817]		Breeding likely to occur within area
[Stiltia isabella](#) Australian Pratincole [818]		Species or species habitat known to occur within area
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area
[Tringa totanus](#) Common Redshank, Redshank [835]		Species or species habitat known to occur within area
[Xenus cinereus](#) Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
[Bulbonaricus brauni](#) Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area
[Campichthys tricarinatus](#) Three-keel Pipefish [66192]		Species or species habitat may occur within area
[Choeroichthys brachysoma](#) Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
[Choeroichthys suillus](#) Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
[Doryrhamphus janssi](#) Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area
[Doryrhamphus negrosensis](#) Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area
[Festucalex scalaris](#) Ladder Pipefish [66216]		Species or species habitat may occur within area
[Filicampus tigris](#) Tiger Pipefish [66217]		Species or species habitat may occur within area
[Halicampus brocki](#) Brock's Pipefish [66219]		Species or species habitat may occur within area
[Halicampus grayi](#) Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
[Halicampus nitidus](#) Glittering Pipefish [66224]		Species or species habitat may occur within area
[Halicampus spinirostris](#) Spiny-snout Pipefish [66225]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat known to occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area
Hydrophis czeblukovi Fine-spined Seasnake [59233]		Species or species habitat may occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowelli null [25926]		Species or species habitat may occur within area
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Species or species habitat known to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Murujuga	WA
Unnamed WA36907	WA
Unnamed WA36909	WA
Unnamed WA36910	WA
Unnamed WA36915	WA
Unnamed WA38287	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
Birds		
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
Mammals		
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 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
Plants		
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 within area
Prosopis spp. Mesquite, Algaroba [68407]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species

Name	Status	Type of Presence
		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

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

-20.799064 116.682674,-20.596088 116.78361,-20.596088 116.782924,-20.596088 116.782924

Acknowledgements

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

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

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

Please feel free to provide feedback via the Contact Us page.

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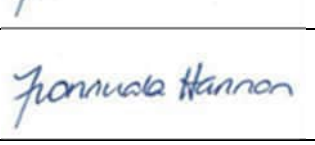
6137808-75968/https://projects.ghd.com/oc/WesternAustralia2/woodsideheppplant/Delivery/Documents/6137808_Rev-0_WoodsideHEPPFaunaSurvey.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev 0	GGaikhorst	Robert Browne Cooper	On file	Fionnuala Hannon		2/8/2019
Rev 0	GGaikhorst	Joel Collins	On file	Fionnuala Hannon		3/12/2019
Rev 1	GGaikhorst	Joel Collins	On file	Fionnuala Hannon		31/01/2020

www.ghd.com

GHD, 2022. Burrup Additional Areas – Reconnaissance/Basic Survey

Technical Memorandum

October 28, 2022

To	Daniel Kippin (Horizon Power)	**Contact No.**	(08) 6310 1810
Copy to	Maurice Ryan (Horizon Power) Shane Potter (Horizon Power) Hannah Lake (Horizon Power)	**Email**	Daniel.Kippin@horizonpower.com.au
From	Sarah Isbister Pali Jayasekara	**Project No.**	12582802
Project Name	Burrup Expansion Project – EP/EPBC Act Referral		
Subject	Rev-0 Burrup Additional Areas Reconnaissance/Basic Survey		

1. Introduction

1.1 Background

Horizon Power is a Western Australian (WA) Government Trading Enterprise (GTE) and the state's regional and remote energy provider. Horizon Power operates under the *Electricity Corporations Act 2005* and is governed by a Board of Directors accountable to the Minister for Energy.

Horizon Power is proposing to expand the North West Interconnected System (NWIS) electricity network, by constructing an approximately 7 kilometer (km) long 132 kilovolt (kV) overhead transmission line between the Dampier substation and the Burrup Strategic Industrial Area (SIA) (the Proposal). The Burrup SIA is not currently connected to the NWIS.

The Proposal will provide common user transmission infrastructure, owned and operated by Horizon Power. As a result, the Proposal will also provide opportunities for tenants on the Burrup to access the higher efficiency generation portfolio, including proposed renewable energy resources available on the NWIS. The Proposal is considered the first step to providing enabling infrastructure to support the transition towards State and Federal Government emission reduction targets.

The Proposal has also been designed to limit impacts to Flora and Vegetation, and Terrestrial Fauna. Final design of the Proposal will limit (where possible) direct and indirect impacts to identified environmental values.

Horizon Power has previously engaged GHD Pty Ltd (GHD) to complete biological surveys for the Project, these included:

– (GHD 2020) – Horizon Power Burrup Expansion Project Flora and Vegetation Survey
– (GHD 2022) – Maitland to Karratha Terminal Flora and Fauna Survey.

These existing surveys cover 88% of the Project Development Envelope (DE). Through progressive Project design iterations an optimised transmission line route was developed, reducing the overall environmental impact of the Project. The purpose of this reconnaissance/basic survey was to assess native vegetation and flora present in previously unsurveyed areas comprising 12% of the DE boundary (the additional survey areas). The additional survey includes areas adjacent to existing vehicle access tracks and Burrup Road.

This survey is intended to inform and facilitate referral of the Project under the *Environmental Protection Act 1986* (EP Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.2 Purpose

Horizon Power commissioned GHD to undertake a reconnaissance survey of the additional survey areas. The survey is required to verify that the dominant vegetation units, vegetation condition and associated fauna habitats of the additional survey areas are consistent with the results of the adjacent recent surveys (GHD 2020; 2022).

The purpose of the survey is to support referral of the Project under the EP Act and the EPBC Act.

This memorandum should be read in conjunction with the existing surveys identified in Section 1.1.

1.3 Scope of works

GHD undertook the following scope of works:

– Review of existing surveys within the vicinity of the Project
– A site visit by a qualified botanist to verify the flora and vegetation and fauna values (which were verified by a Senior ecologist), including vegetation condition and undertaking opportunistic searches for significant flora and fauna
– A site visit by a qualified botanist to confirm the presence and extent of significant vegetation
– The preparation of a memorandum summarising the findings of the survey.

The areas being assessed for the Project include the three areas shown on Figure 1, Appendix A. The survey area covered 13.67 ha.

1.4 Limitations and assumptions

This memorandum has been prepared by GHD for Horizon Power and may only be used and relied on by Horizon Power for the purpose agreed between GHD and Horizon Power as set out in section 1.2 of this memorandum. GHD otherwise disclaims responsibility to any person other than CBH arising in connection with this memorandum. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this memorandum were limited to those specifically detailed in the memorandum and Horizon Power request correspondence. The opinions, conclusions and any recommendations in this memorandum are based on conditions encountered, locations surveyed and information reviewed at the date of preparation of the memorandum. GHD has no responsibility or obligation to update this memorandum to account for additional sampling locations, events or changes occurring subsequent to the date the survey was completed and memorandum prepared.

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

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

The opinions, conclusions and any recommendations in this memorandum are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this memorandum if the site conditions change.

This memorandum has assessed the flora and fauna within the defined additional survey areas. Should the survey area change or be refined, further assessment may be required.

2. Methodology

2.1 Field survey

GHD senior botanist Pali Jayasekara (flora licence no. FB62000208-2) completed the field survey over two days on 3-4 August 2022. Pali Jayasekara has extensive experience in undertaking biological surveys across Western Australia, and in particular the Pilbara region. Additionally, Pali Jayasekara was involved in the project team on the original surveys, and a similar methodology and approach has been maintained for the current reconnaissance/basic survey.

The field survey was undertaken to verify the dominant vegetation units, vegetation condition and associated fauna habitats of the additional survey areas are consistent with the results of adjacent recent surveys (GHD 2020; 2022). Searches for significant flora and fauna species were also undertaken within the additional survey areas.

The survey method involved placing waypoints within each of the three distinct additional survey areas. The area around the waypoints was then traversed on foot, with opportunistic recordings and photographic reference points within identified vegetation units taken. The vegetation within the additional survey areas was mapped using the data collected from the waypoints, and in some areas extrapolated based on similar surrounding vegetation.

Navigation across the site and the recording of data in the field was achieved using hand-held GPS tools, including a Samsung tablet and Garmin GPS. This ensured accurate representation of features observed on the ground into spatial mapping.

The survey methodology employed by GHD was undertaken with reference to the EPA *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) and the EPA T*echnical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020).

Vegetation condition

The vegetation condition was assessed and mapped in accordance with the Eremaean and Northern Botanical Provinces of Western Australia scale devised by Keighery (1994) and adapted by EPA (2016). The scale recognises the intactness of vegetation and consists of six rating levels.

2.2 Survey limitations

The EPA (2016, 2020) states that flora and fauna survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 1.

Table 1 Survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Nil	Adequate information is available for the survey area, this includes broadscale (1:1,000,000) mapping by Beard (1975) and digitised by Shepherd et al. (2002) and database searches (DBCA and ALA).
Scope (what life forms were sampled etc.)	Nil	Vascular flora and terrestrial vertebrate fauna were surveyed. Non-vascular flora, invertebrate and aquatic fauna were not surveyed.
Proportion of flora and fauna collected and identified (based on sampling, timing and intensity)	Minor	The Reconnaissance/Basic Survey was completed on 3-4 August 2022, outside of the primary survey season (March to June) for the Eremaean region. Based on the EPA (2016) guidance (refer to Table 3 of the guidance), supplementary surveys can be completed in the dry season after winter rainfall. The primary objective of this survey was to expand vegetation mapping, vegetation condition mapping and fauna habitat mapping in previously unsurveyed areas of the DE. The conditions experienced were not expected to limit the survey findings for these objectives.
Flora determination	Nil	Flora determination was undertaken by the survey botanist in the field. Species that could not be identified in the field were collected and

Aspect	Constraint	Comment
		identified at the WA Herbarium by the experienced GHD taxonomic botanist Pali Jayasekara. The taxonomy and conservation status of the WA flora is dynamic. This report was prepared with reliance on taxonomy and conservation status current at the time report development, but it should be noted this may change in response to ongoing research and review of International Union for Conservation Nature criteria.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Nil	Waypoints were placed within each of the additional survey areas. The area around the waypoints was then traversed on foot, with opportunistic recordings and photographic reference points within identified vegetation units taken. The vegetation within the additional survey areas was mapped using the data collected from the waypoints, and in some areas extrapolated based on similar surrounding vegetation. The survey areas were adequately surveyed during the field survey in line with the scope. Additional opportunistic sampling was undertaken throughout all survey areas to develop a comprehensive species inventory.
Mapping reliability	Nil	The vegetation and fauna habitats were mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Beard 1975) and field data. Data was recorded in the field using hand-held GPS tools. Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units and GPS enabled tablets used for this survey are accurate to within 2-5 metres on average.
Timing/weather/ season/cycle	Moderate	The field survey was conducted during the dry-season (3-4 August 2022). In the four months prior to the survey (November-February), the Karratha Aero (station No. 004083) recorded a total of 249.2 mm of rainfall (Bureau of Meteorology 2022). Large rainfall was experienced in late May 2022. The Reconnaissance/Basic Survey was completed on 3-4 August 2022, outside of the primary survey season (March to June) for the Eremaean region. Based on the EPA (2016) guidance (refer to Table 3 of the guidance), supplementary surveys can be completed in the dry season after winter rainfall. The primary objective of this survey was to expand vegetation mapping, vegetation condition mapping and fauna habitat mapping in previously unsurveyed areas of the DE. The conditions experienced were not expected to limit the survey findings for these objectives.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	Some of the survey areas have been subjected to historical disturbance events (e.g. clearing, weeds); however, these disturbances did not affect the survey.
Intensity (in retrospect, was the intensity adequate)	Nil	The vascular flora of the survey area was sampled in accordance with EPA (2016) and terrestrial fauna sampled in accordance with EPA (2020). The survey area was sufficiently covered by the field botanist during the survey.
Resources	Nil	Adequate resources were employed during the field survey. One botanist undertook the survey over two days (total survey time being two person days).
Access restrictions	Nil	The survey area was accessed on foot and vehicle. There were no access restrictions.
Experience levels	Nil	The botanist who executed the survey is a practitioner suitably qualified and experienced in his field. The field team lead, Pali Jayasekara (flora licence no. FB62000208-2), is a senior botanist with more than 17 years' experience leading and conducting vegetation and flora surveys (detailed, basic and targeted) in the Eremaean province.

3. Results

3.1 Vegetation types and condition

The vegetation identified within the additional survey areas is consistent with the vegetation types and conditions previously identified by GHD (2020; 2022).

Four of the vegetation types identified by GHD (2020) extend into the additional survey areas. These vegetation types are detailed in Table 2 and shown on Figure 2, Appendix A. The additional survey areas are located along the existing Burrup Road. Vegetated areas cover 11.27 ha of the additional survey areas, with the remaining 2.40 ha being cleared.

Table 2 Vegetation types recorded within the Burrup additional survey area

GHD (2020) vegetation type code	Vegetation type description	Total extent (ha)
VT02	*Corymbia hamersleyiana* open woodland over *Acacia bivenosa, Grevillea pyramidalis* subsp. *pyramidalis* and *Hakea lorea* subsp. *lorea* scattered shrubs over *Triodia epactia* open hummock grassland with **Cenchrus ciliaris* scattered grasss over over *Hybanthus aurantiacus*, *Cleome viscosa* and *Trichodesma zeylanicum* var. *zeylanicum* open forbland on brown sandy loam on elevated rocky plain.	0.10
VT04	*Tecticornia ?indica* subsp. *leiostachya* and *Tecticornia ?pterygosperma* low chenopod shrubland with scattered *Avicennia marina* on saline flats with tidal inundation.	0.32
VT05	**Cenchrus ciliaris* open grassland over *Trianthema turgidifolia* and *Neobassia astrocarpa* open chenopod shrubland on disturbed edges of saline flats.	0.41
VT06	*Grevillea pyramidalis* subsp. *pyramidalis* and **Vachellia farnesiana* scattered shrubs over *Ipomoea costata, Indigofera monophylla* and *Scaevola spinescens* open shrubland over *Triodia epactia* open hummock grassland over *Cleome viscosa, Rhynchosia minima* and *Hybanthus aurantiacus* scattered herbs on red/brown sandy loam on rocky slopes with frequent basalt outcropping. Associated species include *Abutilon lepidum, Gomphrena cunninghamii, Streptoglossa decurrens* and *Indigofera monophylla*	10.44
Total native vegetation		**11.27**
Cleared areas		2.40
Total		**13.67**

Vegetation condition within the additional survey areas ranges from Very Good to Good as detailed in Table 3 and shown on Figure 3, Appendix A. The majority of vegetation is in Good condition. The vegetation structure across the additional survey areas is identified as being in Good to Very Good condition, due to the minimal signs of disturbance and presence of little to no weeds.

Table 3 Vegetation condition within the Burrup additional survey area

Vegetation condition	Total extent (ha)
Excellent	0
Very Good	2.50
Good	8.77
Degraded	0
Completely Degraded	0
Cleared	2.40
Total	**13.67**

3.2 Significant vegetation

No vegetation types recorded within the additional survey areas were considered to represent Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs). In addition, the vegetation was not considered to represent riparian vegetation. The vegetation located in the tidal inlet between Hearson Cover and King Bay (VT04 and VT05) may have some significance due to limited distribution and impacts from threatening processes such as clearing and development on the Burrup Peninsula.

3.3 Significant flora

No significant flora taxa were recorded within the additional survey areas during the survey, however, one Priority species, *Terminalia supranitifolia* (Priority 3) was recorded 50 m to the west.

Based on the GHD (2020) survey, an additional two significant flora taxa are considered likely to occur within the additional survey areas, due to observations of these species within the immediate vicinity and the presence of suitable habitat:

– *Vigna triodiophila* (Priority 3)
– *Rhynchosia bungarensis* (Priority 4).

Rhynchosia bungarensis

Rhynchosia bungarensis (Plate 1) is listed as Priority 4 by the DBCA and is a compact, prostrate shrub, to 0.5 m high with yellow flowers. It is known to occur on pebbly, shingly coarse sand amongst boulders and banks of flow line in the mouth of a gully wall (WA Herbarium 1998–).

According to *FloraBase* there are 84 records of this species, with a large number of records concentrated on the Burrup Peninsula (WA Herbarium 1998-).

Rhynchosia bungarensis was not recorded within the additional survey areas, however, is considered likely to occur due to observations of these species within the immediate vicinity and the presence of suitable habitat (GHD 2020).

Plate 1 ***Rhynchosia bungarensis***

Terminalia supranitifolia

Terminalia supranitifolia (Plate 2) is a spreading, tangled shrub or tree, 1.5-3 m high with green-yellow flowers appearing in May, July or September. It is listed as Priority 3 by the DBCA. Habitat includes sandy areas among basalt rocks (WA Herbarium 1998–). There are 54 records of *T. supranitifolia* reported on *FloraBase* across WA (WA Herbarium 1998-).

This species was not recorded within the additional survey areas, however, one individual was recorded approximately 11.5 m to the west. Some records were isolated plants, whilst most occurred in close proximity along the undulating rockpiles.

Plate 2 *Terminalia supranitifolia*

Vigna triodiophila

Vigna triodiophila (Plate 3) is a fine-stemmed prostrate or scrambling vine with small, ovate to elliptic leaves and known to flower and fruit between May and September. It is listed as Priority 3. It is endemic to basalt rockpile habitats in shallow, red-brown or brown, clayey sand or loam. There are 16 records of *Vigna triodiophila* reported on *FloraBase* across WA (WA Herbarium 1998-).

Vigna triodiophila was not recorded within the additional survey areas, however, is considered likely to occur due to observations of these species within the immediate vicinity and the presence of suitable habitat (GHD 2020).

Plate 3 *Vigna triodiophila*

3.4 Fauna habitats

Three of the fauna habitats identified by GHD (2020 & 2022) extend into the additional survey areas (Table 4, Figure 4 of Appendix A). These habitat types closely align with the vegetation types described in Section 3.1. Some of the habitats within the additional survey areas have been impacted by past disturbances including land clearing for infrastructure and linear corridors (i.e. roads). Fauna habitats cover 11.27 ha of the additional survey areas, with the remaining 2.40 ha being cleared. Cleared areas are not considered to be of value to fauna species.

Table 4 Fauna habitats recorded within the Maitland additional survey area

Fauna habitat	Total extent (ha)
Rocky Hills with exposed boulder piles This habitat type is mostly dominated by a *Triodia* hummock grassland, however, does support tussock grasses and scattered *Acacia* shrubs. However, the boulder rock piles are typically devoid of ground cover. The crests of hills contain extensive rock outcropping or boulder piles and support scattered *Ficus platypoda* and *Brachychiton sp*. The *Ficus, Brachychiton* and *Acacia* provided litter and scattered woody debris, however the boulder piles provide extensive cover via crevices, small caves and cavities. No evidence of recent fire was recorded in the survey area. Evidence of old fire scars were present and determined based on the age of the vegetation.	10.44
Hummock Grassland on Rocky Plain This habitat type is often associated with slight undulation where there is association to low hills or rocky substrates. This habitat type is mostly dominated by a *Triodia* hummock grassland with heavy loam stony soils. The vegetation is a mosaic of shrubs however is dominated by *Acacia*, *Hakea* and *Grevillia* over hummock grasses. Litter, woody debris and branches were present in areas where shrubs were present. No logs or hollows were observed due to the vegetation structure present. No recent fire scaring was present in the survey area but historical evidence was obvious via the age of vegetation present.	0.10
Mudflat with tidal inundation, Mangroves and supportive scattered Samphire Vegetation within this habitat type is minimal except where the mudflats fringe mangroves and samphire. Vegetation was generally sparse and scattered, however, in areas clustered to form low samphire shrublands. Areas were inundated with water during high tides and retracts to several small pools and a minor drainage line during the low period.	0.73
Total fauna habitat	**11.27**
Cleared areas	2.40
Total	**13.67**

3.5 Significant fauna

No significant fauna species were recorded within the additional survey areas. However, based on the GHD (2020) survey, six significant fauna species are known to occur adjacent to the additional survey areas (Table 5). Based on previous surveys conducted within the area (GHD 2020), an additional fourteen significant fauna species are considered likely to occur. These species are discussed further in Table 6.

Table 5 Significant fauna species known to occur adjacent to the Burrup additional survey area (GHD 2020)

Fauna species	EPBC Act	BC Act/DBCA status
North-western Free-tail Bat (*Mormopterus (Ozimops) cobourgianus*)	-	Priority 1
Western Pebble-mound Mouse (*Pseudomys chapmani*)	-	Priority 4
Whimbrel (*Numenius phaeopus*)	Migratory	Protected under International Agreement
Gull-billed Tern (*Gelochelidon nilotica*)	Migratory	Protected under International Agreement
Caspian Tern (*Hydroprogne caspia*)	Migratory	Protected under International Agreement
Crested Tern (*Thalasseus bergii*)	Migratory	Protected under International Agreement

Table 6 Significant fauna species considered likely to occur within the Burrup additional survey area

Fauna species	EPBC Act	BC Act/DBCA status	Likelihood of occurrence
Northern Quoll (*Dasyurus hallucatus*)	Endangered	Endangered	**Likely** The species was not recorded during the field survey, however, the species is known from the Burrup Peninsula in low numbers. Suitable habitat within the DE is present, including the Rocky Hills with exposed boulder piles habitat type.
Pilbara Olive Python (*Liasis olivaceus barroni*)	Vulnerable	Vulnerable	**Likely** The Rocky Hills with exposed boulder piles would be regarded as important habitat for the species. The remainder of the habitat in the Burrup additional survey area is supportive only and the plain habitat off the Burrup is not habitat for Pilbara Olive Python.
Peregrine Falcon (*Falco peregrinus*)	-	Other Specially Protected Fauna	**Likely** The Rocky Hills with exposed boulder piles, Hummock Grassland of Rocky Plain and the Mudflat with tidal inundation, Mangroves and supportive scattered Samphire provides suitable habitat. The Burrup additional survey area is likely part of the species broader home range.
Northern Short-tailed Mouse (*Leggadina lakedownensis*)	-	Priority 4	**Likely** The Hummock Grassland of Rocky Plain habitat type provides suitable habitat for the species. The species has been recorded within the vicinity of the Burrup additional surveyarea, and is likely present.
Lined Soil-crevice Skink (*Notoscincus butleri*)	-	Priority 4	**Likely** The Hummock Grassland of Rocky Plain habitat type provides suitable habitat for the species. The species has been recorded within the vicinity of the Burrup additional surveyarea, and is likely present.
Bridled Tern (*Onychoprion anaethetus*)	Migratory	Protected under International Agreement	**Likely** Most records for this species are on or around the offshore islands, however the species has been recorded breeding on the mainland adjacent to the Maitland Industrial Estate (AECOM 2003) (exact location unknown). A small amount of habitat is present for this species particularly within Mudflat with tidal inundation, Mangroves and supportive scattered Samphire habitat type. However, use would be irregular and opportunistic.
Wood Sandpiper (*Tringa glareola*)	Migratory	Protected under International Agreement	**Likely** The Mudflat with tidal inundation, Mangroves and supportive scattered Samphire habitat type is suitable for the species.
Common Greenshank (*Tringa nebularia*)	Migratory	Protected under International Agreement	**Likely** The Mudflat with tidal inundation, Mangroves and supportive scattered Samphire habitat type is suitable for the species.
Oriental Pratincole (*Glareola maldivarum*)	Migratory	Protected under International Agreement	**Likely** The Mudflat with tidal inundation, Mangroves and supportive scattered Samphire habitat type is suitable for the species.
Oriental Plover (*Charadrius veredus*)	Migratory	Protected under International Agreement	**Likely** The Mudflat with tidal inundation, Mangroves and supportive scattered Samphire habitat type is suitable for the species.
Common Sandpiper (*Actitis hypoleucos*)	Migratory	Protected under International Agreement	**Likely** The Mudflat with tidal inundation, Mangroves and supportive scattered Samphire habitat type is suitable for the species.

Fauna species	EPBC Act	BC Act/DBCA status	Likelihood of occurrence
Osprey (*Pandion haliaetus*)	Migratory	Migratory	**Likely** The Burrup additional survey area is situated near the coastline. This species is likely to fly over, and opportunistically utilise portions of the habitat.
Water-rat (*Hydromys chrysogaster*)	-	Priority 4	**Likely** Known to occur on the Burrup Peninsula however not on the mainland. The habitat within the Burrup additional survey area is considered marginally suitable.
Lined soil-crevice skink (Dampier) (*Notoscincus butleri*)	-	Priority 4	**Likely** The rocky habitats are considered suitable habitat however there are no major creeks or rivers within the Burrup additional survey area.

4. Conclusion

The vegetation identified within the additional survey areas is consistent with the vegetation types and conditions previously identified by GHD (2020; 2022).

Overall, there are four vegetation types within the additional survey areas, with vegetation condition ranging from Very Good to Good. The majority of vegetation is in Good condition. Vegetation within the additional survey areas has been previously impacted by the presence of existing roads, access tracks and infrastructure.

No vegetation within the additional survey areas represents TECs and/or PECs. In addition, no vegetation is considered to be riparian vegetation. Two vegetation types are located within the tidal inlet between Hearson Cover and King Bay. This vegetation may have some significance due to limited distribution and impacts from threatening processes such as clearing and development on the Burrup Peninsula.

No Priority flora species were recorded within the additional survey areas, however, one species, *Terminalia supranitifolia,* was recorded 50 m to the west. In addition, two Priority flora species, *Vigna triodiophila* and *Rhynchosia bungarensis* are considered likely to occur within the additional survey areas.

No significant fauna species were recorded, however six significant fauna species are known to occur adjacent the additional survey areas (GHD 2020) and an additional fourteen species are considered likely to occur. Within the additional survey areas, three fauna habitat types were recorded.

Regards

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5. References

Environmental Protection Authority (EPA) (2016). Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2020, Technical Guide – Terrestrial Fauna Surveys, EPA, Perth, WA.

GHD Pty Ltd (2020). Horizon Power Burrup Expansion Project Flora and Vegetation Survey. Unpublished report prepared for Horizon Power.

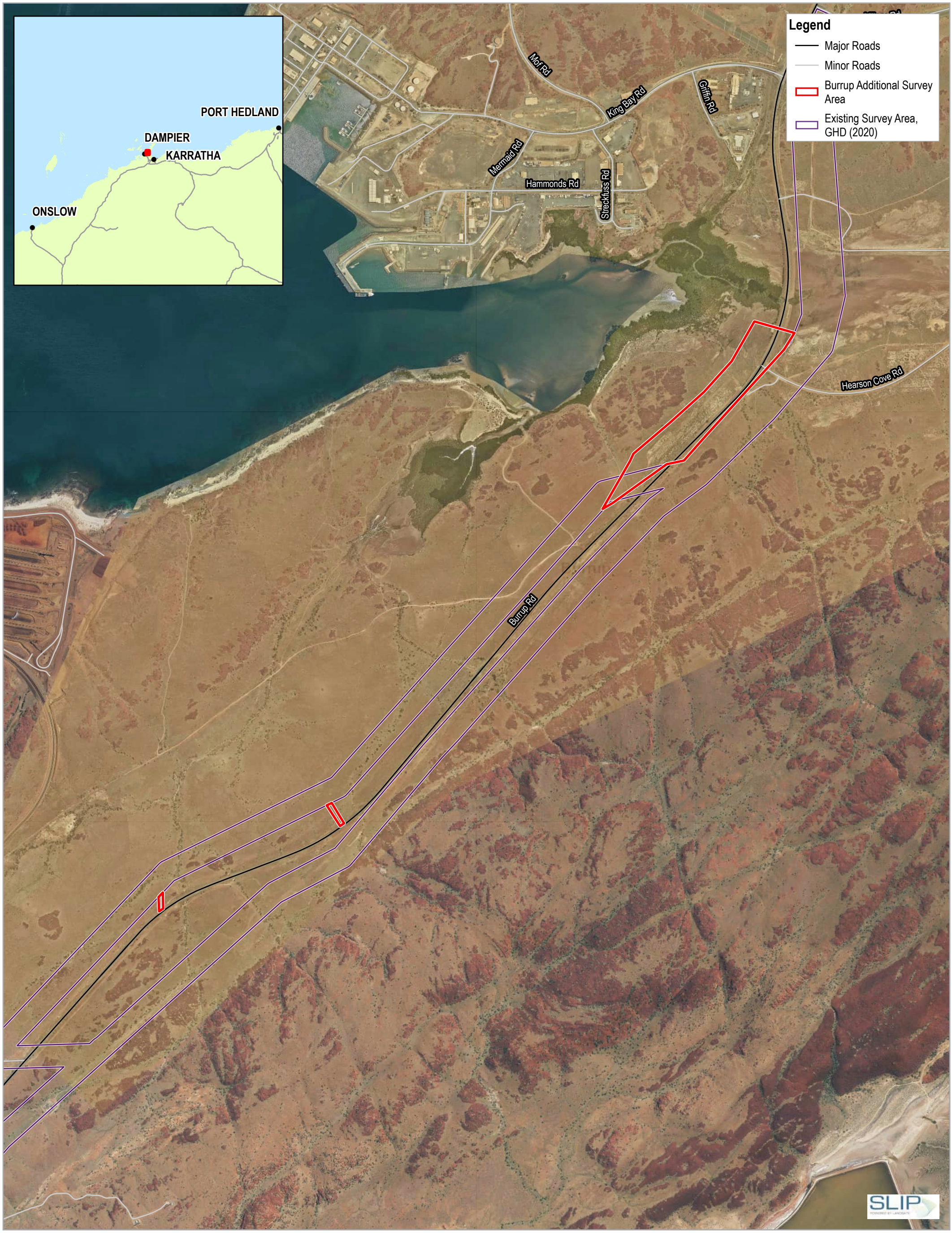
GHD Pty Ltd (2022). Maitland to Karratha Terminal Flora and Fauna Survey. Unpublished report prepared for Horizon Power.

Western Australian (WA) Herbarium 1998–, FloraBase–the Western Australian Flora, Biodiversity, Conservation and Attractions, retrieved August 2021, from http://florabase.dpaw.wa.gov.au/.

Appendices

Appendix A

Figures



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GHD

Horizon Power
Burrup Expansion Program

Location of Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 1

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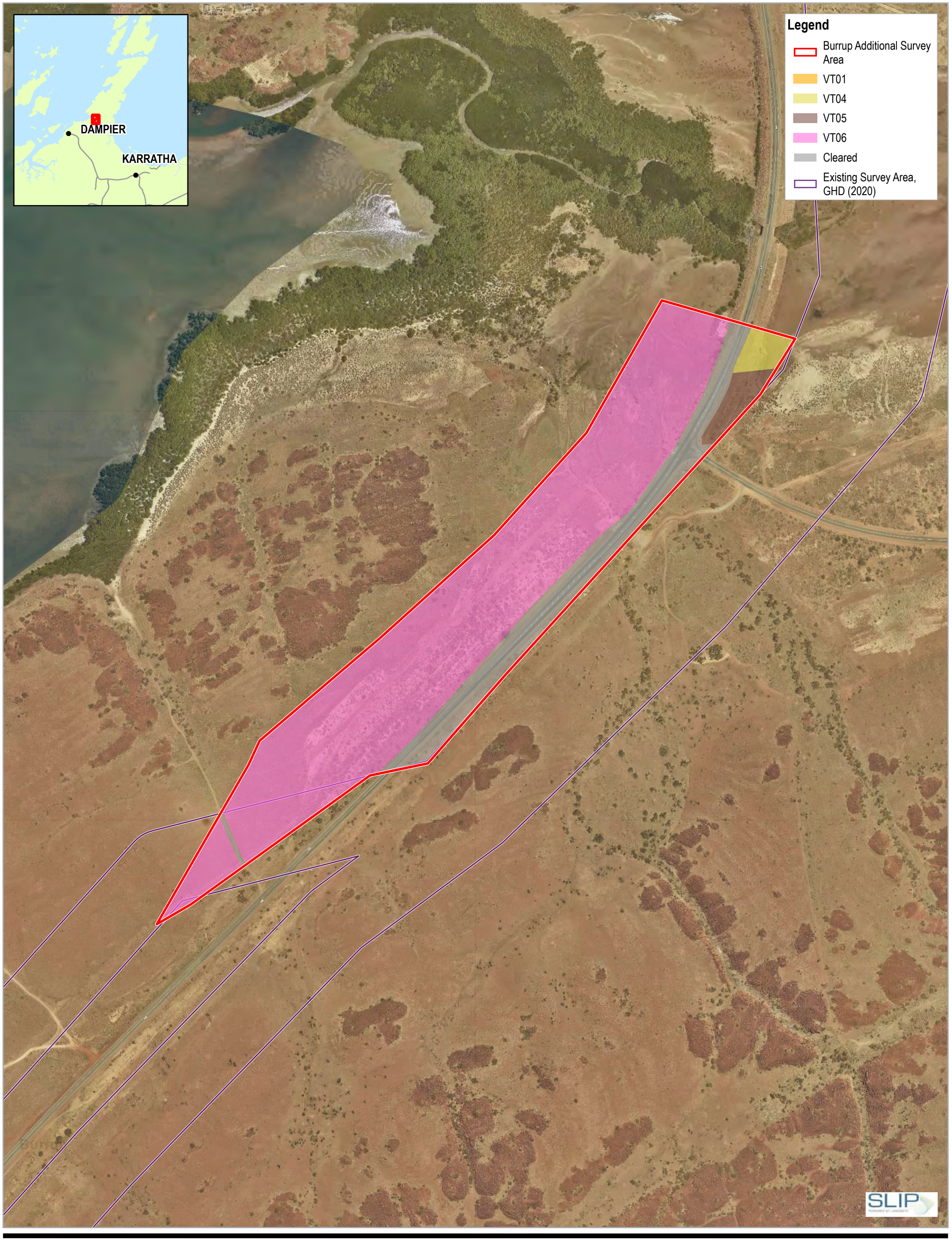

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Horizon Power
Burrup Expansion Program

Vegetation Types
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 2

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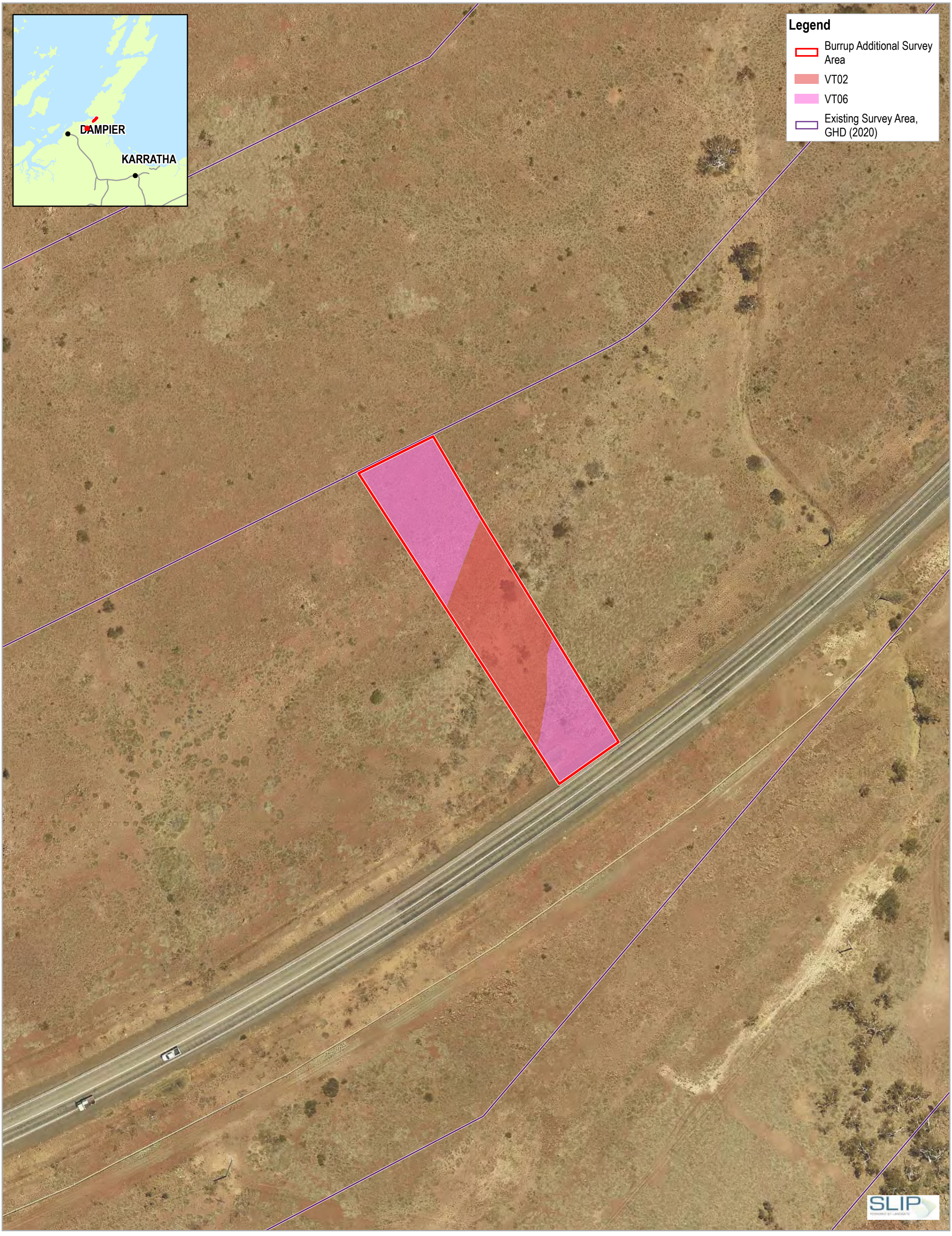

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Horizon Power
Burrup Expansion Program

Vegetation Types
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 2

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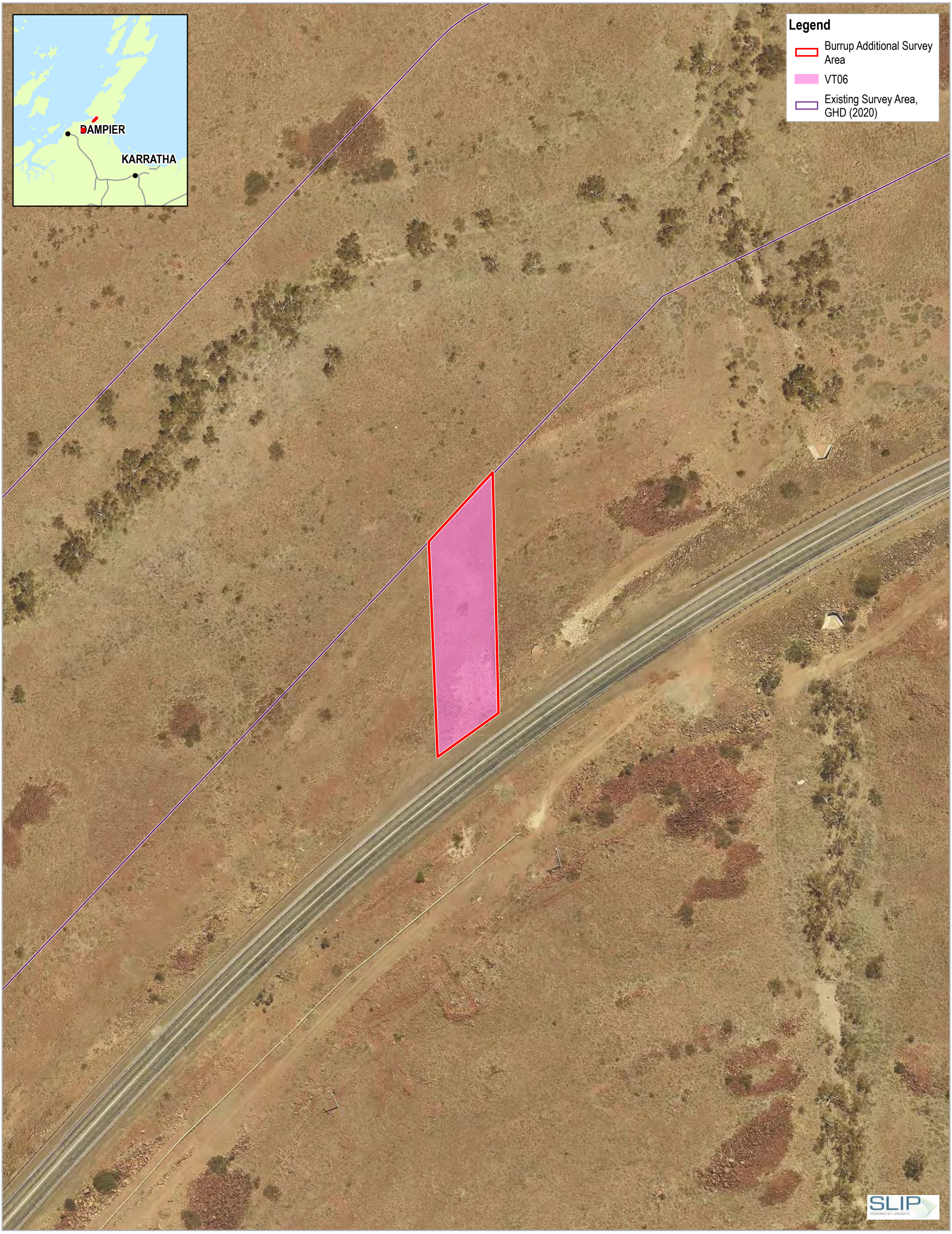

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Horizon Power
Burrup Expansion Program

Vegetation Types
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 2

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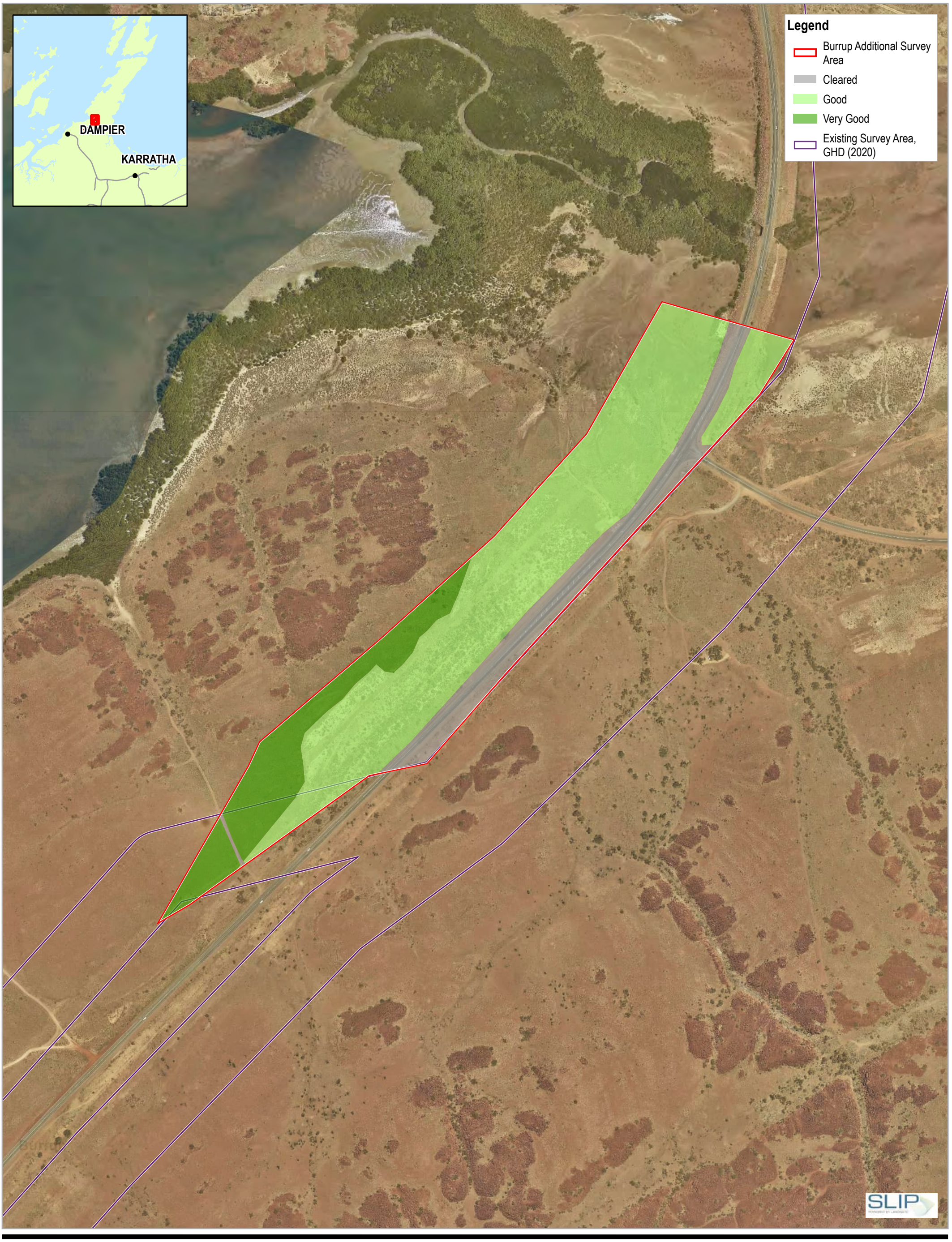

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Grid: GDA 1994 MGA Zone 50

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Horizon Power
Burrup Expansion Program

Vegetation Condition
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 3

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Horizon Power
Burrup Expansion Program

Vegetation Condition
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 3

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Horizon Power
Burrup Expansion Program

Vegetation Condition
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 3

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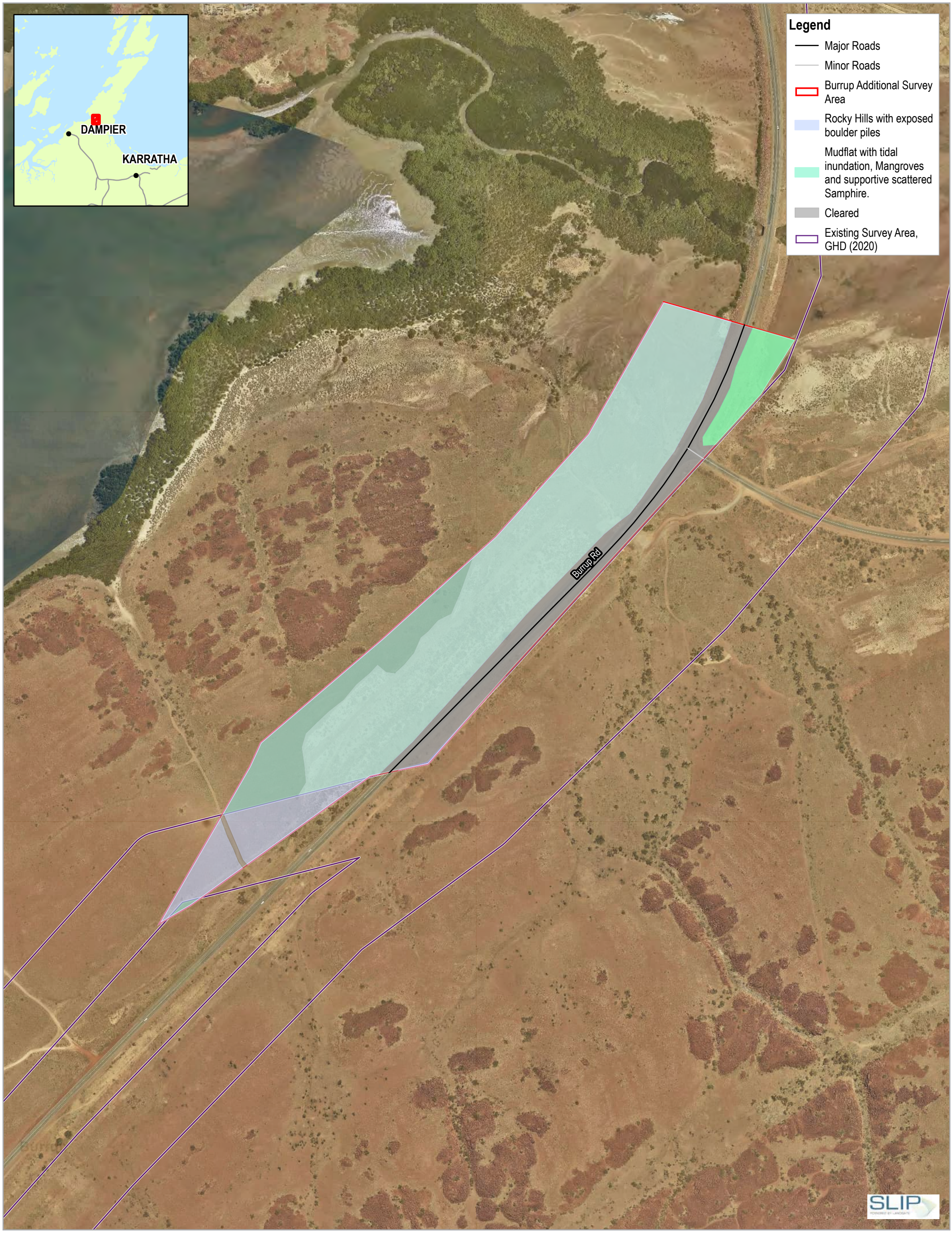

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Horizon Power
Burrup Expansion Program

Fauna Habitat
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 4

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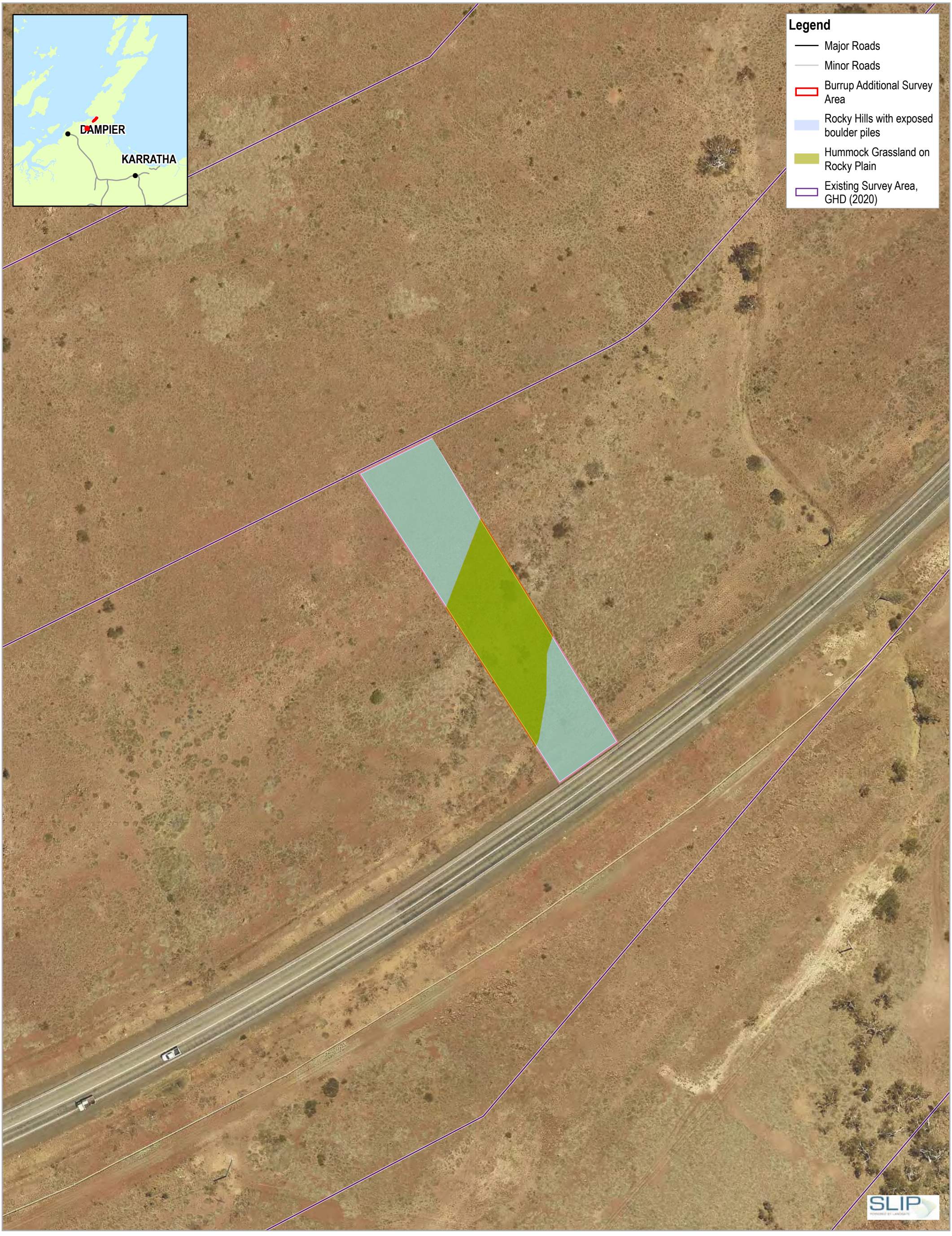

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Horizon Power
Burrup Expansion Program

Fauna Habitat
Burrup Additional Survey Areas

Project No. **12582802**
Revision No. **0**
Date **19/10/2022**

FIGURE 4

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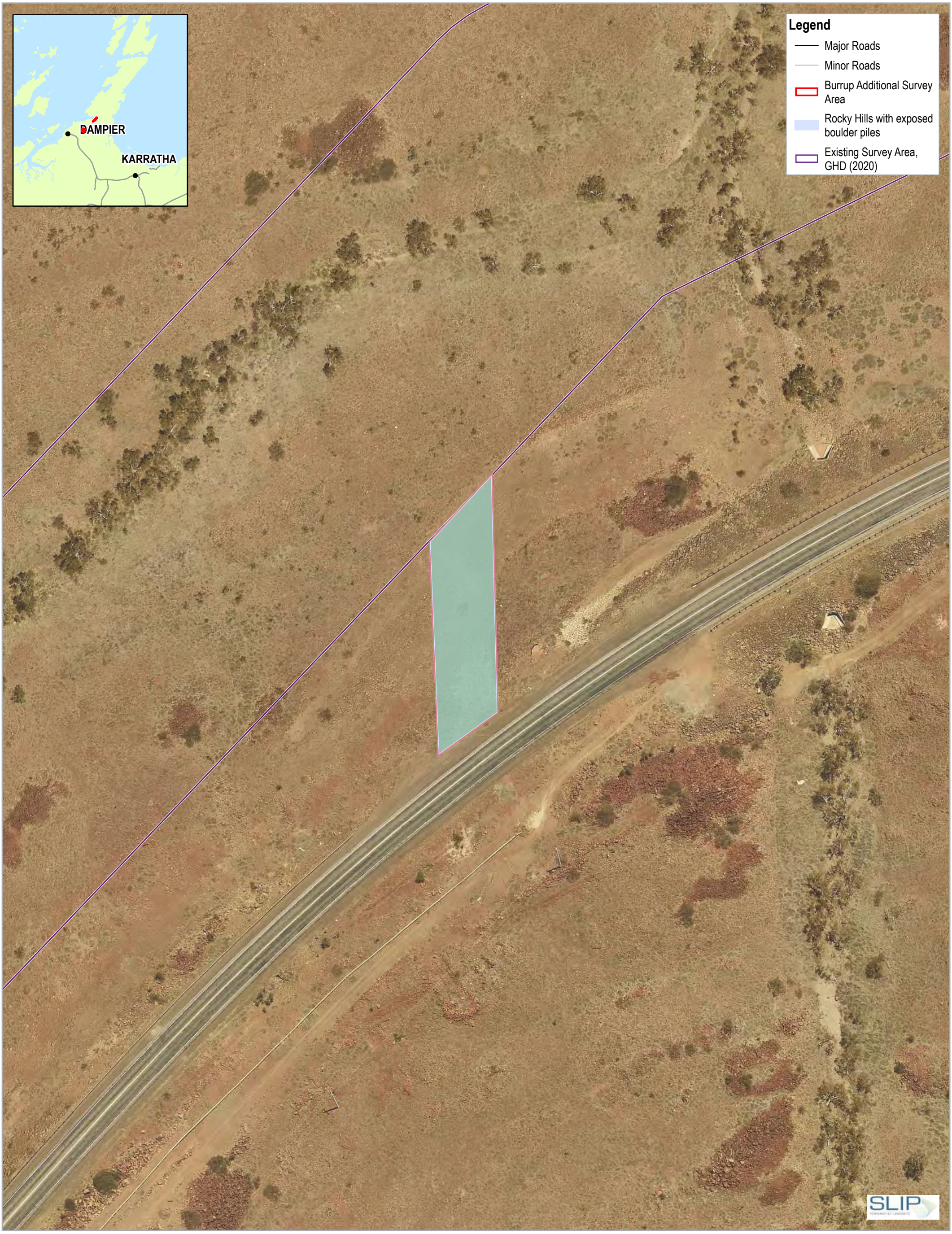

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GHD

Horizon Power
Burrup Expansion Program

Fauna Habitat
Burrup Additional Survey Areas

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FIGURE 4

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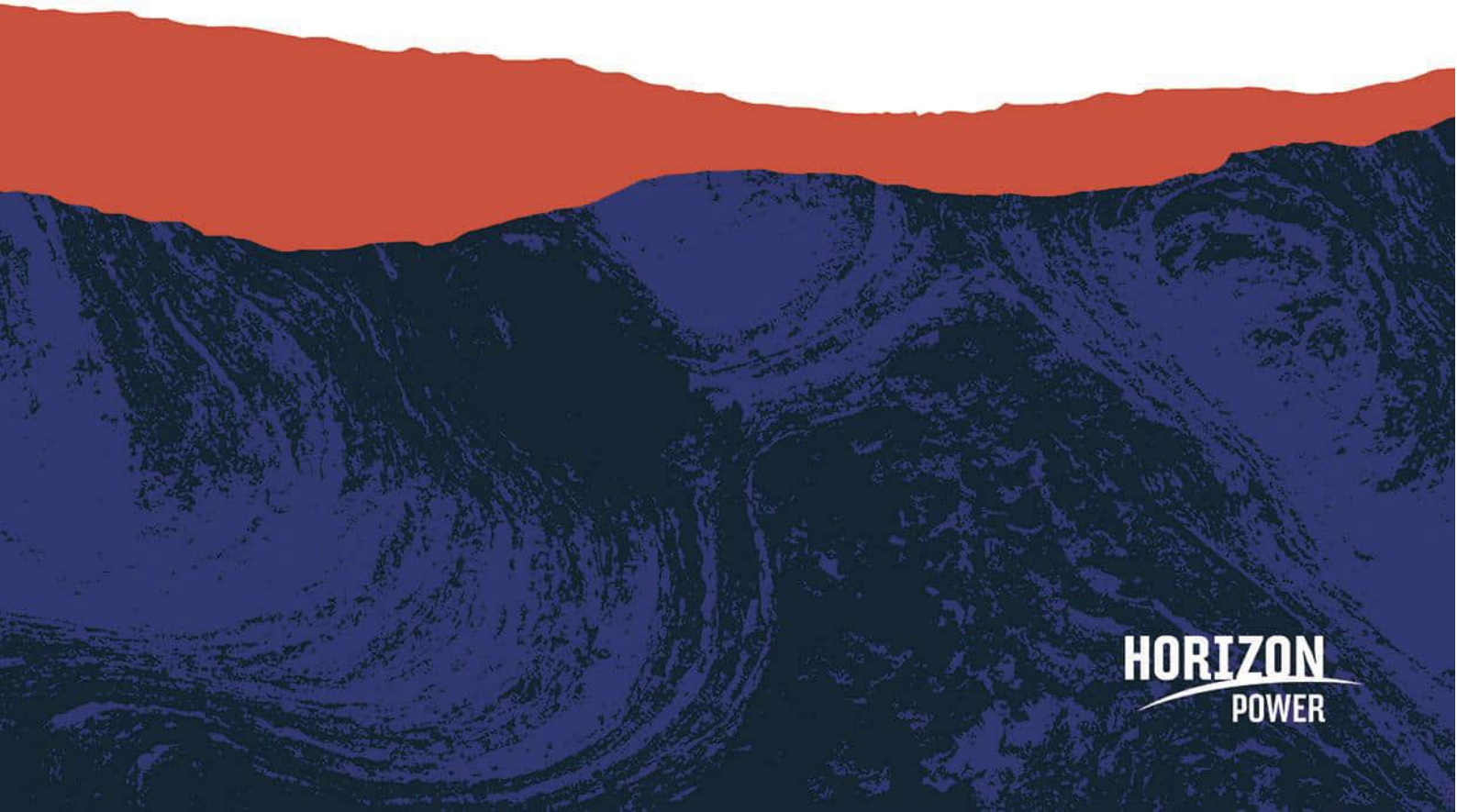
Appendix B: Environmental Management Plan

Burrup Common User Transmission Infrastructure – Environmental Management Plan

Supporting Document

05 February 2024



Cover Page

EPBC Number	2022/09407
Project Name	Burrup Common User Transmission Infrastructure
Proponent	Horizon Power
ACN or ABN	ABN 57 955 011 697
The Proposed Action	Horizon Power is proposing to construct the Burrup Common User Transmission Infrastructure project ('the Proposed Action').
Location of the Action	The Proposed Action is located in Murujuga, Western Australia, approximately 1.5 km east of the Dampier township.

Document Version Control

Revision	Date	Description	Author	Checked	Reviewed	Approved	Signature
0	15/12/2023	Final for Issue	HR	DF	LB	DK	
1	05/02/2024	Updates following DCCEEW comments	DF	LB	LB	RL	

Declaration of accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed:

Full name (please print):

Daniel Kippin

Organisation (please print):

Horizon Power

Date: 06 / 02 / 2024

Table of Contents

Glossary

Acronym	Description
ASS	Acid Sulfate Soils
BC Act	Biodiversity Conservation Act 2016
BMIEA	Burrup and Maitland Industrial Estates Agreement
CoA	Commonwealth of Australia
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DE	Development Envelope
DPAW	Department of Parks and Wildlife
DWER	Department of Water and Environmental Regulation
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986
EPBC	Environment Protection and Biodiversity Conservation
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
IRP	Impact Reconciliation Plan
IRR	Impact Reconciliation Report
GTE	Government Trading Enterprise
km	Kilometre
kV	Kilovolt
m	Metre
MAG	Murujuga Aboriginal Corporation
NWIS	North-West Interconnected System
SIA	Strategic Industrial Area
VT	Vegetation Type
WA	Western Australia
WONS	Weeds of National Significance

1 Introduction

1.1 Background

Regional Power Corporation, trading as (T/A) Horizon Power, is a Western Australian (WA) Government Trading Enterprise (GTE) and the state's regional and remote energy provider. Horizon Power ('the Proponent') operates under the Electricity Corporations Act 2005 and is governed by a Board of Directors accountable to the Minister for Energy.

Horizon Power is proposing to construct the Burrup Common User Transmission Infrastructure project ('the Proposed Action') which involves the expansion of the North-West Interconnected System (NWIS) via construction of an approximately 7 km long 132 kilovolt (kV) overhead transmission line, between the Dampier substation and the Burrup Strategic Industrial Area (SIA) within the Pilbara region (see **Figure 1-1 Proposed Action Location**). This transmission line will be owned and operated by Horizon Power and provide common user transmission infrastructure (electricity transmission equipment infrastructure such as overhead lines and substations to provide grid connection for an area) to tenants on the Burrup Peninsula.

As a result, the Proposed Action will also provide opportunities for tenants on the Burrup Peninsula to access the higher efficiency generation portfolio, including proposed renewable energy resources available on the NWIS. Land constraints on the Burrup Peninsula limit the feasibility of large-scale renewables, therefore the Proposed Action represents an important pathway for decarbonisation on the peninsula. The Proposed Action is considered the first step to providing enabling infrastructure to the Burrup SIA to support the transition towards State and Federal Government emission reduction targets.

Key elements of the project are detailed in **Chapter 3**.

1.2 Assessment Process

Horizon Power referred the Proposed Action to the WA Environmental Protection Authority (EPA) under Part IV (Section 38) of the *Environmental Protection Act* 1986 (EP Act) in November 2022, as the Proposed Action is a significant Proposal that has the potential to impact on one or more of the EPA's key environmental factors. The assessment work concluded that all factors can be managed through avoidance and mitigation measures to meet the EPA's objectives. The EPA responded on 14 August 2023, confirming that the Proposed Action does not require further assessment under Part IV of the EP Act.

Horizon Power also referred the Proposed Action to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) in November 2022, due to potential significant impacts to a National Heritage Place and listed threatened species. DCCEEW responded on 03 April 2023, confirming that the Proposed Action is a controlled action and that the Proposed Action will require further assessment and approval under the EPBC Act before it can proceed.

1.3 Document Purpose

The purpose of this Environmental Management Plan (EMP) is to support the Preliminary Documentation in response to DCCEEW's request for further information. Specifically, this document describes how the Proposed Action might impact the environment, setting out commitments in how impacts will be avoided, minimised and managed so that the Proposed Action is environmentally acceptable.

This document was prepared in accordance with the Commonwealth of Australia's '*Environmental Management Plan Guidelines*' (CoA, 2014).

1.4 Potential impacts and primary mitigation strategy

A summary of the key potential impacts and mitigation strategies for the Proposed Action are identified in **Table 1-1**.

Table 1-1. Potential impacts and mitigation strategy

Potential Impacts	Mitigation Strategy
Vegetation clearance and loss of habitat in excess of the approved amount. Refer to **Chapter 9** for an assessment of this risk.	The extent of the approved clearing will be clearly communicated in documentation. Avoidance areas will be demarcated prior to ground disturbing activities.
Habitat fragmentation through clearing activities and disturbance associated with construction of the transmission line. Refer to **Chapter 9** for an assessment of this risk.	Infrastructure and temporary clearing will be preferentially positioned within the existing cleared areas to reduce the amount of fauna habitat clearing required.
Increased risk of feral animals and weeds as a result of the creation of new pathways for pest animals and potential attraction of animals to waste. Refer to **Chapter 9** for an assessment of this risk.	Biosecurity measures in place and induction for all personnel will include no feeding of native and/or feral animals and no pets allowed on site.
Direct mortality of fauna due to interaction with the construction activities. Construction activities with an associated risk of direct mortality of fauna individuals are the clearing of vegetation and soil excavation. Injury or mortality of fauna individuals due to vehicle strike during construction of the Proposed Action or during routine inspection and maintenance activities during operations. Refer to **Chapter 9** for an assessment of this risk.	Construction personnel induction regarding threatened fauna and direct and indirect impacts (e.g., risk of vehicle strike, interaction with construction activities, waste management and introduction of feral animals). Clearing will be undertaken progressively in one direction, to allow fauna dispersal.
Increased dust causing degradation to habitat. Vegetation damage from increased dust deposition during construction can potentially result in degradation of fauna habitat leading to loss or fragmentation or foraging areas. Refer to **Chapter 9** for an assessment of this risk.	Standard construction dust control and mitigation measures will be implemented during construction. This may include the use of a water trucks.
Increased light and noise pollution from temporary construction lighting or permanent operational lighting. Fauna may be attracted to areas where prey such as insects are attracted to the light emissions. Light emissions may also cause other behaviour responses such as changing the timing of fauna individuals activities or avoidance of the area. Noise is an environmental stressor and can potentially affect fauna in a number of ways including avoidance of noisy habitats or reduction in foraging success due to masking (i.e. interference with the perception of sounds of interest). Refer to **Chapter 9** for an assessment of this risk.	Construction works will generally be undertaken during daylight hours from 06:00 to 18:00. During winter months, limited use of temporary lighting will be in place where required. Standard construction noise management measures will be implemented.
Increased risk of fire. Accidental fire, during construction or operation of the Proposed Action, can result in injury or mortality of fauna individuals. Additionally, fire can temporarily reduce the amount of fauna habitat available, increase habitat fragmentation and open up areas to weed invasion. Refer to **Chapter 9** for an assessment of this risk.	Where increased risk of fire is identified, fire-resistant barriers like screens will be employed to confine sparks generated by welders and other hot work activities. Fire extinguishers will be strategically positioned in locations with a higher risk of fire.
Habitat contamination through mobilisation of Acid Sulfate Soils. Acid Sulfate Soils have the potential to cause serious negative impacts to waterways and estuaries. Refer to **Chapter 9** for an assessment of this risk.	Ensure no mobilisation of Acid Sulfate Soils during construction.
Risk of collision with the transmission line once operational. It is possible that fauna individuals (such as birds) may collide with the transmission line. Collision with the transmission line has the potential to result in injury or mortality of fauna individuals. Refer to **Chapter 9** for an assessment of this risk.	Prevent impacts on bird species due to collision with transmission lines using vertical line marking (aerial marker balls).
Damage or degradation to the National Heritage values of the Dampier Archipelago through construction and operation of the Proposed Action. Refer to **Chapter 9** for an assessment of this risk.	Avoidance areas around known Aboriginal sites will be demarcated prior to ground disturbing activities. The Proposed Action has been designed to be consistent with existing infrastructure and disturbance corridors as far as possible.

2 Conditions of Approval Reference Table

As the Proposed Action is currently progressing through assessment under the EPBC Act, an assessment decision notice with conditions of approval is yet to be issued.

3 Project Description

3.1 Proposed Action Location

The Proposed Action is located in Murujuga (referred to as the Burrup Peninsula here after), Western Australia, approximately 1.5 km east of the Dampier township. The location for the Proposed Action is provided in **Figure 1-1**.

The Development Envelope (DE) has a total extent of 85.54 ha, which represents the boundary within which all development will be contained. The detailed design for the Proposed Action has not yet been finalised, however no more than 14.40 ha of clearing (including up to 11.50 ha of permanent clearing and 2.90 ha of temporary disturbance) is proposed to facilitate construction of the transmission line, new Burrup substation, access tracks, associated electrical infrastructure and the extension of the existing Dampier substation.

The DE also contains an avoidance area footprint covering 5.37 ha (referred to as 'avoidance areas' also displayed on **Figure 1-1**) in order to avoid impacts to significant environmental and heritage values identified within the area. It should be noted that the northern quarter of the DE is constrained by Aboriginal cultural heritage values and environmental values (namely the Priority 1 'Burrup Peninsula rock pile communities' Priority Ecological Community (PEC), which is a State listed PEC). In the unlikely event that construction of the Proposed Action is constrained by Aboriginal cultural heritage (i.e. an unexpected find during initial ground disturbing works) within this area, minor clearing (up to 0.05 ha) within a section of the 'avoidance areas' may be required.

3.2 Activity Overview and Timelines

The Proposed Action includes construction of an approximately 7 km long 132 kV overhead transmission line between the Dampier substation and the Burrup SIA, which is not currently connected via transmission infrastructure to the NWIS. This new transmission line will connect into a new substation on the Burrup, and the Dampier substation will be expanded at the southern extent of the DE.

Construction of the Proposed Action will include the following permanent and temporary elements, all within the DE:

- Permanent elements:
  - approximately 7 km long 132 kV overhead transmission line;
  - approximately 40 poles and cleared pole access pads (40 m x 20 m), and associated pole stays along the transmission line route;
  - cleared, unsealed access track along the transmission line route required for maintenance during operations;
  - Burrup substation (inclusive of 33 kV and 132 kV switchgear, large scale battery, transformers, fencing and ancillary equipment);
  - Dampier substation expansion (inclusive of 132 kV switchgear, fencing and ancillary equipment); and
  - associated electrical infrastructure.
- Temporary elements:
  - additional areas required to construct the transmission line;
  - additional access tracks (4 m wide) as required for the purpose of stringing the transmission line; and
  - 50 m x 40 m winch sites as required.

Construction of the Proposed Action is planned to commence in Q3 2024 for a period of approximately 18 months.

Upon completion of construction, the Proposed Action will be incorporated into the NWIS operations. The completed transmission line will be subject to normal routine, recurrent and periodic maintenance during operation.

3.3 Existing Environment

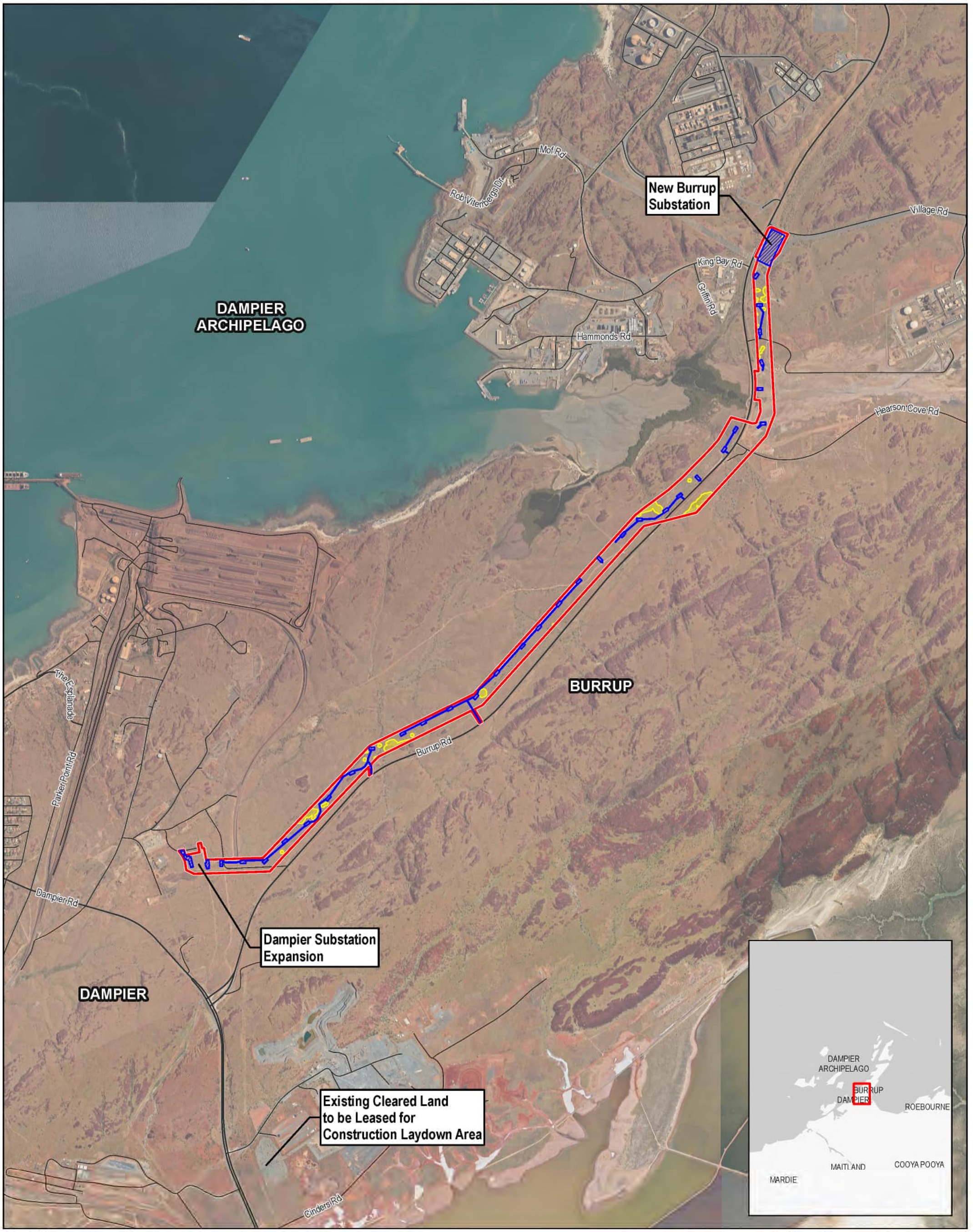
The existing environment is summarised in **Table 3-1**.

Table 3-1. Existing Environment

Environmental value	Assessment
Vegetation associations, types and condition	The Proposed Action is located within Pre-European Vegetation Association 117 (Abydos Plain – Roebourne). More than 96.36% of this vegetation association remains in the State, with 14.79% in DBCA managed lands. In the Interim Biogeographic Regionalisation for Australia (IBRA) Roebourne subregion, 92.03% of this vegetation association remains, with 37.53% in land managed by DBCA. The 85.54 ha DE comprises 78.98 ha of native vegetation representing thirteen vegetation types (VTs) (VLA 2019, GHD 2019, 2020a & 2022). The remaining land within the DE (6.63 ha) is cleared, with these areas containing roads (and associated infrastructure), tracks and areas cleared for pastoralism (GHD 2019, 2020a & 2022). The vegetation within the DE is dominated by hummock grasslands of *Triodia epactia* and *T. wiseana* with scattered to open shrublands dominated by *Acacia, Hakea, Grevillea* and *Senna* species on rocky sandy loam plains and low undulating rocky rises and slopes. The surveys (GHD 2019, 2020a & 2022) also recorded vegetation condition across the DE. The DE comprises 78.97 ha native vegetation, of which 0.62 ha (0.7%) is in Excellent condition, 53.01 ha (53%) is in Very Good condition, 21.66 ha (25.1%) is in Good condition, 3.36 ha (3.9%) is in Poor condition, and the remaining 6.97 ha (8.1%) is in Degraded or worse condition. Completely Degraded or Poor condition vegetation is associated with previously cleared and disturbed areas adjacent to roads and access tracks GHD (2020a). Areas of Excellent condition vegetation were found in areas which were completely undisturbed (i.e. no access tracks, existing power lines or exploration). Fire history did not have a significant impact on the structure and condition of vegetation within the DE, as the majority of the vegetation was long unburnt (6 years or longer) or of moderate age (3 to 5 years) (GHD 2020a). Significant ecological communities (Threatened and Priority Ecological Communities) are addressed in the 'Ecological communities' row of this table (**Table 3-1**). Other significant vegetation recorded in the DE is associated with the drainage lines that intersect the DE. Minor drainage lines which dissect the plain and rocky slopes are lined by *Corymbia hamersleyana* and *Eucalyptus victrix* (GHD 2020a). Within the DE, VT03 and EvAbTa are considered to represent riparian vegetation. There is 6.59 ha of riparian vegetation within the DE. In addition, three vegetation types (Tspp, VT04 and VT05) growing in association with the tidal inlet between Hearson Cove and King Bay may have some significance due to their limited distribution and impacts from threatening processes such as clearing and development. There is 8.99 ha of intertidal adapted vegetation within the DE.
Fauna habitat	Five fauna habitat types (not including cleared and disturbed areas) have been mapped across 78.24 ha of the 85.54 ha DE. These fauna habitats align with the vegetation types identified above, and are associated with the rocky hills, grasslands, drainage lines and mudflats that are present within the DE. Disturbed areas cover 0.78 ha of the DE and are considered to be of minimal value to fauna. The remaining 6.52 ha within the DE is cleared and is not considered to provide habitat for fauna species. Fauna habitats within the DE have moderate to high habitat value in the context of the surrounding environment. Overall, the habitats contain a diversity of fauna, and all provide habitat for significant fauna species (mostly Migratory birds) that are present or likely to be present in the local area. There is only a small amount of habitat within the survey area for the Migratory bird species to utilise. There is habitat (tidal mudflats) available in King Bay and within Hearson Cove of much larger real estate for wading species to utilise in the region.
Significant fauna	Updated desktop searches have been undertaken for this assessment, which identified the presence/potential presence of 78 significance fauna within a 20 km radius of the DE. This total does not include those species that are exclusively marine as no marine habitat is present within the DE. The desktop searches recorded: - 22 species listed as Threatened under the EPBC Act and/or the Biodiversity Conservation Act 2016 (BC Act); - 49 species listed as Migratory under the EPBC Act and/or the BC Act; - One species listed as Specially protected species (Other specially protected fauna) under the BC Act; and - Six species listed as Priority by DBCA.

Environmental value	Assessment
	No Threatened or Priority fauna species were recorded within the DE during the GHD (2019 & 2022) surveys. The GHD (2020b) survey recorded evidence of three significant fauna species within the DE: - Western Pebble-mound Mouse (*Pseudomys chapmani*) – DBCA: Priority 1; - North-western Free-tail Bat (*Mormopterus* (*Ozimops*) *cobourgianus*) – DBCA: Priority 1; and - Whimbrel (*Numenius phaeopus*) – EPBC Act: Migratory and BC Act: Protected under International Agreement. Evidence of the Western Pebble-mound Mouse was limited to an old, inactive mound that was present on the rocky hills in the DE (GHD 2020b). Start (1996) surveys recorded very limited presence of active mounds on the Burrup Peninsula and the species is considered locally extinct. A likelihood of occurrence assessment has been undertaken, which concluded that 26 significant fauna species have the potential to occur within the DE. This likelihood of occurrence assessment was based on species biology, habitat requirements, the quality and availability of suitable habitat, and local occurrence. The remaining species identified during the desktop assessment were considered unlikely or highly unlikely to occur within the DE. Suitable habitat for these species is discussed in detail in the Preliminary Documentation, including the extent of suitable habitat in the DE. No more than 14.4 ha of clearing is proposed.
Significant ecological linkage	The fauna habitats within the DE are part of a contiguous, largely intact area of remnant vegetation present on the Burrup Peninsula. Land within the Burrup SIA has been subject to clearing, but this clearing is restricted to designated industrial sites and connecting service corridors, leaving much of the remnant vegetation intact in the local area. The ephemeral floodplain/ drainage lines within the DE drain towards the coast and the plain areas provide corridors linking the coast to the surrounding hills. Overall, the habitats within the DE are largely contiguous through the local area.
Ecological communities	A search of the Protected Matters Search Tool and other databases did not identify any Threatened Ecological Communities (TECs) listed under the EPBC Act or BC Act as occurring within the DE, which were confirmed by the surveys (GHD 2020a, 2022). However, the State listed Priority Ecological Community (PEC) 'Burrup Peninsula rock pile communities (Priority 1)' was recorded within the DE as Vegetation Type 01 (VT01), GpTeBaTs and TsIcTe, with a total mapped extent of 2.1 ha within the DE. This PEC is included in the 'avoidance areas' that will be avoided during clearing and construction works (identified on **Figure 1-1**). The Burrup Peninsula rock pile communities PEC is characterised by pockets of vegetation in rock piles and outcrops. The rock pile communities vary from open tussock grass assemblages with small herbs and grasses on otherwise bare calcrete, through to hummock sub-shrub communities, to dense shrub/tree communities. The PEC is restricted to Burrup Peninsula and some Dampier Archipelago islands. The 'Burrup Peninsula rock piles community' PEC comprises a mixture of Pilbara and Kimberley fire sensitive species (GHD 2020a). The Burrup Peninsula rock piles communities is listed as Priority 1 by the DBCA. Key threats to this PEC include clearing, altered fire regimes, emissions, weed invasion (DBCA, 2022). The vegetation type identified as representing the PEC community (Burrup Peninsula rock pile communities) will be avoided where possible as it supports Priority flora that are well represented in the area.
Significant flora	Updated desktop searches have been undertaken which identified the presence/potential presence of six significant flora taxa within a 20 km radius of the wider survey areas. This total comprised four Priority 3 taxa, one Priority 2 taxa and one Priority 1 taxon. No threatened flora species listed under the EPBC Act or BC Act were recorded within the DE. Three DBCA-listed Priority species were recorded within the DE during the biological survey (GHD, 2020a): - 34 individuals of *Terminalia supranitifolia* (P3); - Six individuals of *Rhynchosia bungarensis* (P4); and - Five individuals of *Vigna triodiophila* (P3). A likelihood of occurrence assessment (adapted from the VLA [2019] and GHD [2019 & 2020a] surveys) concluded that no additional significant flora taxa were likely or have the potential to occur within the DE. The likelihood of occurrence assessment took into account previous records, habitat requirements, seasonal variation, efficacy of the survey, intensity of the survey, flowering times and the cryptic nature of the species. The density of records are high on the Burrup Peninsula for the three Priority flora recorded during the survey as they have adapted to the habitat-type that the rock piles provide.
Wetlands and/or waterways	There are no Ramsar wetlands, Nationally Important Wetlands (DBCA,2018; DBCA, 2017) or wetlands or waterways gazetted under the *Waterways Conservation Act 1976* (DWER, 2018) within the DE or surrounding area. The Burrup Peninsula has limited surface water. No permanent water bodies are located within the DE, however numerous intermittent drainage lines are present. These drainage lines are ephemeral, with highly

Environmental value	Assessment
	variable flows characterised by short periods of high-water flow associated with high intensity weather events such as tropical cyclones. The Proposed Action is located in close proximity to the tidal inlet between Hearson Cove and King Bay. This area is characterised by saline flats that experience tidal inundation.
Water resources	The DE does not overlap public drinking water source areas. The closest area is the Roebourne Water Reserve, approximately 44 km to the south east of the Proposed Action. The Proposed Action is located within the North-Pilbara Granite-Greenstone Terrane Hydrogeological province and the Pilbara-Fractured aquifer. According to the Water Information Reporting (DWER, 2023a), there is only one registered groundwater bore (Site Ref. 70970061) within the Burrup Peninsula, however, there is no data publicly available.
Conservation Reserves	The Murujuga National Park is located within close proximity, approximately 100 m north and 180 m east of the DE (DBCAa,2023), which is owned by the Murujuga Aboriginal Corporation (MAC) and jointly managed by MAC and DBCA.
Environmentally Sensitive Areas	The DE does not overlap any Environmentally Sensitive Areas.
Land and soil quality	The Proposed Action is located within the Karratha Coast Zone of the Pilbara Province. The Pilbara Province lies over the Pilbara Craton, which consists of two different tectonic components. The two broad geologic sequences are the ancient Archaean granite-greenstone terrain and the younger volcano-sedimentary sequence of the Hamersley Basin (Tille, 2006). The Karratha Coast Zone is characterised by coastal mudflats with sandy coastal plains and some hills on marine deposits and some sedimentary and volcanic rocks of the Pilbara Craton. Soils include tidal soils with some calcareous loamy earths, salt lake soils and red/brown noncracking clays (Tille, 2006). The DE is located within the North-Pilbara Granite-Greenstone Terrane Hydrogeological province and the Pilbara – Fractured aquifer. The DE is also primarily located in areas of the Granitic land system with soils of diverse permeability and not susceptible to erosion. A small portion of the DE is within the Littoral Land System which is susceptible to wind erosion if plant cover is lost by fire or other disturbances (DPIRD, 2004). The Acid Sulfate Soil (ASS) Risk Map of Pilbara Coastline (DWER-053) shows that there is 9.9 ha of 'Moderate to low risk' and 11.6 ha 'High to Moderate Risk', within the DE. This indicates that there is a high risk of ASS occurring within 3 m of the natural soil surface. There are no known sites of contamination present within the DE (DWER, 2023b). The closest confirmed site is 1.5 km east of the northern extent of the DE. It is considered unlikely that contaminating activities have occurred within the DE given the remote location.
Environmental heritage	The Burrup Peninsula and its surrounds supports extensive Aboriginal cultural heritage sites, with the Dampier Archipelago (including Burrup Peninsula) listed on the National Heritage List. The Dampier Archipelago was listed as a National Heritage Place on 3 July 2007, and has been nominated for World Heritage listing, placed on Australia's World Heritage Tentative List in February 2020. The Dampier Archipelago is recognised for its unique natural and Aboriginal cultural heritage. The Archipelago formed 6 – 8,000 years ago comprises a system of islands, rocky reefs, coral reefs, shoals, channels and straits covering approximately 400 km. The underlying rocks are amongst the oldest on earth, formed in the Archaean period more than 2,400 million years ago (DCCEEW, 2022). Home to Indigenous Australians for tens of thousands of years, the Dampier Archipelago contains a diverse array of Aboriginal cultural heritage including dreaming sites, ceremonial sites, rock engravings and other archaeological sites. It is of exceptional heritage interest for its diverse array of rock engravings (potentially numbering in the millions) and stone arrangements, and the importance of these within the Aboriginal traditions of Ngarda-Ngarli people. The rock art of the Dampier Archipelago illustrates the evolution of societies, cultures and the environment over time (DCCEEW, 2022). The marine environment of the Dampier Archipelago is characterised by intertidal mud and sand flats associated with fringing mangals in bays and lagoons, a large tidal range, highly turbid water and the occurrence of fringing coral reefs around some of the islands (DCCEEW, 2022). The DE overlaps a portion of the National Heritage Dampier Archipelago, which includes the Burrup Peninsula and consists of 42 islands, islets, and rocky formations. Murujuga Aboriginal Corporation (MAC) was formed in 2006 as part of the Burrup and Maitland Industrial Estates Agreement (BMIEA) with the WA Government. MAC holds freehold title to the Murujuga National Park. There are 31 known places of Aboriginal cultural heritage significance which intersect the DE (CBG 2020, Scarp 2022). The Proposed Action avoids all known heritage sites identified by the Heritage surveys within the DE.



Legend

- Major Road
- Minor Road
- Development Envelope
- Indicative Impact Area
- Avoidance Areas

0 125 250 500
Metres

N

Scale: 1:25,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; Landgate - Roads, WA Now accessed August 2023
Map Produced: 12/11/2023.
Project Number: IS472900
Rev C

Jacobs
JACOBS, Mia Yellagonga Tower 2, Level 5, 5 Spring Street, (GPO Box H615) | Perth WA 6000 | Australia
Tel: +61 8 9469 4400 Fax: +61 8 9469 4488

Figure 1-1 Proposed Action - Development envelope and Maximum Clearing Extent

4 Objectives

The objective of this EMP is to ensure that appropriate management measures will be in place during construction, operation and decommissioning of the Proposed Action to reduce potential impacts on the matters protected by the EPBC Act. This EMP adopts management objectives based on consideration of:

- survey and study findings;
- key assumptions and uncertainties;
- risks to environmental values including MNES;
- scientific information on the site and region;
- intensity, duration, magnitude and footprint of impact;
- changes in the environment;
- external issues to the Proposed Action; and
- timeframe for mitigation.

The management-based components provided within this EMP seek to align with established industry practises to avoid and minimise potential environmental and heritage impacts. The following environmental objectives have been identified:

- Prevent unauthorised clearing of EPBC Act listed threatened fauna habitat.
- Prevent unauthorised clearing of EPBC Act listed Migratory Shorebird and Seabird habitat.
- Avoid injury or mortality to EPBC Act listed threatened and/or migratory species during construction of the Proposed Action.
- Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.
- Avoid indirect impacts to threatened and/or migratory fauna species due to an increase in noise, light and dust emissions.
- Minimise disturbance, injury or mortality to EPBC listed threatened and/or migratory species during operation and reduce risk of collision impacts as far as possible.
- Prevent indirect impacts on fauna habitats due Acid Sulfate Soils and alteration of fire regime.
- No introduction or spread of declared weeds, Weeds of National Significance (WONS) or serious environmental weed species into surrounding native vegetation adjacent to the DE during and attributable to construction.

The environmental outcomes are detailed in **Section 10.1**.

5 Environmental Management Roles and Responsibilities

5.1 Roles and Responsibilities

Horizon Power has a standard project management methodology that will be applied to this Proposed Action and is applied to projects of this nature. A project board is established as a governing committee, which comprises executive and senior managers from Horizon Power.

The role of the Project Board is to support the Project Sponsor with the management of the Proposed Action by providing a decision-making and governance framework that is logical, robust and repeatable.

The Project team roles and responsibilities are provided in **Table 5-1**.

Table 5-1. Project Board Roles and Responsibilities

Role	Responsibility
Project Sponsor (Executive member)	- Oversee the overall delivery of the Proposed Action to ensure good governance is achieved and Proposed Action objectives are met.
Project Director (Senior Manager)	- Establish the project team to deliver the Proposed Action. - Ensure plans, systems and processes are established, implemented and maintained by the project team to ensure good governance is achieved on the project. - Ensure the Proposed Action objectives are visible to the project team and delivery of the objectives are met by the project. - Monitor performance of the Proposed Action.
Horizon Power Sustainability Manager	- Manage specific onsite compliance obligations for the Proposed Action. - Ensure works cease where required if an environmental incident occurs and provide approval for works to recommence on site when appropriate to do so.
Project Manager	- Establish project plans to manage the Proposed Action. - Manage project team activities to deliver the project. - Implement systems and processes to ensure good governance is achieved on the project. - Manage scope, cost, time, quality, resourcing and compliance obligations for the Proposed Action. - Report performance of the Proposed Action.
Site Representative	- Oversee activities onsite to deliver the Proposed Action. - Monitor systems and processes being implemented onsite to ensure good governance is achieved on the project. - Manage specific onsite compliance obligations for the Proposed Action. - Report onsite performance of the Proposed Action.
Environmental Officer	- Oversee activities onsite to deliver the Proposed Action. - Monitor systems and processes being implemented onsite to ensure good governance is achieved on the project. - Manage specific onsite compliance obligations for the Proposed Action. - Report onsite performance of the Proposed Action.

This EMP outlines the environmental management activities for the implementation of the Proposed Action. Horizon Power and their appointed contractor will undertake these activities and acknowledges they are legal requirements to be met.

The responsibilities for the implementation of the management actions outlined in this document are of the project team detailed in **Table 5-1**. The actions may be undertaken by employees and/or contractors of Horizon Power when communicated and documented to relevant personnel through environmental training.

5.2 Communication

Communication during the construction phase of the Proposed Action will occur on a daily, weekly or as-needed basis with relevant staff, project managers or external stakeholders. Communication will be subject to

the requirements of the construction contact, as determined by Horizon Power. Horizon Power has identified key external stakeholders and will ensure information is communicated as appropriate and as required. A log of communications with external stakeholders and the public will be maintained.

All external communication will be managed by Horizon Power. Construction Contractors will not engage with external stakeholders unless otherwise instructed by Horizon Power or as per contract terms. A plan for specific engagement with community and special interest groups will be developed, to provide these groups with information regarding environmental and heritage matters.

6 Reporting

Horizon Power will report to DCCEEW on the implementation of this EMP as part of annual compliance reporting under the conditions of approval for the Proposed Action.

Where compliance audits undertaken by Horizon Power identify that the environmental management actions and/or the environmental objectives are not being achieved (i.e. non-compliance or an environmental incident), Horizon Power will notify DCCEEW as soon as reasonably practicable. Consistent with standard document control procedures, Horizon Power will maintain copies of all reports submitted to DCCEEW. The reporting requirements for this EMP are identified in **Table 6-1**.

Table 6-1. Reporting requirements

Aspect	Report from	Report to	Reporting Frequency
Implementation of EMP	Environmental Officer	DCCEEW	Annually (as part of annual compliance reporting)
Non-compliance with EMP or Environmental Incident	Environmental Officer	DCCEEW	As soon as reasonably practicable but not more than seven days

The format and content of annual reporting will be in accordance with the requirements of the annual reporting conditions. The format and content of reporting of a non-compliance event or an environmental incident will be subject to the nature of the non-compliance/incident and will include all requested information from DCCEEW. In consideration of this, specific templates for reporting these are not provided as part of this EMP.

7 Environmental Training

All construction personnel and sub-contractors will undergo a project induction, which includes information on the importance of the environmental approvals conditions and the requirements to enable environmental outcomes to be achieved. They will be advised of their responsibilities with regard to the EPBC Act, BC Act, and other relevant legislation, in addition to ministerial and contractual requirements. A record of inductions will be maintained.

Toolbox meetings will be used to reinforce messages on environmental protection, to relay new information and to encourage and celebrate positive outcomes. Key personnel working on the Proposed Action will undertake cultural awareness training to ensure an appropriate level of understanding is maintained on heritage and related matters for the duration of construction activities.

8 Emergency Contacts and Procedures

Environmental incidents and non-compliances will be identified and recorded as soon as possible by the relevant responsible persons within the contractor organisation or Horizon Power. Incidents will be mitigated or rectified where possible within 48 hours of being identified. Incidents and non-conformances will be reported to the Horizon Power representative within 48 hours of identification or as soon as reasonably practicable.

Any non-conformance to this EMP is to be investigated to determine:

- why the non-conformance occurred;
- what was the environmental harm or alteration of the environment that resulted from the non-conformance;
- what changes to Proposed Action activities and/or management plans is required; and
- measures to prevent, control or abate the environmental harm that may have occurred.

A log of incidents and non-conformances is to be maintained.

In the event of an environmental incident, the priority is the ensure the safety of all site personnel and the neighbouring community. All practical steps shall then be taken to minimise further environmental damage through the implementation of the appropriate contingency and corrective actions, as outlined in the Environmental management measures in **Table 10-1**.

9 Potential Environmental Impacts and Risks

9.1 Threats to Matters Protected under the EPBC Act

Matters of National Environmental Significance (MNES) that have the potential to be present in the DE and/or immediate surrounds were identified by DCCEEW as:

- Northern Quoll (*Dasyurus hallucatus*);
- Pilbara Olive Python (*Liasis olivaceus barroni*);
- Ghost Bat (Macroderma gigas);
- Grey Falcon (*Falco hypoleucos*);
- Curlew Sandpiper (*Calidris ferruginea*);
- Eastern Curlew (*Numenius madagascariensis*);
- Greater Sand Plover (*Charadrius leschenaultii*);
- Lesser Sand Plover (*Charadrius mongolus*);
- Red Knot (*Calidris canutus*);
- Northern Siberian Bar-Tailed Godwit (*Limosa lapponica menzbieri*);
- Australian Fairy Tern (*Sternula nereis nereis*);
- Whimbrel (*Numenius phaeopus*);
- Oriental Plover (*Charadrius veredus*);
- Wood Sandpiper (*Tringa glareola*);
- Oriental Pratincole (*Glareola maldivarum*);
- Common Sandpiper (*Actitis hypoleucos*);
- Common Greenshank (*Tringa nebularia*);
- Gull-billed Tern (*Gelochelidon nilotica*);
- Caspian Tern (*Hydroprogne caspia*);
- Crested Tern (*Thalasseus bergii*);
- Bridled Tern (*Onychoprion anaethetus*); and

- National heritage place:
  - Dampier Archipelago (including the Burrup Peninsula).

9.2 Potential Impacts

Potential impacts on MNES associated with the Proposed Action are set out in **Section 9.2.1**.

9.2.1 Threatened and Migratory fauna

Clearing for construction of the transmission line will directly impact the following Threatened and Migratory fauna habitat:

- Up to 14.4 ha from the 59.5 ha of potential Northern Quoll foraging, dispersal, denning/shelter and feeding habitat within the DE, which is all considered to be habitat critical to the survival of the species.
- Up to 14.4 ha from the 59.5 ha of potential Pilbara Olive Python denning/shelter, feeding, foraging and dispersal habitat within the DE, this includes up to 42.09 ha of rocky hills with exposed boulder piles habitat which is regarded as important to the species.
- Up to 14.4 ha from 74.45 ha of potential Ghost Bat and Grey Falcon foraging and flyaway habitat.

- Up to 1.5 ha of Curlew Sandpiper, Great Sand Plover, Lesser Sand Plover, Northern Siberian Bar-tailed Godwit, Australian Fairy Tern, Oriental Pratincole, Common Greenshank, Gull-billed Tern, Caspian Tern, Greater Crested Tern and Bridled Tern foraging habitat. This habitat is critical to the survival of the Australian Fairy Tern.
- Up to 1.5 ha of Eastern Curlew, Red Knot, Whimbrel, Oriental Plover and Common Sandpiper foraging and roosting habitat.

Given the detailed design for the Proposed Action is ongoing, the exact amount of this habitat to be removed is not currently known, therefore as a worst case it has been assumed the Proposed Action has potential to impact up to 14.4 ha of each habitat (which is the maximum clearing extent in the DE), or the total amount of habitat within the DE if this is less than 14.4 ha. The actual amount to be cleared of each habitat type will be much less than 14.4 ha given the Proposed Action will cover multiple habitat types.

Other aspects of the Proposed Action that have the potential to result in impacts to Threatened fauna include:

- Habitat fragmentation and population isolation;
- Increased risk of feral animals and weeds;
- Direct mortality of fauna;
- Increased dust causing degradation to habitat;
- Vehicle strike (considered in direct mortality);
- Increased light and noise pollution;
- Increased risk of fire causing injury to fauna or loss of habitat;
- Habitat contamination by Acid Sulfate Soils;
- Risk of Collision with the Proposed Action; and
- Anthropogenic disturbance (considered as part of the above impacts)

9.2.2 Cultural Heritage

There is no planned direct disturbance to any heritage features within the National Heritage Place during construction or operation of the Proposed Action through implementation of 'avoidance areas'. The Proposed Action has the potential for indirect impacts to known Heritage Sites and areas within the National Heritage Place as a result of vibration and dust deposition from ground preparation works during construction. The potential for unplanned indirect impacts will be managed through the implementation of a Cultural Heritage Management Plan submitted alongside the Preliminary Documentation.

9.3 Risk Assessment

9.3.1 Methodology

Each environmental risk has been given a rating in terms of likelihood and consequence using the criteria outlined in **Table 9-1** and **Table 9-2** below. These ratings are then combined using **Table 9-3** to generate a risk rating of low, medium, high or severe.

Table 9-1. Qualitative measure of likelihood

Descriptor	Qualitative measure of likelihood
Highly Likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the Proposed Action
Possible	Might occur during the life of the Proposed Action
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Table 9-2. Qualitative measure of consequence

Descriptor	Qualitative measure of consequences
Minor	Minor incident of environmental damage that can be reversed
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts
High	Substantial instances of environmental damage that could be reversed with intensive efforts
Major	Major loss of environmental amenity and real danger of continuing
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage

Table 9-3. Risk Rating

	Consequence				
	Minor	**Moderate**	**High**	**Major**	**Critical**
Highly Likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

9.3.2 Environmental Risk Rating

The risk rating for each environmental risk has been assessed and is outlined in **Table 9-4**.

Table 9-4. Environmental Risk Assessment

Development Phase	Factor	Potential Impact	Likelihood	Consequence	Inherent Risk	Planned Mitigation	Likelihood	Consequences	Residual Risk
Pre-construction / construction phase	Fauna	Vegetation clearance and loss of habitat in excess of the approved extent.	Possible	Moderate	Medium	The extent of the approved clearing will be clearly communicated in documentation and site inductions. Avoidance areas will be demarcated prior to ground disturbing activities.	Unlikely	Moderate	Low
		Clearing of the Burrup Peninsula rock pile communities PEC.	Unlikely	High	Medium	PEC to be included in 'avoidance areas'. Avoidance areas will be demarcated prior to ground disturbing activities.	Rare	High	Low
		Habitat fragmentation.	Unlikely	Moderate	Low	Infrastructure and temporary clearing will be preferentially positioned within the existing cleared areas to reduce the amount of fauna habitat clearing required.	Rare	Moderate	Low
		Increased risk of feral animals and weeds.	Possible	Moderate	Medium	Biosecurity measures in place and induction for all personnel will include the requirement to report sightings of feral animals, no feeding of native and/or feral animals and no pets allowed on site.	Rare	Moderate	Low
		Direct mortality of fauna.	Possible	Minor	Low	Personnel induction regarding threatened fauna and direct and indirect impacts (e.g., risk of vehicle strike, interaction with construction activities, waste management and introduction of feral animals). Clearing will be undertaken progressively in one direction, to allow fauna dispersal.	Rare	Minor	Low
		Increased dust causing degradation to habitat.	Unlikely	Minor	Low	Standard construction dust control and mitigation measures will be implemented during construction. This may include the use of a water trucks.	Rare	Minor	Low
		Increased light and noise pollution.	Unlikely	Minor	Low	Construction works will be limited to daylight hours unless otherwise agreed. Standard construction noise management measures will be implemented.	Rare	Minor	Low
		Increased risk of fire causing injury to fauna or loss of habitat.	Possible	Moderate	Medium	Whenever feasible, fire-resistant barriers like screens will be employed to confine sparks generated by welders and other hot work activities. Fire extinguishers will be strategically positioned in locations with a higher risk of fire.	Rare	Moderate	Low
		Habitat contamination by Acid Sulfate Soils.	Possible	Moderate	Medium	Ensure no mobilization of Acid Sulfate Soils during construction.	Rare	Moderate	Low
	Cultural heritage	Damage or degradation to the National Heritage values of the Dampier Archipelago.	Unlikely	Major	High	Avoidance areas around know Aboriginal sites will be demarcated prior to ground disturbing activities.	Rare	Major	Medium
Operation	Fauna	Risk of collision with the Proposed Action.	Possible	Moderate	Medium	Prevent impacts on bird species due to collision with transmission lines using Vertical line marking (aerial marker balls).	Unlikely	Moderate	Low
		Increased risk of feral animals and weeds.	Unlikely	Minor	Low	Implement a quarterly weed monitoring and management program for the first year following completion of ground disturbance activities. Ad-hoc weed checks during operational maintenance activities.	Unlikely	Minor	Low

10 Environmental Management Measures

Mitigation and management of the potential direct and indirect impacts on MNES associated with the Proposed Action will be implemented in accordance with standard construction industry environmental practices, as well as relevant Horizon Power standards and procedures.

An overview of the mitigation and management measures proposed is provided in the following sections. This includes identification of each impact/risk, a description of each measure proposed, the location and timing for each measure, monitoring and reporting requirements, and performance and completion criteria. Measures have been developed to be consistent with the layout as contained within the DCCEEW Environmental Management Plan Guidelines (CoA, 2014).

10.1 Environmental Management Activities, Controls and Performance Targets

The following management targets for EPBC Act listed threatened fauna have been identified[1]:

1. Prevent unauthorised clearing of EPBC Act listed threatened fauna habitat including clearing no more than:
   - 14.4 ha of Northern Quoll foraging, dispersal and denning habitat including no more than 14.4 ha of habitat critical to the survival of the Northern Quoll species;
   - 14.4 ha of Pilbara Olive Python foraging habitat;
   - 14.4 ha of Ghost Bat roosting, foraging, flyway and drinking habitat;
   - 14.4 ha of Grey Falcon nesting, foraging and drinking habitat;
   - 1.5 ha of Curlew Sandpiper roosting and foraging habitat;
   - 1.5 ha of Eastern Curlew roosting and foraging habitat;
   - 1.5 ha of Greater Sand Plover roosting and foraging habitat;
   - 1.5 ha of Great Knot roosting and foraging habitat;
   - 1.5 ha of Lesser Sand Plover roosting and foraging habitat;
   - 1.5 ha of Red Knot roosting and foraging habitat;
   - 1.5 ha of Northern Siberian Bar-Tailed Godwit roosting and foraging habitat; and
   - 1.5 ha of Australian Fairy Tern roosting and foraging habitat.
2. Prevent unauthorised clearing and habitat fragmentation of EPBC Act listed Migratory Shorebird and Seabird habitat including clearing no more than:
   - 1.5 ha of Whimbrel roosting and foraging habitat;
   - 1.5 ha of Oriental Plover roosting and foraging habitat;
   - 1.5 ha of Oriental Pratincole foraging habitat;
   - 1.5 ha of Common Sandpiper roosting and foraging habitat;
   - 1.5 ha of Common Greenshank foraging habitat;
   - 1.5 ha of Gull-billed Tern foraging habitat;
   - 1.5 ha of Caspian Tern foraging habitat;
   - 1.5 ha of Crested Tern foraging habitat; and
   - 1.5 ha of Bridled Tern foraging habitat.

[1] Note that the exact amount of each habitat to be removed will not be known until the detailed design is finalised. Therefore, as a worst-case scenario it has been assumed that the Proposed Action has the potential to impact up to 14.4 ha of habitat. Within the maximum 14.4 ha clearance area, Horizon Power have committed to clearing no more than 1.5 ha of the habitat associated with the tidal inlet area.

3. Minimize the risk of injury or mortality to EPBC Act listed threatened and/or migratory species during construction of the Proposed Action.
4. Prevent indirect impacts on fauna habitats due to Acid Sulfate Soils and alteration of fire regime.
5. Minimize the risk of injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.
6. Avoid indirect impacts to threatened and/or migratory fauna species due to an increase in noise, light and dust emissions, or through altered surface water drainage and flows.
7. Minimise the clearing of intertidal adapted vegetation located within the tidal inlet between Hearson Cove and King Bay.
8. Minimise disturbance, injury or mortality to EPBC listed threatened and/or migratory species during operation and reduce risk of collision impacts as far as possible.
9. No introduction or spread of Declared weeds, WONS or serious environmental weed species into surrounding native vegetation adjacent to the Development Envelope during and attributable to construction.
10. Minimise the damage to habitats caused by erosion and sedimentation.

10.1.1 Environmental Management Actions

In order to comply with relevant environmental legislation and manage the impacts to the local environment, Horizon Power has defined objective, outcomes and management-based provisions to ensure that impacts to the noted MNES are avoided and minimised as far as practicable during implementation of the Proposed Action (**Table 10-1**).

Table 10-1. Environmental management measures to mitigate impacts to MNES

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Construction – Fauna Habitat Management							
Prevent unauthorised clearing of EPBC Act listed threatened and/or migratory fauna habitat as described in items 1. Prevent habitat fragmentation as described in item 2 (Section 10.1)	Clearing and ground disturbing activities limited to the defined clearing limits and boundaries described within the approval document. The extent of the approved clearing will be clearly communicated in documentation and inductions.	Drawings, inductions and shape/CAD files showing approved clearing areas provided to Construction Contractor Representative. Job Hazard Analysis (JHA) or equivalent to include the risks and mitigation actions to be understood and adhered to as they pertain to the contractor and scope of work on the JHA.	Prior to commencement of clearing.	Project Environmental Officer to check that drawings, inductions and shape/CAD files show correct approved clearing areas. Record of provision of drawings and shape/CAD files showing approved clearing areas. All relevant contractors to sign onto JHA or equivalent on a daily basis. Pre-clearing photos to be documented and daily inspection of clearing extents during clearing activities to confirm no over clearing. Visual inspection and record of cleared areas to be undertaken post-clearing to confirm no over clearing and relevant shapefiles provided to Horizon Power.	Drawings and inductions do not show correct approved clearing areas. Shape/CAD files not provided. JHA does not include risk of clearing outside approved area.	All clearing activities will cease immediately. Clearing will not recommence until 'avoidance areas' and clearing boundaries have been checked and confirmed to be accurately maintained. Recommencement of clearing will only occur once approval is granted by the Horizon Power Manager Sustainability. In the event of an environmental incident, a thorough record will be maintained, and an investigation into its causes will be initiated. In cases of unauthorized clearance of vegetation containing habitats for MNES, an assessment for potential rehabilitation will be conducted. Rehabilitation efforts will commence within a timeframe of 6 to 12 months following the incident. If deemed appropriate, refresher or updated training sessions will be organized. Notification will be provided to the DCCEEW along with the investigation report as part of the annual compliance reporting, should any specified triggers be met or exceeded.	Construction Contractor Environmental Officer. Horizon Power Project manager. Horizon Power Sustainability Manager.
	'Avoidance areas' will be demarcated on Proposed Action drawings and physically on site prior to clearing activities.	All 'avoidance areas' clearly marked out on all relevant Proposed Action drawings and demarcated on site with shapefiles provided. JHA or equivalent to include the risks and mitigation actions to be understood and adhered to as they pertain to the contractor and scope of work on the JHA.	Prior to commencement of clearing.	Horizon Power to check that drawings and shape/CAD files show correct approved clearing areas. Record of provision of drawings and shape/CAD files showing approved clearing areas. Weekly site inspections to confirm appropriate demarcations of avoidance areas are maintained. Construction reports which will include clearing extents.	Drawings do not show correct approved clearing areas. Shape/CAD files not provided. Site inspections show 'Avoidance areas' not properly demarcated on site. Clearing more than that described in Items 1 and 2, **Section 10.1**. JHA does not include risk of clearing within avoidance areas.		
	Personnel access routes and parking will be restricted and clearly demarcated on site.	Approved clearing areas including designated access routes and parking areas to be clearly demarcated on site and communicated appropriately.	Prior to commencement of clearing. During construction.	Construction site plan showing all approved access areas. Weekly site inspections.	Construction site plan does not show correct approved access areas. Site inspections show access routes and parking areas not clearly demarcated.	Review and amend construction site plan and physically demarcate the areas on site.	Construction Contractor Environmental Officer.
	The construction of access tracks within the tidal inlet between Hearson Cove and King Bay, will be avoided as far as practicable, to minimise impacts to fauna habitat within this area.	Pre-construction reviews of the construction plan shows that access tracks in that area are minimised and poles	During construction.	Construction site plan showing all approved access areas.	Preconstruction review does not show access tracks in that area being minimised and/or poles being places in available cleared areas.	Review and amend construction site plan. Include areas in rehabilitation strategy and implementation.	Construction Contractor Environmental Officer.

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	Poles will be preferentially positioned within the existing cleared areas associated with the proposed Burrup Peninsula Road and Hearson Cove Road Improvements project (under construction by Main Roads), reducing the amount of fauna habitat clearing required for access tracks.	have been planned to be placed in cleared areas where practicable.					
	Areas required for temporary construction purposes, such as tracks, offices, stockpiling and laydown areas, will be located within existing cleared areas, or areas required for permanent infrastructure, where possible.	Drawings, inductions and shape/CAD files showing approved clearing areas provided to Construction Contractor Representative. Job Hazard Analysis (JHA) or equivalent to include the risks and mitigation actions to be understood and adhered to as they pertain to the contractor and scope of work on the JHA.	Prior to and during construction.	Weekly inspection of Proposal defined clearing limits and boundaries demarcation during clearing activities. Daily inspection of clearing extents during clearing activities to confirm no over clearing.	Drawings and inductions do not show correct approved clearing areas. Shape/CAD files not provided. JHA does not include risk of clearing outside approved area.	Review and amend construction site plan and physically demarcate the areas on site.	Construction Contractor Environmental Officer. Horizon Power Project Manager.
	Minimise clearing to the extent required during construction, and the ongoing maintenance and operation of the assets.		During construction. During operation.	Vegetation clearing records and annual environmental reporting. Report unauthorized clearing as soon as practicable after identification.			
	Progressively rehabilitate laydown areas post construction.	Rehabilitation undertaken in line with rehabilitation strategy	Post construction.	Maintain records of rehabilitation.	Site inspections find rehabilitation has not been undertaken in line with rehabilitation strategy.	Include areas in rehabilitation strategy and implementation.	Horizon Power Project Manager.
Prevent indirect impacts on fauna habitats due to Acid Sulfate Soils	Prior to construction, an ASS investigation will be undertaken in areas with indicative ASS levels. If the investigation identifies ASS within excavation areas, the Contractor will develop and implement an ASS Management Plan (ASSMP). Construction activities will be undertaken in accordance with the recommendations provided in the ASS investigation and/or ASS management plan All site personnel will be inducted regarding ASS.	No mobilization of ASS during construction.	Prior to commencement of construction activities. During construction.	Inspection report. ASS investigation survey report. ASSMP approved by DWER (if required). Site induction records.	Construction activities undertaken without ASS management plan or ASS survey report which confirms low risk of ASS mobilisation. ASSMP not approved by DWER (if required). Site induction doesn't include risk of ASS.	Construction activities will cease within high-risk areas and recommence once investigations or ASS management activities have been carried out. ASSMP to be submitted for approval (if required) before construction can commence in Moderate or higher risk ASS areas. ASS risk added to site induction.	Horizon Power Project Manager.
Prevent indirect impacts on fauna habitats due to accidental fires	Where increased risk of fire is identified, fire-resistant barriers like screens will be employed to confine sparks generated by welders and other hot work activities. Fire extinguishers will be strategically positioned in locations with a higher risk of fire. Hot work permits will be mandatory before commencing any hot work. All personnel will be inducted, including fire risk and Emergency response drills. All non-essential work is to be stopped or postponed in the event that a Total Fire Ban with Catastrophic fire danger ratings	No accidental fires as a result of construction activities.	During construction.	Weekly site inspection report. Record of all site personnel that have undertaken the induction. Compliance with hot work permits.	Site inspections show that management measures not implemented. Inductions are not made prior to construction activities, or personnel do not demonstrate the correct knowledge. Any incidents of fires occurring within or outside the DE, resulting from construction works.	No hot work until management measures implemented. Refresher training will be undertaken. The incident will be reported, and the cause investigated. Extinguish the fire, if safe to do so. If the fire is uncontrolled, notify emergency services and the Local Government Authority.	Construction Contractor Environmental Officer.

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	or Emergency Warning is issued for the construction area. Works to be conducted in accordance with all local fire control laws and regulations. Vehicles and equipment access limited to designated roads/access tracks and cleared areas where possible. Smoking will be confined to designated smoking area only.						
Minimise indirect impacts to surrounding/adjacent habitat areas from altered surface water drainage and flows	Local drainage to be considered during site design and layout. Disturbances to drainage lines will be avoided (where possible) or otherwise minimised.	Pre-construction reviews of the construction site plan shows that significant drainage lines avoided.	Prior to commencement of construction activities.	Construction site plan.	Pre construction review does not show avoidance of significant drainage lines.	Review and amend Construction Site plan.	Construction Contractor Environmental Officer.
Minimise the clearing of intertidal adapted vegetation located within the tidal inlet between Hearson Cove and King Bay	Proposal design to minimise the amount of poles and pole pads required to be located within the tidal inlet as much as possible. JHA or equivalent to include the risks and mitigation actions to be understood and adhered to as they pertain to the contractor and scope of work on the JHA. Access tracks within the tidal area will be minimised, utilising existing access tracks were possible or coming direct from Burrup Road.	Approved clearing areas including designated access routes and parking areas to be clearly demarcated on site and communicated appropriately.	During construction.	All relevant contractors to sign onto JHA or equivalent on a daily basis. Weekly inspections of clearing areas within the tidal zone.	Construction site plan does not show correct approved access areas. Site inspections show access routes and parking areas not clearly demarcated.	Review and amend construction site plan and physically demarcate the areas on site.	Construction Contractor Environmental Officer.
No introduction or spread of declared weeds, WONS or serious environmental weed species into surrounding native vegetation adjacent to the DE during and attributable to construction	A weed register will be developed and maintain for declared weeds, WONS or serious environmental weed species. The register will contain relevant information such as species, distribution, abundance and history of control method.	Avoid the introduction and spread of weeds species and maintain weeds register with relevant information.	During construction.	Implement a quarterly weed monitoring and management program for the first year following completion of ground disturbance activities. Routine spot checks of vehicles and equipment compliance with cleaning. Maintain material import logs. Induction records.	Site inspection shows requirements not met. New significant weed infestation (WONS/Declared Plant) (i.e. above existing background levels) identified. Non-compliance with clean on entry.	Ensure non-compliance issues identified in site inspections are resolved. Where new weed infestation is evident, appropriate controls shall be deployed. Education on clean on entry requirements.	Construction Contractor Environmental Officer.
	Develop and implement vehicle and equipment clean on entry/exit procedures; Any machinery used to remove weed-infested topsoil will be cleaned down before entering or leaving the work site to prevent the introduction and spread of weeds into new areas.	All vehicles and equipment verified and cleaned on arrival site.	All construction activities.				
	Vehicles and machinery to remain on designated compliance roads/access tracks areas where possible.	Approved clearing areas including designated access routes and parking areas to be clearly demarcated on site and communicated appropriately.	During construction.				
	All personnel will be inducted regarding weed identification and weed hygiene training.	Correct knowledge about weed species and hygiene protocol importance.	Prior to their commencement on-site.				

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
Construction – General EPBC Act listed threatened and/or migratory species management							
Avoid injury or mortality to EPBC Act listed threatened and/or migratory species during construction of the Proposed Action.	Personnel induction regarding threatened fauna and direct and indirect impacts (e.g., risk of vehicle strike, interaction with construction activities, waste management and introduction of feral animals).	All inductions being complete prior to personnel commencing work on site and weekly during the construction phase.	Prior to construction. During construction.	Weekly inspection of induction records.	Weekly inspection finds personnel working on site not correctly inducted. Personnel not complying with requirement.	Personnel not correctly inducted will cease work and recommence after the induction. Refresher training will be conducted within 1 week of determining that requirement is not being met.	Construction Contractor Environmental Officer.
	Speed limits between 40-80km/hr in order to avoid fauna strikes during clearing and construction.	No incidents of speeding within the construction site boundary (defined as the area of works within the DE).	During construction.	Visual monitoring by all construction personnel. Incident reporting.	Any incident of speeding within the construction boundary.	Refresher training will be conducted within 1 week.	Construction Contractor Environmental Officer.
	All food waste will be removed from site at the end of each shift. Waste will be stored at the depot and regularly removed.	Waste stored in fauna-proof containers and disposed of appropriately.	During construction.	Weekly inspection. Waste disposal records.	Weekly inspection finds waste not being disposed of appropriately.	Review and update waste management and increase frequency of inspections or collections as required.	Construction Contractor Environmental Officer.
	Clearing will be undertaken progressively in one direction, to allow fauna dispersal.	Clearing is undertaken progressively in the same direction, reducing probability of fauna injury or mortality.	During construction.	Clearing records.	Clearing is not undertaken progressively in one direction.	Refresher training conducted within 1 week of determining that requirement is not being met.	Construction Contractor Environmental Officer.
	Induction for all personnel will include the requirement to report sightings of feral animals, no feeding of native and/or feral animals and no pets allowed on site.	Induction material includes requirement information.	During construction.	Weekly inspection of induction records.	Weekly inspection finds personnel working on site not correctly inducted. Instances of personnel not complying with requirement.	Personnel not correctly inducted to immediately cease work and not recommence until induction complete. Refresher training will be conducted within 1 week of determining that requirement is not being met.	Construction Contractor Environmental Officer.
	Prior to any clearing occurring, a trained fauna spotter will be present to oversee the works. If any listed fauna is identified during clearing, clearing will stop until the listed fauna has moved out of the clearing area or has been relocated by the licenced fauna handler.	No mechanical clearing of vegetation occurs without a trained fauna handler in attendance.	During construction.	Internal Project clearing permit, signed by Supervisor and fauna spotter.	Clearing occurs without a fauna spotter present.	Clearing will cease immediately until a fauna handler is present. Incident will be recorded, and the cause investigated.	Construction Contractor Environmental Officer.
	Excavations shall remain open for the minimal required time to facilitate the ongoing construction. Posts shall be raised as soon as practical after the holes are excavated and holes will not be left open overnight where possible. Where excavations required to be left open overnight, fauna egress points will be made. Any excavations required will generally not be left open and an inspection will be undertaken at the commencement of each workday, to identify and address any potential instances of trapped animals.	No incidents to MNES species due to excavations remaining open.	During construction.	Daily monitoring for trapped fauna. Records of fauna or fauna fatalities. Annual Compliance report	Fauna egress within excavations and trenches sites has not been installed. Dead or injured fauna as a result of interaction with trenches on site.	Refresher training will be conducted within 1 week of determining that requirement is not being met. Inspection will be undertaken daily before end of activities to endure fauna egress is installed correctly.	Construction Contractor Environmental Officer.

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	Ensure temporary fencing is only in place for the minimal required time, and removed as the works progress to the following works area.	No incidents to MNES species due to collisions with temporary fencing.	During construction.	Daily monitoring for injured fauna. Records of fauna or fauna fatalities.	Temporary fencing erected in areas where no work is being undertaken/planned in the near future.	Refresher training will be conducted within 1 week of determining that requirement is not being met.	Construction Contractor Environmental Officer
	In the event of EPBC Act listed threatened fauna injury, advice shall be sought from local qualified wildlife organisations/persons. Sick or injured wildlife will be allocated to an appropriate specialist organisation. Listed species will be handled by a licenced fauna handler. Fauna fatality and injury will be recorded as an environmental incident.	In case of fauna injury, advice undertaken and, if necessary, allocation of rescue animals to an appropriate specialised organisation.	During construction.	Animal injury or fatalities reported as an incident in the incident records system. Record known injuries to, or deaths of conservation significant fauna species in a Conservation Significant Fauna Interaction Register as soon as possible as the injury or death is identified Annual Compliance Reporting.	Fauna injured without proper rescue undertaken.	The appropriate specialised organisation will be contacted to assist with rescue/movement of fauna if possible. Refresher training will be conducted. The incident will be reported, and the cause investigated.	Construction Contractor Environmental Officer.
	Observations of conservation significant fauna species by site personnel are to be reported to the site environment representative.	Sightings of conservation significant fauna recorded in site documentation.	During construction.	Daily inspections of excavations and trenches to identify trapped fauna and to enable capture and relocation.	Conservation significant fauna spotted and not reported to environmental representative.	Refresher training will be conducted.	Construction Contractor Environmental Officer.
	Night-time vehicle movements during construction will be restricted where possible to minimise the potential for vehicle strikes. Working hours will generally take place between 06:00 and 18:00.	In case of fauna injury, advice undertaken and, if necessary, allocation of rescue animals to an appropriate specialised organisation.	During construction.	Daily monitoring for injured fauna. Records of fauna or fauna fatalities.	Unauthorised working outside of general site hours. Vehicle movements detected in excess of speed limits.	Refresher training will be conducted.	Construction Contractor Environmental Officer.
Avoid indirect impacts to threatened and/or migratory fauna species due to an increase in noise, light and dust emissions.	Standard construction noise management measures will be implemented (as detailed in Appendix A). Construction works will generally take place between 06:00 and 18:00, limiting the amount of temporary lighting required to the winter months.	Noise emissions will be kept at a minimum during daylight hours. No increase in noise will occur during night-time hours.	During construction.	Noise complaints will be recorded. Compliance with implementation of noise and vibration minimisation strategies will be developed and implemented during construction of the Proposed Action.	Complaints of excessive noise.	Complaints regarding noise will be recorded and investigated by Horizon Power or the Contractor, and the procedures will be revised.	Construction Contractor Environmental Officer.
	In the event of significant noise activities, noise and vibration minimisation strategies (e.g. soft start) will be developed and implemented during Proposal construction.						
	Light emissions from on-site construction lighting towers will be restricted to the hours of 7 am to 7 pm and will occur transiently, not remaining in the same location unnecessarily.	No light emission will occur after 6 pm or remain in the same location for longer than six months.	During construction.	Incident reports.	Light emissions from towers occurring after 7 pm or remaining in the same location without construction activities occurring in the area within a month.	The incident will be reported, and the cause investigated.	Construction Contractor Environmental Officer.
	Standard construction dust control and mitigation measures will be implemented during clearing (as detailed in Appendix B). This may include the use of a water truck(s). Ground disturbance and/or clearing of vegetation will be restricted during high winds if dust cannot be adequately controlled. Review of weather forecasts will be undertaken prior to native vegetation	No excessive dust nuisance events recorded. Gaseous Air Quality emissions will be kept to a minimum.	During construction.	Incident reports.	Public complaints of excessive dust pollution Excessive dust reported by personnel or contractors.	The incident will be reported, and the cause investigated. Any complaints relating to dust emissions will be recorded and investigated as per Horizon Power's incident management procedure. Refresher training will be conducted.	Construction Contractor Environmental Officer.

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	clearing to identify periods of extreme weather conditions likely to result in increased dust emissions so that additional mitigation measures can be implemented; or ground disturbance and/or clearing of native vegetation will be halted. Use of defined haul routes for machinery / vehicles travelling on unsealed surfaces or roads, and reduced vehicle speed in areas of unconsolidated soil. All site personnel to be inducted on environmental responsibilities. Machinery and vehicles are regularly services and operated/maintained in accordance with the manufacturer's specifications. Vehicles on site will be switched off and not left idling when not in use.						
Construction – Cultural Heritage specific management measures							
See Aboriginal Cultural Heritage Management Plan							
Construction – General management measures							
Prevent erosion resulting from severe weather in the area.	Cyclone warnings will be monitored by the construction contractor and if a cyclone warning is issued, a site inspection and clean-up will be undertaken prior to the cyclone. This will include filling in any holes, as well as stabilisation or dispersal of piles of dirt and removal of rubbish.	No injury, harm or damage to the site as a result of extreme weather events.	During construction.	Cyclone warnings will be monitored. Site inspection reports.	Cyclone warning issued.	A site inspection and clean-up will be undertaken prior to the cyclone.	Construction Contractor Project Manager.
Minimise the damage to habitats caused by erosion and sedimentation. **No noticeable change in sediment discharge into drainage lines or within the tidal inlet between Hearson Cove and King Bay.** **No noticeable increase in soil erosion within the drainage lines or within the tidal inlet between Hearson Cove and King Bay.**	Cleared vegetation will be stockpiled onsite for use post works completion to encourage soil stability and revegetation. Where possible direct return of topsoil material will be undertaken. Establishment of designated access roads to prevent unauthorised disturbance. Erosion and sediment control measures will be applied to prevent erosion of exposed areas and sediment discharge to adjacent areas, where practicable. Laydown areas will be rehabilitated or otherwise stabilised as early as practicable to minimise the potential for erosion.	No excessive sedimentation events recorded.	During construction.	Weekly visual inspections of erosion and sediment discharge within the drainage lines or within the tidal inlet between Hearson Cove and King Bay.	Inspection of clearing areas shows disturbance to drainage lines or the tidal inlet outside of the approved areas.	Review and amend construction site plan to ensure appropriate sediment controls are in place. Include areas in rehabilitation strategy and implementation. Ensure no materials stockpiled near tidal area.	Construction Contractor Environmental Officer.
Minimise impacts to native vegetation.	Retain the vegetative material and topsoil removed by the authorised clearing and stockpile the vegetative material and topsoil in an area that has already been cleared.	Successful rehabilitation of cleared native vegetation.	Within 12 months following completion of construction	Monitoring within 12 months of rehabilitation to determine success.	Determination by environmental specialist that the revegetation efforts undertaken will not rehabilitate the area in line with baseline conditions.	Revegetation of the area by deliberately planting and/ or direct seeding native.	Construction Contractor Environmental Officer.

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	Construct drainage around topsoil stockpiles. At an optimal time within 12 months following completion of temporary clearing, revegetate the areas not required for the authorised purpose for which they were cleared, by: - ripping or other measures to remove soil compaction; and - laying the retained vegetative material and topsoil on the cleared area(s).		works within the temporary clearing areas.				
	In the unlikely event that construction of the Proposal is constrained by Aboriginal cultural heritage within the northern quarter of the DE (e.g., an unexpected find during initial ground disturbing works), minor impacts to the Burrup Peninsula rock pile communities PEC may be required (up to 0.05 ha). Clearing will be kept to the minimum extent practicable for constructability and a valid pathway through the mapped 'avoidance areas' will be approved by Horizon Power's Manager Sustainability.	All 'avoidance areas' clearly marked out on all relevant Proposed Action drawings and demarcated on site with shapefiles provided.	During clearing activities.	Pre-clearance inspections to ensure pegged clearing area of the PEC through the avoidance areas is as minimal as possible; and daily inspection of clearing extents within the northern quarter of the DE during clearing activities to confirm no over clearing of PEC.	Unexpected heritage find encountered on site.	In the event that a change in site is required, e.g. due to unexpected heritage finds, the proposed clearing limit will be assessed and approved by Horizon Power's Sustainability Manager and a valid pathway through the mapped 'avoidance areas' will be developed prior to undertaking any clearing activities.	Construction Contractor Environmental Officer. Horizon Power Sustainability Manager.
Minimise impacts to drainage lines and the tidal inlet between Hearson Cove and King Bay.	All site personnel to be inducted on environmental responsibilities. Vegetation associated with natural drainage lines to be prioritised for protection through detailed design works. Natural drainage lines/creeks to be retained where possible. Vehicle movements to be restricted to designated access tracks.	Pre-construction reviews of the construction site plan shows that significant drainage lines avoided and minimal disturbance to tidal inlet.	Prior to commencement of construction activities. During construction.	Record of all site personnel that have undertaken the induction. Weekly inspections of clearing areas within drainage lines and the tidal inlet between Hearson Cove and King Bay.	Inspection of clearing areas shows disturbance to drainage lines or the tidal inlet outside of the approved areas.	Review and amend construction site plan and physically demarcate the areas on site. Include areas in rehabilitation strategy and implementation.	Construction Contractor Environmental Officer.
Ensure all suspected contamination is characterised and appropriately managed.	In the event of excavation encountering suspected contaminated materials, the excavation works are to be stopped and advice sought from a qualified environmental professional. If required, the suspected contamination will be sampled and analysed to determine the appropriate remediation and disposal.	No new areas of contamination identified.	During construction.	Visual monitoring during excavation.	Monitoring during excavation identifies areas of previously unknown contamination.	Works will cease in that area until samples of the material have been tested and confirmed to be inert. If found to be contaminated, the material will be removed following relevant contaminated waste guidance and protocols and treated or appropriately disposed of to a licenced facility.	Construction Contractor Project Manager.
Ensure all accidental spills or leaks of hazardous materials or waste is appropriately managed. **Minimise the risk of spills or leaks of hazardous materials or waste.**	All site personnel to be inducted on environmental responsibilities. Spill management procedures to be developed prior to construction. Hazardous materials used during construction will be stored in compliance with relevant Australian Standards and Regulations. On-site refuelling of machinery and plant to occur on sealed or bunded areas and at	No new uncontrolled pollution incidents recorded.	During construction.	Site induction records. Record of storage and spill management procedures. Weekly site inspections of hazardous materials and waste storage and handling areas to identify spills / leaks and discharges, and check that storage, handling and signage is appropriate.	Site inspections identify uncontrolled pollution incidents.	Spill response protocols will be implemented including containing the pollution incident as quickly as possible. The incident will be reported, and the cause investigated. Refresher training will be conducted as appropriate.	Construction Contractor Environmental Officer.

Management Objective / Desired Outcome	Management Measures	Performance Target/Completion Criteria	Timing	Monitoring/ Reporting Activity	Corrective Action Trigger(s)	Corrective Action	Corrective Action Responsibility
	least 50m away from all drainage lines or water bodies. Scheduled / major maintenance of vehicles / plant to be undertaken offsite. Provision of spill response kits at refuelling locations (if applicable – only temporary refuelling equipment planned). Safety Data Sheets (SDSs) and hazardous materials inventory to be retained on site. During construction, temporary ablution facilities to be self-contained. Sewage to be collected by a licensed contractor and disposed at an appropriately licensed waste facility. General construction waste material to be appropriately managed and disposed of off-site at an appropriate facility.						
Operation (including maintenance activities) – General EPBC Act listed Threatened and/or Migratory species management							
Minimise disturbance, injury or mortality to EPBC listed threatened and/or migratory species during operation and reduce risk of collision impacts as far as possible.	Mitigate impacts on bird species due to collision with transmission lines using visual balls on section of line over Hearson Cove.	Minimise the loss of individuals due to transmission line collision.	During operational phase.	Incidental records of injury or fauna fatalities during routine maintenance activities. Yearly review of records and maintenance records of line markers.	Line markers visibly breaking or falling off.	Ensure line markers are adequately maintained and replace once they become not fit for purpose.	Construction Contractor Environmental Officer. Horizon Power.
Minimise the spread and/or introduction of weeds.	Implement a quarterly weed monitoring and management program for the first year following completion of ground disturbance activities. Ad-hoc weed checks during operational maintenance activities.	Avoid the introduction and spread of weeds species and maintain weeds register with relevant information.	Post construction.	Quarterly weed inspection and management program.	New significant weed infestation (e.g., above existing background levels) occurred.	Where new weed infestation is evident, relevant treatments will be applied.	Horizon Power Operations Manager.
Prevent mortality or harm to nesting birds during maintenance activities.	Grey Falcon nests from June to November. No clearing of nests will be undertaken during this period to mitigate risk of disturbance to nests during maintenance activities.	No active Grey Falcon nests disturbed during maintenance activities.	During operational phase.	Incidental records of injury or fauna fatalities during routine maintenance activities.	Active nest identified in maintenance works area.	All works within close proximity to the active nest will cease immediately. Clearing will not recommence until the chicks have fledged the nest and the operational Manager Sustainability has confirmed maintenance activities can proceed.	Manager Sustainability

10.1.2 Environmental Management of Maintenance Activities During Operation

Maintenance activities associated with operation of the Proposed Action will be managed by the local regional depot in the same way as Horizon Power's network and assets. A number of standard operating procedures are in place to ensure implementation of appropriate environmental management of standard maintenance activities. These operating procedures are provided as appendices to this EMP and include those listed in **Table 10-2**.

Table 10-2. Horizon Power's Standard Operating Procedures

Appendix	Title	Relevance
C	Transmission Substation Field Instructions - Vegetation Management and Weed Control in Substations	Provides measures for minimising the spread and/or introduction of weeds.
D	D.1 Technical Maintenance Guide: Overhead Network Visual Inspections (Major) & Pillars D.2 Technical Maintenance Guide: Network Visual Inspections (Minor)	Provides measures for the checking of nesting birds during maintenance and ensuring bird and bat covers are in good condition and fully operational.
E	E.1 Guideline: Technical Maintenance for Bushfire/Vegetation Management E.2 Guideline: Technical Maintenance for Bushfire/Vegetation Management (Weed Control)	Ensures appropriate vegetation control is in place to prevent increased risk of bush fires. Provides measures for minimising the spread and/or introduction of weeds.
F	Asset Management Plan. Conductors and Hardware – Distribution	Provides controls during the operation phase for ensuring the upkeep of bird deterrents and other animal barriers to minimise risk of harm to protected and endangered species.

In addition to the measures set out in **Table 10-1**, and the standard operating procedures discussed in **Table 10-2**, all works undertaken on the network during maintenance operations are screened through Horizon Power's Sustainability Portal as part of the activity planning and preparation tasks. This process looks at land access requirements as well as potential impacts to native title, heritage and environmental concerns. The 'avoidance areas' detailed in the Preliminary Documentation have been included in this Portal to ensure these are flagged during the screening process for any maintenance activities in the future, or other activities in the area of the Proposed Action.

10.1.3 Environmental Management During Decommissioning

No specific decommissioning activities have been considered for the Proposed Action as the project is common user infrastructure, rather than a supply for a specific customer, and therefore anticipated to be long term infrastructure which would be maintained indefinitely. When assets are required to be decommissioned this is undertaken via a decommissioning plan on a case by case basis, however the life of the Proposed Action is in excess of 50 years and therefore a decommissioning plan has not been developed at this stage.

With regard to development of any future decommissioning plan, the Horizon Power's Manager Sustainability will be responsible for ensuring compliance to Horizon Power requirements and will work closely with the Project Manager to ensure appropriate governance and compliance processes are established and maintained.

In addition, any planned decommissioning activities will be screened though Horizon Power's Sustainability Portal or equivalent process, as exists in the future. This will ensure that the works avoid any sensitive areas, such as those included in the 'avoidance areas' reported in the Preliminary Documentation, to minimise potential impacts to protected flora or fauna. This process will also ensure clearing will be avoided during bird nesting season where possible, or ensure checks are in place for nesting birds in the event clearing works are required during nesting season.

10.2 Environmental Monitoring

Key monitoring measures have been established to assess the potential effects of the Proposed Action on MNES and their habitats, both during and after construction. This monitoring encompasses the evaluation of both immediate and secondary consequences resulting from the Proposed Action. Qualified individuals with expertise in the specified methodology will conduct the monitoring activities. The outlined monitoring plan for the Proposed Action can be found in **Table 10-3**.

Table 10-3. Environmental monitoring

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
Construction – Fauna Habitat Management					
Prevent unauthorised clearing of EPBC Act listed threatened and/or migratory fauna habitat as described in items 1 and 2 (**Section 10.1**)	Drawings and shape/CAD files showing approved clearing areas provided to Construction Contractor Representative.	Horizon Power to check that drawings and shape/CAD files show correct approved clearing areas. Record of provision of drawings and shape/CAD files showing approved clearing areas.	Inspection of drawings and shape/CAD files.	N/A	Prior to and during construction
	All 'avoidance areas' clearly marked out on all relevant Proposed Action drawings and demarcated on site with shapefiles provided.	Horizon Power to check that drawings and shape/CAD files show correct approved clearing areas. Record of provision of drawings and shape/CAD files showing approved clearing areas. Weekly site inspections to confirm appropriate demarcations on site are maintained. Construction reports which will include clearing extents.	Inspection of drawings and shape/CAD files. Clearing areas visual assessment to confirm 'avoidance areas' are appropriately marked out on site.	5m around 'avoidance areas' within the DE.	
	Approved clearing areas including designated access routes and parking areas to be clearly demarcated on site and communicated appropriately.	Construction site plan showing all approved access areas. Weekly site inspections.	Clearing areas visual assessment.	Temporary clearing areas/ Permanent Clearing areas.	
	Pre-construction reviews of the construction plan shows that access tracks in that area are minimised and poles have been planned to be placed in cleared areas where practicable.	Construction site plan showing all approved access areas.	Pre-construction reviews of Construction Site plan.	During construction	

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
Prevent indirect impacts on fauna habitats due to Acid Sulfate Soils and accidental fires.	No mobilization of ASS during construction.	Inspection report. ASS investigation survey.	Written records. Pre-construction review.	N/A	Prior to construction.
	No accidental fires as a result of construction activities.	Weekly site inspections.. Induction report.	Written records.	N/A	Weekly.
Minimise indirect impacts to surrounding/adjacent habitat areas from altered surface water drainage and flows	Pre-construction reviews of the Construction Site plan shows that significant drainage lines avoided.	Construction Site plan.	Written records. Pre-construction review.	N/A	Prior to construction.
No introduction or spread of declared weeds, WONS or serious environmental weed species into surrounding native vegetation adjacent to the Development Envelope during and attributable to construction.	Avoid the introduction and spread of weeds species and maintain a weeds register with relevant information.	Weekly site inspections. Implement a quarterly weed monitoring and management program for the first year following completion of ground disturbance activities. Ad-hoc weed checks during operational maintenance activities.	Written records.	Clearing aeras	Weekly
	All vehicles and equipment verified and cleaned on arrival site.		Visual inspection. Photographic record, GPS of non-conformance. Weed monitoring reports. Records of waste disposal Records verifying plant and machinery arriving on site is clean.	N/A	Weekly
	Correct knowledge about weed species and hygiene protocol importance.			N/A	Weekly
	No introduction of weeds due to imported soil or materials onto the worksite.			Clearing areas.	Weekly
Construction – General EPBC Act listed threatened and/or migratory species management					
Avoid injury or mortality to EPBC Act listed threatened and/or migratory species during construction of the Proposed Action.	All inductions being complete prior to personnel commencing work on site and weekly during the construction phase.	Inductions records.	Written records.	N/A	Prior to personnel commencing work on site. Weekly during the construction phase.

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	No incidents of speeding within the construction site boundary.	Visual monitoring by all construction personnel. Incident reporting.	Visual Inspection. Written records.	Construction site boundary.	Weekly.
	Waste stored in fauna-proof containers and disposed of appropriately.	Weekly inspection. Waste disposal records.	Visual inspection. Review of disposal records.	N/A	Weekly.
	Clearing is undertaken progressively in the same direction, reducing the probability of fauna injury or mortality.	Clearing records	Visual inspection.	Construction site boundary.	Weekly
	No clearing of vegetation occurs without a trained fauna spotter in attendance.	Proposed Action clearing permit, signed by Supervisor and fauna spotter.	Visual inspection. Review of written records.	Clearing areas.	Weekly
	No incidents to MNES species due to excavations remaining open.	Daily monitoring for trapped fauna. Records of fauna or fauna fatalities	Visual inspection. Written records.	Construction site boundary (Excavation and trenches areas).	Daily.
	In case of fauna injury, advice undertaken and, if necessary, allocation of rescue animals to an appropriate specialised organisation.	Written records of animal injury or fatalities.	Visual inspection.	N/A	Opportunistic.
	Induction material contains required information.	Induction material contains required information.	Review of written records.	N/A	Weekly.
Avoid indirect impacts to threatened and/or migratory fauna species due to an increase in noise, light and dust emissions.	Noise emissions will be kept at a minimum during daylight hours. No increase in noise will occur during night-time hours.	Noise complaints will be recorded.	Review of written records.	Construction site boundary.	Weekly.
	No light emission will occur after 7 pm or remain in the	Incident reports.	Review of written records. Visual inspection.	Construction site boundary.	Weekly.

Management Objective / Desired Outcome	Performance Target/Completion Criteria	Monitoring/Reporting Activity	Monitoring Method	Monitoring Area	Frequency
	same location for a long period.				
	No excessive dust nuisance events recorded.	Incident reports.	Review of written records. Visual inspection.	Construction site boundary.	Weekly.
Construction – Northern Quoll specific management measures					
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	No clearing to be undertaken in critical habitat until pre-clearance surveys confirm species is not present in the area to be cleared.	Records of pre-clearance surveys.	Visual inspection.	Habitat critical to the survival of the Northern Quoll.	Two weeks prior to clearing commencing.
Construction – Pilbara Olive Phyton's specific management measures					
Avoid injury or mortality to EPBC Act listed threatened species during construction of the Proposed Action.	No clearing to be undertaken in 'Rocky Hills with exposed boulder piles' habitat until surveys confirm species is not present in the area to be cleared.	Records of pre-clearance surveys.	Visual inspection. Review of pre-clearance surveys.	Clearing areas.	Prior commencement of clearing activities.
Operation – General EPBC Act listed threatened and/or Migratory species management					
Minimise disturbance, injury or mortality to EPBC listed threatened and/or migratory species during operation and reduce risk of collision impacts as far as possible.	Minimise the loss of individuals due to transmission line collision.	Incidental records of injury or fauna fatalities during routine maintenance activities. Yearly review of records and maintenance records of line markers.	Visual inspection	Operational area.	In line with maintenance schedule.
	Avoid the introduction and spread of weeds species and maintain weeds register with relevant information.	Implement a quarterly weed monitoring and management program for the first year following completion of ground disturbance activities. Ad-hoc weed checks during operational maintenance activities.	Visual inspection. Review of written records.	Operational area.	Quarterly.

11 Audit and Review

This EMP employs an 'adaptive management' approach, aiming to establish a continuous cycle of monitoring, reporting, and implementation of necessary changes. It is therefore anticipated that this EMP will undergo updates as needed throughout the duration of the Proposed Action to reflect modifications in monitoring and management practices, based on the results of monitoring designed to ensure the achievement of environmental objectives. The EMP may also be revised to incorporate insights gained from the corrective measures that have been undertaken.

Furthermore, audit and review schedules are key to establishing a formal process for identifying and considering any required EMP updates, with the aim of enhancing environmental performance.

11.1 Environmental Monitoring and Auditing

Internal monitoring will be conducted throughout the construction phase of the Proposed Action to assess the environmental aspects outlined in this Plan. Any instances of non-conformance or incidents associated with measures set out in this EMP will be investigated and addressed to minimise potential environmental impacts. Appropriate procedures will be implemented as needed, and refresher training will be conducted to reduce the likelihood of future occurrences.

Horizon Power will conduct annual audits during the construction phase of the Proposed Action to verify the implementation of management and monitoring measures and to ensure that the required management measures are successfully implemented and delivering the intended outcomes.

The proposed auditing schedule for this EMP is identified in **Table 11-1**.

Table 11-1. Environmental audit schedule

Timing	Action	Schedule
Pre-construction	Review of construction procedures to ensure EMP management/monitoring actions are incorporated within works procedures.	Prior to construction (single event)
Construction	Inspections by site environmental personnel to identify compliance with EMP.	Periodic (Weekly)
	Internal audit for assessment of compliance with EMP.	Annually (once per calendar year)
Post construction	Internal audit for assessment of compliance with EMP.	Annually (once per calendar year for up to three years)
Decommissioning	To be determined as part of any future decommissioning plan, which will be in accordance to Horizon Power's standard operating procedures and will be approved by Horizon Power's Manager Sustainability.	To be determined as part of any future decommissioning plan.

11.2 Environmental Management Plan Review

This EMP is intended to be dynamic and may be updated to reflect changes in management practices and the natural environment with time. This will also allow flexibility to adopt new technologies/management measures. Amendments to management actions and targets will be completed on an as needs basis. This will include revision/amendment of management actions that are not achieving the desired outcomes, monitoring identifying additional impacts and management actions, changes to relevant legislation or improvements to practices to achieve a greater environmental outcome.

The EMP will be reviewed by the Project Manager and Manager Sustainability annually during construction to:

- consider the effectiveness / appropriateness of management and monitoring actions;
- consider opportunities for improvement in environmental performance (for example, changes to construction methodology or timing); and
- identify any general need to update this EMP (for example, to capture new information on relevant MNES knowledge or management, or updates to the EPBC Act or Policy Statements).

Horizon Power acknowledges that a revision to this EMP may trigger a need for additional approval by DCCEEW prior to implementing any changes to the specified management or monitoring actions.

12 References

CBG (2020). Horizon Power Burrup Peninsula Transmission Line Archaeological & Ethnographic Survey, Burrup Peninsula, WA – Report, Unpublished report prepared for Horizon Power, dated August 2020.

CoA, 2014. Environmental Management Plan Guidelines, Commonwealth of Australia 2014.

Department of Biodiversity, Conservation and Attractions (DBCA), 2017. Ramsar Sites (DBCA-010). Available at: < https://catalogue.data.wa.gov.au/dataset/ramsar-sites>.

Department of Biodiversity, Conservation and Attractions (DBCA), 2018. Directory of Important Wetlands in Australia - Western Australia (DBCA-045). Available at:< https://catalogue.data.wa.gov.au/dataset/directory-of-important-wetlands-in-western-australia>

Department of Biodiversity, Conservation and Attractions (DBCA) (2022). Priority Ecological Communities for Western Australia Version 33. Species and Communities Program, Department of Biodiversity, Conservation and Attractions, 1 June 2022.

Department of Biodiversity, Conservation and Attractions (DBCA), 2023a. DBCA - Legislated Lands and Waters (DBCA-011). Available at: < https://catalogue.data.wa.gov.au/dataset/dbca-legislated-lands-and-waters>

Department of Biodiversity, Conservation and Attractions (DBCA), 2023b. DBCA - Lands of Interest (DBCA-012). Available at: < https://catalogue.data.wa.gov.au/dataset/dbca-lands-of-interest>

Department of Climate Change, Energy, the Environment and Water (DCCEEW) (2022). National Heritage Places - Dampier Archipelago (including Burrup Peninsula). Retrieved online from: https://www.dcceew.gov.au/parks-heritage/heritage/places/national/dampier-archipelago. Accessed August 2022.

Department of Primary Industries and regional Development (DPIRD), 2004. An inventory and condition survey of the Pilbara region, WA. Available at:< https://library.dpird.wa.gov.au/cgi/viewcontent.cgi?article=1006&context=tech_bull>

Department of Water and Environmental Regulations (DWER), 2018. Directory of Important Wetlands in Australia - Western Australia (DBCA-045). Available at: https://catalogue.data.wa.gov.au/dataset/directory-of-important-wetlands-in-western-australia.

Department of Water and Environmental Regulations (DWER), 2023a. Water Information Reporting. Available at: https://wir.water.wa.gov.au/Pages/Water-Information-Reporting.aspx. Accessed on 23/08/2023

Department of Water and Environmental Regulation (DWER), 2023b. Contaminated Sites Database (DWER-059). Available at: < https://catalogue.data.wa.gov.au/dataset/contaminated-reported-sites-dwer-059>

GHD, 2019. Horizon Power 124-KRT-DMP 132kV Line Upgrade Project (Flora and Fauna Survey).

GHD, 2020a. Horizon Power Burrup Expansion Project (Flora and Vegetation Survey)

GHD, 2020b. Woodside Power Pty Ltd – Hybrid Renewable Power Plant (Fauna Survey)

GHD, 2022. Technical Memorandum – Rev-0 Burrup Additional Areas Reconnaissance/Basic Survey

Scarp Archaeology (2022). Advice of an Archaeological Survey, Horizon Power Burrup Transmission Line Project, Murujuga, Western Australia. Report prepared for Murujuga Aboriginal Corporation and Horizon Power.

Start, A. N. 1996. A Review of the Conservation status of the Ngadji (Western Pebble-mound Mouse) Pseudomys chapmani. Kitchener, 1980 (Rodentia Muridae). Department of Conservation and Land Management Science and Information Division.

Tille, P. (2006). Soil-landscapes of Western Australia's Rangelands and Arid Interior, Resource Management Technical Report 313, Perth, Department of Agriculture and Food.

VLA, 2019. Woodside Power Project Flora and Vegetation Surveys (Desktop assessment report).

Appendix A – Standard Construction Noise Mitigation Measures

Typical noise mitigation measures that will be considered for use on site during the construction phase include the following:

- Working Hours: Restrictions on the timing of works and times when noisy construction activities can occur, especially during night time hours.
- Use of Quieter Plant and Equipment: Opting for modern machinery and equipment that's designed to operate more quietly. Regular maintenance of machinery to prevent rattling and other unnecessary noises.
- Site Layout and Planning: Locating noisy equipment as far away as possible from sensitive receptors (e.g., fauna).
- Noise Monitoring: Using noise monitors to measure levels and ensure they're within acceptable limits. Regular monitoring can help identify issues and adjust practices as necessary.
- Public Communication and Signage: Notifying residents and businesses in advance about noisy activities. Using signage to inform the public about construction times and contact details for complaints or concerns.
- Operational Techniques: Using techniques that reduce noise, such as employing hydraulic, rather than impact, methods. Training workers on best practices for minimizing noise.
- Rescheduling of Noisy Activities: Planning the construction schedule so that the noisiest tasks occur during times when they will cause the least disturbance.
- Vibration Management: Measures can include using equipment that produces less vibration or employing vibration dampening techniques.

Appendix B – Standard Construction Dust Management Measures

Typical dust management measures that will be considered for use on site during the construction phase include the following:

- Water Spraying: Water is an effective suppressant for dust. The surface is sprayed to dampen the soil and bind particles. Regular water spraying is necessary, especially during dry or windy conditions. It's essential to use an appropriate amount; overwatering can cause runoff issues or site stability problems.
- Windbreaks: Windbreaks can be made from a variety of materials, including fabric screens, solid barriers, or even vegetation. By reducing wind speed at ground level, these barriers reduce the potential for soil particles to become airborne. Strategic placement is crucial, usually on the windward side of major dust sources.
- Speed Limits: On unsealed roads, vehicles can generate significant dust. Reducing speeds on site roads limits the disturbance to the surface, resulting in less dust. Signage and enforcement are crucial for this measure to be effective.
- Regular Cleaning: Regularly sweeping and cleaning paved areas can prevent the accumulation of dust. This can be particularly important near public roads or populated areas to prevent spreading of dust.
- Regular Monitoring: Dust monitors, often set up around the site perimeter, measure airborne particle levels. They can provide real-time feedback, triggering additional mitigation measures if levels breach predefined thresholds.
- Vehicle Wheel Wash: These are systems, often near site exits, where vehicle wheels are washed to remove clinging soil or dust. This prevents the spread of site dust onto public roads.
- Training: Workers should be educated about the risks associated with construction dust and trained in mitigation strategies. Proper training ensures that everyone on-site knows their role in dust management.
- Public Communication: Keeping the surrounding community informed reduces complaints and misunderstandings. It's beneficial to establish a point of contact or helpline for concerns related to dust.
- Maintenance of Machinery: Properly maintained machinery operates more efficiently, reducing unnecessary disturbances. It also ensures that dust filters or suppressants built into equipment function optimally.

Appendix C – Horizon Power: Transmission Substation Field Instructions - Vegetation Management and Weed Control in Substations

10.2 Vegetation Management and Weed Control in Substations

Purpose

This instruction outlines the minimum safe working requirements for undertaking:

- Vegetation management work near live and/or de-energised conductors in and around transmission substations.
- Weed control in transmission substations.

Note: This instruction must be read in conjunction with FI 4.3 Substation Clearances, in this manual.
If doing any vegetation management work (not weed control), this instruction must also be read in conjunction with Section 10 Vegetation, in the Network Instruction Manual.

Training

The minimum requirements to do these tasks are listed below.

Weed control

- Successfully complete Substation Entry Level 1 (re-assessed two-yearly). For more on this, see FI 4.1 Substation Entry Requirements..
- Possess a Horizon Power Authorisation Card issued by Horizon Power. For more on this, see FI 1.3 Construction Site Access Minimum Requirements.

Vegetation management

- In addition to meeting the requirements for being able to carry out weed control, anyone doing vegetation management work inside of the substation compound must either:
    - Meet the specific training requirements for a High Voltage vegetation management worker as stated in the Code of Practice for Personnel Electrical Safety for Vegetation Control Work near Live Power lines (July 2012)
    - Be a Cert. III (or equivalent) qualified line worker.

Safety

- Clothing and personal protective equipment (PPE) appropriate to the task and location must be worn. For vegetation management work in transmission substations, the minimum PPE is level 1, see FI 2.6 Worksite Clothing / Personal Protective Equipment Requirements.
- Complete the job briefing process for working on a transmission worksite. For more on this, see FI 2.23 Job Hazard and Risk Assessment (JRA).
- A risk assessment must be done before doing any vegetation work. The risk assessment must consider the site conditions, personnel safety, materials, mobile plant, permits, tools and equipment.

- Depending on the situation, ensure that you consider the use of temporary barriers and signs, see FI 2.15 Temporary Barriers and Signs.
- Comply with all general safety requirements of FI 10.2 Vegetation Management and Weed Control in Substations.
- If the task requires the use of an elevated work platform (EWP), all requirements must be applied, see FI 2.7 Safety Requirements When Working from a EWP.

Safety observer

A safety observer must be appointed when carrying out vegetation management inside the compound of the transmission substations. For details on safety observers, including their training requirements, see:

- FI 2.27 Safety Observer Role.
- Code of Practice for Personnel Electrical Safety for Vegetation Control Work near Live Power lines (July 2012).

Instruction

- All cut vegetation must be removed from site.

Inside the Substation

- Vegetation management in substations differs from vegetation management near overhead power lines. Substation clearances must be adhered to when working in substations. For more on this, see the following tables in FI 5.3 Substation Clearances, in this manual.
    - Table 1: Safety Clearances for U_m less than 245 kV
    - Table 2: Safety Clearances for U_m greater than 245 kV.
- Never breach the section (S) safety clearance when inside a substation unless covered under a permit. The applicable permits are described in Table 1 - Substation Clearances and Permits, below.

Table 1 – Substation Clearances and Permits

Clearance	Permit Required	Other Requirements
Less than work safety clearances vertical and horizontal (**V** or **H**)	Electrical Access Permit (EAP)	Apparatus must be isolated and earthed
Between **V** or **H** and **S**	Vicinity Authority (VA)	-
Greater than **S**	No permit required	-

Weed control

- Use Glyphosate weed killer to retard growth.

Vegetation management

- Cut down all vegetation.

Outside the Substation

Note: When vegetation is cut outside of the substation fence, all safety and minimum approach distance requirements of Section 10 Vegetation Management Work, in the Network Instruction Manual must be adhered to.

Vegetation Management

- A minimum three metre gap must be maintained between vegetation and the substation boundary (e.g. fence).
- The vegetation must be cut back to a distance so that it cannot be climbed and used to access the substation.
- Lower tree branches must be pruned at least two metres off the ground to stop surface fires spreading to trees.

References

Transmission Substation Field Instruction Manual:

- FI 2.15 Temporary Barriers and Signs
- FI 2.23 Job hazard and Risk Assessment (JRA)
- FI 2.6 Worksite Clothing / Personal Protection Equipment Requirements
- FI 2.27 Safety Observer Role
- FI 4.1 Substation Entry Requirements
- FI 4.3 Substations Clearances
- FI 2.7 Safety Requirements When Working From an EWP

Code of Practice for Personnel Electrical Safety for Vegetation Control Work near Live Power lines (July 2012)

Appendix D – Horizon Power: Technical Maintenance Guide - Overhead Network Visual Inspections

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Technical Maintenance Guide: Overhead Network Visual Inspections (Major) & Pillars

Standard Number: HPC-2NK-17-0016-2014

Document Control			
Author	**Name:** **Position:**	Tharindu Kolambage Reliability Engineer	 04/12/2020
Reviewed By	**Name:** **Position:**	Bill Bignell A/System Performance Manager	
Document Owner *(May also be the Process Owner)*	**Name:** **Position:**	Bill Bignell A/System Performance Manager	
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Date Created/Last Updated	December 2020		
Review Frequency **	5 yearly		
Next Review Date **	December 2025		

** Shall be the Process Owner and is the person assigned authority and responsibility for managing the whole process, end-to-end, which may extend across more than one division and/or functions, in order to deliver agreed business results.*

*** Frequency period is dependent upon circumstances– maximum is 5 years from last issue, review, or revision whichever is the latest. If left blank, the default shall be 1 year unless otherwise specified.*

Revision Control		
Revision	**Date**	**Description**
1	07/11/2014	Initial Document Creation
2	27/05/2016	First Revision
3	03/08/2016	Reformatted
4	27/11/2017	Minor error corrected
5	01/12/2020	Updated with revised template, Pillar information added

STAKEHOLDERS *The following positions shall be consulted if an update or review is required:*	
Manager Asset Services	Asset Managers
System Performance Manager	Works Delivery Managers

TABLE OF CONTENTS

1 SCOPE

1.1 Application

This guideline is applicable to Horizon Power's overhead distribution system and pillars.

The Condition Assesment Guide [7] and following TMG's have been developed to assist in the detailed inspection, maintenance and/or testing of Horizon Power overhead assets and should be referred to for more detailed information:

- HPC-2NK-17-0001-2014 - TMG - Maintenance for PTS and Disconnector Maintenance [9]
- HPC-2NK-17-0002-2014 - TMG - Maintenance Equipment Earthing [10]
- HPC-2NK-17-0007-2014 - TMG - Steel Pole Assessment [11]
- HPC-2NK-17-0010-2016 - TMG - Maintenance for Thermographic Surveys [12]
- HPC-2NK-17-0014-2014 - TMG - Reclosers, LBS and Sectionaliser [13]
- HPC-2NK-17-0017-2014 - TMG - Street Light Patrols [14]
- HPC-2NK-17-0018-2014 - TMG - Wood Pole Assessment [15]
- HPC-2NK-17-0025-2014 - TMG - Overhead Conductor and Accessories (Horizon Powers Conductor Visual Assessment Guide) [16]
- HPC-2NK-17-0028-2017 - TMG - Concrete Pole Assessment [17]
- HPC-2NK-17-0033-2019 - TMG - Bushfire/Vegetation Management [18]

1.2 Function

Overhead Network Visual Inspections (Major) and pillar inspections intended to periodically survey, locate and record defects in assets that may cause public safety or service reliability issues in the immediate future. The survey quickly and efficiently locates defects that are likely to impact customers. It provides confidence in the overall stability of networks and electricity infrastructure.

1.3 Special Requirements

For all the maintenance planning and scheduling considerations refer to TMG – General Considerations for Planned Maintenance Activities [8].

1.3.1 Patrol Equipment

The following equipment is the minimum required for undertaking of Asset Patrols:

- Fieldreach tablet;
- Binoculars, preferably image stabilised;
- Digital camera (Preferably use a >30 optical zoom image stabilised)

2 METHODOLOGY

Overhead Network Visual Inspections (Major) and Pillar inspections are carried out periodically to identify defects that may impact the proper functioning and advanced deterioration of equipment. This involves identification of the following issues by observation:

- **Physical damage:** Corrosion, breakages, split, major cracks or dents, fire damage, leaning pole / equipment, broken insulators, mounts, pole mount equipment separating from the pole.
- **Environmental issues:** Animal electrocutions, insufficient animal clearances, graffiti / vandalism or objects wrapped around lines or stuck up poles and foundation erosion.
- **Electrical issues:** Broken or heavily corroded wires or parts, damaged insulation, wire ties broken, evidence of loose joints, oil leaking, arcing or damage caused by electrical discharge.
- **Mechanical issues:** Missing bolts, poor standards of workmanship, missing LV spreaders, Operator handles missing, broken or unlocked.
- **Tripped or near tripped protection:** Tripped DoFs or blades, low gas or oil levels (where visible).
- **Standards:** Incorrect standards.
- **Vegetation or junk:** encroaching on lines or equipment, fire hazards or junk near HP equipment.
- **Clearances:** Conductor horizontal and vertical separation, overhead conductors too close to new structures that may have been erected since last inspection, conductors too close to ground, vertical spacing of conductors of different circuits. Consideration to ambient operating temperature at the time of the inspection should be given. For example, a conductor's clearance may be within limits during cold weather, but may exceed limits during hot weather.
- **Obvious safety issues:** heavily corroded, termite damaged or rotted poles where these have been missed by the pole inspection process, unfinished earthing or obvious earthing problems (such as earth braids hanging down), danger labels missing or illegible on HV equipment, unprotected, unearthed conductive poles in heavily trafficked areas, missing covers or exposed wiring.

2.1 Poles and Pole Hardware

2.1.1 Poles

We should only be addressing these issues if they have deteriorate significantly since the last pole inspection or the pole has not been inspected.

- Check pole top and base for signs of physical damage and fire.
- Check foundations for subsidence due to erosion or incorrect backfill, structural stability (leaning).
- Check for obstruction, trash or excessive vegetation at base. Poles and equipment should be accessible.
- Check for birds nests or bee hives at pole top.
- Check for loose, missing or corroded earthing connections and leads.
- Check for danger label, pole ID or illegible Asset ID tags and make repairs/replace as far as reasonably practicable and capture changes.
- Check reinforcing for corrosion and loose components.
- Check condition of anti-climbing guards to poles with mounted equipment.

Address the below issues if there is significant deterioration since the last pole inspection/testing or the pole has not been inspected/tested under the program.

- Check wood poles for
    - deterioration due to internal and external rot decay.
    - termites.
    - fruiting fungus.
    - missing or deteriorated pole cap.
    - splits.
- Check steel poles for corrosion.
- Check concrete poles for
    - loose, cracked, chipped or missing concrete.
    - vertical cracking.

2.1.2 Stays

Stay poles should be checked as per poles (Section 2.1.1) above.

- Check for loose stay wires.
- Check for damaged(broken strands) or corroded stay wires.
- Check for damaged or corroded stay rods.
- Check stay rod installed for correct depth.
- Check for loose, corroded, damaged, missing fittings and connections.
- Check for cracked, chipped or broken insulators.
- Check damaged or missing stay guards.
- Check for locational issues, such as a change in surroundings that could result is public interference.
- Check for Non standard stay wire installs (leaving excess stay wire tails).

2.1.3 Cross Arms

- Check for bent or twisted crossarms.
- Check for loose crossarms.
- Check for loose, corroded or missing hardware on crossarms.
- Check wood cross arms for
    - burnt and electrical tracking.

    - decay, weathering and deterioration, fungal fruiting.
    - rot.
    - termites.
    - cracks and splits.
- Check composite cross arms for
    - burnt and electrical tracking.
    - UV deterioration, degradation or deformation.
- Check steel cross arms for
    - signs of corrosion
    - Extended holes caused by insulator hook

2.1.4 Insulators

- Check for signs of tracking or arcing (carbon deposits), heavy pollution build-up.
- Check the condition of tie wires for corrosion and looseness.
- Check for corroded, loose or missing fixings, ties, clamp fittings, nuts and bolts.
- Check porcelain insulators for obvious signs of damage such as cracking, chipping, crazing (fine cracks on the surface of a material) and holes.
- Check composite insulators for signs of:
    - debonding or delamination of the outer layer from the core.
    - damage to the sheds by wildlife, punctures, cracking, splitting.
    - deterioration or degradation.
- Check post (pin) insulators for obvious signs of leaning.

2.2 Pole Mounted Equipment

2.2.1 Distribution Transformers, Metering Transformers, Capacitors and Reactors

- Check for physical damage, corrosion to housing, peeling/flaking/bubbling paint or oil leaks.
- Check for loose, corroded or missing mountings or nuts.
- Check bushings for dirt build-up or damage
- Check condition of surge arresters (as noted in Section 2.2.2).
- Check the earthing system (as noted in Section 2.2.3).
- For Distribution Transformers also check;
    - obvious clearance issues between HV taps and other apparatus.
    - insulation on LV taps for evidence of burning from overloading.

2.2.2 Surge Arresters (Surge Diverters)

- Check for obvious physical damage, deformation or discolouration.
- Check for dirt build-up or damage to sheds, tracking, arcing or rupture to outer sheath.
- Check for loose, corroded or missing mountings or nuts.
- Check for loose or corroded earthing connections and leads (as noted in Section 2.2.3).

2.2.3 Earthing System

- Check for exposed earth stakes at ground.
- Check for subsidence around earth mat for exposure of earth cables.
- Check earth pit for damage, missing parts and buried to incorrect depth.
- Check all earth conductors, braids and bonds for evidence of:
    - Physical damage, breaks, corrosion, or deterioration.

- Loose, missing, damaged or corroded connections.
- Loose, missing or damaged cover guards.
- Burnt or damaged insulation (e.g. insulated down earth).

2.2.4 Cable Pole Terminations

- Check for signs of obvious damage or deformation, UV degradation, damaged sheds (splitting, cracking, cuts, wildlife), tracking or flashovers and loose or corroded fixings.
- Check cable for external sheath damage, damage from unprotected rubbing on sharp edges, damage caused by fauna and condition of cable guard.

2.2.5 Fuse Boxes

- Inspect for signs of external damage, UV deterioration and degradation.
- Check adequacy of fixing/mounting bracket, cable condition entering box.

2.3 Street Lighting

- Check wood and steel poles as per Section 2.1.1.
- Check street light number is recorded on pole ID plate.
- Check if the light is ON during daytime (day burner).
- Check mountings and fixings for wood street poles are intact, no missing components and free of damage and corrosion.
- Check light lens is clear.
- Check visible connections are intact and free of damage or corrosion.
- Check Inspection plate for damage, corrosion and missing parts.
- Check control boxes for damage and corrosion and missing components.

2.4 Conductors and Accessories

Check for typical indicators of potential conductor failures that can be detected. Deterioration, Physical damage, Broken strands, bird caging, surface discolouration, significant surface and core corrosion(Al oxide build up indicating ACSR core corrosion), major pitting/flaking, excessive sag, signs of arcing or clashed surfaces. Also check for obvious encroachment of vegetation and foreign objects.

Check Ties, Joints and splices, Armour rods, Terminations and Conductor Connections for deterioration, Physical damage, discolouration and significant corrosion. Refer to Visual Conductor Assessment Guide [4] for more details.

2.4.1 Low Voltage Aerial Bundled Cable (LV ABC)

Refer to Low Voltage Aerial Bundled Cable Manual [4] for more details on ABC conductors and accessories.

- Check for signs of degradation or deterioration of the insulation material, particularly at points of support or where rubbing may occur.
- Check mounting hardware for damage, corrosion, loose or missing fixings.
- Check for obvious encroachment of vegetation – minimum clearance should be 0.3m. [18]

2.4.2 Customer Service Wires

- Check height of service wire above roadway, report suspected low services [6].
- Check for deteriorated/damaged service wires.

- Check that there are no open wire services or PVC insulated services.
- Check for damaged wedge clamps.
- Check insulators are utilised in conjunction with pre-formed terminations (dead-ends) and that each termination is properly located on its insulator.
- Check for damaged Mains Connection Boxes (MCBs), missing MCB covers and MCBs pulling away from house.
- Check for obvious encroachment of vegetation – minimum clearance should be 0.3m. [18]

2.4.3 Bird/Bat Covers (Wildlife Proofing)

Bird and animal covers are required in situations where there are short distances between conductors at different voltages or between lines, links, etc and earthed structures or different energised conductors.

Each situation can be different and has to do not only with the clearances but also the species of animals that frequent the pole tops and their size and wingspan.

- Check for damage, signs of degradation or deterioration.
- Check for loose or missing fixings.
- Check for animal remains at base of pole or hanging from lines or poles.
- Check for animal nests, hives.

2.4.4 Fault Indicators

- Inspect for signs of physical damage, maloperation.

2.4.5 Spreader Rods

- Check for deterioration due to weathering, age and UV exposure.
- Check for spreader rod clips damaging the conductors.

2.5 Switching and Fuses

2.5.1 Open Switches

Open switches includes equipment such as Pole Top Switches (PTS), Isolators and HV/LV Disconnectors.

- Check insulator condition (as noted in Section 2.1.4).
- Check for loose and corroded mounting brackets.
- Check Pole Top Switch for
    - signs of damage, corrosion, burning to contacts and blade alignment.
    - Condition of hinged parts such as operating handles, pivot points, joints and clamps.
    - incorrect or missing fixings (ie: bolts, retaining spring used in the flexi tail).
    - arc breaking bar/spring assembly is intact.
    - support springs are fitted to flexible braids and braids are intact and in good condition.
    - operating handle installed in the correct position, lock is placed and any damages to the handle.
    - earthing connections and leads and earth mat is visible.
- Check Drop out Fuse (DoF) for
    - Blown fuses.

    - signs of damage, corrosion, alignment of contacts, contact engagement and tube deterioration.
    - damage to the pivot point and ensure greased correctly.
- Check HV disconnector for corrosion of support assembly(assembly is greased)
- Check LV disconnectors for
    - Corrosion on links.
    - galvanised steel supports for copper busbar switch assembly, pivots and contacts are greased.
    - fuses or solid links fitted to tray of ABC fuse units at normal open points.

2.5.2 Enclosed Switches

Enclosed switches includes equipment such as Load Break Switches (LBS), Reclosers and Sectionalisers.

- Inspect for corrosion to the housing.
- Check for loose mounting bracket.
- Check oil levels and for oil leaks (for oil filled equipment), low gas levels (for SF6 filled equipment).
- Check for damaged bushings and signs of tracking or arcing (carbon deposits).
- Check for deterioration on the terminations.
- Check condition and completeness of earthing connections and leads.

2.5.3 Fuse Savers

- Check for signs of tracking or arcing (carbon deposits) as well as damage to the sheds by wildlife or debonding of outer sheath
- Check for loose, missing or corrosion in clamp fittings and nuts.

2.6 Pillars

- Visually inspect for signs of deterioration, physical damage and fire.
- Inspect foundations for erosion and subsidence, structural stability (leaning).
- Check for obstruction, pillar buried too deep, trash or excessive vegetation. Pillar should be fully accessible.
- Check for missing Lid Retainer screw.

3 CHECKLIST

3.1 Activity 1 – Poles and Pole Equipment

Asset	Scope	Checklist						
Identify assets	Identify the correct pole with associated assets to be inspected and record the pole number	Pole No.						
			(a)	(b)	(c)	(d)	(e)	(f)
Pole	Check for signs of physical damage and fire (both pole top and at base)	Condition: Good ✓ Bad ×						
	Inspect foundations for subsidence due to erosion or incorrect backfill, structural stability (leaning)	Condition: Good ✓ Bad ×						
	Check for obstruction, trash or excessive vegetation at base	Condition: Good ✓ Bad ×						
	Check for birds nests/ bee hives at pole top	Condition: Good ✓ Bad ×						
	Check for loose, missing or corroded earthing connections and leads	Condition: Good ✓ Bad ×						
	Check for missing danger labels or signs or illegible Asset ID tags.	Condition: Good ✓ Bad ×						
	Check pole reinforcing fixings and for corrosion	Condition: Good ✓ Bad ×						
	Check condition of anti-climbing guards to poles with mounted equipment	Condition: Good ✓ Bad ×						
	Check wood poles for termite damage, fungus and rot or missing pole cap	Condition: Good ✓ Bad ×						
	Check for damage or corrosion to steel poles	Condition: Good ✓ Bad ×						
	Check concrete poles for loose, cracked, chipped or missing concrete	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Stay	Check pole as per Activity 2.1.1	Complete ✓						
	Check for loose stay wires	Condition: Good ✓ Bad ×						
	Check for damages (broken strands) or corroded stay wires	Condition: Good ✓ Bad ×						
	Check for damaged or corroded stay rods	Condition: Good ✓ Bad ×						
	Check stay rod installed for correct depth	Condition: Good ✓ Bad ×						
	Check for loose, corroded, damaged, missing fittings and connections	Condition: Good ✓ Bad ×						
	Check for cracked, chipped or broken insulators	Condition: Good ✓ Bad ×						
	Check for missing stay guards	Condition: Good ✓ Bad ×						
	Check for locational issues, such as a change in surroundings that could result is public interference.	Condition: Good ✓ Bad ×						
	Check for non standard stay wire installs	Condition: Good ✓ Bad ×						

Asset	Scope	Checklist						
	If defects are found then comment in the table below 3.7	Follow up						
Cross Arms	Check for bent or twisted crossarms	Condition: Good ✓ Bad ×						
	Check for loose crossarms	Condition: Good ✓ Bad ×						
	Check for loose, corroded or missing hardware	Condition: Good ✓ Bad ×						
	Check wood crossarms for burnt, tracking marks, decay, rot, termites, cracks and splits	Condition: Good ✓ Bad ×						
	Check composite cross arms for burnt, tracking marks, deterioration or deformation	Condition: Good ✓ Bad ×						
	Check steel crossarms for corrossion and damage	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Insulators	Check for signs of tracking or arcing	Condition: Good ✓ Bad ×						
	Check the condition of tie wires	Condition: Good ✓ Bad ×						
	Check for corroded, loose or missing fixings	Condition: Good ✓ Bad ×						
	Check porcelain insulators for signs of damage such as cracking, chipping, crazing and holes	Condition: Good ✓ Bad ×						
	Check composite insulators for signs of debonding or delamination of the outer layer from the core. Damage to the sheds by wildlife, punctures, cracking, splitting, deterioration or degradation.	Condition: Good ✓ Bad ×						
	Check post (pin) insulators for obvious signs of leaning	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						

3.2 Activity 2 – Pole Mounted Equipment

Step	Scope	Checklist						
Identify assets	Identify the correct pole with associated assets to be inspected. Pole number or Asset number	Pole No. / Asset Number						
			(a)	(b)	(c)	(d)	(e)	(f)
Distribution Transformers, Metering Transformers, Capacitors and Reactors	Inspect for physical damage, corrosion to housing, peeling/flaking/bubbling paint or oil leaks	Condition: Good ✓ Bad ×						
	Check for loose, corroded or missing mountings or nuts	Condition: Good ✓ Bad ×						
	Inspect bushings for dirt build-up or damage	Condition: Good ✓ Bad ×						
	Check completeness of earthing	Condition: Good ✓ Bad ×						
	Check condition of surge arresters	Condition: Good ✓ Bad ×						
	Check Transformers for clearance issues between HV taps and other apparatus, Insulation on LV taps for evidence of burning from overloading	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Surge Arresters (Surge Diverters)	Inspect for obvious physical damage, deformation or discolouration	Condition: Good ✓ Bad ×						
	Check for dirt build-up on or damage to sheds, tracking, arcing or rupture to outer sheath	Condition: Good ✓ Bad ×						
	Check for loose, corroded or missing mountings or nuts, loose or corroded earthing connections and leads	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Earthing System	Check for exposed earth stakes at ground	Condition: Good ✓ Bad ×						
	Check for subsidence around earth mat	Condition: Good ✓ Bad ×						
	Check for earth pit damage, missing parts and buries to incorrect depth	Condition: Good ✓ Bad ×						
	Check all earth conductors, braids and bonds for evidence of physical damage, breaks, corrosion, or deterioration. Loose, missing, damaged or corroded cover guards, connections, Burnt or damaged insulation	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Cable Pole Terminations	Check for signs of obvious damage or deformation, UV degradation, damaged sheds (splitting, cracking, cuts, wildlife), tracking or flashovers and loose or corroded fixings.	Condition: Good ✓ Bad ×						
	The cable should be inspected for external sheath damage, damage from unprotected rubbing on sharp edges, damage caused by fauna and condition of cable guard	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Fuse Boxes	Inspect for signs of external damage, UV deterioration and degradation	Condition: Good ✓ Bad ×						
	Check adequacy of fixing/mounting bracket, cable condition entering box	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						

3.3 Activity 3 – Street Lighting

Step	Scope	Checklist						
Identify assets	Identify the correct pole with associated assets to be inspected. Pole number	Pole No.						
			(a)	(b)	(c)	(d)	(e)	(f)
Street Lighting	Check pole as per Activity 2.1.1	Complete ✓						
	Check street light number is recorded on pole ID plate.	Condition: Good ✓ Bad ×						
	Check if the light is ON during the daytime	Condition: Good ✓ Bad ×						
	Check mountings and fixings for wood street poles are complete, intact and free of damage and corrosion.	Condition: Good ✓ Bad ×						
	Check light lens is clear.	Condition: Good ✓ Bad ×						
	Check visible connections are intact and free of damage or corrosion.	Condition: Good ✓ Bad ×						
	Check inspection plate for damage, corrosion and missing parts.	Condition: Good ✓ Bad ×						
	Check condition of control boxes for damage, corrosion and missing components.	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						

3.4 Activity 4 – Conductors and Accessories

Step	Scope	Checklist						
Identify assets	Identify the correct pole with associated assets to be inspected. Pole number	Pole No.						
			(a)	(b)	(c)	(d)	(e)	(f)
Low Voltage Aerial Bundled Cable (LV ABC)	Check for signs of degradation or deterioration of the insulation material, particularly at points of support or where rubbing may occur	Condition: Good ✓ Bad ×						
	Check the condition of mounting hardware	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Customer Service Wires	Check height of service wire above roadway. Measure height of suspected low services and report.	Condition: Good ✓ Bad ×						
	Check for deteriorated/damaged service wires	Condition: Good ✓ Bad ×						
	Check that there are no open wire services or PVC insulated services.	Condition: Good ✓ Bad ×						
	Check condition of wedge clamps.	Condition: Good ✓ Bad ×						
	Check insulators are utilised in conjunction with pre-formed terminations (dead-ends) and that each termination is properly located on its insulator.	Condition: Good ✓ Bad ×						
	Check for damaged mains connection boxes, looking for missing MCB covers and that it is not pulling away from house.	Condition: Good ✓ Bad ×						
	Check vegetation is clear of service wire	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Bird/Bat Covers	Inspect for damage, signs of degradation or deterioration.	Condition: Good ✓ Bad ×						
	Check for looseness of fitting and insect nests.	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Fault Indicators	Inspect for signs of physical damage, maloperation	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Spreader Rods	Check for deterioration and spreader rod clips damaging the conductor	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						

3.5 Activity 5 – Switching and Fuses

Step	Scope	Checklist						
Identify assets	Identify the correct pole with associated assets to be inspected. • Pole number, or • Asset number	Pole No. / Asset Number						
			(a)	(b)	(c)	(d)	(e)	(f)
Open Switches (Pole Tops Switches, Isolators, HV/LV Disconnectors)	Check insulator condition Check for signs of corrosion, burning to contacts and blade alignment.	Condition: Good ✓ Bad ×						
	Check for loose and corroded mounting brackets	Condition: Good ✓ Bad ×						
Pole Top Switch	Check for signs of damage, burning to contacts and blade alignment	Condition: Good ✓ Bad ×						
	Check condition of hinged parts such as operating handles, pivot points, joints and clamps.	Condition: Good ✓ Bad ×						
	Check for incorrect or missing fixings	Condition: Good ✓ Bad ×						
	Check arc breaking bar/spring assembly is intact.	Condition: Good ✓ Bad ×						
	Check support springs are fitted to flexible braids and braids are intact	Condition: Good ✓ Bad ×						
	Check operating handle installed in the correct position, lock is placed and any damage to the handle	Condition: Good ✓ Bad ×						
	Check earthing connections, leads, earth mat is visible.	Condition: Good ✓ Bad ×						
Drop Out Fuses (DOF)	Check for Blown fuses	Condition: Good ✓ Bad ×						
	Check for signs of corrosion, alignment, contact engagement and tube deterioration.	Condition: Good ✓ Bad ×						
	Check for damage to the pivot point and ensure greased correctly	Condition: Good ✓ Bad ×						
HV Disconnectors	Check disconnector for corrosion of support assembly, assembly is greased.	Condition: Good ✓ Bad ×						
LV Disconnectors	Check for corrosion on links	Condition: Good ✓ Bad ×						
	Check galvanised steel supports for copper busbar switch assembly, pivots and contacts are greased.	Condition: Good ✓ Bad ×						
	Check fuses or solid links fitted to tray of ABC fuse units at normal open points.	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Enclosed Switches (Load break Switches, Reclosers, Sectionalisers)	Inspect for corrosion to the housing.	Condition: Good ✓ Bad ×						
	Check for loose mounting bracket	Condition: Good ✓ Bad ×						
	Check oil levels and for oil leaks (for oil filled equipment), low gas levels (for SF6 filled equipment).	Condition: Good ✓ Bad ×						
	Check for damaged bushings and signs of tracking or arcing (carbon deposits).	Condition: Good ✓ Bad ×						
	Check for deterioration on the terminations	Condition: Good ✓ Bad ×						

Step	Scope	Checklist						
	Check condition and completeness of earthing connections and leads	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						
Fuse Savers	Inspect for signs of tracking or arcing (carbon deposits) as well as damage to the sheds by wildlife or debonding of outer sheath.	Condition: Good ✓ Bad ×						
	Check for loose or missing clamp fittings and nuts, corrosion.	Condition: Good ✓ Bad ×						
	If defects are found then comment in the table below 3.7	Follow up						

3.6 Activity 6 – Pillars

Step	Scope	Checklist
External Visual Inspection	Check for signs of deterioration, physical damage and fire.	☐ Satisfactory ☐ Unsatisfactory
	Check foundations for erosion and subsidence, structural stability (leaning).	☐ Satisfactory ☐ Unsatisfactory
	Check for obstruction, pillar buried too deep, trash or excessive vegetation at base. Pillar should be fully accessible.	☐ Satisfactory ☐ Unsatisfactory
	Check for missing Lid Retainer screw.	☐ Satisfactory ☐ Unsatisfactory

3.7 Follow Up Actions Items

Action Required	Responsible

Name: _____Signature:_____Date:___/___/___

4 REFERENCE INFORMATION

4.1 Abbreviations and Definitions

Term	Definition
ACSR	Aluminium conductor steel-reinforced
AL	Aluminium
Composite insulator	An insulator that is made of two insulating parts, a core (typically fibre-resin), and a housing (typically elastomer)
crazing	The formation of fine surface cracks which are visible but are not detectable by touch (typically less than 0.1 mm deep)
Dead	Isolated, proved de-energised and earthed
ENSMS	Horizon Power Electricity Network Safety Management System
MST	Maintenance Scheduled Task
HIM	Horizon Power Network Instruction Manual
Polymer insulator	A non-ceramic insulator, either the resin composite type
shall	Indicates a mandatory requirement
SHMS	Horizon Power Safety and Health Management System [3]
should	Indicates an advisory statement
The Zone	Horizon Power intranet interface for the Safety and Health Management System (SHMS)
TMG	Technical Maintenance Guideline

4.2 Horizon Power Referenced Documents

[1] Horizon Power Instructions Manual

https://horizonpower.com.au/contractors-suppliers/contractors/manuals-and-standards/horizon-power-instructions-manual/

[2] Electricity Network Safety Management System ENSMS

[3] Safety and Health Management System (SHMS)

[4] Visual Conductor Assessment Guide DM# 5277783

[5] Low Voltage Aerial Bundled Cable Manual DM# 2369134

[6] Distribution Design Rules DM# 4777319

[7] Condition Assessment Guide DM# 19522866

[8] HPC-2NK-28-0001-2020 General Considerations for Planned Maintenance Activities, DM# 16066722

[9] HPC-2NK-17-0001-2014 - TMG - Maintenance for PTS and Disconnector Maintenance, DM# 4137031

[10] HPC-2NK-17-0002-2014 - TMG - Maintenance Equipment Earthing, DM# 4064717

[11] HPC-2NK-17-0007-2014 - TMG - Steel Pole Assessment, DM# 1573180

[12] HPC-2NK-17-0010-2016 - TMG - Maintenance for Thermographic Surveys, DM# 4086819

[13] HPC-2NK-17-0014-2014 - TMG - Reclosers, LBS and Sectionaliser, DM# 4136169

[14] HPC-2NK-17-0017-2014 - TMG - Street Light Patrols, DM# 3839107

[15] HPC-2NK-17-0018-2014 - TMG - Wood Pole Assessment, DM# 1569220

[16] HPC-2NK-17-0025-2014 - TMG - Overhead Conductor and Accessories (Horizon Powers Conductor Visual Assessment Guide) , DM# 3310533

[17] HPC-2NK-17-0028-2017 - TMG - Concrete Pole Assessment, DM# 5251581

[18] HPC-2NK-17-0033-2019 - TMG - Bushfire/Vegetation Management, DM# 14059154

APPENDIX A REVISION INFORMATION

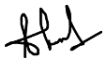
(Informative) Horizon Power has endeavoured to provide standards of the highest quality and would appreciate notification if any errors are found or even queries raised.

Each Standard makes use of its own comment sheet which is maintained throughout the life of the standard, which lists all comments made by stakeholders regarding the standard.

A comment sheet HPC-2NK-17-0016-COM found in **DM#** 4074700, can be used to record any errors or queries found in or pertaining to this standard, which can then be addressed whenever the standard gets reviewed.

Technical Maintenance Guide: Network Visual Inspections (Minor)

Standard Number: HPC-2NK-17-0032-2020

Document Control			
Rev. Author	**Name:** **Position:**	Tharindu Kolambage Reliability Engineer	
Reviewed By	**Name:** **Position:**	Neetha Lakshman System Performance Manager	
Document Owner *(May also be the Process Owner)*	**Name:** **Position:**	Neetha Lakshman System Performance Manager	
Approved By *	**Name:** **Position:**	Mark Herbert Manager Asset Services	
Date Created/Last Updated	October 2021		
Review Frequency **	5 yearly		
Next Review Date **	October 2026		

** Shall be the Process Owner and is the person assigned authority and responsibility for managing the whole process, end-to-end, which may extend across more than one division and/or functions, in order to deliver agreed business results.*

** This person will have the power to grant the process owner the authority and responsibility to manage the process from end to end.*

*** Frequency period is dependent upon circumstances– maximum is 5 years from last issue, review, or revision whichever is the latest. If left blank, the default shall be 1 year unless otherwise specified.*

Date	Rev No.	Notes
15/03/2020	1	Document Creation
14/09/2021	2	Minor content amendment

STAKEHOLDERS *The following positions shall be consulted if an update or review is required:*	
Manager Asset Services	Regional Asset Managers
Manager System Performance	Works Delivery Managers

TABLE OF CONTENTS

1 SCOPE

1.1 Application

This guideline is applicable to Horizon Power's distribution system.

1.2 Asset Patrol - Minor Visual Inspection Function

Minor inspection is a quick visual network inspection to identify obvious defects that are likely to cause public safety or service reliability issues in the immediate future.

It is undertaken between the more detailed network asset inspection to provide confidence in the overall stability of networks and electricity infrastructure.

1.3 Special Requirements

For all the general maintenance planning and scheduling considerations refer to TMG – General Considerations for Planned Maintenance Activities [6].

Refer to MST frequency guideline[5] for scheduling inspection frequencies.

1.3.1 Patrols from a Vehicle

Refer to HIM [1] FI 2.20, Traffic Management, for traffic management requirements.

1.3.2 Patrol Equipment

The following equipment is the minimum required for undertaking of Asset Patrols – Minor Inspection:

- FieldReach tablet
- Optional - Binoculars, preferably image stabilised;

2 ASSET PATROL METHODOLOGY

2.1 Inspection Recording

2.1.1 Electronic

Where practicable, Asset Patrols should be undertaken using FieldReach tablets to **record obvious defects by exception only**.

Recording of defects in this way allows for a quick overview of the network without the rigour of a full inspection.

2.1.2 Photographs

Photographs should be captured using the FieldReach tablet when raising a defect on an asset.

2.2 Asset Patrol – Minor Visual Inspection Guidance

Asset patrols involve identification of the undermentioned issues by observation:

- Physical damage: such as breakages, splits, major cracks or dents, fire damage, paint peeling/flaking/bubbling, leaning pole/equipment, broken insulators and mounts, pole mount equipment separating from the pole.

- Environmental issues: such as animal electrocutions, insufficient animal clearances, graffiti/vandalism or objects wrapped around lines or stuck-up poles, foundation erosion (usually causing leaning).

- Electrical issues: such as broken or heavily corroded wires or parts, damaged insulation, wire ties broken, evidence of loose joints, oil leaking, arcing or damage caused by electrical discharge.

- Mechanical issues: Missing or broken or unlocked Operator handles, Unlocked or broken/ Impact damage on RMU, Transformer, kiosk or pillars.

- Tripped or near tripped protection: tripped DoFs or blades, low gas or oil levels (where visible).

- Vegetation or junk: encroaching on lines or equipment, fire hazards or junk near HP equipment.

- Obvious clearance violations (refer to AS 7000 [7]): conductor horizontal and vertical separation, overhead conductors too close to new structures that may have been erected since last inspection, conductors too close to ground.

- Obvious safety issues: heavily corroded, termite damaged or rotted poles, unfinished earthing or obvious earthing problems (such as earth braids hanging down), unprotected conductive poles in heavily trafficked areas, missing covers or exposed wiring.

2.2.1 Overhead Equipment

Equipment to be visually inspected for obvious defects. Below tasks are a guidance only.

Equipment to be visually inspected	Tasks
Poles and Pole Hardware (Poles, Reinforcing, Stays, Cross Arms, Insulators and ties)	• Check for pole top and base for signs of physical damage and fire. • Check for leaning, breakages, major splits/cracks or dents. • Check for foundation erosion (usually causing leaning). • Check for broken or heavily corroded wires or parts, damaged components, arcing or damage caused by electrical discharge. • Check for heavy vegetation or junk around poles. • Check for fire hazards. • Check for obvious safety issues. Heavily corroded, termite damaged or rotted poles, unfinished earthing or obvious earthing problems (such as earth braids hanging down), unprotected conductive poles in heavily trafficked areas, missing covers or exposed wiring.
Pole Mounted Equipment (Pole Mounted Distribution Transformers, Capacitors and Reactors, Surge Arresters, Earthing Down Leads, Cable Pole Terminations, Krone boxes)	• Check for physical damage, heavy corrosion, peeling/flaking/bubbling paint or oil leaks. • Check for loose or missing components. • Check bushings damage. • Check the earthing system for safety issues. • Check control boxes for damage and missing components.
Street Lighting (Poles, Inspection plates, Lens cover, Anti-vandal guard)	• Check streetlight poles for signs of physical damage. • Check for extensive corrosion particularly at ground line • Check if the light is ON during daytime (day burner). • Check visible connections are intact and free of damage. • Check for damage and missing parts.
Conductors and Accessories	• Check for indicators of obvious conductor failures that can be detected such as deterioration, physical damage, broken strands, bird caging, significant surface corrosion and discolouration. • Check for obvious encroachment of vegetation and foreign objects. • Check Ties, Joints and splices, Armour rods, Terminations and Conductor Connections for obvious defects. • Check for obvious clearance violations.

Equipment to be visually inspected	Tasks
Switching and Fuses Open switches - Pole Top Switches, Isolators, HV/LV Disconnectors Enclosed Switches - Load Break Switches, Reclosers, Sectionalisers	• Check for signs of damage, broken or missing items (without requiring accessing cabinets). • Check for environmental issues such as animal electrocutions. • Check for oil leaking, arcing or damage caused by electrical discharge. • Checked for tripped protection. • Check for fire hazards. • Check for obvious earthing problems.

2.2.2 Underground Equipment

Equipment to be visually inspected for obvious defects without accessing internals. Below tasks are a guidance only.

Equipment to be visually inspected	Tasks
Pillars	• Check for signs of physical damage and fire. • Check for erosion and subsidence, structural stability (leaning). • Check for obstruction, pillar buried too deep, trash or excessive vegetation. Pillar should be fully accessible. • Check for missing components. • If pillar inaccessible record a defect to be addressed during detailed inspection.
DSUBs (RMUs, Transformers, Kiosks)	• Check for physical damage - major cracks or dents, fire damage, leaning equipment • Check for foundation erosion (usually causing leaning). • Check for oil leaking, arcing or damage caused by electrical discharge. • Check for broken, missing unlocked or Impact damaged parts. • Check for fire hazards. • Check for obvious earthing problems.

3 REFERENCE INFORMATION

3.1 Abbreviations and Definitions

Term	Definition
ENSMS	Horizon Power *Electricity Network Safety Management System*
MST	Maintenance Scheduled Task
HIM	Horizon Power *Network Instruction Manual*
shall	Indicates a mandatory requirement
SHMS	Horizon Power *Safety and Health Management System*
should	Indicates an advisory statement
The Zone	Horizon Power intranet interface for the Safety and Health Management System (*SHMS*)
TMG	Technical Maintenance Guideline

3.2 Horizon Power Documents

[1] Horizon Power Instructions Manual (HIM)

https://horizonpower.com.au/contractors-suppliers/contractors/manuals-and-standards/horizon-power-instructions-manual/

[2] Electricity Network Safety Management System, ENSMS

[3] Horizon Power Wiki

[4] Safety and Health Management System – Policies, Procedures and Standards SHMS

[5] MST Frequencies Guidelines DM# 2122467

[6] TMG – Maintenance Planning and Scheduling DM# 16066722

3.3 External Document References

[7] AS 7000 - Overhead line design—Detailed procedures, available at http://infostore.saiglobal.com/

APPENDIX A REVISION INFORMATION

(Informative) Horizon Power has endeavoured to provide standards of the highest quality and would appreciate notification if any errors are found or even queries raised.

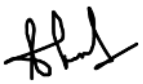
Each Standard makes use of its own comment sheet which is maintained throughout the life of the standard, which lists all comments made by stakeholders regarding the standard.

A comment sheet HPC-2NK-17-0032-COM found in **CS10# 16472385**, can be used to record any errors or queries found in or pertaining to this standard, which can then be addressed whenever the standard gets reviewed.

Appendix E – Guideline: Technical Maintenance for Bushfire / Vegetation Management

Guideline: Technical Maintenance for Bushfire/Vegetation Management

Standard Number: HPC-2NK-17-0033-2019

Document Control			
Author	**Name:**	Tharindu Kolambage	
	Position:	Reliability Engineer	
Reviewed By	**Name:**	Neetha Lakshman	
	Position	System Performance Manager	
Document Owner (May also be the Process Owner)	**Name:**	Neetha Lakshman	
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Approved By *	**Name:**	Mark Herbert	
	Position:	Manager Asset Services	
Date Created/Last Updated	June 2021		
Review Frequency **	5 years		
Next Review Date **	June 2026		

** Shall be the Process Owner and is the person assigned authority and responsibility for managing the whole process, end-to-end, which may extend across more than one division and/or functions, in order to deliver agreed business results.*

*** Frequency period is dependent upon circumstances– maximum is 5 years from last issue, review, or revision whichever is the latest. If left blank, the default shall be 1 year unless otherwise specified.*

Revision Control		
Revision	**Date**	**Description**
1	11/10/2019	First issue of the document
2	21/05/2021	SPS vegetation management added

STAKEHOLDERS *The following positions shall be consulted if an update or review is required:*	
Manager Asset Services	Regional Asset Managers
System Performance Manager	Field Practices Coordinator

TABLE OF CONTENTS

1 SCOPE

1.1 Application

This Technical Maintenance Guide (TMG) applies for

- Vegetation Control Overhead Power Lines - Inspection of vegetation, cut after the inspection, Corridor Slashing.
- Vegetation Control in Generation power stations, Transmission / Distribution substations and Distribution ground mounted assets (Transformers and MPS Units, Ring Main Units, LV Cabinets and Pillars).
- Pole Base Clearing around the base of poles carrying High Voltage Drop out Fuses, Pole Top Switches, HV Isolators.
- Vegetation management activities in Standalone Power Systems (SPS).

1.2 Background

Maintaining sufficient vegetation clearance zones around overhead power lines is critical for minimising the risk of vegetation related faults and bushfires. Line Corridor Slashing activities are primarily focused at maintaining access to overhead line corridors for inspection, maintenance and fault response activities, with a secondary benefit of reducing fire risks and vegetation related faults.

Controlling vegetation within and around Generation power stations, Distribution and Transmission substations, Distribution ground mounted assets and SPS is required to maintain safe operation as well as access to equipment.

Combustible material at the base of poles poses a significant physical and financial risk to both Horizon Power and the public if it were catch alight due to discharge from pole top hardware. The removal of combustible material from clearance areas surrounding the pole base reduces the potential for fires to be initiated.

Landowners / occupiers choosing to undertake their own vegetation management around poles are required to sign the Pole Base Clearing Agreement [20].

1.3 Special Requirements

For all the maintenance planning and scheduling considerations, this TMG must be used in conjunction with TMG: General Considerations for Planned Maintenance Activities [21].

1.3.1 Assessment Frequency

Refer to MST frequencies Guidelines [18] for Vegetation control activity frequencies.

Note: *Frequencies can vary according to local conditions and fire risk*

1.3.2 Regional Climate Considerations

Regional climatic conditions should be considered. Less frequent activities are required if dry conditions persist.

Kimberley region requires pre and post wet season cuts due to the height of regrowth. If cutting activities are carried out less frequently, suckers can get too thick for a slasher and a dozer may be required.

Pole base clearing maintenance works including the follow up site visit shall be carried out before the recommended date as per Table 1.

Table 1 : HP servicing areas and Deadline dates for Pole base clearings

Region	Fire Season	Recommended pole base clearing deadline
Goldfields Esperance	Summer	November 30
Midwest / Gascoyne	Spring	August 30
Pilbara	Spring & Summer	August 30
Kimberley	Winter and Spring	May 30

1.3.3 Local Weather Considerations

Check forecast environmental conditions for scheduled activity. Do not schedule activities such as herbicide spraying if rain is forecasted. Follow the appropriate herbicides instructions for specific details.

1.3.4 Training and Authorisations

Must be suitably authorised and trained in accordance with Technical Training Skills Matrix.

1.3.5 Equipment, Tools and Materials

Standard vegetation control equipment, tools and materials are required.

Any appropriate commercially available herbicides and surfactants can be used for undertaking of pole base clearance, power station and substation, SPS vegetation control.

Appropriate soil binding solutions should be used for erosion control where required.

1.3.6 Site Access and General Considerations

Poles located within properties where the landowner have chosen to take responsibility of the pole base clearing maintenance works are still required to meet the deadline dates of Table 1. Asset Managers should have these poles inspected to ensure the landowners meet the recommended clearing dates.

At least 5 business days' notice to be given to the consumer prior entering the SPS premises for the inspection and maintenance according to SPS Terms and Conditions [22] clause 20.

2 MAINTENANCE METHODOLOGY

2.1 Overview

Pole base clearing

Pole base clearance activities will maintain the minimum requirements for clearing vegetation around the base of poles. This will provide bare ground conditions to minimise fire risk. Appropriate soil binding solution shall be used for erosion control around the base of poles after clearing where required.

Vegetation Control – Ground mount assets

Vegetation and weed control activities involve maintaining vegetation clearances for safe operation and access to distribution ground mounted equipment.

Vegetation Control and Firebreaks – Power stations / Substation sites

Vegetation control activities involve maintaining perimeter firebreaks as well as controlling vegetation and weeds within substations and power stations to maintain safe operation and access to equipment.

Overhead Power lines – Inspect, Cut, Corridor Slash

The minimum clearance zone required between vegetation and power lines must comply with the vertical and horizontal distances as shown in Table 2**.** These are the minimum requirements at all times.

Vegetation Management work is carried out in the Management Zone to maintain these minimum clearances until the next cycle of vegetation management is due in the area. Refer to Figure 1 and Figure 2.

The Regrowth Space shown in Table 2 is the minimum recommendation and can vary according to regional environmental conditions that affect regrowth rates. Other factors such as proximity of fences can limit the practical cut width.

The Management Zone is a designated area where vegetation may be cut to meet all re-growth, vegetation management cycle, environmental and special agreement requirements.

Vegetation management - Standalone Power Systems

SPS vegetation management activities will identify any site vegetation and access issues and rectify them to maintain a safe and reliable system. Reasons for maintaining vegetation within the SPS yard include:

- **PV performance** – Minimise the potential for vegetation to partially shade PV panels and thereby degrade the performance.
- **Fire risk** – Minimise the risk of fire by reducing the available fuel.
- **Housekeeping** – Minimise the hazards presented by overgrown vegetation to workers within the SPS site.
- **Aesthetics** – SPS's are located on customer premises and therefore there is an inherent requirement to maintain an acceptable appearance.

Table 2: Clearance requirements for Overhead Power Lines

Power Line Type	Span Length	Min. Clearance Zone		Regrowth Space		Trees Permitted Above Power Line	Management Zone (m)
		Horizontal Clearance (m)	Vertical Clearance below (m)	Horizontal (m)	Vertical (m)		
Insulated service cables	Any	0.3	0.3	1	1	Yes	1.3
LV ABC	Any	0.3	0.3	1	1	Yes	10
Street Light Pilot Cable	Any	2	0.6	1	1	No[1]	10
Bare LV (Urban)	<70m	2	0.6	1	1	No[1]	10
	>70m	2.5	0.6	1	1	No[1]	10
Bare LV (Non-Urban)	Any	2.5	2	1	1	No[1]	10
Bare HV ≤33kV	<100m	2.5	2	1	1	No[1]	10
	100m - 200m	4	2.5	1	1	No[1]	10
	>200m	5.0[2]	2.5	1	1	No[1]	10
Bare HV >33kV	<100m	3	3	1	1	No	10
	100m - 200m	4	4	1	1	No	10
	200m - 350m	10	5	1	1	No	15
	350m - 450m	13	5.5	1	1	No	15
	450m - 650m	25	6	1	1	No	25
	650m - 800m	37	6	1	1	No	40
	>800 m	47	6	1	1	No	50

Note: In cyclone prone areas, all vegetation clearance zones must be doubled. Refer to Figure 3 for cyclone prone areas.

[1] *Trees may be permitted above the power lines and this would depend on species and condition. The owner occupier will still be held responsible for any damage caused and should seek independent advice from a qualified expert arboriculturalist on the risk and likelihood of the tree causing damage.*

[2] *A formal risk assessment must be carried out where the conductor sag is greater than 4m for spans above 200m.*

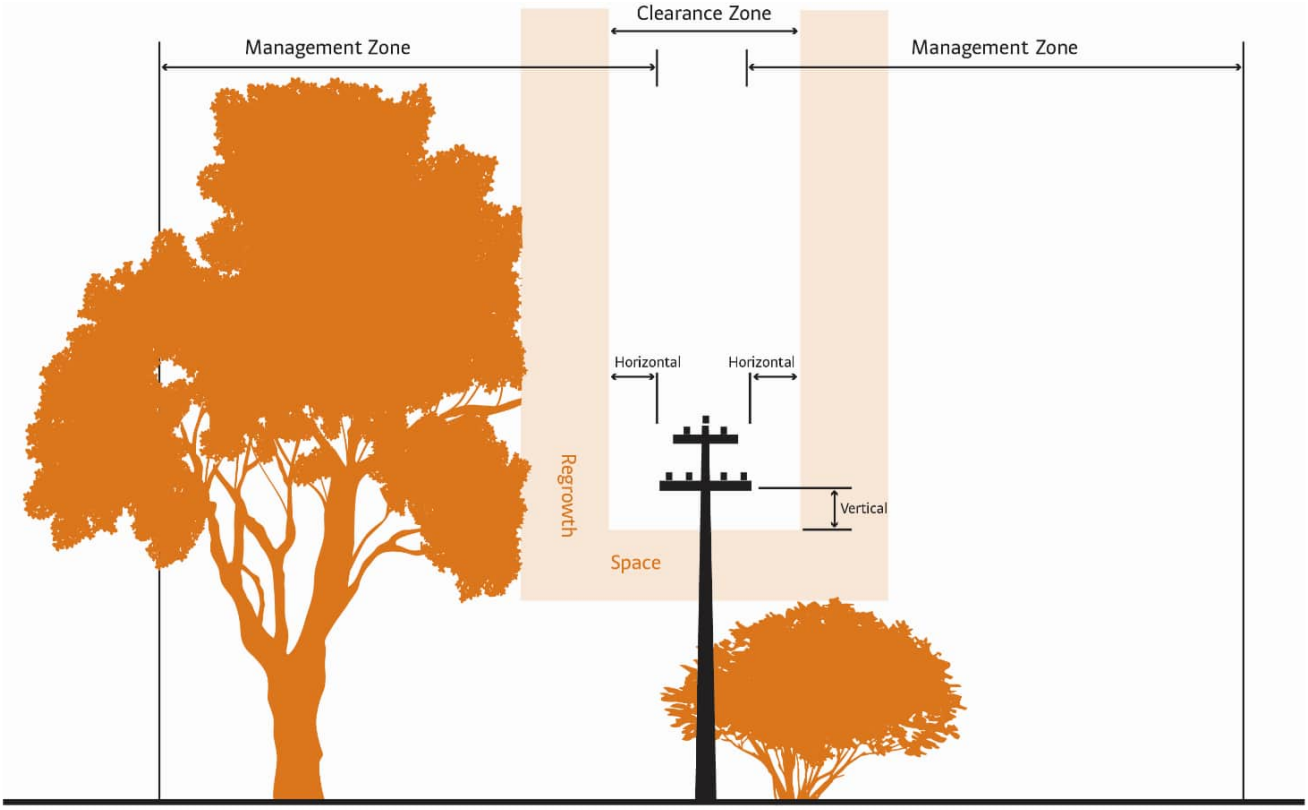


Figure 1: Clearance Zones for Overhead Power Lines

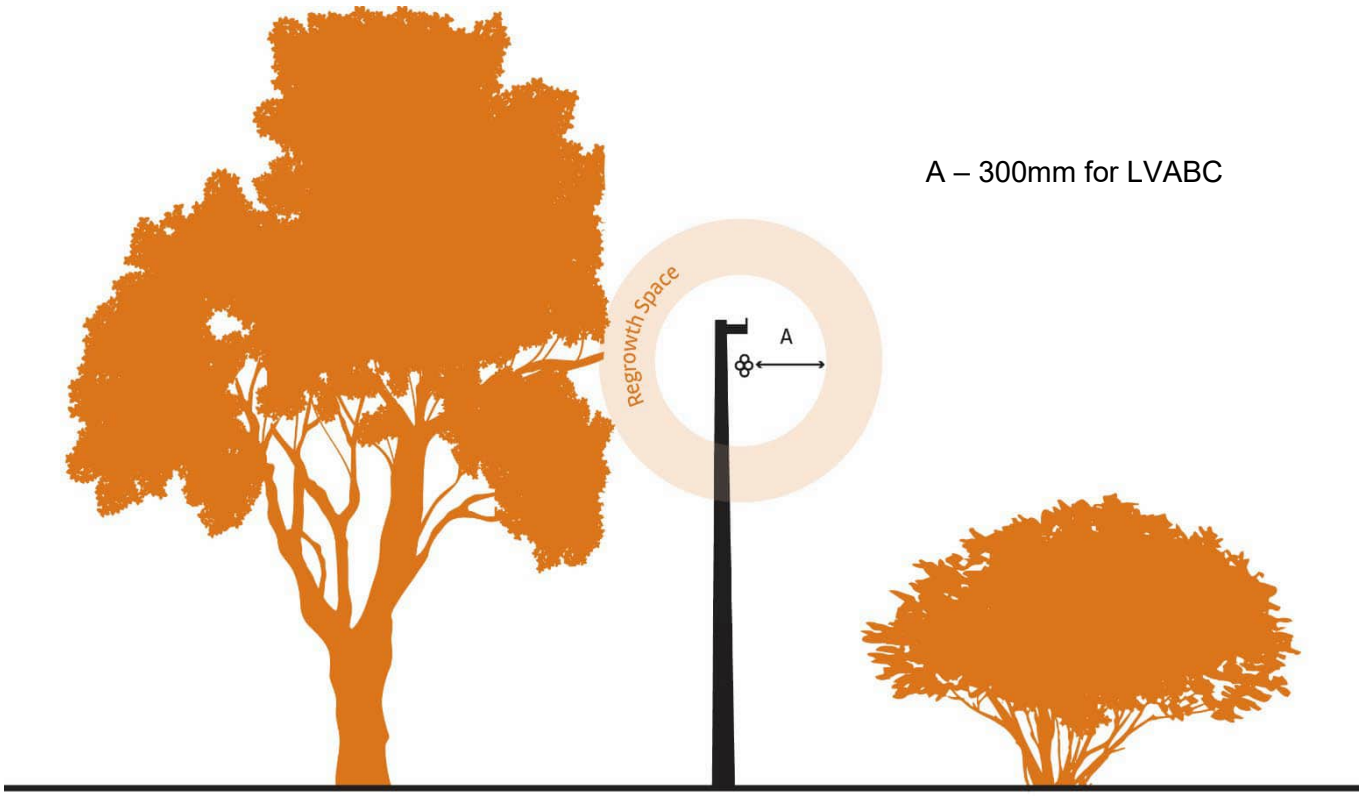


Figure 2: Vegetation Clearance Zones for LV ABC

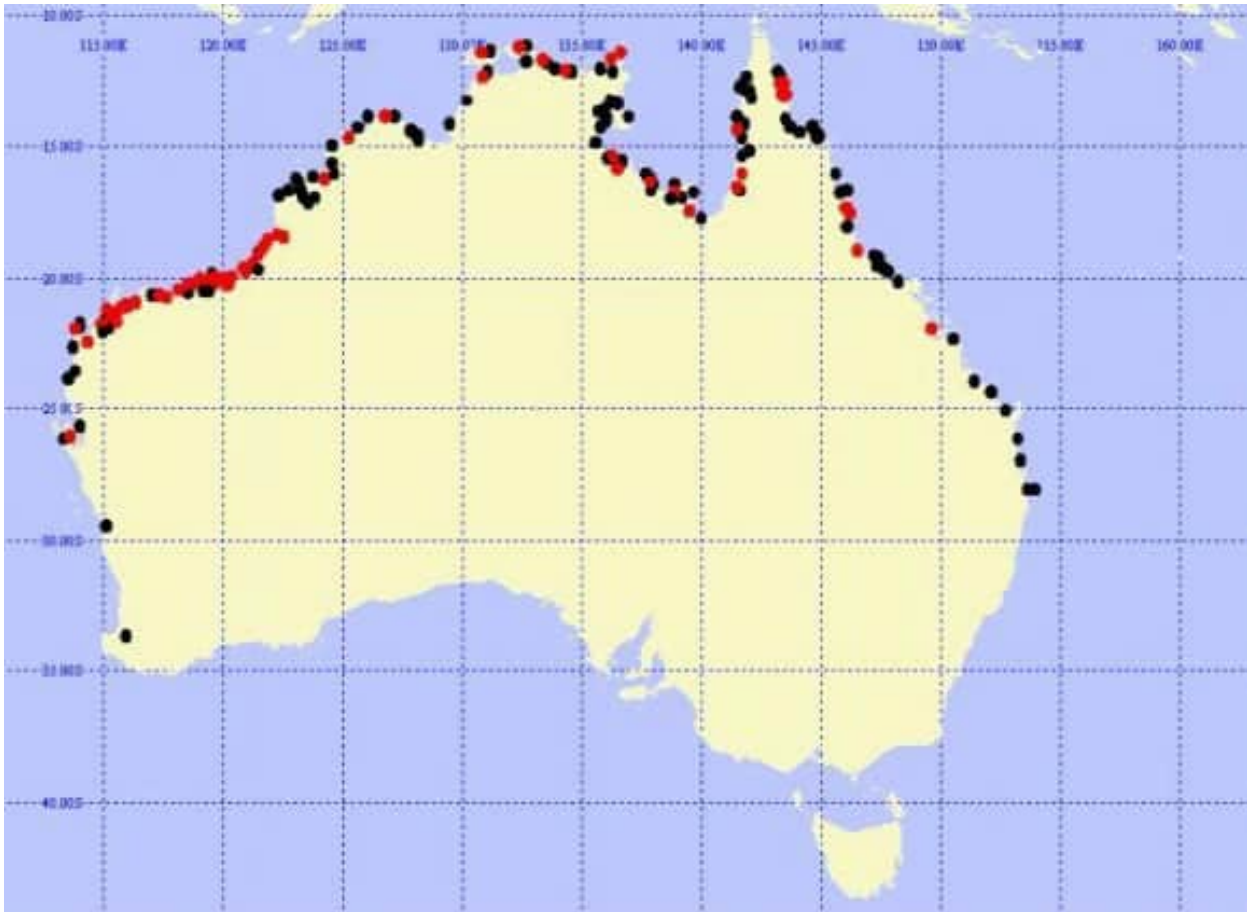


Figure 3: Tropical cyclone coastal crossing points 1970-71 to 2007-08

The northwest Australian coastline between Broome and Exmouth is the most cyclone prone region. Red dots represent severe tropical cyclones (category three or higher) and black dots represent non-severe cyclones.[3]

[3] *http://www.bom.gov.au/cyclone/climatology/wa.shtml*

2.1.1 Activity 1 – Vegetation Inspection Overhead lines

Item	Scope
Vegetation Inspection. Standard Job reference DM# 14059531.	Check line clearance horizontally and vertically from surrounding vegetation to overhead Power lines.
	Check for unsuitable saplings (tall species) in the vegetation management zone.
	Check for vines and creepers growing up poles and stays.
	Check for branches overhanging line.
	Physically place a tag on vegetation in easily assessable location for subsequent identification.
	Immediate issue of notice to occupier of requirement to clear vegetation near assets.
	Capture data including o Nearest asset o Identification if naturally occurring or cultivated vegetation o Responsible party for vegetation o Location where notices have been left o Photograph of item o Estimated duration for cut

2.1.2 Activity 2 – Vegetation Cut Overhead lines

Item	Scope
Vegetation Cut. Standard Job reference DM# 14059151.	Verify if vegetation cutting is still required or not and capture data to indicate the outcome.
	If vegetation cutting is still required o Cut the identified trees, vines and creepers from the vegetation inspection. o Removal of all debris/waste associated with clearance work undertaken
	If vegetation clearance is not required, capture required data.

Item	Scope
	Capture of data including (relevant to both scenarios) o Location where vegetation was cleared o Nearest asset o Responsible party for vegetation o Duration of activities including start and end times o Identification if naturally occurring or cultivated o Vegetation species or description o Photographs of vegetation including but not limited to • Before cut • After cut • Debris / waste • Location identification (ie: house, asset number etc)

2.1.3 Activity 3 – Vegetation Corridor Slashing Overhead lines

Item	Scope
Vegetation corridor slashing. Standard Job reference DM# 14059527.	Clearing of a corridor of vegetation around identified feeders.
	Remove cut vegetation or pulverised into small mulch chips to remain onsite.
	Capture of data including o Location where vegetation was cleared o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before slashing • After slashing

2.1.4 Activity 4 – Firebreak Clearance (Generation power stations / Substation sites)

Item	Scope
Generation Power station. Standard Job reference DM# 13866204	Clear fire break around the external perimeter of Generation Power stations and Transmission / Distribution substations.
	Removal of all debris / waste associated with clearance work undertaken.

Item	Scope
Substation site (Transmission or Distribution). Standard Job reference DM# 13863152	Capture of data including o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste

2.1.5 Activity 5 – Vegetation Control (Power stations / Sub stations)

Item	Scope
Generation Power Stations. Standard Job reference DM# 13865706 Transmission / Distribution Substations. Standard Job reference DM# 13423849	Clear of any vegetation in Generation Power stations and Transmission / Distribution substations within the boundaries of the site.
	Treat area with Herbicides (any appropriate commercially available herbicides). For ESA's use hand pulling or suitable mechanical aid to remove weed.
	Removal of all debris / waste associated with clearance work undertaken.
	Capture of data including o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste o Clearance method o Chemical used if relevant

2.1.6 Activity 6 – Vegetation Control (Distribution ground mounted assets)

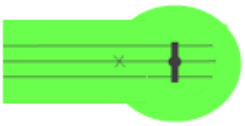
Item	Scope
Distribution ground mounted assets. (Transformers and MPS Units, Ring Main Units, LV Cabinets and pillars)	Clearing of any vegetation around the base of distribution ground mounted assets as defined by Horizon Power.
	Clear an area 1 metre around each side of the underground assets – Transformers and MPS units, Ring Main Units, LV Cabinets. For pillars clear as per drawing U35 in DCS [19].
	Treat area with Herbicides (any appropriate commercially available herbicides). For ESA's use hand pulling or suitable mechanical aid to remove weed.

Item	Scope
Standard Job reference DM# 13423850.	Removal of all debris / waste associated with clearance work undertaken.
	Capture of data including o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste o Clearance method o Chemical used if relevant

2.1.7 Activity 7 – Pole base clearing

Item	Scope
Pole base clearance – Refer to Table 3 for clearance patterns. Standard Job reference DM# 13403226	Prune all the trees over 3 metres in height to 2 metres.
	Clear all weeds, plants, stubble, grass and other flammable material to bare earth.
	Treat area with Herbicides (any appropriate commercially available herbicides).
	Removal of all debris / waste associated with clearance work undertaken.
	Apply appropriate soil binding solution for erosion control.
	Capture of data including o Location where vegetation was cleared o Nearest asset o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste • Location identification (ie: house, asset number etc)

Table 3: Clearance Patterns

Reference	Detail
A. Expulsion Fuse (multiphase) 	Follow a line from the fuse to the ground in the same angle as the fuse (point x). Start 8m beyond this point. Clear a path the width of the cross arm + 6m wide where x is less than 6.4m from the pole or the width of the cross arm + 8m otherwise. Clear back to, and around the pole keeping the same diameter when circling the pole. See Drawing M3-2 in the Distribution Construction Standard [19].
B. Expulsion Fuse (single phase) 	Follow a line from the fuse to the ground in the same angle as the fuse (point X). Start 8m beyond this point. Clear a path of width 6 m back to, and around the pole keeping the same 6 m diameter (3 m radius). If point X is greater than 6.4 m from the pole, clear a path of width 8 m (radius 4 m around the pole). See Drawing M3-2 in the Distribution Construction Standard [19].
C. Expulsion Fuse pointing at pole 	As A or B above but extend the diameter around the pole to 14 m (radius 7 m).
D. Switches and Non Expulsion type fuses 	Clear a circle of diameter 14 m (radius 7 m) around the pole. See Drawing M3-1 in the Distribution Construction Standard [19].

2.1.8 Activity 8 – Pole base clearance follow up site visit – 1 month after pole base clearing

Item	Scope
Follow up site visit. Standard Job reference DM# 13405420	Pole base clearing areas need to be re-visited after one month to make sure the plants are clear. Remove all debris in the area and ensure pole base clear of all combustible material. Apply appropriate soil binding solution for erosion control if required.
	The follow-up site visit is also required to the poles located within properties where the land owner have chosen to take responsibility of the clearing maintenance works themselves to make sure the owner has performed the clearing works as per the agreement date.
	Treat with herbicides of any plant that show's signs of re-growth.

2.1.9 Activity 9 – SPS Site Maintenance

Item	Scope
SPS Site. Standard Job reference DM# 21357291	Trim built up vegetation.
	Remove weed – For Non-ESA's use chemical spraying. For ESA's use hand pulling or suitable mechanical aid.
	Relocate/remove accumulated obstacles, debris or structures.
	Check condition of site access and clear any obstacles.

3 REFERENCE INFORMATION

3.1 Abbreviations and Definitions

Term	Definition
DCS	Distribution Construction Standard
DFES	Department of Fire & Emergency Services
DOF	Drop Out Fuse
ESA	Environmentally Sensitive Area
FI	Field Instructions
HIM	Horizon Instruction Manual
HP	Horizon Power
LVABC	Low Voltage Aerial Bundled Cable
MPS	Modular Package Substations
MST	Maintenance Schedule Tasks
PTS	Pole Top Switch
PV	Photovoltaic
SPS	Standalone Power System
Shall	Indicates a mandatory statement
Should	Indicates an advisory statement
The Zone	Horizon Power intranet interface for Safety and Health Management System (SHMS).

3.2 Related Documents

The following documents shall be read in conjunction with this TMG.

Reference		Document No. / Hyperlink
[1]	FI 12.01 Vegetation Control	HIM
[2]	FI 12.02 Specialised plant and equipment for Vegetation Management	HIM

Reference		Document No. / Hyperlink
[3]	FI 12.03 Tree felling and clearing	HIM
[4]	Standard Job – Vegetation Inspection Overhead Lines	DM# 14059531
[5]	Standard Job – Vegetation Inspect Cut	DM# 14059151
[6]	Standard Job – Vegetation Corridor Slashing	DM# 14059527
[7]	Standard Job – Firebreak clearing around Generation Power stations	DM# 13866204
[8]	Standard Job – Firebreak clearing around Substations	DM# 13863152
[9]	Standard Job – Vegetation control Generation Power stations	DM# 13865706
[10]	Standard Job – Vegetation control in Sub stations	DM# 13423849
[11]	Standard Job – Vegetation Control Distribution ground mounted assets	DM# 13423850
[12]	Standard Job - Pole base clearing	DM# 13403226
[13]	Standard Job - Pole base clearing follow up site visit	DM# 13405420
[14]	Standard Job – SPS Site Maintenance	DM# 21357291

3.3 Referenced Documents

The following documents have been referenced within this TMG.

No.		Document No. / Hyperlink
[15]	FI 2.04 Fire Precautions for Field Work	HIM
[16]	FI 11.02 Environmentally Sensitive Area	HIM
[17]	FI 1.02 Contractor Authorisation Process	HIM
[18]	MST Frequencies Guidelines	DM# 2122467
[19]	Distribution Construction Standard	DM# 17513689
[20]	Pole Base Clearing Agreement Form	DM# 3358612
[21]	TMG – General Considerations for Planned Maintenance Activities	DM# 16066722
[22]	SPS Terms and Conditions	DM# 11080886

APPENDIX A REVISION INFORMATION

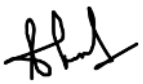
Horizon Power has endeavoured to provide standards of the highest quality and would appreciate notification of errors or queries.

Each Standard makes use of its own comment sheet, which is maintained throughout the life of the standard, which lists all comments made by stakeholders regarding the standard.

A comment sheet found in DM# 14059455 can be used to record any errors or queries found in or pertaining to this standard. This comment sheet will be referred to each time the standard is updated.

Guideline: Technical Maintenance for Bushfire/Vegetation Management

Standard Number: HPC-2NK-17-0033-2019

Document Control			
Author	**Name:**	Tharindu Kolambage	
	Position:	Reliability Engineer	
Reviewed By	**Name:**	Neetha Lakshman	
	Position	System Performance Manager	
Document Owner (May also be the Process Owner)	**Name:**	Neetha Lakshman	
	Position	System Performance Manager	
Approved By *	**Name:**	Mark Herbert	
	Position:	Manager Asset Services	
Date Created/Last Updated	June 2021		
Review Frequency **	5 years		
Next Review Date **	June 2026		

** Shall be the Process Owner and is the person assigned authority and responsibility for managing the whole process, end-to-end, which may extend across more than one division and/or functions, in order to deliver agreed business results.*

*** Frequency period is dependent upon circumstances– maximum is 5 years from last issue, review, or revision whichever is the latest. If left blank, the default shall be 1 year unless otherwise specified.*

Revision Control		
Revision	**Date**	**Description**
1	11/10/2019	First issue of the document
2	21/05/2021	SPS vegetation management added

STAKEHOLDERS *The following positions shall be consulted if an update or review is required:*	
Manager Asset Services	Regional Asset Managers
System Performance Manager	Field Practices Coordinator

TABLE OF CONTENTS

1 SCOPE

1.1 Application

This Technical Maintenance Guide (TMG) applies for

- Vegetation Control Overhead Power Lines - Inspection of vegetation, cut after the inspection, Corridor Slashing.
- Vegetation Control in Generation power stations, Transmission / Distribution substations and Distribution ground mounted assets (Transformers and MPS Units, Ring Main Units, LV Cabinets and Pillars).
- Pole Base Clearing around the base of poles carrying High Voltage Drop out Fuses, Pole Top Switches, HV Isolators.
- Vegetation management activities in Standalone Power Systems (SPS).

1.2 Background

Maintaining sufficient vegetation clearance zones around overhead power lines is critical for minimising the risk of vegetation related faults and bushfires. Line Corridor Slashing activities are primarily focused at maintaining access to overhead line corridors for inspection, maintenance and fault response activities, with a secondary benefit of reducing fire risks and vegetation related faults.

Controlling vegetation within and around Generation power stations, Distribution and Transmission substations, Distribution ground mounted assets and SPS is required to maintain safe operation as well as access to equipment.

Combustible material at the base of poles poses a significant physical and financial risk to both Horizon Power and the public if it were catch alight due to discharge from pole top hardware. The removal of combustible material from clearance areas surrounding the pole base reduces the potential for fires to be initiated.

Landowners / occupiers choosing to undertake their own vegetation management around poles are required to sign the Pole Base Clearing Agreement [20].

1.3 Special Requirements

For all the maintenance planning and scheduling considerations, this TMG must be used in conjunction with TMG: General Considerations for Planned Maintenance Activities [21].

1.3.1 Assessment Frequency

Refer to MST frequencies Guidelines [18] for Vegetation control activity frequencies.

Note: *Frequencies can vary according to local conditions and fire risk*

1.3.2 Regional Climate Considerations

Regional climatic conditions should be considered. Less frequent activities are required if dry conditions persist.

Kimberley region requires pre and post wet season cuts due to the height of regrowth. If cutting activities are carried out less frequently, suckers can get too thick for a slasher and a dozer may be required.

Pole base clearing maintenance works including the follow up site visit shall be carried out before the recommended date as per Table 1.

Table 1 : HP servicing areas and Deadline dates for Pole base clearings

Region	Fire Season	Recommended pole base clearing deadline
Goldfields Esperance	Summer	November 30
Midwest / Gascoyne	Spring	August 30
Pilbara	Spring & Summer	August 30
Kimberley	Winter and Spring	May 30

1.3.3 Local Weather Considerations

Check forecast environmental conditions for scheduled activity. Do not schedule activities such as herbicide spraying if rain is forecasted. Follow the appropriate herbicides instructions for specific details.

1.3.4 Training and Authorisations

Must be suitably authorised and trained in accordance with Technical Training Skills Matrix.

1.3.5 Equipment, Tools and Materials

Standard vegetation control equipment, tools and materials are required.

Any appropriate commercially available herbicides and surfactants can be used for undertaking of pole base clearance, power station and substation, SPS vegetation control.

Appropriate soil binding solutions should be used for erosion control where required.

1.3.6 Site Access and General Considerations

Poles located within properties where the landowner have chosen to take responsibility of the pole base clearing maintenance works are still required to meet the deadline dates of Table 1. Asset Managers should have these poles inspected to ensure the landowners meet the recommended clearing dates.

At least 5 business days' notice to be given to the consumer prior entering the SPS premises for the inspection and maintenance according to SPS Terms and Conditions [22] clause 20.

2 MAINTENANCE METHODOLOGY

2.1 Overview

Pole base clearing

Pole base clearance activities will maintain the minimum requirements for clearing vegetation around the base of poles. This will provide bare ground conditions to minimise fire risk. Appropriate soil binding solution shall be used for erosion control around the base of poles after clearing where required.

Vegetation Control – Ground mount assets

Vegetation and weed control activities involve maintaining vegetation clearances for safe operation and access to distribution ground mounted equipment.

Vegetation Control and Firebreaks – Power stations / Substation sites

Vegetation control activities involve maintaining perimeter firebreaks as well as controlling vegetation and weeds within substations and power stations to maintain safe operation and access to equipment.

Overhead Power lines – Inspect, Cut, Corridor Slash

The minimum clearance zone required between vegetation and power lines must comply with the vertical and horizontal distances as shown in Table 2**.** These are the minimum requirements at all times.

Vegetation Management work is carried out in the Management Zone to maintain these minimum clearances until the next cycle of vegetation management is due in the area. Refer to Figure 1 and Figure 2.

The Regrowth Space shown in Table 2 is the minimum recommendation and can vary according to regional environmental conditions that affect regrowth rates. Other factors such as proximity of fences can limit the practical cut width.

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SPS vegetation management activities will identify any site vegetation and access issues and rectify them to maintain a safe and reliable system. Reasons for maintaining vegetation within the SPS yard include:

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- **Housekeeping** – Minimise the hazards presented by overgrown vegetation to workers within the SPS site.
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Power Line Type	Span Length	Min. Clearance Zone		Regrowth Space		Trees Permitted Above Power Line	Management Zone (m)
		Horizontal Clearance (m)	Vertical Clearance below (m)	Horizontal (m)	Vertical (m)		
Insulated service cables	Any	0.3	0.3	1	1	Yes	1.3
LV ABC	Any	0.3	0.3	1	1	Yes	10
Street Light Pilot Cable	Any	2	0.6	1	1	No[1]	10
Bare LV (Urban)	<70m	2	0.6	1	1	No[1]	10
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	100m - 200m	4	2.5	1	1	No[1]	10
	>200m	5.0[2]	2.5	1	1	No[1]	10
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	>800 m	47	6	1	1	No	50

Note: In cyclone prone areas, all vegetation clearance zones must be doubled. Refer to Figure 3 for cyclone prone areas.

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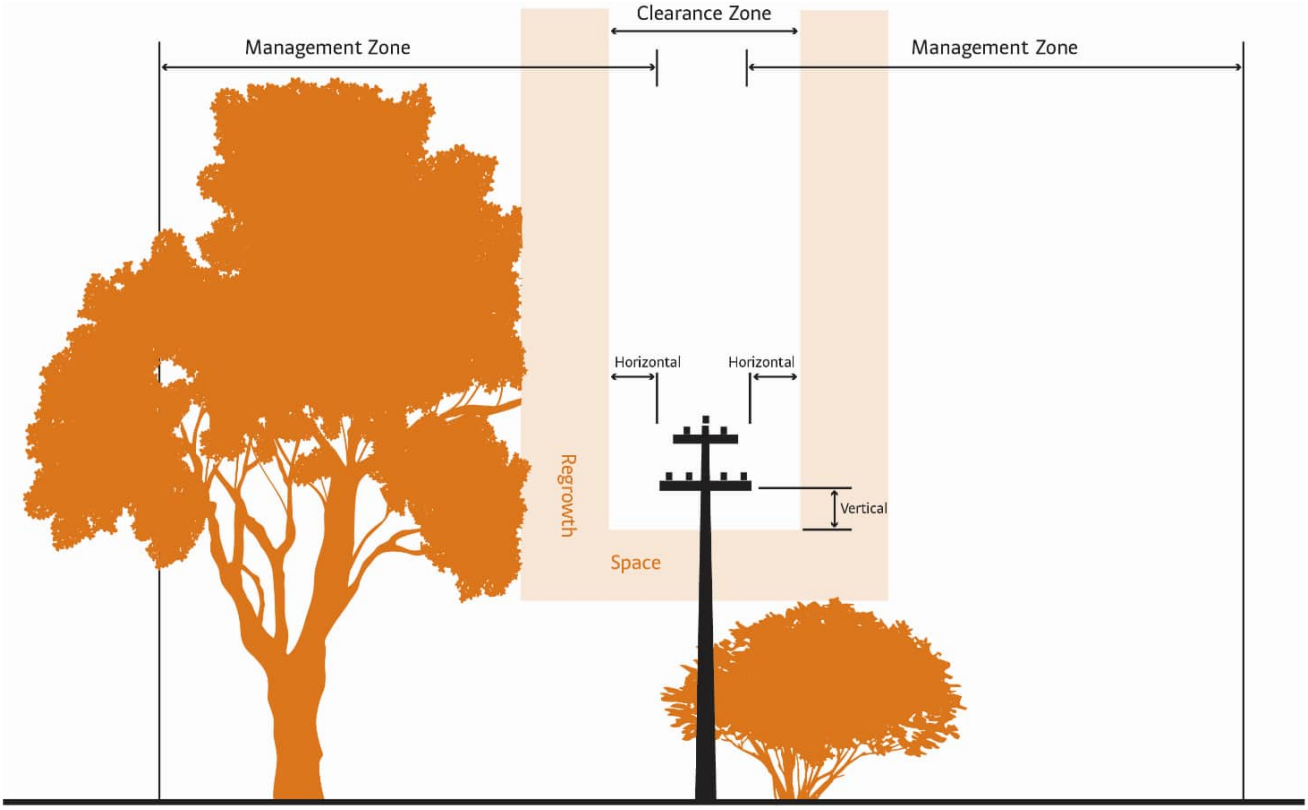

Figure 1: Clearance Zones for Overhead Power Lines

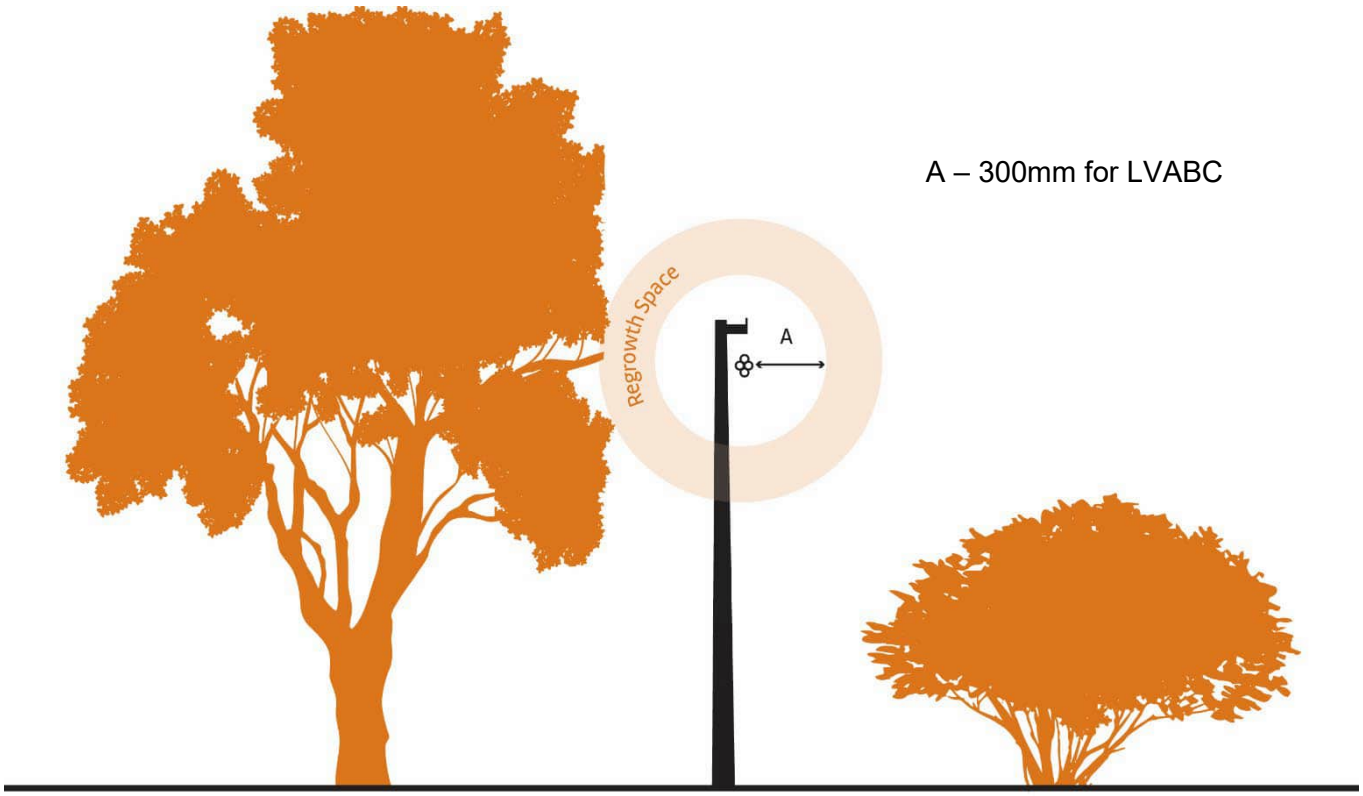

Figure 2: Vegetation Clearance Zones for LV ABC

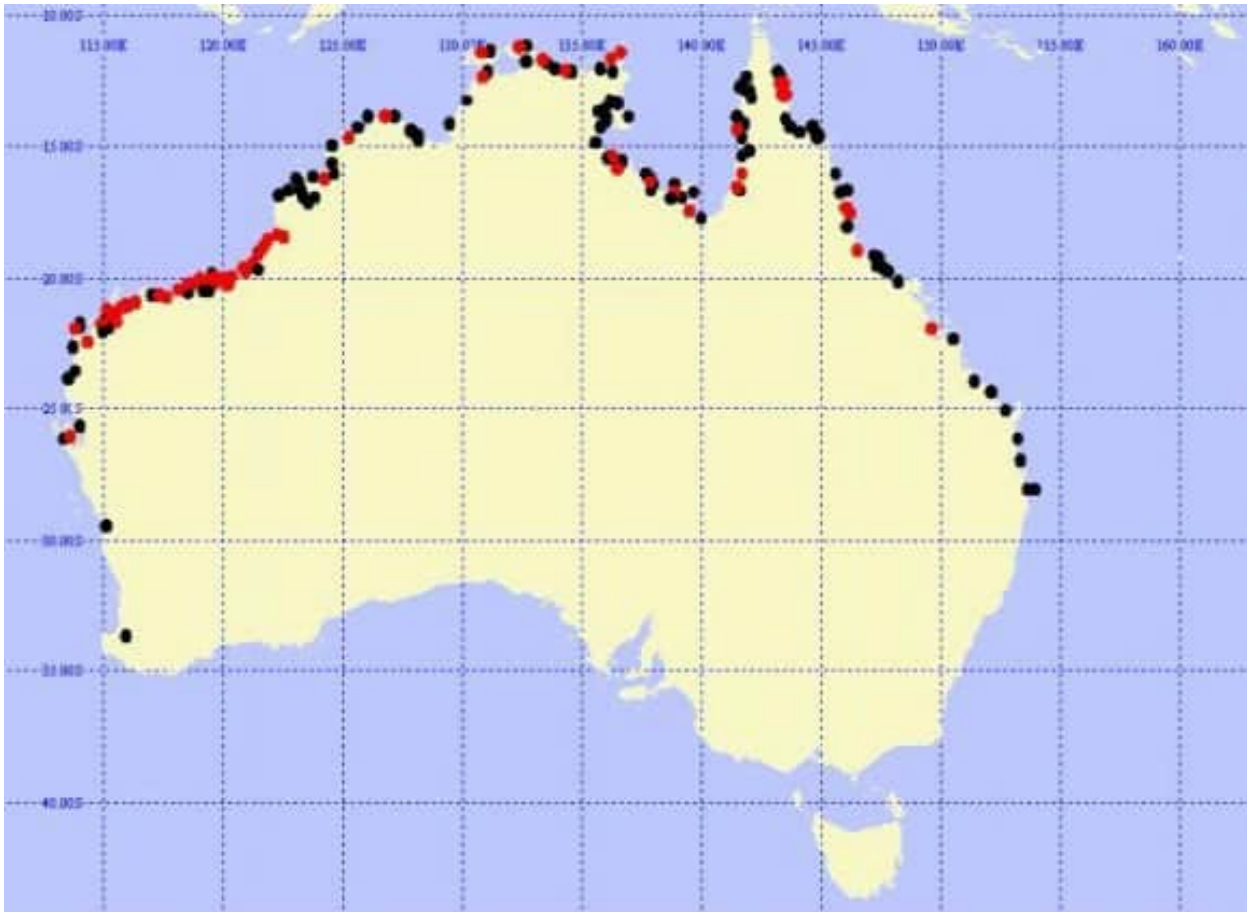

Figure 3: Tropical cyclone coastal crossing points 1970-71 to 2007-08

The northwest Australian coastline between Broome and Exmouth is the most cyclone prone region. Red dots represent severe tropical cyclones (category three or higher) and black dots represent non-severe cyclones.[3]

[3] *http://www.bom.gov.au/cyclone/climatology/wa.shtml*

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	Check for unsuitable saplings (tall species) in the vegetation management zone.
	Check for vines and creepers growing up poles and stays.
	Check for branches overhanging line.
	Physically place a tag on vegetation in easily assessable location for subsequent identification.
	Immediate issue of notice to occupier of requirement to clear vegetation near assets.
	Capture data including o Nearest asset o Identification if naturally occurring or cultivated vegetation o Responsible party for vegetation o Location where notices have been left o Photograph of item o Estimated duration for cut

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Item	Scope
Vegetation Cut. Standard Job reference DM# 14059151.	Verify if vegetation cutting is still required or not and capture data to indicate the outcome.
	If vegetation cutting is still required o Cut the identified trees, vines and creepers from the vegetation inspection. o Removal of all debris/waste associated with clearance work undertaken
	If vegetation clearance is not required, capture required data.

Item	Scope
	Capture of data including (relevant to both scenarios) o Location where vegetation was cleared o Nearest asset o Responsible party for vegetation o Duration of activities including start and end times o Identification if naturally occurring or cultivated o Vegetation species or description o Photographs of vegetation including but not limited to • Before cut • After cut • Debris / waste • Location identification (ie: house, asset number etc)

2.1.3 Activity 3 – Vegetation Corridor Slashing Overhead lines

Item	Scope
Vegetation corridor slashing. Standard Job reference DM# 14059527.	Clearing of a corridor of vegetation around identified feeders.
	Remove cut vegetation or pulverised into small mulch chips to remain onsite.
	Capture of data including o Location where vegetation was cleared o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before slashing • After slashing

2.1.4 Activity 4 – Firebreak Clearance (Generation power stations / Substation sites)

Item	Scope
Generation Power station. Standard Job reference DM# 13866204	Clear fire break around the external perimeter of Generation Power stations and Transmission / Distribution substations.
	Removal of all debris / waste associated with clearance work undertaken.

Item	Scope
Substation site (Transmission or Distribution). Standard Job reference DM# 13863152	Capture of data including o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste

2.1.5 Activity 5 – Vegetation Control (Power stations / Sub stations)

Item	Scope
Generation Power Stations. Standard Job reference DM# 13865706 Transmission / Distribution Substations. Standard Job reference DM# 13423849	Clear of any vegetation in Generation Power stations and Transmission / Distribution substations within the boundaries of the site.
	Treat area with Herbicides (any appropriate commercially available herbicides). For ESA's use hand pulling or suitable mechanical aid to remove weed.
	Removal of all debris / waste associated with clearance work undertaken.
	Capture of data including o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste o Clearance method o Chemical used if relevant

2.1.6 Activity 6 – Vegetation Control (Distribution ground mounted assets)

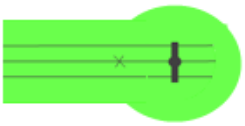
Item	Scope
Distribution ground mounted assets. (Transformers and MPS Units, Ring Main Units, LV Cabinets and pillars)	Clearing of any vegetation around the base of distribution ground mounted assets as defined by Horizon Power.
	Clear an area 1 metre around each side of the underground assets – Transformers and MPS units, Ring Main Units, LV Cabinets. For pillars clear as per drawing U35 in DCS [19].
	Treat area with Herbicides (any appropriate commercially available herbicides). For ESA's use hand pulling or suitable mechanical aid to remove weed.

Item	Scope
Standard Job reference DM# 13423850.	Removal of all debris / waste associated with clearance work undertaken.
	Capture of data including o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste o Clearance method o Chemical used if relevant

2.1.7 Activity 7 – Pole base clearing

Item	Scope
Pole base clearance – Refer to Table 3 for clearance patterns. Standard Job reference DM# 13403226	Prune all the trees over 3 metres in height to 2 metres.
	Clear all weeds, plants, stubble, grass and other flammable material to bare earth.
	Treat area with Herbicides (any appropriate commercially available herbicides).
	Removal of all debris / waste associated with clearance work undertaken.
	Apply appropriate soil binding solution for erosion control.
	Capture of data including o Location where vegetation was cleared o Nearest asset o Duration of activities including start and end times o Photographs of vegetation including but not limited to • Before clearance • After clearance • Debris / waste • Location identification (ie: house, asset number etc)

Table 3: Clearance Patterns

Reference	Detail
A. Expulsion Fuse (multiphase) 	Follow a line from the fuse to the ground in the same angle as the fuse (point x). Start 8m beyond this point. Clear a path the width of the cross arm + 6m wide where x is less than 6.4m from the pole or the width of the cross arm + 8m otherwise. Clear back to, and around the pole keeping the same diameter when circling the pole. See Drawing M3-2 in the Distribution Construction Standard [19].
B. Expulsion Fuse (single phase) 	Follow a line from the fuse to the ground in the same angle as the fuse (point X). Start 8m beyond this point. Clear a path of width 6 m back to, and around the pole keeping the same 6 m diameter (3 m radius). If point X is greater than 6.4 m from the pole, clear a path of width 8 m (radius 4 m around the pole). See Drawing M3-2 in the Distribution Construction Standard [19].
C. Expulsion Fuse pointing at pole 	As A or B above but extend the diameter around the pole to 14 m (radius 7 m).
D. Switches and Non Expulsion type fuses 	Clear a circle of diameter 14 m (radius 7 m) around the pole. See Drawing M3-1 in the Distribution Construction Standard [19].

2.1.8 Activity 8 – Pole base clearance follow up site visit – 1 month after pole base clearing

Item	Scope
Follow up site visit. Standard Job reference DM# 13405420	Pole base clearing areas need to be re-visited after one month to make sure the plants are clear. Remove all debris in the area and ensure pole base clear of all combustible material. Apply appropriate soil binding solution for erosion control if required.
	The follow-up site visit is also required to the poles located within properties where the land owner have chosen to take responsibility of the clearing maintenance works themselves to make sure the owner has performed the clearing works as per the agreement date.
	Treat with herbicides of any plant that show's signs of re-growth.

2.1.9 Activity 9 – SPS Site Maintenance

Item	Scope
SPS Site. Standard Job reference DM# 21357291	Trim built up vegetation.
	Remove weed – For Non-ESA's use chemical spraying. For ESA's use hand pulling or suitable mechanical aid.
	Relocate/remove accumulated obstacles, debris or structures.
	Check condition of site access and clear any obstacles.

3 REFERENCE INFORMATION

3.1 Abbreviations and Definitions

Term	Definition
DCS	Distribution Construction Standard
DFES	Department of Fire & Emergency Services
DOF	Drop Out Fuse
ESA	Environmentally Sensitive Area
FI	Field Instructions
HIM	Horizon Instruction Manual
HP	Horizon Power
LVABC	Low Voltage Aerial Bundled Cable
MPS	Modular Package Substations
MST	Maintenance Schedule Tasks
PTS	Pole Top Switch
PV	Photovoltaic
SPS	Standalone Power System
Shall	Indicates a mandatory statement
Should	Indicates an advisory statement
The Zone	Horizon Power intranet interface for Safety and Health Management System (SHMS).

3.2 Related Documents

The following documents shall be read in conjunction with this TMG.

Reference		Document No. / Hyperlink
[1]	FI 12.01 Vegetation Control	HIM
[2]	FI 12.02 Specialised plant and equipment for Vegetation Management	HIM

Reference		Document No. / Hyperlink
[3]	FI 12.03 Tree felling and clearing	HIM
[4]	Standard Job – Vegetation Inspection Overhead Lines	DM# 14059531
[5]	Standard Job – Vegetation Inspect Cut	DM# 14059151
[6]	Standard Job – Vegetation Corridor Slashing	DM# 14059527
[7]	Standard Job – Firebreak clearing around Generation Power stations	DM# 13866204
[8]	Standard Job – Firebreak clearing around Substations	DM# 13863152
[9]	Standard Job – Vegetation control Generation Power stations	DM# 13865706
[10]	Standard Job – Vegetation control in Sub stations	DM# 13423849
[11]	Standard Job – Vegetation Control Distribution ground mounted assets	DM# 13423850
[12]	Standard Job - Pole base clearing	DM# 13403226
[13]	Standard Job - Pole base clearing follow up site visit	DM# 13405420
[14]	Standard Job – SPS Site Maintenance	DM# 21357291

3.3 Referenced Documents

The following documents have been referenced within this TMG.

No.		Document No. / Hyperlink
[15]	FI 2.04 Fire Precautions for Field Work	HIM
[16]	FI 11.02 Environmentally Sensitive Area	HIM
[17]	FI 1.02 Contractor Authorisation Process	HIM
[18]	MST Frequencies Guidelines	DM# 2122467
[19]	Distribution Construction Standard	DM# 17513689
[20]	Pole Base Clearing Agreement Form	DM# 3358612
[21]	TMG – General Considerations for Planned Maintenance Activities	DM# 16066722
[22]	SPS Terms and Conditions	DM# 11080886

APPENDIX A REVISION INFORMATION

Horizon Power has endeavoured to provide standards of the highest quality and would appreciate notification of errors or queries.

Each Standard makes use of its own comment sheet, which is maintained throughout the life of the standard, which lists all comments made by stakeholders regarding the standard.

A comment sheet found in DM# 14059455 can be used to record any errors or queries found in or pertaining to this standard. This comment sheet will be referred to each time the standard is updated.

Appendix F – Asset Management Plan. Conductors and Hardware - Distribution

Asset Management Plan

Conductors and Hardware – Distribution

Info Zone Record Number: R260427

Version Number: 3.0

Date: October 2017

Authorisations

Action	Name and title	Date
Prepared by	David Eccles – Asset Strategies Engineer, Asset Strategy	15/09/2016
Reviewed by	Murray James Consultant	13/08/2017
Reviewed by	Guy Debney GHD Consultant	20/09/2017
Authorised by	Darryl Munro – Asset Strategy Team Leader	31/10/2017
Review cycle	2.5 Years	

Responsibilities

This document is the responsibility of the Asset Strategy Team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

Please contact the Asset Strategy Team Leader with any queries or suggestions.

- Implementation All TasNetworks staff and contractors.
- Compliance All group managers.

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Record of revisions

Section number	Details
	New Document
All sections	Reviewed and revised in 2017, to include Bushfire Risk Mitigations Overlay and Performance Reporting. This includes aged non-metalllic screened HV ABC replacement need

Table of Contents

1 Purpose

The purpose of this document is to describe for Conductors and Pole-top Hardware Distribution related assets:

- TasNetworks' approach to asset management, as reflected through its legislative and regulatory obligations and strategic plans;
- The key projects and programs underpinning its activities; and
- Forecast CAPEX and OPEX volumes.

2 Scope

This document covers distribution conductors and associated pole-top hardware.

3 Strategic Alignment and Objectives

This asset management plan has been developed to align with both TasNetworks' Asset Management Policy and strategic objectives. This management plan describes the asset management strategies and programs developed to manage the distribution overhead switchgear assets, with the aim of achieving these objectives.

For these assets the management strategy focuses on the following objectives:

- Safety will continue to be our top priority and we will continue to ensure that our safety performance continues to improve
- Service performance will be maintained at current overall network service levels, whilst service to poorly performing reliability communities will be improved to meet regulatory requirements
- Cost performance will be improved through prioritisation and efficiency improvements that enable us provide predictable and lowest sustainable pricing to our customers
- Customer engagement will be improved to ensure that we understand customer needs, and incorporate these into our decision making to maximise value to them
- Our program of work will be developed and delivered on time and within budget

The asset management policy and strategic objectives are outlined within the Strategic Asset Management Plan. Figure 1, from the Strategic Asset Management Plan, represents TasNetworks documents that support the asset management framework. The diagram highlights the existence of, and interdependence between, the Plan, Do, Check, Act components of good asset management practice.

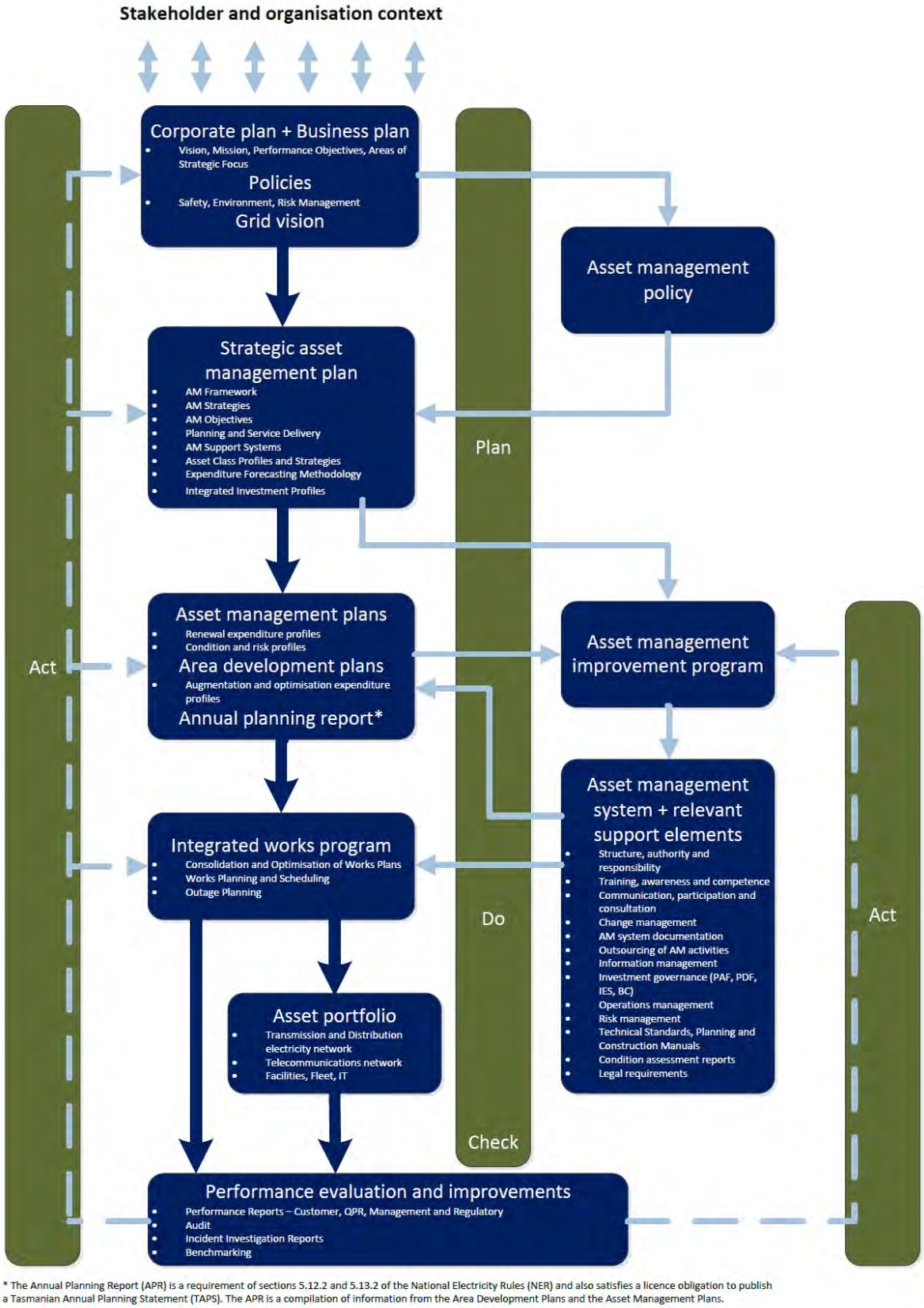
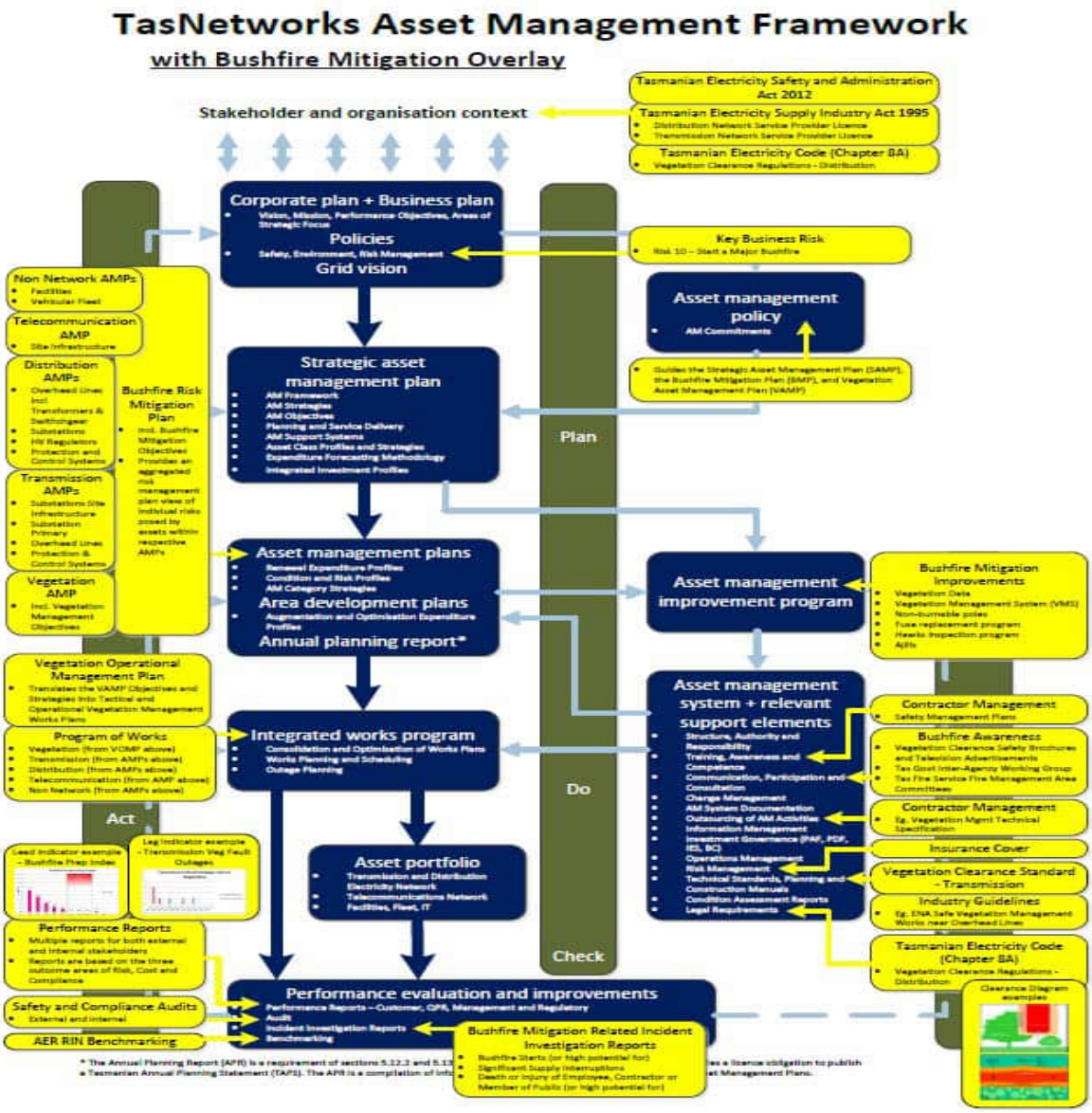


Figure 1: TasNetworks Asset Management Documentation Framework

3.1 Bushfire Mitigation Framework

Many TasNetworks assets, including distribution conductors and poletop hardware are located within areas of the state affected by bushfire. TasNetworks' bushfire mitigation framework has been overlaid onto the TasNetworks Asset Management framework to show the direct relationship between the two, and is shown in Figure 2. The Bushfire Mitigation Asset Management Plan provides guidance to other stakeholders in the preparation of asset management plans, ensuring effective bushfire risk mitigation outcomes are achieved, while also summarising some key bushfire risk mitigation outcomes and commitments made within those asset management plans.

Figure 2: TasNetworks Asset Management Documentation Framework with Bushfire Mitigation Framework Overlay



3.2 Business objectives

Strategic and operational performance objectives relevant to this project are derived from TasNetworks 2017-18 Corporate Plan, approved by the board in 2017. This project is relevant to the following areas of the corporate plan:

- We understand our customers by making them central to all we do;
- We enable our people to deliver value; and
- We care for our assets, delivering safe and reliable networks services while transforming our business.

3.3 Business initiatives

The business initiatives reflected in TasNetworks' Transformation Roadmap 2025 publication (June 2017) for transition to the future that align this asset management plan are as follows:

- Voice of the customer: We anticipate and respond to your changing needs and market conditions.
- Network and operations productivity: We'll improve how we deliver the field works program, continue to seek cost savings and use productivity targets to drive our business.
- Electricity and telecoms network capability: To meet your energy needs and ensure power system security, we'll invest in the network to make sure it stays in good condition, even while the system grows more complex.
- Predictable and sustainable pricing: To deliver the lowest sustainable prices, we'll transition our pricing to better reflect the way you produce and use electricity.
- Enabling and harnessing new technologies and services: By investing in technology and customer service, we'll be better able to host the technologies you're embracing.

4 Asset information systems

4.1 Systems

TasNetworks maintains an asset management information system (AMIS) that contains detailed information relating to distribution overhead conductor and hardware assets. AMIS is a combination of people, processes, and technology applied to provide the essential outputs for effective asset management. AMIS data integrity standards provide additional information relevant to each asset class. Data integrity standards have been developed for transmission assets, however they have not yet been developed for distribution assets.

Distribution asset information is recorded and stored in TasNetworks Geographic Information System (GIS) data systems. The location in which data is stored and maintained is dependent on the particular nature of the data, but systems are often configured to enable the flow of changes in one system to be reflected in the other. These systems will be replaced or updated in 2018 as part of the Ajilis Transformation program.

4.2 Asset management information improvement initiative

To realise this capability at TasNetworks, the AMIS improvement program is delivering a rigorous and methodical series of targeted initiatives designed to build capability. When implemented, this program will deliver trusted, timely and high quality asset information that supports the strategic and operational asset management processes required for best-practice asset management. This program is complimentary with the current upgrade data system project and will rely on and benefit from the integrated asset and works management system provided by that project.

The AMIS improvement program is currently delivering the foundations of a mature asset management system including the establishment of:

- asset hierarchies
- asset data integrity standards and
- asset nomenclature standards

The establishment of a contemporary asset condition inspection system for network assets (including, but not limited to distribution poles) has also been identified as a priority initiative within the scope of the AMIS improvement program. TasNetworks currently relies on an out dated and unsupported product for pole mounted transformer inspections. Whilst this tool captures rudimentary pole mounted transformer condition data, the application is no longer supported and cannot be enhanced to take account of altering asset management practices, changing work practices or varying asset configurations. Options for an enhanced, extensible and future-proofed solution are currently being investigated by TasNetworks.

4.3 Asset Information

The asset information contained on conductors is currently stored in the Spatial Data Warehouse (GIS data) and WASP asset management system. These databases will be replaced as part of the Ajilis program.

The following sections detail the information contained in each location.

4.3.1 Data Warehouse (G-Tech Data)

The information contained in the Data Warehouse (G-Tech Data) includes:

- G-Tech Conductor Type;
- Pole Install Date;
- Distance from Coastline;
- Fire Danger Area;
- Protection Zone;
- Substandard conductor (as per AS 7000);
- Conductor Failure;
- Protection Device Operations;
- Pole IDs;
- Owner; and
- Regional Area (South, North and North West).

4.3.2 WASP Asset Data

The data contained in WASP includes:

- WASP Conductor Type;
- WASP Asset ID;
- Owner; and
- Install date.

5 Description of the Assets

5.1 Overhead Conductors and Cables

Overhead conductors provide the means for electricity to be transported over medium to long distances in urban and rural areas across the distribution network system.

Table 1 details the types of overhead conductor and cable installed in the system.

Table 1: Distribution overhead conductors and cables in TasNetworks' distribution system (as at Jun 2017)

Description	Length (km)
HV Conductors – Copper	1,116
HV Conductors – Aluminium	8,908
HV Conductors – GI	5,791
HV Conductors – ACSR	732
HV ABC	18.5
LV Conductors (including bare and LV ABC)	4,973
Total	**21,539**

The size of the cross sectional area of each strand or group of strands determines the current carrying capacity of the conductor with the larger the cross sectional area the greater the current capacity flow. Although there are many varying sizes of bare conductor, standardised sizes have been introduced which satisfy the network management of voltage levels and current flow in conjunction with the electrical equipment employed in the distribution system.

The varying types and sizes of overhead conductor is a legacy of the changing customer supply requirements, cost constraints, improvements and efficiencies in technology, the refinement of planning tools/models and design standards of the day.

5.1.1 Bare Open Wire Conductors

The most commonly installed type of conductor in the overhead system is bare open wire type conductor. The support structures and pole top equipment are designed to maintain phase to phase separation and provide the required clearance to ground and to third party infrastructure.

HV bare open wire conductor is by far the easiest and most cost effective conductor to install, replace and augment of the conductor types presently in use within the industry.

The current standard materials used as bare open wire conductors are:

1. All Aluminium Conductor 19/3.25 AAC (Neptune);
2. All Aluminium Conductor 7/4.50 AAC (Mercury);
3. All Aluminium Alloy Conductor 7/3.00 AAAC (Fluorine); and
4. Steel Conductor 3/2.75 SC/GZ (GI).

There are a number of legacy materials found in the overhead system but are no longer installed including:

1. Aluminium Conductor Steel Reinforced (ACSR/GZ): multi-strand conductor with a strengthening galvanized steel core;
2. Copper (Cu): multi-strand conductor; and
3. Galvanised Iron (GI): both single strand (such as No.8 GI) and multi-strand (such as 3/12 GI).

Aluminium conductor came in to service in the 1960s. There are 3 types of Aluminium conductor in the system, All Aluminium Conductor (AAC) All Aluminium Alloy Conductors (AAAC) and Aluminium Conductor Steel Reinforced (ACSR/GZ): multi-strand conductor with a strengthening galvanized steel core. Aluminium Conductor Steel Reinforced (ACSR) conductor is no longer installed in the system.

Galvanised Iron (GI) conductor came into service in the 1940s. TasNetworks stopped installation of single strand No. 8 GI conductor in the 1970s and the imperial 3/12 GI conductor was replaced with the metric 3/2.75 GI conductor around 1976, which is the present day TasNetworks standard for rural conductors across private property.

5.1.2 Aerial Bundled Cable (ABC)

Aerial Bundled Cable (ABC) is an insulated overhead conductor of either two or three wires in a bundled or a twisted configuration. Both HV and LV ABC are installed within the distribution system.

ABC can reduce safety and bushfire risks, minimise the vegetation clearing around the overhead power lines and improve supply reliability through minimising the impacts of vegetation, birds, animals and windborne objects on the overhead power lines.

LV ABC is TasNetworks' standard conductor for any new LV networks and the replacement of existing LV networks unless LV ABC is unsuitable (such as for long single phase spans). In those situations bare overhead LV conductor is used.

The TasNetworks' standard HV ABC will in future be changed to a fully non-metallic semiconductive outer screen insulated cable consisting of three phases wrapped around a catenary wire.

Non-metallic screened (NMS) HV ABC was previously installed by TasNetworks in selective locations, such as heavily vegetated areas or areas prone to wind, bird and animal affected areas to reduce the impact of these on the overhead system. The TasNetworks HV network includes over 18 km of NMS HV ABC that is a similar material to Victorian utilities, such as United Energy and AusNet, which is at risk of developing 22 kV insulation failure of the catenary support bare wire rubbing on the semiconductive outer covering of covered phase conductors, initiating insulation stress leading to degradation failure.

In 2016, United Energy has undertaken age based cable replacement of HV ABC non-metallic screened conductors with an installed service life over 15 years. TasNetworks with has some older installed HV ABC assets and is observing the developments in Victoria.

United Energy has trialed but not found a suitable detection method so it adopted a plan to replace its HV ABC in 2016 in response to its accelerating annual rate of failure (see reference 10[1]). United Energy 22 kV HV ABC insulation failure defect details are shown in Appendix B of that document.

The oldest 22kV HV ABC still in service in the TasNetworks' system is located along forested main road at Port Arthur near the Fox & Hounds Inn and it was installed in 1995. This represents an in service age of 22 years for non-metallic screened HV ABC at 22kV system voltage.

As the fault current rating of the metallic screened HV ABC replacement options for 35 mm^2, 50 mm^2, 150 mm^2 and 180 mm^2 are less than that of equivalent phase cross section existing non-metallic screened HVABC a design review is needed for sites with a fault current higher than 4 kA.

United Energy also did not prefer HV spacer as replacemet for HV ABC because of its 'poor aesthetics' in open air skyline background.

For TasNetworks, the aesthetics and economical retention of most existing line structures positions favours a retrofit by Metallic Screened HV ABC replacement design for failed or at risk insulation failure risk in aged non-metallic screened HV ABC .

The alternative design for in longer spans is 22 kV HV Spacer Cable System, which can span span lengths of atleast up to 600 metres, and have relatively small air swing corridor width need.

A 22kV HV Spacer system trial in Yarra Valley, by AusNet, Victoria is noted. HV Spacer is also a routine 22 kV Network Standard overhead line design option used by Western Power in southwest Western Australia.

Also TasNetworks is reviewing new Victorian R&D innovation in progress by Ausnet Services, by Powercor and by United Energy to retrofit in high bushfire risk forest areas using "Hybrid undergrounding" which is metallic screened HV ABC lines but with ducted underground cable sections with ducts installed by the directional underboring method. This would be most favourable for optimally micromanaged sections of line under Tasmania's extremely tall tree species, reducing vegetation impact risks in areas of vegetation determined to be uneconomic to manage and maintain clearances to overhead line. (See Appendix P). Tasmania has locations similar to Victoria with overtopping category 5 risk forest(defined in Appendix Q). Tasmania has the tallest eucalypt species trees in the world, including extensive stringy bark drop risk types and out of corridor tall tree fall risks to manage. The Mountain Ash tree risk in Dandenongs, Victoria is called a Swamp Oak tree risk in Tasmania.

5.1.3 Covered Conductors (CC)

Covered Conductor (CC) differs from HV ABC in that CC is a single core unscreened self-supporting cable with an XLPE insulation thickness of 2 mm. If the insulation thickness is equivalent to that required for the rated voltage it is termed Covered Conductor Thick (CCT). Metallic Screened HV ABC is touch safe while, due to the lack of screen, non-metallic screened, CC and CCT covered conductors are not.

TasNetworks utilises 11kV and 22kV Covered Conductor for short length HV droppers and HV bridgings on a number of polemounted switchgear design kits such as RL27 Enclosed Switches and NOJA reclosers. These are predominantly HDPE insulating external cover.

PVC is the predominant material used as the insulating cover on LV service cables.

[1] NOTE all references in this document are listed in Section 11.

Covered conductors are primarily used for the overhead service cables connecting the customer's installation to the LV distribution network. There is a small amount of LV covered conductor used elsewhere in the system.

The use of covered conductor thick (CCT) HV conductors for overhead line spans is still being investigated.It could be a cost effective new line design or conductor replacement option as it has the potential to reduce bare conductor risk impacts from vegetation, extreme wind and wildlife impacts on the overhead system. However there are in CCT insulation & water blocking stripping, and unshielded conductor lightning strike insulation damage ringbarking risk in service failure mode risk issues to be overcome before it can be used in the TasNetworks network as in tension overhead span conductors.The new 22kV HV covered conductor made to standard EN50397-1 as used in 2017 Victorian-funded Victorian utility trial is showing pragmatic advantage over some older 22kV CCT for failure modes in service interstate.

5.1.4 Overhead Pilot Cables and Fibre Optic Cables

Overhead pilot cables are used to facilitate protection and control between various distribution substations within Hobart's central business district. These are mature aging metallic conductors and will be replaced by fibreoptic cables as and when opportunity arises.

Fibre optic cables are used for protection and control between TasNetworks' 110/33kV substations, urban zone substations, and regional distribution SCADA hub site connectivity.

OPGW used as a subtransmission or HV overhead line lightning shield wire retrofit with fibreoptics for pilot cable protection, IoT sensors ,and SCADA communications. OPGW in shield wire position can halve the line outage reliability risks from direct lightning strike.shield wire or underslung OPGW has a significantly longer service life expectation (60 years) over underslung ADSS (15 to 20 years) in high UV incidence, ice loadings locations, and/or bushfire risk locations.

ADSS as pilot cable was removed from Derwent River crossing service because of mechanical failure unreliability wearout (2015/16). ADSS with wetted surface pollution can become conductive for HV tracking and HV live Line worker voltage proximity risk precautions.

OPGW as underslung or as shield wire is preferred design choice for a TasNetwork owned asset on TasNetworks distribution lines.

Appendix L shows regions of higher lightning risk are mostly in the north /northwest of the state.

5.1.5 Earthing Conductors

Distribution overhead earthing conductors can be line support structure assets to local earth at base of line support structure, or as aerial conductor, spans of Overhead Earth Wire (OHEW) to shield line from lightning strike and/or connect from a line support structure to a remote earth. TasNetworks overhead subtransmission and HV feeders presently are not shielded by spans of overhead earth wires or OPGW. However, HV ABC has a catenary support conductor in the HV covered conductor bundle that is an overhead earthing conductor earthed at line support structures.

Overhead line support structure assets have attached earthing conductors used to connect non-current-carrying metallic parts of overhead system equipment, such as pole mounted transformer tanks and switchgear operating handles, to the HV earthing system. They provide a low impedance path for the flow of earth fault current into the ground for the reliable operation of protection devices, and they help to control voltage rises associated with faults.

Pole copper earth theft is persistent, but vandalism and theft risk is reduced by use of steel covers or using copper clad steel earthing conductors.

In the 64 SWER systems the HV SWER pole earth is also a load current carrying conductor, and any breakage or copper theft deliberate cut of the HV earth conductor can immediately impose 12.7kV ac open circuit voltage to earth on the break gap as a shock hazard risk and a gap current flow resitive heating wood risk of pole fire.

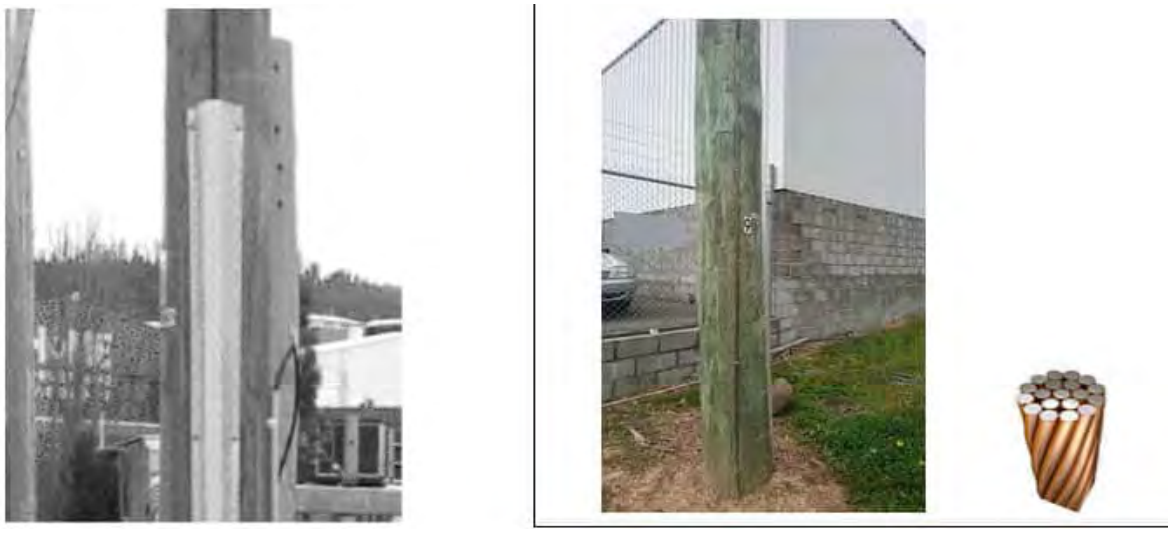


Figure 3: Pole earth copper theft is resisted by steel covers or using copper clad steel

5.2 Pole-top Hardware

TasNetworks' Pole-top Hardware comprises:

- Insulators;
- Cross-arms;
- Conductor fittings;
- Surge arrestors;
- Bird diverters;
- Aircraft warning markers;
- Live line clamps;
- Vibration Dampers; and
- LV Spreaders.

5.2.1 Insulators

Insulators provide an insulated means of attaching the conductors to the poles. The type of insulator, size and make used are dependent on the level of voltage of the conductors, the design requirements of the overhead line and various external influences such as pollution, weather conditions, and geographic location.

Generally HV and LV insulators are grey porcelain or glass and are bolted to the cross arm or pole by a steel pin or bolt. The remaining insulators are brown porcelain and so are a pre-1967 vintage, or over fifty years in service. Older porcelain insulators are at increasing risk to metal pin corrosion necking and thread swelling, for porcelain cracking or punch through risk.

A number of risks need to be addressed before polymeric insulators are selected to be installed extensively: weathershed native parrot chewing risks and the often high level of ultraviolet exposure in Tasmania. 22 kV polymeric post insulators were selected and installed on new air break switches from 2014/15.Shooter vandalism to porcelain and glass insulators is relatively low in Tasmania, but polymeric insulators can be used as needed.

Shortly after the establishment of Aurora Energy in 1998 a number of failures of porcelain insulators in the North-West (possibly due to the high pollution levels) led to a trial installation of polymeric insulators. These are valued long term in service NCI aging trial nearing 15 years (reference 18).

NCI bushings are now being used on polemounted switchgear, polemounted transformers, cable riser terminations, and cycloaliphatic insulators on new polemounted Air Break Switches.

TasNetworks currently uses:

- Pin (porcelain and polymeric)
- Strain (porcelain and polymeric)
- Guy strain (porcelain)

The historical practice of replacing a distribution pin insulator, shackle insulator or porcelain insulation mounting assembly only when its defective , ie one at a time meant the likelihood of repeated outage failures /fault repair works for adjacent similarly aged insulators. The replacement of all three phase set of aged insulators on first outage failure is outage time costly, but a full set replacementcan be done opportunely at times such as a planned condemned pole replacement or crossarm replacement (Figure 4 illustrates a multicircuit vintage poletop with brown porcelain ,grey porcelain and glass insulators in close proximity see Figure 4)..HV pin porcelain insulator punch through failure is hard to visually detect and can be risk minimised by prudent insulator replacement with condemned pole and /or crossarm. The need to replace EDO fuse mouting assemblies for longer Boric Acid fuse retrofit replacement in bushfire risk mitigation program , offers an opportunity to update the EDO fusemount insulation assemblies.

Pending trial of Corona Cameras, and sonic detectors can add to preventation by inspections.

5.2.2 Cross Arms

Insulators are mounted on cross arms attached to the structure to provide the required clearance between conductors.The mix of cross arms is show in Table 3.

Table 2: TasNetworks Crossarm population (2015/16)

Material	Distribution Network Crossarms	Private Crossarms	Crossarms replaced
Fibreglass	21	-	-
Steel	274,615	3,352	827
Timber (CCA)	209,150	58,439	1,707
Unknown	46,409	43,462	2
Total	530,195	105,253	2,536

Steel HV cross arms are used because they provide the structural integrity to withstand high conductor load tensions and associated loads imposed (see Figure 8).ENA industry feedback indicates these have the lowest failure rate of all crossarms at 1.6 per 100,000 crossarms installed.

LV cross arms are predominantly manufactured from sawn timber as this medium is cost effective and offers insulation qualities to allow live line activities to be performed safely. Sawn wood LV crosarms as are shown in Figure 9 and have a relatively short service life ≈20years) ENA industy feedback indicates the untreated wood cross arms mostly fail by fungal decay, and at rate of258 per 100,000 crossarms installed.

In 2016/17, a cross arm trial recommended in its Final Report (reference 17) replacing LV cross arms with more than 15 years service life with Fibreglass crossarms . An 18 months change period has been proposed and a further trial involving alternative HV cross arms was been recommended ,primarily for improved lighter weight lift ergonomics, increased insulation for reliability and endangered species flashover risk mitigation. The LV crossarm trial concluded that the fibreglass crossarms offered safer handling, an improved asset lifecycle cost and improved insulation for reliability (see references 12,17 and the summary in Appendix P) .

Figure 4: Steel HV cross arms and insulators on dual circuit 33kV and 33 kV and 11kV circuits on a stobie pole

Figure 5: Wooden LV cross arms

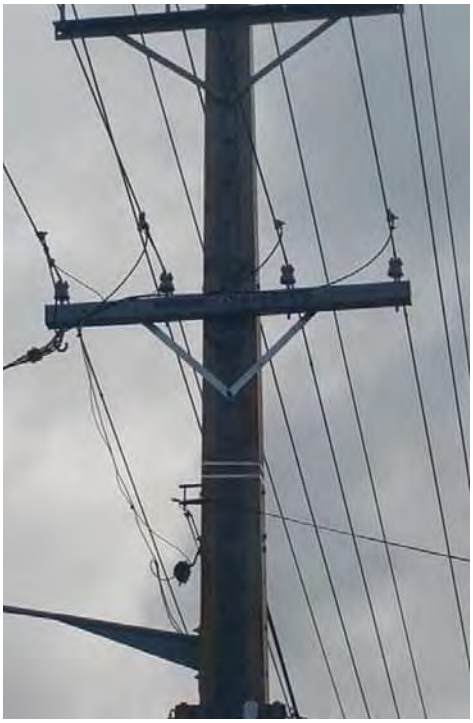


Figure 6: Fibreglass (FRP) LV cross arm in trial

5.2.3 Conductor Fittings

Conductor fittings are used to secure conductors to their supports and for connections between conductors both mechanical under tension and non-tension types. Various types of fittings are used depending on the size and type of conductors involved, their geographical and electrical location within the network for short circuit currents and the electrical loading on the conductors. Both replacement and new LV and HV conductor connections need to be matched for load current rating, load cycle and fault current in the circuit location (see Appendix K).

In SWER systems the HV earth conductor connections are also load current carrying conductor.

The general methods of connection include welds, compression, bolted, tension methods or AMPAC (wedge).

Bare overhead conductors are attached to insulators using conductor ties. These ties are generally the same material as the conductor.

Periodic aerial and thermal camera inspections find fitting defects for preventative repair action.

TasNetworks field requested trial evaluation of several brands of newer shearbolt bolted tension connectors for faster new jointing, and/or shunt repair jointing, for achieving timely and longer service performance jointing for weathered overhead bare conductor tension break repair jointing. SAA AS5804-2010 HV live line working friendlier design choices include ANSI C119.4 Class AA, extra heavy duty connectors like Classic Connectors ClampStar shunt kits or equivalent. Generally the conductor connectors to ANSI C119.4 Class AA, extra heavy have inbuilt spring-loading design and greases to help maintain grip and electrical connectivity on weathered conductors.

5.2.4 Surge Arresters

Surge arresters, alternatively called Surge Diverters, are installed to prevent damage to equipment in the event of a direct lightning strike on the overhead system.

Generally surge arresters are installed on specific higher replacement cost equipment, such as pole mounted cable risers or transformers. Figure 4 shows red weathershed metal oxide surge diverters also used as angled nearly horizontal support insulators for cable riser termination However, the surge arresters may also be placed in the overhead system at strategic locations prone to lightning strike.Appendix L illustrates lightning risk is higher in the north and northwest.

HV ABC installations and where underground cable risers connect to the bare conductor overhead system are examples of locations where surge arresters would be installed to minimise overvoltage doubling risk.

5.2.5 Animal barriers, bird diverters on conductors and poletop insulation

Wood poles are fitted with one or more flat metal sheet ‘possum guards’ to reduce arboreal animal climbing structures resulting in live bare conductor flashovers at the pole top (arboreal species include possums, rats, cats, young Tasmanian Devils, tree frogs , lizards, and snakes).

Nocturnal arboreal glider possums (see Figure 7) might glide/ jump onto urban overheadconductors to avoid ground crossing with urban dog/cat predator risk, to risk energised bare conductor flashover hazards at poletop (located above the pole possum guard). Trials are proposed with spin cover guards mounted on conductor such as critter guards, line guards, rat guards or equivalent, if tall tree/ gardens risk enable.

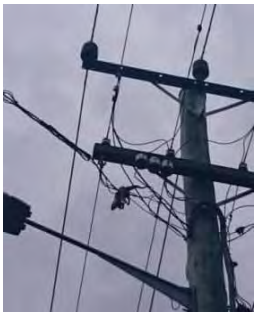


Figure 7: Proposed critter barrier trial for glider possum on pole top risk

Swans, geese, waterfowl and other large birds commonly collide with conductors. Bird diverters are installed in problematic locations to make conductors more visible to birds (Figure 17) but are not installed on substandard conductor that display red rust or have insufficient strength. Birds are the cause over 400 outages a year on TasNetworks' distribution system.

Figure 8: Bird diverters installed on conductor (but not on substandard conductors)

5.2.6 Aircraft Warning Markers

Aircraft warning markers are installed on selected overhead conductors and equipment to warn human aircraft pilots about the presence of aerial obstacles. AS/NZ 3891.1-2008 (reference 2) requires any conductor installed more than 90 metres above the ground or with a span length longer than 1,500 metres to be marked with Aircraft warning markers. This standard also requires any overhead line installed within specified limits of a CASA registered airport to be marked.

AS/NZ 3891.2-2008 (reference 2) specifies the responsibilities of pilots regarding line marking.

5.2.7 Live Line Clamps

In the past, live line clamps were used to connect new transformers directly to HV feeders without requiring an outage as in Figure 10. This connection was intended to be a temporary connection and to be changed to a 'D-loop' at the next planned outage. Records were poorly kept of installations connected using live line clamps and many were not changed to D-clamps. It is estimated that there are approximately 10,000 live line clamps still connected (by the WASP defect pool).

The connection of a live line clamp directly onto a live tensioned conductor can result in arcing, eroding individual strands of the conductor and greatly reducing its strength. The risk is greater for Galvanised Iron (GI) conductor as this arcing can remove the galvanising, which exposes the iron to moisture build up underneath the clamp. This results in corrosion of the conductor, which will lead to conductor failure or the fusing of the conductor to the clamp. Priority will be given to the HBCA for this program to remove live line clamps.

Figure 9: Live line clamp directly connected

Figure 10: Live line clamp connected via D-clamp

5.2.8 Vibration Dampers

Spiral vibration dampers are a relatively simple device used to minimise the effects of wind-induced vibration on HV power lines. Sustained vibration can lead to wearing and abrasion of a conductor and the ties near the connection point. It is for this reason that dampers are normally installed within a hand's width of where the conductor finishes at a pole. Dampers are helically wound around the outside of the conductor and clamped at one end. As the vibrating conductor hits the inside of the damper coil the coil disturbs the build-up of natural frequency, thereby reducing vibration. Figure 11 shows a series of three spiral dampers per phase in a long span.

For minimising conductor fatigue, spiral vibration dampers shall be designed to reduce the effects of wind-induced vibration on aluminium, ACSR, or galvanised steel overhead conductors strung at medium or full tension for a line service life of 50 years.

For longer span lengths more energy generally has to be absorbed by the damper. On longer spans use of two or more dampers might be needed on spans of 200-400m, 400- 500m, and greater than 500m span lengths. Terrain hills and tree shielding may reduce need for dampers.

Installation instructions for damper positioning design by designer and constructor should be supplied from successful tenderer. An application equation (for example only):

Supplier's installation guide should address designer design requirements , but historically empirically more efficient dampers were those placed in the middle of any half loop . Position modified if armour rods fitted .

$$\text{Spacing} = \frac{0.7 \times d}{2 \times 185 \times V} \sqrt{\frac{T}{m}}$$

Where :
d = conductor O.D. (mm)
V= wind speed (m/sec)
T* = horizontal tension (N)
M= conductor mass (Kg/m)

TasNetworks installs spiral vibration dampers in areas prone to heavy winds such as close to the coast and subject to aeolian vibration.

Figure 11: Three in series HV spiral dampers per conductor on a long span

Low Voltage SpreadersLow voltage spreaders are fitted to LV bare conductor spans to reduce LV bare conductor clashing risk. Low voltage fibreglass reinforced plastic spreaders also dampen span conductors relative movement.

5.3 Conductor Age Profile

Condition based assessment is partly indicative by installed conductor service by age. However, SAA AS7000-2016 cites a risk based approach and provides informative on specific failure risk modes that include - conductor stress and fatigue assessment is referenced in SAA AS7000-2016 Appendix Y, Corrosion in Appendix X, and Creep in Appendix U, and annealing in Appendix AA, and short time and circuit current in Appendix Z.

Industry experience is also recognising the overhead conductor's tension joints and connections as points of risk by service age/condition assessment. For example in Appendix Y, it notes conductor fatigue will almost exclusively occur at a conductor fitting.).

LV conductors make up 23 per cent of overhead conductors by length

.There is no consolidated age profile information for LV conductors or for pole top hardware. These assets are risk managed on periodic maintenance inspection basis.

The optional opportunity to replace corroded aged bare conductors as condition based risk mitigation affords opportunity to replace it with LV ABC conductor. Urban load supplying LV ABC retrofit is often safer to perform and convert services, removes bare LV conductor clashing and bird impact risks, for reliability advantage. New LV bare conductor as condition based bare LV conductor replacement is still used for atleast the longer span length replacement works. (LV ABC conductor retrofit is limited by design maximum span length)

HV conductors are 77% of the overhead network by length.

The age profile of all HV overhead conductors is indicated in Figure12. Copper and galvanised iron conductors being the majority of the older conductors.

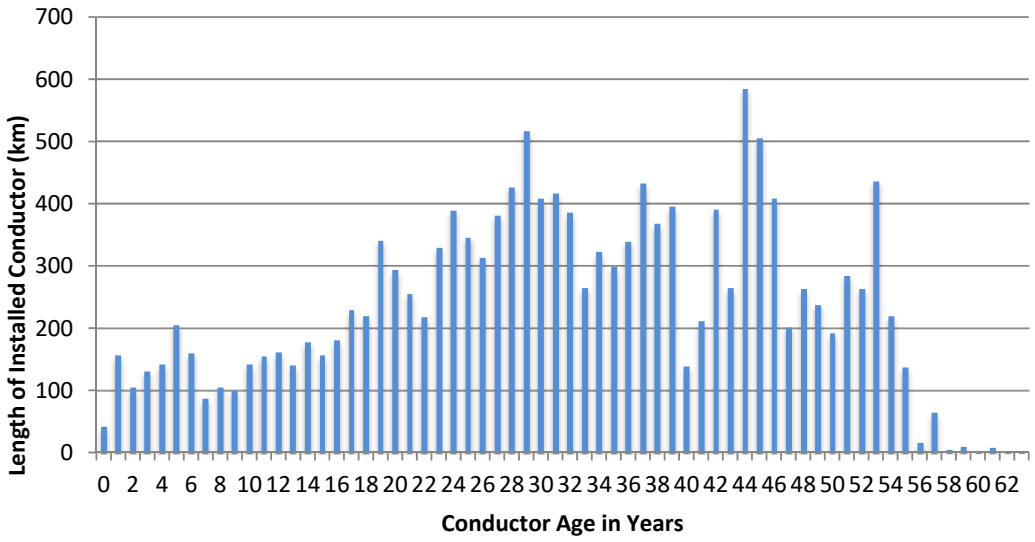


Figure 12: Estimated Age Profile for all HV Conductor in the Network

5.3.1 Copper Conductor Age Profile

Figure 13 gives the age profile of copper conductor. As the majority of copper conductor in the LV and HV system was installed prior to 1964 it will be in excess of 55 years old by the start of the current determination period in 2019.

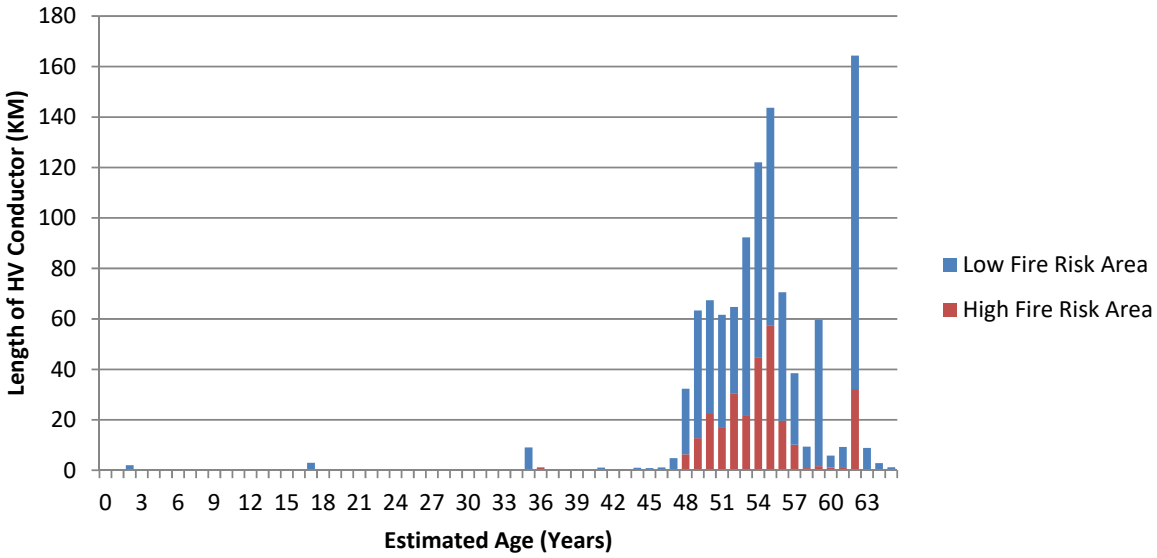


Figure 13 Copper HV Conductor Estimated Age Profile

5.4 GI Conductor Age Profile

Figure 14 shows the estimated age profile for GI HV overhead conductor.

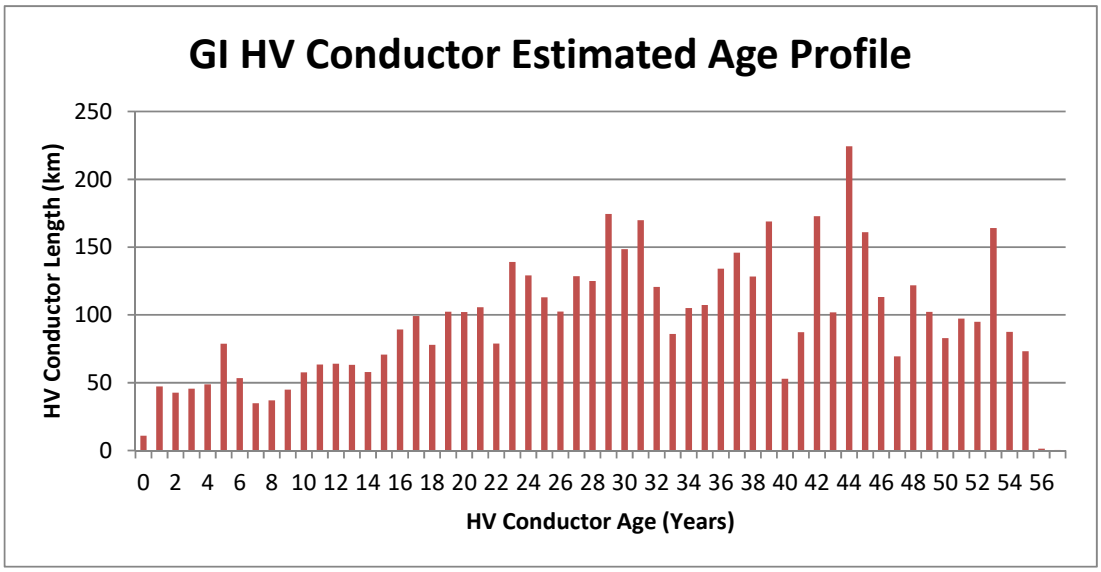


Figure 14: GI HV overhead conductor estimated age profile.

Figure 15 shows the age profile of the most at risk GI HV conductors, those within 2km of the coast. The large age spike of GI conductor currently at 51 years of age can be attributed to the work carried out in the aftermath of the 1967 bushfires and the older is mostly rural electrification not otherwise destroyed in bushfires.

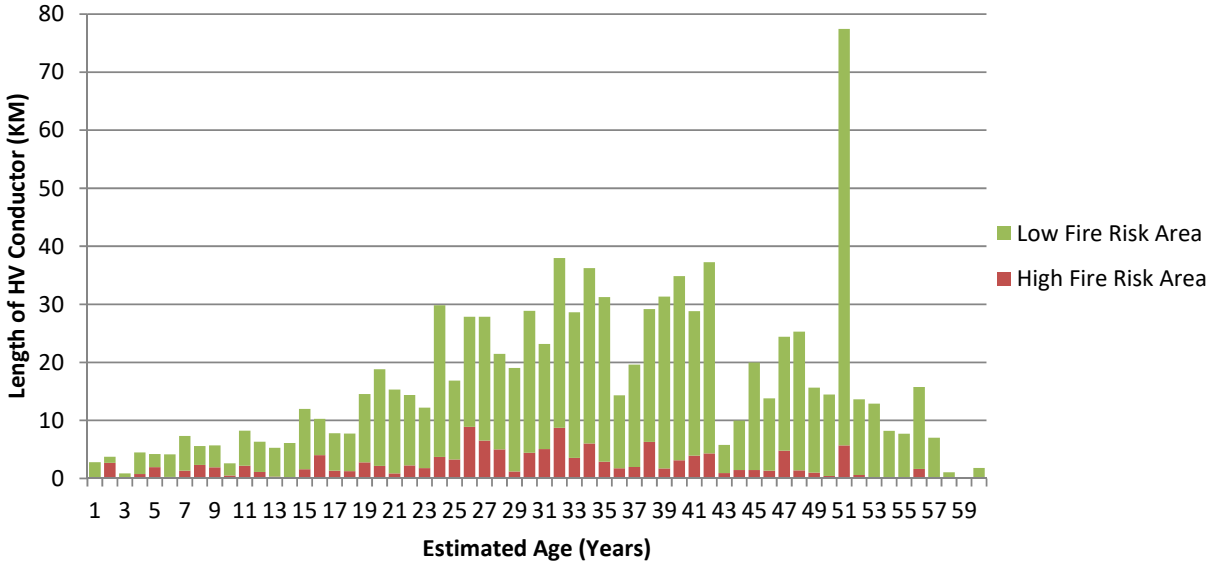


Figure 15: GI Conductor estimated age profile within 2km of the coast

5.5 Aluminium Conductor Age Profile

Figure 16 illustrates the age profile of aluminium conductors in TasNetworks distribution system. The majority of aluminium conductor in the LV and HV system was installed from 1963 and will average in age from new to 53 years by the end of the current determination period (2016/2017). Smaller cross section stranded AA conductor is more surface area to diameter prone to corrosion earlier, and to creep by fatigue if at high mechanical tensions likely in rural lines.

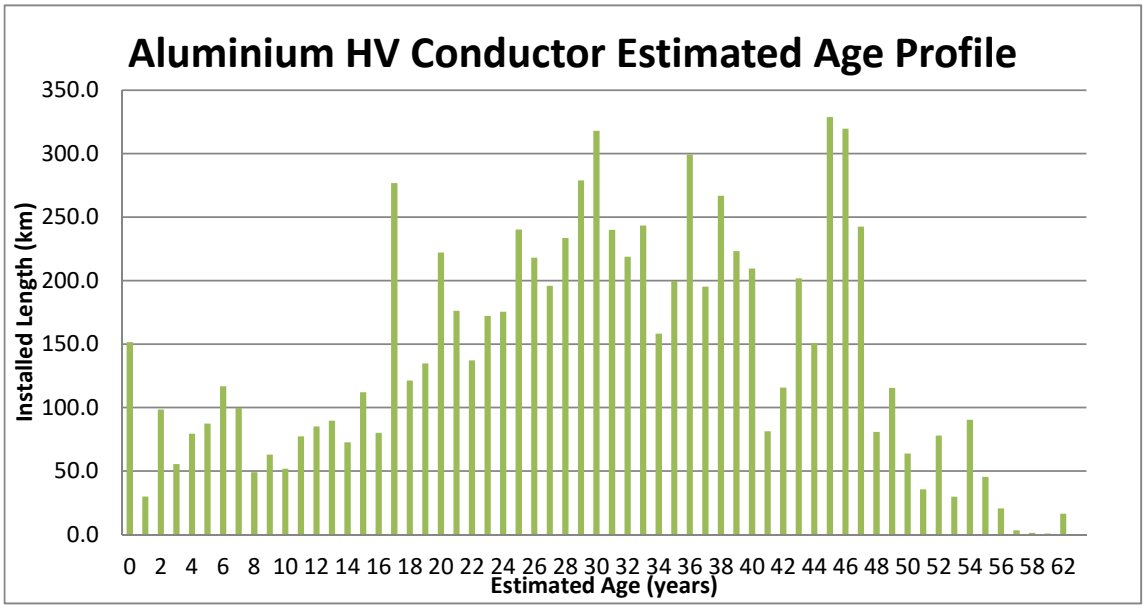


Figure 16: Aluminium HV conductor estimated age profile.

6 Standard of service

6.1 Technical Standards

Standards applying to distribution overhead conductors and hardware include:

- AS/NZS 7000:2010 – Overhead line design – Detailed procedures
- AS/NZS 2067:2016 – Substations and High Voltage Installations
- AS/NZS 5804-2010 –High Voltage Live Working

6.2 Key performance indicators

TasNetworks monitors distribution asset faults through its outage and incident reporting processes.

Asset failures resulting in unplanned outages are recorded in the In-service outage management tool by field staff, with cause and consequence information being available to staff for reporting and analysis. Those outages with a significant enough consequence are also recorded in RMSS and are investigated by the business to establish the root cause of the failure and to recommend remedial strategies to reduce the likelihood of reoccurrence of the failure mode. Reference to individual fault investigation reports can be found in RMSS.

TasNetworks also maintains a defect management system that enables internal performance monitoring and statistical analysis of asset faults and/or defects that either may not result in unplanned outages, or whose failure may only result in a minor consequence not requiring full investigation.

Examples of distribution performance impacts are seen in:

- Appendix L illustrates a 10 year lightning history contour with network asset locations. It identifies a higher lightning frequency risk to asset location concentration in the north of the state.
- Appendix M shows an example of regular report on Asset Performance by Asset Thread Category (12 month rolling average). Localised OHEW /OPGW shielding of higher exposure risk subtransmission and HV line sections might improve reliability.
- Appendix N shows locations of mostly unshielded low profile 33kV lines in Hobart area, which reliability benefits from urban shielding and low thunderday locality.

TasNetworks' Service Target Performance Incentive Scheme (STPIS), which meets the requirements of the Australian Energy Regulator's (AER's) Service Standards Guideline, imposes service performance measures and targets on TasNetworks with a focus on outage duration and frequency. While the STPIS does not target specific asset classes, good asset performance will have a significant impact on TasNetworks' ability to meet the STPIS targets.

STPIS parameters include:

- System Average Interruption Duration Index (SAIDI); and
- System Average Interruption Frequency Index (SAIFI).

Details of the STPIS scheme and performance targets can be found in the "*Electricity distribution network service providers - Service target performance incentive scheme - November 2009"*.

Figure 17 identifies conductor and hardware asset failure contribution to SAIFI 2015/2016 and 2016/2017

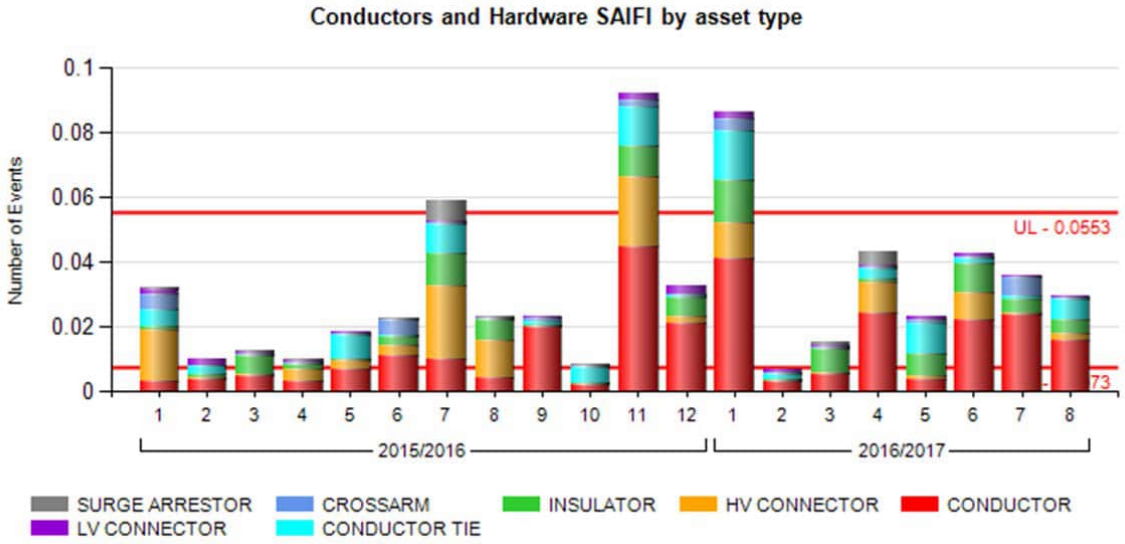


Figure 13: Asset Failure SAIFI contribution – Conductors and Hardware

Figure 18 identifies conductor and hardware asset events as a proportion of all overhead asset events.

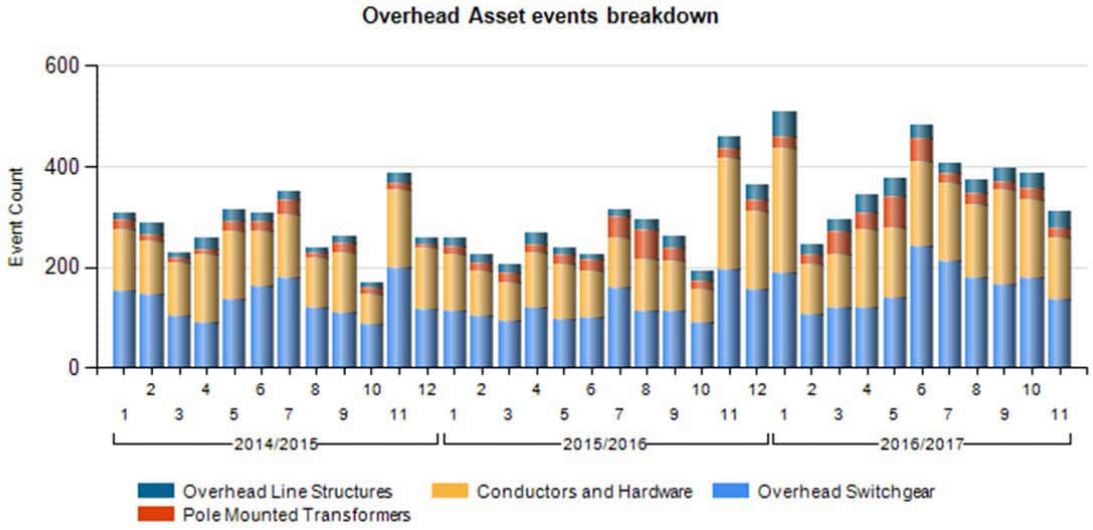


Figure 18: Conductor and hardware as a proportion of all overall Overhead Asset events breakdown (June 2017)

6.3 Benchmarking

TasNetworks' service performance is benchmarked against other DNSPs through the AER's RIN framework.

In addition, TasNetworks also works closely with its other distribution networks, to compare asset management practices and performance.

TasNetworks is also internally benchmarking its Bushfire Risk Mitigation Management. It is updated periodically as Year To Date Performance Report in TasNetworks (refer to Appendices C, D, E, and F). Most of the highest bushfire risk asset types are addressed in this Asset Management Plan and a long lived service life asset types. Strategy actions in condition based replacement including benchmarked technology innovation where practicable.

The definition of the High Bushfire Consequence Area is flexible, and can change between years. TasNetworks has the option of extending the consequence area covered by its pre-summer inspection and cutting program if conditions leading into the bushfire season pose sufficient risk to warrant additional work being undertaken. Such risks and additions to the program are developed in consultation with the Tasmania Fire Service and the Bureau of Meteorology. Map of the current High Bushfire Risk Consequence Area is shown in Figure 19.

About 16% of TasNetworks distribution network assets are located in the current HBCA as in May 2017.

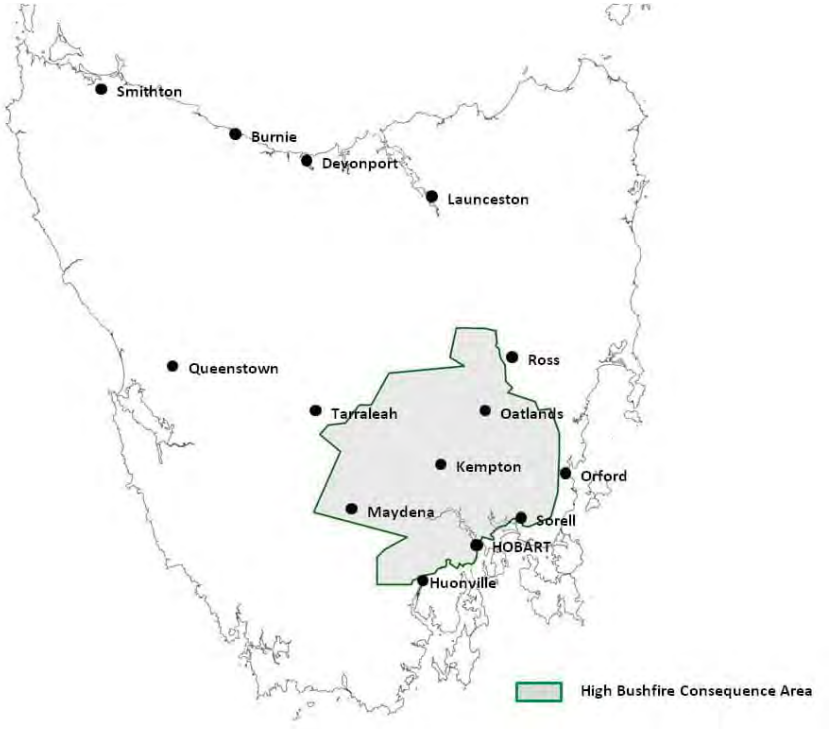


Figure 19: Current High Bushfire Consequence Area

7 Associated Risks

TasNetworks has developed a Risk Management Framework for the purposes of

- Demonstrating the commitment and approach to the management of risk – how it is integrated with existing business practices and processes and ensure risk management is not viewed or practiced as an isolated activity;
- Setting a consistent and structured approach for the management of all types of risk; and
- Providing an overview on how to apply the risk management process.

Assessment of the risks associated with the distribution overhead switchgear has been undertaken in accordance with the Risk Management Framework. The risk assessment involves:

- Identification of the individual risks including how and when they might occur
- Risk analysis of the effectiveness of the existing controls, the potential consequences from the risk event and the likelihood of these consequences occurring to arrive at the overall level of risk.
- Risk evaluation where risks are prioritised based on their ratings and whether the risk can be treated) or managed at the current level.

  The likelihood and consequence of risk events occurred are assessed using the following risk rating matrix in figure 20:

Figure 20 Risk Ranking Matrix

		CONSEQUENCE				
LIKELIHOOD		**1 NEGLIGIBLE**	**2 MINOR**	**3 MODERATE**	**4 MAJOR**	**5 SEVERE**
• ≥ 99% probability • Impact occurring now • Could occur within "days to weeks"	**5 ALMOST CERTAIN**	**MEDIUM**	**MEDIUM**	**HIGH**	**VERY HIGH**	**VERY HIGH**
• 50% - 98% probability • Balance of probability will occur • Could occur within "weeks to months"	**4 LIKELY**	**LOW**	**MEDIUM**	**HIGH**	**HIGH**	**VERY HIGH**
• 20% - 49% probability • May occur shortly but a distinct probability it won't • Could occur within "months to years"	**3 POSSIBLE**	**LOW**	**LOW**	**MEDIUM**	**HIGH**	**HIGH**
• 1% - 19% probability • May occur but not anticipated • Could occur in "years to decades"	**2 UNLIKELY**	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**	**HIGH**
• ≤1% probability • Occurrence requires exceptional circumstances • Only occur as a "100 year event"	**1 RARE**	**LOW**	**LOW**	**LOW**	**MEDIUM**	**MEDIUM**

The Risk Management Framework requires that each risk event is assessed against all of the following consequence categories:

- Safety and People
- Financial
- Customer
- Regulatory Compliance
- Network Performance
- Reputation
- Environment and Community

This asset management plan describes the major risks associated with distribution overhead conductors and hardware assets and the current or proposed treatment plans.

7.1 Overhead Conductors and Cable Risks

7.1.1 Low Conductor Clearances

TasNetworks is required to maintain minimum clearances to ground for its overhead conductors to ensure that pedestrians or vehicles do not come in contact with conductors. Low conductor clearance may be the result of a number of issues; change in the ground level after installation, inadequate design or installation, higher than anticipated load on the conductors or insufficient tension on the conductor.

TasNetworks experiences approximately 30 incidents every year where third party vehicles contact and / or pull down overhead services or conductor. The risks from these events include: damage to third parties' and TasNetworks' assets, electric shocks or electrocution and fire starts.

7.1.2 Vegetation coming in contact with conductors

TasNetworks is required to maintain minimum clearances to vegetation for its overhead conductors to ensure that vegetation does not come in contact with conductors. Venation may come in contact with vegetation for a number of reasons: vegetation near the conductor grows till it comes in contact, a nearby branch sways when windy and hits a conductor or a branch or tree falls onto conductors. The risks from these events include: damage to TasNetworks assets, outages and fire starts.

Mitigation measures that manage the vegetation growth are addressed by the Vegetation Asset Management Plan whilst this plan includes measures that eliminate the risk such as undergrounding sections of a line or relocation of a line or replacing bar conductor with insulated conductor.

7.1.3 Substandard Conductor

Substandard overhead conductor may result in broken wires, presenting fire and safety risks as well as interrupting supply to customers. Copper and Galvanised Iron Conductor have been identified as representing the highest proportion of conductor failures.

TasNetworks records on average approximately 200 outages caused by conductor failures every year. In 2016/17, conductor failures contributed 8.95 minutes SAIDI (or 19% of the total asset related failure contribution to SAIDI of 48.02 minutes) and 0.04 interruptions SAIFI (or 11% if the total asset related failure contribution to SAIFI of 0.37 interruptions).

Table 3 shows the results of analysis of conductor failures by distance from the coast. These results show that over 36% of all conductor failures occur within 5 km of the coast (with 21% of all

conductor located within 5 km of the coast). Conductors installed close to the coast more susceptible to salt spray from the prevailing winds and therefore is more likely to fail due to corrosion.

Table 3: Conductor failure statistics by distance from coast (as at June 2015 – from WASP Outage Data)

	Distance to Coastline (km)						
Conductor Type	**0 - 5**	**5 - 10**	**10 - 20**	**20 - 30**	**>30**	**Total Failures**	**% of Total Failures**
Number of AAC failures	57	11	4	13	24	109	25%
% of all AAC failures	52%	10%	4%	12%	22%		
Number of AAAC failures	30	14	6	3	24	77	18%
% of all AAAC failures	39%	18%	8%	4%	31%		
Number of ACSR Failures	5	4	6	2	12	29	7%
% of all ACSR failures	17%	14%	21%	7%	41%		
Number of Copper failures	15	5	2	4	42	68	15%
% of all Copper failures	22%	7%	3%	6%	62%		
Number of GI failures	53	31	12	18	43	157	36%
% of all GI failures	34%	20%	8%	11%	27%		
Total Number of Failures	160	65	30	40	145	440	100%
% of All Failures	36%	15%	7%	9%	33%		

7.1.3.1 Overhead Copper (Cu) Conductor

Analysis of conductor failures has shown that the percentage of copper conductor failures in the network is higher than any other conductor type. Copper conductors make up 15% of the total failures while only representing 7.8% of total installed conductors.

Table 4 shows there have been an increasing trend of copper conductor failures over the past few years.

Table 4: Copper conductor failure statistics by year

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of failures	5	7	7	8	4	5	1	11	13

During their life these conductors are exposed to significant fault currents that could cause the copper to anneal (reduction in tensile strength) and scale (reduction in diameter). This deterioration, which is easily identified by its orange and scaling appearance, affects the tensile strength. Small size copper conductor is particularly susceptible to corrosion and failure in marine type environments.

The risks from copper conductor failure include: damage to third parties' and TasNetworks' assets, electric shocks or electrocution and fire starts.

7.1.3.2 Overhead Galvanised Iron (GI) Conductor

Galvanised conductor is a poor conductor in marine environments. When subjected to wind borne salt spray and sea fogs containing salt contaminants, salt crystals are deposited on to the steel conductors. A galvanic cell is formed and removal of the zinc coating results over time. Once the

zinc coating has been removed, severe corrosion of the steel leads to loss of mechanical strength and eventual conductor failure.

The risk of public safety as a result of conductor failure in marine environments is exacerbated by the fact that most of these conductors are at the end of long feeders and the ground is sand, having a high resistance, making it highly probable that the protection will not see the event as a fault and isolate the line.

Table 5 shows the number of galvanised iron conductor failures by year.

Table 5: Galvanised iron conductor failure statistics by year

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of failures	7	20	13	15	4	14	9	17	28

Though the conductor failure rate is lower than other conductors, the fire start risk is much greater due to an increased likliness of ground fire ignition from clashing steel conductors compared to copper or aluminum. This is compounded by the fact that a primary benefit of using steel conductors is increased span lengths however, increased span lengths increase the likliness of clashing conductors.

Table 6 shows the results of geospatial analysis of galvanised iron conductor failures from 2010-2014. These results indicate that conductor closer to the coast is more susceptible to salt spray from the prevailing winds and therefore are more likely to fail due to rusting. It can also be seen that galvanised iron conductor represents an average of 36% of all failures.

Table 6: Conductor failure statistics by distance from coast (2010-2014)

	Distance to Coastline (km)				
Row Labels	**0 - 5**	**5 - 10**	**10 - 20**	**20 - 30**	**>30**
AA	57	11	4	13	24
AAA	30	14	6	3	24
ACSR	5	4	6	2	12
Cu	15	5	2	4	42
GI	53	31	12	18	43
Grand Total	160	65	30	40	145

7.1.3.3 Overhead Aluminium (AA) Conductor (REMAC)

The following conductors with a smaller diameter are identified to be at a higher risk of failure:

- AAC 7/2.50 Leo
- ACSR 6/1/2.50 Almond conductor

The only type of Aluminium conductor currently used in TasNetworks distribution system are 19/3.25 AAC (Naptune0, and 7/3.00 AAAC (fluorine) as standard conductors. These are used when higher load carrying capacity is required, such as when the line is a feeder trunk or the future load forecast is high.

As displayed in Table 6, 43% of conductor failures are from aluminium conductor either AAC or AAAC. The causes may be locality specific or a result of generic wearout based on fatigue or corrosion.

Another cause of conductor failure may be a lightning direct strike on an unshielded conductor which results in arc melt those progresses to a broken conductor. Inspections such as by mast camera, EWP, helicopter or unmanned aerial vehicle camera from above and /or by corona camera can assist detection of in span arc melts from lightning strike to unshielded distribution conductors or conductor clashing.

Figure 20 shows one of two adjacent conductor arc melt defects (from another network) that arose from midspan clashing and conductor galloping that could progress to a broken conductor. Figure 21 is an example of midspan set of two 33kV interphase spacers and conductor melt retrofit repair kit (Adapt Australia).

Figure 20 shows one of two adjacent AAC midspan conductor arc melts from galloping

Figure 21 shows a HV mid span spacer set for AAC damping galloping solution

Figure 22 shows fretting fatigue failure that can become a cause of strand failures in both outer and inner strands. Interstrand microslip amplitude increases, small cracks are generated, and some propagate to strand failures (reference 11)

Figure 22 shows example of fretting conductor fatigue failure risk in AA or ACSR conductor

7.2 Other Risks

7.2.1 Cross Arm Failures

Timber cross arms are subject to failure due to decay or loose or fatigued steelwork. The risks from cross arm failure include: damage to TasNetworks assets (falling conductor or equipment such as pole top transformers), injury to the general public, outages and fire starts.

TasNetworks mitigation measures are to inspect and replace damaged or weak cross arms and to tighten any loose bolts or replace fatigued steelwork.

7.2.2 Access Tracks

The majority of TasNetworks' overhead assets are located adjacent to existing roads where there is suitable access to the assets for operations, maintenance and replacement works. However in some locations overhead assets travel through private and public owned land where access tracks adjacent to the overhead lines are required. There is the potential for access to be prevented to TasNetworks lines and equipment for routine maintenance and emergency fault repairs if the vegetation is not periodically removed. The risks from these event includes: damage to TasNetworks vehicles and a delay in access means delay in addressing emergency situations (e.g. making safe on site, larger, longer unplanned outages) or planned works.

7.2.3 Weed Management

Tasmania has specifically designated clean and unclean sites, farms and areas with respect to weed and disease around the state. TasNetworks has strict weed and disease management procedures in place when travelling between these areas. However there is a risk that TasNetworks' activities when travelling on access tracks whilst carrying out overhead works may contribute to the spread of weeds, such as gorse outbreaks in gorse-free areas within TasNetworks' easements. The risks from this event includes: damage to native vegetation or loss of agricultural production due to the spread of weeds or diseases. TasNetworks has approximately 25,000km of easements for transmission and distribution lines, and it is anticipated that additional annual expenditure will be required for weeds management and biosecurity to changing legislative requirements on distribution line easements.

7.2.4 Contact with bird and animal species

It is common for bird and animal species including protected species such as Tasmanian wedge tail eagles to come in contact with poles, conductors and pole top hardware. The separation distances between conductors and pole top hardware are generally adequate to prevent current tracking down the pole to the ground. However, birds and animals occasionally bridge this gap, resulting in phase-to-phase contact of the conductors and the electrocution and potential combustion of the animal.

TasNetworks records approximately 500 outages caused birds and animals every year (including mid-span collisions). The risks from these events include: unplanned outages, damage to TasNetworks' assets, damage to the wildlife involved and the potential for fire starts.

7.3 Summary of Risks

Appendix A has list of the programs for distribution overhead conductor and pole top hardware risks, risk drivers, and residual risk. Each program specific risk is detailed in matching Investment Evaluation Summary.

8 Management Plan

8.1 Historical

TasNetworks' asset management practices on the overhead and structures asset classes have been consistent for a number of years; however current practices are under review, with the approach changing to Reliability Centred Maintenance (RCM).

Although there is a robust condition based replacement process for structures, condition based replacements of overhead assets can be improved. Better understanding of the condition of the overhead assets is required; hence the historic inspection process will have to change to support this.

Operational expenditure on the overhead system is increasing. This is due to an increase in the volume of defects reported along with a growing pool of existing defects carried over from previous years where tasks have been put on hold due to resource and budget constraints. This has prompted a review of TasNetworks' defect management process and has resulted in some restructuring of programs.

8.2 Strategy

8.2.1 Routine Maintenance

There is a fundamental requirement for TasNetworks to periodically inspect its overhead conductors and hardware to ensure their physical state and condition does not represent a hazard to the public. Other than visiting the assets, there is no other economic solution to satisfy this requirement. The Strategy for inspection of overhead lines (reference 16) outlines the roles of ground line inspection, aerial visual inspection photography, thermal inspection and LiDAR survey inspection.

8.3 Planned Asset Replacement versus Reactive Asset Replacement

Failure of overhead conductor and hardware assets have the potential to cause a bushfire or a serious injury or fatality to a member of the public. It is therefore seen as prudent to inspect the condition of assets on a regular basis and to replace or reinforce assets in poor condition before they fail. Poor condition assets are identified in maintenance and inspections activities and feed into the list of proposed capital expenditure projects for prioritisation.

While poor condition assets are primarily replaced for safety reasons, there is also an economic advantage as reactive replacements are generally several times more expensive, incurring overtime, call out penalties and additional repair costs to cables and nearby infrastructure. By identifying weak spots and defects prior to any asset failure, reactive maintenance can be undertaken with less disruption to customers at lower cost and potential fire starts can be avoided.

8.4 Non Network Solutions

Non Networks Solutions are generally not applicable for conductors and hardware asset class. Other options do exist to minimise customer disruption, including temporary mobile generation substitution while an asset is out of service. TasNetworks currently has mobile generators and has leasing arrangements in place to source additional units as required.

Remote Area Power Schemes (RAPS) are used to replace some SWER spurs where cost justified and the end customer agrees to grid disconnection.

8.5 Routine Maintenance

8.5.1 Overhead System Aerial Inspections (AIOFD)

The business objectives driving this program are:

1. Managing Business Operating Risk (through identifying defects before they impact on safety or fire risks – primary driver); and
2. Maintaining Network Performance (through identifying defects before they impact on reliability – secondary driver).

The overhead system contributes over 60 percent of total asset failures impacting TasNetworks' SAIDI and SAIFI (reference 3). The aim of this program is to effectively target maintenance and replacement activities.

In early 2012 a Reliability Centred Maintenance (RCM) review of the overhead system identified that the best method to manage the inspections was to separate the overhead asset inspection from the ground-line pole inspection.

This RCM review resulted on the ground-line inspection of poles moving to a five year cycle.

These are the added programs also implemented from this review e:

1. Aerial inspection program for pole top assets (5 year cycle);
2. Thermal imaging program (2 year cycle); and
3. OH transformers earthing inspection (10 year cycle)[2]

Recently another program was trialled in 2016/17, and now added to a 5 year cycle-

4. Aerial LiDAR survey program for overhead line conductor span clearances

A visual inspection from the ground limits the Asset Inspector undertaking a full assessment of the pole top assets making the identification of critical asset failures such as broken tie wires and faulty cross-arms difficult. The RCM review identified that TasNetworks should visually inspect pole tops from above every five years as part of its new overhead system maintenance strategy.

The use of high definition imagery and remote sensing technologies for asset inspection is becoming commonplace throughout the utility sector across the world, and is gaining acceptance as standard industry best practice. A detailed trial in 2013 of various available technologies (including unmanned aerial vehicles and hi-mast) found that helicopters provided the most cost effective solution. Helicopters also have an added advantage of being able to assist with vegetation inspections due to their ability to efficiently patrol long stretches of feeders.

The program which commenced in 2014/15 consists of using a helicopter to inspect feeders from the air. The inspections will run on a rolling five year program and cover approximately 44,000 poles per year. In the years 2017/18 to 2019/20 additional funds have been allocated to also

[2] *OH transformers earthing inspection program is included in the Distribution Pole Mounted Transformers Asset Management Plan*

inspect TasNetworks' poor performing feeders. TasNetworks has previously only used aerial inspections in the past on an ad-hoc basis, for example for fault finding.

8.3.1.1 Helicopter aerial LiDAR Survey (AIOFD)

TasNetworks commenced LiDAR surveying of transmission lines in 2012 to evaluate the benefits to operational and strategic management of transmission line assets (reference 16). In 2016/17 a trial distribution LiDAR surveys were carried out in conjunction with helicopter aerial patrol of overhead 33kV subtransmission lines near Hobart, and of the overhead line distribution HV feeders from Sorell into the Tasman Peninsula. This trial facilitated improved checks on overhead conductor clearances, line corridor encroachments, line profile data for reviewing overhead line ratings and for use in future simplified redesign.

Aerial LiDAR Survey data can become the basis for future overhead line augmentation redesign because it provides the following benefits;

- improved clearances auditability including for vegetation and from newly built structures
- greater line design productivity,
- enhanced easement management for overhead line corridor encroachments detection, recording changes and in landowner safety communication co-operation such as the positioning of new large travelling irrigators.

A period of five years for aerial LiDAR surveys is proposed to match aging conductors.

In summary, the current progress in LiDAR surveying of distribution overhead lines is:

- A trial of alternative inspection methods to compliment ground based assessment of pole top assets to aerial inspection has resulted in more effective identification and prioritisation of defects lowering overall risk,
- Aerial inspections of pole top assets and spans are now done on a 5 year cycle,
- The LiDAR trials of Tasman Peninsula feeders in early 2017 has proven the effectiveness in assessing all clearances and allowed refinement of scope for roll out to the entire distribution network, and
- Risk priority based LiDAR surveys are planned on the entire network focusing on vegetation, conductor clearances and asset condition (e.g. leaning poles) and are to be completed in 3 years (80% by end year 2).

The longer term distribution LiDAR strategy includes:

- Annual Inspection of highly vegetated HBLCA areas,
- Inspection of less vegetated HBLCA areas on a 3 year cycle, and
- Non HBLCA areas on a 5 year cycle.

A combination of LiDAR, aerial and ground based inspections allows best use of available technologies to better risk assess the network and manage risks associated with potential failures.

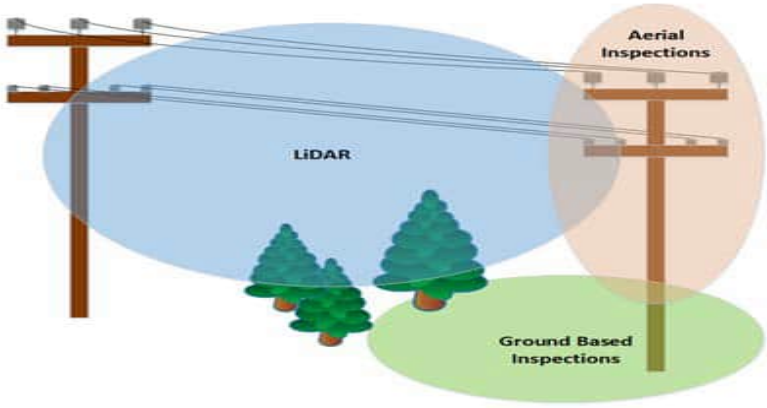


Figure 14: Synergy between Distribution Inspections

Figure 24: The same pole as seen from the ground and from the air

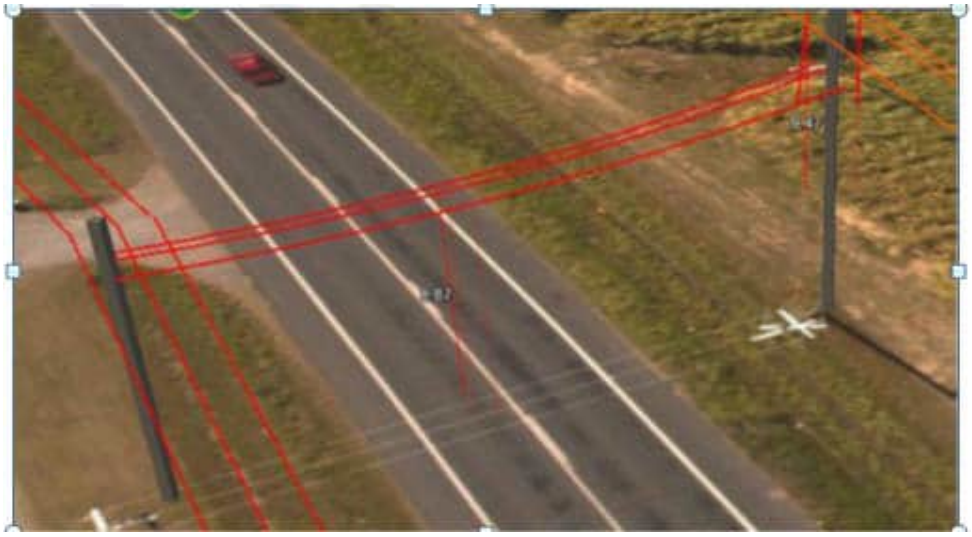


Figure 15: 3D image example of a LiDAR survey identified a line span conductor clearance risk.

Figure 26: shared corridor for a distribution line in this Transmission line for LiDAR survey

8.5.2 Thermal Inspections – Overhead Feeders (AIOTI)

The driver for this program is managing business operating risks (safety) through preventing fire starts. Network reliability improvement is considered as a secondary benefit of the implementation of this program. From 01 July 2012 to 27 April 2015, TasNetworks experienced 2,311 outages as a result of asset failure that may have been identified in a thermal inspection program.

This program entails the use of a thermal imaging camera to identify joints or connections that are displaying signs of high resistance within the network. The results of a recent RCM analysis identified this work as critical to the overhead strategy of no failures that matter. By identifying weak spots and defects prior to asset failure, reactive maintenance can be undertaken with less disruption to customers at lower cost, and potential fire starts can be avoided. Measuring in situ three phase set for asset temperature differences of 5 degrees Centigrade or more can by comparison help identify potential assets at risk, for example a failing surge diverter.

This program commenced in 2013/2014 and was expanded in 2014/2015 to include systematic inspections of all poles containing joints/connections and mid-span connections with greater than 1,000 kVA connected downstream over a three year inspection cycle.

In April 2015 a review of this program was undertaken (see AIOTI Strategy Review, reference 6) which identified a number of opportunities for improving the program's effectiveness and efficiency. This resulted in a more targeted approach and co-ordinating the inspection so feeders are inspected at times when they are more heavily loaded. From 2015/2016 onwards in particular areas of the network such as the high bushfire consequence area and on the seven worst performing feeders, the 1,000 kVA threshold will be maintained. For all other areas of the network it is the inspection threshold will be raised to 4,000 kVA to maximise the likelihood of finding asset defects.

Figure 27: A Live Line Clamp through a thermal imaging camera and a normal camera

8.6 Non Routine Maintenance

8.6.1 OH System Asset Repairs (Defects) (AROCO)

The drivers for this program are managing business operating risks and maintaining network reliability.

This program covers minor asset repairs that have been identified and have the potential to cause asset failure in the future or shorten the expected life of the asset.

The majority of these defects are reported through the Pole inspection program (AIOHS) and the Overhead System Aerial Inspections program (AIOFD). Defects identified include minor work involving asset repair such as refixing loose material, replacing possum guards, replacing loose ties, etc.

A review of the defect pool has resulted in changes to priorities. Some defects, such as missing pole caps will no longer be rectified as time priority, but as opportunity. Replacement of decayed wood LV cross arms has been separated into a new targeted capital program (Refer to RELSA Replace Cross Arms (Safety)).

In 2014/15 TasNetworks began inspecting its assets from the air. This provided a previously hidden view of the network that showed many assets were in a worse condition than previously thought. The first aerial inspection which focused on the High Bushfire Loss Consequence Area, found a total of 1,700 defects (5 per 100 poles), all of which were considered to be potential fire start risks. This resulted in expenditure much higher than forecast. As aerial inspections are done on a five year cycle there is expected to be an increase in overhead maintenance over the next five years, following the first round of aerial inspections as these identify defects that have gone undetected for many years. The following round of aerial inspections is expected to yield a much lower volume of maintenance work.

From January 2015 to March 2016, ten conductor clashing conductor (AROCO) events occurred – one on HV conductor, and nine on LV conductor, with the latter requiring LV spreaders or conversion to LV ABC. In 2016/17, 2017/18, targeted capital programs in bushfire mitigation (SIFIC) were/are installing LV spreaders and HV dampers.

8.6.2 OH System Low Conductor Clearance (AROLC)

The driver for this program is managing business operating risks.

This program covers simple repair tasks such as the re-tensioning of slack spans of LV and HV conductor to address conductor clearance issues. Where a more complex solution is required (such as the installation of a pole) that work is undertaken as an asset replacement task.

Approximately 1,100 LV and LV service conductor clearance defects are identified every year.

The introduction of aerial LIDAR surveys of all overhead assets is expected to bring a sharp increase in the number of under clearance defects identified within the 2019 Regulatory period. Previously TasNetworks underclearance defects have only been identified by visual inspection from the ground level which leaves the possibility that many under clearance defects have gone unnoticed.

8.6.3 Maintain Access Track and Weed Management (RMOTC)

The budget for this program has historically been managed by the Vegetation Management team. Therefore the budget in the 2014/2015 POW and on, has been substantially reduced to reflect the low level of spend by the Overhead Structures team in this program.

There are two components to this program:

1. Access track maintenance; and
2. Weed management.

8.6.3.1 Access Track Maintenance

The aim of this program is to maintain access tracks to a level and condition where safe all-weather access to TasNetworks lines and equipment is possible for the purposes of routine maintenance and emergency fault repairs.

Experience within TasNetworks has shown existing access tracks need to be maintained approximately every four years for optimum cost versus benefit and to stop them degrading to the stage where they require extensive works.

Figure 28 Examples of high slope access tracks & track washout near pole footing

8.6.3.2 Weed Management

There are specifically designated clean and unclean sites, farms and areas with respect to weed and disease around the state. Although TasNetworks has strict weed and disease management procedures in place when travelling between these areas, the aim of this program is to reactively

address situations where TasNetworks' activities have contributed to the spread of weeds, such as gorse outbreaks in gorse-free areas within TasNetworks' easements.

8.7 Reliability and Quality Maintenance

8.7.1 Low HV Conductors (REHCR)

The driver for this project is managing business operating risks.

This program covers the relocation or replacement of HV overhead conductor to address low clearances associated with road crossings and plant contact that cannot be repaired under the reactive maintenance program such as the installation of a pole to fix the clearance issue.

Low HV conductors also pose a significant public safety risk and are addressed as soon as possible.

The introduction of aerial LIDAR surveys of all overhead assets is expected to bring a large increase in the number of under clearance defects identified within the 2019-24 regulatory period. Previously TasNetworks underclearance defects have only been identified by visual inspection from the ground level which leaves the possibility that many under clearance defects have gone unnoticed. The forecasted spending for this program is expected to oscillate following the 3 yearly cycle of the LIDAR survey program.

8.7.2 Rectify Low LV Clearances Public Safety (RELCR)

This program covers the relocation or replacement of LV overhead conductor to address low clearances associated with road crossings and plant contact that require more complex solutions, for example new pole installations, than available under the reactive maintenance program (AROLC).

Approximately 1,100 LV and service conductor clearance defects are identified every year.

8.7.3 Replace/Relocate HV due to Vegetation Issues (REHVE)

The driver for this program is minimising costs to customers and managing business operating risks (fire).

The aim of this program is to address the issue of high vegetation maintenance costs in certain areas. Historically, there have been cases where it is more efficient to relocate hybrid underground or insulate bare overhead assets around vegetation rather than managing the vegetation near the assets such as areas where vegetation is protected (national parks) or where there are community or environmental considerations or there are onerous vegetation management requirements due to bushfire risk management.

This program has been in place for a number of years but as part of the Replace HV Feeders (Safety) and Fire Mitigation asset replacements. This program is being increased in the 2019 Regulatory period due to TasNetworks' increased focus on mitigating bushfire risk.

8.7.4 Replace Cross Arms (RELSA)

The drivers for this program are managing business operating risks. This program commenced midway through 2013/2014 and will continue on throughout the next regulatory period. This is a targeted asset rectification program which focuses mainly on decayed timber cross arms, but also includes other cross arm related defects (such as loose/missing steelwork and transformers hung directly on timber cross arms). This work was previously done under AROCO OH System Asset Repairs Defects, but has been separated into a dedicated program in order to drive efficiencies.

8.7.5 Replace Substandard Overhead Conductor (REMCU/REMGI/REMAC)

Substandard overhead conductor may result in broken wires, presenting fire and safety risks as well as interrupting supply to customers. Copper and Galvanised Iron Conductor have been identified as representing the highest proportion of conductor failures and so have been targeted for prioritised replacement programs. There are three programs for replacing substandard overhead conductor:

1. Replace Substandard Overhead Copper Conductor (REMCU)
2. Replace Substandard Overhead Galvanised Iron (GI) Conductor (REMGI)
3. Replace substandard Overhead Aluminium AAC/AAAC (REMAC)

TasNetworks records on average approximately 200 outages caused by conductor failures every year. In 2016/2017, conductor failures contributed 8.95 minutes SAIDI (or 19% of the total asset related failure contribution to SAIDI of 48.02 minutes) and 0.04 interruptions SAIFI (or 11% if the total asset related failure contribution to SAIFI of 0.37 interruptions).

8.7.5.1 Replace Substandard Overhead Copper Conductor (REMCU)

The drivers for this program are maintaining network performance, and compliance with regulatory responsibilities. The aim of this program is to remove substandard condition copper conductor from the overhead system.

During their life these conductors are exposed to significant fault currents that could cause the copper to anneal (reduction in tensile strength) and scale (reduction in diameter). This deterioration, which is easily identified by its orange and scaling appearance, affects the tensile strength.

Smaller stranded conductor (7/.044 and 7/.048) does not comply with AS 7000, which requires conductors to have an ultimate breaking strength of at least 5 kN. Small size copper conductor is particularly susceptible to corrosion and failure in marine type environments.

The number of joints in a span can be used as an indication of the condition of the conductor.

Initial inspections have shown that approximately 35% of all inspected conductor will require replacement in the near future however, conductor failure rates will be monitored and conductor inspections undertaken.

This program has been in place for a number of years but as part of Replace HV Feeders (Safety) (REHSA). A new work category was created at the beginning of the 2012-2017 Determination Period for this work.

8.7.5.2 Replace Substandard Overhead Galvanised Iron (GI) Conductor (REMGI)

The drivers for this program are maintaining network performance and managing business operating risks (safety). The aim of this program is to remove substandard condition GI conductor from the overhead system and to replace sections of overhead GI conductor around coastal areas.

Galvanised Iron (GI) conductor came into service in the 1940s. TasNetworks stopped installation of single strand No. 8 GI conductor in the 1970s and the imperial 3/12 GI conductor was replaced with the metric 3/2.75 GI conductor around 1976, which is the present day TasNetworks standard for rural conductors across private property. By the end of the current determination period), the minimum age of any 3/12 GI conductor will be 46 years with the majority greater than 55 years.

AS 7000 (Reference 8) rates GI conductor as a very poor conductor in marine environments. When subjected to wind borne salt spray and sea fogs containing salt contaminants, salt crystals are deposited on to the steel conductors. A galvanic cell is formed and removal of the zinc coating results over time. Once the zinc coating has been removed, severe corrosion of the steel leads to loss of mechanical strength and eventual conductor failure.

The risk of public safety as a result of conductor failure in marine environments is exacerbated by the fact that most of these conductors are at the end of long feeders and the ground is sand, having a high resistance, making it highly probable that the protection will not see the event as a fault and isolate the line.

8.7.5.3 Replace or repair Overhead Aluminium (AA) Conductor (REMAC)

The drivers for this program are maintaining network performance and managing business operating risks (safety). The aim of this program is to remove substandard condition AA conductor from the overhead system and to replace sections of overhead AA conductor around coastal areas.

Inspections such as by mast camera, EWP, helicopter or unmanned aerial vehicle camera from above and /or by corona camera can assist detection of in span arc melts from lightning strike to unshielded distribution conductors or conductor clashing.

An unshielded conductor arc melt defect could be from lightning direct strike that could progress to a broken conductor. While Figure 29 shows one of two adjacent conductor arc melt defects that in another network arose from midspan clashing, from conductor galloping could progress to a broken conductor Periodic inspection detection reduces expense in repair, risk mitigation and avoids outage and mitigation options include spiral dampers, HV interphase spacers or increased phase separation redressing. Figure 30 is an example of midspan set of two 33kV interphase spacers and conductor melt retrofit repair kit (Adapt Australia).

Figure 29 shows one of two adjacent AAC midspan conductor arc melts from galloping

Figure 30 shows a HV mid span spacer set for AAC damping galloping solution

Figure 31 shows fretting fatigue failure that can become a cause of strand failures in both outer and inner strands. Interstrand microslip amplitude increases, small cracks are generated, and some propagate to strand failures (reference 11)

Figure 31 shows example of fretting conductor fatigue failure risk in AA or ACSR conductor

Methods for inspecting topside of conductors for arc melts are by use of mirrors on insulated sticks or Go-Pro Cameras. The use of helicopter aerial patrol inspection or UAV rotorcraft camera inspection can be alternatives.

For spans with three or more tension joints in series from conductor or conductor connector break failures, the span should be replaced or sample cut lengths of suspect fretting fatigue conductor can be sent for testing at a NATA Mechanical accredited facility, such as Victoria University Testing Station, Melbourne, One Steel Wire Rope NATA Testing Laboratory, Newcastle or equivalent for assessment of remaining service life estimation. AS7000-2016 includes overhead conductor assessment criteria for creep, annealing, corrosion, stress and fatigue. Improved tension repair joints for use on aged conductors are in industry review.

8.8 Regulatory Obligations

8.8.1 Replace HV Feeders – Safety (REHSA)

This category is for miscellaneous small scale capex jobs that are scoped in response to specific one off situations to do with the HV overhead system. Jobs under this category will be raised throughout the year as they arise with urgent jobs to be processed in the current financial year, and non-urgent jobs to be deferred till the following year.

8.8.2 Replace/Relocate LV OH (Building Clearances) (RELCL and RELCU)

The drivers for this project are compliance with regulatory requirements and managing business operating risks (safety). This program covers relocation or replacement LV overhead conductor because of issues with building clearances e.g. when new buildings are erected that infringe on TasNetworks' clearance, that cannot be repaired under the reactive maintenance program (AROLC).

This program has two components:

1. Relocating or replacing with LV ABC (RELCL); and
2. Replacing with underground cable (RELCU).

Approximately 1,100 low voltage and LV service conductor clearance defects are identified every year.

8.8.3 Endangered Species (SIWES)

The drivers for this project are compliance with regulatory requirements and maintaining network reliability.

This aim of this program is to proactively mitigate pole top assets to ensure that protected species (such as Tasmanian wedge tail eagles) are not harmed when interacting with poles or wires. The secondary and complementary aim is to protect overhead assets from damage due to wildlife

contact. This program is based on asset failures and outage information. TasNetworks records approximately 500 outages caused birds and animals every year (including mid-span collisions). The separation distances between conductors and pole top hardware are generally adequate to prevent current tracking down the pole to the ground. However, birds and animals occasionally bridge this gap, resulting in phase-to-phase contact of the conductors and the electrocution and potential combustion of the animal. This project involves insulating live components and parts on pole tops in high wildlife trafficked areas.

This program is coordinated with the Environment Officer in collaboration with the relevant authorities. Specific detail on the 2017/18 program is included in Appendix K.

8.8.4 Fire Mitigation Projects (SIFIC)

*TasNetworks has a number of fire mitigation programs in place to address the risk of fire start posed by the assets. These programs are pritorised by assets in the HBCA (High Bushfire Consequence Area).*Over this period the Fire Mitigation Projects program is focusing on 3 main components:

- Replace EDO fuses with Boric Acid fuses in HBCA
- Install Vibration Dampers
- Install LV Spreaders

8.6.4.1 Replace EDO fuses with Boric Acid fuses

This program is detailed in Overhead Switchgear Asset Management Plan, but is actioned as an integral part of the Bushfire Risk mitigation on overhead line conductors and poletops.

8.6.4.2 Install Vibration Dampers

This program is to install vibration dampers and armour rods on long spans greater than 300m. A desk top audit and prioritisation will be performed to get volumes.

8.6.4.3 Install LV Spreaders

This program is to retrofit LV Spreaders within all rural areas. Priority will first be within HBCA. A desktop audit is still required to be performed to get exact volumes.

8.7 Removed/obsolete programs

The following programs have been removed as deemed no longer required.

8.7.1 High Load Route Inspection (AIOHL)

The high load route inspection program is used to ensure TasNetworks' infrastructure is not damaged by transportation of high load, which is triggered by requests from the public.

This task is generally undertaken by a TasNetworks preferred contractor under the request of the customer; however, TasNetworks previously retained this program to address the infrequent situations when customers bypass this process. The costs involved are now usually recovered from the customer; this category was used for when costs were not able to be recovered. Historically this category has been underutilised so is deemed no longer required.

8.7.2 Replace Live Line Clamps Fitted on Tensioned Conductors

In the 2013/2014 POW the approach to this issue was to replace all live line clamps attached directly to a conductor with a live line clamp and dee-loop configuration (the dee-loop provides a

more secure double attachment to the conductor so is less likely to wiggle loose. The live line clamp may still become loose but will only burn through the dee-loop and not the conductor so consequences are much lower). The area targeted was the High Bushfire Consequence Loss Zone.

The strategy to deal with this risk has been changed since the 2014/2015 POW. Now, live line clamps attached directly to the conductor are replaced with D-Loops with a priority put on sites within the High Bushfire Loss Consequence Area.

8.7.3 Replace Worn Insulation HV ABC Conductor

The 2017/2018 POW approach is to risk review the insulation wear on 27 km of non-metallic screened (NMS) HV ABC based on in service life and condition assessment for planned replacement based on risk, noting reference 32 illustrates findings of a Victorian Utility.

Figure 32 existing non-metallic screened (NMS) HV ABC conductor

8.8 Investment Evaluation

Investment evaluation is undertaken using TasNetworks' investment evaluation tool, see Gated Investment Framework (reference 7). Investment Evaluation Summaries (IES) are used to provide information in support of a project for inclusion in the Capital Works Program. This information provides a record of the project as it progresses from initiation to finalisation and is required to support a request for funding approval. This IES aims to improve the efficiency and delivery of the capital investment justification and approval process and is a requirement for regulatory and governance purposes.

8.9 Summary of Programs

Table 9 provides a summary of all of the programs described in this management plan.

Table 9: Summary of Conductors & Hardware Programs

Work Program	Work Category	Category Code	Project/Program
Routine Maintenance	OH Feeder Ground Auditing and Inspection	AIOFD	OH System Feeder Inspections by Helicopter LIDAR Survey OH System Feeder Inspections by Helicopter
	OH Feeder High Vehicle Load Auditing and Inspection	AIOHL (Obsolete)	High Load Route Inspection
	OH System thermal inspections	AIOTI	Thermal Inspection – O/H Feeders (Defined)
Non-Routine Maintenance	OH System Asset Repair	AROCO	OH System Asset Repair (Defects)
	OH System Low Conductor Clearance	AROLC	OH System Low Conductor Clearance
	Access Track Clearing	RMOTC	Maintain access tracks and weed management
Reliability and Quality Maintained	Replace/relocate HV OH (Low Clearance)	REHCR	Low HV Conductors
	Replace/relocate HV (Vegetation)	REHVE	Replace/relocate HV due to vegetation issues
	Replace/relocate LV OH (Low Clearance)	RELCR	Rectify low LV clearances public safety
	Replace/relocate LV OH (Low Clearance)	RELSA	Replace Cross arms
Regulatory Obligations	Replace HV Feeders Safety	REHSA	HV Feeders (Safety)
	Replace/relocate LV OH (Building Clearances)	RELCL	Replace/relocate LV OH (Building Clearances)
	Replace/relocate LV OH (Building Clearances) with UG	RELCU	Replace/relocate LV OH (Building Clearances) with UG
	Wildlife Endangered Species Protection	SIWES	Endangered species

9 Responsibilities

Maintenance and implementation of this management plan is the responsibility of Overhead and Structures Asset Strategy Engineer.

Approval of this management plan is the responsibility of the Asset Strategy Team Leader.

10 Related Standards and Documentation

The following documents have been used either in the development of this management plan, or provide supporting information to it:

1. Asset Management Strategic Plan (R94876)
2. Air navigation - Cables and their supporting structures - Marking and safety requirements AS/NZ 3891.1-2008
3. Overhead and Structures Asset Reporting 2012-2013 (R295196)
4. REMGI & REMCU Investment Evaluation Summary (R150772)
5. Overhead Conductor Replacement Programs Prioritisation Guideline (R208597 and R603335)
6. AIOTI Program Strategy Review April 2015 (R159945)
7. Gated Investment Process – Investment Evaluation Summary (R150791)
8. Standard for Design and Maintenance of Overhead Distribution and Transmission Lines AS/NZS 7000 – 2016
9. Bushfire Risk Mitigation Plan (R303735)
10. United Energy HV Bundled Conductor Strategic Direction Plan Document No UEPL 2053
11. Peter Dulhunty,CIGRE B2 WG49, EESA Webinar combining TB 273 and TB653 ,Sydney 11th October 2016
12. Fibreglass reinforced plastic crossarm trial (R 370233)
13. Monthly Asset Performance Report
14. https://blogs.scientificamerican.com/guest-blog/why-do-trees-topple-in-a-storm/
15. https://www.researchgate.net/publication/266260400_Tree_Stability_in_Wind_Storms-_Open_grown_trees_in_Urban_areas
16. Inspections of Overhead Lines Strategy (R210959)
17. Fibreglass Crossarm Trial –Review and Request for Endorsement (R 712219)
    Tasmanian Fire Service Website
18. Polymeric Versus Porcelain, (R 759983)
19. TasNetworks Transformation Roadmap 2025 https://www.tasnetworks.com.au/customer-engagement/submissions/
20. TasNetworks Corporate Plan – Planning period: 2017-18 http://reclink/R0000745475
21. Conductors for the uprating of overhead lines ,CIGRE 244, April 2004
22. AD Stokes ,Fire Ignition by Electrically Produced Incandescent Particles, Journal of Electrical & Electronic Engineering ,10,pp175 to187, Sept 1990.

11 Appendix A - Summary of expenditure programs, main drivers and risks

Description	Work Category	Risk Level	Driver	Expenditure Type	Residual Risk
OH System Feeder Inspections by Helicopter	AIOFD	High	Safety	OPEX	Medium
Thermal Inspection – O/H Feeders (Defined)	AIOTI	High	Safety	OPEX	Medium
OH System Asset Repair (Defects)	AROCO	High	Safety	OPEX	Medium
OH System Low Conductor Clearance	AROLC	High	Safety	OPEX	Medium
Maintain access tracks and weed management	RMOTC	High	Safety	OPEX	Medium
Low HV Conductors	REHCR	High	Safety	CAPEX	Medium
Replace/relocate HV due to vegetation issues	REHVE	High	Safety	CAPEX	Medium
Rectify low LV clearances public safety	RELCR	High	Safety	CAPEX	Medium
Replace Cross arms	RELSA	High	Safety	CAPEX	Medium
HV Feeders (Safety)	REHSA	High	Safety	CAPEX	Medium
Replace/relocate LV OH (Building Clearances)	RELCL	High	Safety	CAPEX	Medium
Replace/relocate LV OH (Building Clearances) with UG	RELCU	High	Safety	CAPEX	Medium
Endangered species	SIWES	High	Environment	CAPEX	Medium

12 Appendix B - Summary of CAPEX Projects for Replacement of Substandard Conductor

REMGI Replacement of aged/deteriorated HV galvanised Iron Conductors

Year	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Unit (km) Volume												
in BFM	14	22	36	36	36	14	14	14	14	14	14	14
other			13	13	13	13	13	13	13	13	13	13
Total	14	22	49	49	49	27	27	27	27	27	27	27

REMCU Replacement of aged/deteriorated HV Copper Conductors

Year	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Unit (km) Volume												
in BFM	19	29	48	48	48	19	19	19	19	19	19	19
other	8.4	0	33	33	33	33	33	33	33	33	33	33
Total	27.4	29	61	61	61	52	52	52	52	52	52	52

REMAC Replacement of aged/deteriorated HV Aluminium Conductors

Year	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Unit (km) Volume												
in BFM	5	7	12	12	12	5	5	5	5	5	5	5
other	0	0	15	15	15	15	15	15	15	15	15	15
Total	5	7	27	27	27	20	20	20	20	20	20	20

REMAC Replacement of aged/deteriorated NMS HV ABC with MS HV ABC

Year	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29
Unit =spans Volume												
in BFM	20	20	20	20	20	20	20	2	2	2	2	2
other	0	0	20	20	20	20	20	20	20	20	20	20
Total	20	20	40	40	40	40	40	22	22	22	22	22

These projects are part of ongoing programs that is risk priority based addressing aging Copper and Galvanised steel conductor wearout including substandard conductors. Another program (REMAC) is for aluminium conductors based on similar risk assessment data including supply reliability.

Condition based decisionmaking can be enhanced using conductor sample testing for risk review evaluation for remaining service life (AS7000-2016 Appendices). High tension small sized Aluminium conductor can be prone to subtle corrosion and metal fatigue risk and the current risk- based decision for aluminium is presently that after more than three full tension joint repairs in just one span, it precipitates the need to replace that span of conductor. Multiple failure rates on 7/3.00 AAC for some now at 50 years in service, has already warranted trial conductor replacement. New

innovations in faster tension jointing, and potentially longer connector service life tension joint connector fittings for emergency broken conductor repairs are under review for field trial.

A new program is added for NMS HV ABC risk management replacement

Appendix C: Regional Records of Significant Fauna

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	21/01/2011	PILB_ISLAND_SPECIES	MOUNT ANKETELL	Walcott	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	4/02/1988	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Haycock	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	16/11/1991	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Haycock	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1994	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Haycock	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1988	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Haycock	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1991	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Haycock	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Haycock	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	4/02/1988	SEABIRDS		Haycock	Laridae
Onychoprion anaethetus	bridled tern	BIRD	Specially Protected - Migratory	MI	MI	16/11/1991	SEABIRDS		Haycock	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	21/06/1978	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/07/2000	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Angel	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/2000	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Angel	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/11/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Angel	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	25/08/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus North	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	21/08/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus North	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus North	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/08/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/01/1982	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	7/07/2000	BIRDATLAS2	Malus Island	Malus Island	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	5/07/2000	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Mawby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		SEABIRDS	DAMPIER ARCHIPELAGO	Mawby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Mawby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1971	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Mawby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Mawby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Mawby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/05/2002	BIRDATLAS2	Malus Island	Malus Island	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/05/2002	BIRDATLAS2	Malus island	Malus island	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/05/2002	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/06/1999	BIRDATLAS2	Malus Island, Dampier Archipelago	Malus Island, Dampier Archipe	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/06/1999	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		SEABIRDS	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	10/11/1982	SEABIRDS	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/07/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	10/11/1982	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/08/1982	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	10/11/1982	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	29/08/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Conzinc	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Tern	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Tern	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	27/09/1984	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Tern	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	18/08/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Enderby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Enderby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	28/06/1901	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	31/10/1979	BIRDATLAS1			Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	31/10/1980	BIRDATLAS1			Laridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/06/1981	BIRDATLAS1			Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	31/07/1981	BIRDATLAS1			Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	31/07/1981	BIRDATLAS1			Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	27/09/1984	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	3/06/2008	BIRDATLAS2	Enderby Island NP	Enderby Island NP	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	3/06/2008	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Enderby	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	10/08/2015	BIRDATA	Burrup Pen.: Hearson's Bay	Burrup Pen.: Hearson's Bay	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	15/10/2017	BIRDATA	Murujuga NP--Hearson Cove	Murujuga NP--Hearson Cove	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1994	PILB_ISLAND_SPECIES	MOUNT ANKETELL	Walcott	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1992	PILB_ISLAND_SPECIES	MOUNT ANKETELL	Walcott	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	29/09/1991	PILB_ISLAND_SPECIES	MOUNT ANKETELL	Walcott	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	MOUNT ANKETELL	Walcott	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	26/05/1991	PILB_ISLAND_SPECIES	MOUNT ANKETELL	Pemberton	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	26/05/1991	SEABIRDS	MOUNT ANKETELL	Pemberton	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	29/07/1999	BIRDATLAS2	Dampier	Dampier	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/06/2011	BIRDATA	Backbeach lookout	Backbeach lookout	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	-20.70933182260088, 116.6451461614	-20.70933182260088, 116.645	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/12/1998	BIRDATLAS2	Karratha Beach	Karratha Beach	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	29/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	30/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	6/01/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	17/02/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	14/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	21/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	23/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	24/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	16/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	22/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	13/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	15/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	27/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	7/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	9/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	30/09/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	28/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	21/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	22/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	28/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	16/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	23/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	4/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	24/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	9/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	4/05/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/05/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	6/06/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	14/06/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	5/07/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	3/10/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	29/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	15/05/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	7/07/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	11/07/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	18/01/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/01/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	14/02/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	20/03/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	17/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	28/05/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	4/06/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	17/07/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	14/04/2015	BIRDATA	Karratha Golf Course	Karratha Golf Course	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	18/04/2015	BIRDATA	Karratha Golf Course	Karratha Golf Course	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	10/07/1999	BIRDATLAS2	Nickol River mouth, Karratha	Nickol River mouth, Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	22/07/2013	BIRDATA	Beach	Beach	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	18/06/2009	BIRDATLAS2	Karratha	Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	16/04/2001	BIRDATLAS2	Karratha	Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	25/07/1999	BIRDATLAS2	Karratha	Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	1/08/2013	BIRDATA	Karratha	Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	6/05/2000	BIRDATLAS2	Karratha	Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	27/06/1999	BIRDATLAS2	Nickol River estuary	Nickol River estuary	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	27/06/1999	BIRDATLAS2	Nickol River estuary	Nickol River estuary	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	19/10/2000	BIRDATLAS2	Dampier Salt Works	Dampier Salt Works	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	10/11/1978	BIRDATLAS1			Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	31/10/1979	BIRDATLAS1			Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	18/02/2015	BIRDATA	Gap Ridge WWTP, Karratha	Gap Ridge WWTP, Karratha	Laridae
Hydroprogne caspia	caspian tern	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Pond 0 Island	Pond 0 Island	Laridae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	21/06/1978	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Enderby	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	9/11/1980	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	31/07/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	21/10/1980	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	1/06/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	31/07/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	14/02/1979	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	31/12/1979	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	20/11/1999	BIRDATLAS2	Withnell Bay	Withnell Bay	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	1/08/2013	BIRDATA	Hearson Cove	Hearson Cove	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	15/10/2017	BIRDATA	Murujuga NP--Hearson Cove	Murujuga NP--Hearson Cove	Scolopacidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	20/11/1999	BIRDATLAS2	King Bay, Dampier	King Bay, Dampier	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	3/07/2002	BIRDATLAS2	Karratha	Karratha	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Hampton Hbr Dampier	Hampton Hbr Dampier	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Hampton Hbr Dampier	Hampton Hbr Dampier	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	19/10/2000	BIRDATLAS2	Dampier Salt Works	Dampier Salt Works	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	-20.70933182260088, 116.6451461614	-20.70933182260088, 116.645	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks Intake	Dampier Saltworks Intake	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	3/12/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	23/10/2007	BIRDATLAS2	Bayside	Bayside	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	1/01/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	29/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	17/02/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	21/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	16/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	20/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	21/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	22/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	27/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	7/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	9/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	1/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	27/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	28/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	19/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	21/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	22/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	23/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	16/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	23/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	2/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	4/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	9/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	20/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	24/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	14/03/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	9/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	4/05/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	6/06/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	2/07/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	3/10/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	1/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	7/07/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	11/07/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	18/01/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	20/01/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	14/02/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	20/03/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	17/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	19/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	30/09/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	19/10/2000	BIRDATLAS2	Karratha Boatramp	Karratha Boatramp	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	19/10/2000	BIRDATLAS2	Nickol Bay mangroves, Karratha	Nickol Bay mangroves, Karrath	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	21/07/2011	BIRDATA	Karratha Golf Course	Karratha Golf Course	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	22/07/2011	BIRDATA	Karratha Golf Course	Karratha Golf Course	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	11/04/2015	BIRDATA	Karratha Golf Course	Karratha Golf Course	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	18/06/2009	BIRDATLAS2	Karratha	Karratha	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	24/10/2006	BIRDATLAS2	Karratha	Karratha	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	-20.73587865104967, 116.6856900976	-20.73587865104967, 116.685(	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Leighton's Dam	Leighton's Dam	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Leighton's Dam	Leighton's Dam	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	19/09/1980	BIRDATLAS1	MAITLAND	MAITLAND	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	11/01/1978	BIRDATLAS1	MAITLAND	MAITLAND	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	10/11/1978	BIRDATLAS1	MAITLAND	MAITLAND	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	31/10/1979	BIRDATLAS1	MAITLAND	MAITLAND	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Dampier	Dampier	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Dampier	Dampier	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	19/10/2000	BIRDATLAS2	Karratha Sewage Ponds	Karratha Sewage Ponds	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	25/11/2012	BIRDATA	South Karratha Water Treatment Work	South Karratha Water Treatme	Scolopacidae
Tringa nebularia	common greenshank	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	1/06/1981	BIRDATLAS1			Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	8/10/1978	BIRDATLAS1			Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	14/02/1979	BIRDATLAS1			Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	27/09/1984	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	25/04/1999	BIRDATLAS2	Watering Cove, Burrup Peninsula	Watering Cove, Burrup Peninsu	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	10/07/1999	BIRDATLAS2	Cowrie Cove	Cowrie Cove	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	31/07/1999	BIRDATLAS2	Cowrie Bay	Cowrie Bay	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	6/09/2000	BIRDATLAS2	Hearson Cove	Hearson Cove	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	5/09/1999	BIRDATLAS2	Hears On Cove	Hears On Cove	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	20/11/1999	BIRDATLAS2	King Bay, Dampier	King Bay, Dampier	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	dampier	dampier	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Hampton Hbr Dampier	Hampton Hbr Dampier	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	6/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	21/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	19/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	1/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	29/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	21/02/1999	BIRDATLAS2	Karatha back beach	Karatha back beach	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	14/02/1999	BIRDATLAS2	Karratha back beach	Karratha back beach	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Leighton's Dam	Leighton's Dam	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	11/01/1978	BIRDATLAS1			Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	31/01/1979	BIRDATLAS1			Scolopacidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Dampier	Dampier	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	18/10/2016	BIRDATA	-20.75134929955798, 116.8682083860	-20.75134929955798, 116.8682	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	19/10/2000	BIRDATLAS2	Karratha Sewage Ponds	Karratha Sewage Ponds	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	23/11/2013	BIRDATA	Gap Ridge WWTP, Karratha	Gap Ridge WWTP, Karratha	Scolopacidae
Actitis hypoleucos	common sandpiper	BIRD	Specially Protected - Migratory	MI	MI	19/03/2015	BIRDATA	Gap Ridge WWTP, Karratha	Gap Ridge WWTP, Karratha	Scolopacidae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	20/05/2002	BIRDATLAS2	Malus Island	Malus Island	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	20/05/2002	BIRDATLAS2	Malus island	Malus island	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	31/10/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	30/04/1979	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	8/09/1979	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	21/10/1980	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	31/10/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	31/07/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	4/04/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	10/07/1999	BIRDATLAS2	Withnell Bay	Withnell Bay	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Enderby Island	Enderby Island	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	1/05/2010	BIRDATLAS2	Enderby Island	Enderby Island	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	25/04/1999	BIRDATLAS2	Watering Cove, Burrup Peninsula	Watering Cove, Burrup Peninsu	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	19/06/1999	BIRDATLAS2	Watering Cove, Burrup Peninsula	Watering Cove, Burrup Peninsu	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	1/08/2013	BIRDATA	Hearson Cove	Hearson Cove	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	10/07/1999	BIRDATLAS2	Cowrie Cove	Cowrie Cove	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	31/07/1999	BIRDATLAS2	Cowrie Bay	Cowrie Bay	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	10/08/2015	BIRDATA	Burrup Pen.: Hearson's Bay	Burrup Pen.: Hearson's Bay	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	5/09/1999	BIRDATLAS2	Hears On Cove	Hears On Cove	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	12/08/2011	BIRDATA	hearson cove	hearson cove	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	12/08/2011	BIRDATLAS2	hearson cove	hearson cove	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	22/10/2000	BIRDATLAS2	Dampier Archipelago	Dampier Archipelago	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	3/07/2002	BIRDATLAS2	Karratha	Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Hampton Hbr Dampier	Hampton Hbr Dampier	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Hampton Hbr Dampier	Hampton Hbr Dampier	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATA	Backbeach lookout	Backbeach lookout	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATLAS2	Backbeach lookout	Backbeach lookout	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Karratha town beach	Karratha town beach	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	29/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	17/02/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/09/2016	BIRDATA	Karratha Boat Ramp	Karratha Boat Ramp	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	14/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	21/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	19/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	22/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	15/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	18/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	19/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	20/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	22/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	27/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	6/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	2/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	30/09/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	27/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	28/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	19/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	19/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	23/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	20/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	24/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	9/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	19/05/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	14/06/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	2/07/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	3/10/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	1/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	29/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	15/05/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	7/07/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	11/07/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	14/02/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	12/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	19/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	4/06/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Nickol Bay Karratha	Nickol Bay Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Nickol Bay Karratha	Nickol Bay Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Nickol Bay Karratha	Nickol Bay Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Nickol Bay Karratha	Nickol Bay Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	10/07/1999	BIRDATLAS2	Nickol River mouth, Karratha	Nickol River mouth, Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	18/06/2009	BIRDATLAS2	Karratha	Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	26/04/1999	BIRDATLAS2	Headland, Karratha	Headland, Karratha	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATA	Miaree Pool Maitland R	Miaree Pool Maitland R	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATLAS2	Back beach lookout	Back beach lookout	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Dampier	Dampier	Laridae
Thalasseus bergii	crested tern	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Dampier	Dampier	Laridae
Macroderma gigas	ghost bat	MAMMAL	Threatened - Vulnerable	VU	VU	1/01/2006	TFAUNA	Burrup	Burrup Peninsula	Megadermatidae
Macroderma gigas	ghost bat	MAMMAL	Threatened - Vulnerable	VU	VU	1/01/2006	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West intercourse	Megadermatidae
Macroderma gigas	ghost bat	MAMMAL	Threatened - Vulnerable	VU	VU	1/01/2006	TFAUNA	West Intercourse Island	West Intercourse Island	Megadermatidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	15/10/2017	BIRDATA	Murujuga NP--Hearson Cove	Murujuga NP--Hearson Cove	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	16/10/2014	BIRDATA	Karratha town beach	Karratha town beach	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	18/02/2001	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	29/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	30/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	17/02/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	19/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	24/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	30/09/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	27/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	28/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	19/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	21/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	28/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	16/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	19/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	24/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	9/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	3/10/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	1/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	29/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	11/07/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	29/09/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	19/10/2000	BIRDATLAS2	Karratha Boatramp	Karratha Boatramp	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	24/10/2006	BIRDATLAS2	Karratha	Karratha	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Scolopacidae
Calidris tenuirostris	great knot	BIRD	Threatened - Critically Endangered	CR	MI	19/10/2000	BIRDATLAS2	Dampier Salt Works	Dampier Salt Works	Scolopacidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	20/11/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Angel	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	16/02/1983	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Malus Large	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	28/08/1999	BIRDATLAS2	Watering Cove Beach	Watering Cove Beach	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	25/04/1999	BIRDATLAS2	Watering Cove, Burrup Peninsula	Watering Cove, Burrup Peninsu	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	20/11/1999	BIRDATLAS2	Withnell Bay	Withnell Bay	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	1/08/2013	BIRDATA	Hearson Cove	Hearson Cove	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	15/10/2017	BIRDATA	Murujuga NP--Hearson Cove	Murujuga NP--Hearson Cove	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	26/10/2010	BIRDATLAS2	Hearson Cove Dampier	Hearson Cove Dampier	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	5/09/1999	BIRDATLAS2	Hears On Cove	Hears On Cove	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	16/10/2007	BIRDATA	Hearson Cove Dampier	Hearson Cove Dampier	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	20/11/1999	BIRDATLAS2	King Bay, Dampier	King Bay, Dampier	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	29/09/2013	BIRDATA	Dampier Supply Base	Dampier Supply Base	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	26/10/2010	BIRDATLAS2	Hampton Hbr Dampier	Hampton Hbr Dampier	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	16/10/2007	BIRDATA	Hampton Hbr Dampier	Hampton Hbr Dampier	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	15/10/2014	BIRDATA	Dampier Saltworks Intake	Dampier Saltworks Intake	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	19/12/1998	BIRDATLAS2	Karratha Beach	Karratha Beach	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	16/10/2014	BIRDATA	Karratha town beach	Karratha town beach	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	23/10/2007	BIRDATLAS2	Bayside	Bayside	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	1/01/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	29/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	30/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	17/02/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	16/09/2016	BIRDATA	Karratha Boat Ramp	Karratha Boat Ramp	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	7/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	30/09/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	27/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	28/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	19/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	21/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	22/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	23/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	28/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	16/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	19/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	23/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	20/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	24/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	3/10/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	1/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	29/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	14/02/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	20/03/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	30/09/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	29/09/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	21/02/1999	BIRDATLAS2	Karatha back beach	Karatha back beach	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	24/10/2006	BIRDATLAS2	Karratha	Karratha	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	16/10/2007	BIRDATA	Dampier	Dampier	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	26/10/2010	BIRDATLAS2	Dampier	Dampier	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius leschenaultii	greater sand plover, lar	BIRD	Threatened - Vulnerable	VU	MI	17/10/2016	BIRDATA	Pond 0 Island	Pond 0 Island	Charadriidae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	31/07/1999	BIRDATLAS2	Cowrie Bay	Cowrie Bay	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	6/09/2000	BIRDATLAS2	Hearson Cove	Hearson Cove	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI		PILB_ISLAND_SPECIES	MOUNT ANKETELL	Walcott	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	1/01/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	17/02/2002	BIRDATLAS2	Nichol Bay	Nichol Bay	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	18/06/2009	BIRDATLAS2	Karratha	Karratha	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	25/07/1999	BIRDATLAS2	Karratha	Karratha	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Gelochelidon nilotica	gull-billed tern	BIRD	Specially Protected - Migratory	MI	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Laridae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	21/06/1978	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	22/10/1977	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	26/10/2010	BIRDATLAS2	Hearson Cove Dampier	Hearson Cove Dampier	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	16/10/2007	BIRDATA	Hearson Cove Dampier	Hearson Cove Dampier	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	15/10/2014	BIRDATA	Dampier Saltworks Intake	Dampier Saltworks Intake	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	24/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	22/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	19/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	21/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	22/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	23/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius mongolus	lesser sand plover	BIRD	Threatened - Endangered	EN	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	4/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	19/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	21/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	21/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	21/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	21/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	TFAUNA	DAMPIER ARCHIPELAGO	SCREE SLOPES	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	TFAUNA	DAMPIER ARCHIPELAGO	SCREE SLOPES	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	TFAUNA	DAMPIER ARCHIPELAGO	SCREE SLOPES	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	25/04/1900	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/07/1970	TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	25/04/1900	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/07/1970	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	31/05/1970	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/07/1970	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/07/1970	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	WAM_MAMMALS		SCREE SLOPES	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	WAM_MAMMALS		SCREE SLOPES	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/05/1986	WAM_MAMMALS		SCREE SLOPES	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/05/1980	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/05/1980	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/05/1980	WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		WAM_MAMMALS		DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		TFAUNA	DAMPIER ARCHIPELAGO	DOLPHIN ISLAND	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	27/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	27/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	28/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	28/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	28/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	28/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	29/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	29/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	29/06/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	19/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	19/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	20/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	21/11/1978	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/1970	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	1/07/2012	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	24/05/2016	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	19/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	12/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	20/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - north	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	20/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	20/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	20/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	20/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	20/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/10/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	19/06/2014	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2016	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		ISLAND_MAMMALS	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		ISLAND_MAMMALS	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	4/07/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - south	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	4/07/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - south	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	4/07/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - south	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	4/07/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - south	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	4/07/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - south	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - south	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/07/2012	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island - south	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/07/2012	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/07/2012	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/07/2012	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	3/07/2012	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2013	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	18/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	14/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	15/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	16/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	17/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	13/06/2015	PILBTFAUNA	DAMPIER ARCHIPELAGO	Dolphin Island	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	1/01/1990	PILBTFAUNA	BURRUP	Karratha/Dampier area	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	1/01/1990	PILBTFAUNA	BURRUP	Karratha/Dampier area	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		ISLAND_MAMMALS	BURRUP	Murujuga (Burrup Peninsula)	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/10/2015	TFAUNA	Burrup	Warehouse 2, King Bay Supplu	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	1/01/1990	PILBTFAUNA	BURRUP	Karratha/Dampier area	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	1/01/1990	PILBTFAUNA	BURRUP	Karratha/Dampier area	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Vulnerable	VU	VU	10/02/2022	TFAUNA	Burrep Peninsula		Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	21/04/2016	TFAUNA	Maitland	AML 70/253 Dampier Salt Ltd r	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		WAM_MAMMALS		KARRATHA	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN		TFAUNA	BULGARRA		Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/03/2012	TFAUNA	Karratha	karratha hills	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/03/2012	PILBTFAUNA	MULATAGA	Karratha Hills	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/03/2012	TFAUNA	Karrathe	karratha hills	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	6/03/2012	PILBTFAUNA	MULATAGA	Karratha Hills	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/10/2018	TFAUNA	Gap Ridge	Exploration Drive	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	5/09/2017	TFAUNA	Maitland	Yurralyi Maya Power Station, N	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	7/07/2015	FAUNASURVEY	MAITLAND	Karratha, Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	8/07/2015	FAUNASURVEY	MAITLAND	Karratha, Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	9/07/2015	FAUNASURVEY	MAITLAND	Karratha, Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2015	FAUNASURVEY	MAITLAND	Karratha, Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	11/07/2014	PILBTFAUNA	MAITLAND	Mount Regal	Dasyuridae
Dasyurus hallucatus	northern quoll	MAMMAL	Threatened - Endangered	EN	EN	10/07/2014	FAUNASURVEY	MAITLAND	Karratha, Mount Regal	Dasyuridae
Charadrius veredus	oriental plover	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius veredus	oriental plover	BIRD	Specially Protected - Migratory	MI	MI	1/01/2008	TFAUNA	Maitland	Dampier Saltworks - Migratory	Charadriidae
Charadrius veredus	oriental plover	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Charadriidae
Charadrius veredus	oriental plover	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Charadriidae
Glareola maldivarum	oriental pratincole	BIRD	Specially Protected - Migratory	MI	MI	16/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Glareolidae
Glareola maldivarum	oriental pratincole	BIRD	Specially Protected - Migratory	MI	MI	19/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Glareolidae
Glareola maldivarum	oriental pratincole	BIRD	Specially Protected - Migratory	MI	MI	4/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Glareolidae
Glareola maldivarum	oriental pratincole	BIRD	Specially Protected - Migratory	MI	MI	9/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Glareolidae
Glareola maldivarum	oriental pratincole	BIRD	Specially Protected - Migratory	MI	MI	7/01/1999	BIRDATLAS2	7 Mile	7 Mile	Glareolidae
Glareola maldivarum	oriental pratincole	BIRD	Specially Protected - Migratory	MI	MI	2/06/2008	BIRDATLAS2	Karatha Sewerage ponds	Karatha Sewerage ponds	Glareolidae
Glareola maldivarum	oriental pratincole	BIRD	Specially Protected - Migratory	MI	MI	30/12/2013	BIRDATA	Gap Ridge WWTP, Karratha	Gap Ridge WWTP, Karratha	Glareolidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU		PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/01/1993	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/01/1993	TFAUNA	Dolphin Island Nature Reserve	Dolphin Island, Dampier Archip	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU		PILB_ISLAND_SPECIES	BURRUP	Burrup Penninsula or Dampier	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	20/06/2016	TFAUNA	Burrup	near Berth 3 Roadway, Karrath	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	14/05/2015	TFAUNA	Burrup	Found near FAR 4 on the east s	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	28/12/2014	TFAUNA	Burrup	Found near Stabiliser 6 on the	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	6/03/2015	TFAUNA	Burrup	Karratha Gas Plant, between T	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	6/03/2015	TFAUNA	Burrup	Karratha Gas Plant, admin area	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	11/02/2017	TFAUNA	Karratha	Karratha Gas Plant	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	23/02/2015	TFAUNA	Burrup	Found in the Refigerant contra	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	4/03/2015	TFAUNA	Burrup	Outside the NE Administration	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	29/01/2016	TFAUNA	Burrup	Admin Building, Karratha Gas P	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	17/10/2022	TFAUNA	Pluto LNG Park, bottom of road 10	Burrup WA 6714	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	14/08/2019	TFAUNA	Burrup Peninsula	Pluto LNG Plant	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	15/02/2016	TFAUNA	Burrup	Woodsie Southern Expansion L	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/05/2021	TFAUNA	Burrup	Pluto LNG Plant - about half wa	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	11/03/2018	TFAUNA	Burrup	Pluto LNG Facility, Site A open	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	23/12/2017	TFAUNA	Burrup	Main road down to Woodside's	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	14/07/2021	TFAUNA	Burrup	Pluto Gas Plant, Burrup Road, E	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	4/02/2018	TFAUNA	Burrup	road within Pluto gas Plant, Bu	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/02/2018	TFAUNA	Burrup	road within Pluto gas Plant, Bu	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	19/03/2018	TFAUNA	Burrup	Pluto LNG Facility, CCR car parl	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	23/08/2017	TFAUNA	Burrup Peninsula	Pluto LNg Plant, Burrup Penins	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	26/08/2016	TFAUNA	Burrup	Pluto Gas Plant, 572 Burrup Pe	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	10/02/2022	TFAUNA	Dampier	Road outside CCR at Woodsie F	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	23/01/2022	TFAUNA	Karratha	Pluto LNG Plant Karratha	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	22/07/2015	TFAUNA	Burrup	Burrup Road, opposite Shlumb	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/01/2004	TFAUNA	Burrup	King Bay, Burrup Peninsula	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/01/2001	TFAUNA	Burrup Rifle Range	Pistol Ranges, Burrup Peninsul	Boidae
Liasis olivaceus barroni	Pilbara olive python	REPTILE	Threatened - Vulnerable	VU	VU	1/01/2005	TFAUNA	Dampier	Dampier	Boidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Calidris canutus	red knot	BIRD	Threatened - Endangered	EN	EN	21/06/1978	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Scolopacidae
Calidris canutus	red knot	BIRD	Threatened - Endangered	EN	EN	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Calidris canutus	red knot	BIRD	Threatened - Endangered	EN	EN	9/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Calidris canutus	red knot	BIRD	Threatened - Endangered	EN	EN	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Calidris canutus	red knot	BIRD	Threatened - Endangered	EN	EN	11/09/2011	BIRDATA	Miaree Pool Maitland R	Miaree Pool Maitland R	Scolopacidae
Calidris canutus	red knot	BIRD	Threatened - Endangered	EN	EN	11/09/2011	BIRDATLAS2	Karratha-Sewrage Ponds	Karratha-Sewrage Ponds	Scolopacidae
Calidris canutus	red knot	BIRD	Threatened - Endangered	EN	EN	19/10/2000	BIRDATLAS2	Dampier Salt Works	Dampier Salt Works	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Gidley	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	22/11/1982	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Gidley	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	21/06/1978	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Angel	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/06/2015	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	Dolphin	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/04/2001	BIRDATLAS2	Burrup Peninsula	Burrup Peninsula	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	21/10/1980	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/06/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	4/04/1981	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	30/06/1978	BIRDATLAS1	DAMPIER ARCHIPELAGO	DAMPIER ARCHIPELAGO	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/01/1990	PILB_ISLAND_SPECIES	DAMPIER ARCHIPELAGO	West Lewis South	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	20/11/1999	BIRDATLAS2	Withnell Bay	Withnell Bay	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/08/2013	BIRDATA	Hearson Cove	Hearson Cove	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	10/07/1999	BIRDATLAS2	Cowrie Cove	Cowrie Cove	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/10/2017	BIRDATA	Murujuga NP--Hearson Cove	Murujuga NP--Hearson Cove	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Hearson Cove Dampier	Hearson Cove Dampier	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	5/09/1999	BIRDATLAS2	Hears On Cove	Hears On Cove	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Hearson Cove Dampier	Hearson Cove Dampier	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	20/11/1999	BIRDATLAS2	King Bay, Dampier	King Bay, Dampier	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	4/06/2004	BIRDATLAS2	Burrup Peninsular	Burrup Peninsular	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	-20.70933182260088, 116.6451461614	-20.70933182260088, 116.645	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks Intake	Dampier Saltworks Intake	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	19/12/1998	BIRDATLAS2	Karratha Beach	Karratha Beach	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Karratha town beach	Karratha town beach	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	23/10/2007	BIRDATLAS2	Bayside	Bayside	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	18/02/2001	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	30/01/2000	BIRDATLAS2	Nickol Bay, Karratha	Nickol Bay, Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	16/09/2016	BIRDATA	Karratha Boat Ramp	Karratha Boat Ramp	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	14/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	19/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	21/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	23/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	20/05/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	16/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	17/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	20/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	21/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	22/04/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	13/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/06/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	18/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	19/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	20/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	27/07/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	6/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	7/12/2011	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	28/09/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	2/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	27/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	28/10/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	19/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	21/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	22/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	23/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	28/11/2012	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	16/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	19/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	23/01/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	2/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	4/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	24/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	9/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	25/04/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	4/05/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	19/05/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	6/06/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	14/06/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	2/07/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	3/07/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	3/10/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	1/11/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	30/12/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/05/2014	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	18/01/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	20/01/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	14/02/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	20/03/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	19/04/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	30/09/2015	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	29/09/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	14/04/2015	BIRDATA	Karratha Golf Course	Karratha Golf Course	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	21/02/1999	BIRDATLAS2	Karatha back beach	Karatha back beach	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	14/02/1999	BIRDATLAS2	Karratha back beach	Karratha back beach	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Nickol Bay Karratha	Nickol Bay Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Nickol Bay Karratha	Nickol Bay Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Nickol Bay Karratha	Nickol Bay Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Nickol Bay Karratha	Nickol Bay Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	22/07/2013	BIRDATA	Beach	Beach	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	18/06/2009	BIRDATLAS2	Karratha	Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/04/2001	BIRDATLAS2	Karratha	Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	24/10/2006	BIRDATLAS2	Karratha	Karratha	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	12/10/2012	BIRDATA	Dampier Salt Ponds	Dampier Salt Ponds	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	10/11/1978	BIRDATLAS1	MAITLAND	MAITLAND	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	31/01/1979	BIRDATLAS1	STOVE HILL	STOVE HILL	Scolopacidae
Numenius phaeopus	whimbrel	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae

Scientific Name	Common Name	Class	WA Listing	WA Status	EPBC sta	Date	Source	Locality	Site	Family
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	24/10/2013	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	15/10/2014	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	20/02/2013	BIRDATA	Nickol Bay Karratha 20 43 09S 116 53 1	Nickol Bay Karratha 20 43 09S	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	17/10/2016	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	2/10/2017	BIRDATA	Dampier Saltworks	Dampier Saltworks	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Leighton's Dam	Leighton's Dam	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	31/01/1979	BIRDATLAS1	STOVE HILL	STOVE HILL	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	Karratha sewage ponds	Karratha sewage ponds	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	18/10/2016	BIRDATA	-20.75134929955798, 116.8682083860	-20.75134929955798, 116.8682	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Karratha WWTP	Karratha WWTP	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Karratha WWTP	Karratha WWTP	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Karratha WWTP 1	Karratha WWTP 1	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	19/10/2000	BIRDATLAS2	Karratha Sewage Ponds	Karratha Sewage Ponds	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	26/10/2010	BIRDATLAS2	Karratha WWTP 1	Karratha WWTP 1	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2014	BIRDATA	old sewage ponds	old sewage ponds	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	6/12/2005	BIRDATLAS2	Old Karratha Sewage Ponds	Old Karratha Sewage Ponds	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	29/11/2012	BIRDATA	South Karratha Water Treatment Work	South Karratha Water Treatme	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	27/10/2010	BIRDATLAS2	Karratha WWTF	Karratha WWTF	Scolopacidae
Tringa glareola	wood sandpiper	BIRD	Specially Protected - Migratory	MI	MI	16/10/2007	BIRDATA	Karratha WWTF	Karratha WWTF	Scolopacidae

Appendix D: Avian Collision Impact Assessment

Technical Memorandum

Jacobs

Avian Collision Impact Assessment

Date: 15/12/2023

Project name: Horizon Power – Burrup Common User Transmission Infrastructure

Project no: IS472900

Revision: 0

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Executive Summary

This Avian Collision Impact Assessment supplements the preliminary documentation for the Environment Protection and Biodiversity Conservation (EPBC) Act Referral for the proposed Burrup Common User Transmission Infrastructure project ('the Proposed Action'). This assessment focuses particularly on those areas where the proposed transmission line traverses the western end of the intertidal area connecting King Bay and Hearson Cove on Burrup Peninsula. It has been identified that, in this area, the proposed transmission line has the potential to act as:

a) A collision risk for listed threatened shorebirds and migratory bird species.

b) A barrier to movement of those species with the potential to modify habitat use.

This assessment conducted a comprehensive review of relevant literature and databases to address the following specific threats:

- The risk of transmission line acting as a barrier across a known flyway and between potential roosting/foraging sites.
- The risk of fatality due to collisions with transmission line, particularly at night.
- The effects of disturbance in the intertidal area on populations using the area for roosting and foraging.

Using the completed likelihood of occurrence assessment, a review of the species of concern was conducted and their associated levels of likely impact from the proposed transmission line was determined.

Recommendations are made as to best practice measures that may be employed to avoid, minimise and mitigate any impacts identified.

The main conclusions of this investigation are:

- Along the proposed transmission line corridor, where it crosses the intertidal area between Kings Bay and Hearson Cove may pose a higher risk for bird collisions.
- Existing disturbance and infrastructure along Burrup Rd (a raised earth causeway and sealed road, and a distribution line) may have already modified shorebird habitat use and movements in this area. The proposed action closely follows this existing area of disturbance.
- The literature provides support for the installation of line marking measures (bird flappers) as a technique for minimising bird collision risk.
- Mitigation measures, along with design features of energized components, can minimise the risk of both collision and electrocution to shorebirds and other bird species of concern.

This assessment has been peer reviewed by Dr. Allan Burbidge[1] (Principal Research Scientist, Science and Conservation Division, Department of Biodiversity, Conservation and Attractions (DBCA)). Comments received were supportive of the methodology and approach. Some review comments regarding bird behaviour and biology have been incorporated.

Limitations and assumptions

This assessment is based on available information at the time of writing. No field observations or Bird Utilization Surveys have been undertaken for this assessment. This assessment assumes no significant changes will be made to the proposed route or project scope as provided at the time of writing.

Introduction

The Proposed Action Development Envelope (DE) is situated on Murujuga (Burrup Peninsula) in WA, approximately 1.5 km east of the Dampier township. The Proposed Action involves the expansion of the North-West Interconnected System (NWIS) via construction of an approximately 7 km long 132 kilovolt (kV) overhead transmission line, between the Dampier substation and the Burrup Strategic Industrial Area (SIA) within the Pilbara region. The Proposed Action is described in Section 1.3 of the EPBC Referral Preliminary Documentation (Ref: 2022/09407), and mapped in Figure 1 of that document. The Proposed Action traverses approximately 420 m of Mudflat with tidal inundation, mangroves and scattered samphire constituting foraging and roosting habitat for migratory shorebirds. Existing ecological values and modifications to habitats along the DE are detailed in Section 2.3 of the EPBC Referral Preliminary Documentation (Ref: 2022/09407).

Bird collisions with static power infrastructure (power transmission and distribution lines; poles and associated fencing) are not well quantified in Australia (Lumsden, Moloney, & Smales, 2019). However, studies from North America suggest avian mortality runs into the millions (annually) in the case of electrocutions and pole collisions, and into the tens of millions for deaths directly attributable to collisions with power lines alone (Loss, Will, & Marra, 2015). Some research also suggests that the risk of both collision and electrocution is higher in regard to distribution power lines than transmission power lines (See 'Electrocution' Section on p4). While the scale of this problem in Australia is likely to be proportionally smaller than it is elsewhere, it may still represent a significant threat to local populations of birds, including threatened species (Shaw J. M., 2009; Schaub & Pradel, 2004; Shaw, et al., 2021).

This investigation has been conducted in order to:

- canvas available literature and databases for relevant research and information relating to the likely impacts of collision and electrocution of birds in the area of the proposed transmission line route;
- determine species present within the DE which are likely to be impacted by collision with powerlines and poles;
- determine potential impacts on individuals and populations of threatened bird species; and
- develop recommendations to minimise and mitigate the impacts of avian mortality from collision with and electrocution from power lines and poles forming part of the Proposed Action.

The potential for electrocution and fatal bird collisions with power lines has been understood since the 1800s (Dorin & Spiegel, 2005). Morphological (body shape) features are among the best predictor of a species' level of risk with long-winged and long-legged species (cranes, pelicans, raptors, swans, bustards) evidently most likely to collide fatally with power lines and other linear infrastructure (Guyonne, 2000). Other factors known to indicate an increased risk of collision are flight behaviours and flight speed (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998) and sensory factors also play an important role in susceptibility (Martin G. R., 2011).

[1] Dr. Allan Burbidge DBCA staff profile available at: https://science.dbca.wa.gov.au/people/?sid=6

Collision vs electrocution

Collisions with power lines cause the majority of deaths and critical injuries in birds when compared with electrocution (Biasotto, et al., 2021); this assessment considers both. As seen in Figure 1, the impact risk to shorebird species is predominantly that of collision, not electrocution. This is likely to be a result of shorebird species typically being a faster-flying, smaller-bodied group (and the fact that most species in this taxonomic group are unlikely to perch on wires).It is important to note that these percentages are largely drawn from Palearctic and Nearctic studies. The authors do not separate electrocution sources by voltage. Northern hemisphere transmission networks range from138 to 765 kV and distribution networks range between 4 and 240 kV (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998).

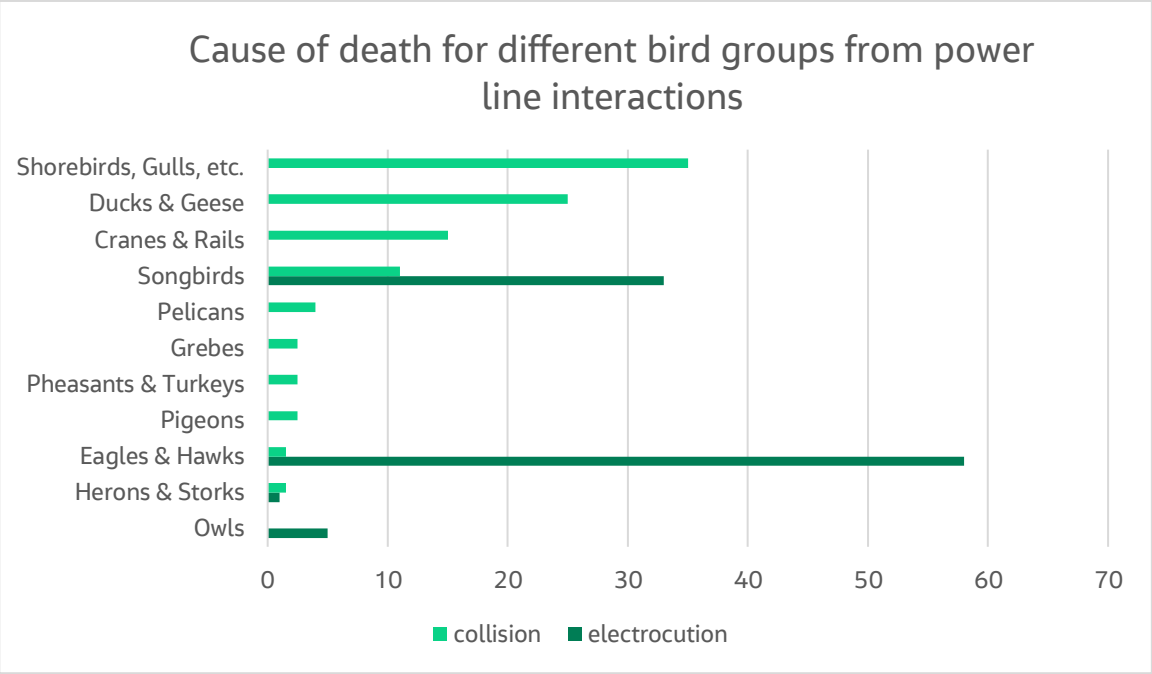


Figure 1 Percentage mortality with bird groups reporting collisions vs electrocution based on 12,000 records adapted from Bevanger (1998)

Collision

There are two separate but related causes of mortality for birds in relation to power lines. Peregrine Falcons (*Falco peregrinus*), the fastest birds, can exceed 320 km/h in diving-flight while hunting prey (Ponitz, Schmitz, Fischer, Bleckmann, & Brucker, 2014). At this speed, a collision with any fixed object is catastrophic and will result in almost certain immediate death or traumatic injury followed by death a short time later. But even comparatively slow-flying birds like swans, pelicans and bustards with flight speeds as low as 30 km/h are likely to suffer injury and indirect mortality from collisions (Silva, et al., 2014). Migratory shorebirds typically exhibit level, powered flight speeds in the range of 50-60 km/h (Pennycuick, Akesson, & Hedenstrom, 2013).

As an adaptation for flight, most birds' bones are hollow with internal reinforcing structures (struts and ridges). This allows bones to be as light as possible while remaining strong enough to withstand tensional and torsional forces related to flight (Gill, 2007). However, this structure renders birds' bones less resistant to compression and shearing forces which are those typically experienced during collisions in flight (Novitskaya, et al., 2017).

Birds with long wings striking a fixed object at speeds of 30 km/h or more, and not killed outright, are likely to suffer fractures of the wing bones; typically the humerus. This will render the bird flightless and

consequently unable to forage and move freely, and unable to avoid terrestrial predators leading to indirect mortality attributable to the collision.

Electrocution

Electrocution is death resulting from contact with an electrical current. Not every bird colliding with power lines will suffer electrocution unless they simultaneously come into contact with electrical grounding wires or a second live wire (Bernardino, et al., 2018).

Both avian collisions and electrocutions can result in damage to electrical infrastructure causing power outages. In some cases bushfires can also be caused by avian collisions and electrocutions (Dorin & Spiegel, 2005).

While electrocution is usually a result of a bird physically closing the connection between energized components, on rare occasions a faecal ejection can also cause electrocution. Large birds sometimes eject long 'streamers' of excrement when they take off from a perch. If perched on a pole or power line when they take to flight, these streamers can cause flashovers if they span energized components. Such incidents often result in power outages, but they only rarely cause the death of a bird (Avian Power Line Interaction Committee (APLIC), 2006).

Transmission lines, compared to distribution lines, are larger infrastructure with greater spacing of conductors and are thus less likely to cause electrocution. The Proposed Action design ensures the conductor spacing will be 230 cm which is significantly greater than the required 140 cm (BirdLife International, 2007) and also exceeds the 150 cm spacing specifically recommended to avoid avian electrocution in (Avian Power Line Interaction Committee (APLIC), 2006).

Methods

Databases and existing literature review

A review of existing literature has been completed based on previous environmental studies by public or private entities and relevant studies in peer-reviewed publications.

The aim of the literature review was to understand the findings of historical records, reports and information relevant to the Proposed Action, for the assessment of avian collision impacts. Information obtained from the review is incorporated into specific sections in order to support the assessment, rather than being written up as a stand-alone literature review.

Several databases of bird observations were checked for records relevant for consideration in this assessment. Databases that were reviewed included:

- The eBird Basic Dataset (Cornell Lab of Ornithology, 2023);
- The Protected Matters Search Tool (PMST (DCCEEW, 2023)
- Birdata (BirdLife Australia, 2023)
- Xeno-Canto (Naturalis Biodiversity Center, 2023);
- AVoCet (Michigan State University, 2023)
- Perdaman Urea Project: Marine Fauna Desktop Assessment (Pendoley Environmental Pty Ltd, 2019)
- Dampier Saltworks Shorebird Survey 2020 (O'Connor, Ringma, & Kirk, 2021)

Some references were consulted which relate to areas outside of the area of investigation. These references inform the understanding of avian collision impact as it relates to similar species elsewhere in Australia (and on other continents) and the movements and ecology of birds found within the area of investigation.

Assessing avian collision impacts

An approach for assessing the collisions *risk* for Victorian birds with wind turbines is set out by Lumsden, et al., (2019). This assessment adapts their approach and applies it to an assessment of collision impacts resulting from linear static energy infrastructure on EPBC listed species identified as being potentially impacted by the Proposed Action. Some elements are necessarily modified to allow for the different character of threat posed to birds from static, linear infrastructure (power lines specifically) as compared with wind turbines. Despite being designed primarily for assessing birds' risk of collision with mobile structures, this approach nonetheless offers a sound and science-based approach from which to draw conclusions about what level of impact various species may be exposed to from collisions with transmission lines. It is therefore a good basis from which to make recommendations for avoiding, minimizing, and mitigating any identified impacts.

At the referral stage, the proposed action was determined to be likely to have a significant impact on eight threatened shorebird species and ten EPBC Migratory species (which are all either shorebirds or seabirds). These 18 species (listed in the Results section) were then assessed according to their: a) likelihood of collision with power lines and; b) the likely consequence of any collision. These assessments were made in accordance with the risk matrix in Table 1. The results of this risk assessment are presented in Table 2.

Table 1 impact risk matrix, [adapted from Lumsden et al, (2019)]

		Consequence of collisions			
		Insignificant	**Minor**	**Moderate**	**Significant**
Likelihood of collisions	**Very rare**	Minimal concern	Minimal concern	Minimal concern	Mild concern
	Rare	Minimal concern	Minimal concern	Mild concern	Concern
	Possible	Minimal concern	Mild concern	Concern	Extreme concern
	Probable	Mild concern	Concern	Extreme concern	Extreme concern

Results

EPBC Act listed bird species

A field survey was conducted by GHD (2020a; 2020b; and 2022). Preceding that field survey a desktop assessment identified several bird species which may occur in the DE or immediate surrounds due to their migratory natures. Those species are primarily expected to occur seasonally or transitionally in the DE due to their migratory life histories. That field survey identified four threatened species listed by the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act):

- Whimbrel (*Numenius phaeopus*) (Migratory)
- Gull-billed Tern (*Gelochelidon nilotica*) (Migratory)
- Caspian Tern (*Hydroprogne caspia*) (Migratory)
- Greater Crested Tern (*Thalasseus bergii*) (Migratory)

At the referral decision stage, the proposed action was determined as likely to have a significant impact on the following threatened shorebird and migratory bird species:

Threatened Shorebird Species

- Curlew Sandpiper (*Calidris ferruginea*) – Critically Endangered, Migratory
- Eastern Curlew (*Numenius madagascariensis*) – Critically Endangered, Migratory
- Greater Sand Plover (*Charadrius leschenaultii*) – Vulnerable, Migratory
- Great Knot (*Calidris tenuirostris*) – Critically Endangered, Migratory
- Lesser Sand Plover (*Charadrius mongolus*) – Endangered, Migratory
- Red Knot (*Calidris canutus*) – Endangered, Migratory
- Northern Siberian Bar-Tailed Godwit (*Limosa lapponica menzbieri*) – Critically endangered
- Australian Fairy Tern (*Sternula nereis nereis*) – Vulnerable

Migratory Shorebird and Seabird Species

- Whimbrel (*Numenius phaeopus*) – Migratory
- Oriental Plover (*Charadrius veredus*) – Migratory
- Wood sandpiper (*Tringa glareola*) – Migratory
- Oriental Pratincole (*Glareola maldivarum*) – Migratory
- Common Sandpiper (*Actitis hypoleucos*) – Migratory
- Common Greenshank (*Tringa nebularia*) – Migratory
- Gull-billed Tern (*Gelochelidon nilotica*) – Migratory
- Caspian Tern (*Hydroprogne caspia*) – Migratory
- Greater Crested Tern (*Thalasseus bergii*) – Migratory
- Bridled tern (*Onychoprion anaethetus*) – Migratory

The level of concern for each identified species is detailed in Table 2 and discussed further in the Impact Assessment section.

Table 2 level of concern of collision for each species

Scientific name	Common Name	EPBC	Likelihood of occurrence	Level of concern
Calidris ferruginea	Curlew Sandpiper	Critically Endangered, Migratory	Likely to occur	Mild
Numenius madagascariensis	Eastern Curlew	Critically Endangered, Migratory	Likely to occur	Mild
Charadrius leschenaultii	Greater Sand Plover	Vulnerable, Migratory	Likely to occur	Minimal

Scientific name	Common Name	EPBC	Likelihood of occurrence	Level of concern
Calidris tenuirostris	Great Knot	Critically Endangered, Migratory	May occur	Mild
Charadrius mongolus	Lesser Sand Plover	Endangered, Migratory	Likely to occur	Minimal
Calidris canutus	Red Knot	Endangered, Migratory	Likely to occur	Mild
Limosa lapponica menzbieri	Northern Siberian Bar-tailed Godwit	Critically Endangered	May occur	Mild
Sternula nereis nereis	Australian Fairy Tern	Vulnerable	May occur	Minimal
Numenius phaeopus	Whimbrel	Migratory	Known to occur	Mild
Charadrius veredus	Oriental Plover	Migratory	Likely to occur	Minimal
Tringa glareola	Wood Sandpiper	Migratory	Unlikely to occur	Minimal
Glareola maldivarum	Oriental Pratincole	Migratory	Likely to occur	Minimal
Actitis hypoleucos	Common Sandpiper	Migratory	Likely to occur	Minimal
Tringa nebularia	Common Greenshank	Migratory	Likely to occur	Minimal
Gelochelidon nilotica	Gull-billed Tern	Migratory	Known to occur	Mild
Hydroprogne caspia	Caspian Tern	Migratory	Known to occur	Mild
Thalasseus bergii	Greater Crested Tern	Migratory	Known to occur	Mild
Onychoprion anaethetus	Bridled Tern	Migratory	May occur	Minimal

Migratory bird habitats

Field investigations and studies of aerial photography of the proposed alignment have identified an area of Mudflat with tidal inundation, mangroves and scattered samphire. This habitat type exists in a band between King Bay and Hearson Cove and the total extent of this habitat type within the DE totals 5.84 ha. Vegetation is minimal excluding where the mudflats fringe mangroves and samphire. Within this habitat, vegetation is mainly sparse and scattered, with small areas of clustered low samphire shrublands. Areas are inundated with seawater during high tides that retract to several small pools and minor drainage lines during low tide.

This habitat type constitutes migratory shorebird foraging and roosting habitat. The development envelope traverses approximately 420 m of this habitat type. Where transmission lines or poles would traverse this habitat, it should be considered a potential collision zone and this area should be treated as a priority for collision mitigation efforts. It should be noted that ongoing clearing and construction works in the tidal inlet by third parties has already reduced the expected hectares of disturbance in this area. Current photos of the area are shown in Photos 1 and 2.

Photo 1 – An area close to the tidal inlet showing pre-existing and ongoing clearing

Photo 2 – An area close to the tidal inlet showing pre-existing and ongoing clearing

Impact assessment

The impact assessment process lists those species which should be considered priorities for any mitigation strategies addressing avian collision risk. The assessed level of concern for each species is provided in Table 2 and the determinations for each species are discussed in greater detail below.

MINIMAL concern species

Greater Sand Plover, Lesser Sand Plover, Australian Fairy Tern, Oriental Plover, Wood Sandpiper, Oriental Pratincole, Common Sandpiper, Common Greenshank, Bridled Tern.

Despite varying in levels of absolute threat and overall rarity, these species share the characteristic of having low reporting rates in the area of the Proposed Action. With the exception of the Greater Sand Plover and Lesser Sand Plover (which are each recorded regularly albeit in low numbers at Hearson Cove (BirdLife Australia, 2023)), these species have few recent records in the DE.

Greater Sand Plover: Prefers sheltered sandy, shelly, and muddy coastal areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its east Asian breeding grounds (Rogers, Clemens, Carey, & Garnett, Eastern Greater Sand Plover Charadrius leschenaultii leschenaultii, 2021). This species is assessed as being of MINIMAL concern due to the size of populations globally being stable and populations in north-western Australia have been increasing since 2008 (Rogers, Scroggie, & Hassell, 2020). As a smaller shorebird it may also be less exposed to the risk of power line collision than larger and longer-winged species (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998).

Lesser Sand Plover: Prefers sheltered sandy, shelly, and muddy coastal areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its east Asian breeding grounds (Rogers, Clemens, Carey, & Garnett, Mongolian Lesser Sand Plover Charadrius mongolus and Kamchatkan Lesser Sand Plover C. m. stegmanni, 2021). Lesser Sand Plover is assessed as being of MINIMAL concern due to its absence from reports of shorebird mortality resulting from power line collision. It is a smaller shorebird making it less morphologically exposed to collision risk and, while the species is regularly recorded at Hearson Cove and nearby areas, these observations are generally of small flocks or individual birds and their foraging and roosting activities are typically confined to sandy beaches and mudflats.

Australian Fairy Tern: A near shore marine species which nests in exclusively coastal colonies on sandy islands, rocky archipelagos, and estuarine beaches. Collision with power lines is not documented as a threat to the species anywhere in its Australian distribution (Greenwell, et al., 2021).

Oriental Plover: A species with diverse habitat preferences, often found on arid inland gibber plains and stony flats but also alongside rivers and saline or freshwater lakes, clay pans, agricultural areas and playing fields, and wetlands with mudflats and sand banks. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its Siberian breeding grounds (Wiersma & Kirwan, 2020). While this does not guarantee that collisions don't occur, it nonetheless permits an assessment of collision risk for this (and other) species that places the potential impact of collisions in the context of population effects.

Wood Sandpiper: Species breeds in northern hemisphere woodlands and peatlands but in non-breeding season it is associated with open areas, usually near the margins of inland fresh water only occasionally coastal saltmarsh and estuarine areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its northern hemisphere breeding grounds (Van Gills, Wiersma, & Kirwan, 2020).

Oriental Pratincole: Inhabits open grassy plains, claypans, muddy wetlands and occasional coastal beaches and intertidal areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its Asian breeding grounds (Maclean & Kirwan, 2020).

Common Sandpiper: Uses a diverse range of habitats, often with a rocky substrate, found on coastal shores, estuaries, saltmarshes, and mangroves as well as far inland in isolated water bodies, clay pans and salt lakes. Large coastal mudflats are not a favoured habitat. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its Eurasian breeding grounds (Van Gils, Wiersma, & Kirwan, 2020).

Common Greenshank: Found in a diverse range of habitats, including coastal shores, estuaries, saltmarshes, and mangroves as well as far inland in freshwater wetlands and artificial reservoirs. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its Eurasian breeding grounds (Clemens, Rogers, Carey, & Garnett, Common Greenshank Tringa nebularia, 2021).

Bridled Tern: Habitat away from breeding colonies (vegetated coral cays, limestone plateaux, rarely on continental coasts) is entirely marine or aerial. May be found from near coastal inshore waters but typically far out at sea beyond continental shelf waters. Collision with power lines is not documented as a threat to the species, either in its colonial nesting areas or in offshore areas (Haney, Lee, & Morris, 2020).

MILD concern species

Curlew Sandpiper, Eastern Curlew, Great Knot, Red Knot, Northern Siberian Bar-tailed Godwit, Whimbrel, Gull-billed Tern, Caspian Tern, Greater Crested Tern.

For the majority of the species in this category, the level of concern is a result of the taxon's overall rarity.

Curlew Sandpiper: There are very few recent records of this Critically Endangered species within 5 km of the Proposed Action. It is however, worth noting that there have been no systematic surveys in the immediate vicinity of the Proposed Action and the species is noted to occur in considerable numbers at sites with more suitable habitat within 10 km (O'Connor, Ringma, & Kirk, 2021). While the species, or its habitat, is modelled to occur, the most recent observations are two records from 2017 which appear in the eBird Basic Dataset (EBD) (Cornell Lab of Ornithology, 2023). The species' overall rarity and global population decline are the main factors leading to its assessment as being of MILD concern. It prefers coastal habitats including brackish lagoons, estuaries, tidal mud and sand flats, and rocky shores. The species exhibits an overall population trend of -53% over three generations and has seen rapid decline in Australian reporting rates over the last decade. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its high Arctic breeding grounds. (Clemens, Rogers, Carey, & Garnett, Curlew Sandpiper Calidris ferruginea, 2021).

Eastern Curlew: This Critically Endangered species has few recent records within 5 km of the Proposed Action. A total of eight records have been documented since 2017. It is a very strongly coastal species preferring estuaries, mud flats, mangroves, saltmarsh, and intertidal flats. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its high Arctic breeding grounds. (Lilleyman, Woodworth, Clemens, Rogers, & Garnett, 2021). Despite this, it is assessed as being of MILD concern, largely due to its relatively recent population decline and, being a larger shorebird, possessing morphological traits (including a wingspan up to 110 cm) in common with other species known for susceptibility to power line collision (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998).

Great Knot: This Critically Endangered species is regularly observed in small numbers at Hearson Cove (some 2.9 km to the east of the Proposed Action site). At that location flocks as large as 15 individuals have been recorded in the majority of each of the last ten years. These regular records of small flocks of birds, in relative proximity to the Proposed Action result in it being assessed as being of MILD concern. The species is entirely coastal within its non-breeding range. It forages on wet muddy substrates including intertidal mud and sand in sheltered areas. No major threats are documented for the species within Australia probably due to it occupying remote and sparsely populated parts of the coastline. As such, Collision with power lines is not documented as a threat to the species in Australia, nor along its migratory route through the East Asian-Australian Flyway or its subarctic breeding grounds (Clemens, Rogers, Melville, Carey, & Garnett, Great Knot Calidris tenuirostris, 2021).

Red Knot: This Endangered species is entirely coastal within its non-breeding range. A single individual was documented at Hearson Cove in October of 2022. Other than this, there are very few records of the species within 20 km of the Proposed Action in recent decades, other than at sites with notable high value habitat for this species, particularly Dampier Saltworks (O'Connor, Ringma, & Kirk, 2021). This scarcity and the presence of suitable habitat in proximity to the Proposed Action result in it being assessed as of MILD concern. It forages on wet muddy substrates including intertidal mud and sand in sheltered areas. Habitat loss is documented as a low level threat within Australia. Collision with power lines is not documented as a threat to the species in Australia, nor along its migratory route through the East Asian-Australian Flyway or its high Arctic breeding grounds (Clemens, Rogers, Melville, Carey, & Garnett, New Siberian Islands Red Knot Calidris canutus piersmai and North-eastern Siberian Red Knot C. c. rogersi, 2021).

Northern Siberian Bar-tailed Godwit: The total abundance of this taxon was estimated to have declined by 57% between 1995 and 2012. In the non-breeding season the species adheres to muddy coastal areas, estuaries, inlets, and intertidal areas. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its breeding grounds in the arctic tundra (Clemens, Rogers, Melville, Carey, & Garnett, Anadyr Bar-tailed Godwit Limosa lapponica anaddyrensis, Alaskan Bar-tailed Godwit L. l. baueri, and Yakutian Bar-tailed Godwit L. l. menzbieri, 2021). It has been assessed here as being of MILD concern due to the species' overall rarity and possible morphological vulnerability to power line collision (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998). There is a record of three

individuals at Hearson Cove in 2021 and at Nickol Bay some 14 km to the southeast of the Proposed Action, the species is recorded more regularly with flocks as large as 100 birds recorded in 2011 and 115 birds in 2021 at that location. Additionally, the species is regularly counted in significant numbers by shorebird surveys at the Dampier Saltworks some 5 km south of the Proposed Action (O'Connor, Ringma, & Kirk, 2021).

Whimbrel: In its Australian non-breeding range this species is mostly confined to coastal areas containing mangroves, predominantly in northern Australia. For this reason it has no threats in Australia due to these areas being mostly free from disturbance and development. Collision with power lines is not documented as a threat to the species, either within its Australian non-breeding range, its migratory route through the East Asian-Australian Flyway or its breeding grounds in eastern Siberia (Clemens, Rogers, Carey, & Garnett, Eastern Siberian Whimbrel Numenius phaeopus variegatus, 2021). Despite this, it assessed here as being of MILD concern due to possessing morphological traits consistent with species which have a demonstrated vulnerability to power line collision (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998) in combination with the relatively high number of regular records of the species' presence at Hearson Cove.

Gull-billed Tern: This species prefers shallow embayments, fresh and saline ephemeral terrestrial wetlands (sometimes far inland), and lagoons usually with mudflats. Collision with power lines is not documented as a threat to the species in Australia, or elsewhere in its near-cosmopolitan distribution (Molina, et al., 2020). It has been assessed as being of MILD concern due to sharing morphological characteristics and flight behaviours with other species with a documented history of power line collision (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998). Additionally, the species is regularly recorded in small numbers at Hearson Cove roughly 2.9 km due east of the Proposed Action and may move widely through the local area.

Caspian Tern: This species is regularly recorded in small numbers at Hearson Cove. It uses a wide variety of habitats including coastal estuarine, salt marsh, fresh and saline ephemeral terrestrial wetlands (sometimes far inland), and lagoons and coastal mudflats. There is a single historical record of death resulting from collision with power lines in North America (Cooke, 1937), but this is otherwise not recognised as a threat to the species in Australia, or elsewhere in its global distribution (Cuthbert & Wires, 2020). As the world's largest tern species, it is assessed as being of MILD concern here due to possessing morphological traits and flight behaviours assessed in other species as rendering them vulnerable to power line collision (Bevanger, Biological and conservation aspects of bird mortality caused by electricity power lines: a review, 1998). It regularly roosts or forages in relative proximity to the Proposed Action and may move widely throughout the area.

Greater Crested Tern: An offshore marine and coastal species, very rarely seen far inland. Great Crested Terns prefer low-lying coral, sandy or rocky islets, spits, lagoons, and sandy beaches. Collision with power lines is not documented as a threat to the species in Australia, or elsewhere in its distribution (Gochfeld, Burger, Kirwan, Christie, & Garcia, 2020). While commonly observed throughout the wider region of Burrup Peninsula and Nickol Bay, the species is only intermittently recorded at Hearson Cove. It does however possess morphological characters and flight behaviours typical of other species which have a demonstrated vulnerability to power line collision. It has therefore been assessed as being of MILD concern as it may infrequently roost or forage in the vicinity of Hearson Cove and associated intertidal habitats.

Risk of transmission line acting as a barrier across a known flyway and between potential roosting and foraging sites.

The proposed transmission line across the intertidal area is not likely to act as a barrier between potential roosting and foraging sites for shorebirds. Consideration will be given to the design of the transmission line and energised components to minimise their potential impact on the natural habitat and the behavioural patterns of shorebirds. The chosen alignment closely follows an existing distribution line easement and causeway and allows for shorebirds to continue accessing potential roosting and foraging locations along the intertidal zone.

There is an existing distribution line and causeway across the intertidal area however no pre-construction monitoring is available to determine the changes these disturbances may have already caused in the patterns of use and behaviour by roosting and foraging shorebirds. By adhering as much as possible to areas of existing disturbance and construction, the Proposed Action will minimise further disturbance to the integrity of the intertidal area as habitat for shorebirds, allowing foraging and roosting in keeping with their current patterns without significant disruption.

Risk of fatality due to collisions with transmission line, particularly at night.

The risk of shorebirds colliding with the proposed transmission line at night is low. Shorebirds fly at night during migration and are also known to be active at night over shorter distances for the purposes of foraging and moving between sites (Dann, 1987) (Finn, 2007) (Stuart, Wooding, & Takurou, 2015). Nonetheless, shorebirds' natural behaviour patterns (Kruger & Garthe, 2001), the lack of attraction to transmission lines, and their ability to navigate safely during the night minimises the risk of collisions with these structures. Design features, various appropriate mitigation devices and positioning of poles are important factors in ensuring the well-being of shorebirds.

The effects of disturbance in the intertidal area on populations using the area for roosting and foraging.

The area of the Proposed Action is already subject to significant clearing and disturbance with further modification planned as part of other approved developments. Additional disturbance in the intertidal area may have some effects on shorebirds and the way that they use the habitat but the existing levels of disturbance should be noted. There are some species present that may rely on components of this area for roosting and foraging. The intertidal area is comprised of mudflats, mangroves, some scattered rocky areas, ephemeral pools, and patches of samphire. These are all habitats which some shorebird species may use for foraging or roosting and disruptions to these habitats can impact the birds' ability to find food and rest.

Potential effects of disturbance in the intertidal area on shorebird populations:

1. **Disruption of Foraging:** Shorebirds primarily use intertidal areas to forage for food, such as insects, crustaceans, molluscs, other benthic fauna and small fish. Disturbances, such as earthworks or construction, can disrupt these feeding patterns. For example, recreational activities, industrial development, or habitat alteration can lead to increased human presence and noise, causing birds to take flight and abandon feeding sessions in that area.

2. **Reduced Food Availability:** Habitat disturbances may alter the availability of food resources for shorebirds. Pollution, habitat degradation, and changes in the abundance of prey species due to environmental factors can result in decreased food availability. This can lead to malnutrition, reduced energy levels, and even population declines among shorebird species.

3. **Increased Energy Expenditure:** Shorebirds have high metabolic rates and need to consume substantial amounts of food daily to meet their energy requirements, especially in the lead up to, and following, migration. Disturbances that force them to expend more energy to find food or avoid disturbances can lead to exhaustion, depletion of critical fat reserves and reduced migratory survival rates.

4. **Loss of Roosting Sites:** The intertidal area may provide roosting sites for shorebirds during high tides or when they need to rest. Disturbances can lead to habitat destruction or alteration, reducing the availability of suitable roosting sites. This can result in increased stress and reduced fitness.

5. **Population Declines:** Cumulative disturbances over time can lead to declines in shorebird populations. These declines can have ecological cascading effects, as shorebirds play important roles in intertidal food webs and ecosystem functioning.

Existing disturbance

The part of the intertidal area which lies within the proposed footprint is traversed by a distribution power line and Burrup Rd, a two-lane sealed road atop a crushed rock causeway with a large central culvert to permit tidal movements of water. On the southern side the intertidal flat is bordered by Hearson Cove Rd and along the northern side there is small network of unsealed roads and two industrial facilities. As such, the intertidal area already exhibits a notable degree of disturbance with pre-existing infrastructure.

Photos 3 and 4 - Burrup Road causeway and existing distribution power lines looking north across intertidal area (this is an older photo and further clearing has been undertaken in the vicinity by third parties since this was taken)

Given this context and that the Proposed Action will closely abut existing disturbed sections alongside Burrup Rd the likelihood of further disturbance to shorebirds is considered to be relatively low. The Proposed Action will occur on the eastern side of Burrup Rd, avoiding areas of mangrove habitat on the western side. Shorebirds are known to adapt to, or even avoid, areas with consistent human activity, often altering their foraging and roosting behaviours to minimise disruptions (Peters & Otis, 2007). The pre-existing disturbance is likely to have already modified shorebird habitat use in the area and the Proposed Action, properly mitigated, would be unlikely to cause additional behavioural modification, changes to habitat use or additional harm at a population level.

Recommendations

Mitigation recommendations

- Line marking

Particularly for birds of prey like eagles, it has been documented that the way they use their vision during hunting may render them vulnerable to collisions with power lines (Martin & Shaw, 2010). Line marking balls are simple and cost-effective installations which make power lines more easily visible to birds and improve their ability to accurately perceive depth in relation to power lines (Avian Power Line Interaction Committee (APLIC), 2006) & (Avian Power Line Interaction Committee (APLIC), 2012). Line marking should be considered specifically for the section of line that runs through the tidal mudflat area. Ultraviolet (UV) line marking, if available, should also be considered, particularly with a view to minimising risks of nocturnal collisions (Dwyer, Pandey, McHale, & Harness, 2020).

- Structural design mitigation

The design of both power lines and poles should comply with recommendations developed by BirdLife International to inform the drafting of international conventions on the protection of birds from collision with power lines (BirdLife International, 2007). These recommendations ensure that components of transmission networks pose the lowest practicable risk of both electrocution and collision to all birds. This guidance confirms the lowest risk for above ground power poles with upright insulators, such as those proposed, are poles with suspended insulators provided the distance between a likely perch (crossarm) to the energized parts (conductors) is at least 60 cm. Conductors should be spaced at least 140 cm apart. Hardware that is used to prevent arcing (“St. Elmo´s fire” on both sides of the insulators) should not be used. Where possible, poles should be positioned to minimise obstruction of flyways between King Bay and Hearson Cove.

References

Andrews, A. (1990). Fragmentation of Habitat by Roads and Utility Corridors: A Review. *Australian Zoologist, 26*(3-4), 130-141.

Ascensao, F., Kindel, A., Teixeira, F. Z., Barrientos, R., D'Amico, M., Borda-de-Agua, L., & Pereira, H. M. (2019). Beware that the lack of wildlife mortality records can mask a serious impact of linear infrastructures. *Global Ecology and Conservation*.

Askins, R. A., Folsom-O'Keefe, C. M., & Hardy, M. C. (2012). Effects of Vegetation, Corridor Width and Regional Land Use on Early Successional Birds on Powerline Corridors. *PLOS One*.

Avian Power Line Interaction Committee (APLIC). (2006). *Suggested practices for avian protection on power lines: the state of the art in 2006.* Sacramento: Edison Electric Institute.

Avian Power Line Interaction Committee (APLIC). (2012). Reducing avian collisions with power lines: the state of the art in 2012. Washington, DC: Edison Electric Institute and APLIC.

Baasch, D. M., Hegg, A. M., Dwyer, J. F., Caven, A. J., Taddicken, W. E., Worley, C. A., . . . Mittman, N. D. (2022). Mitigating avian collisions with power lines through illumination with ultraviolet light. *Avian Conservation & Ecology*.

Bernardino, J., Bevanger, K., Barrientos, R., Dwyer, J. F., Marques, A. T., Martins, R. C., . . . Moreira, F. (2018). Bird collisions with power lines: State of the art and priority areas for research. *Biological Conservation, 222*, 1-13.

Bevanger, K. (1998). Biological and conservation aspects of bird mortality caused by electricity power lines: a review. *Biological Conservation, 86*, 67-76.

Bevanger, K., & Brøseth, H. (2001). Bird collisions with power lines - an experiment with ptarmigan (Lagopus spp.). *Biological Conservation*, 341-346.

Biasotto, L. D., Moreira, F., Bencke, G. A., D'Amico, M., Kindel, A., & Ascensao, F. (2021). Risk of bird electrocution in power lines: a framework for prioritizing species and areas for conservation and impact mitigation. *Animal Conservation*.

BirdLife Australia. (2023, October 17). Retrieved from Birdata: https://birdata.birdlife.org.au/explore#map=-20.6391196_116.7909064_13

BirdLife International. (2007, May 10). *BirdLife.* Retrieved February 21, 2022, from https://migratorysoaringbirds.birdlife.org/sites/default/files/BHDTF__Position_Power_Lines_and_birds_2007_05_10_.pdf

Clancy, T. F. (2020). *Wildlife Management Program for the Magpie Goose (Anseranas semipalmata) in the Northern Territory of Australia, 2020-2030.* Berrimah: Northern Territory Department of Environment and Natural Resources.

Clemens, R., Rogers, D., Carey, M., & Garnett, S. T. (2021). Common Greenshank Tringa nebularia. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 305-308). Melbourne: CSIRO Publishing.

Clemens, R., Rogers, D., Carey, M., & Garnett, S. T. (2021). Curlew Sandpiper Calidris ferruginea. In S. T. Garnett, & G. B. Baker (Eds.), *The Action Plan for Australian Birds 2020* (pp. 287-290). Melbourne: CSIRO Publishing.

Clemens, R., Rogers, D., Carey, M., & Garnett, S. T. (2021). Eastern Siberian Whimbrel Numenius phaeopus variegatus. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 262-264). Melbourne: CSIRO Publishing.

Clemens, R., Rogers, D., Melville, D. S., Carey, M., & Garnett, S. T. (2021). Anadyr Bar-tailed Godwit Limosa lapponica anaddyrensis, Alaskan Bar-tailed Godwit L. l. baueri, and Yakutian Bar-tailed Godwit L. l. menzbieri. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australia Birds 2020* (pp. 267-271). Melbourne: CSIRO Publishing.

Clemens, R., Rogers, D., Melville, D. S., Carey, M., & Garnett, S. T. (2021). Great Knot Calidris tenuirostris. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 277-280). Melbourne: CSIRO Publishing.

Clemens, R., Rogers, D., Melville, D. S., Carey, M., & Garnett, S. T. (2021). New Siberian Islands Red Knot Calidris canutus piersmai and North-eastern Siberian Red Knot C. c. rogersi. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 281-284). Melbourne: CSIRO Publishing.

Conklin, J. R., & Colwell, M. A. (2007). Interaction of predators and manmade object causes potentially significant mortality in a wintering shorebird population. *Bulletin - wader study group*, 57.

Cooke, M. T. (1937). Some longevity records of wild birds. *Bird-Banding*, 52-65.

Cornell Lab of Ornithology. (2023). *eBird: An online database of bird distribution and abundance*. Retrieved February 20, 2022, from http://www.ebird.org

Cuthbert, F. J., & Wires, L. R. (2020, September). *Caspian Tern (Hydroprogne caspia), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/caster1/cur/introduction

Dann, P. (1987). The feeding behaviour and ecology of shorebirds. In B. A. Lane, *Shorebirds in Australia* (pp. 10-20). Melbourne: Royal Australasian Ornithologists Union.

DCCEEW. (2023, September 7). *Protected Matters Search Tool*. Retrieved from DAWE: https://pmst.awe.gov.au/#/map?lng=131.52832031250003&lat=-28.671310915880834&zoom=5&baseLayers=Imagery

Dorin, M., & Spiegel, L. (2005). *Assessment of avian mortality from collisions and electrocutions.* Sacramento: California Energy Commission.

Dwyer, J. F., Pandey, A. K., McHale, L. A., & Harness, R. E. (2020). Near-ultraviolet light reduced Sandhill Crane collisions with a power line by 98%. *The Condor*, 1-10.

Finn, P. G. (2007). Feeding ecology and habitat selection. In A. Geering, I. Agnew, & S. Harding, *Shorebirds of Australia* (pp. 51-59). Collingwood: CSIRO Publishing.

GHD. (2020a). *Burrup Expansion Project Flora and Vegetation Survey.* Horizon Power.

GHD. (2020b). *Hybrid Renewable Power Plant Fauna Survey.* Woodside Power Pty Ltd.

GHD. (2022). Technical Memorandum. *Burrup Additional Areas Reconnaissance / Basic Survey*. Horizon Power.

Gill, F. B. (2007). *Ornithology.* New York City: Freeman.

Gochfeld, M., Burger, J., Kirwan, G. M., Christie, D. A., & Garcia, E. F. (2020, September). *Great Crested Tern (Thalasseus bergii), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/grcter1/cur/introduction#conserv

Greenwell, C. N., Woehler, E. J., Paton, D. C., Paton, F., Dunlop, N., Menkhorst, P., . . . Garnett, S. T. (2021). Australian Fairy Tern Sternula nereis nereis. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 327-330). Melbourne: CSIRO Publishing.

Guyonne, J. F. (2000). Avian mortality from power lines: a morphologic approach of a species-specific mortality. *Biological Conservation, 95*(3), 252-259.

Haney, J. C., Lee, D. S., & Morris, R. D. (2020, September). *Bridled Tern (Onychoprion anaethetus), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/briter1/cur/conservation

Kruger, T., & Garthe, S. (2001). Flight altitudes of coastal birds in relation to wind direction and speed. *Atlantic Seabirds*, 203-216.

Lilleyman, A., Woodworth, B. K., Clemens, R., Rogers, D. I., & Garnett, S. T. (2021). Far Eastern Curlew Numenius madagascariensis. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 264-267). Melbourne: CSIRO Publishing.

Lobermeier, S., Moldenhauer, M., Peter, C., Slominski, L., Tedesco, R., Meer, M., . . . Stewart, A. (2015). Mitigating avian collision with power lines: a proof of concept for installation of line markers via unmanned aerial vehicle. *Journal of Unmanned Vehicle Systems*.

Loss, S. R., Will, T., & Marra, P. P. (2015). Direct Mortality of Birds from Anthropogenic Causes. *Annual Review of Ecology, Evolution, and Systematics*, 99-120.

Lumsden, L. F., Moloney, P., & Smales, I. (2019). *Developing a science-based approach to defining key species of birds and bats of concern for wind farm developments in Victoria.* Heidelberg: Arthur Rylah Institute for Environmental Research.

Maclean, G. L., & Kirwan, G. M. (2020, September). *Oriental Pratincole (Glareola maldivarum), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/oripra/cur/introduction

Macquarie Dictionary Publishers. (2020). *Macquarie Dictionary.* Sydney: Pan Macmillan.

Martin, G. R. (2011). Understanding bird collisions with man-made objects: a sensory ecology approach. *The International Journal of Avian Science*, 239-254.

Martin, G. R., & Shaw, J. M. (2010). Bird collisions with power lines: Failing to see the way ahead? *Biological Conservation, 143*, 2695-2702.

Michigan State University. (2023, September 7). *AVoCet*. Retrieved from Avian Vocalizations Center: https://avocet.integrativebiology.natsci.msu.edu/

Molina, K. C., Parnell, J. F., Erwin, R. M., del Hoyo, J., Collar, N., Kirwan, G. M., & Garcia, E. F. (2020, September). *Gull-billed Tern (Gelochelidon nilotica), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/gubter1/cur/introduction

Naturalis Biodiversity Center. (2023, September 7). *Xeno-Canto*. Retrieved from https://xeno-canto.org/

Novitskaya, E., Ruestes, C. J., Porter, M. M., Lubarda, V. A., Meyers, M. A., & McKittrick, J. (2017). Reinforcements in avian wing bones: experiments, analysis, and modelling. *Journal of the Mechanical Behaviour of Biomedical Materials*, 85-96.

Nye, E. R., Dickman, C. R., & Kingsford, R. T. (2007). A wild goose chase - temporal and spatial variation in the distribution of the Magpie Goose (Anseranas semipalmata) in Australia. *Emu*, 28-37.

O'Connor, F., Ringma, J., & Kirk, H. (2021). Dampier Saltworks Shorebird Survey 2020. *Western Australian Bird Notes 177*, pp. 10-11.

Pendoley Environmental Pty Ltd. (2019). *Perdaman Urea Project: Marine Fauna Desktop Assessment.* Cardno Inc.

Pennycuick, C. J., Akesson, S., & Hedenstrom, A. (2013). Air speeds of migrating birds observed by ornithodolite and compared with predictions from flight theory. *Journal of the Royal Society*.

Peters, K. A., & Otis, D. L. (2007). Shorebird roost-site selection at two temporal scales: is human disturbance a factor? *Journal of Applied Ecology*, 196-209.

Ponitz, B., Schmitz, A., Fischer, D., Bleckmann, H., & Brucker, C. (2014). Diving-Flight Aerodynamics of a Peregrine Falcon (Falco peregrinus). *PLOS One*.

Rogers, D. I., Scroggie, M. P., & Hassell, C. J. (2020). *Review of long-term shorebird monitoring in north Western Australia.* Melbourne: Arthur Rylah Institute for Environmental Research.

Rogers, D., Clemens, R., Carey, M., & Garnett, S. T. (2021). Eastern Greater Sand Plover Charadrius leschenaultii leschenaultii. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 247-250). Melbourne: CSIRO Publishing.

Rogers, D., Clemens, R., Carey, M., & Garnett, S. T. (2021). Mongolian Lesser Sand Plover Charadrius mongolus and Kamchatkan Lesser Sand Plover C. m. stegmanni. In S. T. Garnett, & G. B. Baker, *The Action Plan for Australian Birds 2020* (pp. 244-247). Melbourne: CSIRO Publishing.

Schaub, M., & Pradel, R. (2004). Assessing the relative importance of different sources of mortality from recoveries of marked animals. *Ecology*, 930-938.

Shaw, J. M. (2009). The end of the line for South Africa's national bird? Modelling power line collision risk for the Blue Crane. *Masters Thesis*. Cape Town, Percy Fitzpatrick Istitute of African Ornithology: University of Cape Town.

Shaw, J. M., Reid, T. A., Gibbons, B. K., Pretorius, M., Jenkins, A. R., Visagie, R., . . . Ryan, P. G. (2021). A large-scale experiment demonstrates that line marking reduces power line collision mortality for large terrestrial birds, but not bustards, in the Karoo, South Africa. *Ornithological Applications, 123*, 1-10.

Silva, J. P., Palmeirim, J. M., Alcazar, R., Correia, R., Delgado, A., & Moreira, F. (2014). A spatially explicit approach to assess the collision risk between birds and overhead power lines: A case study with the little bustard. *Biological Conservation, 170*, 256-263.

Stuart, A., Wooding, L., & Takurou, H. (2015). Nocturnal foraging by Grey-tailed Tattlers Tringa brevipes. *Stilt*, 28-30.

Tarburton, M. K. (2021). Recent increase in knowledge about numbers and flight behaviour in the White-throated Needletail Hirundapus caudacutus. *Australian Field Ornithology*, 124-130.

Van Gills, J., Wiersma, P., & Kirwan, G. M. (2020, September). *Wood Sandpiper (Tringa glareola), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/woosan/cur/introduction#conserv

Van Gils, J., Wiersma, P., & Kirwan, G. M. (2020, September). *Common Sandpiper (Actitis hypoleucos), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/comsan/cur/introduction

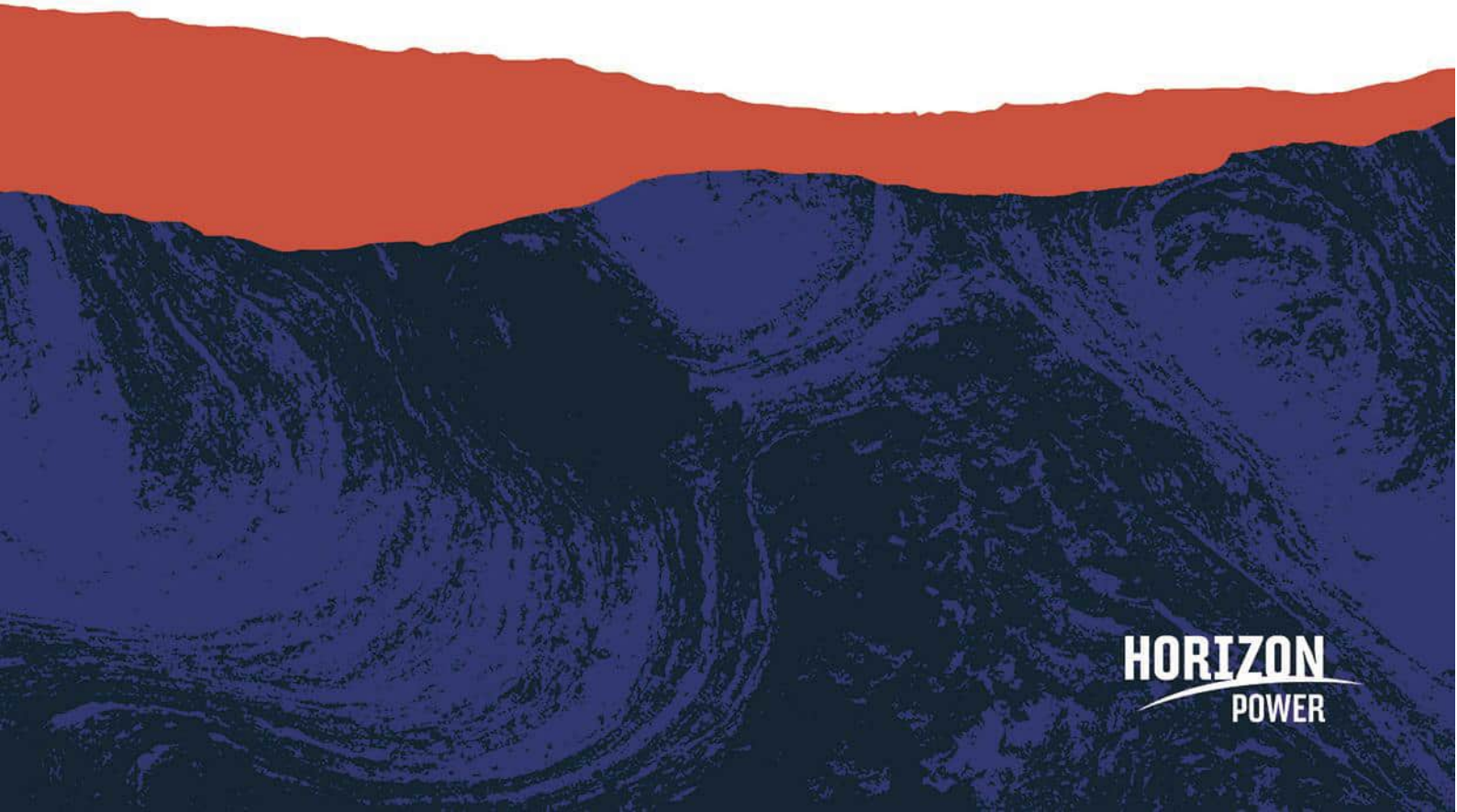
Veltheim, I., Cook, S., Palmer, G. C., Hill, F. R., & McCarthy, M. A. (2019). Breeding home range movements of pre-fledged brolga chicks, Antigone rubicunda (Gruidae) in Victoria, Australia - Implications for wind farm planning and conservation. *Global Ecology and Conservation, 20*.

Wiersma, P., & Kirwan, G. (2020, September). *Oriental Plover (Charadrius veredus), version 1.0*. Retrieved from Birds of the World: https://birdsoftheworld.org/bow/species/oriplo1/cur/introduction#conserv

Appendix E: Impact Reconciliation Procedure

Burrup Common User Transmission Infrastructure – Impact Reconciliation Procedure

15 December 2023



Document History and Status

Burrup Common User Transmission Infrastructure

Document Title: Impact Reconciliation Procedure

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Date: 15 December 2023

File Name: Burrup Transmission Line _Impact Reconciliation Plan_Rev_0

Revision	Date	Description	Author	Checked	Reviewed	Approved	Signature
0	15/12/2023	Final for Issue	HR	DF	LB	RL	

Contents

Acronyms and Abbreviations

Acronym	Description
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DE	Development Envelope
DPAW	Department of Parks and Wildlife
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	Environmental Protection Act 1986
GTE	Government Trading Enterprise
ha	Hectare
IRP	Impact Reconciliation Procedure
IRR	Impact Reconciliation Report
km	Kilometre
kV	Kilovolt
m	Metre
T/A	Trading as
WA	Western Australia

1 Introduction

1.1 Background

Regional Power Corporation, trading as (T/A) Horizon Power, is a Western Australian (WA) Government Trading Enterprise (GTE) and the state's regional and remote energy provider. Horizon Power ('the Proponent') operates under the Electricity Corporations Act 2005 and is governed by a Board of Directors accountable to the Minister for Energy.

Horizon Power is proposing to construct the Burrup Common User Transmission Infrastructure project ('the Proposed Action') which involves the expansion of the North-West Interconnected System (NWIS) via construction of an approximately 7 km long 132 kilovolt (kV) overhead transmission line, between the Dampier substation and the Burrup Strategic Industrial Area (SIA) within the Pilbara region. This transmission line will be owned and operated by Horizon Power and provide common user transmission infrastructure (electricity transmission equipment infrastructure such as overhead lines and substations to provide grid connection for an area) to tenants on the Burrup Peninsula.

As a result, the Proposed Action will also provide opportunities for tenants on the Burrup Peninsula to access the higher efficiency generation portfolio, including proposed renewable energy resources available on the NWIS. Land constraints on the Burrup Peninsula limit the feasibility of large-scale renewables, therefore the Proposed Action represents an important pathway for decarbonisation on the peninsula. The Proposed Action is considered the first step to providing enabling infrastructure to the Burrup SIA to support the transition towards State and Federal Government emission reduction targets.

1.2 Assessment Process

Horizon Power referred the Proposed Action to the WA Environmental Protection Authority (EPA) under Part IV (Section 38) of the *Environmental Protection Act* 1986 (EP Act) in November 2022, as the Proposed Action is a significant Proposal that has the potential to impact on one or more of the EPA's key environmental factors. The assessment work concluded that all factors can be managed through avoidance and mitigation measures to meet the EPA's objectives. The EPA responded on 14 August 2023, confirming that the Proposed Action does not require further assessment under Part IV of the EP Act.

Horizon Power also referred the Proposed Action to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) in November 2022, due to potential impacts to a National Heritage Place and listed threatened species. DCCEEW responded on 03 April 2023, confirming that the Proposed Action is considered to be a controlled action and that the project will require further assessment and approval under the EPBC Act before it can proceed.

1.3 Document Purpose

The purpose of this Impact Reconciliation Procedure (IRP) is to outline the method the Proponent will use to calculate the area of vegetation (and/or other environmental values) impacted within the Development Envelope (DE) of the Proposed Action.

Initially, an IRP was required prior to any ground disturbing activities in accordance with Ministerial Statement conditions. However, it is now a requirement for proponents to submit an IRP with their environmental impact assessment for all new proposals.

Given the proposed offset approach is to utilise the Pilbara Environmental Offset Fund (discussed further in **Chapter 3**), through consultation with DCCEEW it has been agreed that the EPA format for the IRP document will be used. Therefore, this IRP has been prepared in accordance with the EPA's Instructions for preparing Impact Reconciliation Procedures and Impact Reconciliation Reports (EPA, 2021).

2 The Proposal and Condition Requirements

2.1 The Proposal

The Proposed Action is located in Murujuga (referred to as the Burrup Peninsula here after), Western Australia, approximately 1.5 km east of the Dampier township.

The DE has a total extent of 85.54 ha, which represents the boundary that will contain all proposed development and temporary works. The detailed design for the Proposed Action has not yet been finalised, however no more than 14.40 ha of clearing (including up to 11.50 ha of permanent clearing and 2.90 ha of temporary disturbance) is proposed for construction of the transmission line, new Burrup substation, access tracks, associated electrical infrastructure and the extension of the existing Dampier substation.

The DE also contains an avoidance area footprint covering 5.37 ha (referred to as 'avoidance areas') in order to avoid impacts to significant environmental and heritage values identified within the area.

2.1.1 Layout Plan

A layout plan for the Proposed Action is provided in **Figure 1-1**. It should be noted that the design of the Proposed Action has not yet been finalised. As such, the alignment shown in the layout plan is subject to change, however; it will remain within the development envelope and impacts such as disturbance to vegetation will be within the limits detailed in this document.

- Permanent elements:
  - approximately 7 km long 132 kV overhead transmission line;
  - approximately 40 poles and cleared pole access pads (40 m x 20 m), and associated pole stays along the transmission line route;
  - cleared, unsealed access track along the transmission line route required for maintenance during operations;
  - Burrup substation (inclusive of 33 kV and 132 kV switchgear, large scale battery, transformers, fencing and ancillary equipment);
  - Dampier substation expansion (inclusive of 132 kV switchgear, fencing and ancillary equipment); and
  - associated electrical infrastructure.
- Temporary elements:
  - additional areas required to construct the transmission line;
  - cleared access track (4 m wide) for the purpose of stringing the transmission line; and
  - 50 m x 40 m winch sites as required.

2.1.2 Anticipated Timing

Construction of the Proposed Action is planned to commence in Q3 2024 for a period of approximately 18 months.

Upon completion of construction, the Proposed Action will be incorporated into the NWIS operations. The completed transmission line will be subject to normal routine, recurrent and periodic maintenance during operation.

2.2 Ministerial Statement Condition Requirements

As the Proposed Action is currently progressing through assessment under the EPBC Act, a ministerial statement is yet to be issued. It is expected that the conditions of any approval of the Proposed Action under the EPBC Act will specify the requirement to offset significant residual impacts to threatened fauna.

3 Impact Reconciliation Procedure

3.1 Identification of Environmental Values Requiring Offsets

The significant residual impacts of the Proposed Action are:

- Clearing of no more than 14.4 ha of critical habitat, including:
  - up to 14.4 ha of potential Northern Quoll denning/shelter and feeding habitat critical to the survival of the Northern Quoll, and also considered important supporting habitat for the Pilbara Olive Python; and
  - up to 1.5 ha of potential Australia Fairy Tern foraging habitat critical to the survival of the Australian Fairy Tern.

3.2 Pilbara Environmental Offsets Fund

Since 2012, the Western Australian (WA) Minister for Environment has requested proponents to pay offset contributions into a 'fund for conservation,' now known as the Pilbara Environmental Offsets Fund (the 'Fund'). The Fund allows multiple offset payments to be combined for larger conservation projects, enabling landscape-scale projects with widespread environmental benefits, rather than many small and isolated conservation projects. The Department of Water and Environmental Regulation (DWER) invests contributions to the Fund in strategic biodiversity conservation projects across the Pilbara region. Horizon Power proposes to use the fund to counterbalance the Proposed Action's significant residual impacts.

As outlined in **Section 2.1**, the detailed design of the Proposed Action is ongoing, with the exact amount of each habitat to be removed will not be known until the detailed design is finalised. Therefore, as a worst-case scenario it has been assumed the Proposed Action has the potential to impact up to 14.4 ha of habitat (as this is the maximum clearing extent within the DE). Horizon Power have committed to clearing no more than 1.5 ha of the habitat associated with the tidal inlet area.

Table 1. Environmental Values for the Proposed Action with Significant Residual Impacts Requiring an Offset

MNES Habitat	Clearing	Contribution	Offset rate
Habitat Critical to the survival of the Northern Quoll and Australian Fairy Tern; and important supporting habitat for the Pilbara Olive Python.	No more than 14.4 ha of critical habitat comprising: - Up to 14.4 ha of Rocky Hills with exposed boulder piles, which is denning/shelter and feeding habitat for the Northern Quoll, and also considered important supporting habitat for the Pilbara Olive Python (shelter and feeding habitat); and - Up to 1.5 ha of Mudflat with tidal inundation, Mangroves and supportive scattered Samphire, which is foraging habitat for the Australian Fairy Tern.	$3,306/ha	$3,306/ha for 14.4 ha = $47,606.40
Total			**$47,606.40**

It is noted that 10% of this payment will be required to be paid upfront in line with the DCCEEW requirements.

3.3 Determining the Extent of Clearing

Horizon Power will undertake a spatial assessment annually to confirm the extent of vegetation (and associated fauna habitat type) that was cleared. This analysis will be used to compare the state of vegetation and habitat at the end of each financial year with the 'baseline' which existed prior to any clearing activities.

4 Reporting

The Proponent will prepare two Impact Reconciliation Reports (IRRs) to document the clearing undertaken. The IRRs will be provided to DCCEEW to enable DCCEEW to determine the contributions payable. The total value of the contribution will be dependent on the actual amount cleared.

4.1 Frequency and Timing

As outlined within the EPA's 'Instructions on How to Prepare EP Act Part IV IRPs and IRRs, 2021,' the first biennial reporting period will start prior to the date of commencement of ground disturbing activities, and end 30 June, two years later. Then each subsequent reporting period is from 01 July to 30 June, two years later. As the Proposed Action is expected to take 18 months and begin in Q3 2024, the first biennial reporting period will start in Q3 2024 and cover the full period of construction activities.

The IRR will advise DCCEEW on the amount of clearing that has been undertaken within each year of the biennial reporting period. This clearing is then used to define the amount to be contributed to the fund for areas cleared during the reporting period, with the rate/ha determined in accordance with the fund's implementation plan.

Table 2. Timeframes and Frequency of Impact Reconciliation Activities under this IRP

Biennial Reporting Period	Action	Timing
N/A	Commonwealth Decision Notice issued	TBC
	Commencement of clearing action	
Upfront payment	Initial payment (as part of the Commonwealth requirement for 10% of the overall clearing allowable)	Prior to commencement of action
	Approval holder to submit evidence of payment into PEOF account to the Commonwealth Department of Environment	Upon payment
Period 1	First biennial reporting period	The day ground disturbance activities commence / commencement of the proposed action to 30 June two years later
	Aerial survey/ground-truthing	TBC
	IRR submitted to DCCEEW	30 October of the year of the end of reporting period
	Evidence of payment submitted to DCCEEW	Within 10 business days of the date of payment
On completion of clearing	Final IRR submitted to DCCEEW	Within 6 months of the completion of clearing.

No clearing is expected after the end of the last reporting period. However, the Proponent will continue to prepare and submit IRRs according to the reporting frequency established by **Table 2** until DCCEEW advises in writing that the Proponent is no longer required to implement this IRP.

4.2 Content of the IRR

Each IRR will be structured in the manner prescribed in the EPA's 'Instructions on How to Prepare EP Act Part IV IRPs and IRRs, 2022'.

Each IRR will include the following information:

- Identification of the relevant Ministerial Statement, applicable conditions, the Proposal and the reporting period.
- Quantification of clearing undertaken during the reporting period, broken down into the environmental values identified in **Table 1** of this IRP.

- Information from surveys supporting the quantification of clearing undertaken, including spatial data representing areas of ground disturbance (if deemed relevant) and supporting reports.
- A quantitative estimate of clearing expected in the future.

5 Review and Implementation

While no scheduled review of this IRP is required, DCCEEW may direct the Proponent to revise an IRP at its discretion. Irrespective of the schedule set out in **Table 2**, the Proponent will continue to implement this IRP until any of the following occurs:

- The Proponent identifies additional protected species habitat during operations that need to be included into this IRP.
- DCCEEW approves a revised version of this IRP, at which time the revised IRP will be implemented instead.
- DCCEEW advises in writing that this IRP no longer needs to be implemented.

6 References

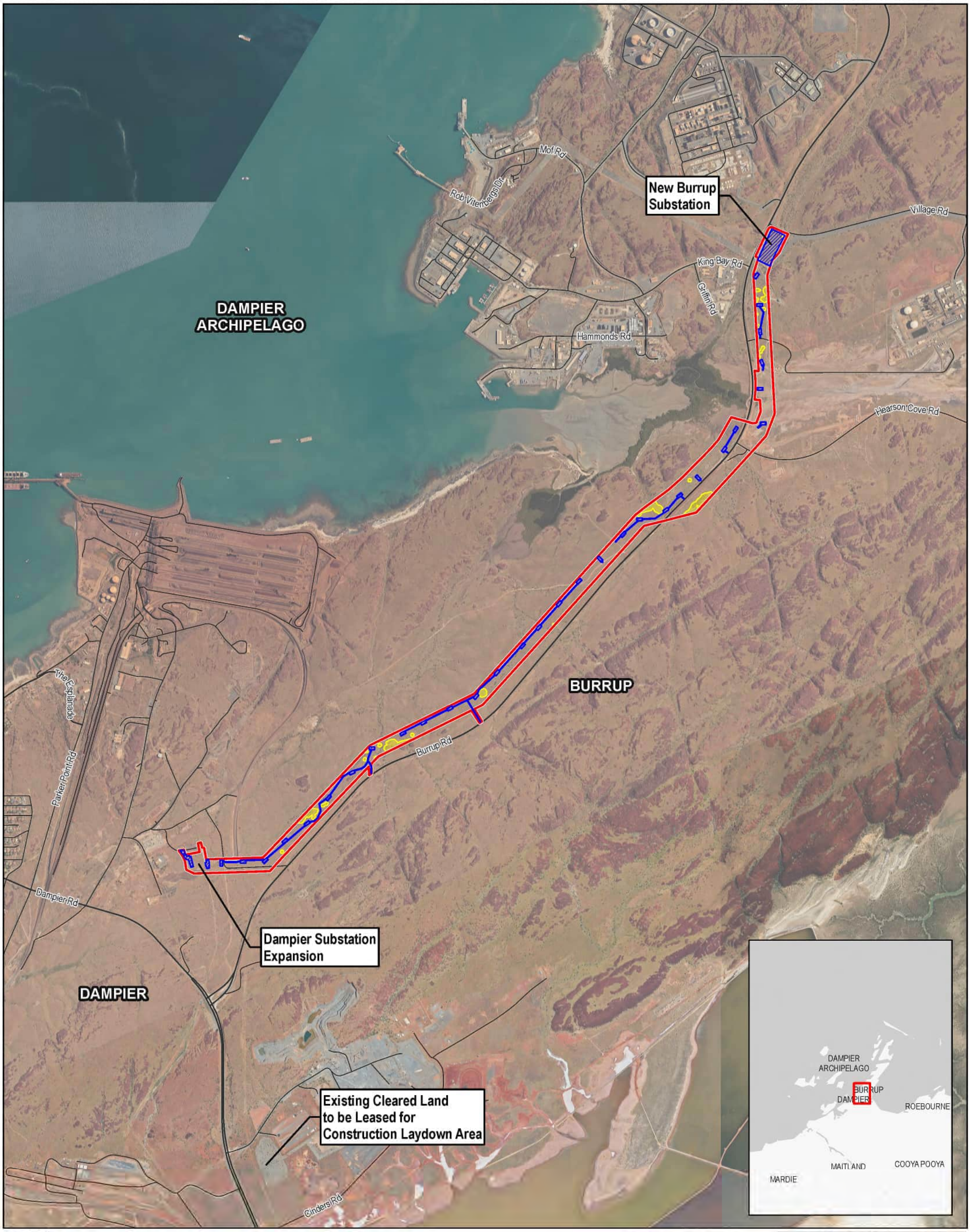
Department of Water and Environmental Regulation (DWER), 2022. Program: Pilbara Environmental Offsets Fund. DWER, Joondalup, WA.

Environmental Protection Authority (EPA), 2016. Environmental Factor Guideline. Flora and Vegetation. Environmental Protection Authority, Joondalup, WA.

EPA, 2021. Instructions on how to prepare Environmental Protection Act 1986 Part IV Impact Reconciliation Procedures and Impact Reconciliation Reports. Environmental Protection Authority, Joondalup, WA.

7 Figures

See Figure attached



Legend

- Major Road
- Minor Road
- Development Envelope
- Indicative Impact Area
- Avoidance Areas

0 125 250 500
Metres

N

Scale: 1:25,000 (A3 Print)

Project Name: Burrup Common User Transmission Infrastructure – Preliminary Documentation
Projection: GDA2020 MGA Zone 50
Sources: Jacobs - Development Envelope; Landgate - Roads, WA Now accessed August 2023
Map Produced: 12/11/2023.
Project Number: IS472900
Rev C

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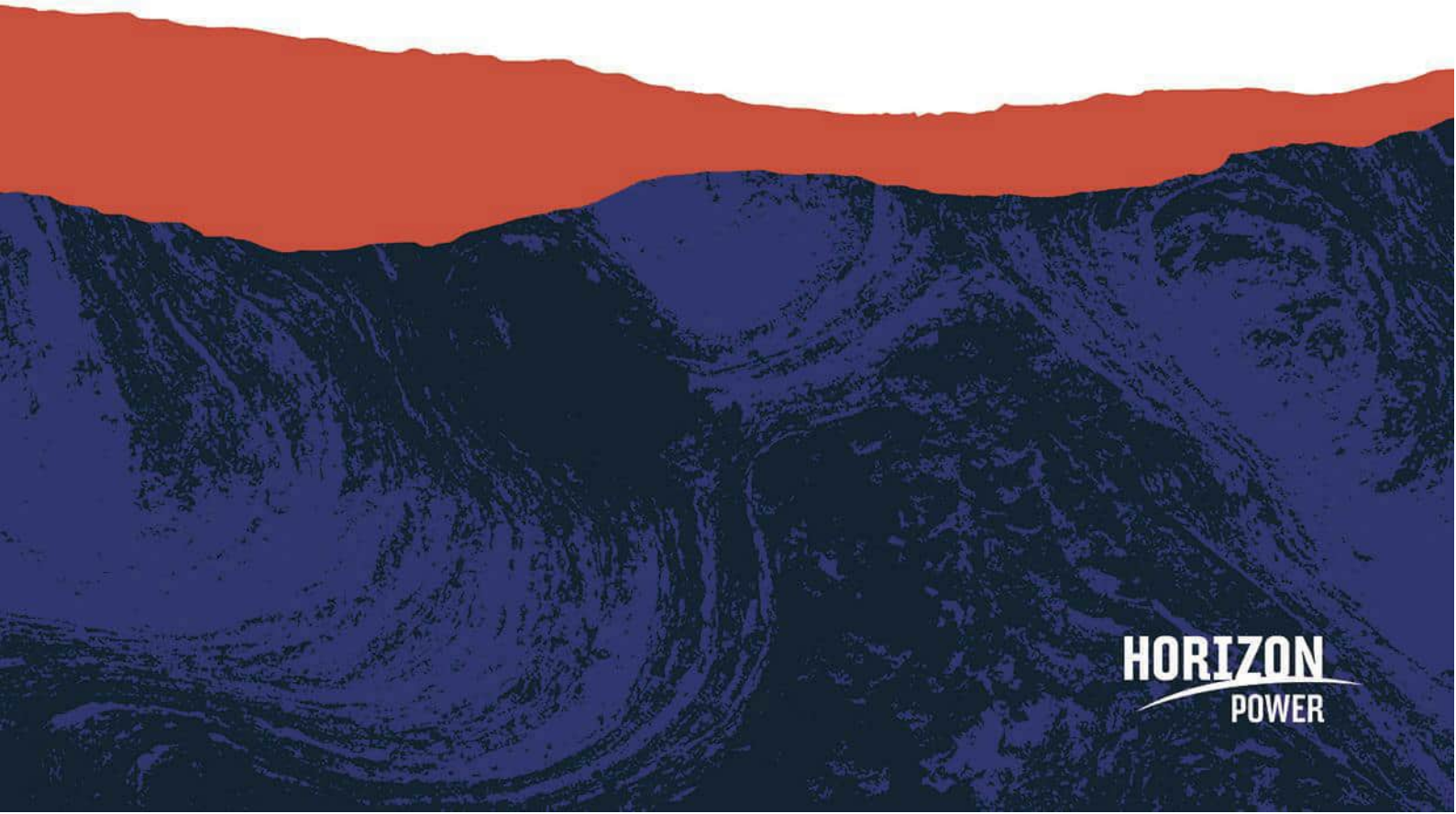
Figure 1-1 Proposed Action - Development envelope and Maximum Clearing Extent


HORIZON
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