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20 June 2019

Our Reference: 21270-19-BILR-1RevA_190620

Jarl Andersen
Land and Mineral Rights Officer
Rio Tinto Exploration
Belmont WA 6104

Dear Jarl,

Re: Paterson Road Corridor – Reconnaissance Flora, Vegetation and Level 1 Fauna Survey, May 2019

Astron Environmental Services (Astron) completed a single-phase flora, vegetation and fauna assessment at Paterson, approximately 290 km east of Port Hedland in the Great Sandy Desert bioregion of Western Australia. The survey area consisted of a corridor approximately 50 m either side of an existing track and was approximately 52 km in length, with a total area of approximately 852 ha. The survey was carried out between 29 April and 9 May 2019 (Astron Environmental Services 2019).

Two priority flora species, *Goodenia hartiana* P2 and *Indigofera ammobia* P3 were recorded during the survey. An estimated of 10,996 individuals of *Goodenia hartiana* P2 were recorded along the entire length of the survey area. It would appear that *Goodenia hartiana* P2 is more widespread locally than previously known and may germinate post-fire.

Two individuals of *Indigofera ammobia* P3 were recorded from a single location on the low slope of a dune within the survey area. The known occurrence this species should be avoided, where possible.

One further priority flora species may occur in the survey area. A scanned specimen of collection DR23-01 was sent to the University of New England to be identified by *Phyllanthus* expert Dr Ian Telford at University of New England (UNE), however its identification could not be confirmed as it lacked diagnostic reproductive material. The specimen most closely aligns with the priority flora species *Phyllanthus hebecarpus* P3 which has been previously recorded in the vicinity of Marble Bar and Port Hedland; due to the uncertainty the specimen has therefore been identified as *Phyllanthus* ?*hebecarpus* P3. The collected specimen will be sent to the UNE for further review. Should this specimen not represent *P. hebecarpus* P3 it is still an under-sampled taxon, and may represent a potentially endemic, geographically restricted or even threatened species. Only one occurrence of this taxon has been recorded by Astron in three field surveys in the vicinity. Until more is known regarding the taxonomy and distribution of this species, the precautionary principle should apply, and impacts upon the known locations should be avoided as far as reasonably practicable.

Astron has compiled two information posters to assist Rio Tinto Exploration field staff with familiarising with the two recorded priority flora species, *Goodenia hartiana* P2 and *Indigofera ammobia* P3. We recommend that the posters are displayed somewhere prominent, such as the mess, to educate your team on local flora of interest to avoid disturbing where possible.

No weed species were identified in the survey area. There is high potential for introduction of weed species as works progress across the Paterson project area; as such it is recommended that a weed hygiene management plan be implemented as soon as practicable to prevent the introduction of weed species via machinery or personnel.

This recommendations memo has been prepared by Environmental Scientists Lucy Dadour and Dr Markus Mikli, with technical review by Principal Scientist Janelle Atkinson. If you have any queries, please contact me or Project Coordinator Haylea Warrener on 9421 9600.

Yours sincerely
ASTRON ENVIRONMENTAL SERVICES

Stuart Pearse
General Manager

References

Astron Environmental Services. 2019. Paterson Road Corridor - Reconnaissance Flora and Vegetation and Level 1 Fauna Survey. Unpublished report prepared for Rio Tinto Iron Ore.

Paterson Road Corridor
Reconnaissance Flora and Vegetation and Level 1 Fauna Survey
May 2019

Prepared for
Rio Tinto Exploration

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Report Reference: 21270-19-BISR-1Rev0_190626

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Paterson Road Corridor
Reconnaissance Flora and Vegetation and Level 1 Fauna Survey

Prepared for
Rio Tinto Exploration

Job Number: 21270-19

Reference: 21270-19-BISR-1Rev0_190626

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Approval

Rev	Date	Issued to	Authorised by	
			Name	**Signature**
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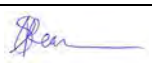
0	26/06/2019	Jarl Andersen	S. Pearse	

Abbreviations

Abbreviation	Definition
°C	Degrees Celsius
ARU	Autonomous Recording Unit
Astron	Astron Environmental Services Pty Ltd
BC Act	*Biodiversity Conservation Act 2016*
BOM	Bureau of Meteorology
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
GDA94	Geocentric Datum of Australia 1994
GIS	Geographic information system
GPS	Global Positioning System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
km	Kilometres
m	Metre
mm	Millimetres
MGA50	Map Grid of Australia
MNES	Matters of National Environmental Significance
P	Priority
PDWSA	Public Drinking Water Source Area
PEC	Priority Ecological Community
Rio Tinto	Rio Tinto Exploration
sp.	Species (singular)
spp.	Species (plural)
subsp.	Subspecies
T	Threatened
TEC	Threatened ecological community
TPFL	Threatened and Priority Flora Database (administered by Department of Biodiversity, Conservation and Attractions)
TP List	Threatened and Priority Flora List (administered by Department of Biodiversity, Conservation and Attractions)
WA Herbarium	Western Australian Herbarium
WoNS	Weeds of National Significance

Executive Summary

Rio Tinto Exploration is evaluating the Paterson mineral exploration site. Paterson is located approximately 290 km east of Port Hedland, in Western Australia. Astron Environmental Services was commissioned to undertake a Reconnaissance flora and vegetation and Level 1 fauna assessment of a proposed haul road corridor. The survey area is approximately 52 km long by 110 m wide, with a total area of 852.1 ha.

There were five vegetation types recorded within the survey area. No threatened or priority ecological communities were recorded. All vegetation types present in the survey area are likely to be well represented across the broader Great Sandy Desert bioregion.

There were 89 confirmed vascular flora species, from 26 families and 55 genera, recorded in the survey area. The dominant plant families were Fabaceae and Poaceae. No threatened flora was recorded within the survey area. Two priority flora species were recorded. Approximately 11,000 plants of *Goodenia hartiana* P2 occurred throughout the survey area, particularly in burnt areas. Two plants of *Indigofera ammobia* P3 were recorded from a single location on the lower slope of a dune. One collected flora specimen is of taxonomic interest and may represent an additional priority flora species. Specimen DR23-01 showed greatest affinity to *Phyllanthus hebecarpus* P3. The specimen was submitted to the WA Herbarium and the University of New England for identification by specialist taxonomists, but was not able to be confidentially identified as it lacked diagnostic reproductive material. Twelve species recorded within the survey area are of interest as they represent range extensions. These disjunct occurrences are likely to be a consequence of the flora within the Great Sandy Desert bioregion being under-sampled. No weeds were identified within the survey area and all remnant vegetation was rated as 'Excellent' condition.

The desktop assessment identified 33 conservation significant fauna species previously recorded within 40 km to 100 km of the survey area, comprising two reptile species, 22 bird species and nine mammal species. One fauna habitat type was described for the survey area: Sandy Plain. This habitat is not restricted to the survey area, nor are they of better condition or quality than the surrounding local area or region. This habitat type has the potential to provide habitat for a suite of terrestrial fauna species, including conservation significant species.

A total of 41 terrestrial fauna species were recorded opportunistically during the survey, comprising six reptile species, 26 bird species and nine mammal species. No species of conservation significance were recorded in the survey area.

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1 Introduction

1.1 Project Background

Astron Environmental Services Pty Ltd (Astron) was engaged by Rio Tinto Exploration (Rio Tinto) to undertake a flora, vegetation and fauna assessment at Paterson, approximately 290 km east of Port Hedland in the Great Sandy Desert bioregion of Western Australia. The survey area is located within the Shire of East Pilbara and has a total area of approximately 852 ha. The survey area is approximately 52 km in length and encompasses approximately 50 m either side of an existing track. The location of the survey area is presented in Figure 1.

1.2 Scope and Objectives

In order to expand exploration activities at Paterson, Rio Tinto required a biological assessment to support a Programme of Work application. The objective of the assessment was to complete a Reconnaissance flora and vegetation survey, and a Level 1 fauna assessment, including a desktop study and field survey.

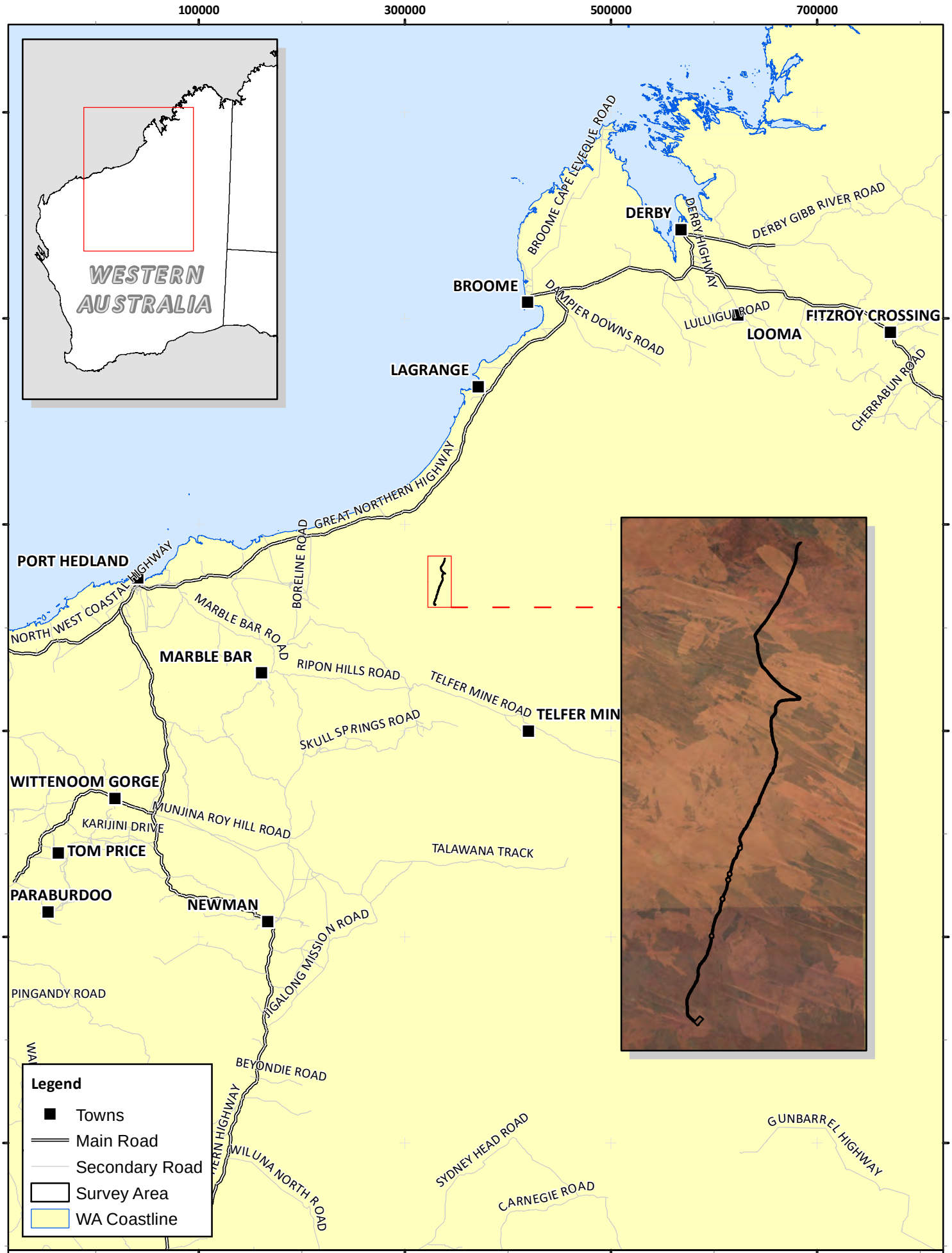
Broadly, the scope of work was to undertake a:

- desktop assessment, including database searches and literature review of available contextual and project related resources
- single-phase vegetation and flora assessment, including:
    - establishment of unpegged relevés representing an estimated 2,500 m^2 to define the vegetation present, ensuring adequate replication within vegetation types and spatial representation
    - vegetation type and condition mapping using relevé information, mapping notes and observations of disturbance within the survey area
    - targeted searches for the presence of threatened (T) and priority (P) flora, weeds and vegetation of conservation significance
    - provision of a vascular flora species list for the survey area.
- Level 1 fauna and fauna habitat field survey, including:
    - habitat assessment mapping
    - targeted fauna searches and sampling, opportunistic sightings and records of species present, and their significance.

The survey conformed to the regulatory guidance documents as listed in Table 1. Section 3.4 provides more detail on the limitations of the survey.

Table 1: Summary of Astron's vegetation, flora and fauna assessment at Paterson.

Level of survey	Total size of survey area	Survey timing	Relevant regulatory guidance documents	Key survey limitations
• Reconnaissance flora and vegetation survey • Level 1 fauna survey	852.1 ha	April/May 2019	• Statement of Environmental Principles, Factors and Objectives (Environmental Protection Authority 2018) • Environmental Factor Guideline - Flora and Vegetation (Environmental Protection Authority 2016a) • Environmental Factor Guideline - Terrestrial Fauna (Environmental Protection Authority 2016b). • Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (Environmental Protection Authority 2016c) • Technical Guidance - Terrestrial Fauna Surveys (Environmental Protection Authority 2016e). • Technical Guidance - Sampling Methods for Terrestrial Fauna (Environmental Protection Authority 2016d). • Interim Guideline for Preliminary Surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia, May 2017 (Department of Parks and Wildlife 2017). • Survey Guidelines for Australia's Threatened Reptiles, Birds, Mammals and Bats (Department of Sustainability Environment Water Population and Communities 2011b; Department of the Environment 2010b; Department of Sustainability Environment Water Population and Communities 2011a; Department of the Environment 2010a)	• Seasonal conditions for the field survey were below average; floristic diversity of annual/ ephemeral and short lived perennial species may therefore have been under-represented. • Few previous biological surveys have been conducted in the vicinity of the survey area, therefore limited contextual information is available.



Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure 1: Survey Area

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Author: L. Dadour	Date: 12-06-2019
Drawn: T. Kovacs-Ledo	Figure Ref: 21270-19-ENVDR_1RevA_190606_Fig1_Loc

Scale: 1:4,704,613 at A4
Coordinate System: GDA 1994 MGA Zone 51
Kilometres
0 40 80 120 160

N

2 Environment Context

2.1 Climate

The climate of the Pilbara region of Western Australia is classified as arid tropical with two distinct seasons: a hot, wet summer (October to April) and a mild, dry winter (May to September) (Bureau of Meteorology 2019).

Based on long-term climatic data from the nearest Bureau of Meteorology weather station at Mandora (Station 004019), approximately 90 km north-west of the survey area, the mean annual rainfall since 1913 is 380.4 mm. The mean maximum temperatures range between 36.9°C in March and 29°C in July, and range above 34°C for much of the year (Bureau of Meteorology 2019).

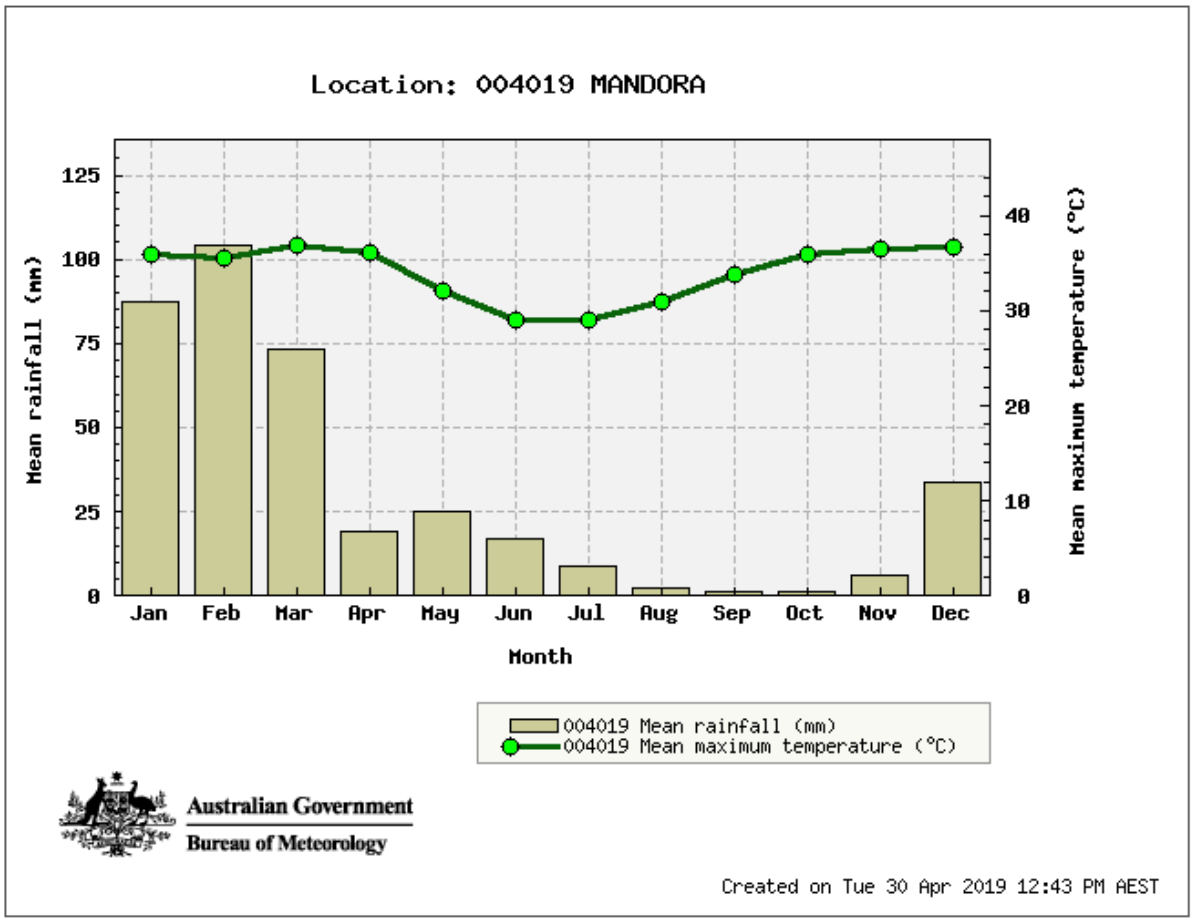

Figure 2: Climate data for Mandora (Station 004019). Mean annual rainfall data has been calculated from 1913 to 2019. Mean maximum temperature data has been calculated from 1962 to 2019 (Bureau of Meteorology 2019).

2.2 Geology

The survey area occurs on the Canning Basin which covers much of the area in the north-east of the Pilbara. The Canning Basin sequence is Late Carboniferous to Cretaceous in age, more than 700 m thick and comprises shale, mudstone, sandstone, conglomerate, siltstone and minor coal. A thin veneer of Cainozoic deposits overlies the sequence (van Vreeswyk et al. 2004). The surface geology of the survey area is comprised of three units (Stewart et al. 2008), with Sand Plain 38499 being the dominant (Table 2). A further three units occur within 5 km of the study area (Qrc, Czl and Kspa). Geological mapping of the survey area and surrounds is presented in Figure A.1 (Appendix A).

Table 2: Geological units of the survey area (Stewart et al. 2008).

Geological name	Label	Area within survey area (ha)
Sand Plain 38499: Sand or gravel plains; quartz sand sheets commonly with ferruginous pisoliths or pebbles, minor clay; local calcrete, laterite, silcrete, silt, clay, alluvium, colluvium, aeolian sand	Czs	639.2
Callawa Formation: Fluviatile cross-bedded very fine to coarse-grained sandstone, granule conglomerate and minor siltstone; plant and trace fossils	JKsc	9.1
Dunes 38496: Dunes, sandplain with dunes and swales; may include numerous interdune claypans; residual and aeolian sand with minor silt and clay; aeolian red quartz sand, clay and silt, in places gypsiferous; yellow hummocky sand	Qd	203.8

The survey area is mapped as containing two soil landscape zones:

- Zone 112 – Great Sandy Desert Zone in the Great Sandy Desert Province. Occurs in the northern arid interior between Dampier Downs Station, Lake Gregory and De Grey River. It is described as: 'sandplains and dunes on sedimentary rocks of the Canning Basin. Red deep sands and red sandy earths with some red loamy earths and shallow gravel. Spinifex grasslands with Eucalypts and some *Acacia* spp. shrublands'.
- Zone 117 – Nita Sandplain Zone in the Great Sandy Desert Province. The Nita Sandplain soil unit (zone 117) is located in the north-west coast hinterland between Broome and the De Grey River. It is described as: 'sandplains and dunes on Cretaceous Canning Basin sedimentary rocks with red deep sands and some red sandy earths. Pindan shrublands and shrubby spinifex grasslands' (Tille 2006).

2.3 Surface Water and Hydrology

The survey area does not contain any wetland classified as Conservation Category or listed in the Directory of Important Wetlands. The nearest wetland listed in the Directory of Important Wetlands is the Mandora Salt Marsh, located approximately 45 km north of the survey area. The nearest Ramsar wetland, Eighty Mile Beach, is located approximately 36 km north of the survey area at its nearest point (Department of the Environment and Energy 2018b, 2018d).

No major drainage lines or rivers intersect with the survey area. The nearest river, De Grey, is located approximately 86 km south west of the survey area. The survey area does not intersect with a mapped Public Drinking Water Source Area (PDWSA). The nearest PDWSA, the Nullagine Water Reserve, is located approximately 195 km south-west of the survey area.

2.4 Biological Environment

2.4.1 Interim Biogeographical Regionalisation of Australia

The Interim Biogeographic Regionalisation for Australia (IBRA version 7) divides the Australian continent into 89 bioregions and 419 subregions (Department of the Environment and Energy 2018c). The IBRA regions represent a landscape-based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna. The survey area occurs in the Great Sandy Desert Bioregion, and at a finer scale within both the Mackay and McLarty subregions. Approximately 35% of the Mackay subregion is represented in the national reserve system. Approximately 38% of the McLarty subregion is represented in the national reserve system (Department of the Environment and Energy 2016b).

- McLarty subregion (GSD1) comprises mainly tree steppe grading to shrub steppe in south; comprising open hummock grassland of *Triodia pungens* and *Triodia schinzii* with scattered trees of *Owenia reticulata* and bloodwoods, and shrubs of *Acacia* spp, *Grevillea wickhamii* and *G. refracta*, on Quaternary red longitudinal sand dune fields overlying Jurassic and Cretaceous sandstones of the Canning and Amadeus Basins. *Casuarina decaisneana* (Desert Oak) occurs in the far east of the region. Gently undulating lateritised uplands support shrub steppe such as *Acacia pachycarpa* shrublands over Triodia pungens hummock grass. Calcrete and evaporite surfaces are associated with occluded palaeo-drainage systems that traverse the desert; these include extensive salt lake chains with samphire low shrublands, and *Melaleuca glomerata - M. lasiandra* shrublands (Graham 2001).
- Mackay subregion (GSD2) comprises mainly tree steppe grading to shrub steppe in the south; comprising open hummock grassland of *Triodia pungens* and *T. schinzii* with scattered trees of *Owenia reticulata* and bloodwood (*Corymbia* spp.) and shrubs of *Acacia* spp., *Grevillea wickhamii* and *G. refracta* on Quaternary red longitudinal sand dune fields overlying Jurassic and Cretaceous sandstones of the Canning and Amadeus Basins. *Casuarina decaisneana* (desert oak) occurs in the south and east of the region. Gently undulating lateritised uplands support shrub steppe such as *Acacia pachycarpa* shrublands over *T. pungens* hummock grass. Calcrete and evaporative surfaces are associated with occluded paleo-drainage systems that traverse the desert; these include extensive salt lake chains with samphire low shrublands and *Melaleuca glomerata – M. lasiandra* shrublands (Kendrick 2001).

The distribution of each subregion within the survey area is shown in Figure A.2 (Appendix A).

2.4.2 Land Systems

Land systems of the Western Australian rangelands have been mapped and described by the Department of Agriculture and Food (now the Department of Primary Industries and Regional Development) outlining the distributions and providing comprehensive descriptions of biophysical resources, including soil and vegetation condition. A total of 77 land systems occur in the Great Sandy Desert bioregion, covering 12,410,090 ha. Two land systems occur in the survey area: the Little Sandy System and the Nita System (Table 3). The layout of these land systems within the survey area is shown in Figure A.2 (Appendix A).

Table 3: Distribution of land systems within the survey area and Great Sandy Desert bioregion(van Vreeswyk et al. 2004).

Land system	Total area within Great Sandy Desert bioregion (ha)	Total area within study area (ha)	Proportion within study area (%)
Little Sandy System - Sandplains with linear and reticulate dunes supporting shrubby hard and soft spinifex grasslands.	1,274,985	749.6	<0.1
Nita System - Sandplains supporting shrubby spinifex grasslands with occasional trees.	921,407	102.5	<0.1

2.4.3 Pre-European Vegetation

The survey area is located in the Great Sandy Desert which has been broadly characterised by Beard and Webb (1974), who completed broad scale pre-European vegetation mapping at a scale of

1:1,000,000 to association level. Three pre-European vegetation associations, 134, 101 and 117, are present within the survey area:

- Great Sandy Desert 134: Sparse low tree-steppe /Sparse shrub-steppe.
- Mandora East 101: Shrub-steppe
- Mandora East 117: Grass steppe

The Beard and Webb vegetation associations mapped within the survey area and their remaining extent across the Great Sandy Desert bioregion are summarised in Table 4.

Table 4: Extent of pre-European vegetation in the survey area (Government of Western Australia 2018)

Vegetation association	Mapping unit (Beard and Webb 1974)	Extent in survey area (ha)	Current extent (ha)	Pre-European extent remaining (ha)	Pre-European extent remaining (%)
134	e23Lr pHi/anSr t,pHi	740.1	13,593,950.8	13,595,888.2	99.9
101	a5Sr t1Hi	96.3	961,124.0	961,169.8	100.0
117	t1Hi	15.7	467,121.7	467,578.8	99.9

2.4.4 State and Commonwealth Conservation Categories and Management

Commonwealth and State regulatory authorities maintain databases of the locations and conservation status of significant flora, fauna and ecological communities in Western Australia.

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage Matters of National Environmental Significance (MNES) including listed flora, fauna and ecological communities. These listed flora, fauna and ecological communities are allocated a conservation category, which are outlined in Tables B.1 and B.2 (Appendix B).

Ecological communities may be subject to processes that threaten to destroy or significantly modify it across much of its range. These communities are identified as threatened ecological communities (TECs) and are listed at both Commonwealth level under the EPBC Act and State level by the *Biodiversity Conservation Act 2016* (BC Act) (Table B.3, Appendix B). The Department of Biodiversity, Conservation and Attractions (DBCA) maintains a list of priority ecological communities (PECs), which may also be under threat and are assigned one of four priority rankings according to the criteria outlined in Table B.4 (Appendix B) (Department of Environment and Conservation 2013).

Under Western Australian legislation, all native flora is protected and it is an offence to 'take' protected flora. The BC Act also provides for native flora to be gazetted as threatened or extinct. Under the BC Act threatened species may be listed as one of three categories: critically endangered, endangered or vulnerable (Table B.5, Appendix B). In addition, due to the diversity of Western Australia's flora, many species are known from only a few collections or locations, but have not been adequately surveyed. Such flora may be threatened, but cannot be considered for declaration as threatened flora until adequate surveys have been undertaken. These flora species are included on a supplementary conservation list managed by DBCA called the *Priority Flora List* (Table B.6, Appendix B).

Under Western Australian legislation, all native fauna is protected and it is an offence to 'take' protected fauna. The BC Act also provides for native fauna species to be specially protected when

they are considered rare, threatened with extinction, or have a high conservation value (Table B.5, Appendix B). In addition, due to the diversity of Western Australia's fauna, many species are known from only a few collections or locations, but have not been adequately surveyed. Such fauna may be rare or threatened, but cannot be considered for declaration as Threatened fauna until adequate surveys have been undertaken. These fauna species are included on a supplementary conservation list managed by DBCA called the *Priority Fauna List*. Priority fauna are categorised according to level of threat and other information and the conservation categories are described in Table B.6 (Appendix B).

In addition to these protections, Environmentally Sensitive Areas (ESAs) are declared by the Minister for Environment under Section 51B of the *Environmental Protection Act 1986* to prevent incremental degradation of important environmental values such as declared rare flora, TECs or significant wetlands.

2.4.5 Introduced Flora

Significant weed species are identified at both the state and national level. The Australian Weeds Strategy (Australian Weeds Committee 2012) identifies Weeds of National Significance (WoNS) which have the potential to impact primary industry and/or environmental and social values. The management of weeds in Western Australia is primarily regulated through the *Biosecurity and Agriculture Management Act 2007*, with further provision under the BC Act. Species listed under this Act are allocated one of three declared pest categories which define the required level of management (Department of Primary Industries and Regional Development 2018). Declared pest categories and listed weed species' priority ratings are presented in Table B.7 (Appendix B).

2.5 Protected Areas and Reserves

The survey area does not occur within or adjacent to any conservation reserves. The nearest land under conservation reserve is the Walyarta Conservation Park, which is located approximately 20 km north of the survey area. The Nyangumarta Warrarn Indigenous Protected Area occurs within the survey area and the Karajarri Indigenous Protected Area occurs 56 km north of the survey area (Department of the Environment and Energy 2016a).

2.6 Environmentally Sensitive Areas

No ESAs intersect the survey area. The closest ESAs to the survey area are Eighty Mile Beach located 36 km north-west; Mandora Salt Marsh located 45 km north; and Mandorah Marsh which was listed on the Register of the National Estate (which is now closed), located 46 km north-east of the survey area (Department of the Environment and Energy 2008).

3 Methods

3.1 Desktop Assessment

3.1.1 Database Searches

A search for ESAs in the vicinity of the survey area was conducted using available datasets. In addition, database searches were conducted to identify listed conservation significant ecological communities, flora and fauna species within, or in close proximity to, the survey area. Details of database searches undertaken are summarised in Table 5. Conservation categories for ecological communities, flora and fauna are presented in Appendix B. Introduced flora species were compared to the Western Australian Organism List (Department of Primary Industries and Regional Development 2019) to determine if any have been listed as declared pests, and the WoNS list (Australian Weeds Committee 2012). Introduced flora and fauna categories are presented in Appendix B.

The DBCA database search results (Department of Biodiversity, Conservation, and Attractions 2018b, 2018d, 2018e) received for an adjacent survey area (Astron Environmental Services 2018) were used to provide contextual information for this survey. The current survey area is approximately 50 km from the previous survey area at its nearest point.

Table 5: Database searches requested.

Database name	Date search results received	Search focus	Search area
Protected Matters Search Tool (Department of the Environment and Energy 2019)	15/05/2019	MNES - flora and fauna	40 km radius from two points, from the northern and southern section of the survey area defined by the coordinates: North: -20.23462°, 121.44008° South: -20.5602°, 121.36159°
Threatened and Priority Ecological Communities database (Department of Biodiversity, Conservation, and Attractions 2018b)	12/10/2018	Listed threatened and priority ecological communities	60 km radius from a centre point immediately east (55 km) of the survey area, defined by the coordinates: 20°46'33 S, 121°51'33 E
Threatened and Priority Flora Database (TPFL) (Department of Biodiversity, Conservation, and Attractions 2018d)	12/10/2018	Threatened and priority flora	60 km radius from a centre point immediately east (55 km) of the survey area, defined by the coordinates: 20°46'33 S, 121°51'33 E
Threatened and Priority Flora Species List (TP list) (Department of Biodiversity, Conservation, and Attractions 2018e)			
Western Australian Herbarium flora (Department of Biodiversity, Conservation, and Attractions 2018f)			

Database name	Date search results received	Search focus	Search area
Threatened and Priority Fauna database (Department of Biodiversity, Conservation, and Attractions 2018c)	15/10/2018	Threatened and priority fauna	60 km radius from a centre point immediately east (55 km) of the survey area, defined by the coordinates: 20°46'33 S, 121°51'33 E
NatureMap *(Department of Biodiversity, Conservation, and Attractions 2019a)*	15/05/2019	Terrestrial flora and fauna of conservation significance	40 km radius from two points, from the northern and southern section of the survey area defined by the coordinates: North: 121° 26' 24'' E, 20° 14' 05'' S South: 121° 21' 41'' E, 20° 33' 38'' S
Birdlife database (Birdlife Australia 2019)	14/05/2019	Bird Species	Approximate 40 km radius from survey area boundary.

3.1.2 Likelihood of occurrence

3.1.2.1 Vegetation and Flora

The 42 PECs and two TECs listed by DBCA for the Pilbara region along with the 62 PECs listed for the Kimberley region and the two TECs listed for the Great Sandy Desert Bioregion (Department of Biodiversity, Conservation, and Attractions 2017) were reviewed to identify the key characterising features to assist with identification in the field.

Prior to conducting the field survey, aerial imagery was interpreted to identify potential habitat types. The conservation significant flora species returned from the database searches were then categorised according to the criteria in Table 6 for potential occurrence within the survey area.

Table 6: Pre-survey criteria used to assess the likely presence of conservation significant flora in the survey area.

Likelihood of occurrence	Pre-survey
Likely	Species previously recorded within the survey area or within 10 km of the survey area and suitable habitat appears to be present in the survey area.
Potential	Species previously recorded within 10 km to 40 km of the survey area and/or suitable habitat appears to be present in the survey area.
Unlikely	No suitable habitat appears to be present in the survey area.

Following the field survey, the conservation significant flora species identified during the desktop assessment as having the highest potential to occur within the survey area, yet were not recorded during the current survey, were again assessed to determine their likelihood of occurrence within the survey area. Post-field survey likelihood of occurrence was primarily based on validating the presence (and thorough inspection) of suitable habitats within the survey area, combined with life form, habitat and flowering information for each flora species.

3.1.2.2 Fauna

Conservation significant fauna species returned from the database searches were categorised pre- and post-survey according to the criteria in Table 7 for likelihood of occurrence within the survey area. The categories of likelihood are based on the interpretation of Pilbara experienced Astron environmental scientists.

Table 7: Criteria used to assess the likely presence of conservation significant fauna in the survey area.

Likelihood of occurrence	Criteria
Recorded	Species or evidence of species recorded during survey.
High	Core or preferred habitats present in the vicinity which are abundant and/or high quality condition. Or Species is known to be cryptic and may not have been detected despite adequate survey effort and suitable habitat present within the survey area. Or Species or evidence of species recorded within the survey area however doubt remains over the taxonomic identification, validity of record.
Moderate	Core or highly suitable habitats present in the survey area, however, non-cryptic species that was not detected despite adequate survey effort. Or Core or preferred habitats present in the survey area are mainly in poor or modified condition.
Low	Species has not been recorded in the survey area despite adequate survey effort. Or Species dependent on specific habitats that do not occur in the survey area. Or Species considered locally extinct.

3.2 Field Survey

3.2.1 Weather

Daily weather observations recorded from Mandora (station 004019) were used to describe local rainfall and temperatures preceding the survey. The total annual rainfall recorded proceeding the survey in 2018 to 2019 was 266.8 mm below the long-term mean of 380.4 mm. A total of 45.2 mm of rainfall was recorded in the three months preceding the survey; this was 151.2 mm below the long-term average (1913 to 2019) for the same time period. The mean maximum temperature for April 2019 (37°C) was higher than the long term April average 36.2°C (1962 to 2019) (Figure 3).

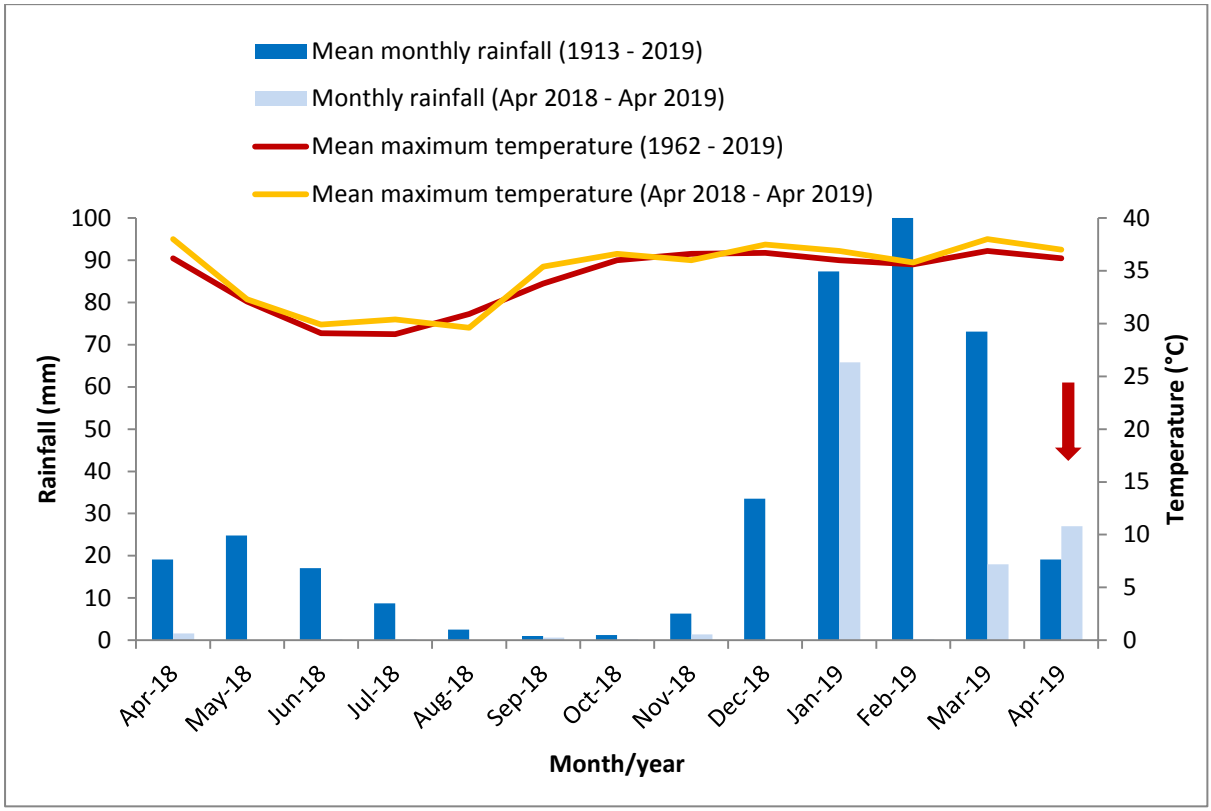

Figure 3: Long-term (1913-2019) mean monthly rainfall (mm) and maximum temperatures (1962-2019) (°C) and total recorded monthly rainfall (mm) and monthly temperatures (°C) (April 2018 to April 2019) at Mandora weather station (station 004019) (Bureau of Meteorology 2018). Red arrow indicates survey timing.

3.2.2 Flora and Vegetation Survey

The flora and vegetation survey was conducted over eleven days between 29 April and 9 May 2019 by Astron Ecologist Lucy Dadour and Botanist Dr Markus Mikli.

Information acquired during the desktop study assisted in the design of the field survey. Pre-survey planning involved the examination of 1:10,000 scale aerial photography to identify potential landforms, habitat and vegetation types. Survey effort is shown in Figure C.1 (Appendix C).

Twenty-eight relevés were sampled from representative vegetation types. The following information was collected for each relevé:

- location – coordinates measured using a handheld global positioning system (GPS) unit (MGA50, GDA94). One set of coordinates taken at the site of the assessment.
- recorder and date –personnel involved in sampling that location and the survey date.
- vegetation description – vegetation was described according to level 5 of the National Vegetation Information System (Department of the Environment and Energy 2018a) and classified according to the Aplin (1979) modification of the vegetation classification system of Specht (1970) (Appendix D).
- vegetation condition – assessed according to the vegetation condition classification adapted from Trudgen (1988) (Appendix D).
- species and foliar cover – vascular plant species present. The inventory of associated species was comprehensive, with each flora species present recorded.

- species cover – the percentage cover of any vascular plant species that was dominant and characteristic of the vegetation type.
- habitat – a broad description of the surrounding landscape based on landform, topography and soil.
- soil – including colour and texture.
- disturbances – records of any obvious disturbances, such as tracks, weed infestations or grazing.
- fire age – an estimate of when any previous fire occurred
- photographs – a photograph was taken of each site to show representative vegetation.

Four mapping notes summarising vegetation type information were also used to collect vegetation data opportunistically throughout the survey area.

The survey area was accessed by vehicle. The entire length was traversed on both sides of the haul road. A geographic information system (GIS) enabled device with the survey area uploaded, plus a hard copy of colour aerial photography on A3 maps at a scale of 1:10,000 were used to locate the survey area and to assist in navigation.

Previously recorded conservation significant flora records and associated habitat preference information were used to identify vegetation types and habitat within the survey area and surrounds that have the potential to support conservation significant flora (Department of Biodiversity, Conservation, and Attractions 2018f, 2018e, 2018d, 2018a, 2019a; Department of the Environment and Energy 2019).These habitats and vegetation types were located from 1:10,000 colour aerial imagery and on-ground observations and were then targeted to record the presence or absence of conservation significant flora.

Assessment for flora range extensions was bases on: A range of more than 80 km from the nearest known record and/or if the record is at the outer most edge of its known population range (Department of Biodiversity, Conservation, and Attractions 2019b).

3.2.3 Fauna Survey

The Level 1 fauna survey was completed by Astron Ecologist Lucy Dadour, concurrently with the botanical assessment, and in accordance with relevant EPA guidance documents (Environmental Protection Authority 2016d, 2016e).

Habitat assessments were conducted within representative fauna habitat types present in the survey area and surrounds. The following information was collected at each site:

- location – coordinates measured using a handheld GPS (GDA94)
- recorder and date – personnel involved in undertaking the fauna habitat assessment and the survey date
- habitat/landform – position in the landscape - major fauna habitat types were described based on the landform and vegetation
- vegetation type – a broad description of vegetation type and structure
- soils – a brief description of soil type
- microhabitat – presence of specific microhabitat features, e.g. leaf litter, logs, burrows, rocky outcrops, rock crevices, hollows, permanent or semi-permanent water

- condition – habitat condition was assessed based on the presence of anthropogenic (human-induced) disturbances, and using the condition ratings suggested by Thompson and Thompson (2010) (Table D.3, Appendix D)
- disturbance – any disturbance such as clearing, fire, weeds, flooding, vehicular, machinery, tracks or grazing
- photographs – a representative photograph was taken of each habitat assessment site.

The information derived from the fauna habitat assessments was used to delineate fauna habitats throughout the survey area, which were then mapped accordingly.

Species of conservation significance likely for the survey area, including the Greater Bilby (*Macrotis lagotis*) and Night Parrot (*Pezoporus occidentalis*), were surveyed through additional methods. The aim of the targeted species searches was to identify area of potentially suitable habitat for these conservation significant fauna, and note secondary signs including tracks, scats, diggings, nests and burrows. Visual observation for conservation significant fauna habitat was ongoing whilst moving through the survey area. Survey effort is shown in Figure C.1 (Appendix C).

Due to the recent discovery of Night Parrot populations in Western Australia, the DBCA have published Interim Guidelines for Preliminary Surveys of Night Parrots in Western Australia (Department of Parks and Wildlife 2017). The survey area is located in the area mapped as 'High priority for survey' for this species. Therefore, passive acoustic surveys were undertaken and acoustic recording units (ARUs) used in the most prospective habitats, generally thought to be plain habitat types containing long unburnt *Triodia* spp. Two ARUs (Song Meter 2, SM2BAT+) were positioned in two locations and set for seven nights, resulting in a total of 14 recording nights. The ARUs were set to record from 1 hour pre-sunset to 1 hour post-dawn. The recordings were recorded at 44.1 k bits and covered the frequency range 100 kHz to 21,000 kHz that brackets the Night Parrot call frequency range of 1,500 kHz to 3,500 kHz.

In conjunction with the Night Parrot acoustic surveys, acoustic ultrahigh frequency equipment was used to record the presence of bats. The data collected on the SM2BAT+ detectors set in the field were analysed by Robert Bullen (Bat Call WA 2018). The reference calls for the Night Parrot were available from Bat Call WA's library and compared against any potential calls made from the survey area (Bat Call WA 2018).

3.3 Taxonomy and Nomenclature

3.3.1 Flora

Plant specimens that were not identified in the field were identified in Perth by Alexandra Sleep and reviewed by Dr Palitha Jayasekara. Both are Astron Botanists who have worked extensively in the Pilbara and are highly familiar with the flora of the region. Difficult specimens were verified by specialist taxonomists.

The assigned nomenclature is consistent with the current listing of scientific names recognised by the Western Australian Herbarium (WA Herbarium) and was used for the species list and associated species information collected. Where specimens had inadequate descriptive material to allow confident identification, they were assigned a 'sp. indet' (species indeterminate) epithet, indicating that identification could not be confirmed beyond genus level. Data from each relevé and mapping note were entered into a customised database.

3.3.2 Fauna

Nomenclature and sequence for the fauna species listed within this report is as per Western Australian Museum's *Checklist of the Vertebrates of Western Australia* (Western Australian Museum 2018). Birds are delineated according to Christidis and Boles (2008). For species identified in the desktop assessment where there is doubt to their true taxonomy (through subsequent name changes or taxonomic reviews) every effort was made to determine the current scientific name for each taxon. In addition, some taxon names may be followed by 'sp.', meaning that the species name was not given in the data source or the identification is in doubt. Invertebrate and fish species were not included in the desktop assessment as they are outside of the scope of this survey.

3.4 Limitations

A review of limitations was conducted following the desktop assessment and field survey. The limitations listed in Table 8 are based on those suggested as considerations in Technical Guidance documents for terrestrial surveys (Environmental Protection Authority 2016c, 2016e).

Table 8: Statement of limitations

Potential limitation	Statement regarding potential limitations
(i) Sources of information and availability of contextual information Is the region well documented?	Previous biological surveys have been conducted in the broader area, and broad-scale information is available from Beard and Webb (1974). The reports from three biological surveys conducted near to the survey area were available for review; therefore limited contextual information available for assessment. The DBCA flora and TEC/PEC searches (Department of Biodiversity, Conservation, and Attractions 2018d, 2018f, 2018b) did not capture the most northern section of the survey area. The NatureMap and PMST searches adequately captured the entire survey area and surroundings. This was a minor limiting factor for this survey.
(ii) Scope The level of survey and detail required to undertake the survey. Was there adequate time to complete the survey to the desired standard?	There was adequate time to complete the flora, vegetation and fauna surveys, complete vegetation and fauna habitat mapping, and conduct targeted searches for threatened and priority flora, vegetation and fauna within identified preferred habitats and landforms within the survey area. Time was not considered a limiting factor.
(iii) Proportion of flora and fauna identified, recorded and/or collected Was the survey sampling, timing and intensity considered adequate? Was the survey conducted at what was considered an appropriate time of the year for plant identification? Were any taxonomic groups considered to be under-represented?	The single season flora and vegetation field survey was conducted in April/May, during seasonally dry conditions for the Great Sandy Desert bioregion. Sampling intensity was considered adequate; the flora taxonomic groups recorded within the survey area were considered well represented. However, flora species which are annual or short-lived perennial species were likely to be under-represented, due to the dry seasonal conditions. This was a limiting factor to the flora survey. The fauna recorded were biased towards species that are readily identifiable and conspicuous such as birds. As the fauna survey was a low intensity, Level 1 survey this was not considered a limiting factor.

Potential limitation	Statement regarding potential limitations
(iv) Completeness Is there further work which may be required i.e. was the relevant area fully surveyed?	The survey area was considered adequately surveyed to compile a representative list of species (including priority and introduced flora species), as well as describe and map vegetation at a level appropriate for management decisions. The flora survey area was adequately surveyed and as such completeness was not a limiting factor. The Level 1 fauna survey was considered complete and adequate for this level of assessment and was not a limiting factor.
(v) Mapping reliability Were the aerial photographs, satellite images and site maps available considered adequate to fully understand the area surveyed? Was the mapping generated considered to have a high degree of reliability?	Colour aerial photography at a scale of 1:10,000 was used to locate the survey area and to assist in navigation and delineation of vegetation boundaries. The aerial photography showed recent fire scars (2018) which challenged interpretation of climax vegetation community boundaries. As such mapping reliability was considered a minor limiting factor for mapping vegetation types.
(vi) Timing When was the survey conducted in terms of season, rainfall, severe weather events etc. Was the survey conducted at an appropriate time for access, observation of the optimal suite of species and for identification of flowering and fruiting species?	Seasonal conditions were considered below average for surveying the Great Sandy Desert bioregion at the end of the wet season. A total of 45.2 mm rainfall was recorded in the three months preceding the survey; this was 151.2 mm below the long term average for that period. In addition, the 12 months preceding the survey had seen below average rainfall. The conditions were not suitable for annual and short-lived perennial species, however perennial flora were generally in good condition. As such, the diversity of species recorded is likely to be under-represented, with a lack of annual and short-lived species. One species of conservation significance (*Seringia katatona* P3) with the potential to occur in the survey area is considered a short lived perennial; this species may not have been observable, should it occur, due to the dry seasonal conditions. As the fauna survey was a low intensity, Level 1 survey focusing on the assessment of fauna habitats survey timing was not considered a limiting factor.
(vii) Disturbance Has the survey area been impacted by any disturbance which may have limited the survey, i.e. fire, flood, accidental human intervention etc.?	The last recorded fire within the survey area was in mid-2018 (Landgate 2019). Vegetation in recently burnt areas had generally had sufficient time to regenerate for flora identification. Although vegetation was dominated by post-fire colonising species, it had regenerated enough to allow description and mapping of vegetation types that are likely to be representative of climax communities. As such, vegetation types were able to be compared to regional TECs and PECs for assessment. One species of conservation significance with potential to occur in the survey area (*Seringia katatona* P3) may have been affected by fire, but it is difficult to assess potential fire impacts on this short-lived species in a poor season with below average rainfall. *Goodenia hartiana* P2 appears to favour burnt areas. Fire was therefore not considered a limiting factor of the survey, and no other disturbances that may have affected the outcomes of the survey were noted.
(viii) Intensity In retrospect, was the intensity considered to be adequate?	The intensity of the survey was considered adequate to compile representative species lists, map the vegetation and fauna habitats of the survey area and conduct targeted surveys for conservation significant flora and fauna in potential habitat. Intensity was not considered a limiting factor.

Potential limitation	Statement regarding potential limitations
(ix) Resources Were the appropriate tools and materials available to complete the task effectively?	Resources were adequate to complete the survey and all appropriate tools and materials required to complete the task were available. Resources were not considered a limiting factor.
(x) Access Were there any factors limiting access to the survey area?	The survey area was able to be accessed by vehicle. As such access was not considered a limiting factor.
(xi) Experience Were personnel undertaking the field survey and plant identification trained and/or experienced in undertaking the required tasks?	The scientists responsible for undertaking the field survey have considerable experience in conducting vegetation and flora surveys, and fauna assessments in the Pilbara. The identification of collected specimens was conducted by Alexandra Sleep and reviewed by Dr Palitha Jayasekara, both who are highly experienced in identifying the flora of the region. Personnel experience was not considered a limiting factor.

4 Results

4.1 Desktop Assessment

4.1.1 Literature Review

No relevant, publically available, environmental surveys within the Great Sandy Desert could be sourced on either the Index of Biodiversity Surveys for Assessments portal (Department of Water and Environmental Regulation 2018) or on the Pilbara Biological Survey Database (Department of Parks and Wildlife 2018). Two recent reports were completed by Astron Environmental Services (2018, 2019) within the vicinity of the survey area; these were 42 km and 50 km east of the survey area respectively. Another report detailing the environmental survey work undertaken for the mine and borefield expansion of the Telfer Project was sourced from referral documentation on the EPA website (Hart Simpson and Associates Pty Ltd 2002). Key results of these three reports are summarised in Table 9.

Table 9: Summary of findings from a review of available relevant literature.

	Telfer Project Ecological Survey (Hart Simpson and Associates Pty Ltd 2002)	Paterson Flora, Vegetation and Fauna Habitat Assessment Survey (Astron Environmental Services 2018)	Paterson Reconnaissance Flora and Vegetation and Level 1 Fauna Survey (Astron Environmental Services 2019)
Area surveyed	1,800 ha	116 ha	292 ha
Level of survey	Level 2 (Detailed) flora, vegetation and fauna	Level 1 (Reconnaissance) flora, vegetation and fauna	Level 1 (Reconnaissance) flora, vegetation and fauna
Approx. distance and direction from current survey area	106 km south-south-east	50 km east	42 km east
Flora diversity recorded	244 taxa from 138 genera and 49 families	49 taxa from 35 genera and 14 families	64 Taxa from 47 genera and 22 families
Fauna diversity recorded	Four amphibians, 37 reptiles, 50 birds, 11 native mammals and four introduced mammals	Two reptiles, nine birds and five mammals	Two reptiles, 19 birds, six native mammals and one introduced mammal
Conservation significant flora recorded	No threatened species Two priority species: *Goodenia hartiana* P2 *Fuirena incrassata* P3	No threatened species No priority species	No threatened species Two priority species: *Goodenia hartiana* P2 *Indigofera ammobia* P3
Conservation significant fauna recorded	One threatened species: Greater Bilby (*Macrotis lagotis* VU; VU) One priority species: Northern marsupial mole (*Notoryctes caurinus* P4)	No threatened species No priority species	No threatened species No priority species
Conservation significant ecological communities	No TECs or PECs	No TECs or PECs	No TECs or PECs

4.1.2 Flora and Vegetation

Database search results are presented in Appendix E.

No State or Commonwealth listed TECs nor any State listed PECs are known to occur within the vicinity of the survey area.

The DBCA TPFL (Department of Biodiversity, Conservation, and Attractions 2018d), WA Herbarium database (Department of Biodiversity, Conservation, and Attractions 2018g) and *NatureMap* (Department of Biodiversity, Conservation, and Attractions 2019a) searches indicated that no species listed as threatened have been recorded within the vicinity of the survey area. One record of one priority species (*Goodenia hartiana* P2) was returned from the database searches; this record occurred approximately 51 km south-east of the current survey area (Department of Biodiversity, Conservation, and Attractions 2018g).

Search results from the DBCA TP List (Department of Biodiversity, Conservation, and Attractions 2018e), which searches based on named locations rather than distance from a geographical point, along with results from the literature review, listed one threatened species and 29 priority flora from the vicinity of the survey area. The threatened species recorded was *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4 (EN; EN)). This species is known from steep hills with skeletal soils near to Marble Bar and is unlikely to occur within the survey area.

Of the priority flora previously recorded in the vicinity, 11 are P1, three are P2 and 15 are P3 status. The pre-survey desktop assessment indicated that two of the listed priority flora species (*Goodenia hartiana* P2 and *Indigofera ammobia* P3) were considered likely to occur within the survey area. An additional three species (*Seringia katatona* P3, *Terminalia kumpaja* P4 and *Tribulopis marliesiae* P4) were considered to have the potential to occur (Table F.1, Appendix F).

4.1.3 Fauna

The database searches (Appendix E) and literature review results indicate that 278 vertebrate fauna have been previously recorded within 40 km to 100 km of the survey area; four amphibian species, 74 reptile species (including one introduced), 163 bird species and 37 mammal species (including nine introduced mammal species) (Tables G.1-G.4, Appendix G). Of these, 33 species are of conservation significance, including two reptile species, 22 bird species and nine mammal species (Table F.2, Appendix F).

Of the conservation significant fauna previously recorded in the vicinity of the survey area, four species were considered to have a 'high' likelihood of occurrence, one species considered to have a 'moderate' likelihood of occurrence and the remaining 28 species were all considered to have a 'low' likelihood of occurrence within the survey area (Table F.2, Appendix F). This is based on their respective ecology, habitats considered likely to be present and any previous records from historic survey and database records (Department of Biodiversity, Conservation, and Attractions 2018c, 2019a; Birdlife Australia 2019; Department of the Environment and Energy 2019).

4.2 Flora and Vegetation Survey

4.2.1 Vegetation

There were five vegetation types recorded within the survey area. Vegetation mapping and relevé locations are presented in Appendix H, survey site data are provided in Appendix I and vegetation type descriptions and representative photos are presented in Table 10.

Table 10: Vegetation types described for the survey area.

Vegetation types code and description	Site(s)	Vegetation condition	Total area (ha) (proportion of survey area (%))	Representative photograph
Code: P1 (Plain 1) Description: Occasional *Erythrophleum chlorostachys* scattered low trees over *Acacia eriopoda* tall open shrubland over *Triodia schinzii* open hummock grassland Associated species: *Acacia ancistrocarpa, Acacia monticola, Calytrix carinata, Cleome uncifera* subsp. *microphylla, Grevillea eriostachya, Jacksonia aculeata, Ptilotus astrolasius, Sorghum plumosum*	DR03 DR07 DR08 DRMN02	Excellent	125.6 ha (6.2%)	 **Plate 1: Vegetation type P1 (Plain 1) at site DR08 (5-10 yrs burnt).**  **Plate 2: Vegetation type P1: (Plain 1) site DRMN02 (0-2 yrs burnt).**

Vegetation type code and description	Site(s)	Vegetation condition	Total area (ha) (proportion of survey area (%))	Representative photograph
Code: P2 (Plain 2) Description: *Erythrophleum chlorocarpus* and occasional *Owenia reticulata* and *Gardenia pyriformis subsp. keartlandii* scattered low trees over occasional *Grevillea wickhamii* subsp. *hispidula* scattered tall shrubs to tall open shrubland over *Gompholobium simplicifolium, Jacksonia aculeata* low open shrubland over *Triodia schinzii* very open to open hummock grassland Associated species: *Acacia anaticeps, Acacia tumida* var. *kulparn, Atriplex* sp., *Calytrix carinata, Cassytha filiformis, Dampiera cinerea, Grevillea eriostachya, Newcastelia cladotricha, Ptilotus arthrolasius*	DR01 DR02 DR05 DR10 DR11 DR12 DR13 DR15 DR17 DR18 DR19 DR20 DR21 DR24 DR26 DRMN01 DRMN03 DRMN04	Excellent	440.8 ha (51.7%)	 **Plate 3: Vegetation type P2 (Plain 2) at site DR02 (2-5 yrs burnt).**  **Plate 4: Vegetation type P2 (Plain 2) at site DRMN01 (0-2 yrs burnt).**

Vegetation type code and description	Site(S)	Vegetation condition	Total area (ha) (proportion of survey area (%))	Representative photograph
Code: P3 (Plain 3) **Description:** *Acacia monticola* and *Grevillea refracta* subsp. *refracta* tall open shrubland over *Acacia hilliana* and *Acacia adoxa* var. *adoxa* low open shrubland over *Triodia schinzii* open hummock grassland **Associated species:** *Acacia ancistrocarpa, Bonamia linearis, Goodenia azurea* subsp. *azurea, Phyllanthus exilis, Trigastrotheca molluginea*	DR04	Excellent	2.3 ha (0.6%)	 Plate 5: Vegetation type P3 (Plain 3) at site DR04 (5-10 yrs burnt).

Vegetation type code and description	Site(s)	Vegetation condition	Total area (ha) (proportion of survey area (%))	Representative photograph
Code: CP (Corymbia Plain) **Description:** *Corymbia zygophylla* low open woodland over occasional *Acacia tumida* var. *kulparn* tall scattered shrubs to open shrubland over occasional *Acacia stellaticeps* scattered low shrubs over *Triodia schinzii* very open hummock grassland **Associated species:** *Atriplex* sp., *Aristida holathera* var. *holathera, Calytrix carinata, Dampiera cinerea, Gompholobium simplicifolium, Grevillea eriostachya, Gyrostemon tepperi, Jacksonia aculeata, Newcastelia cladotricha, Ptilotus arthrolasius*	DR09 DR14 DR16 DR22 DR27 DR29	Excellent	170.7 ha (20.0%)	 **Plate 6: Vegetation type CP (Corymbia Plain) at site DR14 (5-10 yrs burnt).**  **Plate 7: Vegetation type CP (Corymbia Plain) at site DR22 (2-5 yrs burnt).**

Vegetation type code and description	Site(s)	Vegetation condition	Total area (ha) (proportion of survey area (%))	Representative photograph
Code: DP (Drainage Plain) **Description:** *Acacia monticola, Acacia ancistrocarpa (Acacia eriopoda)* tall shrubland over *Triodia schinzii* open hummock grassland **Associated species:** *Acacia arida, Acacia sericophylla, Cassytha filiformis*	DR06 DR23 DR25	Excellent	51.1 ha (6.0%)	 **Plate 8: Vegetation type DP (Drainage Plain) at site DR23 (2-5 yrs burnt).**

4.2.1.1 Conservation Significance of vegetation

No TECs or PECs were recorded in the survey area. All vegetation types present in the survey area are considered to be well represented across the broader Great Sandy Desert bioregion.

4.2.1.2 Vegetation Condition

Vegetated area accounted for 799.4 ha (93.8%) within the survey area. The remaining 52.7 ha (6.2%) consisted of an existing track. All vegetation in the survey area was classified as Excellent condition (Trudgen 1988). The vegetation condition scale (Trudgen 1988) recommended by EPA (2016a) considers fire to be a natural occurrence, and not a disturbance, thus, even recently burnt vegetation was considered to be in excellent condition if there was no other impact.

4.2.2 Flora

There were 89 confirmed vascular flora taxa, from 26 families and 55 genera, recorded during the survey. A further seven specimens could not be identified to species level and one specimen could not be identified to genus level. Each of these eight specimens may represent additional species.

The dominant plant families were Fabaceae and Poaceae with 25 and 12 confirmed species represented respectively. *Acacia* was the most frequently recorded genus (Table 11). Flora diversity was considered lower than expected for the area as a result of below average summer rainfall. A species list for the survey area and a matrix indicating species recorded within each relevé is presented in Appendix J.

Table 11: Taxa most frequently recorded in the survey area.

Family	Number of confirmed taxa
Fabaceae	25
Poaceae	12
Genus	**Number of confirmed taxa**
Acacia	14
Grevillea	6
Ptilotus	5
Eriachne, Goodenia, Indigofera	4

4.2.2.1 Conservation Significant Flora

Survey effort, as shown by track log traverses within the survey area, is presented in Figure C.1 (Appendix C). Conservation significant flora descriptions are presented in Table K.1 (Appendix K), locations are presented in Table K.2 (Appendix K) and mapped in Figures H.1 to H.14 (Appendix H). Estimates of abundance of the priority flora are presented in Appendix K.

No State or Commonwealth listed threatened flora were recorded within the survey area. Two State-listed priority flora species were recorded within the survey area: *Goodenia hartiana* P2 and *Indigofera ammobia* P3. Many small to large populations of *Goodenia hartiana* P2 were recorded throughout the corridor, particularly in lower parts of the landscape. *Goodenia hartiana* P2 appears to be a post-fire opportunist. A total of 10,996 individuals were recorded. Two individuals of *Indigofera ammobia* P3 were recorded from a single location on the lower slope of a dune.

Following the survey, and with greater understanding of the landforms, soils and habitats of the survey area, one priority flora species was considered to have potential to occur but was not recorded: *Seringia katatona* P3. An unidentifiable *Seringia* species was recorded during this survey, however it is unlikely to represent *Seringia katatona* P3. The habit of the *Seringia* sp. located in the survey area was a low perennial shrub; *Seringia katatona* P3 is described as a short-lived perennial herb or shrub (Department of Biodiversity, Conservation, and Attractions 2019b) which is unlikely to have been present considering the poor seasonal conditions.

One specimen of *Phyllanthus* (collection DR23-01) could not be matched to any specimen at the WA Herbarium and a scanned copy was sent to *Phyllanthus* expert Dr Ian Telford at the University of New England. The specimen showed greatest affinity to *P. hebecarpus* P3 but could not be confidently identified as it lacked the diagnostic reproductive material necessary for identification of the species. As such it has been identified as *Phyllanthus* ?*hebecarpus* P3, pending further examination of the specimen. *Phyllanthus* ?*hebecarpus* P3 was recorded from one location, at quadrat DR23, in vegetation type DP: Drainage Plain.

4.2.2.2 Species of Interest

Among the species identified, 11 species located in the survey area represent extensions to the known range of these species. This is a consequence of the under sampled nature of the flora within the Great Sandy Desert bioregion (Table 12) (Department of Biodiversity, Conservation, and Attractions 2019b).

Table 12: Range extensions in the survey area.

Taxa	Nearest record (km)[1]	Justification
Cleome uncifera subsp. *microphylla*	~300	Outer edge of population range and the north-west most record.
Bonamia erecta	~90	Outer edge of population range. Few records in the Great sandy Desert Bioregion
Cucumis variabilis	~90	Outer edge of population range
Acacia drepanocarpa subsp. *drepanocarpa*	~80	Outer edge of population range. Few records in the Great sandy Desert Bioregion
Acacia retivenea subsp. *clandestina*	~80	Outer edge of population range. Few records in the Great sandy Desert Bioregion
Phyllanthus exilis	~130	Outer edge of population range.

Taxa	Nearest record (km)[1]	Justification
Phyllanthus ?hebecarpus	~230	Outer edge of population range. The most north-east record
Eriachne lanata	~80	Outer edge of population range.
Eriachne mucronata	~100	Few records in the Great sandy Desert Bioregion
Setaria surgens	~100	Few records in the Great sandy Desert Bioregion
Persoonia falcata	~15	Outer edge of population range. The most south-east record
Gardenia pyriformis subsp. *Keartlandii*	~50	Outer edge of population range. The most south east record

[1]- Information interpreted from Florabase (Department of Biodiversity, Conservation, and Attractions 2019b)

4.2.2.3 Introduced flora

No weed species were recorded. Given the limited disturbance of the vegetation, minimal weed diversity is expected to occur, even following good rainfall.

4.3 Fauna Survey

4.3.1 Fauna Habitat

One broad fauna habitat, based upon the landforms and vegetation communities present, were recorded in the survey area. The habitat is described in Table 13 and mapping is presented in Figures L.1 to L.5 (Appendix L). Habitat assessments undertaken during the survey are detailed in Table M.1 (Appendix M). The fauna habitats in the survey area were considered 'high quality' (Thompson and Thompson 2010) condition (Appendix D).

The Sandy Plain habitat was the only habitat type/landform feature recorded. The soft sandy soils were suitable for burrowing and digging specialists and there were minimal amounts of leaf litter present. The habitat is continuous and linked with similar habitat in the surrounding area.

Table 13: Fauna habitats described for the survey area.

Fauna habitat	Vegetation description	Sampling locations	Habitat condition	Total area (ha) (proportion of survey area (%))	Representative photo
Sandy Plain	*Owenia reticulata* scattered low trees over *Erythrophleum chlorostachys* or Acacia *eriopoda* over *Triodia schinzii* very open hummock grassland or *Corymbia* zygophylla low open woodland over *Triodia schinzii* very open hummock grassland.	HA1, HA2, HA3, HA4, HA5, HA6, HA7, HA8, HA9, AR1, AR2	High Quality	799.4 ha (93.8%)	 **Plate 9: Sandy Plain Habitat at HA8**
Cleared	None	N/A		52.7 ha (6.2%)	N/A

4.3.2 Fauna Species

A total of 41 fauna species, comprising six reptile species, 26 bird species and nine mammal species, were recorded within the survey area (Table 14). According to the desktop assessment two bat species (*Vespadelus finlaysoni* and *Ozimops lumsdenae*) had not been previously recorded in the vicinity of the survey area. The closest record of *Vespadelus finlaysoni* is approximately 70 km away from the survey area (Department of Biodiversity, Conservation, and Attractions 2019a). *Ozimops lumsdenae* has a patchy distribution from northern Western Australia with the closest record approximately 180 km from the survey area (Atlas of Living Australia 2019).

Table 14: Fauna species recorded during the survey.

Scientific name	Common name	Record type
Reptiles		
Ctenophorus caudicinctus	Ring-Tailed Dragon	Individual(s)
Ctenophorus isolepis isolepis	Military Sand Dragon	Individual(s)
Moloch horridus	Thorny Devil	Individual(s)
Ctenotus helenae		Individual
Morethia ruficauda		Individual
Varanus gouldii	Bungarra or Sand Monitor	Individual
Birds		
Anas gracilis	Grey Teal	Individual(s)
Coturnix ypsilophora	Brown Quail	Individual(s)
Circus assimilis	Spotted Harrier	Individual(s)
Haliastur sphenurus	Whistling Kite	Individual(s)
Ardeotis australis	Australian Bustard	Individual(s), tracks
Turnix varius	Painted Button-Quail	Individual(s)
Geopelia cuneata	Diamond Dove	Individual(s)
Ocyphaps lophotes	Crested Pigeon	Individual(s)
Podargus strigoides	Tawny Frogmouth	Individual(s)
Todiramphus pyrrhopygius	Red-Backed Kingfisher	Individual(s), calls
Falco cenchroides cenchroides	Australian Kestrel	Individual(s)
Falco berigora berigora	Brown Falcon	Individual(s)
Nymphicus hollandicus	Cockatiel	Individual(s)
Melopsittacus undulatus	Budgerigar	Individual(s)
Malurus leucopterus	White-Winged Fairy-Wren	Individual(s)
Certhionyx variegatus	Pied Honeyeater	Individual(s), calls
Lichenostomus penicillatus	White-Plumed Honeyeater	Individual(s)
Ptilotula keartlandi	Grey-Headed Honeyeater	Individual(s), calls
Gavicalis virescens	Singing Honeyeater	Individual(s), calls
Manorina flavigula	Yellow-Throated Miner	Individual(s), calls
Artamus personatus	Masked Woodswallow	Individual(s), calls
Coracina novaehollandiae	Black-Faced Cuckoo-Shrike	Individual(s), calls
Lalage tricolor	White-Winged Triller	Individual(s)
Rhipidura leucophrys leucophrys	Willie Wagtail	Individual(s), calls
Eremiornis carteri	Spinifex-Bird	Individual(s), calls
Taeniopygia guttata	Zebra Finch	Individual(s), calls
Mammals		
Notomys alexis	Spinifex Hopping-Mouse	Tracks

Scientific name	Common name	Record type
Canis lupus familiaris	Dog/Dingo	Individual, tracks
Felis catus	Cat	Individual, tracks
Camelus dromedarius	Dromedary, Camel	Tracks
Tachyglossus aculeatus acanthion	Short-Beaked Echidna	Tracks
Chalinolobus gouldii	Gould's Wattled Bat	Audio recording
Ozimops lumsdenae	Northern Free-Tailed Bat	Audio recording
Scotorepens greyii	Little Broad-Nosed Bat	Audio recording
Vespadelus finlaysoni	Finlayson's Cave Bat	Audio recording

4.3.3 Conservation Significant Fauna

No conservation significant fauna species were recorded in the survey area. A total of 33 species of conservation significance have been previously recorded in the vicinity of the survey area, including two reptile species, 22 bird species and nine mammal species (Table F, Appendix F).

The majority of conservation significant species (28 species) were considered to have a low likelihood of occurrence based on their respective ecology and absence of required habitats, such as surface water for water birds and rocky area for the Northern Quoll. One species (*Lerista separanda*) was considered to have a Moderate likelihood of occurrence as the current distribution of this species is uncertain. Four species were considered likely to be present, include the Greater Bilby (*Macrotis lagotis*), Northern Marsupial Mole (*Notoryctes caurinus*), Short-tailed Mouse (*Leggadina lakedownensis*) and Brush-tailed Mulgara (*Dasycercus blythi*). Specific survey effort was undertaken to establish the presence of the Night Parrot as the survey area is located in the area mapped as 'High priority for survey' for this species (Department of Parks and Wildlife 2017). The post-survey likelihood of occurrence for the Night Parrot was classified as 'low' due to frequent fires of the survey area and lack of large spinifex hummocks.

Greater Bilby (*Macrotis lagotis*)

The Greater Bilby is listed as Vulnerable under the EPBC Act and the BC Act. The current distribution of the Greater Bilby is confined to the deserts of central Australia, from the Tanami Desert in the southern Northern Territory west to the sandy deserts of Western Australia and the Pilbara, plus small populations in the Channel Country and Mitchell Grass Downs of south-western Queensland (Department of Sustainability Environment Water Population and Communities 2011a; Johnson 2008; Pavey 2006). This species inhabits a variety of habitats including cracking clay plains, desert sandplains, dune fields containing hummock grasslands and *Acacia* shrubland (Van Dyck and Strahan 2008).

Numerous records for this species exist in the vicinity of the survey area, particularly associated with the dune systems in the surrounding area (Department of Biodiversity, Conservation, and Attractions 2018c). The Sandy Plain habitat of the survey area provide suitable habitat for the Greater Bilby; however the characteristic diggings and burrows associated with this species were not recorded during the survey.

Northern Marsupial Mole (*Notoryctes caurinus*)

The Northern Marsupial Mole is listed as P4 on the DBCA priority list. The Northern Marsupial Mole occurs across the sand-dune deserts of north-western Australia, particularly the Great Sandy and Little Sandy Deserts. Little is known about this species' habitat preference or ecology due to its fossorial lifestyle, and individuals are rarely seen above ground level.

Two previous records of northern marsupial mole exist in the vicinity of the survey area, in association with dune habitats (Department of Biodiversity, Conservation, and Attractions 2018c). This species is expected to occur in the Sandy Plain habitat type of the survey area.

Short-tailed Mouse (*Leggadina lakedownensis*)

The Short-tailed Mouse is listed as P4 on the DBCA priority list. The Short-tailed Mouse occurs sporadically across northern tropical Australia where it inhabits a diverse range of habitats including spinifex and tussock grasslands, samphires, sedgelands, *Acacia* shrublands, *Eucalyptus* and *Melaleuca* woodlands and stony ranges, mostly associated with seasonally inundated clay soils (Van Dyck and Strahan 2008). This species was identified approximately 70 km from the survey area (Department of Biodiversity, Conservation, and Attractions 2018c). The survey area occurs in the known distribution of this species and it is expected to occur in the Sandy Plain habitat type of the survey area.

Brush-tailed Mulgara (*Dasycercus blythi*)

The Brush-tailed Mulgara is listed as P4 on the DBCA priority list. The Brush-tailed Mulgara occurs throughout the central arid zones of Western Australia, Northern Territory and top of South Australia where it inhabits spinifex grasslands, burrowing on flats between low sand dunes (Van Dyck and Strahan 2008). The closest record of this species to the survey area is approximately 100 km south (near Telfer) and north. Although no records closer to the survey area exist, the survey area is within the known distribution of this species and is expected to occur in the Sandy Plain habitat type of the survey area.

Night Parrot (*Pezoporus occidentalis*)

The Night Parrot is listed as Endangered under the EPBC Act and Critically Endangered under the BC Act. The Night Parrot has long been thought extinct in Australia, with only sporadic and sometimes unconfirmed sightings recorded. However the focus on this species has amplified due to a recent sighting near Wiluna in Western Australia (Jones 2017) and from the rediscovery of this species in Queensland near Pullen Pullen Reserve and at Goneaway and Diamantina National Parks (Palaszczuk and Miles 2017).

Within these locations the Night Parrot is associated with long unburnt stands of spinifex hummocks (*Triodia* spp.), particularly large hummocks that are ring forming that would form a certain level of protection from predators. The hummocks that are < 50 cm in height and collapsed are considered unlikely to provide adequate shelter and/or protection from predators (Department of Parks and Wildlife 2017). Foraging habitat requirements are also largely unknown for this species; however some favoured sites, particularly in Western Australia, seem to be in close association of chenopod communities, principally the succulent *Sclerolaena* species. These succulents are possibly a source of moisture for the Night Parrot, given their preference for the arid regions of Australia and the probable lack of free standing water (Department of Parks and Wildlife 2017).

The survey area was heavily affected by fire in 2018 and lacked the large, unburnt spinifex hummocks or chenopod communities that this species requires. In addition there were no records of Night Parrot calls from the two ARUs (Bat Call WA 2018).

5 Conclusions

5.1 Vegetation and Flora

No State or Commonwealth listed TECs, nor any State listed PECs are known to occur within the vicinity of the survey area, and none were identified within the survey area. The vegetation recorded generally represents what would be expected from similar landforms in the broader Great Sandy Desert bioregion.

A total of five broad vegetation types were mapped. All of the vegetation within the survey area had been burnt within the past one to ten years. Vegetation condition was rated as excellent throughout the survey area, despite the mosaic of fire impacts. No weeds were identified within the survey area.

The survey area lies within the Pre-European vegetation type Great Sandy Desert 134, Mandora East 101 and Mandora East 117, all which have > 99% pre-European extent remaining, well above The Australian and New Zealand Environment and Conservation Council 30% retention target (Commonwealth of Australia 2001) and the criteria for 10% level of pre-clearing extent as representing 'endangered' adopted by the EPA (Environmental Protection Authority 2000).

The suite of flora species recorded was considered typical of what may be expected in the area (Beard and Webb 1974). However, flora species which are annual or short-lived perennial species are likely to be under-represented, due to the dry seasonal conditions.

No threatened species were recorded in the survey area. Two priority species were recorded in the survey area: *Goodenia hartiana* P2 and *Indigofera ammobia* P3. *G. hartiana* was widespread in the Plain 1 and Drainage Plain vegetation types throughout the survey area, particularly recently burnt areas. I*ndigofera ammobia* P3 was restricted in occurrence and favoured lower dune slopes, which was a restricted habitat in the survey area.

One collected flora specimen is of taxonomic interest: *Phyllanthus* ?*hebecarpus* P3, (DR23-01). Despite being examined by taxonomic specialist Dr Ian Telford this specimen was not able to be confidently resolved to species level; however it shows greatest affinity to *P. hebecarpus* P3. *Phyllanthus hebecarpus* P3 is known from seven records at the Western Australian Herbarium; all of these occur south of Port Hedland and east of Marble Bar, with the nearest record approximately 230 km south-west from the survey area (Western Australian Herbarium 1998-2019). Although the vegetation features of specimen DR23-01 were most similar to *P. hebecarpus* P3, the collection did not have reproductive material to assist with identification and therefore there is potential it may represent a different or new species. Twelve species within this survey area demonstrate extensions to their known geographic range. This is unsurprising given the poorly sampled nature of the Great Sandy Desert bioregion in terms of botanical surveys and taxonomic work. It is likely these species may be widespread and simply under sampled.

5.2 Vertebrate Fauna

The survey area contains fauna habitats that are common and widespread in the Great Sandy Desert bioregion. The entire survey area, with exception for the cleared track was mapped as Sandy Plain habitat. Minimal habitat disturbance was recorded during the survey with all habitat considered 'high quality' (Thompson and Thompson 2010).

Two bat species (*Vespadelus finlaysoni* and *Ozimops lumsdenae*) had not been previously recorded in the vicinity of the survey area. The closest record of *Vespadelus finlaysoni* is approximately 70 km away from the survey area and the closest record of *Ozimops lumsdenae* is approximately 180 km

from the survey area (Department of Biodiversity, Conservation, and Attractions 2019a). This is likely due to the lack of biological surveys completed in the vicinity of the survey area rather than the significance of the fauna habitats present.

No conservation significant fauna species were recorded during the survey however four species were considered likely to be present: the Greater Bilby (*Macrotis lagotis*), Northern Marsupial Mole (*Notoryctes caurinus*), Short-tailed Mouse (*Leggadina lakedownensis*) and Brush-tailed Mulgara (*Dasycercus blythi*). These species are likely to inhabit the 93.8% of the survey area described as Sandy Plain habitat. As similar habitat is found in the outside of the survey area at both the local and regional scale, no conservation significant species are likely to be restricted to the survey area.

6 References

Aplin, TEH 1979, 'The flora', in B. J. O'Brien (ed), *Environment and Science*, University of Western Australia Press, Perth.

Astron Environmental Services 2018, *Paterson Flora, Vegetation and Fauna Habitat Assessment Survey*, unpublished report in preparation for Rio Tinto Exploration.

Astron Environmental Services 2019, *Paterson Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, March 2019*, unpublished report to Rio Tinto Exploration, Perth Wa.

Atlas of Living Australia 2019, *The Atlas of Living Australia*, 2019, <http://www.ala.org.au/>.

Australian Weeds Committee 2012, *Weeds of National Significance*, Canberra.

Bat Call WA 2018, *Rio Tinto Paterson Targeted Night Parrot Survey*, unpublished report to Astron Environmental Services.

Beard, JS & Webb, MJ 1974, *Vegetation Survey of Western Australia, Vegetation Map, Great Sandy Desert, Sheet 2, 1: 1, 000, 000 Vegetation Series Explanatory notes*, University of Western Australia Press, Nedlands WA.

Birdlife Australia 2019, *Birdata*, 2019, <https://birdata.birdlife.org.au/>.

Bureau of Meteorology 2018, *Climate Data Online*, <http://www.bom.gov.au/climate/data/index.shtml>.

Bureau of Meteorology 2019, *Climate Data Online*, <http://www.bom.gov.au/climate/data/index.shtml>.

Christidis, L & Boles, WE 2008, *Systematics and Taxonomy of Australian Birds*, CSIRO Publishing, Collingwood.

Commonwealth of Australia 2001, *National Objectives and Targets for Biodiversity Conservation 2001-2005*, Commonwealth of Australia, Canberra.

Department of Biodiversity, Conservation & Attractions 2017, *Priority Ecological Communities for Western Australia, Version 27*, Species and Communities Branch, Department of Biodiversity, Conservation and Attractions.

Department of Biodiversity, Conservation & Attractions 2018a, *Conservation Codes for Western Australia flora and fauna* Goverment of Western Australia, Perth WA.

Department of Biodiversity, Conservation & Attractions 2018b, 'Threatened and Priority Ecological Communities Database', Dept. of Biodiversity, Conservation & Attractions, Perth WA.

Department of Biodiversity, Conservation & Attractions 2018c, 'Threatened and Priority Fauna Database'.

Department of Biodiversity, Conservation & Attractions 2018d, 'Threatened and Priority Flora Database', Dept. of Biodiversity, Conservation & Attractions, Perth WA.

Department of Biodiversity, Conservation & Attractions 2018e, 'Threatened and Priority Flora List', Dept. of Biodiversity, Conservation & Attractions, Perth WA.

Department of Biodiversity, Conservation & Attractions 2018f, 'Western Australian Herbarium database ', Department of Biodiversity, Conservation and Attractions.

Department of Biodiversity, Conservation & Attractions 2018g, 'Western Australian Herbarium database', Department of Biodiversity, Conservation & Attractions, Perth WA.

Department of Biodiversity, Conservation & Attractions 2019a, 'NatureMap Database Search', Dept. of Biodiversity, Conservation & Attractions, Perth WA.

Department of Biodiversity, Conservation & Attractions 2019b, 'Western Australian Herbarium database ', Department of Biodiversity, Conservation and Attractions.

Department of Environment and Conservation 2013, *Definitions, categories and criteria for threatened and priority ecological communities*, Department of Environment and Conservation (Parks and Wildlife), < https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf>.

Department of Parks and Wildlife 2017, *Interim Guideline for Preliminary Surveys of Night Parrot (Pezoporus occidentalis) in Western Australia*, Department of Parks and Wildlife, Perth.

Department of Parks and Wildlife 2018, *Pilbara Biological Survey Database*, Government of Western Australia, Perth WA, 2018, <https://science.dpaw.wa.gov.au/projects/pilbaradb/>.

Department of Primary Industries & Regional Development 2018, *Western Australian Organisms List*, Dept. Primary Industries and Regional Development, Perth, WA, <https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>.

Department of Primary Industries & Regional Development 2019, *Western Australian Organisms List*, Department of Primary Industries and Regional Development, Perth, WA, <https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>.

Department of Sustainability Environment Water Population and Communities 2011a, *Survey guidelines for Australia's threatened mammals: Guidelines for detecting mammals listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia, Canberra.

Department of Sustainability Environment Water Population and Communities 2011b, *Survey guidelines for Australia's threatened reptiles*, Commonwealth of Australia, Canberra.

Department of the Environment, Water, Heritage and the Arts, 2010a, *Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia.

Department of the Environment, Water, Heritage and the Arts, 2010b, *Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999*, Commonwealth of Australia.

Department of the Environment and Energy 2008, 'Register of the National Estate - Spatial Database (RNESDB)'.

Department of the Environment and Energy 2016a, 'Collaborative Australian Protected Areas Database (CAPAD)', Dept. of the Environment and Energy, Canberra ACT.

Department of the Environment and Energy 2016b, *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7*, Department of the Environment, viewed 2016, <http://www.environment.gov.au/land/nrs/science/ibra>.

Department of the Environment and Energy 2018a, *Australian Vegetation Attribute Manual, National Vegetation Information System Version 6*, <http://www.environment.gov.au/erin/nvis/publications/avam/section-2-1.html#table1>.

Department of the Environment and Energy 2018b, 'Directory of Important Wetlands in Australia', Commonwealth of Australia.

Department of the Environment and Energy 2018c, *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7*, Department of the Environment, viewed 2018, <http://www.environment.gov.au/land/nrs/science/ibra>.

Department of the Environment and Energy 2018d, *Protected Matters Search Tool*, <www.environment.gov.au/epbc/pmst/index.html>.

Department of the Environment and Energy 2019, *Protected Matters Search Tool*, <www.environment.gov.au/epbc/pmst/index.html>.

Department of Water & Environmental Regulation 2018, *Index of Biodiversity Surveys for Assessments (IBSA)*, 2018, Government of Western Australia, <https://www.dwer.wa.gov.au/programs/ibsa>.

Environmental Protection Authority 2000, *Environmental Protection of Native Vegetation in Western Australia: Clearing of Native Vegetation, with Particular Reference to the Agricultural Area*, Position Statement 2, Environmental Protection Authority, Perth.

Environmental Protection Authority 2016a, *Environmental Factor Guideline: Flora and Vegetation*, Environmental Protection Authority, Perth.

Environmental Protection Authority 2016b, *Environmental Factor Guideline: Terrestrial Fauna*, Environmental Protection Authority, Perth.

Environmental Protection Authority 2016c, *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment*, Environmental Protection Authority, Perth.

Environmental Protection Authority 2016d, *Technical Guidance - Sampling Methods for Terrestrial Vertebrate Fauna*, Environmental Protection Authority, Perth.

Environmental Protection Authority 2016e, *Technical Guidance - Terrestrial Fauna Surveys*, Environmental Protection Authority, Perth.

Environmental Protection Authority 2018, *Statement of Environmental Principles, Factors and Objectives*, Environmental Protection Authority, Perth.

Government of Western Australia 2018, *2017 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)*, Department of Biodiversity, Conservation and Attractions, Perth, WA.

Graham, G 2001, *Great Sandy Desert 1 (GSD2 - McLarty subregion), A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*, Department of Conservation and Land Management, Perth WA.

Hart Simpson and Associates Pty Ltd 2002, *Telfer Project - Ecological Survey January 2002*, prepared for Newcrest Mining Limited.

Johnson, KA 2008, 'Bilby', in S Van Dyck and R Strahan (eds), *The Mammals of Australia, 3rd edition*, Reed New Holland, Sydney, pp. 191-3.

Jones, A 2017, 'Night parrot sighting in Western Australia shocks birdwatching world', Off Track ABC News Online

Kendrick, P 2001, *Great Sandy Desert 2 (GSD2 - Mackay subregion)*, (M. Cowan, chairman), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*, Department of Conservation and Land Management, Perth.

Landgate 2019, *Fire Watch*, Western Australian Land Information Authority, <http://firewatch.landgate.wa.gov.au/landgate_firewatch_public.asp >.

Palaszczuk, A & Miles, S 2017, *New Night Parrot Community Discovered in Central West Queensland*, Joint Statement. Premier and Minister for the Arts and Minister for National Parks and the Great Barrier Reef. Queensland Government.

Pavey, C 2006, *Recovery Plan for the Greater Bilby, Macrotis lagotis, 2006-2011*, Northern Territory Department of Infrastructure, Planning and Environment, Darwin.

Specht, RL 1970, 'Vegetation', in G. W. Leeper (ed), *The Australian Environment*, CSIRO - Melbourne University Press, Melbourne.

Stewart, AJ, Sweet, IP, Needham, RS, Raymond, OL, Whitaker, AJ, Liu, SF, Phillips, D, Retter, AJ, Connolly, DP & Stewart, GR 2008, 'Surface Geology of Australia 1: 1 000 000 Scale, Western Australia [Digital Dataset]', The Commonwealth of Australia, Geoscience Australia (http://www.ga.gov.au), Canberra.

Thompson, SA & Thompson, GG 2010, *Terrestrial Vertebrate Fauna Assessments for Ecological Impact Assessment*, Terrestrial Ecosystems, Mt Claremont.

Tille, P 2006, *Soil-landscapes of Western Australia's rangelands and arid interior*, Department of Agriculture and Food, Perth.

Trudgen, ME 1988, *A Report of the Flora and Vegetation of the Port Kennedy Area*, unpublished report to Bowman Bishaw and Associates.

Van Dyck, S & Strahan, R 2008, *The Mammals of Australia*, 3 edn., New Holland Publishers, Sydney.

van Vreeswyk, AME, Payne, AL, Leighton, KA & Hennig, P 2004, *An inventory and condition survey of the Pilbara region, Western Australia. Technical Bulletin No. 92*, Department of Agriculture and Food, Perth.

Western Australian Herbarium 1998-2019, 'Florabase - The Western Australian Flora', Parks and Wildlife, Department of Biodiveristy, Conservation and Attractions. http://florabase.dpaw.wa.gov.au.

Western Australian Museum 2018, *Checklist of the Terrestrial Vertebrate Fauna of Western Australia*, updated August 2017, <http://museum.wa.gov.au/research/departments/terrestrial-zoology/checklist-terrestrial-vertebrate-fauna-western-australia>.

Appendix A: Geology and Land Systems Mapping of the Survey Area

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320000
330000
340000
350000
7770000
7760000
7750000
7740000
7730000
7720000

Survey Area
Biogeographical Subregion Boundary
WA Surface Geology
QUATERNARY
Qd
Qrc
CENOZOIC
Czl
Czs
CRETACEOUS
Kspa
JURASSIC-CRETACEOUS
JKsc

Rio Tinto Exploration
Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure A.1: Geology of the Survey Area and Surrounds

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:151,728 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 1,700 3,400 5,100 6,800 8,500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigA1_Geology	

320000 330000 340000 350000

7770000 7760000 7750000 7740000 7730000 7720000

Survey Area
Biogeographical Subregion Boundary

Land System Type

AB21
Buckshot System
Callawa System
Little Sandy System
Nita System

Rio Tinto Exploration
Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure A.2: Land Systems of the Survey Area

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delivering environmental intelligence™

Author: L. Dadour	Date: 12-06-2019	Scale: 1:150,923 at A3 Coordinate System: GDA 1994 MGA Zone 51
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigA2_LandSys	Metres 0 1,700 3,400 5,100 6,800 8,500 N

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Appendix B: Conservation Categories for Flora, Fauna and Ecological Communities and Categories for Introduced Flora

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Table B.1: Categories and definitions for threatened flora and fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999.*

Conservation category	Definition
Extinct	Taxa with no reasonable doubt that the last member of the species has died.
Extinct in the wild	Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriated seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically endangered (CR)	Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (E)	Taxa are not critically endangered; and are facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (V)	Taxa are not critically endangered or endangered; and are facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation dependent (CD)	Taxa are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or the following subparagraphs are satisfied: • the taxa is a species of fish; • the taxa is the focus of a management plan that provides management actions necessary to stop the decline of, and support the recovery of, the taxa so that its chances of long term survival in nature are maximised; • the management plan is in force under a law of the Commonwealth or of a State or Territory; • Cessation of the management plan would adversely affect the conservation status of the taxa • Fish includes all taxa of bony fish, sharks, rays, crustaceans, molluscs and other marine organisms, but does not include marine mammals/reptiles.
Migratory (Mi)	Taxa are considered migratory species on International Agreements; i) if they are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II); ii) all migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA); and iii) Are native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).

Note: CD and Mi are only related to conservation significant fauna

Table B.2: Definitions and criteria for threatened ecological communities under the *Environment Protection and Biodiversity Conservation Act 1999.*

Categories of ecological communities	
Critically endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

Reference: Department of Environment and Conservation 2013, Definitions, Categories and Criteria for Threatened and Priority Ecological Communities DEC (Parks and Wildlife), <https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf.>

Table B.3: Categories of Threatened Ecological Communities (Department of Biodiversity, Conservation and Attractions 2017d).

PD: Presumed Totally Destroyed
An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant **and either** of the following applies (A or B): A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats **or** B) All occurrences recorded within the last 50 years have since been destroyed.
CR : Critically Endangered
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed **as Critically Endangered** when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting **any one or more of** the following criteria (A, B or C): A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii): i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

En: Endangered

An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting **any one or more** of the following criteria (A, B, or C):

A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement **and either or both** of the following apply (i or ii):

i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;

iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

VU: Vulnerable

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Reference: Department of Environment and Conservation 2013, Definitions, Categories and Criteria for Threatened and Priority Ecological Communities DEC (Parks and Wildlife), <https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf.>

Possible Threatened Ecological Communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (Table B.4).

Table B.4: Definitions and criteria for Priority Ecological Communities (Department of Environment and Conservation 2013).

P1: Priority One – Poorly-known ecological communities
Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2: Priority Two – Poorly-known ecological communities
Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3: Priority Three – Poorly-known ecological communities
(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4: Priority Four
Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5: Priority Five – Conservation dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Table B.1: Conservation codes for threatened Western Australian flora and fauna under the *Biodiversity Conservation Act 2016* (Department of Biodiversity, Conservation, and Attractions 2019).

Conservation category	Conservation category	Definition
Critically endangered (CR)	Schedule 1 of the *Wildlife Conservation*.	Taxa "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."
Endangered (EN)	Schedule 2 of the *Wildlife Conservation*.	Taxa "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."
Vulnerable (VU)	Schedule 3 of the *Wildlife Conservation*.	Taxa "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines."
Extinct (EX)	Schedule 4 of the *Wildlife Conservation*.	"there is no reasonable doubt that the last member of the species has died."
Extinct in the wild (EW)	Listing in accordance with Ministerial Guidelines (Section 25 of the BC Act)	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and 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". Currently there are no threatened flora species listed as EW. If listing of a species as EW occurs, then a schedule will be added to the applicable notice.
Migratory species (MI)	Listed as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation*	"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."
Species of special conservation interest (conservation dependent fauna) (CD)	Listed as conservation dependent fauna under schedule 6 of the *Wildlife Conservation*	"Species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened."
Other specially protected species (OS)	Listed as other specially protected fauna under schedule 7 of the *Wildlife Conservation*	"Fauna otherwise in need of special protection to ensure their conservation."

Note: MI, CD and OS are only related to conservation significant fauna

Taxa that have not yet been adequately surveyed to be listed under Schedule 1 or 2 are added to the Priority Flora and Priority Fauna Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as Threatened flora or fauna. Taxa that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These taxa require regular monitoring. Conservation dependent species are placed in Priority 5 (Table B.6).

Table B.6: Priority species under Western Australian *Biological Conservation Act 2016*

P1: Priority One – Poorly known taxa
Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2: Priority Two – Poorly known taxa
Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3: Priority Three – Poorly known taxa
Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4: Priority Four: Rare, near threatened and other taxa in need of monitoring
(a) Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

The management of introduced flora species in Western Australia is now regulated through the *Biosecurity and Agriculture Management Act 2007* (BAM Act). A list of declared pests, including 'pest' plants is provided under the BAM Act, which has been updated to incorporate a number of other Acts that are administered by Department of Agriculture and Food Western Australia (Department of Primary Industries & Regional Development 2018). Declared pests can fall into two categories: one that relates to the prevention of introducing the species or eradicating it; and the other relates to managing the species and whether it can be kept (i.e. for scientific purposes, education or other purpose).

The threat and risk posed to site-specific biodiversity values, influences to rehabilitation success, primary production, infrastructure assets or human health will differ depending on the unique characteristics of each site and the associated land management practice or operation. Therefore site or project specific weed assessments and priorities should be reviewed for each project.

As per introduced flora species, the BAM Act seeks to establish a modern biosecurity regulatory scheme to prevent serious animal pests from entering the State and becoming established, and to minimise the spread and impact of any that are already present within the State. Declared animal pests fall into three categories as Gazetted under the *Biosecurity and Agriculture Management Regulations 2013*. These categories are outlined in Table B.7.

Table B.7: Declared pests control categories as gazetted under the *Biosecurity and Agriculture Management Regulations 2013*.

Category	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Appendix C: Survey Effort Mapping

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GPS Tracklog
Survey Area

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure C.1: Survey Effort

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:26,800 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 300 600 900 1,200 1,500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigC_SurveyEffort	

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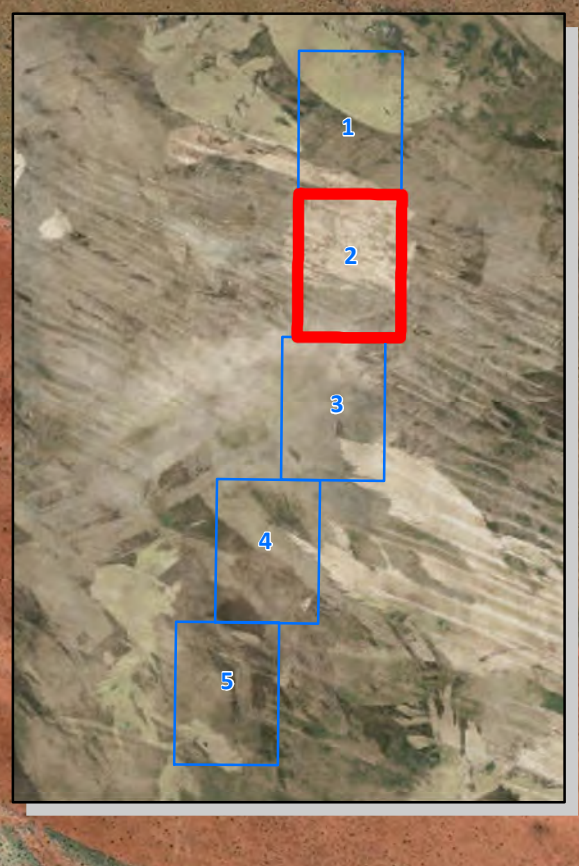

GPS Tracklog

Survey Area

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure C.2: Survey Effort

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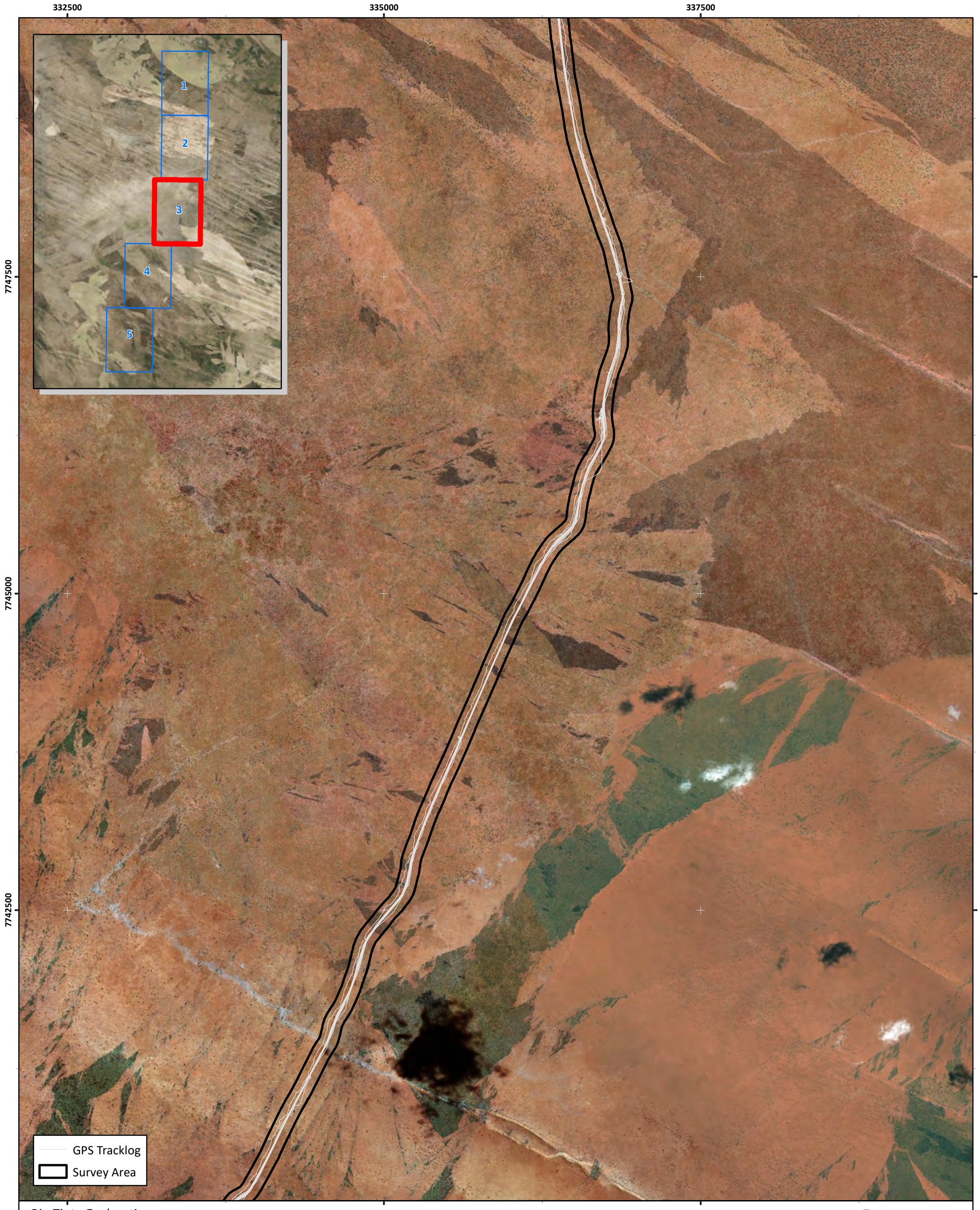
Author: L. Dadour	Date: 12-06-2019
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigC_SurveyEffort

Scale: 1:26,800 at A3

Coordinate System: GDA 1994 MGA Zone 51

0 300 600 900 1,200 1,500 Metres

N



Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure C.3: Survey Effort

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:26,800 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 300 600 900 1,200 1,500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigC_SurveyEffort	

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GPS Tracklog
Survey Area

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure C.4: Survey Effort

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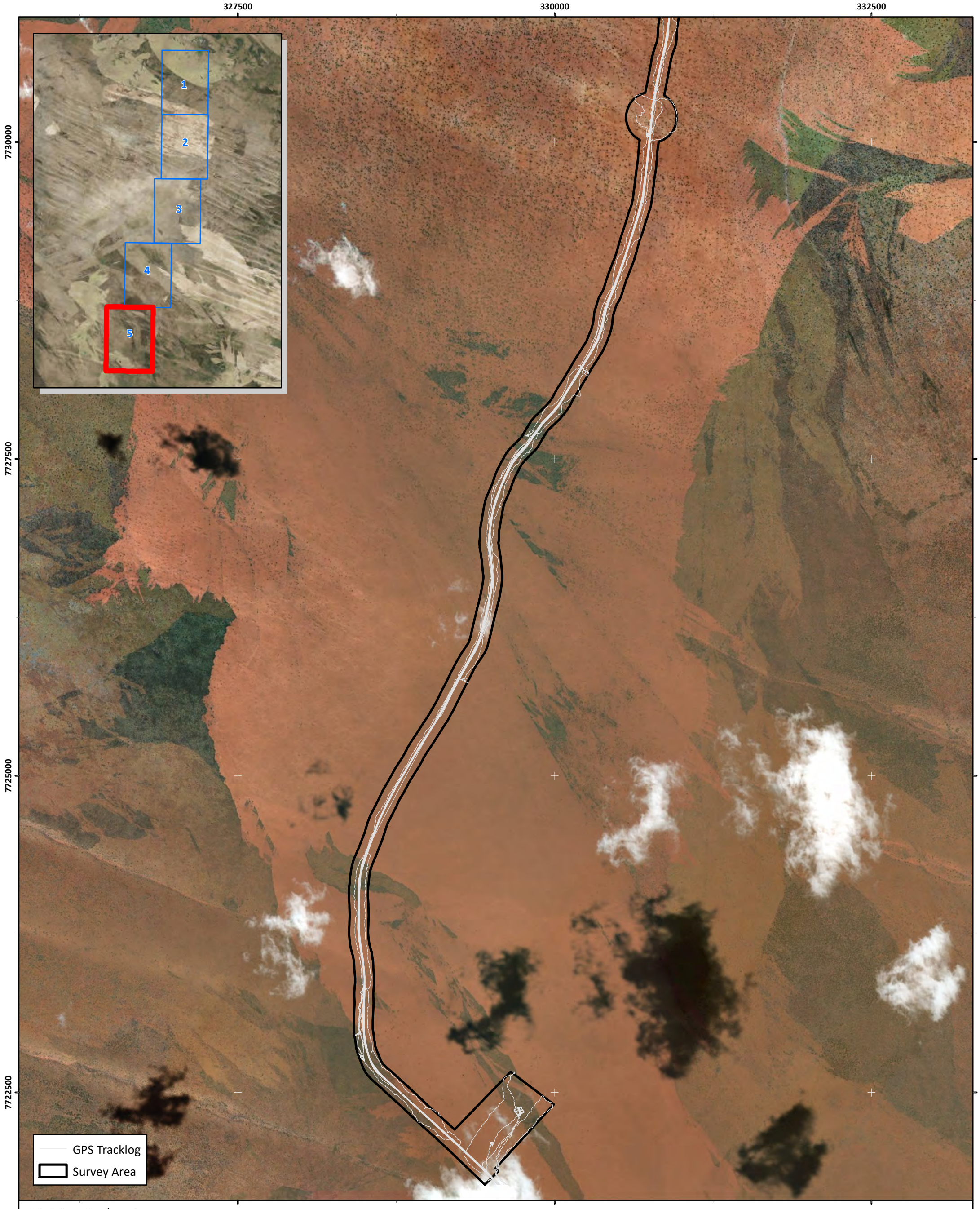
Author: L. Dadour	Date: 12-06-2019
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigC_SurveyEffort

Scale: 1:26,800 at A3

Coordinate System: GDA 1994 MGA Zone 51

0 300 600 900 1,200 1,500 Metres

N



Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure C.5: Survey Effort

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delivering environmental intelligence™

Author: L. Dadour	Date: 12-06-2019	Scale: 1:26,800 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 300 600 900 1,200 1,500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigC_SurveyEffort	

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Appendix D: Vegetation Classification and Condition Scales and Fauna Habitat Condition Scale

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Table D.1: Vegetation Classification System Specht (1970) as modified by Aplin (1979).

Stratum	70-100% cover	30-70% cover	10-30% cover	2-10% cover	<2% cover
Trees > 30 m	Tall closed forest	Tall open Forest	Tall woodland	Tall open woodland	Scattered tall trees
Trees 10-30 m	Closed forest	Open forest	Woodland	Open woodland	Scattered trees
Trees < 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland	Scattered low trees
Shrubs > 2 m	Tall closed scrub	Tall open scrub	Tall shrubland	Tall open shrubland	Scattered tall shrubs
Shrubs 1-2 m	Closed heath	Open heath	Shrubland	Open shrubland	Scattered shrubs
Shrubs < 1 m	Low closed heath	Low open heath	Low shrubland	Low open shrubland	Scattered low shrubs
Hummock grasses	Closed hummock grassland	Hummock grassland	Open hummock grassland	Very open hummock grassland	Scattered hummock grasses
Grasses, sedges, herbs	Closed tussock grassland/ sedgeland/ herbland	Tussock grassland/ sedgeland/ herbland	Open tussock grassland/ sedgeland/ herbland	Very open tussock grassland/ sedgeland/ herbland	Scattered tussock grasses /sedges/herbs

Table D.2: Vegetation condition scale as adapted from Trudgen (1988) (Environmental Protection Authority 2016c).

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

Table D.3: Fauna habitat condition scale (Thompson and Thompson 2010).

Habitat condition	Condition description
High Quality Fauna Habitat	These areas closely approximate the vegetation mix and quality that would have been in the area prior to any human induced disturbance. The habitat has connectivity with other habitats and is likely to support the most natural vertebrate fauna assemblage.
Very Good Fauna Habitat	These areas show minimal signs of human induced disturbance (e.g. grazing, clearing, fragmentation, weeds) and retain almost all of the characteristics of the habitat had it not been disturbed. The habitat has connectivity with other habitats, and fauna assemblages in these areas are likely to be minimally effected by disturbance.
Good Fauna Habitat	These areas show signs of human induced disturbance (e.g. grazing, clearing, fragmentation, weeds) but generally retain many of the characteristics of the habitat had it not been disturbed. The habitat still retains some connectivity with other habitats but fauna assemblages in these areas are likely to be affected by disturbance. Fauna assemblages in these areas are likely to be similar to what might be expected in this habitat.
Disturbed Fauna Habitat	These areas show signs of human induced significant disturbance (e.g. mining, clearing, tracks and roads). Many of the trees, shrubs and undergrowth have died or have been cleared. These areas may be in the early succession and regeneration stages. Areas may show signs of significant grazing, contain an abundance of weeds or have been damaged by vehicles or machinery. Habitats are fragmented or have limited connectivity with other fauna habitats. Fauna assemblages in these areas are likely to differ significantly from what might be expected in the area had the disturbance not occurred.
Highly Degraded Fauna Habitat	These areas often have a significant human induced loss of vegetation, and / or a large number of vehicle tracks and / or have been completely cleared, and / or areas have been heavily grazed or farmed. There is limited or no fauna habitat connectivity. Fauna assemblages in these areas are likely to differ significantly from what existed prior to the disturbance, and are often depleted compared to what existed prior to the disturbance.

Appendix E: Database Search Results

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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 15/05/2019

Current Names Only	Yes
Core Datasets Only	Yes
Species Group	All Plants
Method	'By Circle'
Centre	121° 26' 24" E,20° 14' 05" S
Buffer	40km
Group By	Family

Family	Species	Records
Amaranthaceae	1	1
Chenopodiaceae	1	1
Convolvulaceae	1	1
Fabaceae	6	8
Goodeniaceae	1	1
Gyrostemonaceae	1	1
Malvaceae	1	1
Meliaceae	1	2
Menispermaceae	1	1
Myrtaceae	1	1
Poaceae	2	2
Proteaceae	3	5
Rubiaceae	2	2
TOTAL	**22**	**27**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amaranthaceae					
1.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
Chenopodiaceae					
2.	2582	*Rhagodia eremaea (Thorny Saltbush)*			
Convolvulaceae					
3.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
Fabaceae					
4.	11215	*Acacia adoxa var. adoxa*			
5.	17013	*Acacia colei var. colei*			
6.	15203	*Acacia sabulosa*			
7.	12757	*Bauhinia cunninghamii*			
8.	17432	*Cullen corallum*			
9.	3662	*Erythrophleum chlorostachys (Ironwood, Dyundyu)*			
Goodeniaceae					
10.	7493	*Goodenia azurea*			
Gyrostemonaceae					
11.	2789	*Gyrostemon tepperi*			
Malvaceae					
12.	40917	*Androcalva loxophylla*			
Meliaceae					
13.	4518	*Owenia reticulata (Native Walnut, Bandal)*			
Menispermaceae					
14.	2942	*Tinospora smilacina (Snakevine, Oondala)*			
Myrtaceae					
15.	5446	*Calytrix carinata*			
Poaceae					
16.	409	*Eriachne gardneri*			
17.	717	*Urochloa piligera*			
Proteaceae					
18.	2079	*Grevillea pyramidalis (Caustic Bush, Tjungu)*			
19.	19570	*Grevillea pyramidalis subsp. leucadendron*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
20.	16476	*Grevillea refracta subsp. refracta*			

Rubiaceae

21.	7328	*Gardenia pyriformis (Malara)*			
22.	15234	*Gardenia pyriformis subsp. keartlandii*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 15/05/2019

Current Names Only	Yes
Core Datasets Only	Yes
Species Group	All Plants
Method	'By Circle'
Centre	121° 21' 41" E,20° 33' 38" S
Buffer	40km
Group By	Family

Family	Species	Records
Convolvulaceae	1	1
Fabaceae	2	2
Lamiaceae	1	1
Myrtaceae	1	2
Rubiaceae	1	1
TOTAL	**6**	**7**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Convolvulaceae					
1.	6624	*Ipomoea costata (Rock Morning Glory, Kanti)*			
Fabaceae					
2.	12757	*Bauhinia cunninghamii*			
3.	3662	*Erythrophleum chlorostachys (Ironwood, Dyundyu)*			
Lamiaceae					
4.	6749	*Cyanostegia cyanocalyx*			
Myrtaceae					
5.	5446	*Calytrix carinata*			
Rubiaceae					
6.	7328	*Gardenia pyriformis (Malara)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 15/05/2019

Current Names Only Yes
Core Datasets Only Yes
Species Group All Animals
Method 'By Circle'
Centre 121° 26' 24" E,20° 14' 05" S
Buffer 40km
Group By Family

Family	Species	Records
Accipitridae	5	12
Agamidae	8	390
Alaudidae	1	1
Araneidae	2	2
Artamidae	3	41
Boidae	1	1
Camelidae	1	1
Campephagidae	2	19
Caprimulgidae	1	3
Carphodactylidae	3	22
Centropodidae	1	2
Cinclosomatidae	1	9
Columbidae	2	4
Corvidae	1	1
Cracticidae	1	5
Cuculidae	2	4
Dasyuridae	7	19
Dicruridae	1	11
Diplodactylidae	8	291
Elapidae	3	74
Emballonuridae	1	2
Estrildidae	2	11
Falconidae	3	21
Felidae	1	3
Gekkonidae	5	39
Glareolidae	1	1
Halcyonidae	1	7
Limnodynastidae	1	51
Macropodidae	1	29
Maluridae	2	13
Meliphagidae	7	139
Meropidae	1	8
Motacillidae	1	1
Muridae	3	10
Myobatrachidae	1	12
Otididae	1	7
Pachycephalidae	2	11
Petroicidae	1	1
Phasianidae	1	1
Podargidae	1	1
Psittacidae	2	15
Pygopodidae	5	64
Scincidae	20	779
Scolopacidae	1	1
Sylviidae	2	10
Thylacomyidae	1	25
Turnicidae	1	14
Typhlopidae	3	25
Varanidae	5	50
TOTAL	**131**	**2263**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Accipitridae					
1.	25536	*Accipiter fasciatus (Brown Goshawk)*			
2.	24285	*Aquila audax (Wedge-tailed Eagle)*			
3.	24289	*Circus assimilis (Spotted Harrier)*			
4.	24295	*Haliastur sphenurus (Whistling Kite)*			
5.	47965	*Hieraaetus morphnoides (Little Eagle)*			
Agamidae					
6.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
7.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
8.	24876	*Ctenophorus isolepis subsp. isolepis (Crested Dragon, Military Dragon)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
9.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
10.	42401	*Diporiphora paraconvergens (Grey-striped Western Desert Dragon)*			
11.	24896	*Diporiphora pindan (Pindan Dragon)*			
12.	42402	*Diporiphora vescus (Northern Pilbara Tree Dragon)*			
13.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
Alaudidae					
14.	25545	*Mirafra javanica (Horsfield's Bushlark, Singing Bushlark)*			
Araneidae					
15.		*Argiope protensa*			
16.		*Backobourkia collina*			
Artamidae					
17.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
18.	24356	*Artamus personatus (Masked Woodswallow)*			
19.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
Boidae					
20.	25320	*Aspidites melanocephalus (Black-headed Python)*			
Camelidae					
21.	24254	*Camelus dromedarius (Dromedary, Camel)*	Y		
Campephagidae					
22.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
23.	24367	*Lalage tricolor (White-winged Triller)*			
Caprimulgidae					
24.	24368	*Eurostopodus argus (Spotted Nightjar)*			
Carphodactylidae					
25.	24966	*Nephrurus laevissimus*			
26.	25497	*Nephrurus levis*			
27.	24967	*Nephrurus levis subsp. levis*			
Centropodidae					
28.	25600	*Centropus phasianinus (Pheasant Coucal)*			
Cinclosomatidae					
29.	24390	*Psophodes occidentalis (Western Wedgebill, Chiming Wedgebill)*			
Columbidae					
30.	24401	*Geopelia cuneata (Diamond Dove)*			
31.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
Corvidae					
32.	25593	*Corvus orru (Torresian Crow)*			
Cracticidae					
33.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
Cuculidae					
34.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
35.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
Dasyuridae					
36.	30903	*Dasycercus blythi (Brush-tailed Mulgara, Ampurta)*		P4	
37.	24091	*Dasykaluta rosamondae (Little Red Kaluta)*			
38.	24093	*Dasyurus hallucatus (Northern Quoll)*		T	
39.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
40.	24101	*Planigale ingrami (Long-tailed Planigale)*			
41.	24105	*Pseudantechinus roryi (Rory's Pseudantechinus)*			
42.	24120	*Sminthopsis youngsoni (Lesser Hairy-footed Dunnart)*			
Dicruridae					
43.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
Diplodactylidae					
44.	24926	*Diplodactylus conspicillatus (Fat-tailed Gecko)*			
45.	47934	*Diplodactylus laevis (Desert Fat-tailed Gecko)*			
46.	30933	*Lucasium stenodactylum*			
47.	24982	*Rhynchoedura ornata (Western Beaked Gecko)*			
48.	25517	*Strophurus ciliaris*			
49.	24924	*Strophurus ciliaris subsp. aberrans*			
50.	24927	*Strophurus elderi*			
51.	24932	*Strophurus jeanae*			
Elapidae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
52.	42416	*Pseudonaja mengdeni (Western Brown Snake)*			
53.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
54.	25305	*Simoselaps anomalus (Desert Banded Snake)*			
Emballonuridae					
55.	24175	*Taphozous georgianus (Common Sheath-tailed Bat)*			
Estrilidae					
56.	24631	*Emblema pictum (Painted Finch)*			
57.	30870	*Taeniopygia guttata (Zebra Finch)*			
Falconidae					
58.	25621	*Falco berigora (Brown Falcon)*			
59.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
60.	25623	*Falco longipennis (Australian Hobby)*			
Felidae					
61.	24041	*Felis catus (Cat)*	Y		
Gekkonidae					
62.	24953	*Gehyra montium*			
63.	24956	*Gehyra pilbara*			
64.	24957	*Gehyra purpurascens*			
65.	24959	*Gehyra variegata*			
66.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
Glareolidae					
67.	24481	*Glareola maldivarum (Oriental Pratincole)*		IA	
Halcyonidae					
68.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
Limnodynastidae					
69.	25430	*Notaden nichollsi (Desert Spadefoot)*			
Macropodidae					
70.	25506	*Petrogale lateralis (Black-footed Rock-wallaby, Black-flanked Rock-wallaby)*		T	
Maluridae					
71.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
72.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
Meliphagidae					
73.	24564	*Certhionyx variegatus (Pied Honeyeater)*			
74.	24570	*Epthianura tricolor (Crimson Chat)*			
75.	42314	*Gavicalis virescens (Singing Honeyeater)*			
76.	25661	*Lichmera indistincta (Brown Honeyeater)*			
77.	24583	*Manorina flavigula (Yellow-throated Miner)*			
78.	42323	*Ptilotula keartlandi (Grey-headed Honeyeater)*			
79.	42344	*Purnella albifrons (White-fronted Honeyeater)*			
Meropidae					
80.	24598	*Merops ornatus (Rainbow Bee-eater)*			
Motacillidae					
81.	25670	*Anthus australis (Australian Pipit)*			
Muridae					
82.	24223	*Mus musculus (House Mouse)*	Y		
83.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
84.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
Myobatrachidae					
85.	25442	*Uperoleia micromeles (Tanami Toadlet)*			
Otididae					
86.	24610	*Ardeotis australis (Australian Bustard)*			
Pachycephalidae					
87.	24618	*Oreoica gutturalis (Crested Bellbird)*			
88.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
Petroicidae					
89.	25693	*Microeca fascinans (Jacky Winter)*			
Phasianidae					
90.	25701	*Coturnix ypsilophora (Brown Quail)*			
Podargidae					
91.	25703	*Podargus strigoides (Tawny Frogmouth)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Psittacidae					
92.	24736	*Melopsittacus undulatus (Budgerigar)*			
93.	24742	*Nymphicus hollandicus (Cockatiel)*			
Pygopodidae					
94.	24997	*Delma butleri*			
95.	30830	*Delma desmosa*			
96.	25001	*Delma nasuta*			
97.	25005	*Lialis burtonis*			
98.	25009	*Pygopus nigriceps*			
Scincidae					
99.	25017	*Carlia triacantha (Desert Rainbow Skink)*			
100.	25461	*Ctenotus brooksi*			
101.	25032	*Ctenotus calurus*			
102.	25462	*Ctenotus grandis*			
103.	25045	*Ctenotus helenae*			
104.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
105.	25064	*Ctenotus pantherinus subsp. ocellifer (Leopard Ctenotus)*			
106.	25062	*Ctenotus piankai*			
107.	25066	*Ctenotus quattuordecimlineatus*			
108.	25069	*Ctenotus rufescens*			
109.	25074	*Ctenotus schomburgkii*			
110.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
111.	43381	*Eremiascincus pallidus (Western Narrow-banded Skink, Narrow-banded Sand Swimmer)*			
112.	25125	*Lerista bipes*			
113.	25170	*Lerista separanda (Dampierland plain slider, skink)*		P2	
114.	25178	*Lerista vermicularis*			
115.	25184	*Menetia greyii*			
116.	25495	*Morethia ruficauda*			
117.	25499	*Notoscincus ornatus*			
118.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
Scolopacidae					
119.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
Sylviidae					
120.	47994	*Megalurus cruralis (Brown Songlark)*			
121.	47995	*Megalurus mathewsi (Rufous Songlark)*			
Thylacomyidae					
122.	24168	*Macrotis lagotis (Bilby, Dalgyte, Ninu)*		T	
Turnicidae					
123.	24851	*Turnix velox (Little Button-quail)*			
Typhlopidae					
124.	44628	*Anilios ammodytes*			
125.	44635	*Anilios grypus*			
126.	44645	*Anilios pilbarensis*			
Varanidae					
127.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
128.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
129.	25212	*Varanus eremius (Pygmy Desert Monitor)*			
130.	25215	*Varanus gilleni (Pygmy Mulga Monitor)*			
131.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 15/05/2019

Current Names Only Yes
Core Datasets Only Yes
Species Group All Animals
Method 'By Circle'
Centre 121° 21' 41" E,20° 33' 38" S
Buffer 40km
Group By Family

Family	Species	Records
Accipitridae	3	4
Agamidae	7	231
Artamidae	3	16
Boidae	1	1
Camelidae	1	1
Campephagidae	2	13
Carphodactylidae	2	17
Cinclosomatidae	1	9
Columbidae	1	1
Cuculidae	2	2
Dasyuridae	3	6
Dicruridae	1	2
Diplodactylidae	6	107
Elapidae	2	55
Falconidae	2	5
Felidae	1	2
Gekkonidae	3	14
Halcyonidae	1	2
Limnodynastidae	1	46
Maluridae	2	6
Meliphagidae	5	68
Meropidae	1	4
Muridae	4	6
Myobatrachidae	1	12
Otididae	1	4
Pachycephalidae	2	7
Psittacidae	1	4
Pygopodidae	4	27
Scincidae	16	513
Sylviidae	2	5
Thylacomyidae	1	1
Trochanteriidae	1	1
Turnicidae	1	6
Typhlopidae	3	15
Varanidae	5	25
TOTAL	**93**	**1238**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Accipitridae					
1.	25536	*Accipiter fasciatus (Brown Goshawk)*			
2.	24289	*Circus assimilis (Spotted Harrier)*			
3.	24295	*Haliastur sphenurus (Whistling Kite)*			
Agamidae					
4.	30833	*Amphibolurus longirostris (Long-nosed Dragon)*			
5.	25459	*Ctenophorus isolepis (Crested Dragon, Military Dragon)*			
6.	24882	*Ctenophorus nuchalis (Central Netted Dragon)*			
7.	42401	*Diporiphora paraconvergens (Grey-striped Western Desert Dragon)*			
8.	24896	*Diporiphora pindan (Pindan Dragon)*			
9.	42402	*Diporiphora vescus (Northern Pilbara Tree Dragon)*			
10.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
Artamidae					
11.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
12.	24356	*Artamus personatus (Masked Woodswallow)*			
13.	24357	*Artamus superciliosus (White-browed Woodswallow)*			
Boidae					
14.	25320	*Aspidites melanocephalus (Black-headed Python)*			
Camelidae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
15.	24254	*Camelus dromedarius (Dromedary, Camel)*	Y		
Campephagidae					
16.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
17.	24367	*Lalage tricolor (White-winged Triller)*			
Carphodactylidae					
18.	24966	*Nephrurus laevissimus*			
19.	25497	*Nephrurus levis*			
Cinclosomatidae					
20.	24390	*Psophodes occidentalis (Western Wedgebill, Chiming Wedgebill)*			
Columbidae					
21.	24401	*Geopelia cuneata (Diamond Dove)*			
Cuculidae					
22.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
23.	24431	*Chrysococcyx basalis (Horsfield's Bronze Cuckoo)*			
Dasyuridae					
24.	24095	*Ningaui timealeyi (Pilbara Ningaui)*			
25.	24101	*Planigale ingrami (Long-tailed Planigale)*			
26.	24120	*Sminthopsis youngsoni (Lesser Hairy-footed Dunnart)*			
Dicruridae					
27.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
Diplodactylidae					
28.	47934	*Diplodactylus laevis (Desert Fat-tailed Gecko)*			
29.	30933	*Lucasium stenodactylum*			
30.	24982	*Rhynchoedura ornata (Western Beaked Gecko)*			
31.	25517	*Strophurus ciliaris*			
32.	24927	*Strophurus elderi*			
33.	24932	*Strophurus jeanae*			
Elapidae					
34.	25263	*Pseudonaja modesta (Ringed Brown Snake)*			
35.	25305	*Simoselaps anomalus (Desert Banded Snake)*			
Falconidae					
36.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
37.	25623	*Falco longipennis (Australian Hobby)*			
Felidae					
38.	24041	*Felis catus (Cat)*	Y		
Gekkonidae					
39.	24957	*Gehyra purpurascens*			
40.	24959	*Gehyra variegata*			
41.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
Halcyonidae					
42.	42351	*Todiramphus pyrrhopygius (Red-backed Kingfisher)*			
Limnodynastidae					
43.	25430	*Notaden nichollsi (Desert Spadefoot)*			
Maluridae					
44.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
45.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
Meliphagidae					
46.	24570	*Epthianura tricolor (Crimson Chat)*			
47.	42314	*Gavicalis virescens (Singing Honeyeater)*			
48.	25661	*Lichmera indistincta (Brown Honeyeater)*			
49.	24583	*Manorina flavigula (Yellow-throated Miner)*			
50.	42323	*Ptilotula keartlandi (Grey-headed Honeyeater)*			
Meropidae					
51.	24598	*Merops ornatus (Rainbow Bee-eater)*			
Muridae					
52.	24223	*Mus musculus (House Mouse)*	Y		
53.	24224	*Notomys alexis (Spinifex Hopping-mouse)*			
54.	24237	*Pseudomys hermannsburgensis (Sandy Inland Mouse)*			
55.	24248	*Zyzomys argurus (Common Rock-rat)*			
Myobatrachidae					
56.	25442	*Uperoleia micromeles (Tanami Toadlet)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Otididae					
57.	24610	*Ardeotis australis (Australian Bustard)*			
Pachycephalidae					
58.	24618	*Oreoica gutturalis (Crested Bellbird)*			
59.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
Psittacidae					
60.	24736	*Melopsittacus undulatus (Budgerigar)*			
Pygopodidae					
61.	24997	*Delma butleri*			
62.	30830	*Delma desmosa*			
63.	25001	*Delma nasuta*			
64.	25005	*Lialis burtonis*			
Scincidae					
65.	25461	*Ctenotus brooksi*			
66.	25462	*Ctenotus grandis*			
67.	25045	*Ctenotus helenae*			
68.	25463	*Ctenotus pantherinus (Leopard Ctenotus)*			
69.	25062	*Ctenotus piankai*			
70.	25066	*Ctenotus quattuordecimlineatus*			
71.	25069	*Ctenotus rufescens*			
72.	25090	*Cyclodomorphus melanops subsp. melanops (Slender Blue-tongue)*			
73.	41409	*Eremiascincus musivus (Mosaic Desert Skink)*			
74.	43381	*Eremiascincus pallidus (Western Narrow-banded Skink, Narrow-banded Sand Swimmer)*			
75.	25125	*Lerista bipes*			
76.	25170	*Lerista separanda (Dampierland plain slider, skink)*		P2	
77.	25178	*Lerista vermicularis*			
78.	25495	*Morethia ruficauda*			
79.	25499	*Notoscincus ornatus*			
80.	25202	*Tiliqua multifasciata (Central Blue-tongue)*			
Sylviidae					
81.	47994	*Megalurus cruralis (Brown Songlark)*			
82.	47995	*Megalurus mathewsi (Rufous Songlark)*			
Thylacomyidae					
83.	24168	*Macrotis lagotis (Bilby, Dalgyte, Ninu)*		T	
Trochanteriidae					
84.		*Morebilus diversus*			
Turnicidae					
85.	24851	*Turnix velox (Little Button-quail)*			
Typhlopidae					
86.	44628	*Anilios ammodytes*			
87.	44635	*Anilios grypus*			
88.	44645	*Anilios pilbarensis*			
Varanidae					
89.	25209	*Varanus acanthurus (Spiny-tailed Monitor)*			
90.	25210	*Varanus brevicauda (Short-tailed Pygmy Monitor)*			
91.	25212	*Varanus eremius (Pygmy Desert Monitor)*			
92.	25215	*Varanus gilleni (Pygmy Mulga Monitor)*			
93.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			

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Birdata Species List

Emu
Dromaius novaehollandiae
1 (0.43%)

Plumed Whistling-Duck
Dendrocygna eytoni
1 (0.43%)

Pink-eared Duck
Malacorhynchus membranaceus
3 (1.28%)

Hardhead
Aythya australis
3 (1.28%)

Pacific Black Duck
Anas superciliosa
5 (2.14%)

Grey Teal
Anas gracilis
9 (3.85%)

Freckled Duck
Stictonetta naevosa
1 (0.43%)

Brown Quail
Synoicus ypsilophora
1 (0.43%)

Australasian Grebe
Tachybaptus novaehollandiae
4 (1.71%)

Hoary-headed Grebe
Poliocephalus poliocephalus
3 (1.28%)

Crested Pigeon
Ocyphaps lophotes
12 (5.13%)

Diamond Dove
Geopelia cuneata
35 (14.96%)

Peaceful Dove
Geopelia placida
9 (3.85%)

Bar-shouldered Dove
Geopelia humeralis
7 (2.99%)

Pheasant Coucal
Centropus phasianinus
9 (3.85%)

Horsfield's Bronze-Cuckoo
Chalcites basalis
32 (13.68%)

Pallid Cuckoo
Heteroscenes pallidus
16 (6.84%)

Australian Bustard
Ardeotis australis
32 (13.68%)

Tawny Frogmouth
Podargus strigoides
4 (1.71%)

Spotted Nightjar
Eurostopodus argus
8 (3.42%)

Australian Owlet-nightjar
Aegotheles cristatus
1 (0.43%)

Buff-banded Rail
Hypotaenidia philippensis
4 (1.71%)

Australian Spotted Crake
Porzana fluminea
2 (0.85%)

Baillon's Crake
Zapornia pusilla
3 (1.28%)

Spotless Crake
Zapornia tabuensis
2 (0.85%)

Purple Swamphen
Porphyrio porphyrio
3 (1.28%)

Black-tailed Native-hen
Tribonyx ventralis
1 (0.43%)

Eurasian Coot
Fulica atra
5 (2.14%)

Brolga
Antigone rubicunda
8 (3.42%)

Bush Stone-curlew
Burhinus grallarius
3 (1.28%)

Black-winged Stilt
Himantopus leucocephalus
11 (4.70%)

Red-capped Plover
Charadrius ruficapillus
1 (0.43%)

Oriental Plover
Charadrius veredus
1 (0.43%)

Black-fronted Dotterel
Elseyornis melanops
11 (4.70%)

Masked Lapwing
Vanellus miles
3 (1.28%)

Red-kneed Dotterel
Erythrogonys cinctus
4 (1.71%)

Sharp-tailed Sandpiper
Calidris acuminata
1 (0.43%)

Curlew Sandpiper
Calidris ferruginea
1 (0.43%)

Long-toed Stint
Calidris subminuta
1 (0.43%)

Red-necked Stint
Calidris ruficollis
1 (0.43%)

Common Sandpiper
Actitis hypoleucos
3 (1.28%)

Common Greenshank
Tringa nebularia
3 (1.28%)

Wood Sandpiper
Tringa glareola
2 (0.85%)

Marsh Sandpiper
Tringa stagnatilis
2 (0.85%)

Red-chested Button-quail
Turnix pyrrhothorax
1 (0.43%)

Little Button-quail
Turnix velox
14 (5.98%)

Australian Pratincole
Stiltia isabella
4 (1.71%)

Oriental Pratincole
Glareola maldivarum
2 (0.85%)

Australian Gull-billed Tern
Gelochelidon macrotarsa
2 (0.85%)

Whiskered Tern
Chlidonias hybrida
4 (1.71%)

White-winged Black Tern
Chlidonias leucopterus
1 (0.43%)

Australian Pelican
Pelecanus conspicillatus
3 (1.28%)

Nankeen Night-Heron
Nycticorax caledonicus
6 (2.56%)

Striated Heron
Butorides striata
1 (0.43%)

White-necked Heron
Ardea pacifica
6 (2.56%)

Great Egret
Ardea alba
5 (2.14%)

White-faced Heron
Egretta novaehollandiae
6 (2.56%)

Little Egret
Egretta garzetta
2 (0.85%)

Australian White Ibis
Threskiornis moluccus
2 (0.85%)

Straw-necked Ibis
Threskiornis spinicollis
8 (3.42%)

Royal Spoonbill
Platalea regia
1 (0.43%)

Glossy Ibis
Plegadis falcinellus
6 (2.56%)

Little Pied Cormorant
Microcarbo melanoleucos
3 (1.28%)

Little Black Cormorant
Phalacrocorax sulcirostris
4 (1.71%)

Australasian Darter
Anhinga novaehollandiae
4 (1.71%)

Black-shouldered Kite
Elanus axillaris
3 (1.28%)

Black-breasted Buzzard
Hamirostra melanosternon
2 (0.85%)

Wedge-tailed Eagle
Aquila audax
2 (0.85%)

Little Eagle
Hieraaetus morphnoides
15 (6.41%)

Swamp Harrier
Circus approximans
2 (0.85%)

Spotted Harrier
Circus assimilis
26 (11.11%)

Brown Goshawk
Accipiter fasciatus
11 (4.70%)

Collared Sparrowhawk
Accipiter cirrocephalus
2 (0.85%)

White-bellied Sea-Eagle
Haliaeetus leucogaster
2 (0.85%)

Whistling Kite
Haliastur sphenurus
20 (8.55%)

Black Kite
Milvus migrans
17 (7.26%)

Barn Owl
Tyto alba
1 (0.43%)

Barking Owl
Ninox connivens
5 (2.14%)

Southern Boobook
Ninox boobook
1 (0.43%)

Rainbow Bee-eater
Merops ornatus
28 (11.97%)

Sacred Kingfisher
Todiramphus sanctus
5 (2.14%)

Red-backed Kingfisher
Todiramphus pyrrhopygius
14 (5.98%)

Nankeen Kestrel
Falco cenchroides
40 (17.09%)

Australian Hobby
Falco longipennis
6 (2.56%)

Brown Falcon
Falco berigora
27 (11.54%)

Black Falcon
Falco subniger
2 (0.85%)

Cockatiel
Nymphicus hollandicus
6 (2.56%)

Galah
Eolophus roseicapilla
5 (2.14%)

Major Mitchell's Cockatoo
Cacatua leadbeateri
2 (0.85%)

Little Corella
Cacatua sanguinea
8 (3.42%)

Red-winged Parrot
Aprosmictus erythropterus
7 (2.99%)

Budgerigar
Melopsittacus undulatus
52 (22.22%)

Variegated Fairy-wren
Malurus lamberti
34 (14.53%)

Red-backed Fairy-wren
Malurus melanocephalus
7 (2.99%)

White-winged Fairy-wren
Malurus leucopterus
11 (4.70%)

Black Honeyeater
Sugomel niger
32 (13.68%)

Brown Honeyeater
Lichmera indistincta
57 (24.36%)

Black-chinned Honeyeater
Melithreptus gularis
3 (1.28%)

Pied Honeyeater
Certhionyx variegatus
36 (15.38%)

Crimson Chat
Epthianura tricolor
44 (18.80%)

Spiny-cheeked Honeyeater
Acanthagenys rufogularis
8 (3.42%)

Singing Honeyeater
Gavicalis virescens
80 (34.19%)

Grey-headed Honeyeater
Ptilotula keartlandi
12 (5.13%)

White-plumed Honeyeater
Ptilotula penicillata
10 (4.27%)

White-fronted Honeyeater
Purnella albifrons
12 (5.13%)

Yellow-throated Miner
Manorina flavigula
30 (12.82%)

Red-browed Pardalote
Pardalotus rubricatus
1 (0.43%)

Western Gerygone
Gerygone fusca
1 (0.43%)

Inland Thornbill
Acanthiza apicalis
2 (0.85%)

Grey-crowned Babbler
Pomatostomus temporalis
1 (0.43%)

Black-faced Cuckoo-shrike
Coracina novaehollandiae
27 (11.54%)

White-winged Triller
Lalage tricolor
30 (12.82%)

Rufous Whistler
Pachycephala rufiventris
31 (13.25%)

Grey Shrike-thrush
Colluricincla harmonica
4 (1.71%)

Crested Bellbird
Oreoica gutturalis
2 (0.85%)

Chiming Wedgebill
Psophodes occidentalis
1 (0.43%)

Australian Magpie
Gymnorhina tibicen
1 (0.43%)

Pied Butcherbird
Cracticus nigrogularis
32 (13.68%)

Grey Butcherbird
Cracticus torquatus
1 (0.43%)

Masked Woodswallow
Artamus personatus
42 (17.95%)

White-browed Woodswallow
Artamus superciliosus
1 (0.43%)

Black-faced Woodswallow
Artamus cinereus
32 (13.68%)

White-breasted Woodswallow
Artamus leucorynchus
1 (0.43%)

Willie Wagtail
Rhipidura leucophrys
37 (15.81%)

Torresian Crow
Corvus orru
21 (8.97%)

Little Crow
Corvus bennetti
2 (0.85%)

Restless Flycatcher
Myiagra inquieta
1 (0.43%)

Magpie-lark
Grallina cyanoleuca
20 (8.55%)

Red-capped Robin
Petroica goodenovii
1 (0.43%)

Hooded Robin
Melanodryas cucullata
1 (0.43%)

Mistletoebird
Dicaeum hirundinaceum
2 (0.85%)

Zebra Finch
Taeniopygia guttata
50 (21.37%)

Australasian Pipit
Anthus novaeseelandiae
11 (4.70%)

Horsfield's Bushlark
Mirafra javanica
12 (5.13%)

Brown Songlark
Cincloramphus cruralis
9 (3.85%)

Rufous Songlark
Cincloramphus mathewsi
12 (5.13%)

Spinifexbird
Poodytes carteri
9 (3.85%)

Fairy Martin
Petrochelidon ariel
4 (1.71%)

Tree Martin
Petrochelidon nigricans
9 (3.85%)

Barn Swallow
Hirundo rustica
1 (0.43%)

Yellow White-eye
Zosterops luteus
1 (0.43%)

Crow & Raven spp
1 (0.43%)

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Your Ref: **92477**
Our Ref: **04-1018FL**
Enquiries: Steven Martin
Phone: (08) 9219 9522
Email: flora.data@dbca.wa.gov.au

Astron Environmental Services
129 Royal Street
East Perth WA 6004

Attention: Haylea Warrener

Dear Haylea Warrener,

REQUEST FOR THREATENED AND PRIORITY FLORA INFORMATION

I refer to your request of 27 September 2018 for Threatened (Declared Rare) and Priority Flora information in the Sandfire area. The search was conducted within a 60km radial area from the central coordinate you submitted.

A search was undertaken for this area of **(1)** the Department's *Threatened (Declared Rare) and Priority Flora* database (for results, see "TPFL" – coordinates are GDA94), **(2)** the *Western Australian Herbarium Specimen* database for Threatened and Priority flora species opportunistically collected in the area of interest (for results, see "WAHERB"- coordinates are GDA94 – see condition number 4 in the attached 'Conditions in Respect of Supply') and **(3)**, the Department's *Threatened and Priority Flora List* [this list is searched using 'place names'. This list, which may also be used as a species target list, contains species that are declared rare (Conservation Code R or X for those presumed to be extinct), poorly known (Conservation Codes 1, 2 or 3), or require monitoring (Conservation Code 4) – for results, *if any*, see "TP List"]. The results are attached electronically to this email.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the ninth point, which refers to the requirement to undertake field investigations for the accurate determination of Threatened and Priority flora occurrence at a site. *The information supplied should be regarded as an indication only of the Threatened and Priority flora that may be present and may be used as a target list in any surveys undertaken.*

The information provided does not preclude you from obtaining and complying with, where necessary, land clearing approvals from other agencies.

An invoice for $ 300 (plus GST) to supply this information will be forwarded.

It would be appreciated if any populations of Threatened and Priority flora you encounter in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss Threatened and Priority flora management, please contact Dr Ken Atkins, Manager, Species and Communities Branch, on (08) 9219 9511.

Yours faithfully

Steve Martin
.....
THREATENED FLORA DATABASE OFFICER
for the Director General

12 October 2018

Species and Communities Program
17 Dick Perry Avenue, Technology Park, Kensington
Phone: (08) 9219 9511
Postal Address: Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
www.dbca.wa.gov.au

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

THREATENED AND PRIORITY FLORA INFORMATION

Conditions with Respect to the Supply of Information

- The data supplied may not be provided to any other organisations, nor be used for any purpose other than for the project for which it has been originally provided for; without the prior consent of the Executive Director, Department of Biodiversity, Conservation and Attractions.
- Specific locality information for threatened flora is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for threatened flora may not be used in reports without the written permission of the Executive Director, Department of Biodiversity, Conservation and Attractions. Reports may only show generalised locations at a low resolution or, where necessary, show specific locations without identifying species. Species and Communities Branch is to be contacted for guidance on the presentation of threatened flora information.
- The Department of Biodiversity, Conservation and Attractions respects the privacy of private landowners who may have threatened and priority flora on their property. Threatened and priority flora locations identified in the data as being on private property should be treated in confidence, and contact with property owners must only be made through the Department of Biodiversity, Conservation and Attractions.
- The development of the Perth Herbarium database was not originally intended for electronic mapping (eg. GIS ArcView). The latitude and longitude coordinates for each entry are not verified prior to being data based. It is only in recent times that collections have been submitted with GPS coordinates. Therefore, be aware when using this data in ArcView that some records may not plot to the locality description given with each collection.
- Acknowledgment of the Department Biodiversity, Conservation and Attractions as the source of data is to be made in any published material and cited as Biodiversity, Conservation and Attractions (2018) Threatened and Priority Flora Database Search for [search area] accessed on the [date of search]. Prepared by the Species and Communities Branch for [Requesters name and company] for [purpose of search].
- Copies of all such publications are to be forwarded to the Department of Biodiversity, Conservation and Attractions, Attention; the Manager, Species and Communities Branch.

Disclaimers with Respect to the Supply of Information

- Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data, they may be present. The Department of Biodiversity, Conservation and Attractions accepts no responsibility for this.
- Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.
- It should be noted that the supplied data does not necessarily represent a comprehensive listing of the threatened flora of the area in question. Its comprehensiveness is dependent on the amount of surveys carried out within a specified area. The receiving organisation should consider engaging a botanist, if required, to undertake a survey of the area under consideration.

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

ABBREVIATIONS USED IN THREATENED AND PRIORITY FLORA DATABASE

VESTING

AAP	Aboriginal Planning Authority
AGR	Chief Executive, Dep. of Agriculture
ALT	Aboriginal Land Trust
APB	Agricultural Protection Board of WA
BGP	Botanical Gardens & Parks Authority
BSA	Boy Scouts Association
CC	Conservation Commission – NPNCA - LFC
CGT	Crown Grant in Trust
COM	Commonwealth of Australia
CRO	Crown Freehold-Govt Ownership
CRW	Crown
DAG	Dep. of Agriculture
DOW	Dep. of Water
DPI	Dep. of Planning
EXD	Exec Direc CALM
FES	Fire and Emergency Services Aust.
HOW	Dep. of Housing/State Housing Commission
ILD	Industrial Lands Develop. Auth
LAC	LandCorp
LGA	Shire/LGA
MAG	Minister for Agriculture
MCB	Metropolitan Cemeteries Board
MED	Ministry of Education
MHE	Minister for Health
MIN	Minister for Mines
MPL	Ministry for Planning
MPR	Minister for Prisons
MRD	Main Roads WA
MTR	Minister for Transport
MWA	Minister for Water Resources
MWO	Minister for Works
NAT	Natural Trust of Australia WA
NON	Not Vested
PLB	Pastoral Lands Board
PRI	Private/Freehold
RAI	Public Transport Authority
REL	Religious Organisation
SPC	State Planning Commission
SYN	Synergy (ex Western Power)
SWA	State of Western Australia
TEL	Telstra
UNK	Unknown
WAT	Water Corporation
WEL	Minister Community Welfare
WRC	Water & Rivers Commission
XPL	Ex-Pastoral Lease

PURPOSES

ABR	Aboriginal Reserve
ACC	Access Track
AER	Aerodrome
AIR	Airport
ARS	Agricultural Research Station
BAP	Baptist Union of WA
CAM	Camping
CAR	Caravan park
CEM	Cemetery
CFA	Conservation of Fauna
CFF	Conservation Of Flora & Fauna
CFL	Conservation of Flora
CHU	Church
CMN	Communications
COM	Common
CON	Conservation Park
CPK	Car Park
CRM	Conservation & Resource Management
DEF	Defence
DRA	Drain
EDE	Educational Endowment
EDU	Educational purposes
UWA	
ENE	Enjoyment of Natural Environ.
EPL	Ex-pastoral Lease (Sect 33(2) CALM Act)
EPS	Explosives
EXC	Excepted from sale
EXL	Exploration Lease
EXP	Experimental Farm
FIR	Firing Range
FOR	State Forest
FP	Foreshore Purposes
GE	General Lease
GHA	Grain Handling
GOL	Golf
GRA	Gravel Pit
GVT	Government Requirements
HAR	Harbour Purposes
HEP	Heritage Purposes
HER	Heritage trail
HOS	Hospital
KEN	Kennels
LGA	LGA/Shire Requirements
LPR	Landscape Protection
MIN	Mining lease
MUN	Municipal Purposes
NPK	National Park
NRE	Nature Reserve
OTH	Other
PAR	Parkland (& Recreation)
PAS	Pastoral lease
PCR	Proposed for Conservation
PFF	Protection of Flora & Fauna
PFL	Protection of Flora
PIC	Picnic ground
PLA	Plantation
PMC	Protection of Meteorite Crater
POS	Public Open Space
PPA	Public parkland
PRS	Prison site
PUR	Purchase Lease
PUT	Public Utility
QUA	Quarry
RAC	Racecourse
RAD	Radio Station
REC	Recreation
REH	Rehabilitation/Re-establish Native Plants
RRE	Railway Reserve
RUB	Rubbish
SAL	Saleyards
SAN	Sand
SCH	School-site
SET	Settlers requirements
SHO	Showgrounds
SNN	Sanitary
SOI	Soil Conservation
STO	Stopping place
STK	Stock Route
TIM	Timber
TOU	Tourism
TOW	Town-site
TRA	Training Ground
TRI	Trig station
UCL	Unallocated Crown Land
UNK	Unknown
VER	Road Verge
VPF	Vermin Proof Fence
WAT	Water
WLS	Wildlife Sanctuary
WOO	Firewood

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

ABBREVIATIONS USED IN THE WESTERN AUSTRALIAN HERBARIUM DATABASE

Geocode Method - The method that was used to record the latitude and longitude.

Auto - Indicates that the coordinate data in the record was created automatically (i.e. by software), usually by creating a coordinate from information provided in the Nearest Named Place or Locality textual description fields.

GAP - Acronym for "Generalised Arbitrary Point" as used in HISPID. GAP indicates that the coordinate data was obtained manually from the Nearest Named Place or Locality textual description fields.

GPS - Acronym for "Global Positioning System". GPS indicates that the coordinate data in the record was obtained from a GPS unit by the collector of the specimen.

MAN - Shorthand for manual. MAN indicates that the coordinate data was created by hand using some method not allowed for by one of the other manual Geocode Method values, in particular, TOPO, GAP, or GPS.

TOPO - Shorthand for topographic map. TOPO indicates that the coordinate data was obtained by plotting textual locality details against a topographic map.

None - Indicates that no coordinate data has been supplied by the collector.

Unknown - Indicates that there is no known method for determining the coordinate data. Should be used if the collector provided no indication of how they sampled the specimen's coordinate data.

PREC (Precision) - precision ratings for coordinates.

Precision 1: Absolutely precise (to nearest 100m or nearest second) and must be GPS determined. For example 35°26'42"S 123°40'26"E

Precision 2: Falling within a diameter of 3km (ca 2 minutes) or if no GPS mentioned in collecting notes. (The location must be able to be pinpointed on a 1:250 000 map, a spot locality. For example 35°26'42"S 123°40'26"E

Precision 3: Falling within a diameter of 10km (ca 7 minutes) or for degrees and minutes, where seconds have not been given. For example 35°26'_"S 123°40'_"E

Precision 4: Falling within a diameter of ca 50km (30 minutes). For example 35°26'_"S 123°40'_"E

Precision 5: Where a location is a prescribed large geographical area within a state or only the state is given. Diameter is greater than 50km. For example 35°_'_"S 123°_'_"E

Precision 6: used when localities are New Holland, Eastern Australia or Not given. Fields will be left blank.

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

CONSERVATION CODES

For Western Australian Flora and Fauna

T Threatened species

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

- Fauna that is rare or likely to become extinct are declared to be fauna that is in need of special protection
- Flora that are extant and considered likely to become extinct, or rare and therefore in need of special protection, are declared to be rare flora

Species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.
The assessment of the conservation status of these species is based on their national extent.

X Presumed extinct species

Listed as Specially Protected under the *Wildlife Conservation Act 1950,* published under Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora (which may also be referred to as Declared Rare Flora).

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.

IA Migratory birds protected under an international agreement

Listed as Specially Protected under the *Wildlife Conservation Act 1950,* listed under Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice.

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), relating to the protection of migratory birds.

S Other specially protected fauna

Listed as Specially Protected under the *Wildlife Conservation Act 1950.* Fauna declared to be in need of special protection, otherwise than for the reasons mentioned for Schedules 1, 2 or 3, are published under Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice.

Threatened Fauna and Flora are ranked according to their level of threat using IUCN Red List categories and criteria. *For example:* Carnaby's Cockatoo (*Calyptorynchus latirostris*) is listed as 'Specially Protected' under the *Wildlife Conservation Act 1950,* published under Schedule 1, and referred to as a 'Threatened' species with a ranking of 'Endangered'.

CR Critically Endangered - considered to be facing an extremely high risk of extinction in the wild.

EN Endangered - considered to be facing a very high risk of extinction in the wild.

VU Vulnerable - considered to be facing a high risk of extinction in the wild.

A list of the current rankings can be downloaded from the Parks and Wildlife Threatened Species and Communities webpage at http://dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

P Priority species

Species that maybe threatened or near threatened but are data deficient, have not yet been adequately surveyed to be listed under the Schedules of the Wildlife Conservation (Specially Protected Fauna) Notice or the Wildlife Conservation (Rare Flora) Notice, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Conservation dependent species that are subject to a specific conservation program are placed in Priority 5.

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

1: Priority One: Poorly-known species

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

2: Priority Two: Poorly-known species

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

3: Priority Three: Poorly-known species

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

4: Priority Four: 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 do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.
(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

5: Priority Five: Conservation Dependent species

Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies, variety or forma).

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

ATTACHMENT: THREATENED AND PRIORITY FAUNA INFORMATION CONDITIONS OF SUPPLY

Conditions with Respect to the Supply of Information

- The data supplied may not be provided to any other organisations, nor be used for any purpose other than for the project for which it has been originally provided for; without the prior consent of the Executive Director, Department of Biodiversity, Conservation and Attractions.
- Specific locality information for threatened fauna is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for threatened fauna may not be used in reports without the written permission of the Executive Director, Department of Biodiversity, Conservation and Attractions. Reports may only show generalised locations at a low resolution or, where necessary, show specific locations without identifying species. Species and Communities is to be contacted for guidance on the presentation of threatened fauna information.
- The Department of Biodiversity, Conservation and Attractions respects the privacy of private landowners who may have threatened and priority fauna on their property. Threatened and priority fauna locations identified in the data as being on private property should be treated in confidence, and contact with property owners must only be made through the Department of Biodiversity, Conservation and Attractions.
- Acknowledgment of the Department of Biodiversity, Conservation and Attractions as the source of data is to be made in any published material and cited as Department of Biodiversity, Conservation and Attractions (2018) Threatened and Priority Fauna Database Search for [search area] accessed on the [date of search]. Prepared by the Species and Communities Program for [Requesters name and company] for [purpose of search].
- Copies of all such publications are to be forwarded to the Department of Biodiversity, Conservation and Attractions, Attention; Principal Zoologist, Species and Communities.

Disclaimers with Respect to the Supply of Information

- Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data, they may be present. The Department of Biodiversity, Conservation and Attractions accepts no responsibility for this.
- Receiving organisations must also recognise that the database is subject to continual updating and amendment, and such considerations should be taken into account by the user.
- It should be noted that the supplied data does not necessarily represent a comprehensive listing of the threatened fauna of the area in question. Its comprehensiveness is dependent on the amount of surveys carried out within a specified area. The receiving organisation should consider engaging a biologist/zoologist, if required, to undertake a survey of the area under consideration.

Species and Communities, Biodiversity and Conservation Science
17 Dick Perry Avenue, Technology Park, Kensington
Email: fauna.data@dbca.wa.gov.au Phone: (08) 9219 9511
Postal Address: Locked Bag 104, Bentley Delivery Centre, WA 6983
www.dbca.wa.gov.au

Department of **Biodiversity, Conservation and Attractions**

Science and Conservation Service

DEPARTMENT OF BIODIVERSITY, CONSERVATION AND ATTRACTIONS

THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES INFORMATION

CONDITIONS IN RESPECT OF SUPPLY OF INFORMATION

1. All requests for data are to be made in writing to the Department of Biodiversity, Conservation and Attractions. Attention: Species and Communities Branch

2. The data supplied may not be supplied to other organisations, nor be used for any purpose other than for the project for which they have been provided, without the prior written consent of the data custodian (Val English), Species and Communities Branch.

3. Specific locality information for threatened ecological communities (TECs/PECs) is regarded as confidential, and should be treated as such by receiving organisations. Specific locality information for TECs/PECs may not be used in public reports without the written permission of the data custodian (Val English). Acknowledgment of the Department of Biodiversity, Conservation and Attractions as source of the data is to be made in any published material. Copies of all such publications are to be forwarded to the Department of Biodiversity, Conservation and Attractions, Attention: Manager, Species and Communities Branch.

4. Note that the Department of Biodiversity, Conservation and Attractions respects the privacy of private landowners who may have threatened and priority ecological communities on their property. Locations of TECs/PECs identified in the data as being on private property should be treated in confidence, and contact with property owners made through the Department of Biodiversity, Conservation and Attractions.

5. Receiving organisations should note that while every effort has been made to prevent errors and omissions in the data provided, they may be present. The Department of Biodiversity, Conservation and Attractions accepts no responsibility for this.

6. Receiving organisations must also recognise that the Threatened and Priority Ecological Communities database is subject to continual updating and amendment, and such considerations should be taken into account by the user.

7. It should be noted that the supplied data do not necessarily represent a comprehensive listing of the threatened or priority ecological communities of the area in question. Its comprehensiveness is dependant on the amount of survey carried out within the specified area. Private property has been relatively little surveyed. The receiving organisation should employ a consultant, if there is any likelihood of the presence of any threatened or priority ecological community, to undertake a survey of the area under consideration.

Threatened and Priority Ecological Community buffers and boundaries in WA

UNDER NO CIRCUMSTANCES IS THIS DATA TO BE PROVIDED TO ANY THIRD PARTIES, for more details see conditions for the supply of this information.

Citation

Title: Threatened and Priority Ecological Community buffers and boundaries in WA

Custodian: Department of Biodiversity, Conservation and Attractions

Description

Abstract: Ecological communities throughout WA that are "Presumed Totally Destroyed", "Critically Endangered", "Endangered", "Vulnerable", "Priority 1-5", "Lower Risk" and "Not evaluated". Communities are based on various life-forms including plants, invertebrates and micro-organisms.

Geographical Bounding Box

North: -14.788854

South: -35.005719

East: 128.870214

West: 113.765525

Data Currency and Status

Beginning Date: 1/1/94

Ending Date: 30/10/2017

Maintenance/Update: As requested

Access

Stored Data Format: ESRI shapefile

Coordinate System: GCS_GDA_1994

Access Constraints: Digital data is only available with written permission of the custodian.

Data Quality

Positional Accuracy: Point location data within occurrences usually from GPS location, (usually within 100 metres).

Attribute Accuracy: Not documented.

Logical Consistency: Not documented.

Completeness: Information on specific communities was obtained from regional, subregional or specific habitat surveys of floristic communities, invertebrate communities, wetland assemblages and communities of micro-organisms.

Attributes List:

Name	Description
BDY_ID	Associated boundary polygon unique identifier
OCC_UNIQUE	Unique occurrence identifier
COM_ID	Shortened community name identifier
COM_NAME	Community name
STATE_CATE	State listed category of threat
COMM_CATE	Commonwealth listed category of threat
S_ID_COUNT	Number of Site IDs within a buffer
FIRST_S_ID	First site identifier
LAST_S_ID	Last site identifier
BUFFER	Buffer radius from site ID or boundary in metres

General Information:

Buffers

- A buffer is included around each occurrence of a TEC or PEC to help ensure:
  - that nearby developments with potential for impact are taken into account
  - for ecological communities driven by hydrological processes, buffers are applied to ensure essential ecological functions are maintained and/or potential impact of nearby developments is minimised.
  - mapping inaccuracies are accounted for

Contact Information

Contact Organisation: Department of Biodiversity, Conservation and Attractions

Contact Position: TEC Database Ecologist - Species and Communities Branch

Mail Address: Locked Bag 104, Bentley Delivery Centre, Kensington WA 6983

Telephone: (08) 9219 9157

Email: communities.data@dbca.wa.gov.au

Australian Government
Department of the Environment and Energy

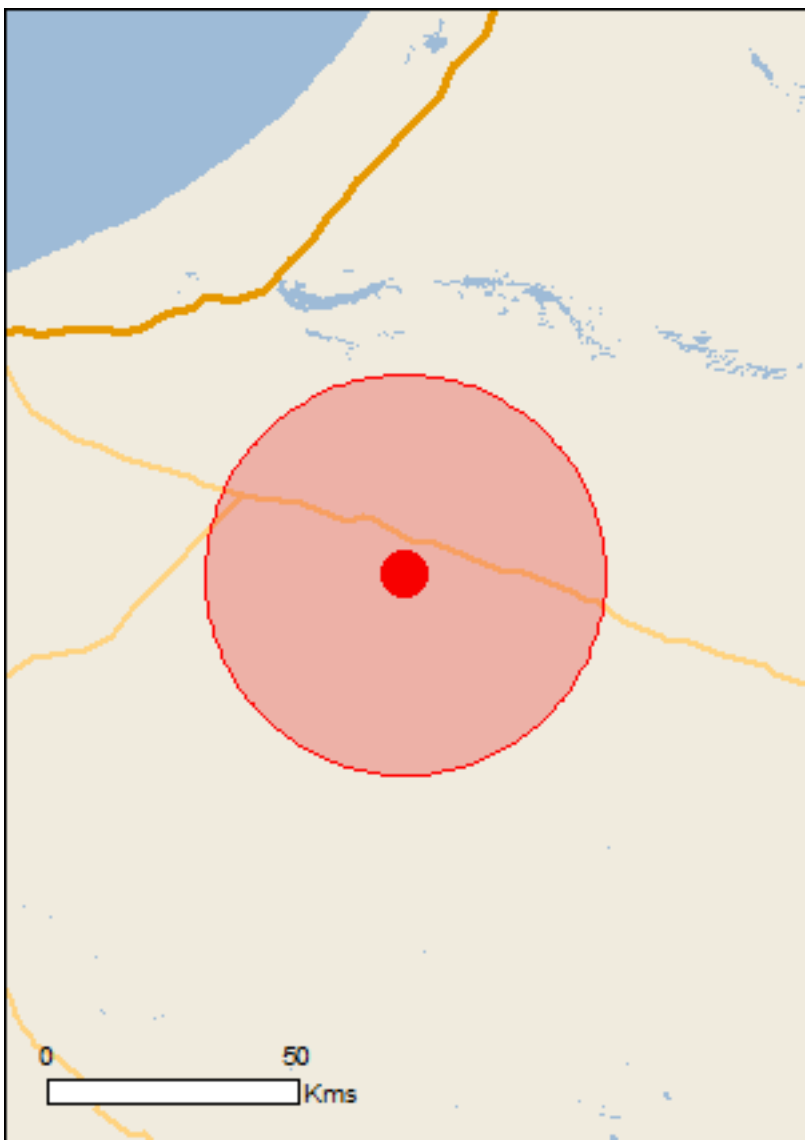
EPBC Act Protected Matters Report

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

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

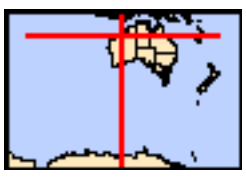
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 15/05/19 11:45:07



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

Coordinates
Buffer: 40.0Km



Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	8
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	10
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Eighty-mile beach	Within 10km of Ramsar

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Charadrius veredus](#) Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
[Glareola maldivarum](#) Oriental Pratincole [840]		Species or species habitat may occur within area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardea alba](#) Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
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[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
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Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Nyangumarta Warrarn	WA

Invasive Species	[Resource Information]

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

Name	Status	Type of Presence
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

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

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

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

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

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

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

- migratory and
- marine

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

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

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

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

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

Coordinates

-20.23462 121.44008

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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Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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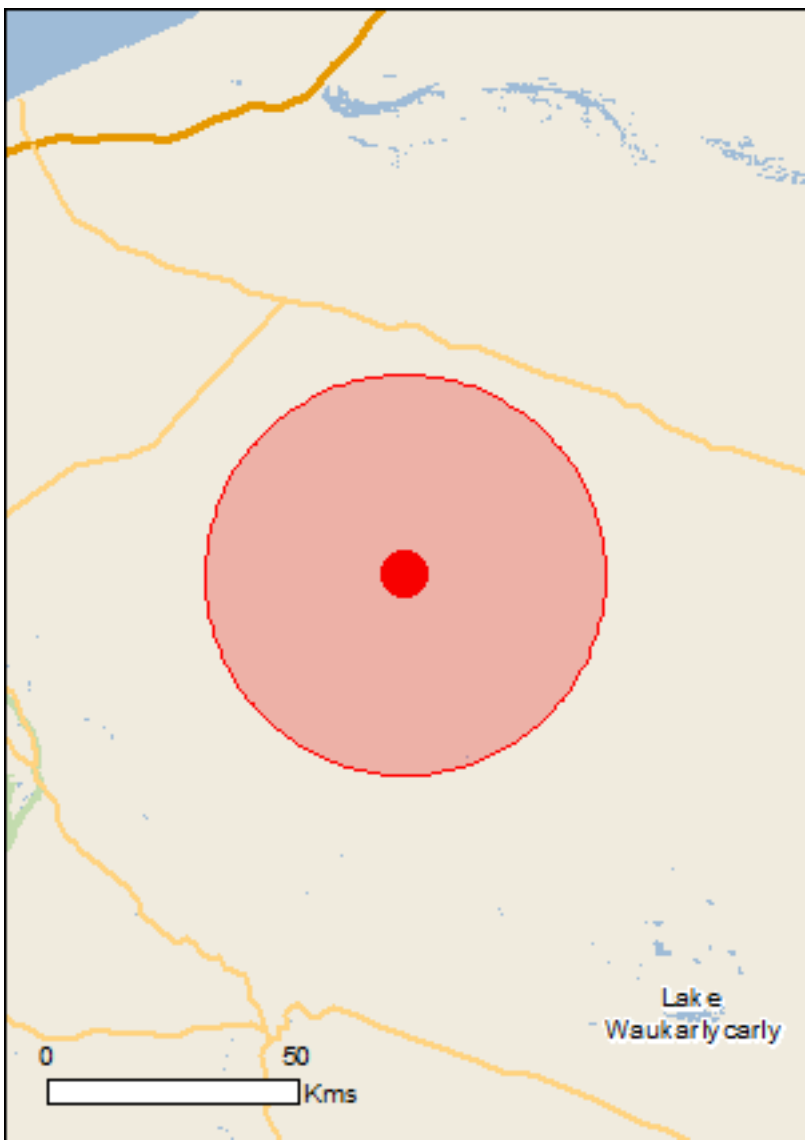
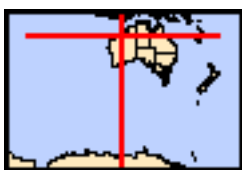
Report created: 15/05/19 11:43:52



Coordinates
Buffer: 40.0Km



Summary

Matters of National Environmental Significance

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World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	10
Listed Migratory Species:	12

Other Matters Protected by the EPBC Act

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

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

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	18
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	11
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Eighty-mile beach	30 - 40km upstream

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		

Name	Threatened	Type of Presence
Migratory Terrestrial Species		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat may occur within area
[Motacilla cinerea](#) Grey Wagtail [642]		Species or species habitat may occur within area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
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[Pandion haliaetus](#) Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]

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

Name	Threatened	Type of Presence
Birds		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardea alba](#) Great Egret, White Egret [59541]		Species or species habitat likely to occur

Name	Threatened	Type of Presence within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
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Nyangumarta Warrarn	WA

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

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-20.5602 121.36159

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-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 F: Threatened and Priority Flora and Fauna Species Likelihood of Occurrence within the Survey Area

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Table F.1: Likelihood of occurrence of threatened and priority flora recorded within 60 km of the survey area (Department of Biodiversity, Conservation, and Attractions 2018d, 2018f, 2018g, 2019, Department of the Environment and Energy 2019). Threatened and Priority Flora List database is searched using place names and as a result, some of the records obtained from this database may occur beyond 60 km of the survey area.

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post-survey
Threatened					
Pityrodia sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4) EN	Shrub to 1.5 m. Flowers pink, August.	Perennial	Steep hills, ironstone, sandstone, skeletal soils.	Unlikely	Unlikely
Priority 1					
Acacia aphanoclada	Slender, wispy shrub, 1.7-5 m high. Yellow flowers, August to October.	Perennial	Skeletal stony soils. Rocky hills, ridges & rises.	Unlikely	Unlikely
Acacia cyperophylla var. *omearana*	Tree, 4-10 m high, 'minni-ritchi' bark. Flowers yellow, March to April	Perennial	Stony and gritty alluvium, along drainage lines	Unlikely	Unlikely
Acacia fecunda	Erect, obconic shrub, to 3m high, bark grey, smooth becoming yellow-brown on upper branches; phyllodes more or less sub-glaucous with a slight sheen; inflorescence of spikes. Yellow flowers, May or August.	Perennial	Quartzite gibbers over grey-red skeletal soil. Along shallow creeks and drainage lines, hills, road verges	Unlikely	Unlikely
Acacia sp. Marble Bar (J.G. & M.H. Simmons 3499)	Shrub. Inflorescence in spikes, to 30 mm long. Flowers yellow, September.	Perennial	No information available.	Unlikely	Unlikely
Acacia sp. Nullagine (B.R. Maslin 4955)	Erect, spindly shrub, to 3 m high, bark 'minni-ritchi', grey above, red underneath.	Perennial	Rocky clay. Low-lying areas between rocky hills.	Unlikely	Unlikely
Atriplex spinulosa	Monoecious, erect, rounded annual, herb ca 0.2 m high	Annual	Simple slopes and footslopes with silty clay loam (brown or grey), occasionally clay flats and drainage floors.	Unlikely	Unlikely
Corchorus sp. Yarrie (J. Bull & D. Roberts CAL 01.05)	Shrub to 0.7 m. Flowers in June.	Perennial	Drainage lines associated with mesas.	Unlikely	Unlikely

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post-survey
Goodenia pedicellata	Single-stemmed perennial herb, (with dense cottony and strigose hairs), to 0.25 m high. Flowers yellow, April to May.	Perennial	Rocky, clayey soils on rocky slopes and crests of small hills.	Unlikely	Unlikely
Ptilotus wilsonii	Shrub, ca 0.5 m high. Flowers green-white, October.	Perennial	Stony gravelly soils, rocky hills	Unlikely	Unlikely
Solanum sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795) PN	Upright grey shrub, ca 1 m high	Perennial	Brown/grey light clay. Semi saline clay plains. Hilly, rocky red clay.	Unlikely	Unlikely
Tribulus minutus	Prostrate herb, plants villous; leaflet pairs 5-7; petals 2.5-7 mm long; spines on fruit not well-developed. Flowers yellow, November to April.	Annual / Short lived perennial	No information available.	Unlikely	Unlikely
Priority 2					
Goodenia hartiana	Erect to spreading, multi-stemmed herb or shrub. Flowers purple, August to September.	Perennial	Sand. Sand dune swales, sandhills.	Likely	Recorded
Indigofera ixocarpa	Shrub, to 1 m high. Flowers pink, May.	Perennial	Skeletal red soils over massive ironstone. Gorge, gully, hilltop. Creekline.	Unlikely	Unlikely
Solanum oligandrum	Prickly shrub, 1 m high. Flowers purple, October.	Perennial	Saline soil with algal crust over calcrete. Near termite mounds, seasonally-inundated	Unlikely	Unlikely
Priority 3					
Acacia levata	Spreading, multi-stemmed shrub, 1-3 m high x 5 m wide. Flowers yellow, May.	Perennial	Sand or sandy loam over granite. Hillslopes.	Unlikely	Unlikely
Fuirena incrassata	Grass-like or herb, 0.1-0.3 m high. Flowers May to August.	Annual	Sand, sandy clay. Swamps, creek beds, claypans, semi-saline lake.	Unlikely	Unlikely

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post-survey
Gomphrena leptophylla	Prostrate or erect to spreading herb, to 0.15 m high. Flowers white, March to September.	Annual	Sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	Unlikely	Unlikely
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Open, erect herb, to 0.2 m high. Flowers yellow, March to September.	Annual or Biennial	Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains, stony plains, hill slopes.	Unlikely	Unlikely
Indigofera ammobia	Many-stemmed shrub, to 0.5 m high. Flowers green and purple, September.	Perennial	Sand dunes.	Likely	Recorded
Lawrencia sp. Anna Plains (N.T. Burbidge 1433)	Upright herb, to 0.8 m high. Flowers white, August.	Perennial	Flats, margin of semi-saline drainage depression on coastal plain.	Unlikely	Unlikely
Nicotiana heterantha	Herb, to 0.5 m high, forming low, spreading colonies. Flowers white-cream, March to June or September.	Annual / Short lived perennial	Black clay, Seasonally wet flats.	Unlikely	Unlikely
Nicotiana umbratica	Erect, herb, 0.3-0.7 m high. Flowers white, April to June.	Annual / Short lived perennial	Shallow soils. Rocky outcrops	Unlikely	Unlikely
Phyllanthus hebecarpus	Woody shrub, 0.5 m high. Covered in small hairs which gives the plant a grey appearance.	Perennial	Moist sites on plateaus or ridges. Granite outcrops.	Unlikely	Unlikely
Polymeria distigma	Prostrate trailing herb. Flowers pink, April to July.	Short-lived perennial	Sandy soils, cracking clay.	Unlikely	Unlikely
Pterocaulon xenicum	Erect herb, 0.3 m high. Flowers pink, March	Perennial	Ridges and gullies. Limestone outcrops. Red-brown sandy loam.	Unlikely	Unlikely
Seringia katatona	Erect multi-stemmed shrub, 0.5 m high. Flowers purple, May to September.	Perennial/ Short lived perennial	Red sand, laterite over sandstone. Gently undulating desert dunes.	Potential	Potential

Species	Habit and flowering information	Life form	Habitat	Likelihood of occurrence	
				Pre-survey	Post-survey
Stylidium weeliwolli	Herb, 0.1-0.25 m high, throat appendages 4, rod-shaped. Flowers pink and red, August to September.	Annual	Gritty sand soil, sandy clay. Edge of watercourses.	Unlikely	Unlikely
Terminalia kumpaja	Spreading deciduous tree, 7 m high. Flowers cream, October.	Perennial	Red sand. Sandy loam soils. Red aeolian sand dune crest. Sand dunes.	Potential	Unlikely
Tribulopis marliesiae	Erect shrub, 0.4 m high. Flowers yellow, October and November.	Perennial	Red sandplain. Plain and road verges.	Potential	Unlikely

Table F.2 Likelihood of occurrence of conservation listed vertebrate fauna species listed as potentially occurring in the vicinity of the survey area (Department of Biodiversity, Conservation, and Attractions 2018c, 2019, Department of the Environment and Energy 2019, Birdlife Australia 2019).

Scientific name (common name)	Conservation codes			Environmental context and preferred habitat	Likelihood of occurrence
	EPBC Act	BC Act	DBCA		
Reptiles					
Lerista separanda (Dampierland Plain Slider)			P2	Sandy area of South-west Kimberly coast between Kimbleton and Nita Downs (Wilson and Swan 2010). Two recent records for this species exist 30 km of the survey area (Department of Biodiversity, Conservation, and Attractions 2019), which is a possible range extension. As such, the current distribution for this species is uncertain.	Moderate
Liasis olivaceus barroni (Pilbara Olive Python)	VU	VU		Generally rocky habitats in close association to permanent and semi-permanent water sources. The survey area lacks the rocky habitats preferred by this species.	Low
Birds					
Pandion haliaetus cristatus (Eastern Ospsprey)	MI	MI		Occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. Also coastal areas, and occasionally travel inland along major rivers.	Low
Charadrius veredus (Oriental Plover)	MI	MI		Breeding habitat includes arid grasslands, saltpans; non-breeding habitat includes grasslands, salt-fields, and coastal regions.	Low
Rostratula australis (Australian Painted Snipe)	EN	EN		Inhabits shallow terrestrial freshwater wetlands, lakes, swamps and claypans. Also found in waterlogged grassland and saltmarsh. Typical sites include areas with emergent tussocks of grass, sedges or samphire; often scattered with clumps of lignum *Muehlenbeckia*, or canegrass or sometimes with tea-tree (*Melaleuca*).	Low
Actitis hypoleucos (Common Sandpiper)	MI	MI		Non-breeding migrant to a wide variety of habitats, such as riverbanks, estuaries, freshwater seeps on coastal shores, tidal creeks, mangrove swamps and saltmarshes.	Low
Calidris acuminata (Sharp-tailed Sandpiper)	MI	MI		Muddy edges of shallow fresh/brackish wetlands with emergent sedges, saltmarsh, grass and low vegetation.	Low

Calidris ferruginea (Curlew Sandpiper)	CR/IA	VU/IA		This species mainly occurs on intertidal mudflats in sheltered coastal areas and also around non-tidal swamps, lakes and lagoons near the coast. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.	Low
Calidris melanotos (Pectoral Sandpiper)	Mi	MI		Mainly swamps, lagoons, river pools, irrigation channels and sewerage ponds. Also in samphire flats around estuaries and salt lakes.	Low
Calidris ruficollis (Red-necked Stint)	MI	MI		The edge of sheltered waters including estuaries, beaches, near-coastal salt lakes, swamps, lakes, sewerage ponds and bore overflows.	Low
Calidris subminuta (Long-toed Stint)	MI	MI		Generally found in coastal environments such as coastal margins, lagoons, beaches and tidal flats.	Low
Numenius madagascariensis (Eastern Curlew)	CR, MI	CR	CR, MI	Mainly tidal flats, also reef flats, sandy beaches and rarely near coastal lakes.	Low
Tringa glareola (Wood Sandpiper)	MI	MI		Generally open areas such as the margins of inland freshwater lakes and reservoirs. This species rarely occurs in coastal habitats, but may be found along the creeks of saltmarshes and mangrove swamps.	Low
Tringa nebularia (Common Greenshank)	MI	MI		A variety of freshwater, marine and artificial wetlands, including swamps, open muddy or rocky shores of lakes and large rivers, sewage farms, saltworks, muddy coastal flats, mangroves and estuaries.	Low
Tringa stagnatilis (Marsh Sandpiper)	MI	MI		Found at the margins of inland freshwater and brackish wetlands such as rice paddy-fields, swamps, salt-pans, salt-marshes, sewage works and marshy lake-edges, and although it is rare on open coastlines it can occasionally be found on estuaries, lagoons and intertidal mudflats.	Low
Glareola maldivarum (Oriental Pratincole)	IA	IA		Open plains, bare ground on swamp-margins, mudflats and claypans. Feeds in the air and roosts on bare ground besides water.	Low
Chlidonias leucopteris (White-winged Black Tern)	MI	MI		Mainly estuaries and sheltered seas, fresh water lakes and swamps and samphire flats.	Low

Apus pacificus (Fork-tailed Swift)	MI	MI		Largely aerial species independent of the terrestrial environment.	Low
Falco peregrinus (Peregrine Falcon)		OS		Cosmopolitan, will hunt in any habitat, soaring at height or from a perch; often near cliffs. Nests on rocky ledges in tall, vertical cliff faces and tall trees associated with drainage lines.	Low
Polytelis alexandrae (Princess Parrot)	VU		P4	Inhabits sand dunes and sand flats in the arid zone. Occurs in savanna woodlands and shrublands that usually consist of scattered stands of *Eucalyptus* spp, *Casuarina/Allocasuarina* trees, an understorey of shrubs and a ground cover dominated by *Triodia* ssp. There are no recent records of this species in the vicinity of the survey area.	Low
Pezoporus occidentalis (Night Parrot)	EN	CR		Most habitat records are from *Triodia* grasslands and/or chenopod shrublands in the arid and semi-arid zones. *Astrebla* spp. (Mitchell grass), shrubby samphire and chenopod associations, scattered trees and shrubs, *Acacia aneura* (Mulga) woodland, treeless areas and bare gibber as associated with sightings of the species.	Low
Hirundo rustica (Barn Swallow)	MI	MI		Coastal open country generally, especially near surface water and man-made structures such as bridges and power wires.	Low
Motacilla cinerea (Grey Wagtail)	MI	MI		Damp short-grass flats, rice stubbles and edge of swamps, sewage ponds, bore overflows, grazed or mowed grass and irrigated areas. Considered a vagrant species to Australia.	Low
Motacilla flava (Yellow Wagtail)	MI	MI		Mainly banks and rocks in fast-running freshwater habitats such as rivers, creeks, streams and around waterfalls. Considered a vagrant species to Australia.	Low
Mammals					

Dasyurus hallucatus (Northern Quoll)	EN	EN		Northern Quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. The survey area does not contain the rocky habitats preferred by this species.	Low
Macrotis lagotis (Greater Bilby, Dalgyte)	VU	VU		Sand or sandy-loam in hummock grassland (*Triodia* species) and or *Acacia* shrublands. There have been numerous recent records of this species in the vicinity of the survey area.	High
Petrogale lateralis (Black-footed Rock-wallaby)	VU	VU		Occurs in cliffs, rock-piles, talus or escarpment refuge and other steep substrates with grassland feeding habitat nearby. Also occurs on limestone outcrops, coastal cliffs and granite outcrops. The survey area does not contain the rocky habitats preferred by this species.	Low
Macroderma gigas (Ghost Bat)	VU	VU		A wide range from rainforest, monsoon and vine scrub in the tropics to open woodlands and arid areas. The survey area does not contain the rocky habitats that support the caves required by this species.	Low
Rhinonicteris aurantia (Pilbara form) (Pilbara Leaf-nosed Bat)	VU	VU		Roosts in deep warm, humid caves or rock crack, especially in proximity to water pools. Forages while flying low along watercourses and gorges and over Triodia grassland. The survey area does not contain the rocky habitats that support the caves required by this species.	Low
Notoryctes caurinus (Northern Marsupial Mole, karkarratul)			P4	Lives primarily underground of sand dunes and sandy soils along river flats. There have been numerous recent records of this species in the vicinity of the survey area.	High
Dasycercus blythi (Brush-tailed Mulgara, Ampurta)			P4	Common in a range of habitats – tussock / hummock grasslands and sparse shrubs and low open woodlands on ridge tops, cliffs, scree slopes, hills and valley floors. The survey area is in the known distribution for this species and the Sand Plain habitat provides suitable habitat. The closest record of this species is from 70km to the east of the survey area (Department of Biodiversity, Conservation and Attractions 2018c) but the survey area exists in the known distribution of this species.	High

Leggadina lakedownensis (Short-tailed Mouse, Karekanga)			P4	Open tussock and hummock grassland, Acacia shrubland and savannah woodland on alluvial clay / sandy soils. Although the closest record of this species is approximately 100 km to the North and south (Naturemap 2019), the survey area exists in the known distribution of this species.	High
Pseudomys chapmani (Western Pebble-mound Mouse)			P4	Gentle rocky slopes, hills and spurs with small pebble surface cover and sparse vegetation. The survey area lacks the rocky scree substrates required by this species.	Low

Department of Biodiversity, Conservation & Attractions 2019, 'NatureMap Database Search', Dept. of Biodiversity, Conservation & Attractions, Perth WA.

Wilson, S & Swan, G 2010, *A Complete Guide to Reptiles of Australia*, 3rd edn., New Holland Publishers, Sydney.

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Appendix G: Results of Fauna Database Searches, Literature Reviews and this Biological Survey

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Table G.1: Amphibian species list – results of database searches, literature reviews and Astron survey results

Scientific name	Common name	Introduced	Conservation codes			Nature Map/ DBCA	EPBC Protected Matters Search	Previous surveys	Current survey
			EPBC Act	BC Act	DBCA				
Hylidae									
Cyclorana maini	Sheep Frog							X	
Litoria rubella	Little Red Tree Frog							X	
Limnodynastidae									
Notaden nichollsi	Desert Spadefoot					X		X	
Myobatrachidae									
Uperoleia micromeles	Tanami Toadlet					X		X	

Table G.2: Reptile species list – results of database searches, literature reviews and Astron survey results.

Scientific name	Common name	Introduced	Conservation codes			Nature Map / DBCA	EPBC Protected Matters Search	Previous surveys	Current survey
			EPBC Act	BC Act	DBCA				
Agamidae									
Amphibolurus longirostris	Lon-nosed Dragon					X		X	
Ctenophorus caudicinctus	Ring-tailed Dragon							X	X
Ctenophorus isolepis	Military Dragon					X		X	X
Ctenophorus isolepis subsp. isolepis	Crested Dragon, Military Dragon					X			
Ctenophorus nuchalis	Central Netted Dragon					X			
Diporiphora paraconvergens	Grey-striped Western Desert Dragon					X		X	
Diporiphora pindan	Pindan Dragon					X			
Diporiphora vescus	Northern Pilbara Tree Dragon					X			
#Diporiphora winneckei	Cane Grass Two-lined Dragon							X	
Moloch horridus	Thorny Devil								X
Pogona minor	Dwarf Bearded Dragon					X		X	
Araneidae									
Argiope protensa						X			
Backobourkia collina						X			
Diplodactylidae									
Diplodactylus conspicillatus	Fat-tailed Gecko					X		X	
Diplodactylus laevis	Desert Fat-tailed Gecko					X			
Lucasium stenodactylum						X		X	
Rhynchoedura ornata	Western Beaked Gecko					X			
Strophurus ciliaris subsp. aberrans						X			
Strophurus elderi						X		X	
Strophurus jeanae						X			
Carphodactylidae									

Scientific name	Common name	Introduced	Conservation codes			Nature Map / DBCA	EPBC Protected Matters Search	Previous surveys	Current survey
			EPBC Act	BC Act	DBCA				
Nephrurus laevissimus						X			
Nephrurus levis subsp. levis						X		X	
Gekkonidae									
Gehyra montium						X			
Gehyra pilbara						X			
Gehyra purpurascens						X			
Gehyra variegata						X		X	
Heteronotia binoei	Bynoe's Gecko					X		X	
Hemidactylus frenatus	Asian House Gecko	*					X		
Pygopodidae									
Delma butleri						X		X	
Delma desmosa						X			
Delma nasuta						X		X	
Lialis burtonis						X		X	
Pygopus nigriceps						X			
Scincidae									
Ctenotus ariadnae								X	
Ctenotus brooksi						X		X	
Ctenotus calurus						X			
Ctenotus grandis						X		X	
Ctenotus helenae						X		X	X
Ctenotus nasutus								X	
Ctenotus pantherinus ocellifer						X		X	
Ctenotus piankai	Coarse Sands Ctenotus					X			
Ctenotus quattuordecimlineatus						X			

Scientific name	Common name	Introduced	Conservation codes			Nature Map / DBCA	EPBC Protected Matters Search	Previous surveys	Current survey
			EPBC Act	BC Act	DBCA				
Ctenotus rufescens						X			
Ctenotus schomburgkii						X			
#Egernia striata								X	
Carlia triacantha	Desert Rainbow Skink					X			
Eremiascincus fasciolatus	Narrow-banded Sand Swimmer							X	
Eremiascincus musivus	Mosaic Desert Skink					X			
Eremiascincus pallidus	Western Narrow-banded Skink					X			
Lerista bipes						X		X	
Lerista ips								X	
Lerista separanda	Dampierland plain slider, skink			P2		X			
Lerista vermicularis						X		X	
Menetia greyii						X		X	
Morethia ruficauda						X		X	X
Notoscincus ornatus						X		X	
Tiliqua multifasciata	Central Blue-tongue					X			
Varanidae									
Varanus acanthurus	Spiny-tailed Monitor					X		X	
Varanus brevicauda	Short-tailed Pygmy Monitor					X		X	
Varanus eremius	Pygmy Desert Monitor					X		X	
Varanus gilleni	Pygmy Mulga Monitor					X			
Varanus gouldii	Bungarra or Sand Monitor					X		X	X
Typhlopidae									
Anilios ammodytes						X			
Anilios grypus						X			
Anilios pilbarensis						X			
Ramphotyphlops endoterus								X	

Scientific name	Common name	Introduced	Conservation codes			Nature Map / DBCA	EPBC Protected Matters Search	Previous surveys	Current survey
			EPBC Act	BC Act	DBCA				
Boidae									
Antaresia stimsoni	Stimson's Python							X	
Aspidites melanocephalus	Black-headed Python					X			
Aspidites ramsayi	Woma							X	
Liasis olivaceus barroni	Pilbara Olive Python		VU	S3/VU			X		
Elapidae									
Pseudechis australis	Mulga Snake					X		X	
Pseudonaja mengdeni	Western Brown Snake					X			
Pseudonaja modesta	Ringed Brown Snake					X			
Simoselaps anomalus	Desert Banded Snake					X			

Taxonomic name not currently valid

Table G.3: Bird species list – results of database searches, literature reviews and Astron survey results.

Scientific name	Common name	Introduced	Conservation codes			Nature Map / DBCA	EPBC Protected Matters Search	Birdlife	Previous surveys	Current survey
			EPBC Act	BC Act	DBCA					
DROMAIIDAE										
Dromaius novaehollandiae	Emu							X		
ANATIDAE										
Anas gracilis	Grey Teal							X		X
Anas superciliosa	Pacific Black Duck							X		
Aythya australis	Hardhead							X		
Dendrocygna eytoni	Plumed Whistling-Duck							X		
Malacorhynchus membranaceus	Pink-eared Duck							X		
Stictonetta naevosa	Freckled Duck							X		
PHASIANIDAE										
Coturnix ypsilophora	Brown Quail					X		X		X
PODICIPEDIDAE										
Tachybaptus novaehollandiae	Australasian Grebe							X		
Poliocephalus poliocephalus	Hoary-headed Grebe							X		
THRESKIORNLTHIDAE										
Threskiornis moluccus	Australian White Ibis							X		
Threskiornis spinicollis	Straw-necked Ibis							X	X	
Platalea regia	Royal Spoonbill							X	X	
Plegadis falcinellus	Glossy Ibis							X		
ARDEIDAE										
Ardea ibis	Cattle Egret						X			
Ardea modesta	Great Egret						X	X		

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
Ardea pacifica	White-necked Heron							X		
Butorides striata	Striated Heron							X		
Egretta garzetta	Little Egret							X		
Egretta novaehollandiae	White-faced Heron							X		
Nycticorax caledonicus	Nankeen Night-Heron								X	
PELECANIDAE										
Pelecanus conspicillatus	Australian Pelican							X		
PHALACROCORACIDAE										
Microcarbo melanoleucos	Little Pied Cormorant							X		
Phalacrocorax sulcirostris	Little Black Cormorant							X		
ANHINGIDAE										
Anhinga novaehollandiae	Australasian Darter							X		
PANDIONIDAE										
Pandion haliaetus cristatus	Osprey, Eastern Osprey		IA	MI			X			
ACCIPITRIDAE										
Elanus axillaris	Black-shouldered Kite							X	X	
Accipiter cirrocephalus	Collared Sparrowhawk							X	X	
Accipiter fasciatus	Brown Goshawk					X	X	X	X	
Aquila audax	Wedge-tailed Eagle					X	X	X		
Circus assimilis	Spotted Harrier					X	X	X	X	X
Circus approximans	Swamp Harrier							X		
Haliaeetus leucogaster	White-bellied Sea-Eagle						X	X		
Haliastur sphenurus	Whistling Kite					X	X	X		X
Hamirostra melanosternon	Black-breasted Buzzard							X		
Hieraaetus morphnoides	Little Eagle					X	X	X	X	
OTIDIDAE										

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
Ardeotis australis	Australian Bustard					X		X	X	X
RALLIDAE										
Fulica atra	Eurasian Coot							X		
Hypotaenidia philippensis	Buff-banded Rail							X		
Porphyrio porphyrio	Purple Swamphen							X		
Porzana fluminea	Australian Spotted Crake							X		
Tribonyx ventralis	Black-tailed Native-hen							X		
Zapornia pusilla	Baillon's Crake							X		
Zapornia tabuensis	Spotless Crake							X		
GRUIDAE										
Antigone rubicunda	Brolga							X		
TURNICIDAE										
Turnix pyrrhothorax	Red-chested Buttonquail							X		
Turnix varius	Painted Button-quail									X
Turnix velox	Little Button-quail					X		X	X	
BURHINIDAE										
Burhinus grallarius	Bush Stone-curlew							X		
RECURVIROSTRIDAE										
Himantopus leucocephalus	Black-winged Stilt							X		
CHARADRIIDAE										
Charadrius veredus	Oriental Plover		IA	MI			X	X		
Erythrogonys cinctus	Red-kneed Dotterel							X	X	
Elseyornis melanops	Black-fronted Dotterel							X	X	
Vanellus miles	Masked Lapwing							X		
ROSTRATULIDAE										
Rostratula benghalensis	Painted Snipe (Greater Painted Snipe)						X			

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
Rostratula australis	Australian Painted Snipe		EN	EN			X			
SCOLOPACIDAE										
Actitis hypoleucos	Common Sandpiper		IA	MI			X	X		
Calidris acuminata	Sharp-tailed Sandpiper		IA	MI			X	X		
Calidris ferruginea	Curlew Sandpiper		CR/IA	VU/IA			X	X		
Calidris melanotos	Pectoral Sandpiper		IA	MI			X	X		
Calidris ruficollis	Red-necked Stint		IA	MI				X		
Calidris subminuta	Long-toed Stint		IA	MI				X		
Numenius madagascariensis	Eastern Curlew		CR & IA	CR			X			
Tringa glareola	Wood Sandpiper		IA	MI				X		
Tringa nebularia	Common Greenshank		IA	MI				X		
Tringa stagnatilis	Marsh Sandpiper		IA	MI				X		
GLAREOLIDAE										
Glareola maldivarum	Oriental Pratincole		IA	MI		X	X	X		
Stiltia isabella	Australian Pratincole							X		
LARIDAE										
Sterna hybrida	Whiskered Tern							X		
Sterna leucoptera	White-winged Black Tern		IA	MI				X		
Sterna nilotica macrotarsa	Australian Gull-billed Tern							X		
COLUMBIDAE										
Geopelia cuneata	Diamond Dove					X		X	X	X
Geopelia humeralis	Bar-shouldered Dove							X		
Geopelia striata placida	Peaceful Dove							X		
Ocyphaps lophotes	Crested Pigeon					X		X	X	X
Geophaps plumifera	Spinifex Pigeon								X	
Phaps chalcoptera	Common Bronzewing								X	

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
CUCULIDAE										
Cacomantis pallidus	Pallid Cuckoo					X		X	X	
Centropus phasianinus	Pheasant Coucal							X		
Chrysococcyx basalis	Horsfield's Bronze Cuckoo					X		X		
Chrysococcyx osculans	Black-eared Cuckoo						X			
TYTONIDAE										
Tyto alba	Barn Owl							X		
STRIGIDAE										
Ninox connivens	Barking Owl							X		
Ninox boobook	Southern Boobook							X		
PODARGIDAE										
Podargus strigoides	Tawny Frogmouth					X		X		X
CAPRIMULGIDAE										
Eurostopodus argus	Spotted Nightjar					X		X		
AEGOTHELIDAE										
Aegotheles cristatus	Australian Owlet-nightjar							X		
APOPDIDAE										
Apus pacificus	Fork-tailed Swift		IA	MI			X			
ACLEDINIDAE										
Todiramphus pyrrhopygius	Red-backed Kingfisher					X			X	X
Todiramphus sanctus	Sacred Kingfisher							X		
MEROPIDAE										
Merops ornatus	Rainbow Bee-eater					X	X	X	X	
FALCONIDAE										
Falco cenchroides cenchroides	Australian Kestrel					X			X	X
Falco berigora berigora	Brown Falcon					X		X	X	X
Falco cenchroides	Nankeen Kestrel					X		X		

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
Falco longipennis	Australian Hobby					X		X	X	
Falco peregrinus	Peregrine Falcon			OS					X	
Falco hypoleucos	Black Falcon							X		
CACATUIDAE										
Cacatua sanguinea	Little Corella							X		
Lophochroa leadbeateri	Major Mitchell's Cockatoo							X		
Eolophus roseicapilla	Galah							X	X	
Nymphicus hollandicus	Cockatiel					X		X		X
PSITTACIDAE										
Aprosmictus erythropterus	Red-winged Parrot							X		
Polytelis alexandrae	Princess Parrot		VU		P4		X			
Melopsittacus undulatus	Budgerigar					X		X	X	X
Pezoporus occidentalis	Night Parrot		EN	CR			X			
MALURIDAE										
Malurus lamberti assimilis	Variegated Fairy-wren					X		X	X	
Malurus leucopterus	White-winged Fairy-wren					X		X	X	X
Malurus melanocephalus	Red-backed Fairy-wren							X		
MELIPHAGIDAE										
Acanthagenys rufogularis	Spiny-cheeked Honeyeater							X	X	
Certhionyx variegatus	Pied Honeyeater					X		X	X	X
Purnella albifrons	White-fronted Honeyeater					X		X	X	
Epthianura tricolor	Crimson Chat					X		X	X	
Lichenostomus penicillatus	White-plumed Honeyeater							X	X	X
Ptilotula keartlandi	Grey-headed Honeyeater					X		X	X	X
Gavicalis virescens	Singing Honeyeater					X		X	X	X
Lichmera indistincta	Brown Honeyeater					X		X	X	
Manorina flavigula	Yellow-throated Miner					X		X	X	X

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
Melithreptus gularis	Black-chinned Honeyeater							X		
Sugomel niger	Black Honeyeater							X	X	
PARDALOTIDAE										
Pardalotus rubricatus	Red-browed Pardalote							X	X	
ACANTHIZIDAE										
Gerygone fusca	Western Gerygone							X		
Acanthiza apicalis	Inland Thornbill							X		
POMATOSTOMIDAE										
Pomatostomus temporalis	Grey-crowned Babbler							X		
PSOPHODIDAE										
Psophodes occidentalis	Chiming Wedgebill					X		X		
ARTAMIDAE										
Artamus cinereus melanops	Black-faced Woodswallow					X		X	X	
Artamus leucorynchus	White-breasted Woodswallow							X		
Artamus minor	Little Woodswallow								X	
Artamus superciliosus	White-browed Woodswallow					X		X		
Artamus personatus	Masked Woodswallow					X		X	X	X
CRACTICIDAE										
Cracticus torquatus	Grey Butcherbird							X		
Cracticus nigrogularis	Pied Butcherbird					X		X	X	
Cracticus tibicen	Australian Magpie							X		
CAMPEPHAGIDAE										
Coracina novaehollandiae	Black-faced Cuckoo-shrike					X		X		X
Lalage tricolor	White-winged Triller					X		X		X
OREOICIDAE										
Oreoica gutturalis	Crested Bellbird					X		X	X	

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
PACHYCEPHALIDAE										
Pachycephala rufiventris	Rufous Whistler					X		X	X	
Cincloramphus cruralis	Brown Songlark					X				
Cincloramphus mathewsi	Rufous Songlark					X				
Colluricincla harmonica	Grey Shrike-thrush							X		
RHIPIDURIDAE										
Rhipidura leucophrys leucophrys	Willie Wagtail					X		X	X	X
MONARCHIDAE										
Grallina cyanoleuca	Magpie-lark							X	X	
Myiagra inquieta	Restless Flycatcher							X		
CORVIDAE										
Corvus orru	Torresian Crow					X		X	X	
Corvus bennetti	Little Crow							X	X	
Corvus coronoides	Australian Raven							X		
Mirafra javanica	Horsfield's Bushlark					X		X		
HIRUNDINIDAE										
Hirundo rustica	Barn Swallow		IA	MI			X	X		
Cheramoeca leucosterna	White-backed Swallow								X	
Petrochelidon ariel	Fairy Martin							X	X	
Petrochelidon nigricans	Tree Martin							X		
LOCUSTELLIDAE										
Cincloramphus cruralis	Brown Songlark							X		
Cincloramphus mathewsi	Rufous Songlark							X		
Eremiornis carteri	Spinifex-bird							X	X	X
ZOSTEROPIDAE										
Zosterops luteus	Yellow White-eye							X		
DICAEIDAE										

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Birdlife	Previous	Current
Dicaeum hirundinaceum	Mistletoebird							X		
ESTRILIDAE										
Emblema pictum	Painted Finch					X			X	
Taeniopygia guttata	Zebra Finch					X		X	X	X
MOTACILLIDAE										
Anthus australis	Australian Pipit					X		X	X	
Motacilla cinerea	Grey Wagtail		IA	MI			X			
Motacilla flava	Yellow Wagtail		IA	MI			X			

Table G.4: Mammal species list – results of database searches, literature reviews and Astron survey results.

Scientific name	Common name	Introduced	Conservation codes			Nature Map / DBCA	EPBC Protected Matters Search	Previous surveys	Current survey
			EPBC Act	BC Act	DBCA				
DASYURIDAE									
Dasycercus blythi	Brush-tailed Mulgara, Ampurta			P4		X			
Dasykaluta rosamondae	Little Red Kaluta					X		X	
Dasyurus hallucatus	Northern Quoll		EN	EN		X	X		
Ningaui ridei	Wongai Ningaui							X	
Ningaui timealeyi	Pilbara Ningaui					X			
Planigale ingrami	Long-tailed Planigale					X		X	
Pseudantechinus roryi	Rory's Pseudantechinus					X			
Sminthopsis youngsoni	Lesser Hairy-footed Dunnart					X		X	
THYLACOMYIDAE									
Macrotis lagotis	Greater Bilby, Dalgyte		VU	VU		X	X	X	
NOTORYCTIDAE									
Notoryctes caurinus	Northern Marsupial Mole				P4			X	
MACROPODIDAE									
Macropus robustus	Common Wallaroo							X	
Osphranter rufus	Red Kangaroo, Marlu							X	
Petrogale lateralis	Black-footed Rock-wallaby		VU	VU		X			
MEGADERMATIDAE									
Macroderma gigas	Ghost Bat		VU	VU			X		
EMBALLONURIDAE									
Taphozous georgianus	Common Sheath-tailed Bat					X			
HIPPOSIDERIDAE									
Rhinonicteris aurantia	Pilbara Leaf-nosed Bat		VU	VU			X		
MURIDAE									

Scientific name	Common name	Introduced	Conservation codes			Nature Map	EPBC Protected	Previous	Current
Leggadina lakedownensis	Short-tailed Mouse				P4	X			
Notomys alexis	Spinifex Hopping-mouse					X		X	X
Pseudomys chapmani	Western Pebble-mound Mouse				P4	X			
Pseudomys desertor	Desert Mouse							X	
Pseudomys hermannsburgensis	Sandy Inland Mouse					X		X	
Mus musculus	House Mouse	*				X	X	X	
Rattus rattus	Black Rat	*					X		
Zyzomys argurus	Common Rock-rat					X			
MOLOSSIDAE									
Chaerephon jobensis	Northern Free-tailed Bat							X	
Ozimops lumsdenae	Northern Free-tailed Bat								X
VESPERTILIONIDAE									
Chalinolobus gouldii	Gould's Wattled Bat							X	X
Scotorepens greyii	Little Broad-nosed Bat							X	X
Vespadelus finlaysoni	Finlayson's Cave Bat								X
CANIDAE									
Canis lupus familiaris	Dog/Dingo	*					X	X	X
Vulpes vulpes	Red Fox	*					X		
FELIDAE									
Felis catus	Cat	*				X	X	X	X
EQUIDAE									
Equus asinus	Donkey	*					X	X	
Equus caballus	Horse	*					X		
SUIDAE									
Sus scrofa	Pig	*					X		
CAMELIDAE									
Camelus dromedarius	Dromedary, camel	*				X	X	X	X
TACHYGLOSSIDAE									
Tachyglossus aculeatus acanthion	Short-beaked Echidna								X

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Appendix H: Vegetation Type Mapping and Site Locations

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Vegetation Description

P1 Occasional *Erythrophleum chlorostachys* scattered low trees over *Acacia eriopoda* tall open shrubland over *Triodia schinzii* open hummock grassland

P2 *Erythrophleum chlorocarpus* and occasional *Owenia reticulata* and *Gardenia pyriformis subsp. keartlandii* scattered low trees over occasional *Grevillea wickhamii* subsp. *hispidula* scattered tall shrubs to tall open shrubland over *Gompholobium simplicifolium, Jacksonia aculeata* low open shrubland over *Triodia schinzii* very open to open hummock grassland

P3 *Acacia monticola* and *Grevillea refracta* subsp. *refracta* tall open shrubland over *Acacia hilliana* and *Acacia adoxa* var. *adoxa* low open shrubland over *Triodia schinzii* open hummock grassland

CP *Corymbia zygophylla* low open woodland over occasional *Acacia tumida* var. *kulparn* tall scattered shrubs to open shrubland over occasional *Acacia stellaticeps* scattered low shrubs over *Triodia schinzii* very open hummock grassland

DP *Acacia monticola, Acacia ancistrocarpa (Acacia eriopoda)* tall shrubland over *Triodia schinzii* open hummock grassland

Vegetation Condition

Excellent

Cleared

Conservation Significant Flora

Goodenia hartiana P2

Indigofera ammobia P3

Phyllanthus ?hebecarpus P3

Flora Sites

Survey Area

Relevé

Mapping Notes

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Legend: Vegetation Unit Mapping

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DR06
DRMN02
DR03
Survey Area
Conservation Significant Flora
Goodenia hartiana (P2)
Flora Sites
Mapping Note
Relevé
Vegetation Condition
Excellent
Cleared
Vegetation Type
DP
P1
P3

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Figure H.1: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 12-06-2019
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon

Scale: 1:11,000 at A3
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Survey Area
Conservation Significant Flora
Goodenia hartiana (P2)
Flora Sites
Relevé
Vegetation Condition
Excellent
Cleared
Vegetation Type
P1
P2

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Figure H.2: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:10,000 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 100 200 300 400 500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

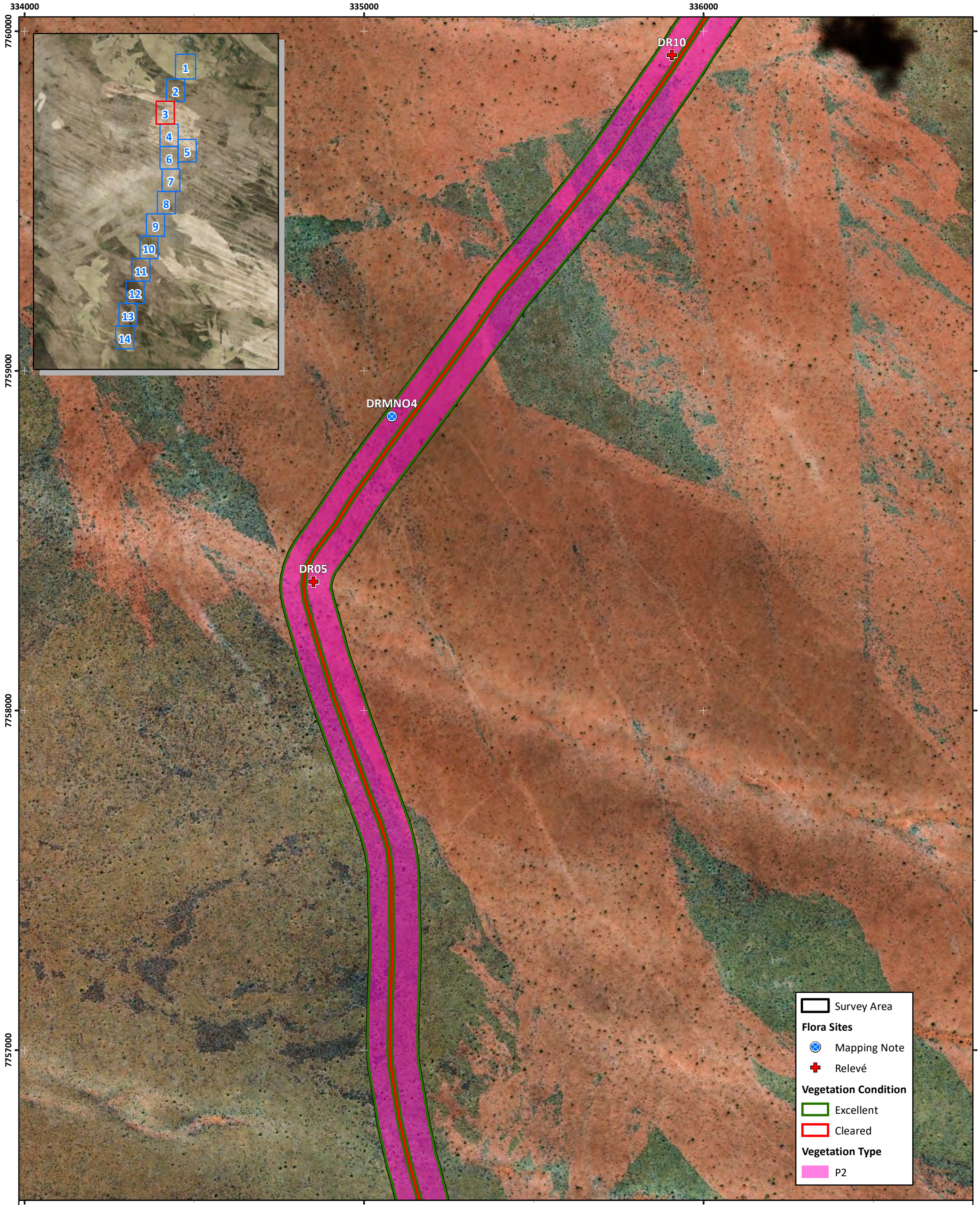

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Figure H.3: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:10,000 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 100 200 300 400 500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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Survey Area

Conservation Significant Flora

Goodenia hartiana (P2)

Flora Sites

Mapping Note

Relevé

Vegetation Condition

Excellent

Cleared

Vegetation Type

P1

P2

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Figure H.4: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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Survey Area
Conservation Significant Flora
Goodenia hartiana (P2)
Flora Sites
Relevé
Vegetation Condition
Excellent
Cleared
Vegetation Type
CP
P1
P2

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Figure H.5: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:10,000 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 100 200 300 400 500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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DR14
DR16
Survey Area
Conservation Significant Flora
Goodenia hartiana (P2)
Indigofera ammobia (P3)
Flora Sites
Relevé
Vegetation Condition
Excellent
Cleared
Vegetation Type
CP
P2

Rio Tinto Exploration
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Figure H.6: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 12-06-2019
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon

Scale: 1:10,000 at A3
Coordinate System: GDA 1994 MGA Zone 51
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Survey Area
Conservation Significant Flora
Goodenia hartiana (P2)
Flora Sites
Relevé
Vegetation Condition
Excellent
Cleared
Vegetation Type
CP
P2

Rio Tinto Exploration

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Figure H.7: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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Dr17

Survey Area

Conservation Significant Flora

Goodenia hartiana (P2)

Flora Sites

Relevé

Vegetation Condition

Excellent

Cleared

Vegetation Type

P2

Rio Tinto Exploration

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Figure H.8: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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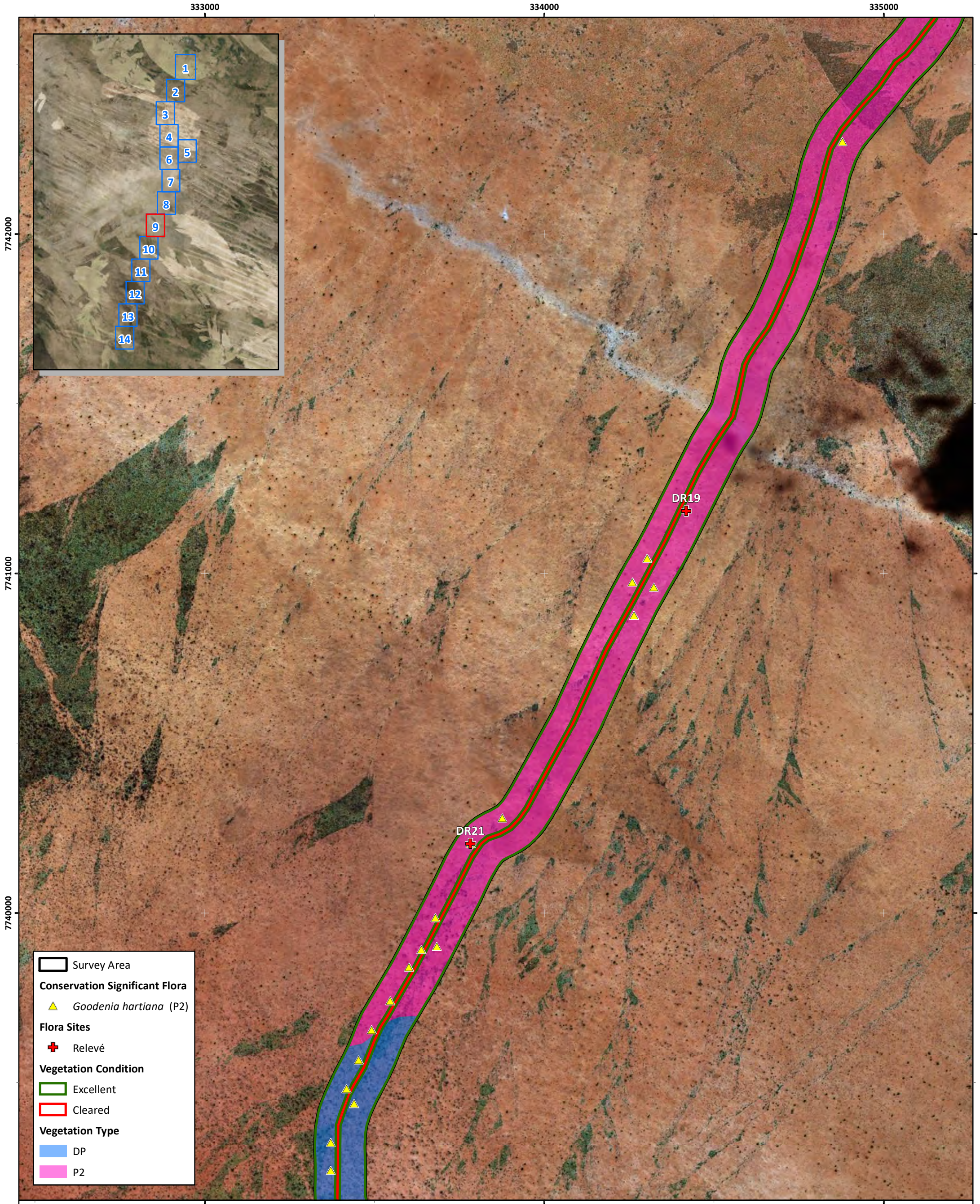
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	



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Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure H.9: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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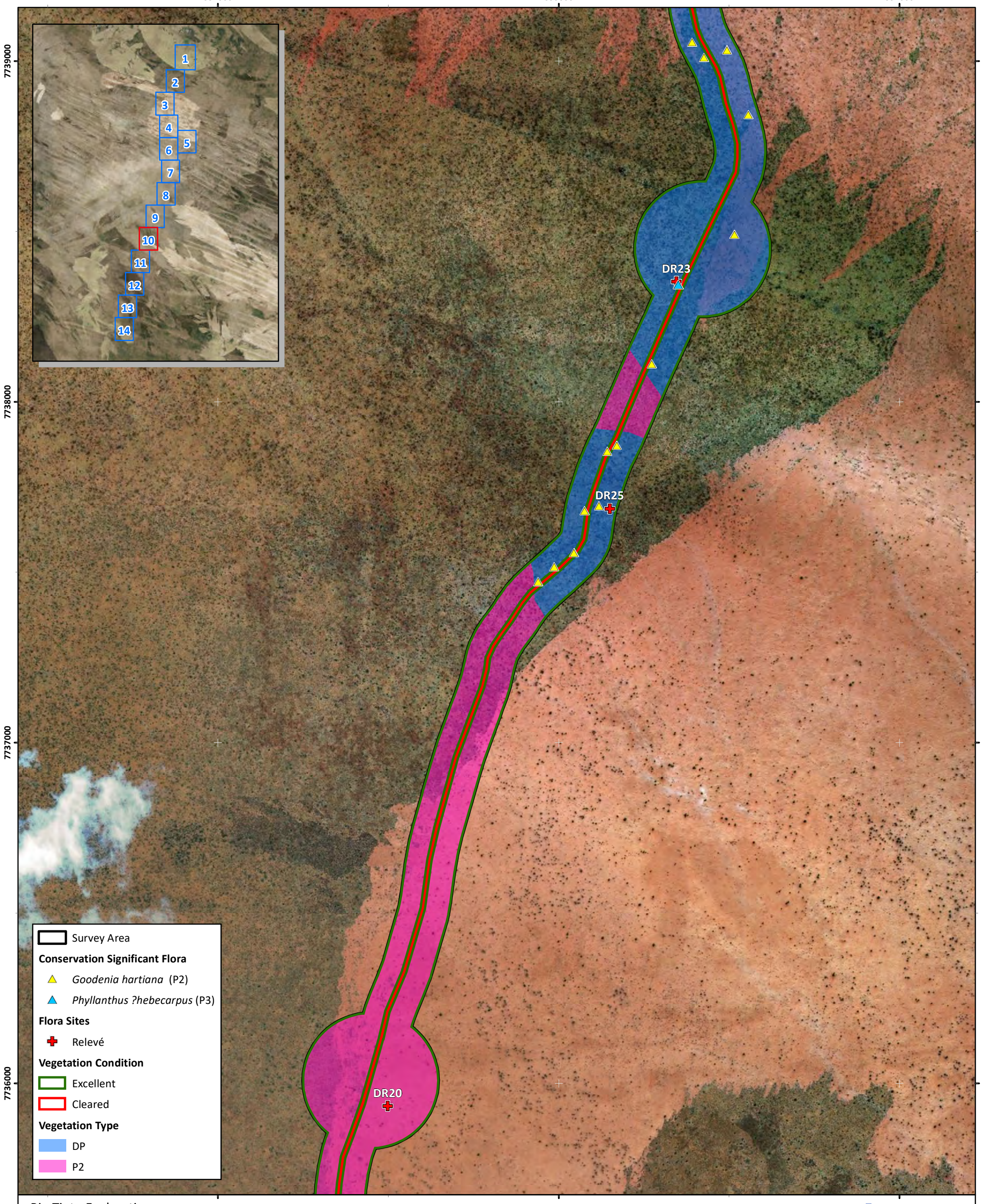
Author: L. Dadour	Date: 12-06-2019	Scale: 1:10,000 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 100 200 300 400 500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	



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Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure H.10: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 19-06-2019	Scale: 1:10,000 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 100 200 300 400 500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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Survey Area

Conservation Significant Flora

Goodenia hartiana (P2)

Flora Sites

Relevé

Vegetation Condition

Excellent

Cleared

Vegetation Type

CP

P2

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure H.11: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:10,000 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 100 200 300 400 500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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DR27

Survey Area

Conservation Significant Flora

Goodenia hartiana (P2)

Flora Sites

Relevé

Vegetation Condition

Excellent

Cleared

Vegetation Type

CP

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure H.12: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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DR24

DR29

DR26

Survey Area

Conservation Significant Flora

Goodenia hartiana (P2)

Flora Sites

Relevé

Vegetation Condition

Excellent

Cleared

Vegetation Type

CP

P2

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure H.13: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	

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Survey Area
Conservation Significant Flora
Goodenia hartiana (P2)
Flora Sites
Mapping Note
Relevé
Vegetation Condition
Excellent
Cleared
Vegetation Type
P2

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure H.14: Vegetation Type, Vegetation Condition and Conservation Significant Taxa and Site Locations

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:10,000 at A3 Coordinate System: GDA 1994 MGA Zone 51
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigH_VegTypeCon	Metres 0 100 200 300 400 500 N

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Appendix I: Relevé and Flora Sample Site Data

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Site: DR01

Location: Old Dump Road **Type**: Relevé

Date: 2019-05-01 **Described by**: LD/MM

Location co-ordinates: 51K 329724.2m E 7722332.31m N

Habitat: Plain

Soil: Orange brown

Vegetation: *Acacia tumida* var. *kulparn, Grevillea wickhamii* subsp. *aprica* tall open shrubland over *Acacia retivenea* subsp. *clandestina scattered* shrubs over *Triodia schinzii* open hummock grassland

Veg. Condition: Excellent

Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia melleodora	0.1	2.5
Acacia retivenea subsp. *clandestina*	1.0	1.2
Acacia stellaticeps	0.1	0.4
Acacia tumida var. *kulparn*	1.0	2.2
Androcalva sp.	0.1	0.2
Aristida holathera	0.1	0.6
Atriplex sp.	0.1	0.4
Bonamia linearis	0.1	0.2
Calytrix carinata	0.1	0.3
Cassytha filiformis	0.1	0.0
Cyanostegia cyanocalyx	0.1	0.3
Dampiera cinerea	0.1	0.3
Dodonaea coriacea	0.1	1.2
Eragrostis cumingii	0.1	0.5
Eriachne mucronata	0.1	0.5
Erythrophleum chlorostachys	0.1	2.6
Gardenia pyriformis subsp. *keartlandii*	0.1	3.2
Gompholobium simplicifolium	0.1	1.1

Goodenia hartiana	0.1	0.6
Grevillea eriostachya	0.1	1.1
Grevillea wickhamii subsp*. aprica*	1.0	2.7
Gyrostemon tepperi	0.1	0.5
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Jacksonia aculeata	0.1	0.6
Newcastelia cladotricha	0.1	0.2
Ptilotus arthrolasius	0.1	0.3
Ptilotus calostachyus	0.1	1.1
Scaevola parvifolia	0.1	0.2
Triodia schinzii	25.0	1.6

? denotes unconfirmed ID

Site: DR02
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 329502.63m E 7722096.87m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Erythrophleum chlorostachys* scattered low trees over *Gompholobium simplicifolium, Jacksonia aculeata* and *Acacia retinevea* subsp. *clandestina* low open shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia retivenea subsp. *clandestina*	1.0	0.9
Acacia stellaticeps	0.1	0.4
Acacia tumida var. *kulparn*	0.1	1.5
Androcalva sp.	0.1	0.4
Aristida holathera	0.1	0.4
Atriplex sp.	0.1	0.5
Bonamia linearis	0.1	0.1
Calytrix carinata	0.1	0.2
Cassytha filiformis	0.1	0.0
Dampiera candicans	0.1	0.6
Eragrostis cumingii	0.1	0.3
Eriachne lanata	0.1	0.7
Erythrophleum chlorostachys	1.0	2.6
Gardenia pyriformis subsp. *keartlandii*	0.1	2.5
Gompholobium simplicifolium	3.0	0.6
Goodenia hartiana	0.1	0.2
Grevillea eriostachya	0.1	1.6
Grevillea wickhamii subsp. *aprica*	0.1	2.3
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.6

Indigofera trita	0.1	0.6
Jacksonia aculeata	2.5	0.6
Newcastelia cladotricha	0.1	0.3
Owenia reticulata	0.1	3.8
Ptilotus arthrolasius	0.1	0.2
Scaevola parvifolia	0.1	0.2
Triodia schinzii	15.0	1.7

Site: DR03
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 338136.94m E 7764035.09m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Acacia monticola, Acacia ancistrocarpa* and *Acacia eriopoda* tall shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia ancistrocarpa	5.0	2.2
Acacia eriopoda	3.0	2.5
Acacia monticola	11.0	2.2
Bonamia linearis	0.1	0.1
Cassytha filiformis	0.1	0.0
Cleome uncifera subsp. *microphylla*	0.1	0.2
Eragrostis cumingii	0.1	0.3
Eriachne lanata	0.1	0.3
Gardenia pyriformis subsp. *keartlandii*	0.1	3.5
Goodenia hartiana	0.1	0.3
Grevillea eriostachya	0.1	0.5
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Jacksonia aculeata	0.1	0.9
Ptilotus astrolasius	0.1	0.3
Ptilotus incanus	0.1	0.3
Ptilotus polystachyus	0.1	0.4
Sorghum plumosum	0.5	1.3
Trigastrotheca molluginea	0.1	0.1
Triodia schinzii	5.0	1.5

Zornia chaetophora	0.1	0.2

Site: DR04
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 338952.56m E 7766934.55m N
Habitat: Plain
Soil: Light reddish brown
Rock Type: Ironstone
Vegetation: *Acacia monticola* and *Grevillea refracta* subsp. *refracta* tall open shrubland over *Acacia hilliana* and *Acacia adoxa* var. *adoxa* low open shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia adoxa var. *adoxa*	1.0	0.4
Acacia ancistrocarpa	0.1	2.1
Acacia hilliana	2.0	0.5
Acacia monticola	4.0	2.0
Bonamia linearis	0.1	0.1
Cassytha filiformis	0.1	-
Goodenia azurea subsp. *azurea*	0.1	0.3
Grevillea refracta subsp. *refracta*	1.0	3.0
Phyllanthus exilis	0.1	0.4
Trigastrotheca molluginea	0.1	0.1
Triodia schinzii	32.0	0.4

Site: DR05
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 334851.23m E 7758377.61m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Owenia reticulata, Erythrophleum chlorostachys* scattered low trees over *Atriplex* sp., *Dampiera cinerea* low shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia ancistrocarpa	0.5	2.5
Atriplex sp.	11.0	0.4
Calytrix carinata	0.1	0.3
Dampiera cinerea	3.0	0.6
Eriachne sulcata	0.1	0.7
Erythrophleum chlorostachys	1.0	2.7
Gompholobium simplicifolium	0.1	0.5
Grevillea wickhamii subsp. *hispidula*	0.5	2.5
Gyrostemon tepperi	0.1	0.5
Hakea lorea	0.1	1.2
Jacksonia aculeata	0.1	0.5
Owenia reticulata	1.0	5.5
Ptilotus arthrolasius	0.1	0.3
Seringia sp.	0.1	0.4
Triodia schinzii	12.0	1.6

Site: DR06
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 338750.46m E 7766409.45m N
Habitat: Plain
Soil: Light reddish brown
Rock Type: Ironstone
Vegetation: *Acacia ancistrocarpa* and *Acacia monticola* tall open shrubland over *Acacia arida* open shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia ancistrocarpa	1.0	2.1
Acacia arida	2.0	1.8
Acacia colei var. *colei*	0.1	1.6
Acacia monticola	2.0	2.2
Cassytha filiformis	0.1	-
Dodonaea coriacea	0.1	0.9
Grevillea refracta subsp. *refracta*	0.1	3.0
Ptilotus calostachyus	0.1	1.1
Sida ?arenicola	0.1	1.8
Sorghum plumosum	0.1	1.5
Streptoglossa macrocephala	0.1	0.3
Triodia schinzii	29.0	0.4

? denotes unconfirmed ID

Site: DR07
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 337460.27m E 7753470.94m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Erythrophleum chlorostachys* scattered low trees over *Acacia eriopoda* tall open shrubland over *Calytrix carinata* scattered low shrubs over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia eriopoda	9.0	3.5
Acacia sericophylla	0.1	2.6
Aristida sp.	0.1	0.2
Atriplex sp.	0.1	0.4
Calytrix carinata	1.5	1.2
Erythrophleum chlorostachys	1.5	4.0
Grevillea eriostachya	0.1	1.2
Jacksonia aculeata	0.1	0.4
Ptilotus astrolasius	0.1	0.3
Sida arenicola	0.1	2.2
Triodia schinzii	4.0	1.4

Site: DR08
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 336326.58m E 7760586.75m N
Habitat: Plain
Soil: Light reddish brown
Vegetation: *Acacia eriopoda* tall open shrubland over *Atriplex* sp. and *Jacksonia aculeata* scattered low shrubs over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia eriopoda	6.0	2.1
Acacia tumida var. *kulparn*	0.5	1.9
Atriplex sp.	0.5	0.3
Calytrix carinata	0.1	0.5
Cleome uncifera subsp. *microphylla*	0.1	0.2
Dodonaea hispidula var. *arida*	0.1	1.1
Erythrophleum chlorostachys	0.1	1.2
Gompholobium simplicifolium	0.1	0.5
Grevillea eriostachya	0.1	1.9
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Jacksonia aculeata	0.5	0.4
Ptilotus arthrolasius	0.1	0.3
Ptilotus astrolasius	0.1	0.3
Ptilotus polystachyus	0.1	0.8
Seringia ?elliptica	0.1	0.5
Sida sp.	0.1	0.2
Sida sp. Pindan (B.G. Thomson 3398)	0.1	0.6
Triodia schinzii	20.0	0.5

? denotes unconfirmed ID

Site: DR09
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 338890.68m E 7752430.6m N
Habitat: Plain
Soil: Orange brown
Rock Type:
Vegetation: *Corymbia zygophylla* low open woodland over *Acacia stellaticeps* low open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia stellaticeps	3.0	0.8
Acacia tumida var. *kulparn*	0.1	2.5
Aristida sp.	0.1	0.3
Cassytha filiformis	0.1	0.0
Corymbia zygophylla	3.0	7.0
Dampiera cinerea	0.5	0.6
Eriachne mucronata	0.1	0.4
Eriachne sulcata	0.1	0.4
Gompholobium simplicifolium	0.1	0.6
Grevillea eriostachya	0.1	1.6
Grevillea wickhamii subsp. *hispidula*	0.1	0.7
Gyrostemon tepperi	0.1	2.3
Jacksonia aculeata	0.1	0.7
Newcastelia cladotricha	0.1	0.6
Ptilotus arthrolasius	0.1	0.3
Triodia schinzii	3.0	1.6

Site: DR10
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 335906.86m E 7759928.07m N
Habitat: Plain
Soil: Orange brown
Rock Type:
Vegetation: *Erythrophleum chlorocarpus* and *Gardenia pyriformis* subsp. *keartlandii* low scattered trees over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia anaticeps	0.1	2.1
Acacia tumida var. *kulparn*	0.1	1.2
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	0.3
Cyanostegia cyanocalyx	0.1	0.3
Dampiera cinerea	1.0	0.5
Erythrophleum chlorostachys	0.5	2.1
Gardenia pyriformis subsp. *keartlandii*	0.5	3.0
Gompholobium simplicifolium	0.1	0.4
Grevillea eriostachya	0.1	1.2
Grevillea wickhamii subsp. *aprica*	0.1	2.1
Jacksonia aculeata	0.1	0.4
Triodia schinzii	19.0	0.3

? denotes unconfirmed ID

Site: DR11
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 337417.53m E 7752301.99m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Erythrophleum chlorostachys* scattered low trees over *Jacksonia aculeata, Gompholobium simplicifolium* and *Dampiera cinerea* low open shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia stellaticeps	0.1	0.8
Aristida sp.	0.1	0.3
Atriplex sp.	0.1	0.4
Dampiera cinerea	2.0	0.6
Eragrostis cumingii	0.1	0.4
Eriachne lanata	1.0	0.3
Erythrophleum chlorostachys	1.0	1.8
Gompholobium simplicifolium	3.0	0.9
Grevillea eriostachya	0.1	0.5
Jacksonia aculeata	3.0	0.8
Newcastelia cladotricha	0.1	1.2
Ptilotus arthrolasius	0.1	0.3
Triodia schinzii	15.0	1.3

Site: DR12
Location: Old Dump Road **Type**: Relevé
Date: 2019-05-01 **Described by**: LD/MM
Location co-ordinates: 51K 335911.6m E 7755122.18m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Owenia reticulata* (*Erythrophleum chlorostachys*) scattered low trees over *Acacia tumida* var. *kulparn* tall open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia colei var. *colei*	0.1	1.7
Acacia sericophylla	0.1	2.2
Acacia tumida var. kulparn	2.0	2.2
Aristida holathera	0.1	0.6
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	0.6
Cucumis variabilis	0.1	-
Cyanostegia cyanocalyx	0.1	0.3
Dampiera cinerea	0.1	0.3
Erythrophleum chlorostachys	0.5	2.5
Gompholobium simplicifolium	0.1	0.6
Grevillea eriostachya	0.1	2.5
Grevillea stenobotrya	0.1	1.6
Grevillea wickhamii	0.1	2.6
Jacksonia aculeata	0.5	0.5
Newcastelia cladotricha	0.1	0.7
Owenia reticulata	1.0	3.0
Ptilotus arthrolasius	0.1	0.2
Triodia schinzii	13.0	0.4

? denotes unconfirmed ID

Site: DR13
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 336463.95m E 7748877.48m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Grevillea wickhamii* tall open shrubland over *Gompholobium simplicifolium* scattered shrubs over *Jacksonia aculeata* scattered low shrubs over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia anaticeps	0.1	0.8
Aristida holathera var. *holathera*	0.1	0.4
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	0.5
Cucumis variabilis	0.1	0.0
Dampiera cinerea	0.1	0.3
Eragrostis cumingii	0.1	0.4
Eriachne mucronata	0.1	0.4
Erythrophleum chlorostachys	0.1	0.4
Gompholobium simplicifolium	1.5	1.2
Grevillea wickhamii subsp. *hispidula*	4.0	3.0
Gyrostemon tepperi	0.1	1.7
Jacksonia aculeata	1.0	0.8
Newcastelia cladotricha	0.1	0.4
Owenia reticulata	0.1	6.5
Ptilotus arthrolasius	0.1	0.2
Triodia schinzii	12.0	1.7

Site: DR14
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 336712.22m E 7751473.69m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Corymbia zygophylla* low open woodland over *Acacia tumida* var. *kulparn* tall open shrubland over *Acacia stellaticeps* scattered low shrubs over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia eriopoda	0.1	1.6
Acacia sericophylla	0.1	1.7
Acacia stellaticeps	1.0	0.5
Acacia tumida var. *kulparn*	3.0	2.1
Aristida holathera var. *holathera*	0.1	0.2
Bonamia linearis	0.1	0.2
Cleome uncifera subsp. *microphylla*	0.1	0.1
Corchorus sidoides	0.1	0.3
Corymbia zygophylla	3.0	4.0
Cucumis variabilis	0.1	-
Cyanostegia cyanocalyx	0.1	0.3
Dampiera cinerea	0.1	0.3
Dodonaea coriacea	0.1	0.4
Dodonaea hispidula var. *arida*	0.1	0.6
Eragrostis eriopoda	0.1	0.3
Erythrophleum chlorostachys	0.1	2.0
Gompholobium simplicifolium	0.1	0.6
Grevillea eriostachya	0.1	1.7
Grevillea wickhamii	0.1	1.8
Gyrostemon tepperi	0.1	0.5

Hibiscus leptocladus	0.1	0.3
Jacksonia aculeata	0.1	0.5
Newcastelia cladotricha	0.1	0.3
Polycarpaea longiflora	0.1	0.2
Ptilotus arthrolasius	0.1	0.3
Ptilotus polystachyus	0.1	0.5
Sida sp. Pindan (B.G. Thomson 3398)	0.1	0.4
Trigastrotheca molluginea	0.1	0.1
Triodia schinzii	2.0	0.4

? denotes unconfirmed ID

Site: DR15
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 336729.28m E 7747966.32m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Grevillea wickhamii* subsp. *hispidula* (*Acacia drepanocarpa* subsp. *drepanocarpa*) tall shrubland over *Gompholobium simplicifolium* low shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia drepanocarpa subsp. *drepanocarpa*	0.5	2.1
Aristida holathera var. *holathera*	0.1	0.4
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	0.3
Dampiera cinerea	0.1	0.5
Eragrostis cumingii	0.1	0.4
Erythrophleum chlorostachys	0.1	0.8
Gompholobium simplicifolium	12.0	0.9
Grevillea wickhamii subsp. *hispidula*	14.0	3.5
Gyrostemon tepperi	0.1	0.7
Jacksonia aculeata	0.1	0.5
Ptilotus arthrolasius	0.1	0.3
Triodia schinzii	4.0	1.5

Site: DR16
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 336326.8m E 7749576.09m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Corymbia zygophylla* open woodland over *Grevillea wickhamii* subsp. *aprica* scattered tall shrubs over *Gompholobium simplicifolium* scattered low shrubs over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia anaticeps	0.1	0.5
Acacia melleodora	0.1	1.3
Acacia platycarpa	0.1	0.6
Aristida holathera var. *holathera*	0.1	0.3
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	0.6
Corchorus sidoides	0.1	0.4
Corymbia zygophylla	4.0	4.2
Corynotheca micrantha	0.1	0.3
Cucumis variabilis	0.1	-
Cyanostegia cyanocalyx	0.1	0.3
Dampiera cinerea	0.1	0.3
Eragrostis eriopoda	0.1	0.2
Eriachne aristidea	0.1	0.3
Gompholobium simplicifolium	1.0	0.5
Grevillea eriostachya	0.1	2.2
Grevillea wickhamii subsp. *aprica*	0.5	2.5
Gyrostemon tepperi	0.1	0.8
Jacksonia aculeata	0.1	0.4
Newcastelia cladotricha	0.1	0.6

Ptilotus arthrolasius	0.1	0.2
Sida sp. Pindan (B.G. Thomson 3398)	0.1	0.5
Triodia schinzii	5.0	0.4

? denotes unconfirmed ID

Site: DR17
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 335602.2m E 7743862.91m N
Habitat: Plain
Soil: Orange brown
Rock Type:
Vegetation: *Grevillea wickhamii* subsp. *hispidula* scattered tall shrubs over *Gompholobium simplicifolium*, *Atriplex* sp. low open shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia colei var. *colei*	0.1	0.5
Aristida holathera var. *holathera*	0.1	0.3
Atriplex sp.	1.0	0.4
Cyanostegia cyanocalyx	0.1	0.3
Dampiera cinerea	0.1	0.4
Erythrophleum chlorostachys	0.1	0.8
Gompholobium simplicifolium	2.0	0.7
Grevillea eriostachya	0.1	1.7
Grevillea wickhamii subsp. *hispidula*	1.0	3.3
Gyrostemon tepperi	0.1	1.5
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Jacksonia aculeata	0.1	0.5
Triodia schinzii	8.0	1.6

? denotes unconfirmed ID

Site: DR18
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 336677.08m E 7746380.38m N
Habitat: Plain
Soil: Orange brown
Rock Type:
Vegetation: *Erythrophleum chlorocarpus* and *Acacia platycarpa* scattered shrubs over *Gompholobium simplicifolium* scattered low shrubs over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia anaticeps	0.1	2.5
Acacia melleodora	0.1	0.5
Acacia platycarpa	1.0	1.5
Aristida holathera var. *holathera*	0.1	0.4
Atriplex sp.	0.1	0.2
Calytrix carinata	0.1	0.6
Cassytha filiformis	0.1	-
Dampiera cinerea	0.1	0.4
Eriachne aristidea	0.1	0.2
Erythrophleum chlorostachys	0.5	1.2
Gompholobium simplicifolium	1.0	0.6
Goodenia hartiana	0.1	0.4
Grevillea eriostachya	0.1	2.0
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.2
Jacksonia aculeata	0.1	0.5
Newcastelia cladotricha	0.1	0.6
Ptilotus arthrolasius	0.1	0.4
Triodia schinzii	8.0	0.4

Site: DR19
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 334419.71m E 7741180.88m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Erythrophleum chlorostachys* scattered low trees over *Acacia colei* var. *colei* open shrubland over *Gompholobium simplicifolium* and *Jacksonia aculeata* low open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia colei var. *colei*	4.0	1.8
Atriplex sp.	0.1	0.4
Calytrix carinata	0.1	1.1
Dampiera cinerea	0.1	0.6
Erythrophleum chlorostachys	1.0	2.5
Gompholobium simplicifolium	4.0	0.6
Grevillea eriostachya	0.1	1.5
Grevillea wickhamii subsp. *hispidula*	0.1	2.7
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Indigofera boviperda subsp. *eremaea*	0.1	0.2
Jacksonia aculeata	1.0	0.5
Ptilotus arthrolasius	0.1	0.2
Seringia sp.	0.1	0.8
Triodia schinzii	8.0	1.7

Site: DR20
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 332499.78m E 7735938.64m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Owenia reticulata* scattered low trees over *Jacksonia aculeata* low open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia sericophylla	0.1	1.2
Acacia stellaticeps	0.1	0.3
Androcalva loxophylla	0.1	0.4
Aristida holathera var. *holathera*	0.1	0.3
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	1.1
Cassytha filiformis	0.1	-
Dampiera cinerea	0.1	0.3
Dodonaea hispidula var. arida	0.1	1.2
Erythrophleum chlorostachys	0.5	1.5
Gompholobium simplicifolium	0.1	0.4
Grevillea eriostachya	0.1	2.0
Halgania solanacea var. *solanacea*	0.1	0.4
Jacksonia aculeata	2.0	0.5
Owenia reticulata	1.0	4.0
Ptilotus arthrolasius	0.1	0.2
Scaevola parvifolia	0.1	0.2
Setaria surgens	0.1	0.3
Tinospora smilacina	0.1	-

Triodia schinzii	8.0	0.4

Site: DR21
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 333786.81m E 7740201.31m N
Habitat: Plain
Soil: Orange brown
Rock Type:
Vegetation: *Grevillea wickhamii* subsp. *hispidula* tall open shrubland over *Acacia colei* var. *colei* open shrubland over *Atriplex* sp. (*Dampiera cinerea*) low open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	**Cover (%)**	**Height (m)**
Acacia colei var. *colei*	2.0	1.7
Androcalva sp.	0.1	0.3
Atriplex sp.	2.0	0.5
Cassytha filiformis	0.1	0.0
Dampiera cinerea	0.5	0.4
Goodenia hartiana	0.1	0.3
Grevillea eriostachya	0.1	0.7
Grevillea wickhamii subsp. *hispidula*	3.0	2.7
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Jacksonia aculeata	0.1	0.5
Ptilotus arthrolasius	0.1	0.3
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0.1	0.2
Trigastrotheca molluginea	0.1	0.2
Triodia schinzii	7.0	1.7

Site: DR22
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 331396.43m E 7732240.24m N
Habitat: Plain
Soil: Orange brown
Rock Type:
Vegetation: *Corymbia zygophylla* low open woodland over *Jacksonia aculeata* low open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia melleodora	0.1	1.2
Acacia sericophylla	0.1	1.8
Acacia stellaticeps	0.1	0.5
Amyema sanguinea var. *sanguinea*	0.1	-
Aristida holathera var. *holathera*	0.1	0.3
Atriplex sp.	0.1	0.4
Calytrix carinata	0.1	0.4
Clerodendrum tomentosum	0.1	0.2
Corchorus sidoides	0.1	0.3
Dampiera cinerea	0.1	0.4
Eragrostis eriopoda	0.1	0.3
Eriachne aristidea	0.1	0.2
Gompholobium simplicifolium	0.1	0.4
Goodenia hartiana	0.1	0.3
Grevillea wickhamii subsp. *hispidula*	0.1	0.6
Halgania solanacea var. *solanacea*	0.1	0.2
Indigofera boviperda subsp. *eremaea*	0.1	0.4
Jacksonia aculeata	5.0	0.6
Newcastelia cladotricha	0.1	0.5

Ptilotus arthrolasius	0.1	0.2
Sida arenicola	7.0	4.0
Sida sp. Pindan (B.G. Thomson 3398)	0.1	0.3
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0.1	0.5
Tinospora smilacina	0.1	-
Trigastrotheca molluginea	0.1	0.1
Triodia schinzii	5.0	0.4

Site: DR23
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 333346.95m E 7738352.88m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Acacia ancistrocarpa, Acacia eriopoda* and *Acacia monticola* tall shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia ancistrocarpa	7.0	2.2
Acacia eriopoda	5.0	3.5
Acacia monticola	5.0	2.3
Acacia sericophylla	0.1	2.5
Aristida holathera var. *holathera*	0.1	0.3
Cassytha filiformis	0.1	0.0
Jacksonia aculeata	0.1	0.6
Phyllanthus ?hebecarpus	0.1	0.2
Triodia schinzii	12.0	1.6

Site: DR24
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 330241.33m E 7728182.16m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Gardenia pyriformis* subsp. *keartlandii* scattered low trees over *Acacia anaticeps* scattered tall shrubs over *Acacia tumida* var. *kulparn* scattered shrubs over *Jacksonia aculeata* scattered low shrubs over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia anaticeps	0.5	2.4
Acacia tumida var. *kulparn*	1.0	1.9
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	0.8
Dampiera cinerea	0.1	0.3
Dodonaea coriacea	0.1	0.8
Dodonaea hispidula var. *arida*	0.1	1.3
Gardenia pyriformis subsp. *keartlandii*	0.5	3.0
Gompholobium simplicifolium	0.1	0.6
Grevillea eriostachya	0.1	1.3
Grevillea wickhamii subsp. *hispidula*	0.1	1.8
Halgania solanacea var. *solanacea*	0.1	0.2
Jacksonia aculeata	1.0	0.6
Newcastelia cladotricha	0.1	0.2
Ptilotus arthrolasius	0.1	0.2
Scaevola parvifolia	0.1	0.2
Triodia schinzii	9.0	0.4

Site: DR25
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 333151.62m E 7737685.9m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Acacia monticola*, *Acacia ancistrocarpa* tall shrubland over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia ancistrocarpa	7.0	3.6
Acacia eriopoda	0.1	3.3
Acacia monticola	15.0	2.3
Acacia sericophylla	0.1	3.2
Owenia reticulata	0.1	4.5
Ptilotus astrolasius	0.1	0.3
Triodia schinzii	13.0	1.7

Site: DR26
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 329290.57m E 7725747.93m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Erythrophleum chlorocarpus* scattered tall shrubs over *Jacksonia aculeata* low open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia anaticeps	0.1	2.2
Acacia sericophylla	0.1	2.9
Acacia tumida var. *kulparn*	0.1	1.2
Atriplex sp.	0.1	0.2
Calytrix carinata	0.1	0.4
Erythrophleum chlorostachys	1.0	2.2
Gardenia pyriformis subsp. *keartlandii*	0.1	2.8
Gompholobium simplicifolium	0.1	0.5
Grevillea eriostachya	0.1	1.6
Grevillea wickhamii subsp. *hispidula*	0.1	2.1
Gyrostemon tepperi	0.1	0.6
Halgania solanacea var. *solanacea*	0.1	0.3
Jacksonia aculeata	4.0	0.5
Newcastelia cladotricha	0.1	0.3
Triodia schinzii	4.0	0.6

Site: DR27
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 330729.38m E 7730063.9m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Corymbia zygophylla* low open woodland over *Dampiera cinerea*, *Atriplex* sp. low open shrubland over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia sericophylla	0.1	4.2
Acacia tumida var. *kulparn*	0.1	1.7
Aristida holathera var. *holathera*	0.1	0.3
Atriplex sp.	1.0	0.4
Calytrix carinata	0.1	0.5
Cassytha filiformis	0.1	0.0
Clerodendrum tomentosum var. *tomentosum*	0.1	0.5
Corymbia zygophylla	4.0	4.5
Dampiera cinerea	3.0	0.5
Eragrostis cumingii	0.1	0.5
Eriachne aristidea	0.1	0.4
Gompholobium simplicifolium	0.1	0.6
Grevillea eriostachya	0.1	1.6
Grevillea wickhamii	0.1	0.4
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.5
Indigofera boviperda subsp. *eremaea*	0.1	0.2
Jacksonia aculeata	0.1	0.4
Ptilotus arthrolasius	0.1	0.3
Scaevola parvifolia	0.1	0.3
Seringia sp.	0.1	0.6

Tinospora smilacina	0.1	0.0
Triodia schinzii	6.0	1.7

Site: DR29
Location: Old Dump Road
Type: Relevé
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 329783.58m E 7727673.54m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Corymbia zygophylla* scattered low trees over *Acacia platycarpa* scattered shrubs over *Triodia schinzii* open hummock grassland
Veg. Condition: Excellent
Fire Age: 2-5 years

Species List:

Name	Cover (%)	Height (m)
Acacia anaticeps	0.1	1.7
Acacia platycarpa	1.0	1.3
Aristida holathera var. *holathera*	0.1	0.3
Atriplex sp.	0.1	0.3
Calytrix carinata	0.1	0.5
Cassytha filiformis	0.1	0.0
Corchorus sidoides	0.1	0.6
Dampiera cinerea	0.1	0.4
Dodonaea coriacea	0.1	0.5
Eragrostis cumingii	0.1	0.3
Eriachne mucronata	0.1	0.5
Eriachne sulcata	0.1	0.5
Gompholobium simplicifolium	0.1	0.4
Grevillea eriostachya	0.1	2.6
Grevillea wickhamii subsp. *aprica*	0.1	2.8
Gyrostemon tepperi	0.1	0.6
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Jacksonia aculeata	0.1	0.3
Newcastelia cladotricha	0.1	0.3
Ptilotus arthrolasius	0.1	0.2

Sida arenicola	1.0	4.2
Triodia schinzii	11.0	1.7

Site: DRMN01
Location: Old Dump Road
Type: Mapping Note
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 328459.28m E 7722961.04m N
Habitat: Plain
Soil: Orange brown
Rock Type:
Vegetation: *Acacia stellaticeps*, *Dampiera cinerea* and *Gompholobium simplicifolium* low open shrubland
Veg. Condition: Excellent
Fire Age: 0-2 years

Species List:

Name	Cover (%)	Height (m)
Acacia stellaticeps	1.0	0.3
Dampiera cinerea	1.0	0.3
Eriachne lanata	0.1	0.4
Gompholobium simplicifolium	1.0	0.4
Grevillea wickhamii subsp. *aprica*	0.1	1.2
Gyrostemon tepperi	0.1	0.6
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.3
Jacksonia aculeata	0.1	0.3
Owenia reticulata	0.1	3.5
Triodia schinzii	0.1	0.2

Site: DRMN02
Location: Old Dump Road **Type**: Mapping Note
Date: 2019-05-01 **Described by**: LD/MM
Location co-ordinates: 51K 338656.4m E 7765298.74m N
Habitat: Plain
Soil: Light reddish brown
Rock Type:
Vegetation: *Erythrophleum chlorostachys* and *Acacia eriopoda* scattered shrubs over *Triodia schinzii* very open hummock grassland
Veg. Condition: Excellent
Fire Age: 0-2 years

Species List:

Name	Cover (%)	Height (m)
Acacia eriopoda	0.5	1.1
Bonamia linearis	0.1	0.2
Cleome uncifera subsp. *microphylla*	0.1	0.2
Erythrophleum chlorostachys	0.5	1.6
Gardenia pyriformis subsp. *keartlandii*	0.1	3.0
Gompholobium simplicifolium	0.1	0.6
Goodenia armitiana	0.1	0.2
Ptilotus astrolasius	0.1	0.3
Scaevola parvifolia	0.1	0.2
Sorghum plumosum	0.1	1.1
Triodia schinzii	7.0	0.2

Site: DRMN03
Location: Old Dump Road
Type: Mapping Note
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 335164.46m E 7756461.1m N
Habitat: Plain
Soil: Orange brown
Vegetation: *Owenia reticulata* scattered low trees over *Erythrophleum chlorostachys* scattered shrubs
Veg. Condition: 0.8-Very Good
Fire Age: 0-2 years

Species List:

Name	Cover (%)	Height (m)
Acacia tumida var. *kulparn*	0.1	1.1
Corchorus sidoides	0.1	0.3
Dampiera cinerea	0.1	0.3
Erythrophleum chlorostachys	1.0	1.2
Gardenia pyriformis subsp. *keartlandii*	0.1	3.5
Gompholobium simplicifolium	0.1	0.3
Grevillea wickhamii	0.1	0.8
Hakea lorea	0.1	1.5
Heliotropium diversifolium	0.1	0.2
Jacksonia aculeata	0.1	0.3
Owenia reticulata	1.0	6.0
Trianthema pilosum	0.1	0.1
Triodia schinzii	0.1	0.3

Site: DRMN04
Location: Old Dump Road
Type: Mapping Note
Date: 2019-05-01
Described by: LD/MM
Location co-ordinates: 51K 335083.58m E 7758863.58m N
Habitat: Plain
Soil: Orange Brown
Vegetation: Owenia reticulata scattered low trees over Erythrophleum chlorostachys (Gardenia pyriformis subsp. keartlandii) scattered tall shrubs over Acacia tumida var. kulparn scattered shrubs over Triodia schinzii open hummock grassland
Veg. Condition: Excellent
Fire Age: 5-10 years

Species List:

Name	Cover (%)	Height (m)
Acacia stellaticeps	0.1	0.5
Acacia tumida var. *kulparn*	1.0	1.9
Androcalva loxophylla	0.1	0.4
Atriplex sp.	0.1	0.4
Dampiera cinerea	0.1	0.4
Dodonaea coriacea	0.1	1.0
Erythrophleum chlorostachys	1.0	2.5
Gardenia pyriformis subsp. *keartlandii*	0.5	3.0
Gompholobium simplicifolium	0.1	0.5
Jacksonia aculeata	0.5	0.5
Owenia reticulata	1.0	6.0
Ptilotus arthrolasius	0.1	0.2
Triodia schinzii	14.0	0.3

Appendix J: Vascular Flora Species List and Site by Species Matrix

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Table J.1: Vascular flora species list for the survey area.

Family Name	Species Name	Conservation Category	Weed
Aizoaceae	*Trianthema pilosum*		
Amaranthaceae	*Ptilotus arthrolasius*		
	Ptilotus astrolasius		
	Ptilotus calostachyus		
	Ptilotus incanus		
	Ptilotus polystachyus		
Asteraceae	*Streptoglossa macrocephala*		
Boraginaceae	*Halgania solanacea* var. Mt Doreen (G.M. Chippendale 4206)		
	Halgania solanacea var. solanacea		
	Heliotropium diversifolium		
Caryophyllaceae	*Polycarpaea longiflora*		
Chenopodiaceae	*Atriplex* sp.		
Cleomaceae	*Cleome uncifera* subsp. *microphylla*		
Convolvulaceae	*Bonamia erecta*		
	Bonamia linearis		
Cucurbitaceae	*Cucumis variabilis*		
Fabaceae	*Acacia adoxa* var. *adoxa*		
	Acacia anaticeps		
	Acacia ancistrocarpa		
	Acacia arida		
	Acacia colei var. *colei*		
	Acacia drepanocarpa subsp. *drepanocarpa*		
	Acacia eriopoda		
	Acacia hilliana		
	Acacia melleodora		
	Acacia monticola		
	Acacia platycarpa		
	Acacia retivenea subsp. *clandestina*		
	Acacia sericophylla		
	Acacia stellaticeps		
	Acacia tumida var. *kulparn*		
	Erythrophleum chlorostachys		
	Gompholobium simplicifolium		
	Indigofera ammobia	P3	
	Indigofera boviperda subsp. *eremaea*		
	Indigofera monophylla		
	Indigofera trita		
	Jacksonia aculeata		
	Senna venusta		
	Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)		
	Zornia chaetophora		
Goodeniaceae	*Dampiera candicans*		

Family Name	Species Name	Conservation Category	Weed
	Dampiera cinerea		
	Goodenia armitiana		
	Goodenia azurea subsp. *azurea*		
	Goodenia azurea subsp. *hesperia*		
	Goodenia hartiana	P2	
	Scaevola parvifolia		
Gyrostemonaceae	*Gyrostemon tepperi*		
Hemerocallidaceae	*Corynotheca micrantha*		
Lamiaceae	*Clerodendrum tomentosum*		
	Clerodendrum tomentosum var. *tomentosum*		
	Cyanostegia cyanocalyx		
	Newcastelia cladotricha		
	Cassytha filiformis		
Loranthaceae	*Amyema sanguinea* var. *sanguinea*		
Malvaceae	*Androcalva loxophylla*		
	Androcalva sp.		
	Corchorus sidoides		
	Hibiscus leptocladus		
	Seringia ?elliptica		
	Seringia sp.		
	Sida ?arenicola		
	Sida arenicola		
	Sida sp.		
	Sida sp. Pindan (B.G. Thomson 3398)		
Meliaceae	*Owenia reticulata*		
Menispermaceae	*Tinospora smilacina*		
Molluginaceae	*Trigastrotheca molluginea*		
Myrtaceae	*Calytrix carinata*		
	Corymbia zygophylla		
Phyllanthaceae	*Phyllanthus exilis*		
	Phyllanthus ?hebecarpus		
Poaceae	*Aristida holathera*		
	Aristida holathera var. *holathera*		
	Aristida sp.		
	Eragrostis cumingii		
	Eragrostis eriopoda		
	Eriachne aristidea		
	Eriachne lanata		
	Eriachne mucronata		
	Eriachne sulcata		
	Setaria surgens		
	Sorghum plumosum		
	Triodia schinzii		
	Yakirra australiensis var. *australiensis*		

Family Name	Species Name	Conservation Category	Weed
Proteaceae	*Grevillea eriostachya*		
	Grevillea refracta subsp. *refracta*		
	Grevillea stenobotrya		
	Grevillea wickhamii		
	Grevillea wickhamii subsp. *aprica*		
	Grevillea wickhamii subsp. *hispidula*		
	Hakea lorea		
	Persoonia falcata		
Rubiaceae	*Gardenia pyriformis* subsp. *keartlandii*		
Sapindaceae	*Dodonaea coriacea*		
	Dodonaea hispidula var. *arida*		

Table J.2: Site by species matrix for the survey area.

Species	DR01	DR02	DR03	DR04	DR05	DR06	DR07	DR08	DR09	DR10	DR11	DR12	DR13	DR14	DR15	DR16
Acacia adoxa var. *adoxa*	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Acacia anaticeps	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0.1
Acacia ancistrocarpa	0	0	5	0.1	0.5	1	0	0	0	0	0	0	0	0	0	0
Acacia arida	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Acacia colei var. *colei*	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0	0
Acacia drepanocarpa subsp. *drepanocarpa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0
Acacia eriopoda	0	0	3	0	0	0	9	6	0	0	0	0	0	0.1	0	0
Acacia hilliana	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Acacia melleodora	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Acacia monticola	0	0	11	4	0	2	0	0	0	0	0	0	0	0	0	0
Acacia platycarpa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Acacia retivenea subsp. *clandestina*	1.1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia sericophylla	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0.1	0	0
Acacia stellaticeps	0.1	0.1	0	0	0	0	0	0	3	0	0.1	0	0	1	0	0
Acacia tumida var. *kulparn*	1	0.1	0	0	0	0	0	0.5	0.1	0.1	0	2	0	3	0	0
Amyema sanguinea var. *sanguinea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Androcalva loxophylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Androcalva sp.	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida holathera	0.1	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Aristida holathera var. *holathera*	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0.1
Aristida sp.	0	0	0	0	0	0	0.1	0	0.1	0	0.1	0	0	0	0	0
Atriplex sp.	0.1	0.1	0	0	11	0	0.1	0.5	0	0.1	0.1	0.1	0.1	0	0.1	0.1
Bonamia linearis	0.1	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0
Calytrix carinata	0.1	0.1	0	0	0.1	0	1.5	0.1	0	0.1	0	0.1	0.1	0	0.1	0.1
Cassytha filiformis	0.1	0.1	0.1	0.1	0	0.1	0	0	0.1	0	0	0	0	0	0	0
Cleome uncifera subsp. microphylla	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0

Species	DR01	DR02	DR03	DR04	DR05	DR06	DR07	DR08	DR09	DR10	DR11	DR12	DR13	DR14	DR15	DR16
Clerodendrum tomentosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clerodendrum tomentosum var. *tomentosum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corchorus sidoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1
Corymbia zygophylla	0	0	0	0	0	0	0	0	3	0	0	0	0	3	0	4
Corynotheca micrantha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Cucumis variabilis	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0.1	0	0.1
Cyanostegia cyanocalyx	0.1	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0.1	0	0.1
Dampiera candicans	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dampiera cinerea	0.1	0	0	0	3	0	0	0	0.5	1	2	0.1	0.1	0.1	0.1	0.1
Dodonaea coriacea	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0
Dodonaea hispidula var. *arida*	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0
Eragrostis cumingii	0.1	0.1	0.1	0	0	0	0	0	0	0	0.1	0	0.1	0	0.1	0
Eragrostis eriopoda	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1
Eriachne aristidea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Eriachne lanata	0	0.1	0.1	0	0	0	0	0	0	0	1	0	0	0	0	0
Eriachne mucronata	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0
Eriachne sulcata	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0
Erythrophleum chlorostachys	0.1	1	0	0	1	0	1.5	0.1	0	0.5	1	0.5	0.1	0.1	0.1	0
Gardenia pyriformis subsp. *keartlandii*	0.1	0.1	0.1	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Gompholobium simplicifolium	0.1	3	0	0	0.1	0	0	0.1	0.1	0.1	3	0.1	1.5	0.1	12	1
Goodenia armitiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia azurea subsp. *azurea*	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Goodenia hartiana P2	0.1	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Grevillea eriostachya	0.1	0.1	0.1	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0	0.1	0	0.1
Grevillea refracta subsp. *refracta*	0	0	0	1	0	0.1	0	0	0	0	0	0	0	0	0	0
Grevillea stenobotrya	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Grevillea wickhamii	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0
Grevillea wickhamii subsp. *aprica*	1	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.5

Species	DR01	DR02	DR03	DR04	DR05	DR06	DR07	DR08	DR09	DR10	DR11	DR12	DR13	DR14	DR15	DR16
Grevillea wickhamii subsp. *hispidula*	0	0	0	0	0.5	0	0	0	0.1	0	0	0	4	0	14.1	0
Gyrostemon tepperi	0.1	0	0	0	0.1	0	0	0	0.1	0	0	0	0.1	0.1	0.1	0.1
Hakea lorea	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.2	0.2	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Halgania solanacea var. *solanacea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heliotropium diversifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hibiscus leptocladus	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Indigofera boviperda subsp. *eremaea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indigofera trita	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jacksonia aculeata	0.1	2.5	0.1	0	0.1	0	0.1	0.5	0.1	0.1	3	0.5	1	0.1	0.1	0.1
Newcastelia cladotricha	0.1	0.1	0	0	0	0	0	0	0.1	0	0.1	0.1	0.1	0.1	0	0.1
Owenia reticulata	0	0.1	0	0	1	0	0	0	0	0	0	1	0.1	0	0	0
Phyllanthus exilis	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Phyllanthus ?hebecarpus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polycarpaea longiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Ptilotus arthrolasius	0.1	0.1	0	0	0.1	0	0	0.1	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1
Ptilotus astrolasius	0	0	0.1	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0
Ptilotus calostachyus	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Ptilotus incanus	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ptilotus polystachyus	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0
Scaevola parvifolia	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seringia ?elliptica	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Seringia sp.	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Setaria surgens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sida ?arenicola	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Sida arenicola	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Sida sp.	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0

Species	DR01	DR02	DR03	DR04	DR05	DR06	DR07	DR08	DR09	DR10	DR11	DR12	DR13	DR14	DR15	DR16
Sida sp. Pindan (B.G. Thomson 3398)	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0.1
Sorghum plumosum	0	0	0.5	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Streptoglossa macrocephala	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tinospora smilacina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trianthema pilosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trigastrotheca molluginea	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0.1	0	0
Triodia schinzii	25	15	5	32	12	29	4	20	3	19	15	13	12	2	4	5
Zornia chaetophora	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	DR17	DR18	DR19	DR20	DR21	DR22	DR23	DR24	DR25	DR26	DR27	DR29	DRM N01	DRM N02	DRM N03	DRM NO4	Point Observations
Acacia adoxa var. *adoxa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia anaticeps	0	0.1	0	0	0	0	0	0.5	0	0.1	0	0.1	0	0	0	0	0
Acacia ancistrocarpa	0	0	0	0	0	0	7	0	7	0	0	0	0	0	0	0	0
Acacia arida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia colei var. *colei*	0.1	0	4	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Acacia drepanocarpa subsp. *drepanocarpa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Acacia eriopoda	0	0	0	0	0	0	5	0	0.1	0	0	0	0	0.5	0	0	0
Acacia hilliana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia melleodora	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Acacia monticola	0	0	0	0	0	0	5	0	15	0	0	0	0	0	0	0	0
Acacia platycarpa	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Acacia retivenea subsp. *clandestina*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acacia sericophylla	0	0	0	0.1	0	0.1	0.1	0	0.1	0.1	0.1	0	0	0	0	0	0.1
Acacia stellaticeps	0	0	0	0.1	0	0.1	0	0	0	0	0	0	1	0	0	0.1	0
Acacia tumida var. *kulparn*	0	0	0	0	0	0	0	1	0	0.1	0.1	0	0	0	0.2	1	0
Amyema sanguinea var. *sanguinea*	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.1
Androcalva loxophylla	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Androcalva sp.	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Aristida holathera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aristida holathera var. *holathera*	0.1	0.1	0	0.1	0	0.1	0.1	0	0	0	0.1	0.1	0	0	0	0	0.1
Aristida sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atriplex sp.	1	0.1	0.1	0.1	2.1	0.1	0	0.1	0	0.1	1	0.1	0	0	0	0.1	0
Bonamia linearis	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Calytrix carinata	0	0.1	0.1	0.1	0	0.1	0	0.1	0	0.1	0.1	0.1	0	0	0	0	0
Cassytha filiformis	0	0.1	0	0.1	0.1	0	0.1	0	0	0	0.1	0.1	0	0	0	0	0
Cleome uncifera subsp. microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Clerodendrum tomentosum	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0

Species	DR17	DR18	DR19	DR20	DR21	DR22	DR23	DR24	DR25	DR26	DR27	DR29	DRM N01	DRM N02	DRM N03	DRM NO4	Point Observations
Clerodendrum tomentosum var. *tomentosum*	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Corchorus sidoides	0	0	0	0	0	0.1	0	0	0	0	0	0.1	0	0	0.1	0	0
Corymbia zygophylla	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
Corynotheca micrantha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Cucumis variabilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyanostegia cyanocalyx	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dampiera candicans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Dampiera cinerea	0.1	0.1	0.1	0.1	0.5	0.1	0	0.1	0	0	3	0.1	1	0	0.1	0.1	0
Dodonaea coriacea	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0	0	0.1	0
Dodonaea hispidula var. *arida*	0	0	0	0.1	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1
Eragrostis cumingii	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0	0
Eragrostis eriopoda	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Eriachne aristidea	0	0.1	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0
Eriachne lanata	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1
Eriachne mucronata	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Eriachne sulcata	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Erythrophleum chlorostachys	0.1	0.5	1	0.5	0	0	0	0	0	1	0	0	0	0.5	1	1	0
Gardenia pyriformis subsp. *keartlandii*	0	0	0	0	0	0	0	0.5	0	0.1	0	0	0	0.1	0.1	0.5	0.1
Gompholobium simplicifolium	2	1	4	0.1	0	0.1	0	0.1	0	0.1	0.1	0.1	1	0.1	0.1	0.1	0.9
Goodenia armitiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Goodenia azurea subsp. *azurea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6
Goodenia hartiana P2	0	0.1	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	27.10007
Grevillea eriostachya	0.1	0.1	0.1	0.1	0.2	0	0	0.1	0	0.1	0.1	0.1	0	0	0	0	0
Grevillea refracta subsp. *refracta*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grevillea stenobotrya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grevillea wickhamii	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0.1	0	0
Grevillea wickhamii subsp. *aprica*	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0	0	0

Species	DR17	DR18	DR19	DR20	DR21	DR22	DR23	DR24	DR25	DR26	DR27	DR29	DRM N01	DRM N02	DRM N03	DRM NO4	Point Observations
Grevillea wickhamii subsp. *hispidula*	1	0	0.1	0	3	0.1	0	0.1	0	0.1	0	0	0	0	0	0	0
Gyrostemon tepperi	0.1	0	0	0	0	0	0	0	0	0.1	0	0.1	0.1	0	0	0	0
Hakea lorea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Halgania solanacea var. Mt Doreen (G.M. Chippendale 4206)	0.1	0.1	0.1	0	0.2	0	0	0	0	0	0.1	0.1	0.1	0	0	0	0.1
Halgania solanacea var. *solanacea*	0	0	0	0.1	0	0.1	0	0.1	0	0.1	0	0	0	0	0	0	0
Heliotropium diversifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Hibiscus leptocladus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indigofera boviperda subsp. *eremaea*	0	0	0.1	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0.1
Indigofera trita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jacksonia aculeata	0.1	0.1	1	2	0.1	5	0.1	1	0	4	0.1	0.1	0.1	0	0.1	0.5	0
Newcastelia cladotricha	0	0.1	0	0	0	0.1	0	0.1	0	0.1	0	0.1	0	0	0	0	0
Owenia reticulata	0	0	0	1	0	0	0	0	0.1	0	0	0	0.1	0	1	1	0
Phyllanthus exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllanthus ?hebecarpus	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Polycarpaea longiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ptilotus arthrolasius	0	0.1	0.1	0.1	0.1	0.1	0	0.1	0	0	0.1	0.1	0	0	0	0.1	0
Ptilotus astrolasius	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0
Ptilotus calostachyus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ptilotus incanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ptilotus polystachyus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Scaevola parvifolia	0	0	0	0.1	0	0	0	0.1	0	0	0.1	0	0	0.1	0	0	0
Seringia ?elliptica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seringia sp.	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Setaria surgens	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Sida ?arenicola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sida arenicola	0	0	0	0	0	7	0	0	0	0	0	1	0	0	0	0	0
Sida sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Species	DR17	DR18	DR19	DR20	DR21	DR22	DR23	DR24	DR25	DR26	DR27	DR29	DRM N01	DRM N02	DRM N03	DRM NO4	Point Observations
Sida sp. Pindan (B.G. Thomson 3398)	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Sorghum plumosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Streptoglossa macrocephala	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Tephrosia sp. D Kimberley Flora (R.D. Royce 1848)	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0
Tinospora smilacina	0	0	0	0.1	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0.1
Trianthema pilosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1
Trigastrotheca molluginea	0	0	0	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0
Triodia schinzii	8	8	8	8	7	5	12	9	13	4	6	11	0.1	7	0.1	14	0
Zornia chaetophora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Appendix K: Flora Species of Interest

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Table K.1: Conservation significant flora recorded in the survey area.

Species	Description[1]	Habitat[1]
Goodenia hartiana P2 	Erect to spreading, multistemmed perennial, herb or shrub (sub-shrub).	Sand. Sand dune swales, sandhills.
Indigofera ammobia P3 	Many-stemmed shrub, to 0.5 m high. Flowers green & purple, September.	Red sand. Sand dunes.

[1] – Florabase (Western Australian Herbarium 1998-2019).

Table K.2: Flora species of interest recorded during the survey (GDA94, Zone 51).

Species	Abundance	Easting (mE)	Northing (mN)
Indigofera ammobia P3	2	336827	7751789
Goodenia hartiana P2	50	329715	7722318
	12	329502	7722096
	15	338138	7764035
	27	336713	7746384
	13	333783	7740204
	15	331400	7732241
	25	328496	7722755
	70	328458	7722808
	80	328508	7722732
	55	328607	7722602
	50	328880	7722336
	65	329077	7722163
	5	329131	7722132
	80	337878	7763287
	70	337853	7763224
	80	337826	7763175
	100	337825	7763102
	140	337688	7762952
	40	337656	7762913
	65	337636	7762858
	100	337615	7762830
	50	337604	7762808
	45	337594	7762778
	100	337575	7762722
	25	337550	7762740
	90	337628	7762908
	40	337664	7762983
	30	337686	7763052
	200	337756	7763151
	90	337799	7763249
	80	337820	7763305
	180	337860	7763447
	80	337884	7763514
	30	337916	7763624
	120	337976	7763871
	25	336750	7761228
	43	336777	7761206
	25	336782	7761277
	22	336835	7761339
	260	336900	7761418
	135	336931	7761418
	165	336918	7761450
	105	336937	7761493
	165	336955	7761520
	280	336994	7761527
	55	336987	7761606

Species	Abundance	Easting (mE)	Northing (mN)
Goodenia hartiana P2 (contd.)	255	337084	7761768
	127	337112	7761756
	185	337187	7761964
	425	337212	7761961
	220	337233	7762048
	95	337305	7762188
	193	337315	7762181
	95	337324	7762251
	48	337346	7762292
	152	337384	7762380
	300	337411	7762379
	125	337398	7762403
	225	337511	7762660
	370	337559	7762719
	90	336751	7751690
	118	336759	7751619
	40	336793	7751588
	73	336870	7747354
	28	336885	7747280
	3	336865	7747041
	12	336798	7746792
	54	336765	7746748
	35	334323	7740959
	24	334265	7740876
	60	334259	7740974
	20	334304	7741045
	35	333517	7738491
	9	333274	7738111
	151	333171	7737873
	49	333143	7737854
	4	333119	7737694
	8	333076	7737680
	33	333045	7737558
	4	332988	7737516
	25	332940	7737472
	35	331185	7732058
	10	331398	7732246
	23	329493	7727079
	49	329835	7727751
	45	328889	7725201
	22	329781	7722187
	17	329858	7722289
	38	329854	7722417
	35	329814	7722354
	5	329583	7722117
	25	329508	7722010
	41	337098	7761746
	13	368732	7707292

Species	Abundance	Easting (mE)	Northing (mN)
Goodenia hartiana P2 (contd.)	1	368642	7707282
	42	368611	7707339
	64	368508	7707396
	18	368441	7707379
	97	368463	7707408
	35	368320	7707442
	90	368269	7707465
	2	368236	7707491
	65	368224	7707517
	26	368235	7707547
	36	368260	7707561
	110	368258	7707582
	26	368261	7707605
	35	368274	7707621
	30	368274	7707639
	26	368278	7707662
	100	368304	7707682
	45	368285	7707722
	55	368284	7707798
	35	368396	7708221
	60	368407	7708301
	70	368454	7708472
	28	329657	7722496
	30	329651	7722633
	40	329686	7722664
	15	329606	7722614
	22	329598	7722523
	30	329599	7722500
	28	329604	7722455
	30	329432	7722245
	24	329312	7722055
	15	329284	7722003
	12	329249	7722083
	30	329164	7722184
	11	328975	7722369
	11	328543	7723194
	80	334878	7742272
	60	333877	7740280
	20	333680	7739986
	20	333638	7739892
	64	333683	7739901
	25	333602	7739840
	28	333546	7739741
	34	333492	7739655
	40	333454	7739566
	20	333418	7739481
	20	333440	7739438
	12	333557	7738843

Species	Abundance	Easting (mE)	Northing (mN)
Goodenia hartiana P2 (contd.)	9	333494	7739033
	6	333494	7739032
	20	333371	7739323
	28	333372	7739241
	12	333392	7739055
	82	333427	7739010
	6	331579	7732558
	34	329951	7727778
	62	329891	7727734
	4	368640	7707357
	10	368617	7707365
	24	368572	7707404
	24	368561	7707413
	59	368518	7707427
	27	368512	7707441
	88	368460	7707447
	96	368444	7707425
	72	368426	7707463
	60	368394	7707485
	150	368350	7707504
	60	368328	7707534
	135	368297	7707529
	62	368332	7707587
	42	368355	7707612
	60	368353	7707641
	60	368360	7707680
	45	368494	7708163
	45	368531	7708347
	6	338437	7764732
	6	338358	7764565
	12	338208	7764207
	40	336954	7753993
	60	337863	7753221
	28	336501	7745667

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Appendix L: Fauna Habitat Mapping and Sample Site Locations

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335000
337500
340000
7767500
7765000
7762500
7760000
1
2
3
4
5
Ha2
AR1
HA3
Survey Area
Fauna Sites
Acoustic Recording
Habitat Assessment
Fauna Habitat
Sandy Plain
Cleared

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure L.1: Fauna Habitat Mapping

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:26,800 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 300 600 900 1,200 1,500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigL_FaunaHabitat	

335000

337500

340000

7757500

7755000

7752500

7750000

HA4

HA5

HA6

1

2

3

4

5

Survey Area

Fauna Sites

Habitat Assessment

Fauna Habitat

Sandy Plain

Cleared

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure L.2: Fauna Habitat Mapping

astron

delivering environmental intelligence™

Author: L. Dadour	Date: 12-06-2019	Scale: 1:26,800 at A3 Coordinate System: GDA 1994 MGA Zone 51
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigL_FaunaHabitat	0 300 600 900 1,200 1,500 Metres N

332500

335000

337500

7747500

7745000

7742500

1

2

3

4

5

Survey Area

Fauna Sites

Habitat Assessment

Fauna Habitat

Sandy Plain

Cleared

HA7

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure L.3: Fauna Habitat Mapping

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Author: L. Dadour	Date: 12-06-2019
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigL_FaunaHabitat

Scale: 1:26,800 at A3

Coordinate System: GDA 1994 MGA Zone 51

Metres

0 300 600 900 1,200 1,500

N

330000
332500
335000
7740000
7737500
7735000
7732500
1
2
3
4
5
HA8
AR2
Survey Area
Fauna Sites
Acoustic Recording
Habitat Assessment
Fauna Habitat
Sandy Plain
Cleared

Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure L.4: Fauna Habitat Mapping

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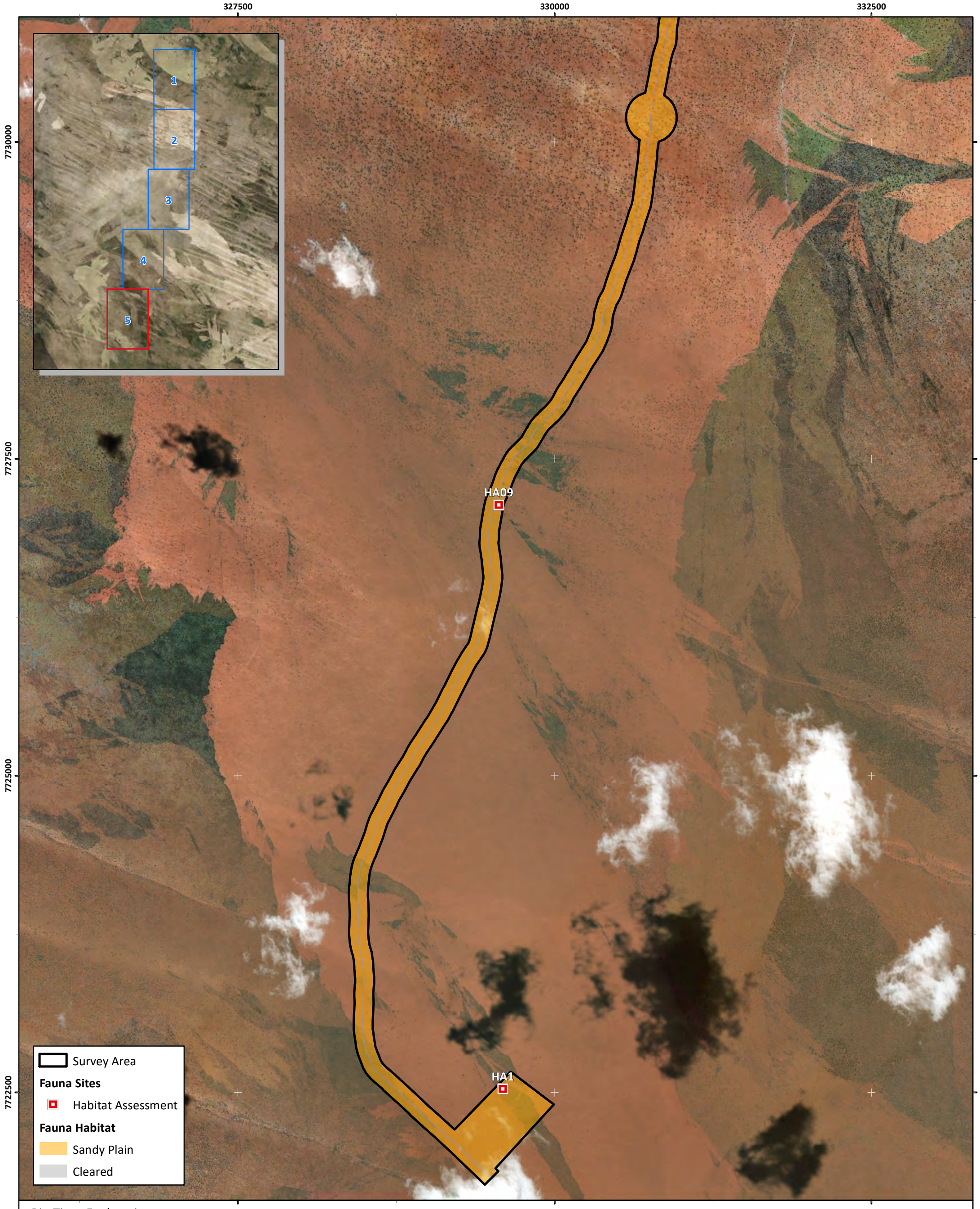
Author: L. Dadour	Date: 12-06-2019	Scale: 1:26,800 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 300 600 900 1,200 1,500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigL_FaunaHabitat	



Rio Tinto Exploration

Paterson Road Corridor – Reconnaissance Flora and Vegetation and Level 1 Fauna Survey, April/May 2019

Figure L.5: Fauna Habitat Mapping

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Author: L. Dadour	Date: 12-06-2019	Scale: 1:26,800 at A3 Coordinate System: GDA 1994 MGA Zone 51 Metres 0 300 600 900 1,200 1,500 N
Drawn: C. Dyde	Figure Ref: 21270-19-ENVDR_1RevA_190606_FigL_FaunaHabitat	

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Appendix M: Fauna Habitat Assessment Site Data

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Table M.1: Habitat assessment site data and photographs.

Site	Easting	Northing	Landform/ habitat type	Soil type	Habitat description	Vegetation type	Habitat condition	Disturbances	Photograph
HA1	955210	7717277	Sandy Plain	Orange brown sandy loam	Low lying plain	*Acacia tumida* var. *kulparn*, *Grevillea wickhamii* subsp. *aprica* tall open shrubland over *Acacia retivenea* subsp. *clandestina* scattered shrubs over *Triodia schinzii* open hummock grassland	High Quality	Nil	
HA2	965977	7760851	Sandy Plain	Orange brown sandy loam	Low lying plain	*Acacia monticola*, *Acacia ancistrocarpa* (*Acacia eriopoda*) tall shrubland over *Triodia schinzii* open hummock grassland	High Quality	Nil	

Site	Easting	Northing	Landform/ habitat type	Soil type	Habitat description	Vegetation type	Habitat condition	Disturbances	Photograph
HA3	962910	7754525	Sandy Plain	Orange brown sandy loam	Low lying plain	*Erythrophleum chlorocarpus* and *Gardenia pyriformis* subsp. *keartlandii* low scattered trees over *Triodia schinzii* very open hummock grassland	High Quality	Nil	
HA4	961958	7751389	Sandy Plain	Orange brown sandy loam	Low lying plain	*Erythrophleum chlorocarpus* and occasional *Owenia reticulata* over *Triodia schinzii* very open to open hummock grassland	High Quality	Nil	
HA5	965705	7746862	Sandy Plain	Orange brown sandy loam	Low lying plain	*Owenia reticulata* and *Corymbia zygophylla* low open woodland over *Triodia schinzii* very open hummock grassland	High Quality	Nil	

Site	Easting	Northing	Landform/ habitat type	Soil type	Habitat description	Vegetation type	Habitat condition	Disturbances	Photograph
HA6	963481	7745743	Sandy Plain	Orange brown sandy loam	Low lying plain	Corymbia zygophylla low open woodland over occasional *Acacia tumida* var. *kulparn* tall scattered shrubs to open shrubland over occasional *Acacia stellaticeps* scattered low shrubs over *Triodia schinzii* very open hummock grassland	High Quality	Nil	
HA7	960303	7735097	Sandy Plain	Orange brown sandy loam	Low lying plain	*Grevillea wickhamii* subsp. *hispidula* over *Triodia schinzii* very open hummock grassland	High Quality	Nil	
HA8	958419	7729907	Sandy Plain	Orange brown sandy loam	Low lying plain	*Owenia reticulata* scattered low trees over *Jacksonia aculeata* scattered low shrubs over *Triodia schinzii* very open hummock grassland	High Quality	Nil	

Site	Easting	Northing	Landform/ habitat type	Soil type	Habitat description	Vegetation type	Habitat condition	Disturbances	Photograph
HA9	955348	7721893	Sandy Plain	Orange brown sandy loam	Low lying plain	*Owenia reticulata* scattered low trees over *Grevillea wickhamii* subsp. *hispidula*, *Erythrophleum chlorocarpus* scattered tall shrubs over *Triodia schinzii* open hummock grassland	High Quality	Nil	
AR1	963277	7755070	Sandy Plain	Orange brown sandy loam	Low lying plain	*Acacia eriopoda* tall open shrubland over *Atriplex* sp. and *Jacksonia aculeata* scattered low shrubs over *Triodia schinzii* open hummock grassland	High Quality	Nil	
AR2	957297	7726953	Sandy Plain	Orange brown sandy loam	Low lying plain	*Corymbia zygophylla* low open woodland over occasional *Acacia tumida* var. *kulparn* tall scattered shrubs to open shrubland over occasional *Acacia stellaticeps* scattered low shrubs over *Triodia schinzii* very open hummock grassland	High Quality	Nil	

Table N.2: Fauna sampling locations.

Site name	Sampling type	Zone	Easting	Northing	Habitat
HA1	Habitat Assessment	51K	955210	7717277	Sand Plain
HA2	Habitat Assessment	51K	965977	7760851	Sand Plain
HA3	Habitat Assessment	51K	962910	7754525	Sand Plain
HA4	Habitat Assessment	51K	961958	7751389	Sand Plain
HA5	Habitat Assessment	51K	965705	7746862	Sand Plain
HA6	Habitat Assessment	51K	963481	7745743	Sand Plain
HA7	Habitat Assessment	51K	960303	7735097	Sand Plain
HA8	Habitat Assessment	51K	958419	7729907	Sand Plain
HA9	Habitat Assessment	51K	955348	7721893	Sand Plain
AR1	Acoustic Recording Unit	51K	963277	7755070	Sand Plain
AR2	Acoustic Recording Unit	51K	957297	7726953	Sand Plain

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