Karratha Rail Bridge Biological Survey

Main Roads Western Australia

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BAM Act	State *Biosecurity and Agriculture Management Act 2007*
BC Act	State *Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
CR	Critically Endangered
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DPIRD	Department of Primary Industries and Regional Development
ELA	Eco Logical Australia
EN	Endangered
EP Act	State *Environmental Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
IBRA	Interim-Biogeographic Regionalisation for Australia
M	Migratory
Main Roads	Main Roads Western Australia
P	Priority
PEC	Priority Ecological Community
PMST	Protected Matters Search Tool
PRIMER	Plymouth Routines in Multivariate Ecological Research v6
T	Threatened
TEC	Threatened Ecological Community
VU	Vulnerable
WA	Western Australia
WAH	Western Australian Herbarium
WoNS	Weeds of National Significance

Executive Summary

Main Roads Western Australia (Main Roads) is proposing a rail separation along North West Coastal Highway due to planned increase in traffic (the project). The project area is located in the City of Karratha, approximately 5 km south-west of Karratha, Western Australia. The project area includes the biological survey area (212.72 ha), extrapolation area (12.02 ha) and the desktop study area (40 km radius from the biological survey area and extrapolation area). The biological survey area and extrapolation area are henceforth referred to as the combined survey area, unless otherwise stated. Eco Logical Australia was engaged by Main Roads to undertake a desktop assessment and biological survey to inform the environmental assessment and approvals process, with the results of the assessment also assisting in the preparation of Environmental Impact Assessment documentation.

A desktop assessment was undertaken, including a review of relevant databases within the 40 km desktop study area, to assess for the potential presence of significant flora and fauna species and ecological communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the State *Biodiversity Conservation Act 2016* (BC Act) or by the Department of Biodiversity, Conservation and Attractions (DBCA).

A Detailed and Targeted flora and vegetation survey and Basic fauna survey were undertaken within the biological survey area from 20 to 24 June 2022. Survey timing was consistent with the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016). The extrapolation area was then surveyed on 3 August 2022, outside the EPA (2016) recommendations.

A total of 160 flora taxa (151 native and 9 introduced) from 49 families and 104 genera were recorded across 23 quadrats established within the biological survey area and from opportunistic collections. A species accumulation curve determined that approximately 85% of the flora species potentially present within the biological survey area were recorded, resulting in sufficient data to define and assess the presence, extent and significance of vegetation communities within the biological survey area. No Threatened flora species listed under the EPBC Act or the BC Act, or Priority listed species by DBCA were recorded within the biological survey area from the field survey. Based on a post-survey likelihood of occurrence assessment, one significant flora species was considered as having the potential to occur within the combined survey area, namely *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479; Priority 3 by DBCA). This assessment is based on the close proximity of recent records, its potentially cryptic nature (annual herb) and presence of potentially suitable habitat in the combined survey area.

A total of nine introduced flora were recorded within the biological survey area, representing 5.6% of the total number of species recorded. None of the introduced species recorded within the biological survey area are listed as Weeds of National Significance or Declared Pests under the State *Biosecurity and Agriculture Management Act 2007* (BAM Act).

Seven intact native vegetation communities were delineated and mapped within the combined survey area, covering a total area of 184.74 ha (82.20%). The remaining 40.01 ha (17.80%) comprised cleared areas and rehabilitation (i.e., current and historic borrow pits and prominent roadside batters). The most widespread community was AbSaTw, which occurred across 53.83% of the vegetated area.

No ecological communities listed as Threatened under the EPBC Act or the BC Act occurred or were inferred to occur within the combined survey area. One community, Roebourne Plains gilgai grasslands (Priority 1 by DBCA) was considered as being Likely to occur, given the combined survey area lies within the known PEC buffer and vegetation community AxEtEx is considered to potentially represent floristic and soil/landform aspects of the PEC.

Vegetation condition within the combined survey area ranged from Degraded to Very Good based on the Trudgen (1988) vegetation scale provided in the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016). Majority of the intact vegetation within the combined survey area was recorded as being in Very Good condition. Disturbances within the combined survey area included the presence of weeds, grazing and historical clearing.

A total of three fauna habitats were identified and mapped within the combined survey area, covering a total area of 184.74 ha (82.20%). The remaining 40.01 ha (17.80%) comprised cleared areas and rehabilitation (i.e., current and historic borrow pits and prominent roadside batters). The most widespread habitat was Acacia shrubland over mixed grassland which occurred across 81.05% of the vegetated area.

A total of 30 vertebrate fauna species (27 native and three introduced) were recorded within the biological survey area, comprising 25 birds, four mammals and one reptile. No Threatened fauna species listed under the EPBC Act or the BC Act, or Priority listed species by DBCA were recorded within the biological survey area from the field survey. Based on a post-survey likelihood of occurrence assessment, six significant fauna species were considered as having the potential to occur within the combined survey area. This assessment is based on the close proximity of recent records and presence of potentially suitable habitat in the combined survey area.

A total of three introduced (feral) fauna species were recorded within the biological survey area. Dog/Dingo (**Canis familiaris*) and Cat (**Felis catus*) are both listed as Declared Pests under the BAM Act s22(2) and Dingo/Dog has a C3 management control category.

1. Introduction

1.1. Project background

Main Roads Western Australia (Main Roads) is proposing a rail separation along North West Coastal Highway due to planned increase in traffic (the project). The project area is located in the City of Karratha, approximately 5 km south-west of Karratha, Western Australia (Figure 1). The project area includes the biological survey area (212.72 ha), extrapolation area (12.02 ha) and the desktop study area (40 km radius from the biological survey area and extrapolation area). The biological survey area and extrapolation area will henceforth be referred to as the combined survey area, unless otherwise stated.

Eco Logical Australia (ELA) was engaged by Main Roads to undertake a desktop assessment and biological survey to inform the environmental assessment and approvals process, with the results of the assessment also assisting in the preparation of Environmental Impact Assessment documentation.

The objectives of this survey included:

- Undertake a desktop assessment to identify potential biological features and constraints within the project area;
- Undertake a Detailed flora and vegetation survey and Targeted flora survey in accordance with the Environmental Protection Authority (EPA) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016);
- Undertake a Basic fauna survey in accordance with the EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (2020); and
- Prepare a final report, detailing the findings of the survey.

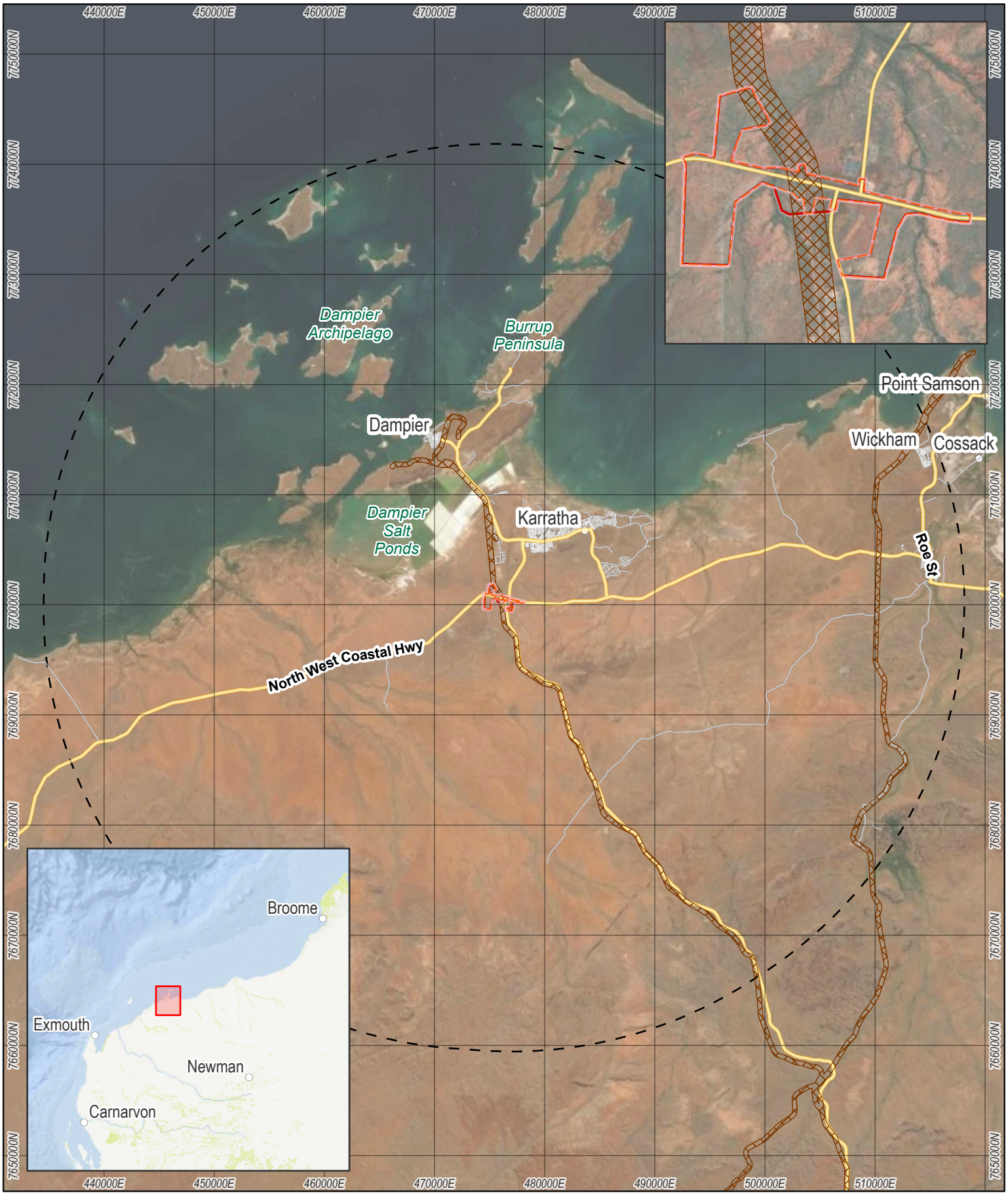

Figure 1: Project area overview

- Karratha Rail Bridge Biological Survey
- Extrapolation Area
- Desktop Study Area (40km)
- Town
- Freight Railway
- Distributor Road
- Access Road

0 5 10
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 50

22PER2129-RD Date: 6/09/2022

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2. Environmental setting

2.1. Bioregion

The Interim Biogeographic Regionalisation for Australia (IBRA7) currently classifies 89 bioregions across Australia, based on a range of biotic and abiotic factors such as climate, vegetation, fauna, geology and landform (Thackway and Cresswell 1995; Department of Agriculture, Water and the Environment [DAWE] 2012). These bioregions are currently further refined into 419 sub-regions representing more localised and homogenous geomorphological units in each bioregion. IBRA divides Western Australia into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation.

The combined survey area is situated within the Pilbara bioregion in the Roebourne (PIL04) subregion, which is described as '*Coastal and sub-coastal 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*' (Kendrick and Stanley 2001).

2.2. Climate

The combined survey area is located within the Roebourne bioregion which experiences an arid (semi-desert) tropical climate with highly variable rainfall, falling mainly in summer (Kendrick and Stanley 2001). Based on climate data from the nearby Bureau of Meteorology (BoM) Karratha Aero weather station (station number 4083; climate data 1971 - current) the region receives an annual average rainfall of 297.5 mm, with most rainfall occurring during the summer months of December to March (BoM 2022a; Figure 2). Mean maximum air temperatures range from 26.5°C in June and July to 36.2°C in March, and mean minimum temperatures range from 13.9°C in July to 26.9°C in January (BoM 2022a).

In the 12 months preceding the field survey, Karratha Aero weather station received a total of 263.8 mm of rainfall which is slightly less than the long-term average for the area (297.5 mm). A total of 226.6 mm was recorded in the three months prior to the field survey, which is significantly higher than the long-term average for the same period (91.7 mm; Figure 2).

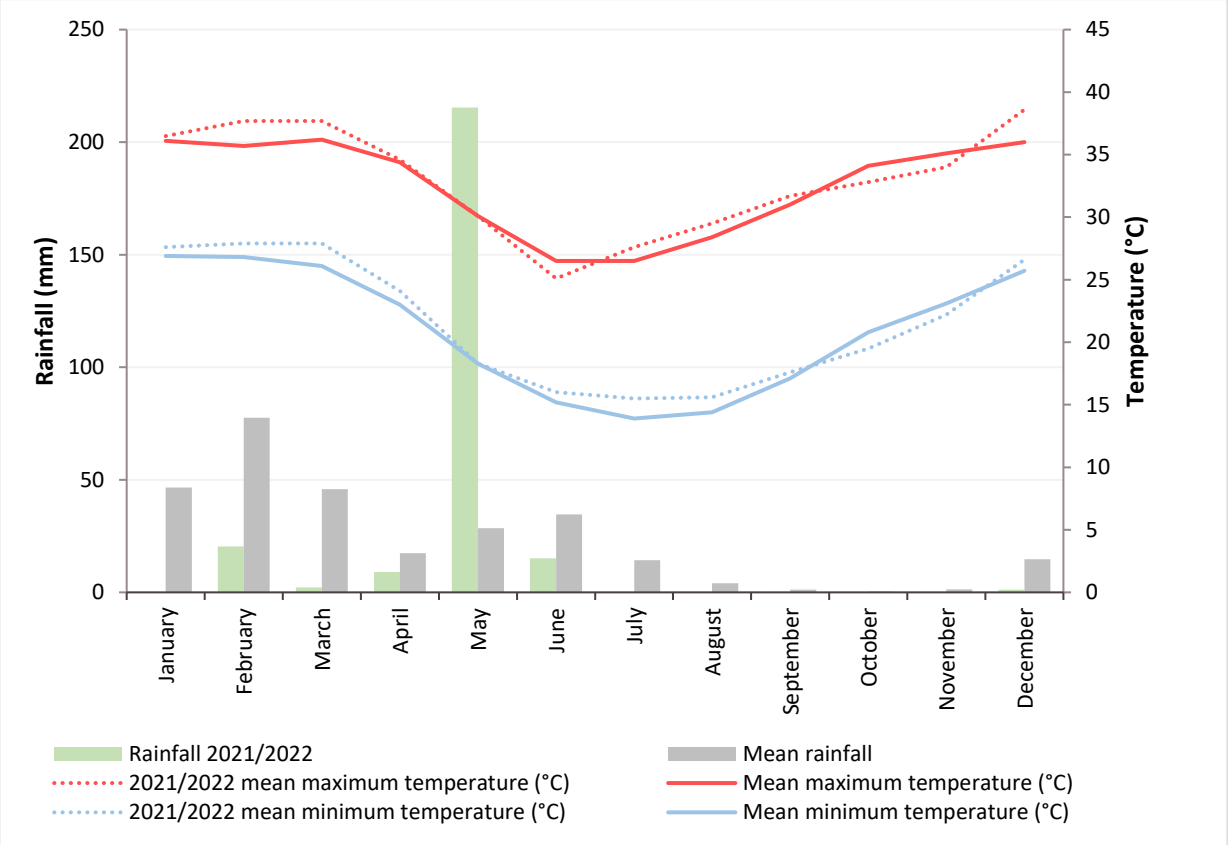

Figure 2: Short term (2021 – 2022) and long term (1971 – 2022) average rainfall data for Karratha weather station (station number 4083)

Source: BoM 2022a. Rainfall 2021/2022 is from June 2021 to May 2022

2.3. Land system mapping

Soil Landscape Mapping - Systems mapping, prepared by the Department of Primary Industries and Regional Development (DPIRD), provides an inventory and condition survey of lands at a 1: 250 000 scale (DPIRD 2021a). Three land systems overlap the combined survey area, namely Horseflat, Ruth and Boolgeeda Systems, as outlined in Table 1 and Figure 3.

Table 1: Land systems of the combined survey area

Land system	Land system description	Total extent (ha)	Extent (ha) within the combined survey area	% total extent within the combined survey area
Horseflat System	Gilgaied clay plains supporting Roebourne Plains grass grasslands and minor grassy snakewood shrublands.	328,730.99	180.17	0.05
Ruth System	Hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands.	169,366.81	37.58	0.02
Boolgeeda System	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	999,896.07	7.00	0.00

Source: DPIRD 2021a

2.4. Broad-scale vegetation mapping

Vegetation type and extent have been mapped at a regional scale by Beard (1975) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:250,000, the DPIRD has compiled a list of vegetation extent and types across WA (Shepherd et al. 2002).

Two vegetation associations overlap the combined survey area (DPIRD 2019), with 589 comprising most of the combined survey area and 157 occurring in the south-west (Figure 4). Both vegetation associations are listed as 'Least Concern' as the remaining extent is more than 50% (Shepherd et al. 2002).

Table 2: Beard's (1975) vegetation associations of the combined survey area

Vegetation association	Description	Pre-European extent in PIL04 subregion (ha)	Current extent in PIL04 subregion (ha)	% Remaining in PIL04 subregion	Extent (ha) within the combined survey area	% total remaining extent within the combined survey area
589	Mosaic: Short bunch grassland - savanna / grass plain (Pilbara) / Hummock grasslands, grass steppe; soft spinifex	675,391.80	671,327.48	99.40	167.76	0.02
157	Hummock grasslands, grass steppe; hard spinifex, *Triodia wiseana*	14,972.09	14,451.45	96.52	56.99	0.38

Source: DPIRD 2019, DBCA 2019a (Report 3a)

2.5. Geology and soils

Geology of the Roebourne subregion comprises quaternary alluvial and older colluvial coastal and subcoastal plains (Kendrick and Stanley 2001; Figure 5).

Two soil units overlap the combined survey area (ASRIS 2021), with MM17 comprising most of the combined survey area and Fa19 occurring in the south-west (Figure 5).

2.6. Hydrology

The combined survey area is located within the Port Hedland Coast Basin and Karratha Coast sub-catchment (Figure 6; DWER 2018a). The combined survey area is approximately 10 km south of the coast and 8 km north of Maitland River (DWER 2018b).

The combined survey area lies within a low potential Groundwater Dependent Ecosystem (GDE; Figure 6) and Inflow Dependent Ecosystem (IDE) likelihood of 7 (BoM 2022b). The combined survey area does not lie any public drinking water source area, with the closest P1 protection area 35 km south-east (DWER 2022).

2.7. Areas of significance

Environmentally Sensitive Areas (ESAs) are defined in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005 under s. 51B of the State *Environmental Protection Act 1986* (EP Act). ESAs include areas declared as World Heritage, included on the Register of the National Estate, defined wetlands, Bush Forever sites, vegetation containing rare (Threatened) flora and/or Threatened Ecological Communities (TECs).

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the State *Biodiversity Conservation Act 2016* (BC Act) provide for the statutory listing of TECs, either by the Australian Government's Environmental Minister or the Environment Minister of WA. TECs are also defined as ESAs. PECs are those biological communities that are recognised by the Environment Minister of WA to be of significance, but which do not meet the criteria for a TEC or ESA. There are five categories of PECs, none of which are currently protected under State or Commonwealth legislation.

The combined survey area does not lie within an ESA or DBCA-managed lands (DWER 2021, DBCA 2021a). Murujuga National Park lies approximately 15 km north of the combined survey area on the Burrup Peninsula and ESAs lie approximately 20 km north in the Dampier Archipelago. There are no known wetlands of significance or Ramsar sites within 40 km of the combined survey area (DBCA 2018a, DBCA 2017). One significant ecological community overlaps majority of the combined survey area, namely Roebourne Plains gilgai grasslands (listed as P1 by DBCA).

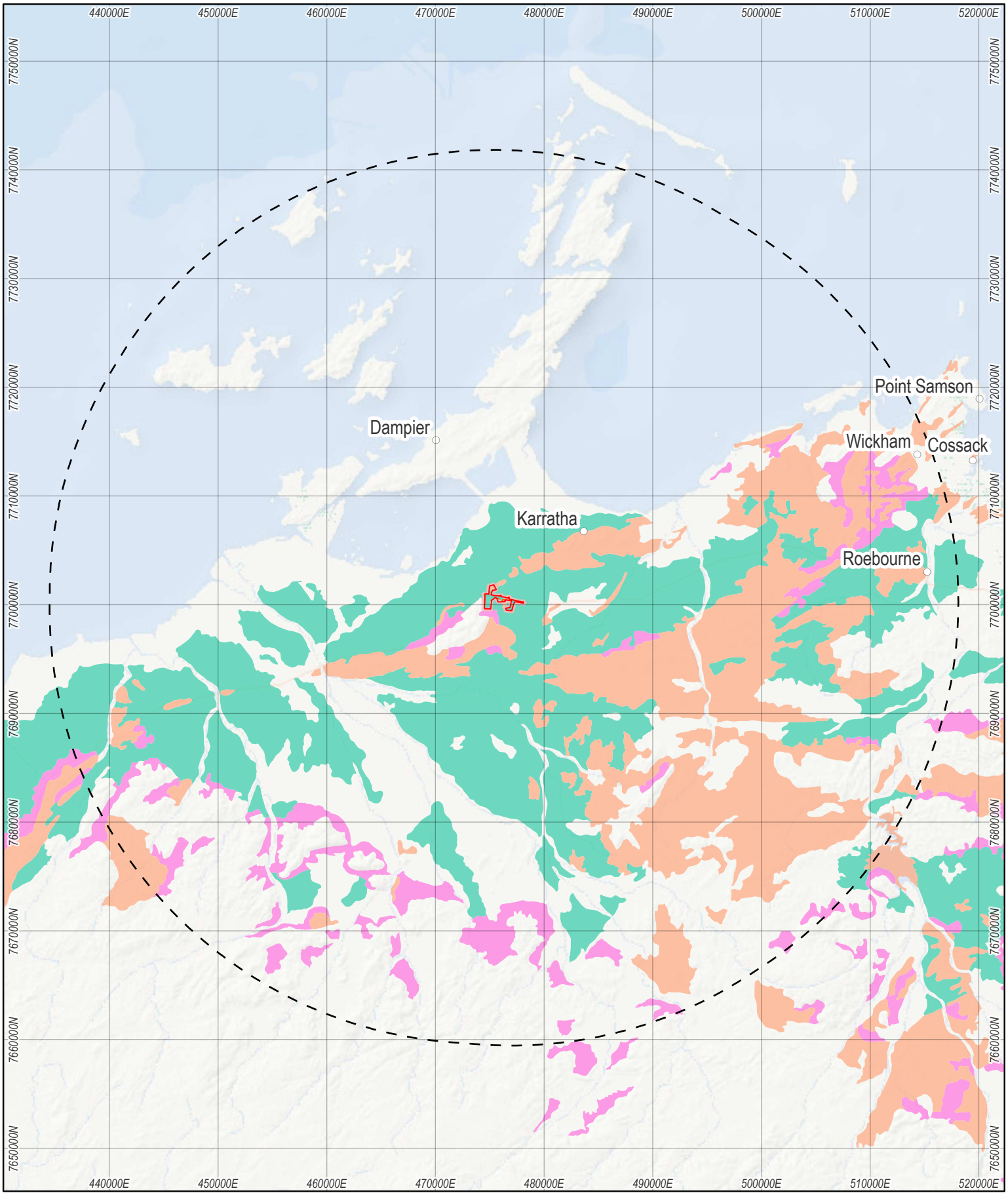

Figure 3: Land system mapping of the project area

Karratha Rail Bridge Biological Survey

Extrapolation Area

Desktop Study Area (40km)

Land Systems (DPIRD 2021)

Boolgeeda System

Horseflat System

Ruth System

0 5 10

Kilometres

Datum/Projection:
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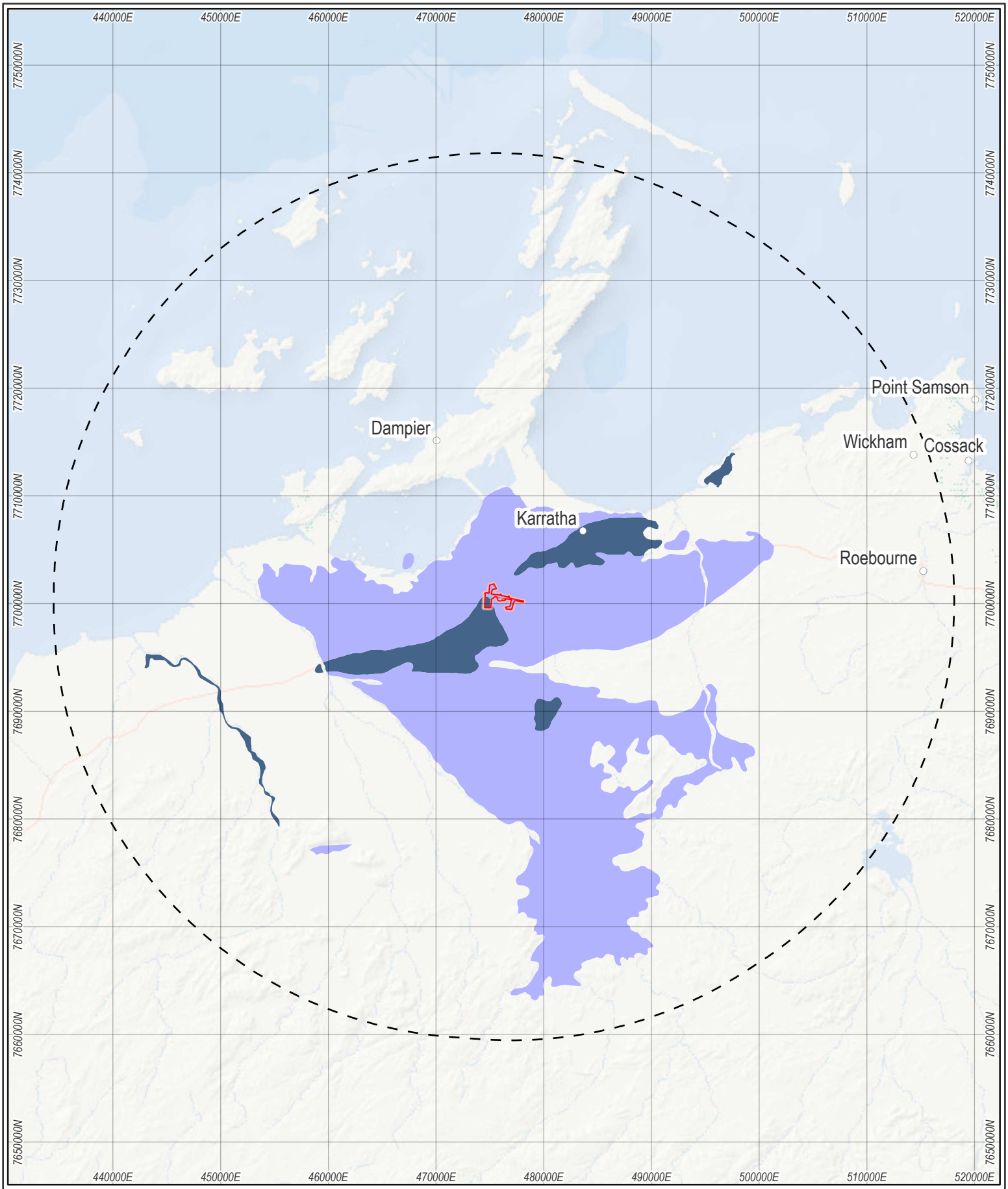

Figure 4: Pre-European vegetation associations of the project area

Karratha Rail Bridge Biological Survey

Extrapolation Area

Desktop Study Area (40km)

Pre-European Vegetation Associations (Shepherd *et al*. 2002)

157

589

0 5 10

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 50

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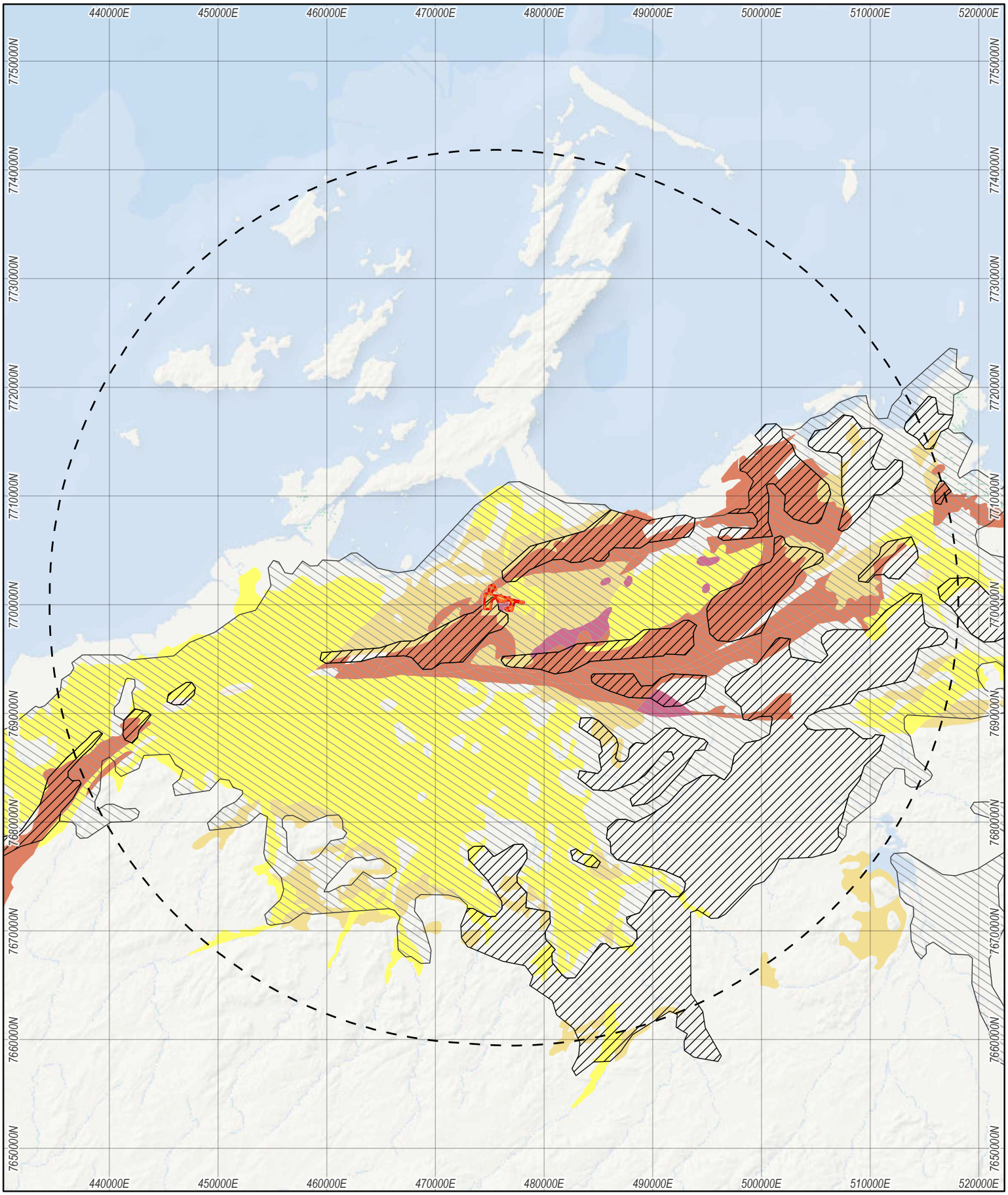

Figure 5: Geology and soils of the project area

Karratha Rail Bridge Biological Survey

Extrapolation Area

Desktop Study Area (40km)

Soil type (ASRIS - BRS 2021)

Fa19

MM17

Surface Geology of Australia - 1:1,000,000

QUATERNARY

Qa

Qrc

ARCHEAN

Ager

Awr

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Datum/Projection:
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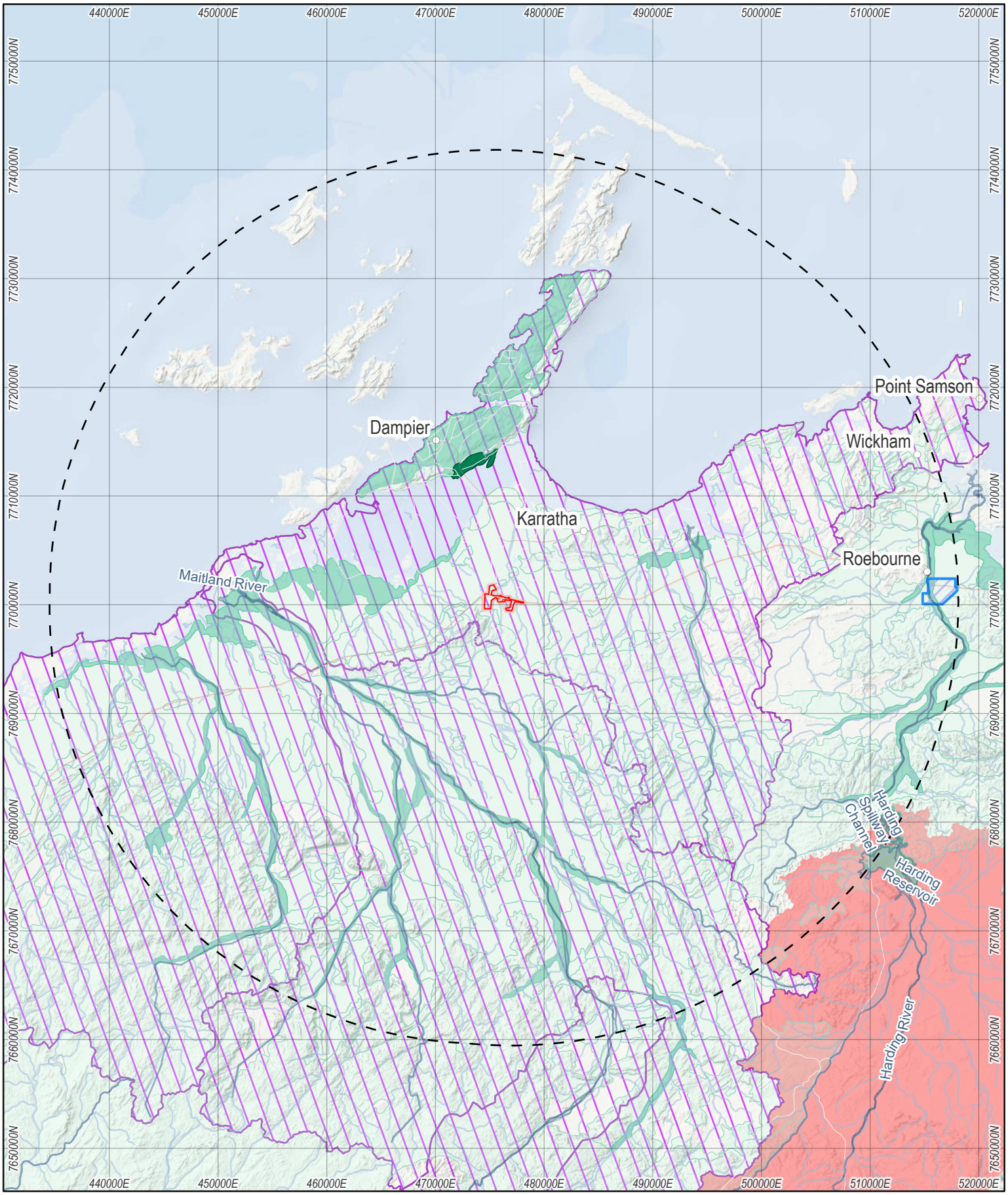

Figure 6: Hydrology of the project area

- Karratha Rail Bridge Biological Survey
- Extrapolation Area
- Desktop Study Area (40km)
- Major watercourse
- Minor watercourse

Hydrographic catchments - subcatchments

- Karratha Coast

Public drinking water source areas

- Protection Area - P1
- Protection Area-NA

Groundwater Dependent Ecosystems (GDE)

- High potential
- Moderate potential
- Low potential

0 5 10
Kilometres

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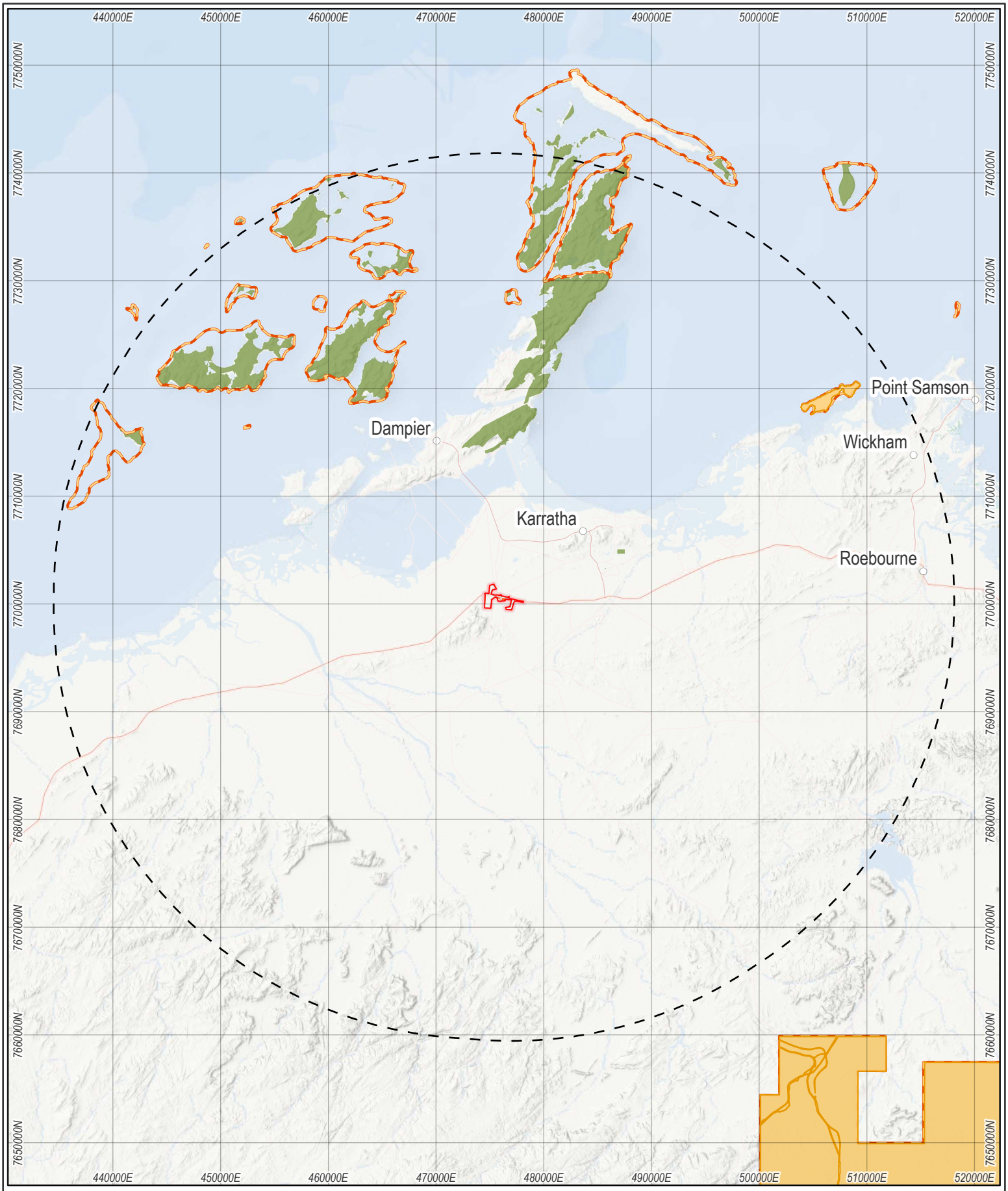

Figure 7: Areas of significance of the project area

- Karratha Rail Bridge Biological Survey
- Extrapolation Area
- Desktop Study Area (40km)
- Offsets Register - Offsets
- Environmentally Sensitive Area (ESA) (DWER 2020b)
- DBCA Legislated Lands and Waters (DBCA 2021a)

0 5 10
Kilometres

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3. Methodology

3.1. Desktop review

3.1.1. Database searches

The following Commonwealth and State databases were searched for information relating to significant flora, fauna and ecological communities in order to compile and summarise existing data to inform the field survey. The relevant databases reviewed within the 40 km desktop study area during the desktop assessment include[1]:

- Atlas of Living Australia (ALA; ALA 2022);
- Birdlife Australia's Birdata (Birdata 2022);
- DAWE Protected Matters Search Tool (PMST; DAWE 2022[2]; Appendix A);
- Index of Biodiversity Surveys for Assessment database (IBSA); and
- Main Roads supplied database searches from DBCA's Species and Communities Branch (Threatened and Priority flora, fauna, ecological communities and black cockatoo habitat; Main Roads 2022a, 2022b, 2022c).

Aerial photography for the combined survey area was reviewed to identify land use patterns, the extent of vegetation, relevant landscape/catchment matters and any other relevant issues where possible.

3.1.2. Literature review

The following publicly available literature and previous surveys relevant to the combined survey area were reviewed:

- Timmins (2020) *Flora and Vegetation Data for Application for Clearing Permit, Bayly Avenue Road Reserve – Karratha*. *Prepared for Talis Consultants Pty Ltd.*

3.1.3. Likelihood of occurrence assessment

A likelihood of occurrence assessment was undertaken, both pre-field and post field, to identify significant flora and fauna species that possibly occur within the combined survey area, identified from a review of key datasets and literature, as specified above. Aquatic and marine species were not considered in the likelihood of occurrence assessment as the combined survey area does not contain core habitat that these species solely rely on for survival.

Conservation codes, categories and criteria for flora and fauna protected under the EPBC Act and the BC Act are provided in Appendix B (DBCA 2019b, 2018b, c, d). Criteria used for this assessment is presented in Appendix C.

[1] As of 17 December 2021, Department of Biodiversity, Conservation and Attractions (DBCA) and Western Australian Museum (WAM) *NatureMap* online database was taken offline.

[2] EPBC Act Protected Matters Report was created on 20 May 2022, before DAWE became Department of Climate Change, Energy, the Environment and Water (DCCEEW).

3.2. Field survey

3.2.1. Survey team and timing

The initial field survey of the biological survey area was conducted by Dr Jeffry Cargill (Principal Ecologist) and Daniel Brassington (Botanist) from 20 to 24 June 2022. Survey timing was consistent with the EPA recommendations for undertaking Detailed and Targeted flora and vegetation survey in the Eremaean botanical province i.e., 6-8 weeks post wet season (March to June; EPA 2016).

The survey team's relevant qualifications, experience and licences are provided in Table 3.

Table 3: Survey team

Name	Qualification	Relevant experience	Licences
Dr. Jeffry Cargill	BSc. Hons. PhD Environmental Sciences	Jeff has more than 12 years' experience in botanical and ecological studies throughout Western Australia including baseline vegetation studies (Reconnaissance and Detailed surveys), Targeted threatened and priority flora surveys, fauna surveys, MNES surveys, environmental risk assessments and rehabilitation and vegetation monitoring programs.	Flora scientific collection licence: FB62000138 Declared Rare Flora (DRF) permit: TFL 48-1920
Daniel Brassington	BSc. Hons. Environmental Science	Daniel has more than 10 years' experience in botanical surveys and environmental services throughout Western Australia. This includes baseline vegetation studies, threatened and priority flora surveys, weed surveys, rehabilitation and vegetation monitoring.	Flora scientific collection licence: SL012503 DRF permit: TFL 15-1920

The follow-up field survey of the extrapolation area was conducted by Dr Jeffry Cargill (Principal Ecologist) on 3 August 2022. Survey timing was outside the EPA (2016) recommendations (discussed further in Section 3.3); however conditions were still considered suitable for floristic surveys with late season flowering occurring.

3.2.2. Detailed flora and vegetation survey

A Detailed flora and vegetation survey was conducted in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016). The survey included:

- Description and mapping of vegetation types, including the presence of any TECs or PECs, or wetland/riparian habitat, and compilation of a species inventory;
- Vegetation condition mapping adapted from Keighery (1994; EPA 2016); and
- Identification and mapping of any identified Weeds of National Significance (WoNS) or Declared Pests listed under the State *Biosecurity and Agriculture Management Act 2007* (BAM Act).

The survey involved the use of quadrats measuring 50 x 50 m, as recommended for the Pilbara bioregion (EPA 2016). Quadrats established for assessment using wooden stakes but were not permanently marked. Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. Photos were taken from the north-western corner of each quadrat. Where relevant, opportunistic sampling of species not recorded within the quadrats was undertaken to supplement the existing list of species recorded from within the biological survey area.

A total of 23 quadrats were established across the biological survey area (Figure 8). Three quadrats per vegetation community were established, except for one community with a restricted extent. The following data were recorded within each quadrat:

- Vegetation structure and classes, cover of all species and dominant species list for each vegetation type (in accordance with the National Vegetation Information System (NVIS) Level V structure and floristics);
- Vegetation condition, in accordance with the scale outlined in EPA (2016) adapted from Trudgen (1988);
- Full species inventory (angiosperm and gymnosperm) of both native and introduced species across the subject site; and
- Relevant site data including coordinates, site photograph, soil, geology, drainage, slope and any other relevant observational data.

One relevé was established in the borrow pit to collect supplementary data to the Detailed flora and vegetation survey. The following data was recorded:

- Broad vegetation type based on an assessment of the dominant flora species for the three traditional strata (upper, mid and ground) and their extent;
- Compilation of a flora species inventory (angiosperm and gymnosperm) of both native and introduced species;
- Broad vegetation condition mapping, including the location of any identified WoNS or Declared Pests listed under the BAM Act and a description of disturbances;
- Relevant relevé site data, including location coordinates (UTM), a site photograph, landform, soil, geology, drainage, slope etc. and any other applicable observational data;
- Presence of significant flora and vegetation listed under the EPBC Act, the BC Act or by DBCA; and
- Presence of any TECs, PECs and any other areas of ecological importance (such as EPBC listed ecological communities, Bush Forever sites, National Parks, wetlands, Environmental Protection Policy Areas, and Environmentally Sensitive Areas).

3.2.3. Targeted flora survey

A Targeted flora survey was also undertaken across the biological survey area to assess the presence of significant flora and ecological communities within areas considered suitable habitat. Potentially occurring species, communities and associated suitable habitat were determined during the desktop likelihood assessment. The targeted flora survey involved personnel walking meandering transects, with spacing dependent on the presence of suitable habitat for target species and communities. All encountered significant flora and vegetation were recorded by taking the coordinates of each individual and/or a centroid coordinate location for a group of individuals (>100) within a 20 m radial circumference, to enable mapping of individual locations and/or population extents. Survey effort is presented in Figure 8.

Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For significant flora identified in the field, the following was recorded:

- A colour photograph;
- GPS location;

- Population size estimate;
- Location of population boundaries;
- Associated habitat/landscape element;
- Time and date observed;
- Observer details; and
- A voucher specimen suitable for use as a reference specimen (if appropriate to do so for significant flora).

3.2.4. Flora identification and nomenclature

Flora specimen identification following the field survey was undertaken by taxonomic specialists at the Western Australian Herbarium (WAH). Suitable material that meets WAH specimen lodgement requirements, such as flowering material and range extensions, will be submitted along with Threatened and Priority Report forms to DBCA, as required by conditions of collection licences issued under the BC Act.

Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and Western Australian Herbarium [WAH] 2022).

3.2.5. Extrapolation mapping

Vegetation mapping, undertaken during the initial field survey of the biological survey area, was extrapolated during the follow-up field survey. This involved personnel walking meandering transects across the extrapolation area (Figure 8). No quadrat or relevés were established within the extrapolation area.

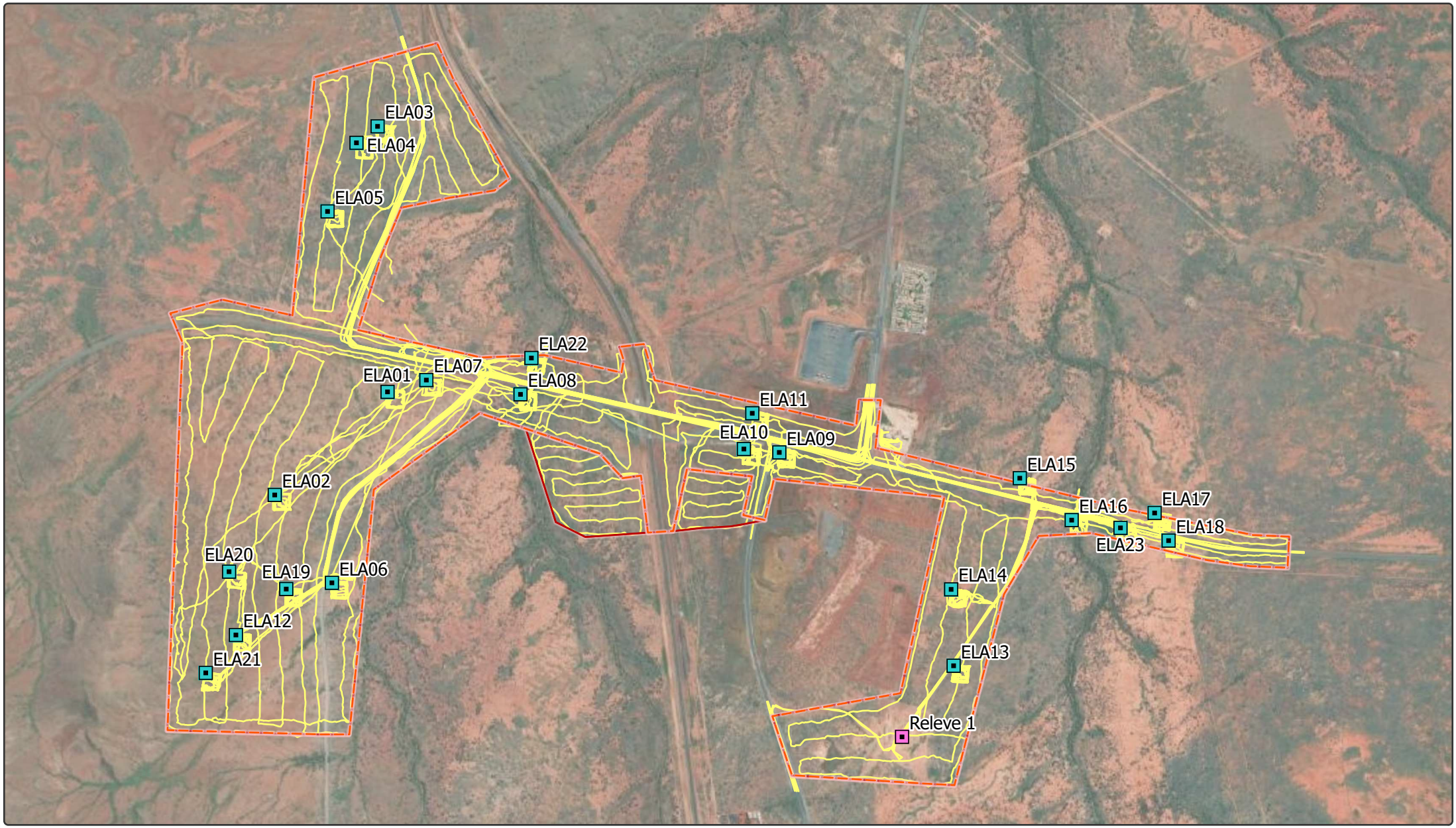

Figure 8: Survey effort and quadrats locations within the combined survey area

- Karratha Rail Bridge Biological Survey
- Extrapolation Area
- Quadrat
- Relevé
- Traverse

0 150 300 600
Metres

Datum/Projection:
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3.2.6. Data analysis

3.2.6.1. Flora species accumulation curve

A flora species accumulation curve was undertaken to indicate adequacy of the survey effort (Clarke and Gorley 2015). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness. When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered adequate.

3.2.6.2. Vegetation communities

Plymouth Routines in Multivariate Ecological Research v7 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke and Gorley 2015). To down weight the relative contributions of quantitatively dominant species a 4th root transformation was applied to the species percentage cover dataset. Specimens not identified to species level and singletons (species recorded at a single quadrat and not forming a dominant structural component) were excluded from the data set prior to analysis. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Similarity Profile, Hierarchical Clustering and Similarity Percentages. Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

3.2.7. Fauna survey

The Basic fauna survey was conducted in accordance with the EPA *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020).

The Basic fauna survey involved personnel walking transects through the biological survey area, delineating and mapping fauna habitats and recording opportunistic sightings of fauna.

Fauna habitats were assessed for their ability to support and sustain populations of fauna, along with an assessment of the likelihood of occurrence of significant fauna species. The habitat characteristics and fauna database records used in assessing likelihood of occurrence for fauna included:

- Vegetation community, structure and condition;
- Soil and landform type;
- Extent and connectivity of bushland;
- Fauna species habitat preferences;
- Proximity of significant fauna records; and
- Signs of species presence.

Opportunistic recordings of fauna species were made at all times during the field survey. These included visual sightings of active fauna such as reptiles and birds; records of bird calls; and signs of species presence such as tracks, diggings, burrows, scats and any other signs of fauna activity.

Nomenclature used for the vertebrate fauna species within this report follows the WAM Checklist of the Vertebrates of Western Australia (WAM 2022).

3.3. Limitations

The EPA Technical Guidance documents (EPA 2016, 2020) recommends including discussion of the limitations of the survey methods used. An assessment of potential constraints and limitations of this survey are summarised in Table 4. One potential survey limitation was identified.

Table 4: Survey limitations

Potential survey limitation	Impact on survey
Sources of information and availability of contextual information (i.e., pre-existing background versus new material).	**Not a limitation**. Land system mapping (DPIRD 2021a) and broad-scale vegetation mapping (DPIRD 2019) were available at a scale of 1:250,000. Soil and landform mapping was also available. Available information was sufficient to provide context at varying scales and therefore was not considered a limitation.
Scope (i.e., what life forms, etc., were sampled).	**Not a limitation**. The survey requirement of a Detailed and Targeted flora and vegetation survey and a Basic fauna survey in accordance with relevant State and Commonwealth legislation and EPA guidance was adequately met.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Not a limitation**. Adequacy of sampling effort was tested via a species accumulation curve; approximately 85% of the flora potentially present within quadrats in the biological survey area were recorded. This result, in addition to opportunistic collections, indicates that the majority of flora potentially present within the biological survey area were recorded. This is discussed in detail in Section 4.2.2.
Completeness and further work which might be needed (i.e., was the relevant survey area fully surveyed).	**Not a limitation**. The biological survey area was fully covered to meet requirements outlined in the scope of works. Site selection and replication was considered adequate to accurately analyse and discriminate sites based on species composition and subsequently delineate vegetation community boundaries.
Mapping reliability.	**Not a limitation**. Coverage of the combined survey area was considered adequate. High quality aerial maps were used for both the survey and subsequent vegetation mapping.
Timing, weather, season, cycle.	**Potential limitation.** The initial field survey of the biological survey area was undertaken in the appropriate season (i.e., June) as specified by the EPA Technical Guidance (EPA 2016, 2020). The follow-up field survey of the extrapolation area was undertaken outside the appropriate season (i.e., August). However the follow-up field survey was just to undertake extrapolation mapping and the conditions were still considered suitable for floristic surveys with late season flowering occurring.
Disturbances (fire, flood, accidental human intervention, etc.).	**Not a limitation**. Disturbances within the combined survey area included grazing, weeds and historical clearing. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Intensity (in retrospect, was the intensity adequate).	**Not a limitation**. The survey effort was adequately met. The area was searched for significant flora species by field staff undertaking meandering transects spaced adequately apart across the biological survey area. This method provides an accurate assessment of habitat characteristics and likelihood of significant species. The number of quadrats established was sufficient, given survey geometry and the restricted extent of some communities, to determine the vegetation communities present (including their structurally and compositionally dominant species) and to identify any vegetation of significance.
Resources (i.e., were there adequate resources to complete the survey to the required standard).	**Not a limitation**. The number of personnel conducting this field survey in the given time was adequate to undertake the required level of survey. Additional resources, including equipment available, additional support and personnel were adequate.
Access problems (i.e., ability to access survey area).	**Not a limitation**. Relevant areas within the combined survey area were able to be accessed and surveyed.

Potential survey limitation	Impact on survey
Experience levels (e.g., degree of expertise in plant identification to taxon level).	**Not a limitation**. The personnel conducting this field survey were all suitably qualified to identify specimens, having previously undertaken flora and fauna surveys in the Pilbara bioregion of Western Australia.

4. Results

4.1. Desktop review

4.1.1. Significant flora and fauna and ecological communities

An initial 18 significant flora species were identified as possibly occurring within the 40 km desktop study area, based on the database searches undertaken in Section 3.1.1. All taxa were listed as Priority (P) flora by DBCA (Figure 9). A pre-survey likelihood of occurrence assessment was undertaken for significant flora species identified from the desktop assessment. Following this assessment, three species were assessed as having Potential to occur within the combined survey area, namely *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479), *Terminalia supranitifolia* and *Rhynchosia bungarensis* (all listed as P3 by DBCA) (Appendix D). This assessment was based on the presence of potentially suitable habitat within the combined survey area and close proximity of recent records. Majority of the flora species records occur approximately 15 km north from the Burrup Peninsula.

An initial 66 significant fauna species were identified as possibly occurring within the 40 km desktop study area, based on the database searches undertaken in Section 3.1.1. These taxa comprised 58 species listed under the EPBC Act and BC Act, one species listed under the BC Act only and seven species listed as Priority fauna by DBCA (Figure 9). A pre-survey likelihood of occurrence assessment was undertaken for significant fauna species identified from the desktop assessment. Following this assessment, one species was assessed as Likely to occur within the combined survey area, namely Northern Quoll (*Dasyurus hallucatus*; listed as EN under the EPBC Act and BC Act), and five species were assessed as having Potential to occur within the combined survey area, namely Fork-tailed Swift (*Apus pacificus*), Oriental Pratincole (*Glareola maldivarum*) (both listed as MI under the EPBC Act and BC Act), Northern short-tailed mouse (*Leggadina lakedownensis*), Lined soil-crevice skink (Dampier) (*Notoscincus butleri*) and Western pebble-mound mouse (*Pseudomys chapmani*) (all three listed as P4 by DBCA) (Appendix E). This assessment was based on the presence of potentially suitable habitat within the combined survey area and close proximity of recent records. Over 20 marine species (e.g., whales, turtles) were recorded within the 40 km desktop study area, however these were excluded from the assessment.

A total of seven significant ecological communities were identified as possibly occurring within the 40 km desktop study area (Figure 9). One community overlaps majority of the combined survey area and was assessed as Likely to occur, namely Roebourne Plains gilgai grasslands (listed as P1 by DBCA) (Appendix F). This community is described as '*These grasslands occur on microrelief on strongly gilgaied self-mulching cracking clays, and emergent depositional surfaces. The grasslands are surrounded by clay plains/flats and sandy coastal and alluvial plains*' (DBCA 2021b).

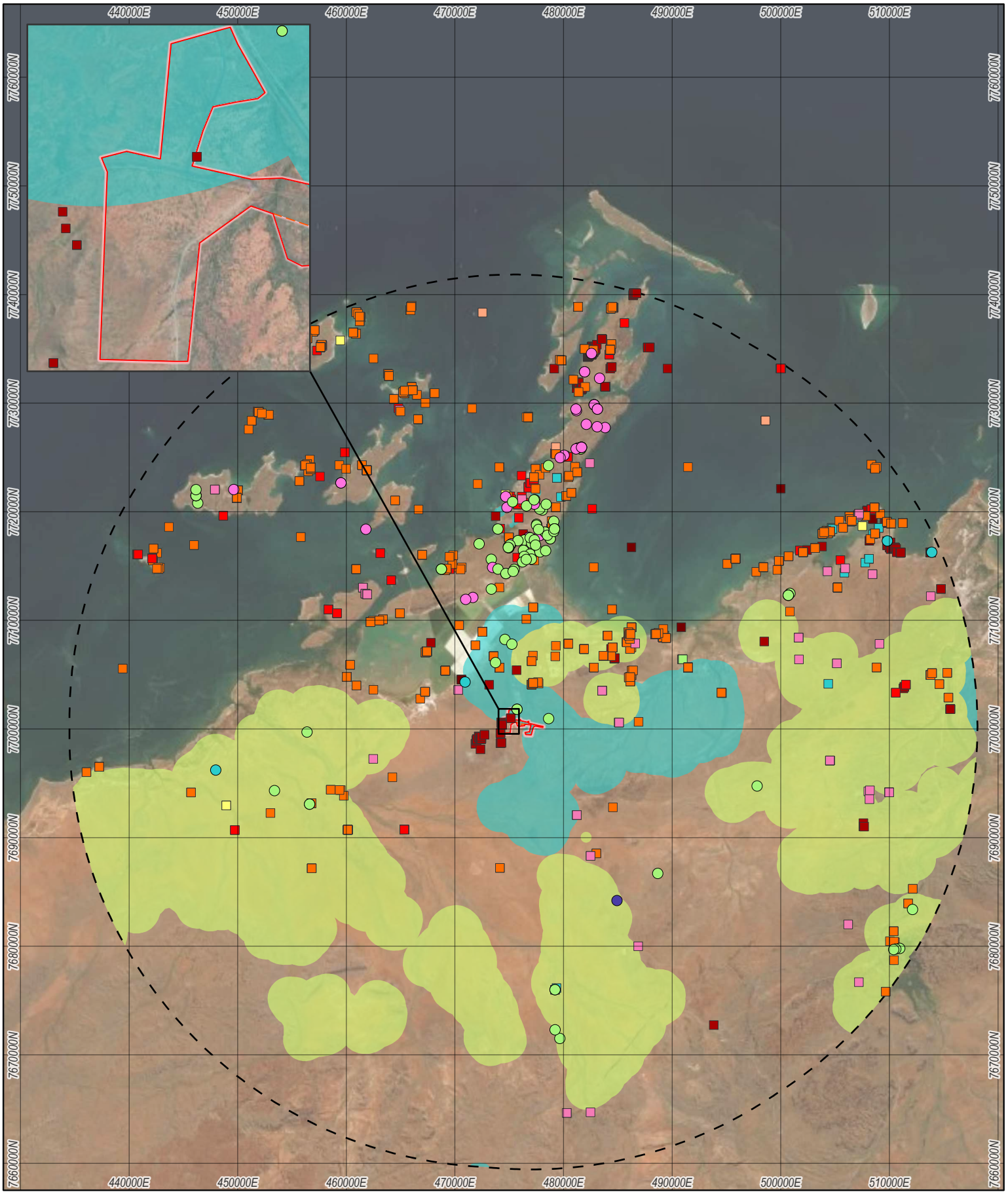

Figure 9: Significant flora, fauna and ecological communities previously recorded in the vicinity of the project area

Karratha Rail Bridge Biological Survey
Extrapolation Area
Desktop Study Area (40km)

Significant ecological communities

Priority community listed by DBCA

Priority 1
Priority 3

Significant flora

Priority flora listed by DBCA

1
2
3
4

Significant fauna

CR
EN
VU
MI
CD
OS
P1
P3
P4

0 5 10
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 50

22PER2129-RD Date: 6/09/2022

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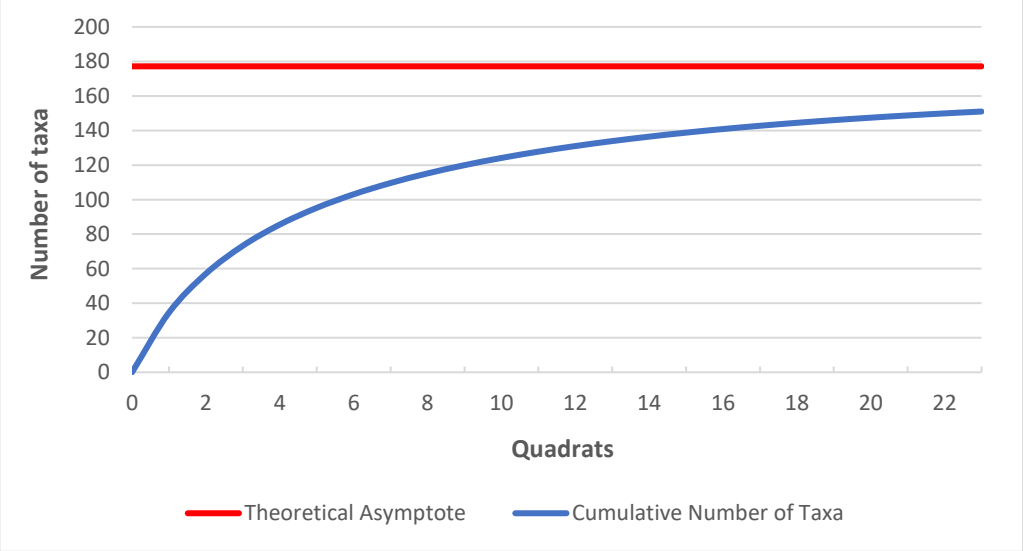
4.2. Flora and vegetation survey

4.2.1. Flora overview

A total of 160 flora taxa (151 native and 9 introduced) from 49 families and 104 genera were recorded across 23 quadrats established within the biological survey area and from opportunistic collections. Of these, 150 species were recorded in quadrats (144 native and 6 introduced) and 10 species were recorded opportunistically (7 native and 3 introduced). Average species richness per quadrat was 34.6 species, ranging from a low of 21 species at ELA07 to a high of 43 species at ELA19. Families with the highest number of species included Poaceae (33 species), Fabaceae (32 species) and Amaranthaceae (11 species). Acacia, Ptilotus and Senna were the best represented genera throughout the biological survey area with 11, 8 and 5 taxa recorded respectively. A full species list and species by quadrat matrix is provided in Appendix G and ELA quadrat data is provided in Appendix H.

4.2.2. Accumulated species – site surveyed (species-area curve)

A species accumulation curve was used to evaluate the adequacy of sampling (Clarke and Gorley 2006; Figure 10). Only species data recorded from defined quadrats were used (150 species; 144 native and 6 introduced); no opportunistic flora collections were included. The asymptotic value was determined using Michaelis Menten modelling. Using this analysis, the incidence-based coverage estimator of species richness was calculated to be 177.17. Based on this value, and the total of 150 species recorded within quadrats, approximately 85% of the flora species potentially present within the biological survey area were recorded. This result, in addition to opportunistic collections (10 species), indicates that the majority of flora potentially present within the biological survey area were recorded.



Note: Only species recorded from quadrats were used to calculate the species accumulation curve and theoretical maximum number of species (asymptotic value).

Figure 10: Average randomised species accumulation curve

4.2.3. Significant flora

No Threatened flora species listed under the EPBC Act or the BC Act, or Priority listed species by DBCA were recorded within the biological survey area from the field survey.

A post-survey flora likelihood of occurrence assessment was undertaken following the field survey. Following this assessment, one of the 18 significant flora species identified from the desktop assessment (see Section 4.1.1) has the potential to occur within the combined survey area. *Dolichocarpa* sp.

Hamersley Station (A.A. Mitchell PRP 1479; listed as P4 by DBCA) could not be discounted as suitable habitat is present within the combined survey area and given the cryptic nature of the species (annual herb) it's possible that this species wasn't flowering and therefore not detectable at the time of the survey.

The remaining 17 species are considered as unlikely to occur within the combined survey area due to lack of suitable habitat for these species and age/proximity to previous records. The complete flora likelihood of occurrence assessment is provided in Appendix D.

4.2.4. Introduced flora

A total of nine introduced flora were recorded within the biological survey area, representing 5.6% of the total number of species recorded. None of the introduced species recorded within the biological survey area are listed as WoNS or Declared Pests under the BAM Act.

4.2.5. Vegetation communities

Similarity Profile Analysis separated the 23 quadrats into seven statistically dissimilar groupings (hierarchical cluster dendrogram shown in Appendix I). As a result, seven intact native vegetation communities were delineated and mapped within the combined survey area, covering a total area of 184.74 ha (82.20%; Table 5, Figure 11). The remaining 40.01 ha (17.80%) comprised cleared areas and rehabilitation (i.e., current and historic borrow pits and prominent roadside batters). The most widespread community was AbSaTw, which occurred across 53.83% of the vegetated area.

Vegetation community SgTw occurred on a small hillock area (i.e., 1.91% of the combined survey area) therefore only two quadrats were able to be established. All other vegetation communities had three or more quadrats established.

No ecological communities listed as Threatened under the EPBC Act or the BC Act occurred or were inferred to occur within the combined survey area. One priority ecological community, Roebourne Plains gilgai grasslands (P1 by DBCA) was considered as being Likely to occur, as the buffer overlaps majority of the combined survey area (Main Roads 2022c, Figure 9). One vegetation community, AxEtEx, likely represents floristic (i.e., suite of tussock grasses) and landform elements (i.e., areas comprised cracking clay) of this PEC. Precautionary approach has been taken to infer the presence of this PEC within the AxEtEx vegetation community (i.e., 9.47 ha).

The complete communities' likelihood of occurrence assessment is provided in Appendix F.

Table 5: Extent of vegetation communities within combined survey area

Vegetation community code	Representative Photograph	Quadrats	Vegetation description	Associated species	Extent in the combined survey area (ha)	Proportion of combined survey area (%)
AxEtEx		ELA01, ELA06, ELA07, ELA17, ELA18 and ELA23	*Acacia xiphophylla* tall isolated clumps of shrubs over *Enchylaena tomentosa*, *Atriplex codonocarpa* mid isolated chenopod shrubs over *Eragrostis xerophila*, *Xerochloa barbata*, **Cenchrus ciliaris* low open tussock grassland.	*Alysicarpus muelleri, Aristida contorta, Corchorus trilocularis, Chrysopogon fallax, Dactyloctenium radulans, Enneapogon caerulescens, Euphorbia biconvexa, Iseilema membranaceum, Nellica maderaspatensis, Neptunia dimorphantha, Panicum decompositum, Rhynchosia minima, Salsola australis, Sclerolaena costata, Sclerolaena densiflora, Sida fibulifera, Trianthema triquetrum*.	9.47	4.21
AbSaTw		ELA02, ELA05 and ELA13	*Acacia bivenosa, Acacia ancistrocarpa, Acacia inaequilatera* tall sparse shrubland over *Senna artemisioides* subsp. *oligophylla, Senna glutinosa* subsp. *pruinosa*, *Eremophila longifolia* mid sparse shrubland over *Diplopeltis eriocarpa* low sparse shrubland and *Triodia wiseana, Triodia epactia* low open hummock grassland.	*Aristida contorta, Afrohybanthus aurantiacus, Bonamia pilbarensis, Cassytha capillaris, *Cenchrus ciliaris, Corchorus laniflorus, Cymbopogon ambiguus, Euploca ovalifolia, Evolvulus alsinoides* var. *villosicalyx, Goodenia muelleriana, Indigofera monophylla, Paraneurachne muelleri, Paspalidium clementii, Ptilotus astrolasius, Trichodesma zeylanicum, Triumfetta clementii*.	99.44	44.24

Vegetation community code	Representative Photograph	Quadrats	Vegetation description	Associated species	Extent in the combined survey area (ha)	Proportion of combined survey area (%)
SgTw		ELA03 and ELA04	*Senna glutinosa* subsp. *glutinosa*, *Senna glutinosa* subsp. *pruinosa* mid isolated shrubs over *Triodia wiseana* low hummock grassland and *Eriachne mucronata*, **Cenchrus ciliaris* low sparse tussock grassland.	*Abutilon amplum, Bonamia pilbarensis, Corchorus elachocarpus, Cucumis variabilis, Dysphania rhadinostachya, Euphorbia biconvexa, Evolvulus alsinoides* var. *villosicalyx, Gomphrena cunninghamii, Indigofera monophylla, Paspalidium clementii, Rhynchosia minima, Solanum horridum, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Trachymene oleracea, Tribulus astrocarpus*.	4.30	1.91
ChSsCc		ELA08, ELA16 and ELA22	*Corymbia hamersleyana, Acacia coriacea* subsp. *pendens, Acacia trachycarpa* low open woodland over *Scaevola spinescens, Santalum lanceolatum, Clerodendrum tomentosum* mid open shrubland over *Triodia epactia* low open hummock grassland and **Cenchrus ciliaris, Chrysopogon fallax* low open tussock grassland.	*Abutilon amplum, Acacia bivenosa, Acacia pyrifolia, Alysicarpus muelleri, Bonamia erecta, Corchorus laniflorus, Cucumis variabilis, Eremophila longifolia, Eulalia aurea, Indigofera trita, Rhynchosia minima, Senna artemisioides* subsp. *oligophylla, Solanum phlomoides, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Trichodesma zeylanicum, Triodia wiseana*.	3.36	1.50

Vegetation community code	Representative Photograph	Quadrats	Vegetation description	Associated species	Extent in the combined survey area (ha)	Proportion of combined survey area (%)
AaTe		ELA09, ELA10 and ELA11	*Acacia arida, Acacia maitlandii, Acacia ancistrocarpa* mid sparse shrubland over *Triodia epactia* low hummock grassland.	*Acacia pyrifolia, Afrohybanthus aurantiacus, Bonamia pilbarensis, Cassytha capillaris, Corchorus elachocarpus, Corchorus laniflorus, Enneapogon caerulescens, Goodenia stobbsiana, Indigofera monophylla, Paspalidium clementii, Ptilotus calostachyus, Sporobolus virginicus, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Trichodesma zeylanicum, Triumfetta clementii*.	8.39	3.73
ChAbTe		ELA12, ELA20, ELA21	*Corymbia hamersleyana, Acacia inaequilatera, Hakea lorea* low open woodland over *Acacia bivenosa, Acacia pyrifolia, Eremophila longifolia* mid sparse shrubland over *Triodia epactia, Triodia wiseana* low hummock grassland.	*Abutilon amplum, Acacia tumida, Afrohybanthus aurantiacus, Aristida contorta, Bonamia erecta, Bulbostylis barbata, Cassytha capillaris, *Cenchrus ciliaris, Eragrostis eriopoda, Eriachne pulchella* subsp. *dominii, Goodenia muelleriana, Hibiscus coatesii, Indigofera monophylla, Senna artemisioides* subsp. *oligophylla, Paspalidium clementii, Trigastrotheca molluginea, Urochloa holosericea*.	27.09	12.05

Vegetation community code	Representative Photograph	Quadrats	Vegetation description	Associated species	Extent in the combined survey area (ha)	Proportion of combined survey area (%)
AxSgTw		ELA14, ELA15 and ELA19	*Acacia xiphophylla* tall sparse shrubland over *Senna glutinosa* subsp. x *luerssenii*, *Senna artemisioides* subsp. *oligophylla* mid sparse shrubland over *Triodia wiseana, Triodia epactia* low open hummock grassland and **Cenchrus ciliaris, Eragrostis xerophila* low sparse tussock grassland.	*Aristida contorta, Abutilon amplum, Chrysopogon fallax, Dactyloctenium radulans, Enchylaena tomentosa, Enteropogon ramosus, Euphorbia biconvexa, Fimbristylis dichotoma, Maireana tomentosa, Paspalidium clementii, Rhynchosia minima, Sclerolaena densiflora, Sida fibulifera, Solanum phlomoides, Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356), *Xerochloa barbata*.	32.69	14.55
				Rehabilitation	20.90	9.30
				Cleared	19.11	8.50
				Total	**224.74**	**100.00**

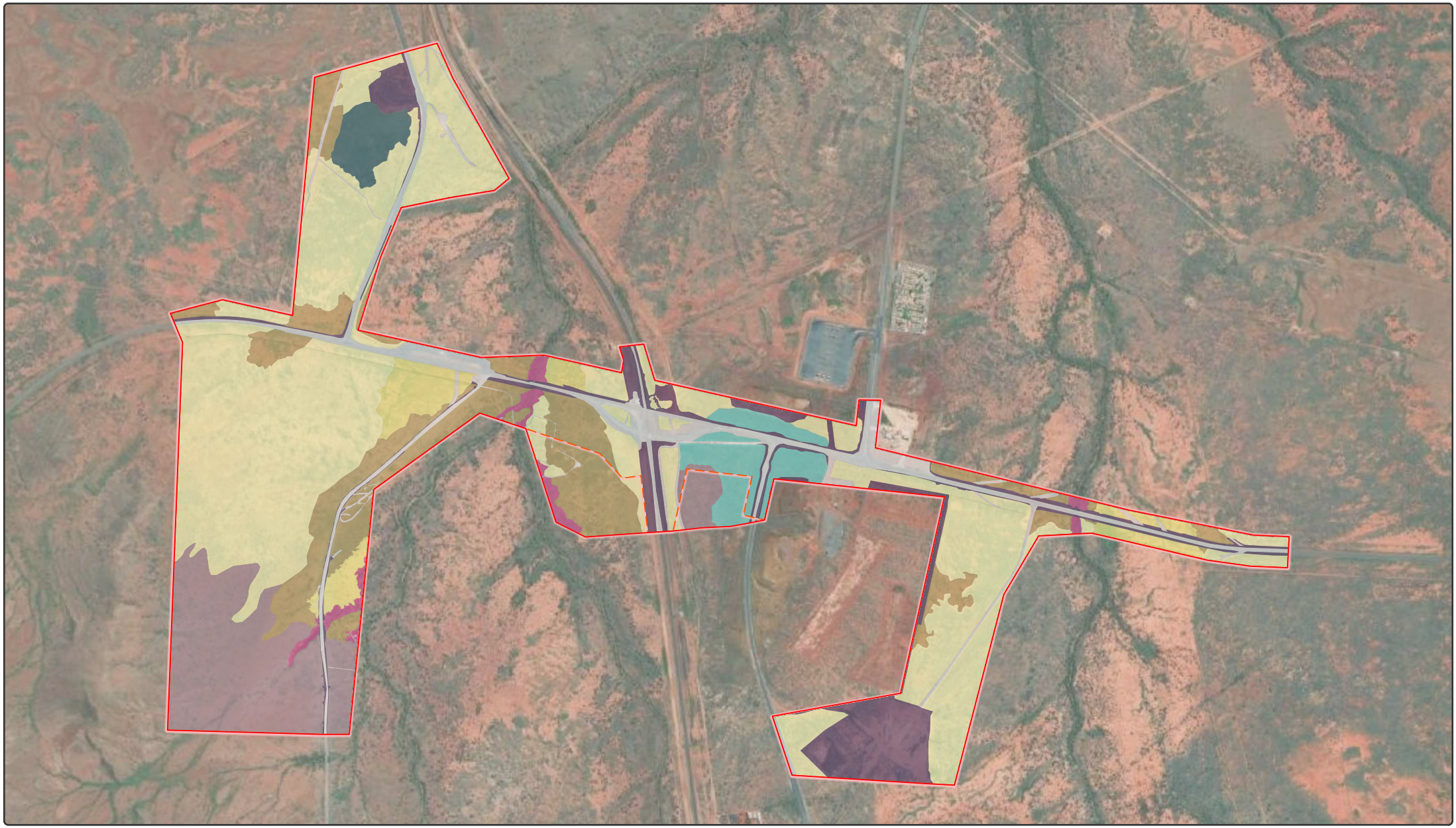


Figure 11: Vegetation communities recorded within the combined survey area

4.2.6. Vegetation condition

Condition of intact vegetation within the combined survey area ranged from Degraded to Very Good based on the Trudgen (1988) vegetation scale provided in EPA (2016) for the Eremaean Botanical Province. Majority of the intact vegetation within the combined survey area was recorded as being in Very Good condition (111.67 ha; 49.69%). Cleared areas accounted for 19.11 ha (8.50%) of the combined survey area. Disturbances within the combined survey area included the presence of weeds, grazing and historical clearing.

Table 6: Vegetation condition recorded in the combined survey area

Condition	Extent in the combined survey area (ha)	Proportion of combined survey area (%)
Very Good	111.67	49.69
Good	48.06	21.38
Degraded	45.90	20.42
Cleared	19.11	8.50
Total	**224.74**	**100.00**

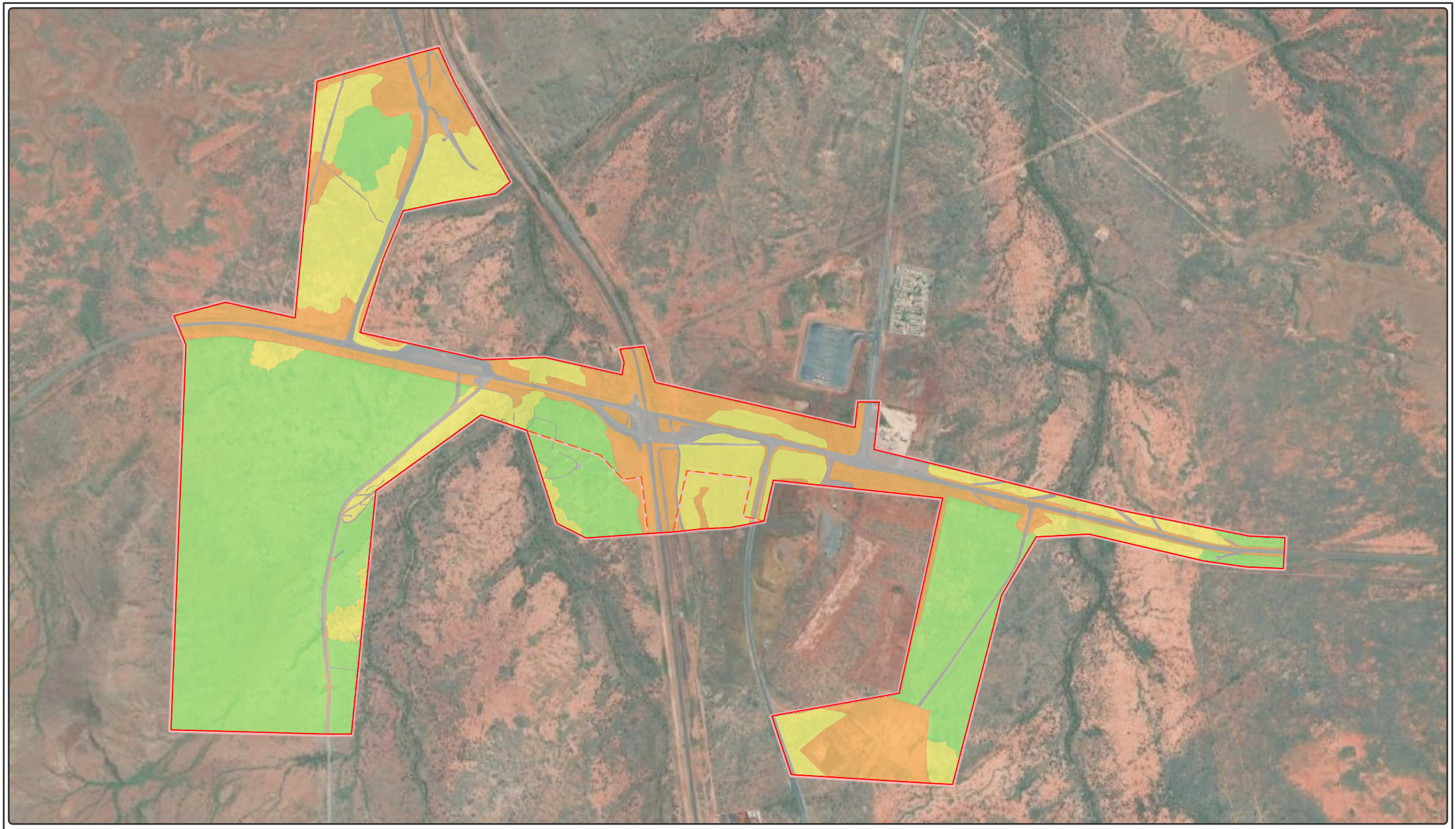


Figure 12: Vegetation condition recorded within the combined survey area

4.3. Fauna survey

4.3.1. Fauna overview

A total of 30 vertebrate fauna species (27 native and three introduced) were recorded within the biological survey area, comprising 25 birds, four mammals and one reptile. A complete fauna list is presented in Appendix J.

4.3.2. Significant fauna

No Threatened fauna species listed under the EPBC Act or the BC Act, or Priority listed species by DBCA were recorded within the biological survey area from the field survey.

A post-survey fauna likelihood of occurrence assessment was undertaken following the field survey. Following this assessment, six of the 66 significant fauna species identified from the desktop assessment (see Section 4.1.1) has the potential to occur within the combined survey area, namely:

- Northern Quoll (*Dasyurus hallucatus*; listed as EN under the EPBC Act and BC Act);
- Fork-tailed Swift (*Apus pacificus*; listed as MI under the EPBC Act and BC Act);
- Oriental Pratincole (*Glareola maldivarum*; listed as MI under the EPBC Act and BC Act);
- Northern short-tailed mouse (*Leggadina lakedownensis*; listed as P4 by DBCA);
- Lined soil-crevice skink (Dampier) (*Notoscincus butleri*; listed as P4 by DBCA); and
- Western pebble-mound mouse (*Pseudomys chapmani*; listed as P4 by DBCA).

This assessment is based on suitable habitat present and proximity to previous records. The remaining 60 significant fauna species were considered as unlikely to occur within the combined survey area due to lack of suitable habitat for these species, adequacy of survey effort undertaken and proximity to previous records. The complete fauna likelihood of occurrence assessment is provided in Appendix E.

4.3.3. Introduced fauna

A total of three introduced (feral) fauna species were recorded within the biological survey area, namely, European Cattle (**Bos primigenius taurus*), Dog/Dingo (**Canis familiaris*) and Cat (**Felis catus*). Dog/Dingo and Cat are both listed as Declared Pests under the BAM Act s22(2) and Dingo/Dog has a C3 management control category.

4.3.4. Fauna habitat

A total of three fauna habitats were identified and mapped within the combined survey area, covering a total area of 184.74 ha (82.20%; Table 7, Figure 13). The remaining 40.01 ha (17.80%) comprised cleared areas and rehabilitation (i.e., current and historic borrow pits and prominent roadside batters). The most widespread habitat was Acacia shrubland over mixed grassland which occurred across 81.05% of the vegetated area.

Significant habitat features and significant fauna considered as having the potential to utilise fauna habitats within the combined survey area are outlined in Table 7.

Table 7: Fauna habitats recorded within the combined survey area

Fauna habitat	Description	Significant fauna species potentially utilising the habitat	Extent in the combined survey area (ha)	Proportion of the combined survey area (%)	Photo
Acacia shrubland over mixed grassland	This habitat contains *Acacia xiphophylla, Acacia bivenosa* or *Acacia arida* over mixed tussock grassland or *Triodia* spp. hummock grassland. Aligned with vegetation communities AxEtEx, AbSaTw, AaTe and AxSgTw.	• Northern Quoll foraging habitat • Fork-tailed Swift foraging habitat • Oriental Pratincole habitat • Northern short-tailed mouse habitat	149.73	66.62	
Corymbia and Acacia open woodland	This habitat contains *Corymbia hamersleyana* and Acacia spp. over *Triodia* spp. hummock grassland. Aligned with vegetation communities ChSsCc and ChAbTe.	• Northern Quoll foraging habitat • Fork-tailed Swift foraging habitat • Northern short-tailed mouse habitat	30.71	13.67	

Fauna habitat	Description	Significant fauna species potentially utilising the habitat	Extent in the combined survey area (ha)	Proportion of the combined survey area (%)	Photo
Rocky hill	This habitat contains *Senna* spp. shrubs over *Triodia wiseana* on a rocky hill. Aligned with vegetation community SgTw.	• Northern Quoll foraging habitat • Fork-tailed Swift foraging habitat • Lined soil-crevice skink habitat • Western pebble-mound mouse	4.30	1.91	
		Rehabilitation	20.90	9.30	
		Cleared	19.11	8.50	
		Total	**224.74**	**100.00**	

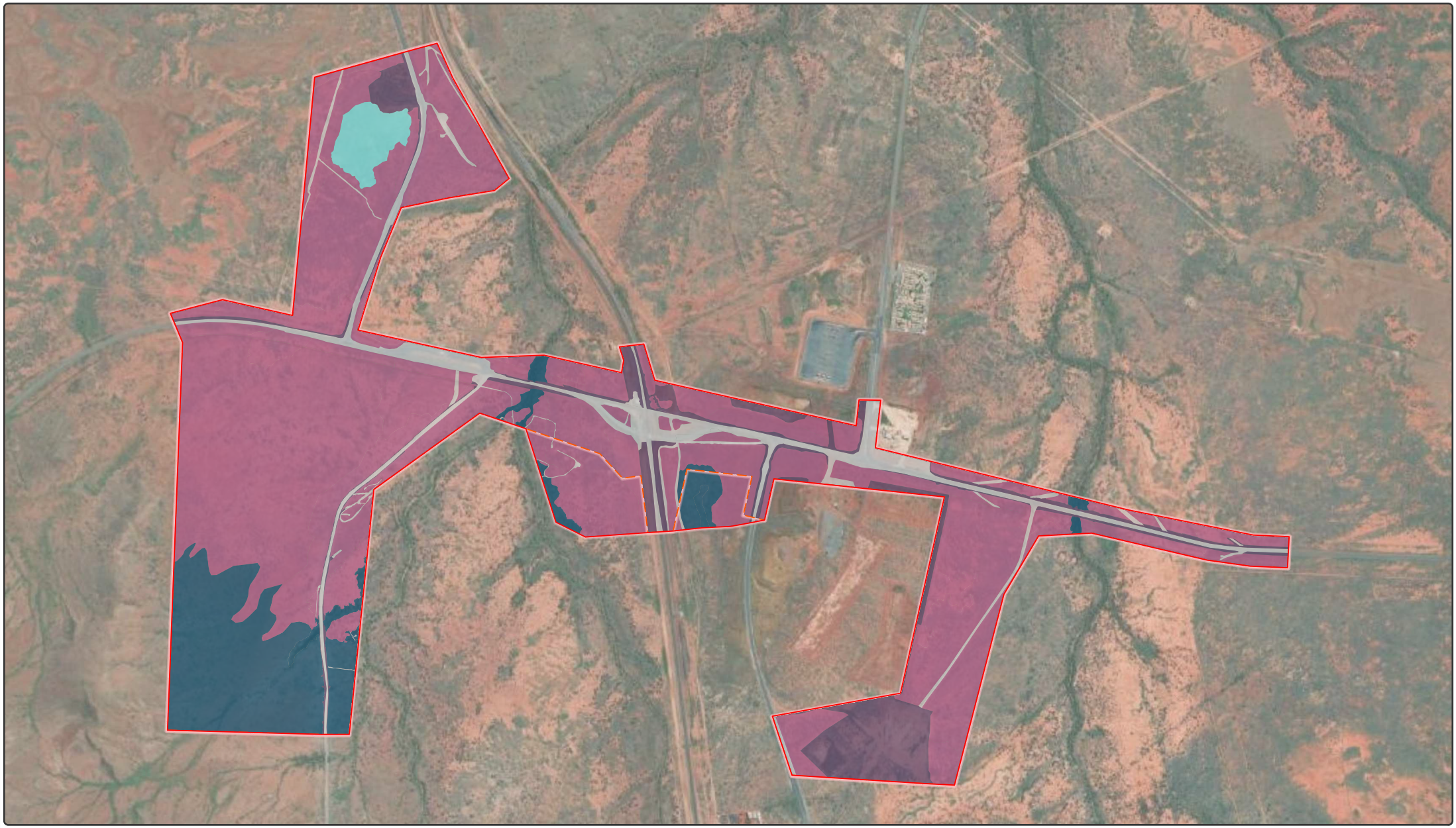


Figure 13: Fauna habitats recorded within the combined survey area

5. Discussion

5.1. Flora

The initial field survey was undertaken in the optimal timing for the Eremaean Botanical Province. The species accumulation curve determined that majority of the flora species potentially present within the biological survey area were recorded, resulting in sufficient data to define and assess the presence, extent and significance of vegetation communities within the biological survey area.

Whilst no Threatened or Priority flora species were recorded in the biological survey area, one Priority flora species identified from the desktop assessment has the potential to occur within the combined survey area. *Dolichocarpa* sp. Hamersley Station (A.A. Mitchell PRP 1479) is listed as Priority 3 by DBCA which is a poorly known species. This species is known to be a 0.1 m high herb on claypan, red-brown sandy clay. This species is known from 32 records on FloraBase, of which only six were collected in flower from May and early June (DBCA and WAH 2022). This species could not be discounted as suitable habitat is present (i.e., majority of quadrats recorded sandy clay soil) within the combined survey area and given the cryptic nature of the species (annual herb) it's possible that this species wasn't flowering and therefore not detectable at the time of the survey.

No introduced species recorded within the biological survey area were listed as WoNS or Declared Pests under the BAM Act. Majority of the weeds observed within the biological survey area were recorded at low densities (i.e., <0.5% cover), however Buffel Grass (**Cenchrus ciliaris*) was observed at 45%, 15% and 65% cover in quadrats ELA08, ELA16 and ELA22 respectively. Weeds of note were several individuals of the woody shrub *Vachellia farnesiana*, which occurred in creeklines (by road crossings), and the highly invasive woody climber *Passiflora foetida,* which was common in larger creeklines and if not managed, can occur to the exclusion of native flora.

5.2. Vegetation

Seven vegetation communities, comprising two isolated shrubs over hummock/tussock grassland communities AxEtEx and SgTw, three sparse shrubland over hummock grassland communities AbSaTw, AaTe, and AxSgTw and two open woodland over hummock/tussock grassland communities ChSsCc and ChAbTe, were delineated and mapped within the combined survey area. These seven vegetation communities covered majority of the combined survey area, whilst cleared areas including roads, road batters and tracks, and rehabilitation (i.e., current and historic borrow pits and prominent roadside batters), accounted for the remaining area.

The combined survey area intersects with three land systems; majority Horseflat System, then Ruth System and Boolgeeda System. The Horseflat System is characterised by 'gilgaied clay plains supporting Roebourne Plains grass grasslands and minor grassy snakewood shrublands'. Characteristics of this land system are represented by vegetation communities AxEtEx and AxSgTw, containing *Acacia xiphophylla* (snakewood) and *Eragrostis xerophila* (Roebourne Plains grass). The Ruth System is characterised by 'hills and ridges of volcanic and other rocks supporting shrubby hard spinifex and occasionally soft spinifex grasslands'. Characteristics of this land system are represented by vegetation community SgTw, stony hill with isolated shrubs over hummock/tussock grassland. The Boolgeeda System is characterised

by 'stony lower slopes and plains below hill systems' and is associated with Mount Regal within the Rocklea System, which occurs 500 m south-west of the combined survey area.

Two vegetation associations overlap the combined survey area; of which the majority comprises 589 with 157 occurring in the south-west. Vegetation communities SgTw, AbSaTw, ChSsCc, AaTe, ChAbTe and AxSgTw mapped within the combined survey area align with Beard's vegetation association mapping. These vegetation communities broadly comprise aspects of the two associations with the presence of hummock grasslands and *Triodia* spp. Pre-European vegetation associations mapped within the combined survey area have more than 95% of their extent remining within Western Australia (Government of Western Australia 2019), with the combined survey area representing less than 0.5% of their total extent in WA.

No ecological communities listed as Threatened under the EPBC Act or the BC Act occurred or were inferred to occur within the survey area. One priority ecological community, Roebourne Plains gilgai grasslands (P1 by DBCA) was considered as being Likely to occur, as the buffer overlaps majority of the combined survey area. This community is described briefly as 'these grasslands occur on microrelief on strongly gilgaied self-mulching cracking clays, and emergent depositional surfaces' and is restricted to the Karratha area (DBCA 2021b; full description Appendix F). One vegetation community, AxEtEx, likely represents floristic and landform elements of this PEC. This community is locally variable, with a suite of tussock grasses occurring at various densities including *Eragrostis xerophila*, *Chrysopogon fallax* and *Panicum decompositum*. This vegetation community was recorded in Very Good or Good condition, with weeds such as **Cenchrus ciliaris* being present, although not dominant. Areas within this community often comprised cracking clay, with alluvial soils and light clays creating an admixture on the periphery of these smaller centralised depressions. Proximity of these areas to major road verges and associated artificial drainage has likely led to altered natural water flows, however the presence of cracking clays supporting a dominant suite of native tussock grasses was still evident. A precautionary approach has therefore been taken to infer the presence of this PEC within the AxEtEx vegetation community.

Condition of intact vegetation within the combined survey area ranged from Degraded to Very Good based on Trudgen (1988) vegetation scale provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016). Majority of the intact vegetation within the combined survey area was recorded as being in Very Good condition. Disturbances included the presence of weeds, grazing and historical clearing.

5.3. Fauna

Fauna habitats present within the combined survey area are considered to provide suitable habitat for terrestrial and avian fauna, providing a mixture of suitable vegetation, substrate and microhabitats suitable for a variety of fauna species. Majority of bird species recorded during the initial field survey are widespread and common species, including nectivores, insectivores and granivores.

Whilst no Threatened or Priority fauna species were recorded in the biological survey area, three Threatened fauna species and three Priority fauna species identified from the desktop assessment have the potential to occur within the combined survey area.

Northern Quoll (*Dasyurus hallucatus*) is listed as Endangered under the EPBC Act and BC Act. The Northern Quoll occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert (TSSC 2005). Northern Quoll makes its dens in rock crevices, tree holes or occasionally termite mounds. The closest known records occur from remote cameras on Mount Regal, which occurs 500 m south-west of the combined survey area. Mount Regal occurs within the Rocklea land system which the species prefers. Whilst the combined survey area do not have suitable denning habitat, it is considered that the Northern Quoll would utilise all three fauna habitats present for foraging purposes and moving through the landscape. Northern Quoll consume a wide variety of prey including insects, fruit, nectar and vertebrates (TSSC 2005).

The Fork-tailed Swift (*Apus pacificus*) and Oriental Pratincole (*Glareola maldivarum*) are listed as Migratory under the EPBC Act and BC Act. Both species are non-breeding visitors to Australia and utilise a wide variety of habitats for foraging. The Fork-tailed Swift could potentially forage for insects above all three fauna habitats whilst the Oriental Pratincole could utilise the bare areas and short grassland within the 'Acacia shrubland over mixed grassland' habitat. A variety of Migratory birds are also known to utilise the terrestrial wetlands (i.e., Gap Ridge WWTP and Dampier salt ponds), approximately 5 km north of the combined survey area.

The Northern short-tailed mouse (*Leggadina lakedownensis*), Lined soil-crevice skink (Dampier) (*Notoscincus butleri*) and Western pebble-mound mouse (*Pseudomys chapmani*) are all listed as Priority 4 by DBCA which is a rare, near threatened or other species in need of monitoring. The Northern short-tailed mouse could utilise the sandy soils of the 'Acacia shrubland over mixed grassland' and 'Corymbia and Acacia open woodland' habitats, whilst the Lined soil-crevice skink and Western pebble-mound mouse could utilise the exposed small stones (pebbles) of the 'Rocky hill' habitat.

Two introduced species recorded within the biological survey area; Dog/Dingo and Cat, are both listed as Declared Pests under the BAM Act s22(2) and Dingo/Dog has a C3 management control category. This means that 'organisms that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism' (DPIRD 2021b).

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Appendix A PMST database search results

Australian Government
Department of Agriculture, Water and the Environment

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. Please see the caveat for interpretation of information provided here.

Report created: 20-May-2022

Summary

Matters of National Environment 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 (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
Listed Migratory Species:	65

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

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 Lands:	68
Commonwealth Heritage Places:	None
Listed Marine Species:	106
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	3

Extra Information

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

State and Territory Reserves:	8
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	48
Key Ecological Features (Marine):	None
Biologically Important Areas:	27
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Indigenous			
Dampier Archipelago (including Burrup Peninsula)	WA	Listed place	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris canutus			
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris			
Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus			
Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Falco hypoleucos			
Grey Falcon [929]	Vulnerable	Species or species habitat known to occur within area	In feature area
Limosa lapponica menzbieri			
Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes giganteus			
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Numenius madagascariensis			
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pezoporus occidentalis			
Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis			
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
Sternula nereis nereis			
Australian Fairy Tern [82950]	Vulnerable	Breeding known to occur within area	In feature area
FISH			
Thunnus maccoyii			
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
MAMMAL			
Balaenoptera musculus			
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Dasyurus hallucatus			
Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area	In feature area
Macroderma gigas			
Ghost Bat [174]	Vulnerable	Species or species habitat known to occur within area	In feature area
Macrotis lagotis			
Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Rhinonicteris aurantia (Pilbara form)			
Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area	In feature area
REPTILE			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only
Lerista nevinae Nevin's Slider [85296]	Endangered	Species or species habitat known to occur within area	In buffer area only
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known to occur within area	In feature area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
SHARK			
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pristis pristis			
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Pristis zijsron			
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sphyrna lewini			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In buffer area only
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna pacifica			
Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
Calonectris leucomelas			
Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In buffer area only
Fregata ariel			
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only
Hydroprogne caspia			
Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Macronectes giganteus			
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Onychoprion anaethetus](#) Bridled Tern [82845]		Breeding known to occur within area	In buffer area only
[Phaethon lepturus](#) White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
[Sterna dougallii](#) Roseate Tern [817]		Breeding likely to occur within area	In buffer area only
[Sternula albifrons](#) Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
[Anoxypristis cuspidata](#) Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area	In buffer area only
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
[Carcharhinus longimanus](#) Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
[Carcharodon carcharias](#) White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Tursiops aduncus (Arafura/Timor Sea populations)](#)			
Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In buffer area only
Migratory Terrestrial Species			
[Hirundo rustica](#)			
Barn Swallow [662]		Species or species habitat may occur within area	In feature area
[Motacilla cinerea](#)			
Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
[Motacilla flava](#)			
Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#)			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
[Arenaria interpres](#)			
Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
[Calidris acuminata](#)			
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
[Calidris alba](#)			
Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
[Calidris canutus](#)			
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area	In feature area
[Calidris ferruginea](#)			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#)			
Pectoral Sandpiper [858]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius veredus](#) Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area	In feature area
[Glareola maldivarum](#) Oriental Pratincole [840]		Species or species habitat known to occur within area	In feature area
[Limicola falcinellus](#) Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
[Limnodromus semipalmatus](#) Asian Dowitcher [843]		Species or species habitat may occur within area	In buffer area only
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
[Limosa limosa](#) Black-tailed Godwit [845]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Numenius phaeopus](#) Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
[Pandion haliaetus](#) Osprey [952]		Breeding known to occur within area	In buffer area only
[Phalaropus lobatus](#) Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis fulva](#) Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
[Pluvialis squatarola](#) Grey Plover [865]		Species or species habitat known to occur within area	In buffer area only
[Thalasseus bergii](#) Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
[Tringa brevipes](#) Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area
[Tringa stagnatilis](#) Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only
[Tringa totanus](#) Common Redshank, Redshank [835]		Species or species habitat known to occur within area	In buffer area only
[Xenus cinereus](#) Terek Sandpiper [59300]		Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [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.

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - KARRATHA TRAINING DEPOT [50238]	WA	In buffer area only
Defence - KARRATHA TRAINING DEPOT [50237]	WA	In buffer area only
Defence - KARRATHA TRAINING DEPOT [50200]	WA	In buffer area only
Unknown		
Commonwealth Land - [51583]	WA	In buffer area only
Commonwealth Land - [51574]	WA	In buffer area only
Commonwealth Land - [51935]	WA	In buffer area only
Commonwealth Land - [52205]	WA	In buffer area only
Commonwealth Land - [50978]	WA	In buffer area only
Commonwealth Land - [50989]	WA	In buffer area only
Commonwealth Land - [51598]	WA	In buffer area only
Commonwealth Land - [51599]	WA	In buffer area only
Commonwealth Land - [51592]	WA	In buffer area only
Commonwealth Land - [51593]	WA	In buffer area only
Commonwealth Land - [51553]	WA	In buffer area only
Commonwealth Land - [51554]	WA	In buffer area only
Commonwealth Land - [51555]	WA	In buffer area only
Commonwealth Land - [51556]	WA	In buffer area only
Commonwealth Land - [51577]	WA	In buffer area only
Commonwealth Land - [51552]	WA	In buffer area only
Commonwealth Land - [51565]	WA	In buffer area only
Commonwealth Land - [51557]	WA	In buffer area only
Commonwealth Land - [51560]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51558]	WA	In buffer area only
Commonwealth Land - [51561]	WA	In buffer area only
Commonwealth Land - [51559]	WA	In buffer area only
Commonwealth Land - [51562]	WA	In buffer area only
Commonwealth Land - [51563]	WA	In buffer area only
Commonwealth Land - [51601]	WA	In buffer area only
Commonwealth Land - [51569]	WA	In buffer area only
Commonwealth Land - [51568]	WA	In buffer area only
Commonwealth Land - [52131]	WA	In buffer area only
Commonwealth Land - [51579]	WA	In buffer area only
Commonwealth Land - [51578]	WA	In buffer area only
Commonwealth Land - [51587]	WA	In buffer area only
Commonwealth Land - [51573]	WA	In buffer area only
Commonwealth Land - [51939]	WA	In buffer area only
Commonwealth Land - [51572]	WA	In buffer area only
Commonwealth Land - [51564]	WA	In buffer area only
Commonwealth Land - [51567]	WA	In buffer area only
Commonwealth Land - [51575]	WA	In buffer area only
Commonwealth Land - [51428]	WA	In buffer area only
Commonwealth Land - [51566]	WA	In buffer area only
Commonwealth Land - [52220]	WA	In buffer area only
Commonwealth Land - [50975]	WA	In buffer area only
Commonwealth Land - [51571]	WA	In buffer area only
Commonwealth Land - [50974]	WA	In buffer area only
Commonwealth Land - [51586]	WA	In buffer area only
Commonwealth Land - [51585]	WA	In buffer area only
Commonwealth Land - [51584]	WA	In buffer area only

Commonwealth Land Name	State	Buffer Status
Commonwealth Land - [51600]	WA	In buffer area only
Commonwealth Land - [51570]	WA	In buffer area only
Commonwealth Land - [51581]	WA	In buffer area only
Commonwealth Land - [51580]	WA	In buffer area only
Commonwealth Land - [51594]	WA	In buffer area only
Commonwealth Land - [51595]	WA	In buffer area only
Commonwealth Land - [51596]	WA	In buffer area only
Commonwealth Land - [51597]	WA	In buffer area only
Commonwealth Land - [51590]	WA	In buffer area only
Commonwealth Land - [51591]	WA	In buffer area only
Commonwealth Land - [50990]	WA	In buffer area only
Commonwealth Land - [51393]	WA	In buffer area only
Commonwealth Land - [51582]	WA	In buffer area only
Commonwealth Land - [51934]	WA	In buffer area only
Commonwealth Land - [51588]	WA	In buffer area only
Commonwealth Land - [50977]	WA	In buffer area only
Commonwealth Land - [50976]	WA	In buffer area only
Commonwealth Land - [51589]	WA	In buffer area only
Commonwealth Land - [51576]	WA	In buffer area only

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus			
Common Noddy [825]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna pacifica as Puffinus pacificus Wedge-tailed Shearwater [84292]		Breeding known to occur within area	In buffer area only
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris subminuta Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In buffer area only
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat known to occur within area overfly marine area	In feature area
Chroicocephalus novaehollandiae as Larus novaehollandiae Silver Gull [82326]		Breeding known to occur within area	In buffer area only
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat known to occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area	In feature area
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area	In feature area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limnodromus semipalmatus Asian Dowitcher [843]		Species or species habitat may occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Breeding known to occur within area	In buffer area only
Onychoprion fuscatus as Sterna fuscata Sooty Tern [90682]		Breeding known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In buffer area only
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Phalaropus lobatus Red-necked Phalarope [838]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Sterna dougallii Roseate Tern [817]		Breeding likely to occur within area	In buffer area only
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Sternula nereis as Sterna nereis Fairy Tern [82949]		Breeding known to occur within area	In buffer area only
Stiltia isabella Australian Pratincole [818]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Thalasseus bergii as Sterna bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Tringa totanus](#) Common Redshank, Redshank [835]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Xenus cinereus](#) Terek Sandpiper [59300]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Fish			
[Bulbonaricus brauni](#) Braun's Pughead Pipefish, Pug-headed Pipefish [66189]		Species or species habitat may occur within area	In buffer area only
[Campichthys tricarinatus](#) Three-keel Pipefish [66192]		Species or species habitat may occur within area	In buffer area only
[Choeroichthys brachysoma](#) Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In buffer area only
[Choeroichthys suillus](#) Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus janssi](#) Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus negrosensis](#) Flagtail Pipefish, Masthead Island Pipefish [66213]		Species or species habitat may occur within area	In buffer area only
[Festucalex scalaris](#) Ladder Pipefish [66216]		Species or species habitat may occur within area	In buffer area only
[Filicampus tigris](#) Tiger Pipefish [66217]		Species or species habitat may occur within area	In buffer area only
[Halicampus brocki](#) Brock's Pipefish [66219]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In buffer area only
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area	In buffer area only
Halicampus spinirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In buffer area only
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area	In buffer area only
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In buffer area only
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In buffer area only
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In buffer area only
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In buffer area only
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area	In buffer area only
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In buffer area only
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In buffer area only
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area	In buffer area only
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area	In buffer area only
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In buffer area only
Trachyrhamphus longirostris Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In buffer area only
Mammal			
Dugong dugon Dugong [28]		Species or species habitat known to occur within area	In buffer area only
Reptile			
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area	In buffer area only
Aipysurus apraefrontalis Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area	In buffer area only
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aipysurus foliosquama Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area	In buffer area only
Aipysurus tenuis Brown-lined Seasnake [1121]		Species or species habitat may occur within area	In buffer area only
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Chitulia ornata as Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [87377]		Species or species habitat may occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area	In buffer area only
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area	In buffer area only
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area	In buffer area only
Ephalophis greyi North-western Mangrove Seasnake [1127]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only
Hydrelaps darwiniensis Black-ringed Seasnake [1100]		Species or species habitat may occur within area	In buffer area only
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area	In buffer area only
Hydrophis macdowelli as Hydrophis mcdowelli Small-headed Seasnake [75601]		Species or species habitat may occur within area	In buffer area only
Leioselasma czeblukovi as Hydrophis czeblukovi Fine-spined Seasnake, Geometrical Seasnake [87374]		Species or species habitat may occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area	In buffer area only

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Breeding known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In buffer area only
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops aduncus (Arafura/Timor Sea populations) Spotted Bottlenose Dolphin (Arafura/Timor Sea populations) [78900]		Species or species habitat known to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Habitat Critical to the Survival of Marine Turtles			
Scientific Name	Behaviour	Presence	Buffer Status
Aug - Sep			
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only
Dec - Jan			
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur	In buffer area only
Nov - May			

Scientific Name	Behaviour	Presence	Buffer Status
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Murujuga	National Park	WA	In buffer area only
Unnamed WA36907	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA36909	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA36910	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA36913	Nature Reserve	WA	In buffer area only
Unnamed WA36915	Nature Reserve	WA	In buffer area only
Unnamed WA38287	5(1)(h) Reserve	WA	In buffer area only
Unnamed WA40877	5(1)(h) Reserve	WA	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Ammonium Nitrate Project	2010/5423	Controlled Action	Completed	In buffer area only
Anketell Point Iron Ore Processing & Export Port	2009/5120	Controlled Action	Post-Approval	In buffer area only
Burrup North East Sand Mining Project	2008/4611	Controlled Action	Completed	In buffer area only
Cape Lambert Port B Development	2008/4032	Controlled Action	Post-Approval	In buffer area only
Construct and operate LNG & domestic gas plant including onshore and offshore facilities - Wheatstone	2008/4469	Controlled Action	Post-Approval	In buffer area only
Development of an iron ore mine and associated infrastructure	2010/5630	Controlled Action	Assessment Approach	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Development of Browse Basin Gas Fields (Upstream)	2008/4111	Controlled Action	Completed	In buffer area only
Duplication of the Dampier Highway Stages 2 & 6	2010/5419	Controlled Action	Post-Approval	In buffer area only
Eramurra Industrial Salt Project	2021/9027	Controlled Action	Assessment Approach	In buffer area only
Eramurra Industrial Salt Project, near Karratha, WA	2019/8448	Controlled Action	Completed	In buffer area only
North West Shelf Gas Venture Phase VI Expansion	2007/3436	Controlled Action	Referral Decision	In buffer area only
North West Shelf Project Extension, Carnarvon Basin, WA	2018/8335	Controlled Action	Assessment Approach	In buffer area only
Perdaman Urea Project, near Karratha, WA	2018/8383	Controlled Action	Post-Approval	In buffer area only
Pluto Gas Project	2005/2258	Controlled Action	Completed	In buffer area only
Pluto Gas Project Including Site B	2006/2968	Controlled Action	Post-Approval	In buffer area only
Proposed technical ammonium nitrate production facility	2008/4546	Controlled Action	Post-Approval	In buffer area only
Proposed West Pilbara Iron Ore Project	2009/4706	Controlled Action	Post-Approval	In buffer area only
site preparations	2005/2391	Controlled Action	Post-Approval	In buffer area only
Widening and resurfacing two principal roads servicing the Dampier Port Authori	2010/5677	Controlled Action	Completed	In buffer area only
Not controlled action				
Ammonia Plant	2001/199	Not Controlled Action	Completed	In buffer area only
Construction of Loadout Facility and Laydown Area	2002/598	Not Controlled Action	Completed	In buffer area only
Deep Gorge Boardwalk, Murujuga National Park, WA	2018/8283	Not Controlled Action	Completed	In buffer area only
Development of Industrial Land, Port of Dampier	2003/1293	Not Controlled Action	Completed	In buffer area only
Dimethyl ether plant	2001/509	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
King Bay East Rock Quarry & Industrial Estate Development	2003/1150	Not Controlled Action	Completed	In buffer area only
Methanol manufacturing	2001/528	Not Controlled Action	Completed	In buffer area only
Methanol plant	2001/521	Not Controlled Action	Completed	In buffer area only
Murujuga archaeological excavation, collection and sampling, Dampier Archipelago, WA	2014/7160	Not Controlled Action	Completed	In buffer area only
Pluto-North West Shelf Interconnector, Burrup Peninsula, WA	2018/8353	Not Controlled Action	Completed	In buffer area only
Port Expansion and Dredging	2003/1265	Not Controlled Action	Completed	In buffer area only
Roebourne Quarry	2017/7873	Not Controlled Action	Completed	In buffer area only
Stages 1 & 2 Port of Dampier Security Upgrade & Associated Works	2004/1751	Not Controlled Action	Completed	In buffer area only
Widening of MOF Road	2005/2305	Not Controlled Action	Completed	In buffer area only
Woodside Project Facilities Increase	2006/3191	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
2D Seismic Survey	2005/2146	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Algae Farm and Processing Facilities	2012/6596	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Ammonia Plant, Murujuga Burrup Peninsula - Renewable Hydrogen Project	2020/8739	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Dampier Marine Services Facility including 300m Wharf and Dredging Works	2009/5108	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
Diesel Fuel Bunker Operation	2012/6289	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Millstream 20GL Pipeline, Bungaroo, Borefield Integration	2012/6379	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
MOF Road Widening and Resurfacing Works	2011/5843	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Nickol Bay Quarry Eastern Extension Proposal, Burrup Peninsula, WA	2013/6915	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Reindeer gas reservior development, Devil Creek, Carnarvon Basin - WA	2007/3917	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Scarborough Development nearshore component, NWS, WA	2018/8362	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
The Dampier Heavy Load Out Facility Berth and Swing Basin Expansion	2012/6271	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
Referral decision				
construction of a new loadout facility and associated laydown area south of the	2002/579	Referral Decision	Completed	In buffer area only
Relocation of 2 heritage sites to National Heritage Place	2010/5709	Referral Decision	Completed	In buffer area only

Biologically Important Areas			
Scientific Name	Behaviour	Presence	Buffer Status
Marine Turtles			
Caretta caretta Loggerhead Turtle [1763]	Internesting buffer	Known to occur	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Nesting	Known to occur	In buffer area only

Scientific Name	Behaviour	Presence	Buffer Status
Chelonia mydas Green Turtle [1765]	Foraging	Known to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Foraging	Likely to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Internesting	Known to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Internesting buffer	Known to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Mating	Known to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Migration corridor	Known to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Likely to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Foraging	Known to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting	Known to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting buffer	Known to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Mating	Known to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Migration corridor	Known to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Foraging	Known to occur	In buffer area only

Scientific Name	Behaviour	Presence	Buffer Status
Natator depressus Flatback Turtle [59257]	Internesting	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Internesting buffer	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Mating	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Migration corridor	Known to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only
Seabirds			
Ardenna pacifica Wedge-tailed Shearwater [84292]	Breeding	Known to occur	In feature area
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur	In buffer area only
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur	In buffer area only
Whales			
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur	In buffer area only
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and 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

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

Where little information is available for a 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 detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

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 B Framework for significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (M)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australian and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

* CD and M are only related to significant fauna

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Specially protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threatened species (T)
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.

Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.

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

Category	Code	Description
Critically Endangered species	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. 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.
Endangered species	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. 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.

Category	Code	Description
Vulnerable species	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. 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.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild, as follows:

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

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting 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 species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

Categories are detailed below.

Category	Code	Description
Migratory species	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. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
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, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Other specially protected species	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). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Priority species (P)

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 fauna or flora.

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.

Category	Code	Definition
Priority 1	P1	*Poorly-known species* Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	*Poorly-known species* Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	*Poorly-known species* Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	P4	*Rare, Near Threatened and other species in need of monitoring* (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix C Likelihood of occurrence assessment criteria

Likelihood rating	Criteria
Recorded	The species has previously been recorded within survey area from DBCA database search results and/or from previous surveys of the survey area, and/or the species has been confirmed through a current vouchered specimen at WA Herbarium.
Likely	The species has not previously been recorded from within the survey area. However, (to qualify requires one or more criteria to be met): the species has been recorded in close proximity to the survey area, and occurs in similar habitat to that which occurs within the survey area core habitat and suitable landforms for the species occurs within the survey area either year-round or seasonally. In relation to fauna species, this could be that a host plant is seasonally present on site, or habitat features such as caves are present that may be used during particular times during its life cycle e.g. for breeding. In relation to both flora and fauna species, it may be there are seasonal wetlands present there is a medium to high probability that a species uses the survey area.
Potential	The species has not previously been recorded from within the survey area. However, (one or more criteria requires to be met): targeted surveys may locate the species based on records occurring in proximity to the survey area and suitable habitat occurring in the survey area the survey area has been assessed as having potentially suitable habitat through habitat modelling the species is known to be cryptic and may not have been detected despite extensive surveys the species is highly mobile and has an extensive foraging range so may not have been detected during previous surveys The species has been recorded in the survey area by a previous consultant survey or there is historic evidence of species occurrence within the survey area. However, (one or more criteria requires to be met): doubt remains over taxonomic identification, or the majority of habitat does not appear suitable (although presence cannot be ruled out due to factors such as species ecology or distribution) coordinates are doubtful.
Unlikely	The species has been recorded locally through DBCA database searches. However, it has not been recorded within the survey area and it is unlikely to occur due to the site lacking critical habitat, having at best marginally suitable habitat, and/or being severely degraded it is unlikely to occur due to few historic record/s and no other current collections in the local area. The species has been recorded within the bioregion based on literature review but has not been recorded locally or within the survey area through DBCA database searches. The species has not been recorded in the survey area despite adequate survey efforts, such as a standardised methodology or targeted searching within potentially suitable habitat.

Likelihood rating	Criteria
Does not occur (one or more criteria requires to be met).	The species is not known to occur within the IBRA bioregion based on current literature and distribution. The conspicuous species has not been recorded in the survey area despite adequate survey efforts at an appropriate time of year to detect the species within potentially suitable habitat. The survey area lacks important habitat for a species that has highly selective habitat requirements. The species has been historically recorded within survey area or locally; however, it is considered locally extinct due to significant habitat changes such as land clearing and/or introduced predators.

Appendix D Flora likelihood of occurrence assessment

Species	Conservation status		Source	Description	Habitat	Likelihood Rating	
	EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Gomphrena axillaris R.W.Davis & J.Palmer	-	P1	DBCA 2022b	Only known from two specimens in WA.	Low red sand dune. Red/brown sand.	**Unlikely** Only known from two specimens in WA, and only one record within 40km (5km north-west from 2006).	**Unlikely** No suitable habitat occurs within the combined survey area.
Goodenia pallida	-	P1	DBCA 2022b	Erect herb, to 0.5 m high. Fl. purple, Aug.	Red soils.	**Unlikely** Only one record within 40km (30km west from 1970).	**Unlikely** No suitable habitat occurs within the combined survey area.
Tephrosia rosea var. Port Hedland (A.S. George 1114)	-	P1	DBCA 2022b	Semi-protrate shrub 45 cm high.	Sand dune. Red brown sand.	**Unlikely** Two records 35km north-east, along the coast near Point Samson (from 2007 and 2012).	**Unlikely** No suitable habitat occurs within the combined survey area.
Trianthema sp. Python Pool (G.R. Guerin & M.E. Trudgen GG 1023)	-	P2	DBCA 2022b	Only known from six specimens in WA.	Plain. Brown sand.	**Unlikely** Only one record within 40km (18km south from 2004), species only known from Millstream National Park.	**Unlikely** No suitable habitat occurs within the combined survey area.
Atriplex lindleyi subsp. *conduplicata*	-	P3	DBCA 2022b	Monoecious, short-lived annual or perennial, herb, ca 0.2 m high.	Crabhole plains.	**Unlikely** Only one record within 40km (22km south-west from 1996).	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Conservation status		Source	Description	Habitat	Likelihood Rating	
	EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	-	P3	DBCA 2022b	Herb, 0.1 m high.	Claypan. Red-brown sandy clay.	**Potential** Three records within 40km, with the closest 1km north-east in a floodplain (from 2004).	**Potential** Suitable habitat present within the combined survey area. Species detection dependent on the presence of flowers. Only 6 of the 32 records on Florabase were collected in flower, namely from May and early June. Therefore this species may not have been in flower during the field survey.
Eragrostis surreyana	-	P3	DBCA 2022b	Grass 5 cm high.	Red-brown sandy clay.	**Unlikely** Three records within 40km are known from the Burrup Peninsula, 25km north.	**Unlikely** No suitable habitat occurs within the combined survey area.
Eriochloa fatmensis	-	P3	DBCA 2022b	Only known from three specimens in WA.	Banks of the Fitzroy River.	**Unlikely** Only one record within 40km (38km south-east from 1981).	**Unlikely** No suitable habitat occurs within the combined survey area.
Glycine falcata	-	P3	DBCA 2022b	Mat-forming perennial, herb, to 0.2 m high. Fl. blue-purple, May or Jul.	Black clayey sand. Along drainage depressions in crabhole plains on river floodplains.	**Unlikely** Only one record within 40km (25km south from 2011).	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Conservation status		Source	Description	Habitat	Likelihood Rating	
	EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Gomphrena cucullata	-	P3	DBCA 2022b	Spreading or erect annual, herb, to 0.25 m high. Fl. white/pink/purple, Feb or May.	Red sandy loam, clayey sand. Open floodplains.	**Unlikely** Only two records within 40km (20km south-west and south-east from 2004 and 2012).	**Unlikely** No suitable habitat occurs within the combined survey area.
Gomphrena leptophylla	-	P3	DBCA 2022b	Prostrate or erect to spreading annual, herb, to 0.15 m high. Fl. white, Mar to Sep.	Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	**Unlikely** Only one record within 40km (20km south-west from 2004).	**Unlikely** No suitable habitat occurs within the combined survey area.
Gymnanthera cunninghamii	-	P3	DBCA 2022b	Erect shrub, 1-2 m high. Fl. cream-yellow-green, Jan to Dec.	Sandy soil.	**Unlikely** A total of five records within 40km, >25km north from the Dampier Archipelago.	**Unlikely** No suitable habitat occurs within the combined survey area.
Solanum albostellatum	-	P3	DBCA 2022b	Low shrub to 15 cm, purple flowers.	Flat, gravel.	**Unlikely** Only one record within 40km (25km south from 2011), species mainly known from Millstream National Park.	**Unlikely** No suitable habitat occurs within the combined survey area.
Stackhousia clementii	-	P3	DBCA 2022b, ALA 2022	Dense broom-like perennial, herb, to 0.45 m high. Fl. green/yellow/brown.	Skeletal soils. Sandstone hills.	**Unlikely** A total of four records within 40km, mainly from >15km north from the Burrup Peninsula. One record 7km north from 2013.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Conservation status		Source	Description	Habitat	Likelihood Rating	
	EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Terminalia supranitifolia	-	P3	DBCA 2022b, ALA 2022	Spreading, tangled shrub or tree, 1.5-3 m high. Fl. green-yellow, May or Jul or Dec.	Sand. Among basalt rocks.	**Potential** A total of 36 records within 40km, mainly from >15km north from the Burrup Peninsula. One record 300m north-east in rock piles (from 1982).	**Unlikely** No suitable habitat occurs within the combined survey area. This species is conspicuous and would have been detected during the field survey if present.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	-	P3	DBCA 2022b	Tussocky perennial, grass-like or herb, 0.9-1.8 m high. Fl. Aug.	Red clay. Clay pan, grass plain.	**Unlikely** Only two records within 40km (7km north from 1992 and 20km south-east from 2007).	**Unlikely** No suitable habitat occurs within the combined survey area.
Vigna triodiophila	-	P3	DBCA 2022b	Fine, sprawling herb with yellow flowers.	Stony red-brown clay loam.	**Unlikely** A total of 14 records within 40km, mainly from >15km north from the Burrup Peninsula.	**Unlikely** No suitable habitat occurs within the combined survey area.
Rhynchosia bungarensis	-	P3	DBCA 2022b, ALA 2022	Compact, prostrate shrub, to 0.5 m high. Fl. yellow.	Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	**Potential** A total of 37 records within 40km, mainly from >15km north from the Burrup Peninsula. One record 300m north-east in crevices in rock piles (from 1983).	**Unlikely** No suitable habitat occurs within the combined survey area. This species is conspicuous and would have been detected during the field survey if present.

Appendix E Fauna likelihood of occurrence assessment

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Calidris ferruginea	Curlew Sandpiper	CR, MI	CR	DAWE 2022b, DBCA 2022c	Widespread. Within Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in small numbers.	The Curlew Sandpiper does not breed in Australia. 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. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they sometimes forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Curlew sandpipers roost in open situations with damp substrate, especially on bare 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 saltmarsh.	**Unlikely** A total of 27 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Numenius madagascariensis	Eastern Curlew	CR, MI	CR	DAWE 2022b, DBCA 2022c	Widespread. Within Australia, Eastern Curlew primarily has a coastal distribution.	The Eastern Curlew does not breed in Australia. The eastern curlew mainly forages during the non-breeding season on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The birds are rarely seen on near-coastal lakes or in grassy areas. The eastern curlew roosts during high tide periods on sandy spits, sandbars and islets, especially on beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves.	**Unlikely** A total of 89 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Pezoporus occidentalis	Night Parrot	EN	CR	DAWE 2022b	The current distribution of the night parrot is not known. Historic records and observations are scanty and anecdotal with few substantiated	Most habitat records are of Triodia (Spinifex) grasslands and/or chenopod shrublands in the arid and semi-arid zones, and Astrebla spp. (Mitchell grass), shrubby samphire and chenopod associations, scattered trees and shrubs, Acacia aneura (Mulga)	**Unlikely** No previous records within 40km of the combined survey area. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					records since 1935. There are accepted historical records from remote arid and semi-arid inland regions of Western Australia, Northern Territory, South Australia and Queensland. It is possible that the night parrot may continue to occur throughout much of this range.	woodland, treeless areas and bare gibber. Roosting and nesting sites are consistently reported as within clumps of dense vegetation, primarily old and large Spinifex clumps, but sometimes other vegetation types.		
Lerista nevinae	Nevin's Slider	EN	EN	DAWE 2022b, DBCA 2022c	It is known to occur on an estimated 18km length of coastal dune between Pope's Nose Creek, near Point Samson, and the southwest corner of Dixon Hedland.	No habitat information available.	**Unlikely** A total of 77 previous records all from Point Samson, over 25km north-east of the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Rostratula australis	Australian Painted Snipe	EN	EN	DAWE 2022b	Widespread. The Australian Painted Snipe has been recorded at wetlands in all states and	The Australian painted snipe occurs in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, claypans, inundated	**Unlikely** No previous records within 40km of the combined survey area. No suitable habitat present	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					territories and is most common in eastern Australia.	or waterlogged grassland/saltmarsh, dams, rice crops, sewage farms and bore drains, generally with a good cover of grasses, rushes and reeds, low scrub, Muehlenbeckia spp. (lignum), open timber or samphire.	within the combined survey area.	
Dasyurus hallucatus	Northern Quoll	EN	EN	DAWE 2022b, DBCA 2022c	In the Pilbara, the distributional boundaries of Northern Quoll are defined in the north, east and south by the Great Sandy Desert, Gibson Desert and Little Sandy Deserts. Records from the Pilbara bioregion are scattered across the four subregions; namely the Hamersley, Fortescue Plains, Chichester and Roebourne Plains subregions. The majority of recent records however have come from the	The Northern Quoll occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. Northern Quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Rocky habitats are usually of high relief, often rugged and dissected but can also include tor fields or caves in low lying areas such as in Western Australia.	**Likely** A total of 434 previous records occur within 40km of the combined survey area (mainly from the Burrup Peninsula), including 36 records within 3km. One of these records is 12m from the combined survey area, however this record and the remaining 35 records aforementioned were from remote cameras on Mount Regal (from 2014/2015), which occurs 500m south-west of the combined survey area. Mount Regal occurs within the Rocklea land system which this	**Potential** Foraging habitat for this species has the potential to occur in the combined survey area, therefore cannot be discounted as potentially occurring.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					Rocklea, Macroy and Robe land systems.		species prefers, but the combined survey area lies within majority Horseflat land system. This species may utilise the low lying combined survey area as foraging and dispersal habitat therefore is Likely to occur.	
Charadrius leschenaultii	Greater Sand Plover	VU, MI	MI	DAWE 2022b, DBCA 2022c	In Western Australia, this species is especially widespread between North West Cape and Roebuck Bay and also occasionally recorded along the coast of southern Western Australia.	The Greater Sand Plover does not breed in Australia. 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. Greater sand plovers usually feed from the surface of wet sand or mud on open intertidal flats of	**Unlikely** A total of 80 previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
						sheltered embayments, lagoons or estuaries. Greater sand plovers usually roost on sand-spits and banks on beaches or in tidal lagoons, and occasionally on rocky points or in adjacent areas of saltmarsh or claypans.	combined survey area.	
Falco hypoleucos	Grey Falcon	VU	VU	DAWE 2022b	Widespread. The distribution of this species is restricted largely to areas of the highest annual average temperatures where there is an average annual rainfall of less than 500 mm.	The Grey Falcon favours lightly timbered and untimbered lowland plains that are crossed by tree-lined watercourses, but frequents other habitats including grassland and sand dune habitats. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter.	**Unlikely** No previous records within 40km of the combined survey area. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Liasis olivaceus barroni	Olive Python (Pilbara subspecies)	VU	VU	DAWE 2022b, DBCA 2022c	The Olive Python (Pilbara subspecies) is restricted to ranges within the Pilbara region, north-western Western Australia, such as the Hamersley Range, and islands of the Dampier Archipelago. It is	The Olive Python (Pilbara subspecies) prefers escarpments, gorges and water holes in the ranges of the Pilbara region.	**Unlikely** A total of 26 previous records occur from the Burrup Peninsula and Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					known to occur at 17 locations within the Pilbara. Four populations occur at Pannawonica, Millstream, Tom Price and Burrup Peninsula			
Macroderma gigas	Ghost Bat	VU	VU	DAWE 2022b, DBCA 2022c	The species' current range is discontinuous, with geographically disjunct colonies occurring in the Pilbara, Kimberley (including several islands), northern Northern Territory, the Gulf of Carpentaria, coastal and near coastal eastern Queensland from Cape York to near Rockhampton, and western Queensland.	They currently occupy habitats ranging from the arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. Roost sites used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C and a moderate to high relative humidity of 50–100 percent. This species generally forages within 1-2km of the roost site, with most of the prey comprising large invertebrates, bats, birds, reptiles and frogs.	**Unlikely** A total of nine previous records within 40km of the combined survey area. These records occur 30km south-west and east and 20km north along the coast, mainly recorded along rivers. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Macrotis lagotis	Greater Bilby	VU	VU	DAWE 2022b	The Gibson Desert, Little Sandy Desert, Great Sandy Desert and parts of the Pilbara and	The remaining populations of the greater bilby occupy three main habitats: open tussock grassland on uplands and hills, Acacia aneura (mulga)	**Unlikely** No previous records within 40km of the combined survey area. No suitable	**Unlikely** No suitable habitat occurs within the

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					Southern Kimberley.	woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas.	habitat present within the combined survey area.	combined survey area.
Rhinonicteris aurantia (Pilbara form)	Pilbara Leaf-nosed Bat	VU	VU	DAWE 2022b, DBCA 2022c	*Rhinonicteris aurantia* is endemic to Australia, and ranges throughout the Pilbara and Kimberley regions of Western Australia, the Top End of the Northern Territory, and parts of several bioregions across the Gulf of Carpentaria in the Northern Territory and western Queensland.	The Pilbara Leaf-nosed Bat roosts during the day in caves and mine adits (horizontal tunnels) with stable, warm and humid microclimates because of its poor ability to maintain its heat and water balance.	**Unlikely** Two historical (1985) records occur 15km south-west of the combined survey area. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Sternula nereis nereis	Australian Fairy Tern	VU	VU	DAWE 2022b, DBCA 2022c	Within Australia, the Fairy Tern occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia; occurring as far north as the Dampier	The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation.	**Unlikely** A total of 39 previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					Archipelago near Karratha.			
Actitis hypoleucos	Common Sandpiper	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	Widespread. Found along all coastlines of Australia and in many areas inland, the Common Sandpiper is widespread in small numbers.	The Common Sandpiper does not breed in Australia. 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. 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. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves.	**Unlikely** A total of 69 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Gap Ridge WWTP or Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Anous stolidus	Common Noddy	MI	MI	DAWE 2022b, DBCA 2022c	Widespread throughout the tropical regions of the Indian, Pacific and Atlantic Oceans.	The Common Noddy usually occurs out to sea during the non-breeding season, but when breeding it usually stays near islands.	**Unlikely** All previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
							combined survey area.	
Apus pacificus	Fork-tailed Swift	MI	MI	DAWE 2022b, DBCA 2022c	Widespread. The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. In Western Australia, there are sparsely scattered records of the Fork-tailed Swift along the south coast, ranging from near the Eyre Bird Observatory and west to Denmark.	The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. This species is known to be insectivorous.	**Potential** Potentially suitable habitat present and species utilises a variety of habitats.	**Potential** This species could potentially forage on insects above the combined survey area, therefore cannot be discounted as potentially occurring.
Ardenna pacifica	Wedge-tailed Shearwater	MI	MI	DAWE 2022b, DBCA 2022c	In the Pacific Ocean, the Wedge-tailed Shearwater occurs in an area similar to its breeding range.	The Wedge-tailed Shearwater breeds on the east and west coasts of Australia and on off-shore islands.	**Unlikely** All previous records occur from the Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Arenaria interpres	Ruddy Turnstone	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	In Australia, Ruddy Turnstones are widespread around the coast of the mainland and off-shore islands.	The Ruddy Turnstone is found singly or in small groups along the coastline and only occasionally inland. They are mainly found on exposed rocks or reefs, often with shallow pools, and on beaches. In the north, they are found in a wider range of habitats, including mudflats.	**Unlikely** A total of 128 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Gap Ridge WWTP or Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Calidris acuminata	Sharp-tailed Sandpiper	MI	MI	DAWE 2022b, DBCA 2022c	In Western Australia, 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	The Sharp-tailed Sandpiper does not breed in Australia. In Australia, the species prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. Roosting occurs at the edges of wetlands, on wet open mud or sand, in shallow water, or in short	**Unlikely** A total of 41 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Gap Ridge WWTP or Dampier salt ponds. No suitable habitat present	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					south-west and east Kimberley Division.	sparse vegetation, such as grass or saltmarsh.	within the combined survey area.	
Calidris alba	Sanderling	MI	MI	DAWE 2022b, DBCA 2022c	Sanderlings are found very widely along Australian coastlines.	Sanderlings are found on open sandy beaches at the edge of the waves, on sandbars and spits. They roost on bare sand in the dunes or behind piles of kelp.	**Unlikely** A total of 11 previous records ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Calidris canutus	Red Knot	MI	MI	DAWE 2022b, DBCA 2022c	Red Knots are widespread around the Australian coast, less in the south and with few inland records.	Red Knots gather in large flocks on the coast in sandy estuaries with tidal mudflats.	**Unlikely** A total of 10 previous records ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Calidris melanotos	Pectoral Sandpiper	MI	MI	DAWE 2022b	In Western Australia, the species is rarely recorded, however has been observed in the Pilbara.	The Pectoral Sandpiper does not breed in Australia. In Australia, the species prefers shallow fresh to saline wetlands, coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands,	**Unlikely** No previous records within 40km of the combined survey area. No suitable habitat present	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
						saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. The species is omnivorous, consuming algae, seeds, crustaceans, arachnids and insects.	within the combined survey area.	
Calidris ruficollis	Red-necked stint	MI	MI	DAWE 2022b, DBCA 2022c	The Red-necked Stint has been recorded in all coastal regions, and found inland in all states when conditions are suitable.	Coastal areas, including sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores.	**Unlikely** A total of 37 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Calidris subminuta	Long-toed Stint	MI	MI	DAWE 2022b, DBCA 2022c	In Western Australia the Long-toed Stint is found mainly along the coast, with a few scattered inland records.	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	**Unlikely** A total of 11 previous records ~5km north from the Gap Ridge WWTP or Dampier salt ponds. No suitable habitat	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
						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	present within the combined survey area.	
Calidris tenuirostris	Great Knot	MI	MI	DAWE 2022b, DBCA 2022c	Great Knots occur around coastal areas in many parts of Australia during the southern summer.	In Australia, Great Knots inhabit intertidal mudflats and sandflats in sheltered coasts, including bays harbours and estuaries. They forage on the moist mud, and they often roost on beaches or in nearby low vegetation, such as mangroves or dune vegetation.	**Unlikely** A total of 39 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	MI	MI	DAWE 2022b, DBCA 2022c	Within Australia, the Lesser Sand-Plover is widespread in coastal regions, and has been recorded in all states.	In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments.	**Unlikely** A total of 30 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
							the Dampier salt ponds. No suitable habitat present within the combined survey area.	
Charadrius veredus	Oriental Plover	MI	MI	DAWE 2022b, DBCA 2022c	The species occurs in both coastal and inland areas, mostly in northern Australia. Most records are along the north-western coast, between Exmouth Gulf and Derby in Western Australia, and there are records at a few scattered sites elsewhere.	The Oriental Plover does not breed in Australia. The species spends 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. Oriental Plovers usually forage among short grass or on hard stony bare ground, but also on mudflats or among beachcast seaweed on beaches. Oriental Plovers sometimes roost on soft wet mud or in shallow water of beaches and tidal mudflats, and also occasionally in dry, open habitats, such as saltmarsh or paddocks.	**Unlikely** A total of seven previous records ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Chlidonias leucopterus	White-winged black tern, white-winged tern	MI	MI	DBCA 2022c	In Western Australia, the species is widespread on the southern west	In Australia, and elsewhere in their non-breeding range, the species mostly inhabits fresh, brackish or saline, and coastal or subcoastal wetlands. White-	**Unlikely** A total of 10 previous records ~5km north from the Dampier salt ponds. No suitable	**Unlikely** No suitable habitat occurs within the

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					coast, 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.	winged Black Terns frequent tidal wetlands, such as harbours, bays, estuaries and lagoons, and their associated tidal sandflats and mudflats.	habitat present within the combined survey area.	combined survey area.
Cuculus optatus	Oriental Cuckoo	MI	MI	DBCA 2022c	This species is a vagrant to northern Australia.	The Oriental Cuckoo is found in forest canopy, open wooded areas.	**Unlikely** Two hisorical (1977) records occur off the coast of the Burrup Peninsula. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Fregata ariel	Lesser frigatebird	MI	MI	DAWE 2022b, DBCA 2022c	The lesser frigatebird is said to be the most common and widespread frigatebird in Australian seas.	Breeding seems to occur between May and December in the Australian region. They nest in trees on Christmas Island.	**Unlikely** A total of 42 previous records within 40km of the combined survey area, with majority of records occurring north from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Gallinago stenura	Pin-tailed Snipe	MI	MI	DBCA 2022c	The species distribution within Australia is not well understood.	During non-breeding period 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.	**Unlikely** Two hisorical (1979) records occur 15km south-west of the combined survey area. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Gelochelidon nilotica	Gull-billed Tern	MI	MI	DBCA 2022c, ALA 2022	The Gull-billed Tern occurs on all continents except Antarctica.	Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands. They are only rarely found over the ocean. The diet of the Gull-billed Tern is extremely varied, consisting mainly of small fish, reptiles, amphibians, crustaceans, small mammals, insects and their larvae.	**Unlikely** A total of 22 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Glareola maldivarum	Oriental Pratincole	MI	MI	DAWE 2022b, DBCA 2022c	Within Australia the Oriental Pratincole is widespread in northern areas, especially along the coasts of the Pilbara Region and the	The Oriental Pratincole does not breed in Australia. The species inhabits open plains, floodplains or short grassland, often with extensive bare areas. Often occur near terrestrial wetlands, such as	**Potential** A total of 16 previous records occur within 40km of the combined survey area, with majority of records within 10km.	**Potential** Suitable habitat present within the combined survey area including extensive bare

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					Kimberley Division in Western Australia, the Top End of the Northern Territory, and parts of the Gulf of Carpentaria.	billabongs, lakes or creeks, and artificial wetlands such as reservoirs, saltworks and sewage farms, especially around the margins.	The closest records are ~5km north from the Gap Ridge WWTP. Potentially suitable habitat present.	areas and short grassland near terrestrial wetlands, therefore cannot be discounted as potentially occurring.
Hirundo rustica	Barn Swallow	MI	MI	DAWE 2022b, DBCA 2022c	The Barn Swallow usually occurs in northern Australia , and patchily along the north coast of the mainland from the Pilbara region, Western Australia.	Open country in coastal lowlands, often near water, towns and cities, also in or over freshwater wetlands, paperbark Melaleuca woodland , mesophyll shrub thickets and tussock grassland.	**Unlikely** A total of four previous records ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely**No suitable habitat occurs within the combined survey area.
Hydroprogne caspia	Caspian Tern	MI	MI	DAWE 2022b, DBCA 2022c	Widespread. Within WA, Caspian Tern is widespread in coastal regions, from the Great Australian Bight to the Dampier Peninsula. There are sparse records on the coasts east of King Sound and in eastern regions	This species 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 lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks.	**Unlikely** A total of 258 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Limicola falcinellus	Broad-billed sandpiper	MI	MI	DAWE 2022b, DBCA 2022c	In Australia it is distributed over the northern coasts, particulary the north west, with occasional birds seen on the southern coasts and very occasionally inland.	Whilst in Australia, Broad-billed Sandpipers are most commonly seen feeding and roosting in estuarine mudflats, saltmarshes, and reefs. Individuals have occasionally been recorded at sewage farms and freshwater lagoons. The intertidal mudflats along the north coast are preferred, particularly areas of soft mud on the seaward side of mangroves.	**Unlikely** A total of five previous records ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Limosa lapponica	Bar-tailed godwit	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	In Western Australia it is widespread around the coast, from Eyre to Derby, with a few scattered records elsewhere in the Kimberley Division.	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	**Unlikely** A total of 134 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
						recorded in paddocks at some locations overseas.		
Limosa limosa	Black-tailed godwit	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	The Black-tailed Godwit is found in all states and territories of Australia, however, it prefers coastal regions and the largest populations are found on the north coast between Darwin and Weipa. It is generally found in small numbers elsewhere and there are scattered inland records.	The Black-tailed Godwit does not breed in Australia. 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.	**Unlikely** Four previous records occur north-east along the coast. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Numenius minutus	Little curlew, little whimbrel	MI	MI	DBCA 2022c	Little Curlews generally spend the non-breeding season in northern Australia from Port Hedland in Western Australia to the Queensland coast.	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. 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.	**Unlikely** A total of 17 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Numenius phaeopus	Whimbrel	MI	MI	DAWE 2022b, DBCA 2022c	The Whimbrel is a regular migrant to Australia and New Zealand, with a primarily coastal distribution.	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. The Whimbrel generally forages on intertidal mudflats, along the muddy banks of estuaries	**Unlikely** A total of 147 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
						and in coastal lagoons, either in open unvegetated areas or among mangroves.	the Dampier salt ponds. No suitable habitat present within the combined survey area.	
Motacilla cinerea	Grey Wagtail	MI	MI	DAWE 2022b	This species is a vagrant to northern Australia.	This species inhabits fast-flowing mountain streams and rivers with riffles and exposed rocks or shoals, often in forested areas. It is also found in more lowland watercourses, even canals, where there are artificial waterfalls, weirs, millraces or lock gates. Outside of the breeding season it occupies a wider variety of habitats, including farmyards, sewage farms, forest tracks, tea estates and even town centres.	**Unlikely** No previous records within 40km of the combined survey area. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Motacilla flava	Yellow Wagtail	MI	MI	DAWE 2022b	This species is a vagrant to northern Australia.	Inhabits fast-flowing mountain streams and rivers with riffles and exposed rocks or shoals, often in forested areas. It is also found in more lowland watercourses where there are artificial waterfalls, weirs, millraces or lock gates.	**Unlikely** No previous records within 40km of the combined survey area. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Oceanites oceanicus	Wilson's storm-petrel	MI	MI	DBCA 2022c	In Australia, most reports of the Wilson's Storm-Petrel are from the edge of the continental shelf and during autumn. The species is known to breed on Heard Island.	Wilson's Storm-Petrel spends much of its life at sea	**Unlikely** A total of 11 previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Onychoprion anaethetus	Bridled tern	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	In 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.	Bridled Terns occupy tropical and subtropical seas, breeding on islands, including vegetated coral cays, rocky continental islands and rock stacks. Bridled Terns 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 Western Australia.	**Unlikely** A total of 67 previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Pandion haliaetus	Osprey	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	The breeding range of the Eastern Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in NSW.	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 water for foraging.	**Unlikely** A total of 377 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Plegadis falcinellus	Glossy ibis	MI	MI	DBCA 2022c	Within Australia, the Glossy Ibis is generally located east of the Kimberley in Western Australia and Eyre Peninsula in South Australia.	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.	**Unlikely** A total of five previous records ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Pluvialis fulva	Pacific golden plover	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	Within Australia, the Pacific Golden Plover is widespread in coastal regions, though there are also a number of inland records (in all states).	The Pacific Golden Plover does not breed in Australia. 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 sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks.	**Unlikely** A total of 12 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Pluvialis squatarola	Grey plover	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	The Grey Plover breeds around the Arctic regions and migrates to the southern hemisphere, being a regular summer migrant to Australia, mostly to the west and south coasts.	The Grey Plover is almost entirely coastal, being found mainly on marine shores, inlets, estuaries and lagoons with large tidal mudflats or sandflats for feeding, sandy beaches for roosting, and also on rocky coasts.	**Unlikely** A total of 37 previous records occur within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
							within the combined survey area.	
Sterna dougallii	Roseate tern	MI	MI	DAWE 2022b, DBCA 2022c	In Australia, the subspecies gracillis occurs on much of the west, north and north-east coasts, from south-west Western Australia to south-east Queensland.	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.	**Unlikely** A total of 31 previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Sterna hirundo	Common tern	MI	MI	DBCA 2022c	In northern Australia, there are only scattered records in the Kimberley Division of Western Australia, but the species has recently been found to be one of the most abundant species recorded in ground surveys of waterbirds of the	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.	**Unlikely** A total of 11 previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					Top End of the Northern Territory, including Groote Eylandt, and is also widespread in the Gulf of Carpentaria and along western Cape York Peninsula.			
Sternula albifrons	Little tern	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	A northern subpopulation breeds across northern Australia, from about Broome in north-western Western Australia.	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.	**Unlikely** A total of 13 previous records ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Sula leucogaster	Brown booby	MI	MI	DBCA 2022c, ALA 2022	In Australia, the Brown Booby is found from Bedout Island in Western Australia.	The Brown Booby uses both marine and terrestrial habitat. The species occurs in, but is not restricted to, tropical waters of all major oceans, often staying close to breeding islands. The species is known to approach mainland coastlines more than other boobies and has been recorded in coastal waters, harbours and estuaries and near offshore islands but seldom flying over land.	**Unlikely** A total of 12 previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Thalasseus bergii	Crested tern	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	There are few stretches of the Australian coastline where the Crested Tern cannot be seen.	Though the Crested Tern is usually a strictly coastal species, there are occasional records in the arid interior of Australia, where birds were possibly blown by passing tropical cyclones.	**Unlikely** A total of 103 previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Tringa glareola	Wood sandpiper	MI	MI	DAWE 2022b, DBCA 2022c	The Wood Sandpiper has its largest numbers recorded in north-west Australia, with all areas of national importance located in Western-Australia.	Well-vegetated, shallow, freshwater wetlands, such as swamps, 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. The Wood Sandpiper forages on moist or dry mud at the edges of	**Unlikely** A total of 35 previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
						wetlands, either along shores, among open scattered aquatic vegetation, or in clear shallow water.		
Tringa nebularia	Common Greenshank	MI	MI	DAWE 2022b, DBCA 2022c	It occurs around most of the coast from Cape Arid in the south to Carnarvon in the north-west.	The Common Greenshank does not breed in Australia. The species 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. The species is known to forage at edges of wetlands, in soft mud on mudflats, in channels, or in shallows around the edges of water. The Common Greenshank roosts and loafs round wetlands, in shallow pools and puddles, or slightly elevated on rocks, sandbanks or small muddy islets.	**Unlikely** A total of 125 previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Tringa stagnatilis	Marsh sandpiper, little greenshank	MI	MI	DAWE 2022b, DBCA 2022c	In Western Australia they are mainly found around the coast. A few visit New Zealand. The Marsh Sandpiper is also recorded on Lord Howe Island, Norfolk Island, Chatham Island and Christmas Island	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. The Marsh Sandpiper usually forages in shallow water at the edge of wetlands. They probe wet mud of mudflats or feed among marshy vegetation. The Marsh Sandpiper has been recorded roosting or loafing on tidal mudflats, near low saltmarsh, and around inland swamps.	**Unlikely** A total of 38 previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Xenus cinereus	Terek sandpiper	MI	MI	DAWE 2022b, DBCA 2022c, ALA 2022	In Australia, the Terek Sandpiper has a primarily coastal distribution, with occasional records inland. It is more widespread and common in northern and eastern Australia than southern Australia.	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons.	**Unlikely** A total of 23 previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
							combined survey area.	
Tringa brevipes	Grey-tailed tattler	MI	P4	DAWE 2022b, DBCA 2022c	There are a few scattered records for the species along the south coast near the Eyre Bird Observatory, Point Malcolm, Rossiter Bay, Shark Lake Nature Reserve and surrounding swampland.	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.	**Unlikely** A total of 174 previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Falco peregrinus	Peregrine falcon	-	OS	DAWE 2022b, DBCA 2022c	The Peregrine Falcon is found across Australia, but is not common anywhere.	Peregrine falcons prefer open habitats, such as grasslands, tundra, and meadows. They are most common in tundra and coastal areas and rare in sub-tropical and tropical habitats. They nest on cliff faces and crevices. They have recently begun to colonize urban areas	**Unlikely** A total of nine previous records within 40km of the combined survey area, with majority of records occurring north along the coast. The closest records	**Unlikely** No suitable habitat occurs within the combined survey area.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
						because tall buildings are suitable for nesting in this species, and because of the abundance of pigeons as prey items.	are ~5km north from the Dampier salt ponds. No suitable habitat present within the combined survey area.	
Lerista quadrivincula	Four-lined slider (Karratha)	-	P1	DBCA 2022c	Only known from a couple of records near Karratha.	No habitat information available.	**Unlikely** This species is only known from a couple of historical (1980) records, 25km south of the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Mormopterus cobourgianus	North-western Free-tailed bat	-	P1	DBCA 2022c	North Western Freetail Bats appear to be restricted to mangroves and adjoining areas.	North Western Freetail Bats roost in small spouts and crevices in dead branches of mangrove trees.	**Unlikely** A total of 19 records within 40km of the combined survey area. The records mainly occur near Point Samson and the Burrup Peninsula. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Ctenotus angusticeps	Airlie Island Ctenotus, Northwestern coastal Ctenotus	-	P3	DBCA 2022c	The Airlie Island Ctenotus is known from approximately 12 locations in	On the mainland, the Airlie Island Ctenotus generally inhabits the landward fringe of salt marsh communities in	**Unlikely** Six previous records occur 15km north-east of the combined	**Unlikely** No suitable habitat occurs within the

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
					north-west WA, including Karratha.	samphire shrubland or marine couch grassland in the intertidal zone.	survey area, from Mount Anketell. No suitable habitat present within the combined survey area.	combined survey area.
Hydromys chrysogaster	Water-rat, rakali	-	P4	DBCA 2022c	The species is broadly expected to occur through much of the south-west. It is also found in all other Australian states and territories, as well as Papua New Guinea and Indonesian West Papua.	Lives in burrows on low banks of rivers, lakes, wetlands, estuaries and even along the coast. Intact riparian vegetation and associated bank stability is critical to their survival. They have a home range of around 1–4 km of waterways.	**Unlikely** Six previous records occur from the Burrup Peninsula or Dampier Archipelago. No suitable habitat present within the combined survey area.	**Unlikely** No suitable habitat occurs within the combined survey area.
Leggadina lakedownensis	Northern short-tailed mouse, Lakeland Downs mouse, kerakenga	-	P4	DBCA 2022c	The Lakeland Down's short-tailed mouse occurs across northern Australia, from Cape York to the Pilbara (Western Australia), with one population on Thevenard Island (Western Australia).	Known to occur on sandy soils and cracking clays in Western Australia.	**Potential** A total of 16 previous records occur within 40km of the combined survey area. The closest records are ~5km north from near the Dampier salt ponds. Potentially suitable habitat present.	**Potential** Suitable habitat present within the combined survey area including sandy soils, therefore cannot be discounted as potentially occurring.

Species	Common name	Conservation status		Source	Distribution	Habitat (breeding, foraging, roosting)	Likelihood Rating	
		EPBC Act	BC Act / DBCA				Pre-Survey	Post survey
Notoscincus butleri	Lined soil-crevice skink (Dampier)	-	P4	DBCA 2022c	N. butleri is found in the Pilbara region.	The preferred natural habitat is stony grassland.	**Potential** A total of 55 previous records occur within 40km of the combined survey area. The closest records occur 7km east from Stove Hill. Potentially suitable habitat present.	**Potential** Suitable habitat present within the combined survey area including stony grassland, therefore cannot be discounted as potentially occurring.
Pseudomys chapmani	Western pebble-mound mouse, ngadji	-	P4	DBCA 2022c	The species is restricted to the non-coastal, central and eastern parts of the Pilbara.	Pebbly soils in arid tussock grassland and Acacia woodland. The vegetation at the preferred habitat, hummock grasslands, is Triodia basedowii, Cassia, Acacia and Ptilotus, and it is associated with eroding sands at natural features which expose small stones (pebbles).	**Potential** A total of 19 previous records occur within 40km of the combined survey area. The closest record is 12km north-east along the coast. Potentially suitable habitat present.	**Potential** No mounds (active or inactive) found but suitable habitat present within the combined survey area including hummock grasslands. Therefore cannot be discounted as potentially occurring.

Appendix F Communities' likelihood of occurrence assessment

Community ID	Community name	Conservation status		Source	Description	Likelihood rating	
		EPBC Act	BC Act / DBCA			Pre-Survey	Post survey
Burrup Peninsula rock pile communities	Burrup Peninsula rock pile communities	-	P1	DBCA 2022d	Pockets of vegetation in rock piles, rock pockets and outcrops of Gidley granophyre, restricted to Burrup Peninsula and some Dampier Archipelago islands. Comprise a mixture of Pilbara and Kimberley fire sensitive species. Communities are different from those of the Hamersley and Chichester Ranges. Short-range endemic land snails.	**Unlikely** Combined survey area does not occur within known PEC buffer. Community occurs in the Burrup Peninsula, >15km north.	**Unlikely** No suitable habitat occurs within the combined survey area.
Burrup Peninsula rock pool communities	Burrup Peninsula rock pool communities	-	P1	DBCA 2022d	Calcareous tufa deposits. Interesting aquatic snails.	**Unlikely** Combined survey area does not occur within known PEC buffer. Community occurs in the Burrup Peninsula, >15km north.	**Unlikely** No suitable habitat occurs within the combined survey area.

Community ID	Community name	Conservation status		Source	Description	Likelihood rating	
		EPBC Act	BC Act / DBCA			Pre-Survey	Post survey
Roebourne chenopod association	Stony Chenopod association of the Roebourne Plains area	-	P1	DBCA 2022d	The community is dominated by Eragrostis xerophila and chenopods (Sclerolaena, Atriplex species) growing in saline clay soils with moderate to dense surface strew of pebbles and cobbles. The association appears to be uncommon and only been located to date at Roebourne Airport and west of Nickol (Karratha) however it is likely some other small occurrences occur between Cape Preston and Mundabullangana. This community incorporates Unit 5 (alluvial plains) of the Horseflat land system and Unit 3 (saline clay plains) of the Cheerawarra land system as described in van Vreeswyk, A M, Leighton, K A, Payne, A L, and Hennig, P. (2004). An inventory and condition survey of the Pilbara region, Western Australia. Department of Agriculture and Food, Western Australia, Perth. Technical Bulletin 92.	**Unlikely** Combined survey area does not occur within known PEC buffer. Community occurs 38km east.	**Unlikely** No suitable habitat occurs within the combined survey area.

Community ID	Community name	Conservation status		Source	Description	Likelihood rating	
		EPBC Act	BC Act / DBCA			Pre-Survey	Post survey
Roebourne Plains gilgai grasslands	Roebourne Plains coastal grasslands with gilgai microrelief on deep cracking clays (Roebourne Plains gilgai grasslands)	-	P1	DBCA 2022d	These grasslands occur on microrelief on strongly gilgaied self-mulching cracking clays, and emergent depositional surfaces. The grasslands are 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). Restricted to the Karratha area, where it has been largely removed. 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). This community incorporates Unit 3 (gilgaied plains) of the Horseflat land system as described in van Vreeswyk, A M, Leighton, K A, Payne, A L, and Hennig, P. (2004), An inventory and condition survey of the Pilbara region, Western Australia. Department of Agriculture and Food, Western Australia, Perth. Technical Bulletin 92.	**Likely** PEC buffer overlaps majority of the combined survey area. Majority of the combined survey area overlaps the Horseflat land system.	**Likely** Four of the six dominant flora species from the PEC description were recorded within the biological survey area. Suitable habitat present within the combined survey area.

Community ID	Community name	Conservation status		Source	Description	Likelihood rating	
		EPBC Act	BC Act / DBCA			Pre-Survey	Post survey
Wona Land System	Four plant assemblages of the Wona Land System (previously 'Cracking clays of the Chichester and Mungaroona Range')	-	P1	DBCA 2022d	1. Cracking clays of the Chichester and Mungaroona Range. This shrubless plain of stony gibber community occurs on the tablelands with very little vegetative cover during the dry season, however during the wet a suite of ephemerals/annuals and short-lived perennials emerge, many of which are poorly known and range-end taxa. 2. Annual Sorghum grasslands on self mulching clays with a moderate-dense overlay of rocks. This community appears very rare and restricted to the Pannawonica-Robe valley end of Chichester Range. Naturally species poor when dry. 3. Mitchell grass plains (Astrebela spp.) on gilgai. 4. Mitchell grass and Roebourne plain grass (Eragrostis xerophila) plain on gilgai. Astrebla pectinata, A. elymoides, E. xerophila, Aristida latifolia, Eriachne and Sida fibulifera	**Unlikely** Combined survey area does not occur within known PEC buffer. Community occurs 39km south.	**Unlikely** No suitable habitat occurs within the combined survey area.
Coastal dune native tussock grassland	Coastal dune tussock grassland dominated by Whiteochloa airoides	-	P3	DBCA 2022d	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 dampierii subsp. dampierii, Scaevola spinescens, S. cunninghamii, Trianthema turgidifolia and Corchorus species (C. walcottii, C. laniflorus).	**Unlikely** Combined survey area does not occur within known PEC buffer. Community occurs along the northern coastline.	**Unlikely** No suitable habitat occurs within the combined survey area.

Community ID	Community name	Conservation status		Source	Description	Likelihood rating	
		EPBC Act	BC Act / DBCA			Pre-Survey	Post survey
Horseflat Land System	Horseflat Land System of the Roebourne Plains	-	P3	DBCA 2022d	(Does not include priority ecological communities 'Roebourne Plains coastal grasslands with gilgai microrelief on cracking clays' and the 'Chenopod vegetation associations of the Roebourne Plains') 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 (Roebourne Plains grass) 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 Peedamulla to Balla Balla surrounding the towns of Karratha and Roebourne.	**Unlikely** Combined survey area does not occur within known PEC buffer. Community surrounds the Roebourne Plains gilgai grasslands, and is >5km from the combined survey area.	**Unlikely** Based on the PEC buffer, it is likely that the Roebourne Plains gilgai grasslands PEC occurs rather than this PEC.

Appendix G Flora species by site matrix

Family	Species name	ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	Relevé 1	Opportunistic
Amaranthaceae	**Aerva javanica*																								X
Poaceae	**Cenchrus ciliaris*	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	
Poaceae	**Cenchrus setiger*																	X	X				X		
Poaceae	**Chloris barbata*	X					X																X		
Fabaceae	**Clitoria ternatea*																								X
Passifloraceae	**Passiflora foetida*																						X		
Asteraceae	**Sonchus oleraceus*																X			X					
Fabaceae	**Stylosanthes hamata*																	X	X				X		
Fabaceae	**Vachellia farnesiana*																								X
Malvaceae	*Abutilon amplum*			X	X				X				X	X	X	X	X			X		X	X		
Malvaceae	*Abutilon fraseri*															X	X								
Fabaceae	*Acacia coriacea* subsp. *pendens*			X					X					X			X						X		
Fabaceae	*Acacia elachantha*												X												
Fabaceae	*Acacia synchronicia*				X												X								
Fabaceae	*Acacia ancistrocarpa*		X			X			X	X	X	X		X										X		X
Fabaceae	*Acacia arida*									X	X	X													
Fabaceae	*Acacia bivenosa*		X			X			X				X	X	X		X					X	X	X	X
Fabaceae	*Acacia inaequilatera*		X			X							X									X	X		
Fabaceae	*Acacia maitlandii*									X	X	X													
Fabaceae	*Acacia pyrifolia*								X		X	X	X										X	X	X	X
Fabaceae	*Acacia trachycarpa*																						X		
Fabaceae	*Acacia tumida*																						X	X	
Fabaceae	*Acacia xiphophylla*	X					X								X	X				X					
Afrohybanthus	*Afrohybanthus aurantiacus*		X			X			X	X	X	X	X				X						X	X	
Sapindaceae	*Alectryon oleifolius*				X																				
Fabaceae	*Alysicarpus muelleri*	X						X	X								X	X	X				X	X	
Poaceae	*Aristida latifolia*																	X	X						
Poaceae	*Aristida contorta*	X	X			X	X					X	X		X	X		X	X	X	X	X	X		
Cleomaceae	*Arivela viscosa*	X	X		X			X										X							
Poaceae	*Astrebla pectinata*															X									
Chenopodiaceae	*Atriplex codonocarpa*	X					X	X								X		X	X						

Family	Species name	ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	Relevé 1	Opportunistic
Nyctaginaceae	*Boerhavia schomburgkiana*																		X						
Convolvulaceae	*Bonamia erecta*								X	X		X	X				X				X				
Convolvulaceae	*Bonamia pilbarensis*		X	X	X	X					X	X		X	X		X								
Cyperaceae	*Bulbostylis barbata*	X	X										X		X						X	X			
Fabaceae	*Cajanus cinereus*																								X
Asteraceae	*Calotis sp.*	X					X	X								X		X	X	X			X		
Capparaceae	*Capparis spinosa* subsp. *nummularia*			X																					
Apocynaceae	*Carissa lanceolata*																X								
Lauraceae	*Cassytha capillaris*					X			X	X	X	X	X	X								X			
Poaceae	*Chrysopogon fallax*	X				X			X						X	X	X			X			X		
Lamiaceae	*Clerodendrum tomentosum*								X														X		
Malvaceae	*Corchorus elachocarpus*			X	X					X	X	X													
Malvaceae	*Corchorus laniflorus*		X		X	X			X		X	X			X		X			X			X	X	
Malvaceae	*Corchorus triocularis*	X						X	X									X	X						
Myrtaceae	*Corymbia hamersleyana*								X				X				X					X	X		
Fabaceae	*Crotalaria medicaginea*														X		X								
Cucurbitaceae	*Cucumis variabilis*			X	X				X	X		X					X						X		
Poaceae	*Cymbopogon ambiguus*		X		X							X		X						X					
Apocynaceae	*Cynanchum viminale* subsp. *australe*	X					X																		
Poaceae	*Cynodon prostratus*	X														X			X						
Cyperaceae	*Cyperus iria*														X										
Poaceae	*Dactyloctenium radulans*	X					X					X			X	X		X	X	X		X			
Phyllanthaceae	*Dendrophyllanthus erwinii*								X			X								X					
Poaceae	*Dichanthium sericeum*																								X
Fabaceae	*Dichrostachys spicata*																								X
Poaceae	*Digitaria ctenantha*																				X				
Sapindaceae	*Diplopeltis eriocarpa*					X								X										X	
Bignoniaceae	*Dolichandrone sp.*																				X	X			
Chenopodiaceae	*Dysphania rhadinostachya*			X	X					X		X			X		X	X	X	X	X				
Chenopodiaceae	*Enchylaena tomentosa*	X					X		X						X	X									
Poaceae	*Enneapogon caerulescens*	X					X				X	X				X		X					X		
Poaceae	*Enteropogon ramosus*															X				X					

Family	Species name	ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	Relevé 1	Opportunistic
Poaceae	*Eragrostis xerophila*	X					X	X							X	X		X	X	X					
Poaceae	*Eragrostis eriopoda*																				X	X			
Scrophulariaceae	*Eremophila longifolia*	X	X		X				X				X	X		X	X				X	X	X		
Poaceae	*Eriachne flaccida*																	X							
Poaceae	*Eriachne mucronata*			X	X												X								
Poaceae	*Eriachne pulchella* subsp. *dominii*		X									X	X		X						X				
Geraniaceae	*Erodium cygnorum*					X																	X		
Poaceae	*Eulalia aurea*					X			X								X						X		
Euphorbiaceae	*Euphorbia australis*		X			X		X		X					X	X	X				X				
Euphorbiaceae	*Euphorbia biconvexa*	X	X	X	X		X	X	X			X			X	X		X	X	X	X	X	X		
Euphorbiaceae	*Euphorbia boophthona*					X			X						X	X	X			X			X		
Euphorbiaceae	*Euphorbia careyi*										X	X													
Boraginaceae	*Euploca ovalifolia* (ex. Heliotropium ovalifolium)		X			X								X							X				
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*		X	X	X	X			X				X	X	X							X			
Cyperaceae	*Fimbristylis dichotoma*	X	X										X		X		X	X		X	X				
Phyllanthaceae	*Flueggea virosa*																X								
Amaranthaceae	*Gomphrena affinis*	X																X	X						
Amaranthaceae	*Gomphrena cunninghamii*			X	X																				
Goodeniaceae	*Goodenia muelleriana*		X			X			X		X	X	X	X			X			X	X	X	X		
Goodeniaceae	*Goodenia* sp.					X																	X		
Goodeniaceae	*Goodenia stobbsiana*									X	X	X					X								
Proteaceae	*Grevillea pyramidalis*			X																					
Proteaceae	*Hakea lorea*												X								X	X			
Malvaceae	*Hibiscus brachysiphonius*															X		X	X						
Malvaceae	*Hibiscus coatesii*												X	X			X				X				
Fabaceae	*Indigofera colutea*		X																			X			
Fabaceae	*Indigofera monophylla*		X	X	X	X				X	X	X	X								X	X			
Fabaceae	*Indigofera trita*	X							X											X			X		
Convolvulaceae	*Ipomoea coptica*																	X	X						

Family	Species name	ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	Relevé 1	Opportunistic
Convolvulaceae	*Ipomoea lonchophylla*																X								
Convolvulaceae	*Ipomoea muelleri*											X													
Poaceae	*Iseilema membranaceum*	X					X	X										X	X	X					
Oleaceae	*Jasminum didymum* subsp. *lineare*				X				X				X												
Brassicaceae	*Lepidium* sp.														X	X				X					
Chenopodiaceae	*Maireana tomentosa*						X								X	X				X					
Malvaceae	*Melhania oblongifolia*								X																
Phyllanthaceae	*Nellica maderaspatensis* (ex. Phyllanthus maderaspatensis)	X				X	X	X	X				X				X	X	X	X					
Fabaceae	*Neptunia dimorphantha*	X					X	X				X				X	X	X	X	X			X		
Poaceae	*Panicum decompositum*							X										X	X				X		
Poaceae	*Paraneurachne muelleri*		X								X			X											
Poaceae	*Paspalidium clementii*		X	X	X					X	X	X	X	X	X	X				X	X	X			
Asteraceae	*Pluchea ferdinandi-muelleri*																								X
Asteraceae	*Pluchea rubelliflora*																								X
Poaceae	*Poaceae* sp.															X									
Caryophyllaceae	*Polycarpaea longiflora*		X										X								X	X			
Polygalaceae	*Polygala glaucifolia*															X				X	X				
Portulacaceae	*Portulaca conspicua*																		X						
Portulacaceae	*Portulaca decipiens*																	X	X						
Portulacaceae	*Portulaca oleracea*	X			X		X					X	X		X										
Asteraceae	*Pterocaulon sphacelatum*																								X
Amaranthaceae	*Ptilotus aervoides*	X					X	X							X		X		X	X	X	X	X		
Amaranthaceae	*Ptilotus astrolasius*		X			X					X			X						X	X				
Amaranthaceae	*Ptilotus calostachyus*									X	X	X													
Amaranthaceae	*Ptilotus exaltatus*	X	X	X	X	X	X	X		X	X	X			X	X		X	X	X					
Amaranthaceae	*Ptilotus gomphrenoides*	X					X											X	X						
Amaranthaceae	*Ptilotus helipteroides*											X			X					X					
Amaranthaceae	*Ptilotus obovatus*																								X

Family	Species name	ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	Relevé 1	Opportunistic
Amaranthaceae	*Ptilotus polystachyus*												X	X	X					X	X	X			
Chenopodiaceae	*Rhagodia eremaea*	X			X															X					
Fabaceae	*Rhynchosia minima*	X		X	X	X	X	X	X	X			X		X	X	X	X	X	X		X	X		
Chenopodiaceae	*Salsola australis*	X					X	X				X				X		X	X						
Santalaceae	*Santalum lanceolatum*								X								X								
Goodeniaceae	*Scaevola spinescens*	X	X	X		X			X			X				X	X						X	X	
Chenopodiaceae	*Sclerolaena bicornis*	X						X																	
Chenopodiaceae	*Sclerolaena costata*	X						X				X			X			X	X	X			X		
Chenopodiaceae	*Sclerolaena densiflora*	X					X								X	X		X	X						
Chenopodiaceae	*Sclerolaena diacantha*																		X						
Fabaceae	*Senna glutinosa* subsp. *glutinosa*			X	X	X											X			X			X		
Fabaceae	*Senna glutinosa* subsp. x *luerssenii*						X								X	X				X					
Fabaceae	*Senna hamersleyensis*						X																		
Fabaceae	*Senna artemisioides* subsp. *oligophylla*		X			X			X				X	X	X		X			X	X	X	X		
Fabaceae	*Senna glutinosa* subsp. *pruinosa*			X	X	X				X			X	X										X	
Fabaceae	*Sesbania cannabina*																		X				X		
Malvaceae	*Sida fibulifera*	X					X	X								X	X	X	X	X			X		
Solanaceae	*Solanum diversiflorum*					X				X													X		
Solanaceae	*Solanum lasiophyllum*					X																			
Solanaceae	*Solanum phlomoides*		X			X				X					X		X			X			X		
Solanaceae	*Solanum horridum*			X	X				X																
Poaceae	*Sporobolus australasicus*															X									
Poaceae	*Sporobolus virginicus*										X	X		X											
Plantaginaceae	*Stemodia* sp.																			X					
Fabaceae	*Tephrosia* sp. clay soils (S. van Leeuwen et al. PBS 0273)					X					X														
Fabaceae	*Tephrosia* sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)		X	X	X	X			X	X	X	X	X		X	X	X				X		X		
Poaceae	*Themeda triandra*																X								
Menispermaceae	*Tinospora smilacina*			X									X								X	X			
Araliaceae	*Trachymene oleracea*			X	X				X													X			

Family	Species name	ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	Relevé 1	Opportunistic
Portulacaceae	*Trianthema pilosum*																					X			
Aizoaceae	*Trianthema triquetrum*	X					X									X		X							
Zygophyllaceae	*Tribulus astrocarpus*			X	X	X																			
Boraginaceae	*Trichodesma zeylanicum*		X		X	X	X		X	X	X	X	X	X	X	X		X	X		X	X	X		
Molluginaceae	*Trigastrotheca molluginea*		X								X	X	X								X				
Poaceae	*Triodia epactia*					X			X	X	X	X	X		X	X	X			X	X	X	X		
Poaceae	*Triodia wiseana*		X	X	X				X				X	X	X	X	X			X		X	X	X	
Poaceae	*Tripogonella loliiformis*														X										
Malvaceae	*Triumfetta clementii*		X	X	X	X				X	X	X		X						X	X		X		
Poaceae	*Urochloa holosericea*																				X	X			
Poaceae	*Xerochloa barbata*	X					X	X							X	X		X	X						

Appendix H Quadrat data

Site name	Date	Site type	Observer
ELA01	20/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Grazing, weeds	Old (>20)	AxEtEx
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
Quartz	0	475210	7700715

Species name	Height (m)	Cover (%)
Acacia xiphophylla	1.6	6
Enchylaena tomentosa	0.8	0.3
Chrysopogon fallax	0.8	1
Eremophila longifolia	0.8	0.2
**Chloris barbata*	0.6	0.1
Cynanchum viminale subsp. australe	0.5	0.1
**Cenchrus ciliaris*	0.5	3
Rhagodia eremaea	0.4	0.5
Scaevola spinescens	0.4	0.1
Salsola australis	0.3	0.1

Species name	Height (m)	Cover (%)
Sclerolaena bicornis	0.3	0.1
Alysicarpus muelleri	0.3	0.1
Rhynchosia minima	0.3	0.1
Eragrostis xerophila	0.3	18
Sclerolaena costata	0.2	0.1
Arivela viscosa	0.2	0.1
Fimbristylis dichotoma	0.2	0.1
Indigofera trita	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Sida fibulifera	0.2	0.1
Enneapogon caerulescens	0.2	0.1
Iseilema membranaceum	0.2	0.5
Dactyloctenium radulans	0.15	0.1
Gomphrena affinis	0.1	0.1
Ptilotus exaltatus	0.1	0.2
Calotis sp.	0.1	0.3
Atriplex codonocarpa	0.1	0.1
Sclerolaena densiflora	0.1	0.5
Euphorbia biconvexa	0.1	0.1
Corchorus triocularis	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	0.1
Xerochloa barbata	0.1	1
Aristida contorta	0.1	0.1
Trianthema triquetrum	0.05	0.1
Ptilotus gomphrenoides	0.05	1
Ptilotus aervoides	0.05	0.1
Cynodon prostratus	0.05	0.1
Portulaca oleracea	0.05	0.1
Bulbostylis barbata	0.03	0.1

Site name	Date	Site type	Observer
ELA02	20/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	N/A	Moderate (10-20)	AbSaTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	474847	7700383

Species name	Height (m)	Cover (%)
Acacia ancistrocarpa	1.7	0.4
Acacia inaequilatera	1.6	0.1
Acacia bivenosa	1.3	7
Trichodesma zeylanicum	1	0.1
Eremophila longifolia	0.6	0.1
Cymbopogon ambiguus	0.5	0.1
Senna artemisioides subsp. oligophylla	0.5	0.2
Scaevola spinescens	0.4	0.1
Corchorus laniflorus	0.4	1
Afrohybanthus aurantiacus	0.3	0.4
Ptilotus astrolasius	0.3	2
Euploca ovalifolia (ex. Heliotropium ovalifolium)	0.3	1

Species name	Height (m)	Cover (%)
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Goodenia muelleriana	0.3	0.1
Paraneurachne muelleri	0.3	0.1
Triodia wiseana	0.3	55
Evolvulus alsinoides var. villosicalyx	0.2	0.1
Fimbristylis dichotoma	0.2	0.1
Indigofera monophylla	0.2	0.1
**Cenchrus ciliaris*	0.2	0.1
Solanum phlomoides	0.2	0.1
Paspalidium clementii	0.15	0.1
Ptilotus exaltatus	0.1	0.1
Arivela viscosa	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Triumfetta clementii	0.1	0.1
Trigastrotheca molluginea	0.1	0.1
Aristida contorta	0.1	0.1
Indigofera colutea	0.05	0.1
Polycarpaea longiflora	0.04	0.1
Eriachne pulchella subsp. dominii	0.04	0.1
Bulbostylis barbata	0.03	0.1
Euphorbia australis	0.01	0.1

Site name	Date	Site type	Observer
ELA03	21/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Weeds	Young (1-10)	SgTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Crest, Hill	30	Orange brown	Sand
Rock type	Outcropping (%)	Easting	Northing
Laterite	>50	475178	7701570

Species name	Height (m)	Cover (%)
Grevillea pyramidalis	1.8	0.1
Senna glutinosa subsp. pruinosa	1.4	0.1
Scaevola spinescens	0.6	0.5
Capparis spinosa subsp. nummularia	0.5	0.1
Acacia coriacea subsp. pendens	0.5	0.1
Corchorus elachocarpus	0.5	0.1
Tinospora smilacina	0.4	0.1
Indigofera monophylla	0.3	1
Senna glutinosa subsp. glutinosa	0.3	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
**Cenchrus ciliaris*	0.3	2
Triodia wiseana	0.3	70

Species name	Height (m)	Cover (%)
Rhynchosia minima	0.2	0.1
Eriachne mucronata	0.2	0.2
Gomphrena cunninghamii	0.1	0.1
Ptilotus exaltatus	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Evolvulus alsinoides var. villosicalyx	0.1	0.1
Cucumis variabilis	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Abutilon amplum	0.1	0.1
Triumfetta clementii	0.1	0.1
Paspalidium clementii	0.1	0.1
Solanum horridum	0.1	0.1
Dysphania rhadinostachya	0.05	0.1
Tribulus astrocarpus	0.03	0.1
Trachymene oleracea	0.01	1

Site name	Date	Site type	Observer
ELA04	21/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Weeds	Young (1-10)	SgTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Crest, Hill	30	Orange brown	Sand
Rock type	Outcropping (%)	Easting	Northing
Laterite	>50	475110	7701517

Species name	Height (m)	Cover (%)
Alectryon oleifolius	2	0.2
Eremophila longifolia	1.1	0.1
Trichodesma zeylanicum	1	0.1
Senna glutinosa subsp. glutinosa	1	0.1
Acacia synchronicia	0.8	0.1
Cymbopogon ambiguus	0.7	0.1
Jasminum didymum subsp. lineare	0.6	0.1
Rhagodia eremaea	0.4	0.1
Senna glutinosa subsp. pruinosa	0.4	0.1
Hibiscus coatesii	0.4	
Cucumis variabilis	0.3	0.2
Indigofera monophylla	0.3	0.1

Species name	Height (m)	Cover (%)
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Abutilon amplum	0.3	0.1
Corchorus elachocarpus	0.3	0.1
**Cenchrus ciliaris*	0.3	2
Eriachne mucronata	0.3	0.1
Triodia wiseana	0.3	60
Rhynchosia minima	0.2	0.1
Corchorus laniflorus	0.2	0.1
Solanum horridum	0.2	0.1
Gomphrena cunninghamii	0.1	0.1
Ptilotus exaltatus	0.1	0.1
Trachymene oleracea	0.1	0.2
Dysphania rhadinostachya	0.1	0.1
Arivela viscosa	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Evolvulus alsinoides var. villosicalyx	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Triumfetta clementii	0.1	0.1
Paspalidium clementii	0.1	0.1
Tribulus astrocarpus	0.05	0.1
Portulaca oleracea	0.02	0.1

Site name	Date	Site type	Observer
ELA05	21/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Weeds	Moderate (10-20)	AbSaTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
Quartz	0	475017	7701296

Species name	Height (m)	Cover (%)
Acacia inaequilatera	3	0.2
Acacia ancistrocarpa	1.9	1
Acacia bivenosa	1.8	8
Senna glutinosa subsp. glutinosa	1.5	0.1
Senna glutinosa subsp. pruinosa	1	0.1
Scaevola spinescens	1	0.2
Eulalia aurea	0.5	1
Afrohybanthus aurantiacus	0.4	0.1
Solanum diversiflorum	0.4	0.1
Euploca ovalifolia (ex. Heliotropium ovalifolium)	0.3	0.1
Indigofera monophylla	0.3	0.1
Senna artemisioides subsp. oligophylla	0.3	0.1

Species name	Height (m)	Cover (%)
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Goodenia sp.	0.3	0.1
Cassytha capillaris	0.3	0.1
Corchorus laniflorus	0.3	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.3	0.1
**Cenchrus ciliaris*	0.3	0.1
Chrysopogon fallax	0.3	0.1
Triodia epactia	0.3	50
Diplopeltis eriocarpa	0.3	4
Solanum lasiophyllum	0.3	0.1
Ptilotus astrolasius	0.2	0.1
Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)	0.2	0.1
Rhynchosia minima	0.2	0.1
Goodenia muelleriana	0.2	0.1
Solanum phlomoides	0.2	0.1
Aristida contorta	0.15	0.1
Ptilotus exaltatus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Evolvulus alsinoides var. villosicalyx	0.1	0.1
Euphorbia boophthona	0.1	0.1
Erodium cygnorum	0.1	0.1
Triumfetta clementii	0.1	0.1
Euphorbia australis	0.01	0.1
Tribulus astrocarpus	0.01	0.1

Site name	Date	Site type	Observer
ELA06	21/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Grazing, weeds	Old (>20)	AxEtEx
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	475031	7700100

Species name	Height (m)	Cover (%)
Acacia xiphophylla	0.8	15
Cynanchum viminale subsp. australe	0.6	0.1
Enchylaena tomentosa	0.5	1
**Chloris barbata*	0.5	0.1
Senna glutinosa subsp. x luerssenii	0.3	0.1
**Cenchrus ciliaris*	0.3	3
Eragrostis xerophila	0.3	9
Maireana tomentosa	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Senna hamersleyensis	0.2	0.1
Rhynchosia minima	0.2	0.1
Sida fibulifera	0.2	0.1

Species name	Height (m)	Cover (%)
Iseilema membranaceum	0.15	0.1
Xerochloa barbata	0.15	0.5
Aristida contorta	0.15	0.1
Ptilotus exaltatus	0.1	0.1
Calotis sp.	0.1	12
Trichodesma zeylanicum	0.1	0.1
Atriplex codonocarpa	0.1	0.1
Salsola australis	0.1	0.1
Sclerolaena densiflora	0.1	1
Euphorbia biconvexa	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Portulaca oleracea	0.1	0.1
Trianthema triquetrum	0.05	0.1
Ptilotus gomphrenoides	0.05	0.1
Ptilotus aervoides	0.05	0.1

Site name	Date	Site type	Observer
ELA07	21/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Grazing, weeds, track	Old (>20)	AxEtEx
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Sandy clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	475335	7700753

Species name	Height (m)	Cover (%)
Sclerolaena bicornis	0.4	1
**Cenchrus ciliaris*	0.3	0.1
Eragrostis xerophila	0.3	45
Iseilema membranaceum	0.3	4
Panicum decompositum	0.3	0.1
Sclerolaena costata	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Rhynchosia minima	0.2	0.2
Sida fibulifera	0.2	0.2
Ptilotus exaltatus	0.1	0.1
Calotis sp.	0.1	5
Atriplex codonocarpa	0.1	0.1

Species name	Height (m)	Cover (%)
Salsola australis	0.1	0.1
Arivela viscosa	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Alysicarpus muelleri	0.1	0.1
Corchorus triocularis	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	1
Xerochloa barbata	0.1	0.2
Ptilotus aervoides	0.05	0.1
Euphorbia australis	0.01	0.1

Site name	Date	Site type	Observer
ELA08	21/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Weeds	Old (>20)	ChSsCc
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Drainage line	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	475638	7700707

Species name	Height (m)	Cover (%)
Corymbia hamersleyana	6	9
Acacia coriacea subsp. pendens	4	11
Clerodendrum tomentosum	1.8	0.1
Acacia ancistrocarpa	1.5	0.1
Acacia pyrifolia	1.5	0.1
Santalum lanceolatum	1.5	2
Scaevola spinescens	1.3	0.2
Abutilon amplum	1.2	0.1
Acacia bivenosa	1.1	0.1
Eremophila longifolia	1.1	0.1
Jasminum didymum subsp. lineare	1	0.1
Chrysopogon fallax	0.8	5

Species name	Height (m)	Cover (%)
Senna artemisioides subsp. oligophylla	0.6	0.1
**Cenchrus ciliaris*	0.6	45
Eulalia aurea	0.6	0.1
Triodia epactia	0.6	15
Bonamia erecta	0.5	1
Cucumis variabilis	0.5	0.2
Afrohybanthus aurantiacus	0.4	0.1
Enchylaena tomentosa	0.4	0.1
Indigofera trita	0.4	0.1
Corchorus laniflorus	0.4	0.1
Triodia wiseana	0.4	10
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Rhynchosia minima	0.3	0.1
Cassytha capillaris	0.3	0.1
Melhania oblongifolia	0.3	0.1
Evolvulus alsinoides var. villosicalyx	0.2	0.1
Euphorbia boophthona	0.2	0.1
Goodenia muelleriana	0.2	0.1
Solanum horridum	0.2	0.1
Trachymene oleracea	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Alysicarpus muelleri	0.1	0.1
Dendrophyllanthus erwinii	0.1	0.1
Corchorus triocularis		0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)		0.1

Site name	Date	Site type	Observer
ELA09	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Previously cleared for roadworks	Old (>20)	AaTe
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Drainage line	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
Laterite	<2	476471	7700520

Species name	Height (m)	Cover (%)
Acacia maitlandii	3	0.5
Acacia arida	1.4	4
Ptilotus calostachyus	1	0.1
Acacia ancistrocarpa	1	0.1
Cucumis variabilis	0.5	0.1
Afrohybanthus aurantiacus	0.4	0.1
Indigofera monophylla	0.4	0.1
Senna glutinosa subsp. pruinosa	0.4	0.1
Goodenia stobbsiana	0.4	0.1
Cassytha capillaris	0.4	0.8
Corchorus elachocarpus	0.4	0.1
Triodia epactia	0.4	75

Species name	Height (m)	Cover (%)
Bonamia erecta	0.3	6
**Cenchrus ciliaris*	0.3	0.1
Solanum diversiflorum	0.3	0.1
Solanum phlomoides	0.3	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.2	0.1
Triumfetta clementii	0.2	0.1
Ptilotus exaltatus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Rhynchosia minima	0.1	0.1
Paspalidium clementii	0.1	0.1
Dysphania rhadinostachya	0.05	0.1
Euphorbia australis	0.01	0.1

Site name	Date	Site type	Observer
ELA10	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Historical clearing	Old (>20)	AaTe
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Slope	N/A	Reddish brown	Sandy loam
Rock type	Outcropping (%)	Easting	Northing
Laterite	<2	476357	7700531

Species name	Height (m)	Cover (%)
Ptilotus calostachyus	1	0.1
Acacia maitlandii	1	0.1
Acacia pyrifolia	1	0.1
Acacia ancistrocarpa	0.8	0.2
Acacia arida	0.8	5
Goodenia stobbsiana	0.5	1.5
Afrohybanthus aurantiacus	0.4	0.1
Ptilotus astrolasius	0.3	0.1
Indigofera monophylla	0.3	0.1
Cassytha capillaris	0.3	0.1
Corchorus laniflorus	0.3	0.1
Paraneurachne muelleri	0.3	0.1

Species name	Height (m)	Cover (%)
Triodia epactia	0.3	9
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.2	0.1
Triumfetta clementii	0.2	0.1
Sporobolus virginicus	0.2	0.1
Goodenia muelleriana	0.15	0.1
Ptilotus exaltatus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Euphorbia careyi	0.1	0.1
Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)	0.1	0.1
Corchorus elachocarpus	0.1	0.1
Trigastrotheca molluginea	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Paspalidium clementii	0.1	0.1

Site name	Date	Site type	Observer
ELA11	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Previously cleared for roadworks	Old (>20)	AaTe
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Reddish brown	Sandy loam
Rock type	Outcropping (%)	Easting	Northing
Laterite	<2	476384	7700646

Species name	Height (m)	Cover (%)
Acacia maitlandii	1.8	4
Acacia arida	1.1	12
Ptilotus calostachyus	1	0.1
Acacia ancistrocarpa	1	0.5
Scaevola spinescens	1	0.1
Afrohybanthus aurantiacus	0.5	0.1
**Cenchrus ciliaris*	0.5	5
Bonamia erecta	0.4	0.1
Indigofera monophylla	0.4	0.2
Goodenia stobbsiana	0.4	0.1
Cassytha capillaris	0.4	0.1
Corchorus elachocarpus	0.4	0.1

Species name	Height (m)	Cover (%)
Cymbopogon ambiguus	0.4	0.1
Triodia epactia	0.4	30
Ipomoea muelleri	0.3	0.1
Cucumis variabilis	0.3	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Corchorus laniflorus	0.3	0.1
Salsola australis	0.2	0.1
Sclerolaena costata	0.2	0.1
Euphorbia careyi	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Acacia pyrifolia	0.2	0.1
Goodenia muelleriana	0.2	0.1
Triumfetta clementii	0.2	0.1
Sporobolus virginicus	0.2	0.1
Aristida contorta	0.15	0.1
Ptilotus helipteroides	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Trigastrotheca molluginea	0.1	0.1
Dendrophyllanthus erwinii	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Paspalidium clementii	0.1	0.1
Portulaca oleracea	0.1	0.1
Ptilotus exaltatus	0.05	0.1
Dysphania rhadinostachya	0.05	0.1
Euphorbia biconvexa	0.05	0.1
Eriachne pulchella subsp. dominii	0.05	0.1

Site name	Date	Site type	Observer
ELA12	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Weeds	Old (>20)	ChAbTe
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Sandy loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	474722	7699932

Species name	Height (m)	Cover (%)
Corymbia hamersleyana	3	0.1
Acacia inaequilatera	2.5	0.8
Acacia bivenosa	1.8	2
Acacia elachantha	1.7	0.1
Jasminum didymum subsp. lineare	1.7	0.1
Hakea lorea	1.6	0.1
Senna glutinosa subsp. pruinosa	1.1	0.1
Acacia pyrifolia	1	0.1
Eremophila longifolia	1	0.1
Tinospora smilacina	0.7	0.1
Hibiscus coatesii	0.6	0.1
Abutilon amplum	0.5	0.1

Species name	Height (m)	Cover (%)
Afrohybanthus aurantiacus	0.4	0.1
Bonamia erecta	0.4	0.5
Senna artemisioides subsp. oligophylla	0.4	0.1
**Cenchrus ciliaris*	0.4	0.1
Triodia epactia	0.4	70
Indigofera monophylla	0.3	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Cassytha capillaris	0.3	0.1
Triodia wiseana	0.3	0.1
Evolvulus alsinoides var. villosicalyx	0.2	0.1
Fimbristylis dichotoma	0.2	0.1
Goodenia muelleriana	0.2	0.1
Ptilotus polystachyus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Rhynchosia minima	0.1	0.1
Trigastrotheca molluginea	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	0.1
Aristida contorta	0.1	0.1
Paspalidium clementii	0.1	0.1
Polycarpaea longiflora	0.05	0.1
Bulbostylis barbata	0.05	0.1
Eriachne pulchella subsp. dominii	0.05	0.1
Portulaca oleracea	0.01	0.1

Site name	Date	Site type	Observer
ELA13	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Weeds	Moderate (10-20)	AbSaTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	477032	7699833

Species name	Height (m)	Cover (%)
Acacia ancistrocarpa	1.8	0.1
Acacia bivenosa	1.5	4
Acacia coriacea subsp. pendens	1.2	0.1
Senna glutinosa subsp. pruinosa	1.1	0.1
Eremophila longifolia	1	0.1
Senna artemisioides subsp. oligophylla	0.5	0.1
Abutilon amplum	0.5	0.1
Hibiscus coatesii	0.5	0.1
Cymbopogon ambiguus	0.4	0.1
Paraneurachne muelleri	0.4	0.1
Ptilotus astrolasius	0.3	0.1
Euploca ovalifolia (ex. Heliotropium ovalifolium)	0.3	0.1

Species name	Height (m)	Cover (%)
Cassytha capillaris	0.3	0.1
**Cenchrus ciliaris*	0.3	0.1
Sporobolus virginicus	0.3	0.1
Triodia wiseana	0.3	50
Diplopeltis eriocarpa	0.3	2
Ptilotus polystachyus	0.2	0.1
Evolvulus alsinoides var. villosicalyx	0.2	0.1
Goodenia muelleriana	0.2	0.1
Triumfetta clementii	0.2	0.1
Paspalidium clementii	0.2	0.1
Trichodesma zeylanicum	0.1	0.1
Bonamia pilbarensis	0.1	0.1

Site name	Date	Site type	Observer
ELA14	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Weeds, track	Old (>20)	AxSgTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	477024	7700079

Species name	Height (m)	Cover (%)
Acacia xiphophylla	1.5	5
Acacia bivenosa	1	0.1
Enchylaena tomentosa	0.5	0.1
Maireana tomentosa	0.5	0.2
Senna artemisioides subsp. oligophylla	0.5	0.2
Chrysopogon fallax	0.5	0.1
Senna glutinosa subsp. x luerssenii	0.4	0.1
Corchorus laniflorus	0.4	0.1
**Cenchrus ciliaris*	0.4	1
Triodia epactia	0.4	0.3
Abutilon amplum	0.3	0.1
Eragrostis xerophila	0.3	0.2

Species name	Height (m)	Cover (%)
Triodia wiseana	0.3	30
Solanum phlomoides	0.3	0.1
Sclerolaena costata	0.2	0.1
Fimbristylis dichotoma	0.2	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus polystachyus	0.1	0.1
Ptilotus aervoides	0.1	0.1
Ptilotus exaltatus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Lepidium sp.	0.1	0.1
Sclerolaena densiflora	0.1	0.1
Dysphania rhadinostachya	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Evolvulus alsinoides var. villosicalyx	0.1	0.1
Cyperus iria	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Euphorbia boophthona	0.1	0.1
Crotalaria medicaginea	0.1	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.1	0.1
Rhynchosia minima	0.1	0.1
Eriachne pulchella subsp. dominii	0.1	0.1
Tripogonella loliiformis	0.1	0.2
Xerochloa barbata	0.1	0.1
Aristida contorta	0.1	0.2
Dactyloctenium radulans	0.1	0.1
Paspalidium clementii	0.1	0.1
Bulbostylis barbata	0.05	0.1
Portulaca oleracea	0.05	0.1
Euphorbia australis	0.01	0.1

Site name	Date	Site type	Observer
ELA15	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Weeds, track	Moderate (10-20)	AxSgTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat, open depression	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
Limestone	0	477245	7700437

Species name	Height (m)	Cover (%)
Acacia xiphophylla	1.5	9
Scaevola spinescens	1.1	0.1
Enchylaena tomentosa	1	0.2
Senna glutinosa subsp. x luerssenii	1	0.3
Eremophila longifolia	1	0.1
Maireana tomentosa	0.6	0.1
Abutilon fraseri	0.5	0.1
Chrysopogon fallax	0.5	0.1
Abutilon amplum	0.4	0.1
**Cenchrus ciliaris*	0.4	1
Astrebla pectinata	0.4	0.5
Enteropogon ramosus	0.4	0.1

Species name	Height (m)	Cover (%)
Triodia epactia	0.4	35
Hibiscus brachysiphonius	0.3	0.1
Eragrostis xerophila	0.3	1
Triodia wiseana	0.3	0.1
Neptunia dimorphantha	0.2	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.2	0.1
Rhynchosia minima	0.2	0.1
Sida fibulifera	0.2	0.1
Trianthema triquetrum	0.1	0.1
Ptilotus exaltatus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Salsola australis	0.1	0.1
Sclerolaena densiflora	0.1	0.1
Euphorbia boophthona	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Xerochloa barbata	0.1	0.1
Aristida contorta	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Paspalidium clementii	0.1	0.1
Calotis sp.	0.05	0.1
Lepidium sp.	0.05	0.1
Atriplex codonocarpa	0.05	0.1
Euphorbia biconvexa	0.05	0.1
Cynodon prostratus	0.05	0.1
Poaceae sp.	0.05	0.1
Sporobolus australasicus	0.05	0.1
Polygala glaucifolia	0.05	0.1
Portulaca oleracea	0.05	0.1
Euphorbia australis	0.01	0.1

Site name	Date	Site type	Observer
ELA16	22/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Weeds	Old (>20)	ChSsCc
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Drainage line	N/A	Orange brown	Sandy loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	477412	7700302

Species name	Height (m)	Cover (%)
Corymbia hamersleyana	8	10
Acacia coriacea subsp. pendens	6	16
Abutilon amplum	4	0.1
Acacia bivenosa	3	0.5
Carissa lanceolata	1.8	3
Scaevola spinescens	1.8	0.1
Senna glutinosa subsp. glutinosa	1.6	0.1
Santalum lanceolatum	1.5	1.5
Senna artemisioides subsp. oligophylla	1.4	0.1
Flueggea virosa	1.1	0.1
Cucumis variabilis	1	0.1
Acacia synchronicia	1	0.2

Species name	Height (m)	Cover (%)
Themeda triandra	1	3
Eremophila longifolia	0.8	0.1
**Cenchrus ciliaris*	0.6	15
Chrysopogon fallax	0.6	4
Goodenia stobbsiana	0.5	0.1
Corchorus laniflorus	0.5	0.1
Eulalia aurea	0.5	2
Afrohybanthus aurantiacus	0.4	0.1
Bonamia erecta	0.4	1
Hibiscus coatesii	0.4	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.4	0.1
Triodia epactia	0.4	12
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Eriachne mucronata	0.3	0.1
Triodia wiseana	0.3	5
Solanum phlomoides	0.3	0.1
Ipomoea lonchophylla	0.2	0.1
Alysicarpus muelleri	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Rhynchosia minima	0.2	0.1
Sida fibulifera	0.2	0.1
Euphorbia boophthona	0.15	0.1
**Sonchus oleraceus*	0.1	0.1
Dysphania rhadinostachya	0.1	0.1
Bonamia pilbarensis	0.1	0.1
Fimbristylis dichotoma	0.1	0.1
Crotalaria medicaginea	0.1	0.1
Goodenia muelleriana	0.1	0.1
Abutilon fraseri	0.1	0.1
Euphorbia australis	0.01	0.1

Site name	Date	Site type	Observer
ELA17	23/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Weeds, track	Old (>20)	AxEtEx
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	477679	7700325

Species name	Height (m)	Cover (%)
**Cenchrus ciliaris*	0.4	4
**Cenchrus setiger*	0.4	0.5
Aristida latifolia	0.4	0.5
Panicum decompositum	0.4	0.1
Eragrostis xerophila	0.3	20
Eriachne flaccida	0.3	3
Gomphrena affinis	0.2	0.1
Salsola australis	0.2	0.3
Ipomoea coptica	0.2	0.1
Fimbristylis dichotoma	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Hibiscus brachysiphonius	0.2	0.1

Species name	Height (m)	Cover (%)
Sida fibulifera	0.2	0.1
Iseilema membranaceum	0.2	0.1
Xerochloa barbata	0.2	0.2
Portulaca decipiens	0.2	0.1
Ptilotus gomphrenoides	0.1	0.1
Ptilotus exaltatus	0.1	0.1
Calotis sp.	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Sclerolaena costata	0.1	0.1
Sclerolaena densiflora	0.1	0.2
Dysphania rhadinostachya	0.1	0.1
Arivela viscosa	0.1	0.1
Euphorbia biconvexa	0.1	0.1
**Stylosanthes hamata*	0.1	0.1
Alysicarpus muelleri	0.1	0.1
Rhynchosia minima	0.1	0.1
Corchorus triocularis	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	0.1
Enneapogon caerulescens	0.1	0.3
Aristida contorta	0.1	0.1
Dactyloctenium radulans	0.1	0.2
Trianthema triquetrum	0.05	0.2
Atriplex codonocarpa	0.05	0.1
Portulaca oleracea	0.05	0.1

Site name	Date	Site type	Observer
ELA18	23/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Weeds, track	Old (>20)	AxEtEx
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Reddish brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	477724	7700236

Species name	Height (m)	Cover (%)
Panicum decompositum	0.8	0.2
Aristida latifolia	0.5	0.1
**Cenchrus ciliaris*	0.4	5
Gomphrena affinis	0.3	0.1
Rhynchosia minima	0.3	0.1
Sesbania cannabina	0.3	0.1
Hibiscus brachysiphonius	0.3	0.1
**Cenchrus setiger*	0.3	0.1
Eragrostis xerophila	0.3	20
Salsola australis	0.2	0.1
Sclerolaena costata	0.2	0.1
Sclerolaena diacantha	0.2	0.1

Species name	Height (m)	Cover (%)
Alysicarpus muelleri	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Iseilema membranaceum	0.2	1
Portulaca decipiens	0.2	0.1
Ptilotus gomphrenoides	0.1	2
Ptilotus exaltatus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Atriplex codonocarpa	0.1	0.1
Sclerolaena densiflora	0.1	0.5
Ipomoea coptica	0.1	0.1
Euphorbia biconvexa	0.1	0.1
**Stylosanthes hamata*	0.1	0.1
Corchorus triocularis	0.1	0.1
Sida fibulifera	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	0.1
Xerochloa barbata	0.1	1
Aristida contorta	0.1	0.1
Dactyloctenium radulans	0.1	0.3
Portulaca conspicua	0.1	0.1
Calotis sp.	0.05	0.1
Dysphania rhadinostachya	0.05	0.1
Cynodon prostratus	0.05	0.1
Portulaca oleracea	0.05	0.1
Boerhavia schomburgkiana	0.01	0.1

Site name	Date	Site type	Observer
ELA19	23/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Dust	Young (1-10)	AxSgTw
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Sandy loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	474884	7700080

Species name	Height (m)	Cover (%)
Acacia xiphophylla	1.8	5
Senna glutinosa subsp. glutinosa	0.8	0.1
Maireana tomentosa	0.5	0.2
Rhagodia eremaea	0.5	0.1
Senna glutinosa subsp. x luerssenii	0.5	0.3
Abutilon amplum	0.5	0.1
Enteropogon ramosus	0.5	0.1
Indigofera trita	0.4	0.1
**Cenchrus ciliaris*	0.4	1
Chrysopogon fallax	0.4	0.1
Triodia epactia	0.4	1
Ptilotus astrolasius	0.3	0.1

Species name	Height (m)	Cover (%)
Corchorus laniflorus	0.3	0.1
Cymbopogon ambiguus	0.3	0.1
Eragrostis xerophila	0.3	0.1
Triodia wiseana	0.3	25
Solanum phlomoides	0.3	0.1
Sclerolaena costata	0.2	0.1
Fimbristylis dichotoma	0.2	0.4
Neptunia dimorphantha	0.2	0.1
Sida fibulifera	0.2	0.1
Triumfetta clementii	0.2	0.1
Ptilotus helipteroides	0.1	0.1
Ptilotus polystachyus	0.1	0.1
Ptilotus exaltatus	0.1	0.1
Calotis sp.	0.1	0.3
**Sonchus oleraceus*	0.1	0.1
Dysphania rhadinostachya	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Euphorbia boophthona	0.1	0.1
Senna artemisioides subsp. oligophylla	0.1	0.1
Rhynchosia minima	0.1	0.1
Goodenia muelleriana	0.1	0.1
Dendrophyllanthus erwinii	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	0.1
Iseilema membranaceum	0.1	0.1
Aristida contorta	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Paspalidium clementii	0.1	0.1
Lepidium sp.	0.05	0.1
Stemodia sp.	0.05	0.3
Polygala glaucifolia	0.05	0.1
Portulaca oleracea	0.01	0.1

Site name	Date	Site type	Observer
ELA20	23/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Dust	Moderate (10-20)	ChAbTe
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Sand
Rock type	Outcropping (%)	Easting	Northing
N/A	0	474700	7700136

Species name	Height (m)	Cover (%)
Acacia inaequilatera	2	0.4
Acacia tumida	1.8	2
Tinospora smilacina	1.6	0.1
Dolichandrone sp.	1.5	0.1
Acacia bivenosa	1.2	1
Acacia pyrifolia	1	0.1
Hakea lorea	1	0.1
Eremophila longifolia	1	0.1
Senna artemisioides subsp. oligophylla	0.6	0.1
Afrohybanthus aurantiacus	0.5	0.1
Ptilotus astrolasius	0.4	0.1
Bonamia erecta	0.4	1

Species name	Height (m)	Cover (%)
Indigofera monophylla	0.4	2
Hibiscus coatesii	0.4	0.1
Triodia epactia	0.4	55
Euploca ovalifolia (ex. Heliotropium ovalifolium)	0.3	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Triumfetta clementii	0.3	0.1
**Cenchrus ciliaris*	0.3	0.1
Digitaria ctenantha	0.3	0.1
Eragrostis eriopoda	0.3	0.1
Fimbristylis dichotoma	0.2	0.1
Goodenia muelleriana	0.2	0.1
Ptilotus polystachyus	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Polycarpaea longiflora	0.1	0.1
Dysphania rhadinostachya	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Trigastrotheca molluginea	0.1	0.1
Eriachne pulchella subsp. dominii	0.1	0.1
Urochloa holosericea	0.1	0.1
Aristida contorta	0.1	0.1
Paspalidium clementii	0.1	0.1
Polygala glaucifolia	0.05	0.1
Bulbostylis barbata	0.02	0.1
Portulaca oleracea	0.02	0.1
Euphorbia australis	0.01	0.1

Site name	Date	Site type	Observer
ELA21	23/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Very Good	Weeds	Moderate (10-20)	ChAbTe
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Flat	N/A	Orange brown	Sand
Rock type	Outcropping (%)	Easting	Northing
N/A	0	474625	7699810

Species name	Height (m)	Cover (%)
Dolichandrone sp.	3	1.5
Acacia inaequilatera	3	2
Tinospora smilacina	3	0.1
Corymbia hamersleyana	3	0.5
Eremophila longifolia	2	1
Acacia tumida	1.8	0.2
Acacia ancistrocarpa	1	0.1
Acacia bivenosa	1	0.2
Senna artemisioides subsp. oligophylla	1	1
Abutilon amplum	0.7	0.1
Acacia pyrifolia	0.5	0.1
Afrohybanthus aurantiacus	0.4	0.1

Species name	Height (m)	Cover (%)
**Cenchrus ciliaris*	0.4	2
Triodia epactia	0.4	50
Indigofera monophylla	0.3	0.1
Cassytha capillaris	0.3	0.1
Eragrostis eriopoda	0.3	0.1
Triodia wiseana	0.3	2
Ptilotus polystachyus	0.2	0.1
Alysicarpus muelleri	0.2	0.1
Trachymene oleracea	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Polycarpaea longiflora	0.1	0.1
Evolvulus alsinoides var. villosicalyx	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Indigofera colutea	0.1	0.1
Rhynchosia minima	0.1	0.1
Goodenia muelleriana	0.1	0.1
Urochloa holosericea	0.1	0.1
Aristida contorta	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Paspalidium clementii	0.1	0.1
Trianthema pilosum	0.1	0.1
Bulbostylis barbata	0.05	0.1
Portulaca oleracea	0.02	0.1
Hakea lorea		1

Site name	Date	Site type	Observer
ELA22	23/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Weeds	Old (>20)	ChSsCc
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Drainage line	N/A	Orange brown	Sandy clay loam
Rock type	Outcropping (%)	Easting	Northing
Limestone	<2	475673	7700824

Species name	Height (m)	Cover (%)
Corymbia hamersleyana	8	9
Acacia coriacea subsp. pendens	7	4
Acacia trachycarpa	6	7
Clerodendrum tomentosum	4	1
Acacia bivenosa	2	0.2
Eremophila longifolia	1.4	0.1
Abutilon amplum	1.3	0.1
Senna glutinosa subsp. glutinosa	1	0.1
Acacia pyrifolia	1	0.1
Scaevola spinescens	1	1
Cucumis variabilis	0.5	0.1
**Cenchrus ciliaris*	0.5	65

Species name	Height (m)	Cover (%)
Chrysopogon fallax	0.5	2
Eulalia aurea	0.5	1
Panicum decompositum	0.5	0.1
Indigofera trita	0.4	0.1
Senna artemisioides subsp. oligophylla	0.4	0.1
Corchorus laniflorus	0.4	0.2
**Cenchrus setiger*	0.4	1
Triodia epactia	0.4	8
Sclerolaena costata	0.3	0.1
**Stylosanthes hamata*	0.3	0.1
Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)	0.3	0.1
Sesbania cannabina	0.3	0.1
Goodenia sp.	0.3	0.1
Triumfetta clementii	0.3	0.1
**Passiflora foetida*	0.3	0.1
Triodia wiseana	0.3	2
Solanum diversiflorum	0.3	0.1
Solanum phlomoides	0.3	0.1
Neptunia dimorphantha	0.2	0.1
Rhynchosia minima	0.2	0.1
Goodenia muelleriana	0.2	0.1
Sida fibulifera	0.2	0.1
Calotis sp.	0.1	0.1
Trichodesma zeylanicum	0.1	0.1
Euphorbia biconvexa	0.1	0.1
Euphorbia boophthona	0.1	0.1
Alysicarpus muelleri	0.1	0.1
Erodium cygnorum	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Aristida contorta	0.1	0.1

Site name	Date	Site type	Observer
ELA23	23/06/2022	Quadrat 50 x 50m	JC & DB
Vegetation condition	Disturbance notes	Age since fire (years)	Vegetation community
Good	Weeds, track	Old (>20)	AxEtEx
Landform unit	Aspect / slope (%)	Soil colour	Soil type
Drainage line, flat	N/A	Orange brown	Clay loam
Rock type	Outcropping (%)	Easting	Northing
N/A	0	477569	7700277

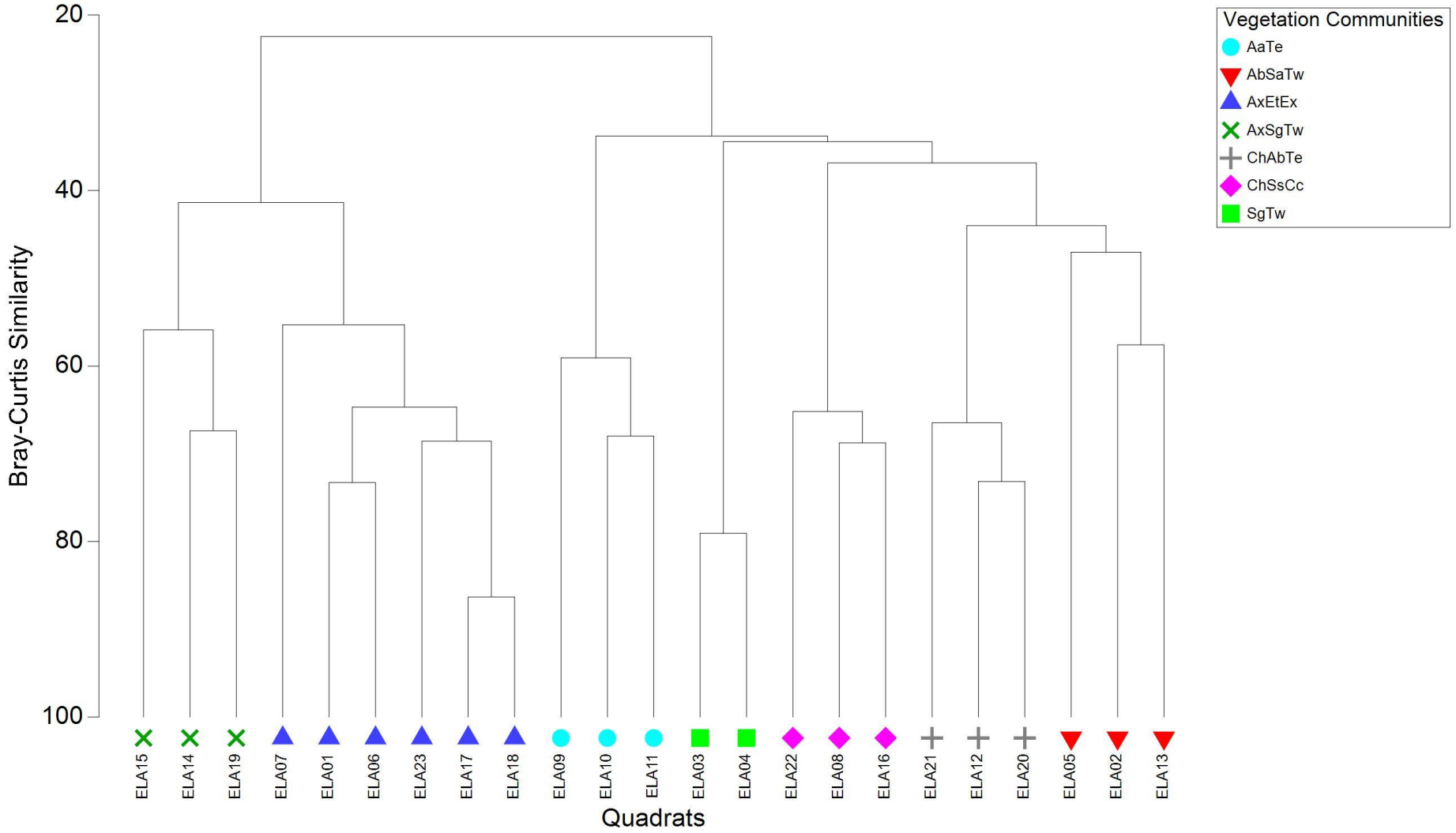
Species name	Height (m)	Cover (%)
Acacia synchronicia	3	0.5
Acacia xiphophylla	1.6	6
Enchylaena tomentosa	1.4	2
Senna glutinosa subsp. glutinosa	1	0.2
Acacia bivenosa	0.5	0.1
Chrysopogon fallax	0.5	0.5
Panicum decompositum	0.5	0.2
**Cenchrus ciliaris*	0.4	8
**Cenchrus setiger*	0.4	1
Sida fibulifera	0.3	0.2
Eragrostis xerophila	0.3	8
Atriplex codonocarpa	0.2	0.1

Species name	Height (m)	Cover (%)
Salsola australis	0.2	0.1
Sclerolaena costata	0.2	0.1
Ipomoea coptica	0.2	0.1
Neptunia dimorphantha	0.2	0.1
Ptilotus exaltatus	0.1	0.1
Calotis sp.	0.1	0.5
Trichodesma zeylanicum	0.1	0.1
Lepidium sp.	0.1	0.1
Euphorbia biconvexa	0.1	0.1
**Stylosanthes hamata*	0.1	0.1
Rhynchosia minima	0.1	0.1
Nellica maderaspatensis (ex. Phyllanthus maderaspatensis)	0.1	0.1
Stemodia sp.	0.1	0.1
Enneapogon caerulescens	0.1	0.1
Iseilema membranaceum	0.1	3
Sporobolus australasicus	0.1	0.1
Xerochloa barbata	0.1	0.2
Aristida contorta	0.1	0.1
Dactyloctenium radulans	0.1	0.1
Trianthema triquetrum	0.05	0.1
Sclerolaena densiflora	0.05	0.1
Corchorus triocularis	0.05	0.1
Portulaca oleracea	0.05	0.1

Site name	Date	Site type	Observer
Relevé 1	23/06/2022	Relevé	JC & DB
Vegetation condition	**Vegetation description**	**Easting**	**Northing**
Degraded	Mixed shrubland	476866	7699604

Species name
**Cenchrus ciliaris*
Acacia ancistrocarpa
Acacia bivenosa
Acacia pyrifolia
Corchorus laniflorus
Diplopeltis eriocarpa
Scaevola spinescens
Senna glutinosa subsp. pruinosa
Triodia wiseana

Appendix I Hierarchical clustering dendrogram



Appendix J Fauna species list

Species name	Common name	Observation type
Birds		
Aquila audax	Wedge-tailed Eagle	Observed
Ardeotis australis	Australian Bustard	Observed
Artamus cinereus	Black-Faced Woodswallow	Observed
Chalcites basalis	Horsfield's Bronze Cuckoo	Heard
Cincloramphus cruralis	Brown Songlark	Heard
Cincloramphus mathewsi	Rufous Songlark	Observed and Heard
Coracina novaehollandiae	Black-faced Cuckooshrike	Observed
Corvus bennetti	Little Crow	Observed and Heard
Cracticus nigrogularis	Pied Butcherbird	Observed
Eolophus roseicapilla	Galah	Observed
Falco berigora	Brown Falcon	Observed
Falco cenchroides	Australian Kestrel (Nankeen Kestrel)	Observed
Gavicalis virescens	Singing Honeyeater	Observed and Heard
Geopelia cuneata	Diamond Dove	Observed
Geophaps plumifera	Spinfex Pigeon	Observed
Grallina cyanoleuca	Magpie-lark	Observed
Haliastur sphenurus	Whistling Kite	Observed and Heard
Lalage tricolor	White-Winged Triller	Heard
Melopsittacus undulatus	Budgerigar	Observed
Ocyphaps lophotes	Crested Pigeon	Observed
Pachycephala rufiventris	Rufous Whistler	Heard
Petrochelidon nigricans	Tree Martin	Observed and Heard
Rhipidura leucophrys	Willie Wagtail	Observed and Heard
Synoicus ypsilophorus	Brown Quail	Observed
Taeniopygia castanotis	Australian Zebra Finch	Observed
Mammals		
**Bos primigenius taurus*	European Cattle	Tracks
**Canis familiaris*	Dog/Dingo	Tracks in the creeklines
**Felis catus*	Cat	Tracks in the creeklines
Macropus fuliginosus melanops	Western Grey Kangaroo	Scats
Reptiles		
Ctenophorus isolepis	Central Military Dragon	Observed

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