

**Reconnaissance Flora/ Vegetation
& Fauna Survey Jundee TSF
alternative locations**

**Prepared For
Northern Star Resources Limited**



**April 2020
Version 1**

**Prepared by:
Botanica Consulting Pty Ltd
PO Box 2027
Boulder WA 6432
90930024**

Disclaimer

This document and its contents are to be treated as confidential and are published in accordance with and subject to an agreement between Botanica Consulting (BC) and the client for whom it has been prepared and is restricted to those issues that have been raised by the client in its engagement of BC. Neither this document nor its contents may be referred to or quoted in any manner (report or other document) nor reproduced in part or whole by electronic, mechanical or chemical means, including photocopying, recording or any information storage system, without the express written approval of the client and/or BC.

This document and its contents have been prepared utilising the standard of care and skill ordinarily exercised by Environmental Scientists in the preparation of such documents. All material presented in this document is published in good faith and is believed to be accurate at the time of writing. Any person or organisation who relies on or uses the document and its contents for purposes or reasons other than those agreed by BC and the client without primarily obtaining the prior written consent of BC, does so entirely at their own risk. BC denies all liability in tort, contract or otherwise for any loss, damage or injury of any kind whatsoever (whether in negligence or otherwise) that may be endured as a consequence of relying on this document and its contents for any purpose other than that agreed with the client.

Quality Assurance

An internal quality review process has been implemented to each project task undertaken by BC. Each document and its contents are carefully reviewed by core members of the Consultancy team and signed off at Director Level prior to issue to the client. Draft documents are submitted to the client for comment and acceptance prior to final production.

Document Job Number: 2020/31

Prepared by: Lauren Pick
Senior Environmental Consultant
Botanica Consulting

Reviewed by: Andrea Williams
Director
Botanica Consulting

Approved by: Jim Williams
Director
Botanica Consulting

Contents	Page No.
1 Introduction	1
1.1 Project Description	1
1.2 Objectives	1
2 Regional Biophysical Environment	3
2.1 Regional Environment	3
2.2 Soils and Landscape Systems	5
2.3 Remnant Vegetation	7
2.4 Climate	9
2.5 Hydrology	9
2.6 Land Use	11
3 Survey Methodology	11
3.1 Desktop Assessment	11
3.2 Field Assessment	13
3.2.1 Flora Assessment	13
3.2.2 Fauna Assessment	13
3.2.3 Personnel involved	14
3.2.4 Scientific licences	14
3.3 Survey limitations and constraints	14
4 Results	16
4.1 Desktop Assessment	16
4.1.1 Flora and Vegetation	16
4.1.2 Fauna	18
4.2 Field Assessment	22
4.2.1 Vegetation Types	22
4.2.2 Vegetation Condition	29
4.2.3 Fauna Habitat	30
4.2.4 Introduced Species	34
4.2.5 Significant Flora	35
4.2.6 Significant Vegetation	35
4.2.7 Significant Fauna	36
4.3 Matters of National Environmental Significance	36
4.3.1 <i>Environment Protection and Biodiversity Conservation Act 1999</i>	36
4.4 Matters of State Environmental Significance	37
4.4.1 <i>Environmental Protection Act WA 1986</i>	37
4.4.2 <i>Biodiversity Conservation Act 2016</i>	37
4.4.3 Conservation Reserves	38
4.5 Native Vegetation Clearing Principles	38
5 Bibliography	40

Appendices

Appendix 1: Conservation Ratings BC Act and EPBC Act	44
Appendix 2: Regional map of the survey area in relation to conservation areas.....	48
Appendix 3: List of species identified within each vegetation type	49
Appendix 4: Vegetation Condition Rating	51
Appendix 5: Potential Fauna Species List	52

Tables

Table 2-1: Soil Landscape Systems within the survey area	5
Table 2-2: Pre-European Vegetation Associations within the survey area.....	7
Table 3-1: Scientific Licences of Botanica Staff coordinating the flora survey	14

Table 3-2: Limitations and constraints associated with the survey	15
Table 4-1: Likelihood of occurrence for Threatened and Priority Flora within the survey area	17
Table 4-2: Likelihood of Occurrence – Fauna Species of Conservation Significance	20
Table 4-3: Summary of vegetation types within the survey area	22
Table 4-4: Vegetation assemblage for Low woodland of <i>Acacia incurvaneura</i> over low shrubland of <i>Eremophila forrestii</i> / <i>E. margarethae</i> and low tussock grassland of <i>Eragrostis eriopoda</i> on clay-loam plain	24
Table 4-5: Vegetation assemblage for Low open woodland of <i>Acacia incurvaneura</i> / <i>Hakea lorea</i> over mid open shrubland of <i>Eremophila fraseri</i> and low shrubland of <i>Eremophila margarethae</i> on quartz-rocky plain	25
Table 4-6: Vegetation assemblage for Low woodland of <i>Acacia incurvaneura</i> over mid open shrubland of <i>Psyrdrax suaveolens</i> and low open tussock grassland of <i>Eragrostis eriopoda</i> on quartz-rocky plain	26
Table 4-7: Vegetation assemblage for Low woodland of <i>Acacia ayersiana</i> / <i>A. incurvaneura</i> over mid open shrubland of <i>Eremophila fraseri</i> / <i>E. latrobei</i> and low tussock grassland of <i>Eriachne mucronata</i> on rocky slope.....	27
Table 4-8: Vegetation assemblage for Low woodland of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over mid open shrubland of <i>Eremophila forrestii</i> and low hummock grassland of <i>Triodia basedowii</i> on sand-loam plain.....	28
Table 4-9: Vegetation Condition within the survey area	29
Table 4-10: Main Terrestrial Fauna Habitats within the survey area	31
Table 4-11: Summary of Potential Vertebrate Fauna Species	34
Table 4-12: Assessment of development within the survey area against native vegetation clearing principles	38

Figures

Figure 1-1: Regional map of the survey area.....	2
Figure 2-1: Map of IBRA Subregions in relation to the survey area	4
Figure 2-2: Map of Soil Landscape Systems within the survey area	6
Figure 2-3: Pre-European Vegetation Associations within the survey area	8
Figure 2-4: Monthly rainfall and mean monthly rainfall (January 2018 to February 2020) for the Wiluna Aero weather station #13044 (BoM, 2020)	9
Figure 2-5: Surface Hydrology of the survey area	10
Figure 4-1: Vegetation types within the survey area.....	23
Figure 4-2: Vegetation Condition within the survey area	30
Figure 4-3: Main Terrestrial Fauna Habitats within the survey area.....	33

Plates

Plate 4-1: Low woodland of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over open mixed low scrub of <i>Acacia</i> / <i>Eremophila</i> / <i>Sida</i> spp. and low grass of <i>Eragrostis eriopoda</i> / <i>Eriachne</i> spp. in open depression.....	25
Plate 4-2: Low woodland of <i>Acacia incurvaneura</i> over mid open shrubland of <i>Senna artemisioides</i> subsp. <i>xsturtii</i> and low open shrubland of <i>Ptilotus obovatus</i> / <i>Maireana triptera</i> on quartz-rocky plain.....	26
Plate 4-3: Low open forest of <i>Acacia balsamea</i> / <i>A. incurvaneura</i> over low shrubland of <i>Ptilotus obovatus</i> and low tussock grassland of <i>Eragrostis eriopoda</i> on rocky hillslope	24
Plate 4-4: Open low woodland of <i>Acacia ayersiana</i> / <i>A. quadrimarginea</i> over scrub of <i>A. burkittii</i> / <i>Hakea kippistiana</i> over low scrub of <i>Senna</i> spp. and low scrub of <i>Ptilotus obovatus</i> on rocky hillslope.....	27
Plate 4-5: Low open forest of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over mid open shrubland of <i>Acacia craspedocarpa</i> and low tussock grassland of <i>Eragrostis eriopoda</i> / hummock grassland of <i>Triodia desertorum</i> on sand-loam plain.....	28

Glossary

Acronym	Description
ANCA	Australian Nature Conservation Agency.
BA	Birdlife Australia (Formerly RAOU, Birds Australia).
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i> , WA Government.
BC Act	<i>Biodiversity Conservation Act 2016</i> , WA Government.
Botanica	Botanica Consulting Pty Ltd.
BoM	Bureau of Meteorology.
CAMBA	China Australia Migratory Bird Agreement 1998.
DAFWA	Department of Agriculture and Food (now DPIRD), WA Government.
DAWE	Department of the Agriculture, Water and Environment (formerly known as DotEE), Australian Government.
DBCA	Department of Biodiversity, Conservation and Attractions (formerly DPaW), WA Government.
DEC	Department of Environment and Conservation (now DBCA), WA Government.
DER	Department of Environment Regulation (now DWER), WA Government.
DMIRS	Department of Mines, Industry Regulation and Safety (formerly DMP), WA Government
DMP	Department of Mines and Petroleum (now DMIRS), WA Government.
DotEE	Department of the Environment and Energy (now known as DAWE), Australian Government.
DoW	Department of Water (now DWER), WA Government.
DPaW	Department of Parks and Wildlife (now DBCA), WA Government.
DPIRD	Department of Primary Industries and Regional Development, WA Government
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DotEE.), Australian Government.
DWER	Department of Water and Environmental Regulation (formerly EPA, DER and DoW), WA Government
EP Act	Environmental Protection Act 1986, WA Government.
EP Regulations	Environmental Protection (Clearing of Native Vegetation) Regulations 2004, WA Government.
EPA	Environmental Protection Authority, WA Government.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> , Australian Government.
ESA	Environmentally Sensitive Area.
Ha	Hectare (10,000 square meters).
IBRA	Interim Biogeographic Regionalisation for Australia.
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union.
JAMBA	<i>Japan Australia Migratory Bird Agreement 1981</i> .
Km	Kilometer (1,000 meters).
MVG	Major Vegetation Groups.
NVIS	National Vegetation Information System.
OEPA	Office of the Environmental Protection Authority (now DWER), WA Government.
PEC	Priority Ecological Community.

Acronym	Description
Northern Star	Northern Star Resources Limited.
RAOU	Royal Australia Ornithologist Union.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement 2007.
SRE	Short Range Endemic.
SSC	Species Survival Commission, International.
Survey Area	Jundee TSF alternative locations.
TEC	Threatened Ecological Community.
WA	Western Australia.
WAHERB	Western Australian Herbarium.
WAM	Western Australian Museum, WA Government.
WC Act	<i>Wildlife Conservation Act 1950</i> , WA Government.

Executive Summary

Botanica Consulting (Botanica) was commissioned by Northern Star Resources Limited (Northern Star) to undertake a reconnaissance flora survey and fauna survey of the Jundee TSF alternative locations (referred to as the 'survey area'). The survey area is located within the Jundee Pastoral Lease, approximately 40km north-east of Wiluna, Western Australia. The survey was conducted from the 4th to 6th March 2020 covering a total area of 733 ha.

Five vegetation types were identified within the survey area. These vegetation types were located within four different landform types and comprised of two major vegetation groups, which were represented by a total of 14 Families, 21 Genera and 46 Taxa. The broad scale terrestrial fauna habitats within the survey area have been identified as comprising a mosaic of quartz-rocky plain/rocky slopes, clay-loam plains and sand-loam plains.

Results of the literature review identified 35 mammals (including 11 bat species), 109 birds, 90 reptiles and 11 frog species that have previously been recorded in the general area, some of which have the potential to occur, subject to the identified habitats being suitable.

No Threatened Flora, Threatened Fauna, Migratory Fauna or Threatened Ecological Communities (TEC) as listed under the Western Australian *Biodiversity Conservation (BC) Act 2016* or Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* were identified within the survey area. No Priority Ecological Communities (PEC) as listed by the Department of Biodiversity, Conservation and Attractions (DBCA) were identified within the survey area. No Priority Flora or Fauna taxa as listed by the DBCA were identified within the survey area.

A review of the EPBC Act threatened fauna list, DBCA's Threatened Fauna Database and Priority List, unpublished reports and scientific publications identified a number of specially protected, migratory or priority fauna species as having been previously recorded or as being potentially present in the general vicinity of the survey area. However, no fauna of conservation significance is likely to be significantly impacted on by the proposed development. This conclusion is primarily based on the lack of suitable habitats, the known local extinction of some species, the relatively small size of the impact footprint and the extensive habitat connectivity with adjoining areas. Impacts on fauna and fauna habitat are therefore anticipated to be localised, small/negligible and as a consequence manageable.

The survey area does not contain any world or national heritage places and does not occur within a Bush Forever site. There are no wetlands of international importance (Ramsar Wetlands), national importance (Australian Nature Conservation Agency (ANCA) Wetlands) or conservation category wetlands within the survey area.

The survey area does not contain any Environmentally Sensitive Areas (ESA) or Schedule 1 Areas listed under the *Environmental Protection (EP) Act 1986*; The survey is not located within DBCA managed land. The closest conservation reserve is the ex. Lorna Glen Unallocated Crown Land Reserve (LR3014/946), which is managed by DBCA and is located approximately 43km east of the survey area.

Based on the vegetation condition rating scale adapted from Keighery, 1994 and Trudgen, 1988 (ranging from 'pristine' to 'completely degraded'), vegetation ranged from 'good' to 'very good'. Two introduced species were recorded during the survey; *Cynodon dactylon* (Couch) and *Tribulus terrestris* (Caltrop). Neither species is listed as a Declared Pest under the *Biosecurity and Agriculture Management (BAM) Act 2007*.

1 **Introduction**

1.1 **Project Description**

Botanica Consulting (BC) was commissioned by Northern Star Resources Limited (Yandal) to undertake a reconnaissance flora and fauna survey of the Jundee TSF alternative locations (referred to as the 'survey area'). The survey area is located within the Jundee Pastoral Lease, approximately 40km north-east of Wiluna, Western Australia. (Figure 1-1). The survey was conducted from the 4th to 6th March 2020 covering a total area of 733 ha.

1.2 **Objectives**

The flora assessment was conducted in accordance with the requirements of a reconnaissance flora survey as defined in *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016a). The objectives of the assessment were to:

- gather background information on flora and vegetation in the target area (literature review, database and map-based searches);
- identify significant flora, vegetation/ecological communities and assess the potential sensitivity to impact;
- conduct a field survey to verify / ground truth the desktop assessment findings;
- undertake floristic community mapping to a scale appropriate for the bioregion and described according to the National Vegetation Information System (NVIS) structure and floristics;
- undertake vegetation condition mapping;
- assess the project area's plant species diversity, density, composition, structure and weed cover, using NVIS classification system for vegetation description;
- assess Matters of National Environmental Significance (MNES) and indicate whether potential impacts on MNES as protected under the EPBC Act are likely to require referral of the project to the Commonwealth DoEE; and
- determine the State legislative context of environmental aspects required for the assessment.

The fauna assessment was conducted in accordance with the requirements of a reconnaissance terrestrial fauna survey as defined in *Technical Guidance - Terrestrial Fauna Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016b). The objectives of the assessment were to:

- Gather background information on fauna in the survey area (literature review, database and map-based searches);
- Delineate and characterise the faunal assemblages and fauna habitats present in the survey area;
- Document and map locations of any Threatened or Priority listed fauna species located; and
- Assess the regional and local conservation status of fauna species and fauna habitats within the survey area.

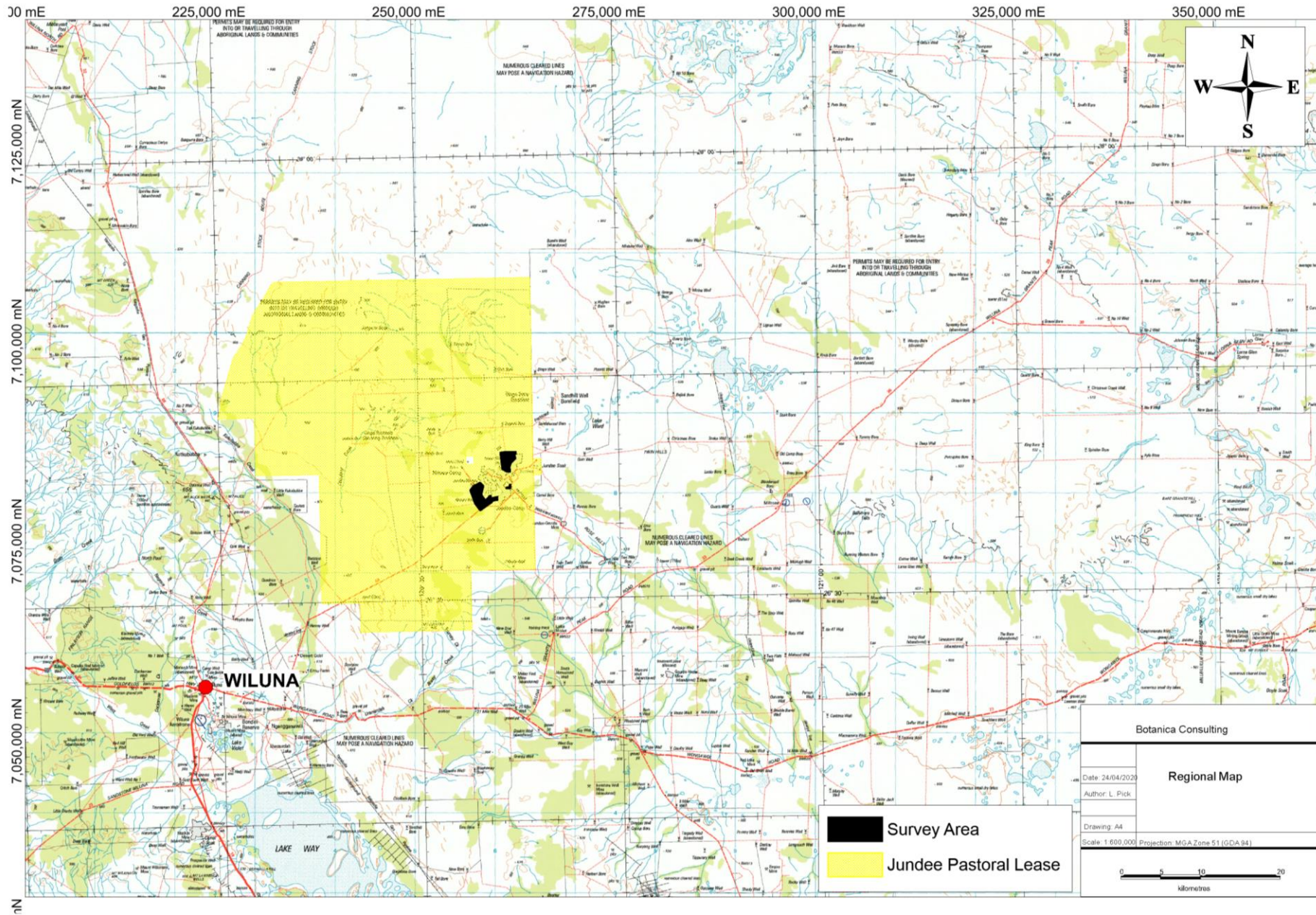


Figure 1-1: Regional map of the survey area

2 Regional Biophysical Environment

2.1 Regional Environment

The survey area lies within the Murchison Region of the Eremaean Province of WA in a region known as the Austin Botanical District. The Murchison Region is further divided into subregions, based on the Interim Biogeographic Regionalisation of Australia (IBRA), with the survey area located within the Eastern Murchison (MUR1) as shown in Figure 2-1.

The landscape of the Murchison bioregion comprises low hills, mesas of duricrust separated by flat colluvium and alluvial plains (Commonwealth Government, 2008). It is dominated by the Archaean (over 2500 million years ago) granite greenstone terrain of the Yilgarn Craton (Commonwealth Government, 2008). Alluvial soils and sands mantle the granitic and greenstone units of the Yilgarn Craton. These soils are shallow, sandy and infertile. Underlying the soils in low areas is a red-brown siliceous hard pan (Curry et al. 1994). The soils in the eastern half of the bioregion are typically red sands, calcareous red earth soil, duplex soil and clays. There are 41 vegetation associations (hummock grasslands, succulent steppe or low woodlands) that have at least 85 per cent of their total area in the bioregion. The bioregion is rich and diverse in both its flora and fauna but most species are wide ranging and usually occur in adjoining regions (McKenzie, May and McKenna, 2002).

The Eastern Murchison comprises the northern parts of the craton's Southern Cross and Eastern Goldfields Terrains and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt Lake systems are associated with the occluded paleodrainage system. Broad plains of red-brown soils and breakaways complexes as well as red sandplains are widespread. Vegetation is dominated by Mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and Samphire shrublands (McKenzie *et. al.*, 2002). The Eastern Murchison subregion comprises diverse mulga woodlands, which occur on low greenstone belts. The sand plains have red loamy earths and red deep sands are found on the sandy banks.

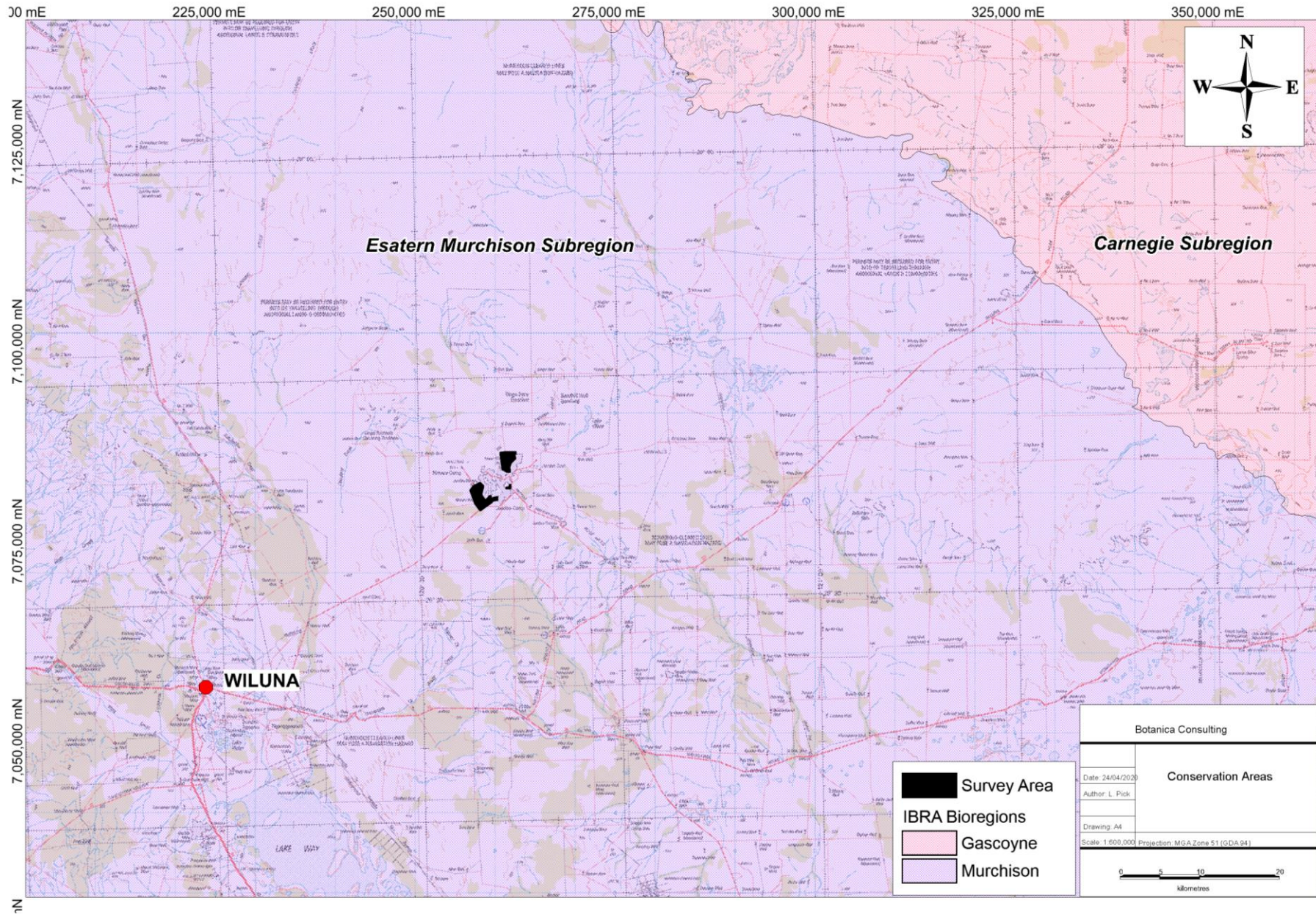


Figure 2-1: Map of IBRA Subregions in relation to the survey area

2.2 Soils and Landscape Systems

The survey area lies within the Murchison Province, which consists of Hardpan wash plains and sandplains (with some stony plains, hills, mesas and salt lakes) on the granitic rocks and greenstone of the Yilgarn Craton. The Murchison Province is located in the inland Mid-west and northern Goldfields between three Springs, the Gascoyne River, Wiluna, Cosmo Newberry and Menzies. Soil types are dominated by red loamy earths, red sandy earths, red shallow loams, red deep sands and red-brown hardpan shallow loams with some red shallow sands and red shallow sandy duplexes present. Vegetation communities are dominated by Mulga shrublands with spinifex grasslands and some bowgada shrublands, Eucalypt woodlands and halophytic shrublands (Tille, 2006).

The Murchison Province is further divided into seven soil-landscape zones, with the survey area located within the Salinaland Plains Zone (279). The Salinaland Plains Zone comprises of sandplains (with hardpan wash plains and some mesas, stony plains and salt lakes) on granitic rocks (and some greenstone) of the Yilgarn Craton. Soils include red sandy earths, red deep sands, red shallow loams and red loamy earths with some red-brown hardpan shallow loams, salt lake soils and red shallow sandy duplexes. Vegetation is dominated by mulga shrublands with spinifex grasslands (and some halophytic shrublands and eucalypt woodlands). This zone is located in the northern Goldfields from Lakes Barlee and Ballard to Wiluna and Laverton (Tille, 2006). The Salinaland Plains Zone is further divided into soil landscape systems, with the survey area located within two soil landscape systems Table 2-1 and Figure 2-2 below.

Table 2-1: Soil Landscape Systems within the survey area

Soil Landscape System	Description
Jundee System	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.
Violet System	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.



Figure 2-2: Map of Soil Landscape Systems within the survey area

2.3 Remnant Vegetation

The survey area is situated in the Austin Botanical District within the Eremaean Botanical Province. This botanical district is predominantly Mulga low woodlands on plains, often rich in ephemerals, which reduce to scrub on hills. It is also characterised by hummock grasslands, Saltbush shrublands and Samphire shrublands, according to the DAFWA. The Eremaean Province is the largest of the three botanical provinces within Western Australia. The vegetation of the Austin Botanical District of the Murchison Region is predominantly low mulga (*Acacia aneura*) woodlands on plains and reduced to scrub on hills. This district is often associated with a tree steppe of *Eucalyptus* spp. and *Triodia basedowii* on sand plains.

The Department of Primary Industries and Regional Development GIS file (DPIRD, 2018) indicates that the survey area is located within Pre-European Beard vegetation association Wiluna 18. The extent of this vegetation association, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2017) is provided in Table 2-2 and Figure 2-3.

Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered “endangered” (EPA, 2000). Development within the survey area will not significantly reduce the extent of pre-European vegetation.

Table 2-2: Pre-European Vegetation Associations within the survey area

Vegetation Association	Pre-European Extent (ha)	Pre-European extent remaining (%)	% of Current extent within DBCA managed lands	Vegetation Description (Beard, 1990)
Wiluna 18	4,273,509.56	99.59	1.05	Low woodland; mulga (<i>Acacia aneura</i>)



Figure 2-3: Pre-European Vegetation Associations within the survey area

2.4 Climate

The climate of the Eastern Murchison subregion is characterised as an arid climate with mainly winter rainfall and annual rainfall of approximately 200 mm (Beard, 1990; Cowan, 2001). Rainfall data for the Wiluna aero weather station (#13044) located approximately 40km south-west of the survey area is shown in Figure 2-4 (BoM, 2020). Monthly mean maximum temperature at Wiluna ranges from 38°C during January to 19.4°C in July. Mean monthly rainfall ranges from 38 mm in February to 5 mm in September, whilst the mean annual rainfall is 263 mm.

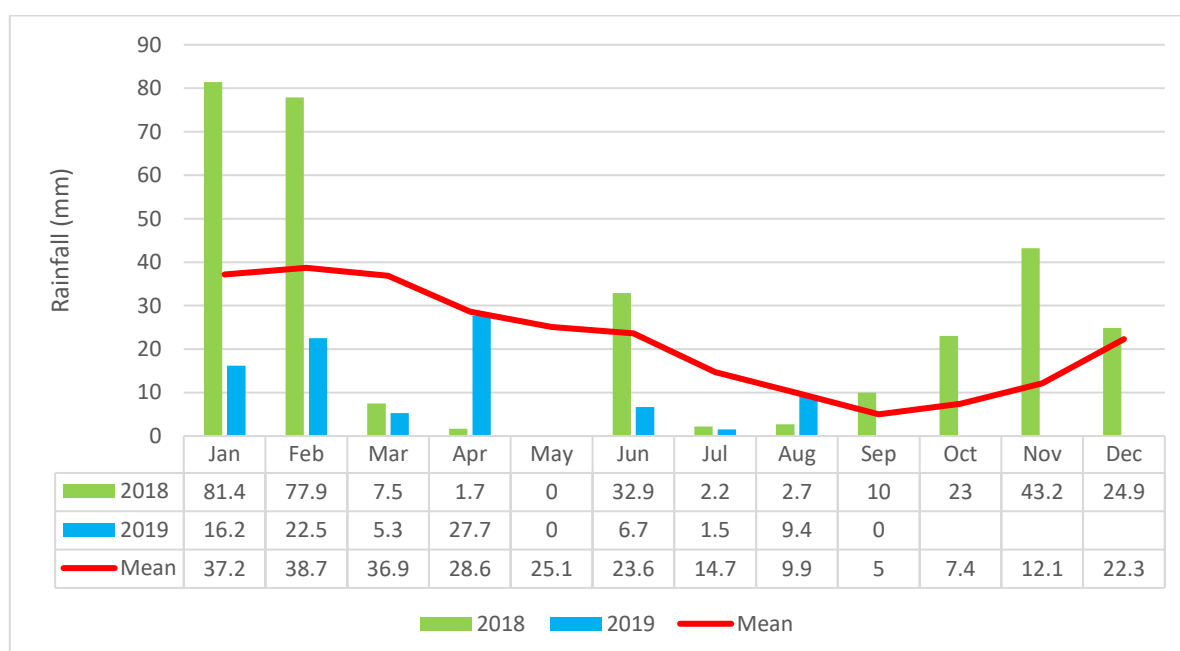


Figure 2-4: Monthly rainfall and mean monthly rainfall (January 2018 to February 2020) for the Wiluna Aero weather station #13044 (BoM, 2020)

2.5 Hydrology

According to the Geoscience Australia database (2015), there are no permanent or non-perennial inland waters within the survey area. The closest inland water to the survey area is Lake Ward which is located 9km north-east of the survey area. No permanent or non-perennial drainage lines intersect the survey area (Figure 2-5).

Groundwater Dependent Ecosystems (GDE) includes biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. According to the BoM *Atlas of Groundwater Dependent Ecosystems* (BoM, 2019b) database, there are no known or potential aquatic/terrestrial GDEs located within the survey area (Figure 2-5).

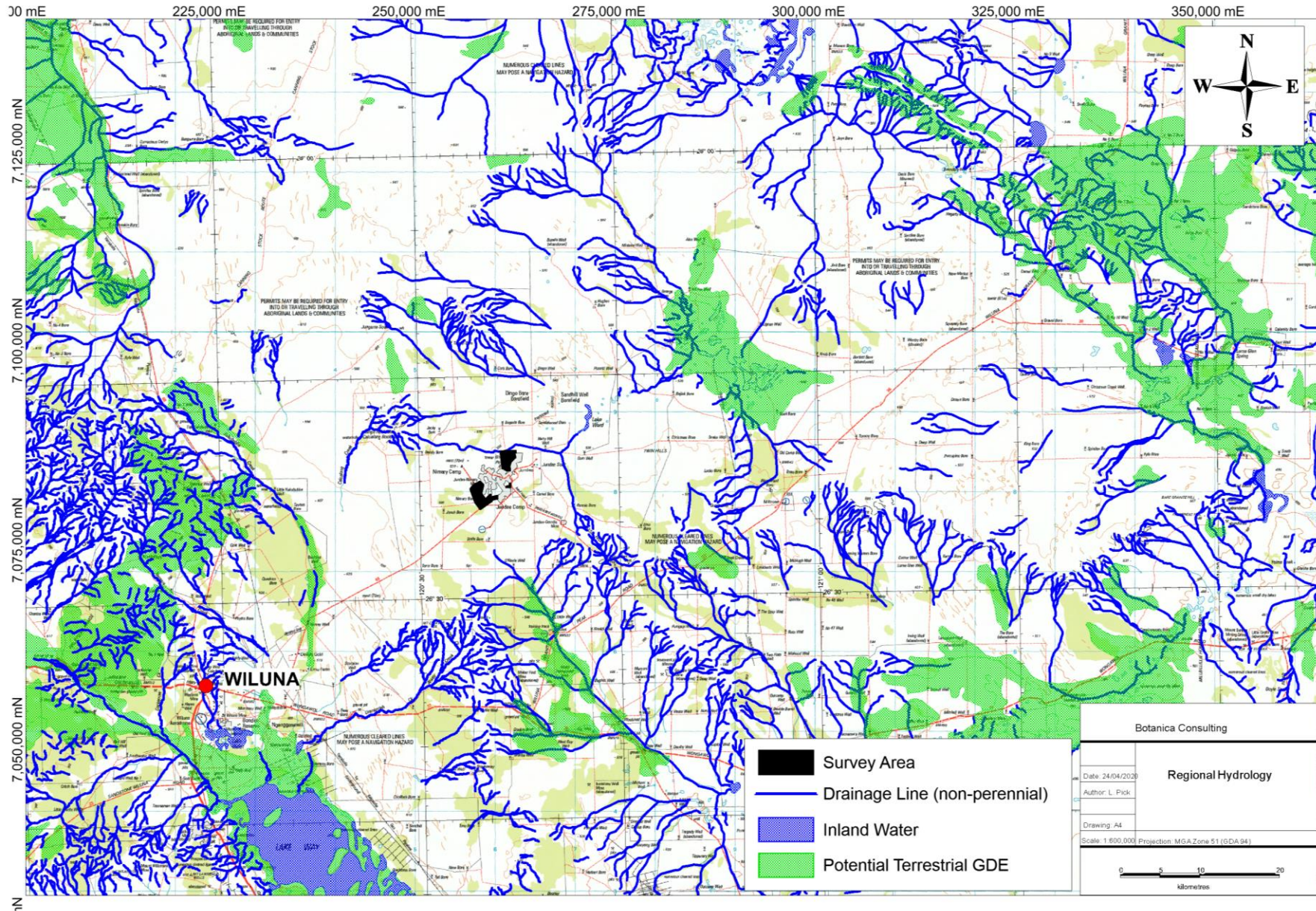


Figure 2-5: Surface Hydrology of the survey area

2.6 Land Use

The dominant land uses of the Eastern Murchison subregion include grazing native pastures (85.47%), unallocated crown reserves (11.34%), conservation (1.4%) and mining (1.79%) (Cowan, 2001). The survey area is located within the Jundee Pastoral Lease.

3 Survey Methodology

3.1 Desktop Assessment

Prior to the field assessment a literature review was undertaken of previous flora and fauna assessments conducted within the local region. Documents reviewed included:

- Animal Plant Mineral (2015). Vegetation Clearing Permit Application, Matilda Gold Project, Support Information for Matilda Mine Site Native Vegetation Clearing (Purpose) Permit Application, October 2015.
- Biota Environmental Sciences (2004). Waterloo and Amorcac Extension Fauna Site Inspection. Unpublished report for LionOre.
- Botanica Consulting (2014). Level 1 Flora and Vegetation Survey of the Thunderbox to Bannockburn Project.
- Botanica Consulting (2016). Level 1 Flora and Fauna Survey Julius Project, Prepared for Echo Resources Limited.
- Botanica Consulting (2019a). Reconnaissance Flora/ Vegetation and Fauna Survey Orelia Project. Prepared for Echo Resources Limited.
- Botanica Consulting (2019b). Reconnaissance Flora/ Vegetation & Fauna Survey. Mt Joel Project. Prepared For Echo Resources Limited.
- Botanica Consulting (2020). Detailed Flora/ Vegetation Survey Lake Way Potash Project. Prepared for Salt Lake Potash Limited.
- Ecologia (1995). Jundee Gold Project Environmental Assessment.
- Engenium (2015). Lake Maitland - Level 2 Vertebrate Fauna and Targeted Reptile Survey Report. Unpublished report for Toro Energy Limited
- Hall, N.J., Newbey, K.R., McKenzie, N.L., Keighery, G.J., Rolfe, J.K & Youngson, W. K., (1993). *The Biological survey of the Eastern Goldfields of Western Australia Part 7: Sandstone-Sir Samuel. Laverton-Leonora study area*, West. Aust. Mus. Suppl. 47.
- Outback Ecology (2008a). Bronzewing – Mt McClure, Application for a Purpose Permit to Clear Native Vegetation at the Bronzewing – Mt McClure Project – Corboys Prospect M53/15, prepared for View Resources
- Outback Ecology (2008b). Bronzewing – Mt McClure, Report on the distribution of *Eremophila pungens* (P4) within the Bronzewing – Mt McClure Gold Project, prepared for View Resources.
- Paul Armstrong and Associates (2001). Rare Flora Search, and Flora and Vegetation Survey of the Exploration and Mine Lease of Thunderbox.
- Paul Armstrong and Associates (2004). Rare Flora Search and Vegetation Survey at the Waterloo Prospects.
- Trudgen, M (1989). A Flora and Vegetation Survey of Part of the Cyprus Gold Mount McClure Gold Mining Leases. Report prepared for Cyprus Gold for inclusion in the Mt McClure Project Feasibility Study, Volume 2 Environmental Study

In addition to the literature review, searches of the following databases were undertaken to aid in the compilation of a list of flora and fauna taxa within the survey area:

- DBCA Priority/ Threatened Flora Database Search (DBCA, 2019a);

- DBCA Priority/ Threatened Ecological Communities Database Search (DBCA, 2019b);
- DBCA NatureMap Database (DBCA, 2020); and
- DAWE Protected Matters search tool (DAWE, 2020).

The NatureMap and Protected Matters Search were conducted for an area encompassing a 40km radius of the centre coordinates -26.357S 120.591E. It should be noted that these lists are based on observations from a broader area than the assessment area (40km radius) and therefore may include taxa not present. The databases also often include very old records that may be incorrect or in some cases the taxa in question have become locally or regionally extinct. Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining what actual species may be present within the specific area being investigated.

The conservation significance of flora and fauna taxa was assessed using data from the following sources:

- *Environment Protection and Biodiversity and Conservation (EPBC) Act 1999*. Administered by the Australian Government (DAWE);
- *Biodiversity Conservation (BC) Act 2016*. Administered by the WA Government (DBCA);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List – the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and
- Priority Flora/ Fauna list. A non-legislative list maintained by DBCA for management purposes (fauna list released January 2019; flora list released December 2018).

The EPBC Act also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA)¹;
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and
- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

Most but not all migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as Matters of National Environmental Significance (MNES) under the EPBC Act. Descriptions of conservation significant species and communities are provided in Appendix 1.

¹ Most but not all species listed under JAMBA are also specially protected under Specially Protected Species of the BC Act.

3.2 Field Assessment

Botanica conducted a reconnaissance flora/ vegetation and fauna survey covering an area of 733 ha. The survey was conducted from the 4th to 6th March 2020 with the area traversed on foot and ATV/ 4WD by two staff members.

3.2.1 Flora Assessment

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the coordinates of the boundaries between existing vegetation communities. At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant taxa for each stratum;
- All vascular taxa (including annual taxa);
- Landform classification;
- Vegetation condition rating;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of flora of conservation significance if encountered.

Unknown specimens collected during the survey were identified with the aid of samples housed at the BC Herbarium and Western Australian Herbarium. Vegetation was classified in accordance with NVIS classifications.

3.2.2 Fauna Assessment

Vegetation and landform units identified during the flora assessment have been used to define broad fauna habitat types across the site. This information has been supplemented with observations made during the fauna assessment.

The main aim of the fauna habitat assessment was to determine if it was likely that any species of conservation significance would be utilising the areas that maybe impacted on as a consequence of development at the site. The habitat information obtained was also used to aid in finalising the overall potential fauna list.

As part of the desktop literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was researched. During the field survey, the habitats within the study area were assessed and specific elements identified, if present, to determine the likelihood of listed threatened species utilising the area and its significance to them.

Opportunistic observations of fauna species were made during all field survey work which involved a series of transects across the study area during the day including observations of bird species with binoculars. Secondary evidence of a species presence such as tracks, scats, skeletal remains, foraging evidence or calls were also noted if observed/heard.

3.2.3 Personnel involved

Lauren Pick- Senior Environmental Consultant (Bachelor of Science-Zoology/Conservation Biology)

April Slater-Graduate Environmental Consultant (BSc-Conservation)

3.2.4 Scientific licences

Table 3-1: Scientific Licences of Botanica Staff coordinating the flora survey

Licensed staff	Permit Number	Valid Until
Lauren Pick	FB62000109 (Licence to flora for scientific purposes)	27/05/2019-27/05/2022

3.3 Survey limitations and constraints

It is important to note that flora surveys will entail limitations notwithstanding careful planning and design. Potential limitations are listed in Table 3-2.

The conclusions presented in this report are based upon field data and environmental assessments and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of the field assessments. Also, it should be recognised that site conditions can change with time. Information not available at the time of this assessment which may subsequently become available may alter the conclusions presented.

Some species are reported as potentially occurring based on there being suitable habitat (quality and extent) within the survey area or immediately adjacent. The habitat requirements and ecology of many of the species known to occur in the wider area are however often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitats or microhabitats within the survey area. As a consequence of this limitation, the potential species list produced is most likely an overestimation of those species that actually utilise the survey area for some purpose.

In recognition of survey limitations, a precautionary approach has been adopted for this assessment. Any flora and fauna species that would possibly occur within the survey area (or immediately adjacent), as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the author, has been listed as having the potential to occur.

Table 3-2: Limitations and constraints associated with the survey

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted via 4WD and on foot. Numerous tracks were located within the survey area, providing ease of access.
Competency/ Experience	Not a constraint	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. Coordinating Botanist/ Zoologist: Lauren Pick Data Interpretation: Jim Williams, Lauren Pick and Greg Harewood.
Timing of survey, weather & season	Not a constraint	Fieldwork was completed within the EPA's recommended primary survey time period (i.e., 6-8 weeks post wet season (March – June) for the Eremaean Province and was conducted following cyclonic rainfall received in December 2019 to February 2020.
Area disturbance	Not a constraint	The area has been disturbed from exploration and cattle grazing; however, vegetation was mostly intact and comprised of native vegetation.
Survey Effort/ Extent	Not a constraint	Survey intensity was appropriate for the size/significance of the area with a reconnaissance survey completed to identify vegetation types/fauna habitats and conservation significant species/communities.
Availability of contextual information at a regional and local scale	Not a constraint	Threatened flora database searches provided by the DBCA were used to identify any potential locations of Threatened/Priority taxa. BoM, DWER, DPIRD, DBCA and DotEE databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region. Flora/ Fauna surveys within the local area have been limited however Botanica was able to obtain information about the regional area from previous flora/fauna assessments conducted within the region which provided context on the local environment.
Completeness	Minor constraint	In the opinion of Botanica, the survey area was covered sufficiently in order to identify vegetation assemblages. Few of the plants during the survey were in flower, however annual species present. It is estimated that approximately 90% of the flora within the survey area were able to be fully identified. The vegetation types for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities/ fauna habitats outside the study area is not known, however vegetation types identified were categorised via comparison to vegetation distributions throughout WA specified in the NVIS Major Vegetation Groups (DotEE, 2017b).

4 **Results**

4.1 **Desktop Assessment**

4.1.1 **Flora and Vegetation**

According to the results of the NatureMap search (DBCA, 2020), a total of 206 flora taxa have been recorded within a 40 km radius of the survey area. Dominant genera include *Acacia* and *Eremophila*. Results of database searches identified five introduced taxa as potentially occurring within a 40 km radius of the survey area:

1. *Carrichtera annua* (Wards weed)
2. *Cenchrus ciliaris* (Buffel Grass)
3. *Cynodon dactylon* (Couch)
4. *Polypogon monspeliensis* (Annual Beard grass)
5. *Tribulus terrestris* (Caltrop)

The results of the literature review, combined search of the DBCA's Flora of Conservation Significance databases (DBCA, 2019a) and DAWE protected matters search (DAWE, 2020) recorded no Threatened Flora or Priority Flora within the survey area. No Threatened Flora and a total of eleven Priority Flora taxa were listed on the databases as occurring within a 40km radius of the survey area (map of flora locations provided in Appendix 2). A description of the known habitat for each taxon is provided in Table 4-1.

Table 4-1: Likelihood of occurrence for Threatened and Priority Flora within the survey area

Taxon	EPBC Act	BC Act	DBCA Priority Rating	Habitat Description (WAHERB, 2020)	Habitat present in Survey Area
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>			P3	Hardpan plains.	Yes
<i>Eremophila arguta</i>			P1	Loamy soils, floodplains.	No
<i>Eremophila congesta</i>			P1	Lateritic outcrops in greenstone hills, stony quartzite slopes.	No
<i>Eremophila pungens</i>			P4	Sandy loam, clayey sand over laterite. Plains, ridges, breakaways.	No
<i>Hemigenia exilis</i>			P4	Rocky lower slopes of hill sides, drainage lines.	No
<i>Ptilotus luteolus</i>			P3	Rocky slopes, screes, and ridges	Yes
<i>Sida picklesiana</i>			P3	Breakaways and outcrops, banded ironstone.	No
<i>Stackhousia clementii</i>			P3	Skeletal soils. Sandstone hills.	No
<i>Tribulus adelacanthus</i>			P3	Lower slopes. Gravelly loam soils.	No
<i>Vittadinia pustulata</i>			P3	Sandy soils.	No
<i>Xanthoparmelia nashii</i>			P3	Granite rocks	No

4.1.2 Fauna

According to the results of the NatureMap search (DBCA, 2020), a total of 152 vertebrate fauna taxa have been recorded within a 40 km radius of the survey area including 87 bird species, 5 amphibians, 16 mammals and 44 reptiles. Combined results of database searches identified nine introduced taxa as potentially occurring within the survey area, these being:

1. *Camelus dromedaries* (Camel)
2. *Canis lupus familiaris* (Dog)
3. *Capra hircus* (Goat)
4. *Columba livia* (Rock Pigeon)
5. *Equus asinus* (Donkey)
6. *Felis catus* (Cat)
7. *Mus musculus* (House Mouse)
8. *Oryctolagus cuniculus* (Rabbit)
9. *Vulpes vulpes* (Red Fox)

Fauna of conservation significance identified during the literature review as previously being recorded in the general area were assessed and ranked for their likelihood of occurrence within the survey area itself (Table 4-2). The rankings and criteria used were:

- **Would Not Occur:** There is no suitable habitat for the species in the survey area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).
 - **Locally Extinct:** Populations no longer occur within a small part of the species natural range, in this case within 10 or 20km of the survey area. Populations do however persist outside of this area.
 - **Regionally Extinct:** Populations no longer occur in a large part of the species natural range, in this case within the northern goldfields region. Populations do however persist outside of this area.
- **Unlikely to Occur:** The survey area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the site itself would not support a population or part population of the species
- **Possibly Occurs:** Survey area is within the known distribution of the species in question and habitat of at least marginal quality was identified as likely to be present during the field survey and literature review, supported in some cases by recent records being documented in literature from within or near the survey area. In some cases, while a species may be classified as possibly being present at times, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

- **Known to Occur:** The species in question has been positively identified as being present (for sedentary species) or as using the survey area as habitat for some other purpose (for non-sedentary/mobile species) during field surveys within or near the survey area. This information may have been obtained by direct observation of individuals or by way of secondary evidence (e.g. tracks, foraging debris, scats). In some cases, while a species may be classified as known to occur, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

Table 4-2: Likelihood of Occurrence – Fauna Species of Conservation Significance

Species	Conservation Status			Habitat Description	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA Priority		
Malleefowl <i>Leipoa ocellata</i>	VU	VU	-	Scrublands and woodlands dominated by mallee and wattle species (DAWE, 2020).	Unlikely to Occur. No recent records nearby and habitat unsuitable/very marginal
Grey Falcon <i>Falco hypoleucos</i>		VU		The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (DAWE, 2020).	Possibly Occurs aerially over survey area on very rare occasions. No suitable breeding habitat.
Peregrine Falcon <i>Falco peregrinus</i>	-	OS	-	The Peregrine Falcon is found in most habitats, from rainforests to the arid zone, and at most altitudes, from the coast to alpine areas. It requires abundant prey and secure nest sites, and prefers coastal and inland cliffs or open woodlands near water, and may even be found nesting on high city buildings (Birdlife Australia, 2018).	Possibly Occurs aerially over survey area on very rare occasions. No suitable breeding habitat.
Migratory Shorebirds (Various species)	MI	IA	-	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland (DAWE, 2020).	Would Not Occur. No Suitable Habitat.
Grey Wagtail <i>Motacilla cinerea</i>	MI	IA	-	Running water in disused quarries, sandy, rocky streams in escarpments and rainforest, sewerage ponds, ploughed fields and airfields (Morecombe 2004).	Would Not Occur. No documented records in goldfields region
Yellow Wagtail <i>Motacilla flava</i>	MI	IA	-	Occurs in a variety of damp or wet habitats with low vegetation, from rushy pastures, meadows, hay fields and marshes to damp steppe and grassy tundra (Morecombe 2004).	Would Not Occur. No documented records in the goldfields region.
Night Parrot <i>Pezoporus occidentalis</i>	EN	CR	-	Broad habitat requirements include areas of old-growth spinifex (<i>Triodia</i>) for roosting and nesting, together with foraging habitats that are likely to include various native grasses and herbs, and may or may not contain shrubs or low trees. (DPaW, 2017).	Unlikely to Occur. No recent records nearby and no suitable habitat.
Princess Parrot <i>Polytelis alexandrae</i>	VU	-	P4	Inhabits sand dunes and sand flats in the arid zone of western and central Australia. It occurs in open savanna woodlands and shrublands that usually consist of scattered stands of <i>Eucalyptus</i> (including <i>E. gongylocarpa</i> , <i>E. chippendalei</i> and mallee species), <i>Casuarina</i> or <i>Allocasuarina</i> trees; an understorey of shrubs such as <i>Acacia</i> (especially <i>A. aneura</i>), <i>Cassia</i> , <i>Eremophila</i> , <i>Grevillea</i> , <i>Hakea</i> and <i>Senna</i> ; and a ground cover dominated by <i>Triodia</i> species (DAWE, 2020)	Unlikely to Occur. Rarely recorded this far south and no recent records nearby.
Brush-tailed Mulgara <i>Dasycercus blythi</i>	-	-	P4	Occurs on sand dunes with sparse cover of sandhill cain grass or areas around salt lakes (DAWE, 2020).	Possibly Occurs though habitat in some areas appears marginal.

Species	Conservation Status			Habitat Description	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA Priority		
Greater Bilby <i>Macrotis lagotis</i>	VU	VU		Suitable habitat includes; open tussock grassland (both grasses and forbs) growing on uplands and hills, mulga woodland/shrubland (both pure mulga and mixed stands of mulga/witchetty bush) growing on ridges and rises, and hummock grassland growing on sand plains and dunes, drainage systems, salt lake systems and other alluvial areas Pavey, C., 2006).	Unlikely to Occur. No recent records nearby and habitat unsuitable/very marginal

4.2 Field Assessment

4.2.1 Vegetation Types

Five vegetation types were identified within the survey area. These vegetation types were identified within four landform types and comprised of two major vegetation groups according to the NVIS, Major Vegetation Group (MVG) definition (Table 4-3). These vegetation types were represented by a total of 14 Families, 11 Genera and 46 Taxa as listed in Appendix 3. A map showing the vegetation types present in the survey area is provided in Figure 4-1.

Table 4-3: Summary of vegetation types within the survey area

Landform	Major Vegetation Group	Vegetation Type	Vegetation Code	Area (ha)	Area (%)
Clay-Loam Plain	Acacia Forests and Woodland (MVG 6)	Low woodland of <i>Acacia incurvaneura</i> over low shrubland of <i>Eremophila forrestii</i> / <i>E. margarethae</i> and low tussock grassland of <i>Eragrostis eriopoda</i> on clay-loam plain	CLP-AFW1	300	40.9
Quartz-Rocky Plain	Acacia Open Woodland (MVG 13)	Low open woodland of <i>Acacia incurvaneura</i> / <i>Hakea lorea</i> over mid open shrubland of <i>Eremophila fraseri</i> and low shrubland of <i>Eremophila margarethae</i> on quartz-rocky plain	QRP-AOW1	122	16.6
	Acacia Forests and Woodland (MVG 6)	Low woodland of <i>Acacia incurvaneura</i> over mid open shrubland of <i>Psyrdrax suaveolens</i> and low open tussock grassland of <i>Eragrostis eriopoda</i> on quartz-rocky plain	QRP-AFW1	99	13.4
Rocky slope	Acacia Forests and Woodland (MVG 6)	Low woodland of <i>Acacia ayersiana</i> / <i>A. incurvaneura</i> over mid open shrubland of <i>Eremophila fraseri</i> / <i>E. latrobei</i> and low tussock grassland of <i>Eriachne mucronata</i> on rocky slope	RS-AFW1	27	3.7
Sand-Loam Plain	Acacia Forests and Woodland (MVG 6)	Low woodland of <i>Acacia caesaneura</i> / <i>A. incurvaneura</i> over mid open shrubland of <i>Eremophila forrestii</i> and low hummock grassland of <i>Triodia basedowii</i> on sand-loam plain	SLP-AFW1	162	22.1
N/A	N/A	Cleared Vegetation	CV	24	3.2
TOTAL				733	100



Figure 4-1: Vegetation types within the survey area

Clay-Loam Plain: Acacia Forests and Woodlands

4.2.1.1 Low woodland of *Acacia incurvaneura* over low shrubland of *Eremophila forrestii*/*E. margarethae* and low tussock grassland of *Eragrostis eriopoda* on clay-loam plain (CLP-AFW1)

The total flora recorded within this vegetation type was represented by a total of 11 Families, 14 Genera and 22 Taxa (Plate 4-1). Dominant taxa are shown in Table 4-4. According to the NVIS, this vegetation community is best represented by the MVG 6-Acacia Forests and Woodlands (DotEE, 2017b).

Table 4-4: Vegetation assemblage for Low woodland of *Acacia incurvaneura* over low shrubland of *Eremophila forrestii*/*E. margarethae* and low tussock grassland of *Eragrostis eriopoda* on clay-loam plain

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <10m	30-70%	<i>Acacia incurvaneura</i>
Shrub <1m	30-70%	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Eremophila margarethae</i>
Tussock Grass <1m	30-70%	<i>Eragrostis eriopoda</i>



Plate 4-1: Low woodland of *Acacia incurvaneura* over low shrubland of *Eremophila forrestii*/*E. margarethae* and low tussock grassland of *Eragrostis eriopoda* on clay-loam plain

Quartz-Rocky Plain: Acacia Open Woodlands

4.2.1.2 Low open woodland of *Acacia incurvaneura*/ *Hakea lorea* over mid open shrubland of *Eremophila fraseri* and low shrubland of *Eremophila margarethae* on quartz-rocky plain (QRP-AOW1)

The total flora recorded within this vegetation type was represented by a total of 9 Families, 11 Genera and 23 Taxa (Plate 4-2). Dominant taxa are shown in Table 4-5. According to the NVIS, this vegetation community is best represented by the MVG 13-Acacia Open Woodlands (DotEE, 2017b).

Table 4-5: Vegetation assemblage for Low open woodland of *Acacia incurvaneura*/ *Hakea lorea* over mid open shrubland of *Eremophila fraseri* and low shrubland of *Eremophila margarethae* on quartz-rocky plain

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <10m	5-10%	<i>Acacia incurvaneura</i> <i>Hakea lorea</i>
Shrub 1-2m	10-30%	<i>Eremophila fraseri</i>
Shrub <1m	30-70%	<i>Eremophila margarethae</i>



Plate 4-2: Low open woodland of *Acacia incurvaneura*/ *Hakea lorea* over mid open shrubland of *Eremophila fraseri* and low shrubland of *Eremophila margarethae* on quartz-rocky plain

Quartz-Rocky Plain: Acacia Forests and Woodlands

4.2.1.3 Low woodland of *Acacia incurvaneura* over mid open shrubland of *Psydrax suaveolens* and low open tussock grassland of *Eragrostis eriopoda* on quartz-rocky plain (QRP-AFW1)

The total flora recorded within this vegetation type was represented by a total of 8 Families, 14 Genera and 23 Taxa (Plate 4-3). Dominant taxa are shown in Table 4-6. According to the NVIS, this vegetation community is best represented by the MVG 6-Acacia Forests and Woodlands (DotEE, 2017b).

Table 4-6: Vegetation assemblage for Low woodland of *Acacia incurvaneura* over mid open shrubland of *Psydrax suaveolens* and low open tussock grassland of *Eragrostis eriopoda* on quartz-rocky plain

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <10m	30-70%	<i>Acacia incurvaneura</i>
Shrub 1-2m	10-30%	<i>Psydrax suaveolens</i>
Tussock Grass <1m	10-30%	<i>Eragrostis eriopoda</i>



Plate 4-3: Low woodland of *Acacia incurvaneura* over mid open shrubland of *Psydrax suaveolens* and low open tussock grassland of *Eragrostis eriopoda* on quartz-rocky plain

Rocky Slope: Acacia Forests and Woodlands

4.2.1.4 Low woodland of *Acacia ayersiana*/ *A. incurvaneura* over mid open shrubland of *Eremophila fraseri*/ *E. latrobei* and low tussock grassland of *Eriachne mucronata* on rocky slope (RS-AFW1)

The total flora recorded within this vegetation type was represented by a total of 11 Families, 14 Genera and 22 Taxa (Plate 4-4). Dominant taxa are shown in Table 4-7. According to the NVIS, this vegetation community is best represented by the MVG 6-Acacia Forests and Woodlands (DotEE, 2017b).

Table 4-7: Vegetation assemblage for Low woodland of *Acacia ayersiana*/ *A. incurvaneura* over mid open shrubland of *Eremophila fraseri*/ *E. latrobei* and low tussock grassland of *Eriachne mucronata* on rocky slope

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <10m	30-70%	<i>Acacia ayersiana</i> <i>Acacia incurvaneura</i>
Shrub <1m	10-30%	<i>Eremophila fraseri</i> <i>Eremophila latrobei</i> subsp. <i>latrobei</i>
Tussock Grass <1m	30-70%	<i>Eriachne mucronata</i>



Plate 4-4: Low woodland of *Acacia ayersiana* / *A. incurvaneura* over mid open shrubland of *Eremophila fraseri*/ *E. latrobei* and low tussock grassland of *Eriachne mucronata* on rocky slope

Sand-Loam Plain: Acacia Forests and Woodlands

4.2.1.5 Low woodland of *Acacia caesaneura*/ *A. incurvaneura* over mid open shrubland of *Eremophila forrestii* and low hummock grassland of *Triodia basedowii* on sand-loam plain (SLP-AFW1)

The total flora recorded within this vegetation type was represented by a total of 11 Families, 12 Genera and 27 Taxa (Plate 4-5). Dominant taxa are shown in Table 4-8. According to the NVIS, this vegetation community is best represented by the MVG 6-Acacia Forests and Woodlands (DotEE, 2017b).

Table 4-8: Vegetation assemblage for Low woodland of *Acacia caesaneura*/ *A. incurvaneura* over mid open shrubland of *Eremophila forrestii* and low hummock grassland of *Triodia basedowii* on sand-loam plain

Life Form/Height Class	Canopy Cover	Dominant taxa present
Tree <10m	30-70%	<i>Acacia caesaneura</i> <i>Acacia incurvaneura</i>
Shrub 1-2m	10-30%	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>
Hummock Grass <1m	30-70%	<i>Triodia basedowii</i>



Plate 4-5: Low woodland of *Acacia caesaneura*/ *A. incurvaneura* over mid open shrubland of *Eremophila forrestii* and low hummock grassland of *Triodia basedowii* on sand-loam plain

4.2.2 Vegetation Condition

Based on the vegetation condition rating scale adapted from Keighery, 1994 and Trudgen, 1988 (Appendix 4), vegetation ranged from 'good' to 'very good' (Table 4-9; Figure 4-2). 'Good' condition depicts 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. 'Very Good' condition indicates there are 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.

Table 4-9: Vegetation Condition within the survey area

Condition Rating	Area (ha)	Area (%)
Cleared Vegetation	24	3.2
Good	501	71.0
Very Good	185	25.8





Figure 4-2: Vegetation Condition within the survey area

4.2.3 Fauna Habitat

The broad scale terrestrial fauna habitats within the survey area presented below are based on vegetation and associated landforms identified during the flora and vegetation assessment. The extent of the identified fauna habitats and a summary description of each are provided in Table 4-10 below.

Table 4-10: Main Terrestrial Fauna Habitats within the survey area

Fauna Habitat Description	Example Image
<p><u>Clay-Loam Plain</u></p> <p>Acacia Woodland</p> <p>(approximate area = 300 ha; 40.9%).</p>	
<p><u>Quartz-Rocky Plain</u></p> <p>Acacia Open Woodland/ Woodland</p> <p>(approximate area = 220 ha; 30.1%).</p>	



Fauna Habitat Description	Example Image
<p><u>Rocky Slope</u></p> <p>Acacia Woodland</p> <p>(approximate area = 27 ha; 3.7%).</p>	
<p><u>Sand-Loam Plain</u></p> <p>Acacia Woodland</p> <p>(approximate area = 162 ha; 22.1%).</p>	



Figure 4-3: Main Terrestrial Fauna Habitats within the survey area

A list of expected vertebrate fauna species likely to occur in the survey area was compiled from information obtained during the literature review and is presented in Appendix 5. The results of some previous fauna surveys carried out in the general area are also summarised in this species listing as are the DBCA NatureMap database search results. Table 4-11 summarises the numbers of potential species based on vertebrate class considered likely to be present in the general vicinity of the survey area based on the complete list held Appendix 5.

Not all species listed in existing databases and publications as potentially occurring within the region (i.e. EPBC Act Threatened Fauna and Migratory species lists, DBCA NatureMap Fauna Database and various publications) are considered likely to be present within the survey area. The list of potential fauna takes into consideration that firstly the species in question is not known to be locally/regionally extinct and secondly that suitable habitat for each species, as identified during the habitat assessment, is present within the survey area, though compiling an accurate list has limitations (see **Section 3.3 Survey limitations and constraints**).

Table 4-11: Summary of Potential Vertebrate Fauna Species

Group	Total number of potential species	Potential number of specially protected species	Potential number of migratory species	Potential number of priority species
Amphibians	11	0	0	0
Reptiles	90	0	0	0
Birds	109	1	0	1
Non-Volant Mammals	24 ⁸	0	0	1
Volant Mammals (Bats)	11	0	0	0
Total	245⁸	1	0	2

⁸Superscript = number of introduced species included in the total. Note: Where a species state and federal conservation status is different, the highest category is used.

Despite the omission of some species it should be noted that the list provided is still very likely an over estimation of the fauna species utilising the survey area (either on a regular or infrequent basis) as a result of the precautionary approach adopted for the assessment. At any one time only, a subset of the listed potential species is likely to be present within the bounds of the study area.

4.2.4 Introduced Species

Two introduced species were recorded during the survey; *Cynodon dactylon* (Couch) and *Tribulus terrestris* (Caltrop). Neither species is listed as a Declared Pest under the *Biosecurity and Agriculture Management (BAM) Act 2007*.

No introduced fauna were observed during the survey however there was evidence of cattle tracks and scats within the survey area.

4.2.5 Significant Flora

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016a) significant flora includes:

- flora being identified as threatened or priority species;
- locally endemic flora or flora associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or anomalous features that indicate a potential new species;
- flora representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; and
- flora with relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

No significant flora were identified within the survey area. A map showing regional Threatened and Priority Flora known records in relation to the survey area is provided in Appendix 2.

4.2.6 Significant Vegetation

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant vegetation includes:

- vegetation being identified as threatened or priority ecological communities;
- vegetation with restricted distribution;
- vegetation subject to a high degree of historical impact from threatening processes;
- vegetation which provides a role as a refuge; and
- vegetation providing an important function required to maintain ecological integrity of a significant ecosystem.

No significant vegetation was identified within the survey area. Seven Priority 1 Ecological Communities (PEC) occur within a 40km radius of the survey area (see Appendix 2) none of which occur within the survey area. These PECs are underground invertebrate assemblages and are not pertinent to vegetation.

1. Hinkler Well calcrete groundwater assemblage type on Carey palaeodrainage on Lake Way Station (intersects the on-playa development envelope);
2. Lake Violet south and lake Violet calcrete groundwater assemblage types on Carey palaeodrainage on Millbillillie Station (intersects the on-playa development envelope);
3. Lake Way South calcrete groundwater assemblage type on Carey palaeodrainage on Lake Way Station;
4. Uramurdah Lake calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station;
5. Wiluna BF calcrete groundwater assemblage type on Carey palaeodrainage on Millbillillie Station;
6. Jundee South Hill calcrete groundwater assemblage type on Carnegie palaeodrainage on Jundee Station; and
7. Jundee Homestead calcrete groundwater assemblage type on Carnegie palaeodrainage on Jundee Station.

4.2.7 Significant Fauna

According to the EPA *Environmental Factor Guideline for Terrestrial Fauna* (EPA, 2016d) significant fauna includes:

- Fauna being identified as a threatened or priority species;
- Fauna species with restricted distribution;
- Fauna subject to a high degree of historical impact from threatening processes; and
- Fauna providing an important function required to maintain the ecological integrity of a significant ecosystem.

No significant fauna species were observed during the survey.

The current status of some species on site and/or in the general area is difficult to determine, however, based on the habitats present and, in some cases, direct observations or recent nearby records, the following species of conservation significance can be regarded as possibly utilising the survey area for some purpose at times, these being:

- **Greg Falcon *Falco hypoleucos* – P4 (DBCA Priority Species)**
The species potentially utilises some sections of the survey area as part of a much larger home range, though records in this area are rare and therefore it is only likely to be present very occasionally. No suitable breeding habitat. No significant impact likely.
- **Peregrine Falcon *Falco peregrinus* – OS (BC Act)**
The species potentially utilises some sections of the survey area as part of a much larger home range, though records in this area are rare and therefore it is only likely to be present very occasionally. No suitable breeding habitat. No significant impact likely.
- **Brush-tailed Mulgara *Dasyercus blythi* – P4 (DBCA Priority Species)**
This species preferred habitat (sand plains) is absent though it may occur on clay-loam and sand-loam plains. The actual status of this species in the survey area is difficult to determine though it has been recorded in the general area in the past (DBCA, 2020). The proposal will result in the loss of some potential habitat but it is unlikely to have a significant impact on the species status in the wider area.

It should be noted that while habitats onsite for one or more of the species listed above are considered possibly suitable, some or all may be marginal in extent/quality and therefore the fauna species considered as possibly occurring may in fact only visit the area for short periods as infrequent vagrants.

4.3 Matters of National Environmental Significance

4.3.1 *Environment Protection and Biodiversity Conservation Act 1999*

The EPBC Act protects matters of national environmental significance, and is used by the Commonwealth DoEE to list threatened taxa and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance. Matters of national environmental significance as defined by the Commonwealth EPBC Act include:

- Nationally threatened flora species;
- World heritage properties;
- National heritage places;
- Wetlands of international importance (often called ‘Ramsar’ wetlands after the international treaty under which such wetlands are listed);
- Nationally threatened ecological communities;
- Commonwealth marine area;
- The Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mining) a water resource, in relation to coal seam gas development and large coal mining development.

No matters of national environmental significance as defined by the Commonwealth EPBC Act were identified within the survey area.

4.4 Matters of State Environmental Significance

4.4.1 Environmental Protection Act WA 1986

The EP Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment. The Act is administered by The Department of Water and Environment Regulation (DWER), which is the State Government’s environmental regulatory agency.

Under Section 51C of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations (Regulations) WA 2004* any clearing of native vegetation in Western Australia that is not eligible for exemption under Schedule 6 of the *EP Act 1986* or under the Regulations 2004 requires a clearing permit from the DWER or DMIRS. Under Section 51A of the *EP Act 1986* native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent. Section 51A of the *EP Act 1986* defines clearing as “the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above”. Exemptions under Schedule 6 of the EP Act and the EP Regulations do not apply in ESAs as declared under Section 51B of the EP Act or TEC listed under State and Commonwealth legislation.

No evidence of the survey area containing any TEC or Threatened Flora or Fauna was found during the survey period. The survey area is not located within an ESA.

4.4.2 Biodiversity Conservation Act 2016

This Act is used by the Western Australian DBCA for the conservation and protection of biodiversity and biodiversity components in Western Australia and to promote the ecologically sustainable use of biodiversity components in the State. Taxa are classified as ‘Threatened’ when their populations are geographically restricted or are threatened by local processes (see following sections for Threatened definitions). Under this Act all native flora and fauna are protected throughout the State. Financial penalties are enforced under this Act if threatened species are collected without an appropriate licence.

Under Section 54(1) of the BC Act, habitat is eligible for listing as critical habitat if:

- (a) it is critical to the survival of a threatened species or a threatened ecological community; and
- (b) its listing is otherwise in accordance with the ministerial guidelines.

No threatened species or critical habitat listed under the BC Act were recorded within the survey area.

4.4.3 Conservation Reserves

The survey area is not located within a proposed or vested Conservation Reserve. The survey is not located within DBCA managed land. The closest DBCA managed land is the ex. Lorna Glenn UCL, which is located approximately 43km east of the survey area. A map showing areas of proposed and vested Conservation Reserves in relation to the survey area is provided in Appendix 2.

4.5 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, as presented in this report, Botanica provides the following comments regarding the native vegetation clearing principles listed under Schedule 5 of the EP Act (Table 4-12).

Table 4-12: Assessment of development within the survey area against native vegetation clearing principles

Letter	Principle	Assessment	Outcome
Native vegetation should not be cleared if it:			
(a)	comprises a high level of biological diversity.	Vegetation identified within the survey area is not considered to be of high biological diversity and is well represented in the local area.	Clearing is unlikely to be at variance to this principle
(b)	comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	No significant fauna were observed within the survey area. Majority of the survey area comprises of broad fauna habitats that are typical of those in the wider region. No water bodies (both perennial/ non-perennial) occur within the survey area.	Clearing may be at variance to this principle
(c)	includes, or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the BC Act and the EPBC Act were identified within the survey area.	Clearing is unlikely to be at variance to this principle
(d)	comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No TEC listed under the EPBC Act or by the BC Act occur within the survey area.	Clearing is unlikely to be at variance to this principle
(e)	is significant as a remnant of native vegetation in an area that has been extensively cleared	The survey area occurs within the pre-European Beard vegetation association Wiluna 18 which retains >98% of the original pre-European vegetation extent.	Clearing is unlikely to be at variance to this principle
(f)	is growing, in, or in association with, an environment associated with a watercourse or	There are no inland waters (lakes/ playas) or drainage lines within the survey area. No vegetation growing in, or in association with a watercourse or wetland were identified within	Clearing may be at variance to this principle

Letter	Principle	Assessment	Outcome
	Native vegetation should not be cleared if it:		
	wetland	the survey area.	
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The Project area occurs within the pre-European Beard vegetation association Wiluna 18 which retains >98% of the original pre-European vegetation extent. Clearing within these vegetation associations is not likely to lead to land degradation issues such as salinity, water logging or acidic soils.	Clearing is unlikely to be at variance to this principle
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The survey area is not located within a conservation area. The closest conservation reserve is the ex. Lorna Glenn UCL, which is located approximately 43km south of the survey area. Given the distance from the survey area, impacts to the environmental values of this conservation reserve are unlikely.	Clearing is unlikely to be at variance to this principle
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	There are no inland waters (lakes/ playas) or drainage lines within the survey area. No vegetation growing in, or in association with a watercourse or wetland were identified within the survey area. Most rainfall is lost by evaporation or surface runoff. Only a small portion infiltrates the soil and recharges the groundwater.	Clearing may be at variance to this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Rainfall is unreliable and highly variable with an average rainfall of 200mm and an evaporation rate of 2461mm. The region is not prone to flooding and does not contain ephemeral water sources.	Clearing is unlikely to be at variance to this principle

5 **Bibliography**

- Animal Plant Mineral (2015). Vegetation Clearing Permit Application, Matilda Gold Project, Support Information for Matilda Mine Site Native Vegetation Clearing (Purpose) Permit Application, October 2015.
- Armstrong, (2001). *Rare Flora Search, and Vegetation and Flora Survey on the Exploration and Mine Lease of Thunderbox*, Paul Armstrong and Associates.
- Armstrong, (2004). *Rare Flora Search and Vegetation Survey at Waterloo Prospect*, Paul Armstrong and Associates.
- Anstis, M. (2013). *Tadpoles and Frogs of Australia*. New Holland Publishers, Sydney.
- Aplin, K. P. and Smith, L.A. (2001). *Checklist of the frogs and reptiles of Western Australia*, Records of the Western Australian Museum Supplement No. 63, 51-74.
- ASRIS (2014). *Atlas of Australian Soils Database*. Australian Soil Resource Information System
- Australian Government (2020). *National Map*. Australian Government.
- Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union, Victoria.
- Beard, J.S., (1990). *Plant Life of Western Australia*, Kangaroo Press Pty Ltd, NSW.
- Biota Environmental Sciences (2004). Waterloo and Amorac Extension Fauna Site Inspection. Unpublished report for LionOre.
- Biota Environmental Sciences (2017). Mt Keith Satellite Proposal Vertebrate Fauna Review. Prepared for BHP Billiton Nickel West, Biota Environmental Sciences.
- BoM, (2020a). Wiluna Climate Data, Bureau of Meteorology.
Available: <http://www.bom.gov.au/climate>
- BoM (2020b). Groundwater Dependent Ecosystems Atlas. Bureau of Meteorology
Available: <http://www.bom.gov.au/water/groundwater/gde/map.shtml>
- Botanica Consulting (2014). Level 1 Flora and Vegetation Survey of the Thunderbox to Bannockburn Project.
- Botanica Consulting (2016). Level 1 Flora and Fauna Survey Julius Project, Prepared for Echo Resources Limited.
- Botanica Consulting (2019a). Reconnaissance Flora/ Vegetation and Fauna Survey Orelia Project. Prepared for Echo Resources Limited.
- Botanica Consulting (2019b). Reconnaissance Flora/ Vegetation & Fauna Survey. Mt Joel Project. Prepared for Echo Resources Limited.
- Botanica Consulting (2020). Detailed Flora/ Vegetation Survey Lake Way Potash Project. Prepared for Salt Lake Potash Limited.
- Curry, P.J., Payne, A.L., Leighton, K.A., Hennig, P. and Blood, D.A. (1994). *Technical Bulletin: An inventory and condition survey of the Murchison River catchment, Western Australia (No. 84)*. Department of Agriculture WA.
- Cowan, M. (2001). *A Biodiversity Audit of Western Australia's 53 Biogeographical Region in 2001- Eastern Murchison (MUR1 –Eastern Murchison subregion)*, Department of Conservation and Land Management.

- DAFWA (2011). *Pre-European Vegetation - Western Australia (NVIS Compliant Version GIS file)*, Department of Agriculture and Food Western Australia
- DAFWA (2014). *Soil Landscape System of Western Australia*, Department of Agriculture and Food Western Australia
- DAWE (2020). *Protected Matters Search Tool, Environment Protection and Biodiversity Conservation Act 1999*, Department of Agriculture, Water and Environment.
- DBCA (2018). *2018 Statewide Vegetation Statistics (formerly the CAR Reserve Analysis)*. Department of Biodiversity, Conservation and Attractions.
- DBCA (2019a). *Threatened and Priority Flora Database search results*, Department of Biodiversity, Conservation and Attractions.
- DBCA (2019b). *Threatened Ecological Community and Priority Ecological Community database search*, Department of Biodiversity, Conservation and Attractions.
- DBCA (2020). *NatureMap Database search*, Department of Biodiversity, Conservation and Attractions.
- DotEE (2012). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7*, Department of the Environment and Energy.
- DotEE (2017). *National Vegetation Information System (NVIS) Major Vegetation Groups, Version 4.2*, Department of the Environment and Energy.
- DPIRD (2020). *Declared Organism-database search*, Department of Primary Industries and Regional Development, Western Australia.
Available: <http://www.biosecurity.wa.gov.au/>
- Duncan, Anne. & Baker, G. B. & Montgomery, Narelle. & Natural Heritage Trust (Australia) (1999). *The action plan for Australian bats* / edited by Anne Duncan, G. Barry Baker and Narelle Montgomery; with assistance from Lindy Lumsden *et al.* Natural Heritage Trust, Canberra.
- Ecologia (1995). Jundee Gold Project Environmental Assessment.
- Engenium (2015). Lake Maitland - Level 2 Vertebrate Fauna and Targeted Reptile Survey Report. Unpublished report for Toro Energy Limited
- EPA, (2000). Position Statement No. 2 *Environmental Protection of Native Vegetation in Western Australia*, Environmental Protection Authority
- EPA (2016a). *Technical Guide - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016*. Environmental Protection Authority.
- EPA (2016b). *Technical Guide – Terrestrial Fauna Surveys for Environmental Impact Assessment – December 2016*. Environmental Protection Authority.
- Geoscience Australia (2015). *Surface Hydrology GIS*. Australian Government.
- Hall, N.J., Newbey, K.R., McKenzie, N.L., Keighery, G.J., Rolfe, J.K & Youngson, W. K., (1993). *The Biological survey of the Eastern Goldfields of Western Australia Part 7: Sandstone-Sir Samuel. Laverton-Leonora study area*, West. Aust. Mus. Suppl. 47.
- Grieve, B.J., (1998). *How to know Western Australian Wildflowers – A key to the flora of the extratropical regions of Western Australia Part II*, University of Western Australia Press, Nedlands, WA.
- Hall, N.J., Newbey, K.R., McKenzie, N.L., Keighery, G.J., Rolfe, J.K & Youngson, W. K., (1993). *The Biological survey of the Eastern Goldfields of Western Australia Part 7: Sandstone-Sir Samuel. Laverton-Leonora study area*, West. Aust. Mus. Suppl. 47.

- Halpern Glick Maunsell, (1997). *Barwidgee Pastoral Lease Mulgara Dasycercus cristicauda Survey*. Unpublished report prepared for Great Central Mines, November 1997.
- Harewood, G. (2015). Fauna Assessment, Laverton Gold Project. Unpublished report for Bullseye Mining Limited.
- Hart, R.P. and Kitchener, D.J., (1986). *First Record of Sminthopsis psammophila (Marsupialia: Dasyuridae) from Western Australia*. Records of the Western Australian Museum 13(1): 139-144.
- Harvey, M. S. (2002). *Short-range endemism among the Australian fauna: some examples from non-marine environments*. Invertebrate Systematics 16: 555-570.
- Hatton T, Evans R, (1998). *Dependence of ecosystems on groundwater and its significance to Australia*. LWRDC Occasional Paper No 12/98.
- How, R., Cooper, N.K. and Bannister, J.L. (2001). *Checklist of the mammals of Western Australia*, Records of the Western Australian Museum Supplement No. 63, 91-98.
- Jackson, S. & Groves, C. (2015). *Taxonomy of Australian mammals*. CSIRO Publishing.
- Johnson, S.L, Commander, D.P & O'Boy, C.A (1999). *Groundwater Resources of the Northern Goldfields, Western Australia*. Water and Rivers Commission Hydrogeological Report Series Report Hg 2.
- Johnstone, R.E. (2001). *Checklist of the birds of Western Australia*, Records of the Western Australian Museum Supplement No. 63, 75-90.
- Johnstone, R.E. and Storr, G.M. (1998). *Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird)*. Western Australian Museum, Perth Western Australia.
- Johnstone, R.E. and Storr, G.M. (2004). *Handbook of Western Australian Birds: Volume 2 – Passerines (Blue-winged Pitta to Goldfinch)*. Western Australian Museum, Perth Western Australia.
- Keighery, B. J., (1994). *Bushland Plant Survey: A guide to plant community survey for the community*. Wildflower Society of Western Australia (Inc.), Nedlands.
- Masters, P., Dickman, C. R., and Crowther, M. (2003). *Effects of cover reduction on mulgara Dasycercus cristicauda (Marsupialia: Dasyuridae), rodent and invertebrate populations in central Australia: implications for land management*. Austral Ecology 28, 658-665.
- Mc Donald, R.C, Isbell, R.F & Speight, J.G (1998). *Australian Soil and Land Survey Field Handbook* (3rd edn). CSIRO Publishing: Melbourne.
- Morcombe, M. (2004). *Field Guide to Australian Birds*. Steve Parish Publishing, Archerfield, Queensland.
- National Committee on Soil and Terrain (2009). *Australian soil and land survey field handbook* (3rd edn). CSIRO Publishing: Melbourne
- Ninox (2007). A Vertebrate Fauna Survey of the Wiluna West Project Area Western Australia # 3. Unpublished report for Golden West Resources Ltd.
- Outback Ecology (2008a). Bronzewing – Mt McClure, Application for a Purpose Permit to Clear Native Vegetation at the Bronzewing – Mt McClure Project – Corboys Prospect M53/15, prepared for View Resources
- Outback Ecology (2008b). Bronzewing – Mt McClure, Report on the distribution of *Eremophila pungens* (P4) within the Bronzewing – Mt McClure Gold Project, prepared for View Resources
- Outback Ecology Services (2009). Lake Maitland Baseline Terrestrial Fauna Survey. Unpublished report for Mega Uranium Pty Ltd.

- Pavey, C. (2006). National Recovery Plan for the Greater Bilby *Macrotis lagotis*. Northern Territory Department of Natural Resources, Environment and the Arts.
- Pizzey, G & Knight, F. (2012). *The Field Guide to the Birds of Australia*. 9th Edition. Harper Collins, Sydney.
- Pringle, H. J. R., Van Vreeswyk, A. M. E. and Gilligan, S. A. (1994). *An inventory and condition survey of the north-eastern Goldfields, Western Australia*. Department of Agriculture Western Australia, Perth, W.A.
- Simpson, K. and Day, N. (2010), *Field Guide to the Birds of Australia*. Penguin Books, Ringwood.
- Tille, P. (2006). *Soil Landscapes of Western Australia's Rangelands and Arid Interior*, Department of Agriculture and Food Western Australia
- Trudgen, M. (1989). *A Flora and Vegetation Survey of Part of the Cyprus Gold Mount McClure Gold Mining Leases*. Report prepared for Cyprus Gold for inclusion in the Mt McClure Project Feasibility Study, Volume 2 Environmental Study.
- WAHERB, (2020). *Florabase – Information on the Western Australian Flora*, Department of Biodiversity, Conservation and Attractions.
Available: <https://florabase.dpaw.wa.gov.au/>

Appendix 1: Conservation Ratings BC Act and EPBC Act

Definitions of Conservation Significant Species

Code	Category
State categories of threatened and priority species	
Threatened Species (T)	
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act).	
CR	<p>Critically Endangered</p> <p>Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”.</p> <p>Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.</p>
EN	<p>Endangered</p> <p>Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”.</p> <p>Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.</p>
VU	<p>Vulnerable</p> <p>Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”.</p> <p>Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.</p>
Extinct species	
Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	<p>Extinct</p> <p>Species where “<i>there is no reasonable doubt that the last member of the species has died</i>”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).</p> <p>Published as presumed extinct under schedule 4 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> for extinct fauna or the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> for extinct flora.</p>
EW	<p>Extinct in the Wild</p> <p>Species that “<i>is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form</i>”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).</p> <p>Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.</p>
Specially protected species	
Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.	
Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	
IA	<p>International Agreement/ Migratory</p> <p>Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).</p> <p>Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the <i>Convention on the Conservation of Migratory Species of Wild Animals</i> (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.</p> <p>Published as migratory birds protected under an international agreement under schedule 5</p>

Code	Category
	of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i> .
CD	<p>Species of special conservation interest Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p>
OS	<p>Other specially protected species Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the <i>Wildlife Conservation (Specially Protected Fauna) Notice 2018</i>.</p>
<p>Priority species Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.</p>	
P1	<p>Priority 1: Poorly-known species Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.</p>
P2	<p>Priority 2: Poorly-known species Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p>
P3	<p>Priority 3: Poorly-known species Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p>
P4	<p>Priority 4: Rare, Near Threatened and other species in need of monitoring (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>
<p>Commonwealth categories of threatened species</p>	
EX	<p>Extinct Taxa where there is no reasonable doubt that the last member of the species has died.</p>
EW	<p>Extinct in the Wild Taxa where it is known only to survive 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 appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.</p>
CR	<p>Critically Endangered Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.</p>
EN	<p>Endangered Taxa which are not critically endangered and is facing a very high risk of extinction in the</p>

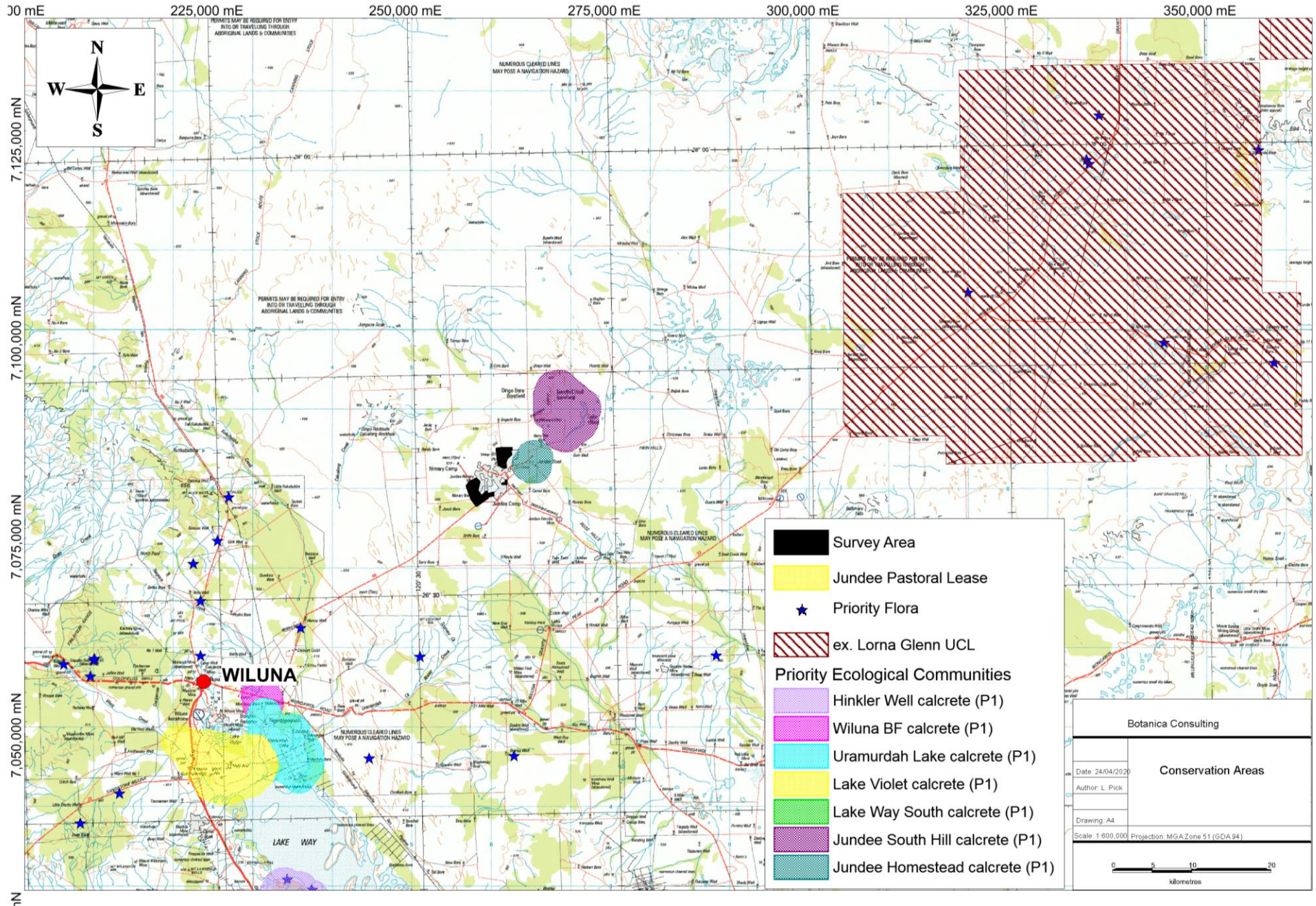
Code	Category
	wild in the near future, as determined in accordance with the prescribed criteria.
VU	<p>Vulnerable</p> <p>Taxa which are not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.</p>
CD	<p>Conservation Dependent</p> <p>Taxa which are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied:</p> <p>(i) the species is a species of fish;</p> <p>(ii) the species is the focus of a plan of management that provides for actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised;</p> <p>(iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory;</p> <p>(iv) cessation of the plan of management would adversely affect the conservation status of the species.</p>

Definitions of Conservation Significant Communities

Category Code	Category
State categories of Threatened Ecological Communities (TEC)	
PD	<p>Presumed Totally Destroyed</p> <p>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:</p> <ul style="list-style-type: none"> records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or; all occurrences recorded within the last 50 years have since been destroyed.
CR	<p>Critically Endangered</p> <p>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, meeting any one of the following criteria:</p> <p>The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;</p> <p>The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;</p> <p>The ecological community is highly modified with potential of being rehabilitated in the immediate future.</p>
EN	<p>Endangered</p> <p>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. The ecological community must meet any one of the following criteria:</p> <p>The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short-term future, or is unlikely to be substantially rehabilitated in the short-term future due to modification;</p> <p>The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;</p> <p>The ecological community is highly modified with potential of being rehabilitated in the short-term future.</p>
VU	<p>Vulnerable</p> <p>An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:</p> <p>The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;</p> <p>The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;</p>

Category Code	Category
	The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.
Commonwealth categories of Threatened Ecological Communities (TEC)	
CE	Critically Endangered If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
EN	Endangered If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
VU	Vulnerable If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).
Priority Ecological Communities (PEC)	
P1	Poorly-known ecological communities Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	Poorly-known ecological communities Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	Poorly known ecological communities 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: 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; 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 and inappropriate fire regimes.
P4	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.
P5	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.

Appendix 2: Regional map of the survey area in relation to conservation areas



Appendix 3: List of species identified within each vegetation type

Blue text (A)-annual species (WAHERB, 2020); Green text (W)-introduced species (WAHERB, 2020).

Family	Genus	Taxon	CLP-AFW1	QRP-AOW1	QRP-AFW1	RS-AFW1	SLP-AFW1
Amaranthaceae	<i>Ptilotus</i>	<i>aeroides</i> (A)		*			
Amaranthaceae	<i>Ptilotus</i>	<i>obovatus</i>	*	*	*		*
Amaranthaceae	<i>Ptilotus</i>	<i>schwartzii</i>		*	*	*	*
Fabaceae	<i>Acacia</i>	<i>aptaneura</i>			*		*
Fabaceae	<i>Acacia</i>	<i>ayersiana</i>				*	
Fabaceae	<i>Acacia</i>	<i>caesaneura</i>			*		*
Fabaceae	<i>Acacia</i>	<i>incurvaneura</i>	*	*	*	*	*
Fabaceae	<i>Acacia</i>	<i>mulganeura</i>			*		*
Fabaceae	<i>Acacia</i>	<i>pachyacra</i>	*	*	*		*
Fabaceae	<i>Acacia</i>	<i>pruinocarpa</i>	*	*	*		*
Fabaceae	<i>Acacia</i>	<i>quadrimarginea</i>		*	*	*	
Fabaceae	<i>Acacia</i>	<i>ramulosa</i> var. <i>linophylla</i>				*	
Fabaceae	<i>Acacia</i>	<i>tetragonophylla</i>	*	*	*	*	*
Fabaceae	<i>Senna</i>	<i>artemisioides</i> subsp. <i>filifolia</i>				*	
Fabaceae	<i>Senna</i>	<i>artemisioides</i> subsp. <i>helmsii</i>		*	*		
Fabaceae	<i>Senna</i>	sp. Meekatharra (E. Bailey 1-26)		*	*	*	
Loranthaceae	<i>Amyema</i>	<i>fitzgeraldii</i>			*		*
Malvaceae	<i>Brachychiton</i>	<i>gregorii</i>	*	*			
Malvaceae	<i>Sida</i>	<i>calyxhymenia</i>	*	*	*		
Poaceae	<i>Aristida</i>	<i>contorta</i> (A)	*	*	*		
Poaceae	<i>Cynodon</i>	<i>dactylon</i> (W)	*				
Poaceae	<i>Dactyloctenium</i>	<i>radulans</i> (A)	*				*
Poaceae	<i>Eragrostis</i>	<i>eriopoda</i>	*	*	*		
Poaceae	<i>Eriachne</i>	<i>mucronata</i>		*	*	*	*
Poaceae	<i>Triodia</i>	<i>basedowii</i>				*	*
Poaceae	<i>Triodia</i>	<i>melvillei</i>					*
Portulacaceae	<i>Portulaca</i>	<i>oleracea</i> (A)	*	*			
Proteaceae	<i>Hakea</i>	<i>lorea</i>		*	*		*
Pteridaceae	<i>Cheilanthes</i>	<i>sieberi</i> subsp. <i>sieberi</i>	*	*	*		*
Rubiaceae	<i>Psydrax</i>	<i>latifolia</i>	*	*	*		*
Rubiaceae	<i>Psydrax</i>	<i>suaveolens</i>	*	*			
Santalaceae	<i>Santalum</i>	<i>lanceolatum</i>			*		*
Santalaceae	<i>Santalum</i>	<i>spicatum</i>	*	*	*		*
Sapindaceae	<i>Dodonaea</i>	<i>rigida</i>				*	
Scrophulariaceae	<i>Eremophila</i>	<i>alternifolia</i>	*	*			
Scrophulariaceae	<i>Eremophila</i>	<i>forrestii</i> subsp. <i>forrestii</i>	*	*	*	*	*

Family	Genus	Taxon	CLP-AFW1	QRP-AOW1	QRP-AFW1	RS-AFW1	SLP-AFW1
Scrophulariaceae	<i>Eremophila</i>	<i>fraseri</i>	*	*	*	*	*
Scrophulariaceae	<i>Eremophila</i>	<i>gilesii</i> subsp. <i>variabilis</i>	*	*	*		*
Scrophulariaceae	<i>Eremophila</i>	<i>latrobei</i> subsp. <i>glabra</i>	*	*	*	*	
Scrophulariaceae	<i>Eremophila</i>	<i>latrobei</i> subsp. <i>latrobei</i>				*	
Scrophulariaceae	<i>Eremophila</i>	<i>longifolia</i>	*	*	*		*
Scrophulariaceae	<i>Eremophila</i>	<i>margarethae</i>	*	*	*	*	*
Scrophulariaceae	<i>Eremophila</i>	<i>oldfieldii</i> subsp. <i>angustifolia</i>			*		*
Solanaceae	<i>Solanum</i>	<i>lasiophyllum</i>	*	*	*		*
Zygophyllaceae	<i>Tribulus</i>	<i>astrocarpus</i> (A)	*	*			
Zygophyllaceae	<i>Tribulus</i>	<i>terrestris</i> (W)	*				

Appendix 4: Vegetation Condition Rating

Vegetation Condition Rating	South West and Interzone Botanical Provinces	Eremaean and Northern Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	/
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	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	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	/	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.	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	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.	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.

Appendix 5: Potential Fauna Species List

Potential Vertebrate Fauna List

Jundee TSF - Northern Star Resources Limited

Approximate centroid 26.357°S and 120.591°E

Compiled by Greg Harewood - April 2020

Recorded (Sighted/Heard/Signs) = X

Botanica (2020). Reconnaissance Flora/ Vegetation and Fauna Survey Jundee TSF alternative locations. Unpublished report for Northern Star Resources Limited.

Engenium (2015). Lake Maitland - Level 2 Vertebrate Fauna and Targeted Reptile Survey Report. Unpublished report for Toro Energy Limited.

Harewood, G. (2015). Fauna Assessment (L1) - Laverton Gold Project. Unpublished report for Bullseye Mining Limited.

Outback Ecology Services (2009). Lake Maitland Baseline Terrestrial Fauna Survey. Unpublished report for Mega Uranium Pty Ltd.

Ninox (2007). A Vertebrate Fauna Survey of the Wiluna West Project Area Western Australia # 3. Unpublished report for Golden West Resources Ltd.

Biota Environmental Sciences (2017). Mt Keith Satellite Proposal Vertebrate Fauna Review. Unpublished report for BHP Billiton Nickel West.

Hall, N.J., McKenzie, N.L. and Keighery, G.J. (eds) (1994). The Biological Survey of the Eastern Goldfields of WA - Pt 10: Sandstone-Sir Samuel and Laverton-Leonora Study Areas. Records of the WAM, Supplement 47: 1 – 166

DBCA (2020). NatureMap Database Search – “By Circle” Centre 120° 35' 28" E, 26° 21' 25" S (plus 40km buffer). Accessed 2 April 2020.

Class Family <i>Species</i>	Common Name	Conservation Status	Botanica	Engenium	Harewood	Outback	Ninox	Biota	Hall et	DBCA
			2020	2015	2015	2009	2007	2017	al. 1994	2020

Amphibia

Myobatrachidae

Ground or Burrowing Frogs

<i>Neobatrachus aquilonius</i>	Northern Burrowing Frog	LC								X
<i>Neobatrachus centralis</i>	Trilling Frog	LC								
<i>Neobatrachus kunapalari</i>	Kunapalari Frog	LC							X	
<i>Neobatrachus sutor</i>	Shoemaker Frog	LC								X
<i>Neobatrachus wilsmorei</i>	Plonking Frog	LC								X
<i>Notaden nichollsi</i>	Desert Spadefoot	LC		X				X		

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
<i>Platyplectrum spenceri</i>	Centralian Burrowing Frog	LC								
<i>Pseudophryne occidentalis</i>	Western Toadlet	LC						X		
Hylidae										
Tree or Water-Holding Frogs										
<i>Cyclorana maini</i>	Sheep Frog	LC		X				X	X	X
<i>Cyclorana occidentalis</i>	Water-holding Frog	LC		X				X	X	
<i>Litoria rubella</i>	Little Red Tree Frog	LC					X	X		X

Reptilia

Carphodactylidae

Knob-tailed Geckos

<i>Nephrurus laevis</i>	Smooth Knob-tail Gecko			X						
<i>Nephrurus laevisissimus</i>	Pale Knob-tail Gecko							X		
<i>Nephrurus vertebralis</i>	Midline Knob-tailed Gecko			X		X	X	X		
<i>Nephrurus wheeleri</i>	Banded Knob-tailed Gecko			X		X	X			

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Diplodactylidae										
Geckoes										
<i>Diplodactylus conspicillatus</i>	Fat-tailed Gecko			X		X		X	X	X
<i>Diplodactylus granariensis</i>	Western Stone Gecko						X	X		X
<i>Diplodactylus pulcher</i>	Western Saddled Ground Gecko			X		X	X	X		X
<i>Lucasium squarrosus</i>	Mottled Ground Gecko						X	X	X	
<i>Lucasium stenodactylus</i>	Sand-plain Gecko			X		X	X			
<i>Rhynchoedura ornata</i>	Beaked Gecko			X		X	X	X	X	X
<i>Strophurus assimilis</i>	Goldfields Spiny-tailed Gecko									
<i>Strophurus elderi</i>	Jewelled Gecko			X		X		X	X	X
<i>Strophurus strophurus</i>	Ring-tailed Gecko			X				X	X	
<i>Strophurus wellingtonae</i>	Western-shield Spiny-tailed Gecko						X	X	X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Gekkonidae										
Geckoes										
<i>Gehyra purpurascens</i>	Purple Arid Dtella			X		X			X	
<i>Gehyra variegata</i>	Variiegated Dtella			X	X	X	X	X	X	X
<i>Heteronotia binoei</i>	Bynoe's Gecko			X		X	X	X	X	X
<i>Underwoodisaurus milii</i>	Barking Gecko			X					X	
Pygopodidae										
Legless Lizards										
<i>Delma butleri</i>	Unbanded Delma							X	X	X
<i>Delma nasuta</i>	Long-nosed Delma			X		X		X	X	X
<i>Lialis burtonis</i>	Burton's Legless Lizard			X		X		X	X	
<i>Pygopus nigriceps</i>	Hooded Scaly Foot			X				X		X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Agamidae										
Dragon Lizards										
<i>Caimanops amphiboluroides</i>	Mulga Dragon						X			
<i>Ctenophorus caudicinctus</i>	Ring-tailed Dragon						X	X		X
<i>Ctenophorus cristatus</i>	Bicycle Dragon				X					
<i>Ctenophorus fordii</i>	Mallee Sand Dragon								X	
<i>Ctenophorus isolepis</i>	Military Dragon			X	X	X	X	X	X	X
<i>Ctenophorus nuchalis</i>	Central Netted Dragon			X	X	X		X	X	X
<i>Ctenophorus reticulatus</i>	Western Netted Dragon							X	X	X
<i>Ctenophorus salinarum</i>	Salt Pan Dragon			X	X	X		X	X	
<i>Ctenophorus scutulatus</i>	Lozenge-marked Bicycle Dragon			X	X	X	X	X	X	X
<i>Moloch horridus</i>	Thorny Devil			X		X		X	X	
<i>Pogona minor</i>	Western Bearded Dragon			X		X		X	X	X
<i>Tympanocryptis cephalala</i>	Pebble Dragon							X		
<i>Tympanocryptis cephalus</i>	Pebble Dragon									

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Varanidae										
Monitor's or Goanna's										
<i>Varanus brevicauda</i>	Short-tailed Pygmy Monitor			X				X	X	X
<i>Varanus caudolineatus</i>	Stripe-tailed Pygmy Monitor			X			X	X	X	X
<i>Varanus eremius</i>	Pygmy Desert Monitor			X		X	X	X		
<i>Varanus giganteus</i>	Perentie							X		
<i>Varanus gouldii</i>	Sand Monitor			X	X	X		X	X	
<i>Varanus panoptes</i>	Yellow-spotted Monitor		X	X	X	X	X	X		
<i>Varanus tristis</i>	Racehorse Monitor							X		X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Scincidae Skinks										
<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink			X		X	X		X	
<i>Cryptoblepharus plagiocephalus</i>	Fence Skink					X	X			
<i>Ctenotus ariadnae</i>	Ariadna's Ctenotus							X		X
<i>Ctenotus atlas</i>	Southern Mallee Ctenotus			X		X		X		
<i>Ctenotus brooksi</i>	Central Wedge-snout Ctenotus									
<i>Ctenotus calurus</i>	Blue-tailed Skink			X				X		X
<i>Ctenotus dux</i>	Narrow-lined Skink									
<i>Ctenotus grandis</i>	Giant Desert Ctenotus			X		X		X		X
<i>Ctenotus greeri</i>	Greer's Ctenotus								X	
<i>Ctenotus hanloni</i>	Nimble Ctenotus							X		
<i>Ctenotus helena</i>	Dusky Ctenotus			X		X		X	X	X
<i>Ctenotus leonhardii</i>	Leonhardi's Skink			X	X	X		X		X
<i>Ctenotus pantherinus</i>	Leopard Ctenotus			X		X		X	X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
<i>Ctenotus piankai</i>	Pianka's Ctenotus									
<i>Ctenotus quattuordecimlineatus</i>	Fourteen-lined Ctenotus			X				X		
<i>Ctenotus schomburgkii</i>	Barred Wedge-snout Ctenotus			X	X	X	X	X	X	X
<i>Ctenotus severus</i>	Stern Rock Ctenotus			X		X				
<i>Ctenotus uber</i>	Spotted Ctenotus				X			X		X
<i>Cyclodomorphus melanops</i>	Eastern Slender Blue-tongue									
<i>Egernia depressa</i>	Pygmy Spiny-tailed Skink			X		X		X		X
<i>Egernia formosa</i>	Goldfields Crevice Skink									
<i>Egernia inornata</i>	Desert Skink							X		
<i>Egernia striata</i>	Night Skink									
<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer			X		X		X		X
<i>Lerista bipes</i>	Western Two-toed Slider			X		X				X
<i>Lerista desertorum</i>	Giant Desert Slider			X		X	X	X	X	X
<i>Lerista kingi</i>	Common Mulch Skink			X					X	

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria> for others

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
<i>Lerista muelleri</i>	Common Mulch Skink			X		X	X			X
<i>Lerista timida</i>	Dwarf Three-toed Slider			X			X	X		X
<i>Menetia greyii</i>	Dwarf Skink			X		X	X	X	X	X
<i>Morethia butleri</i>	Woodland Dark-flecked Morethia			X				X	X	X
<i>Tiliqua multifasciata</i>	Central Blue-tongue			X		X		X	X	
<i>Tiliqua occipitalis</i>	Western Bluetongue							X	X	
Typhlopidae										
Blind Snakes										
<i>Anilius bicolor</i>	Dark-spined Blind Snake									
<i>Anilius hamatus</i>	Northern Hook-snouted Blind Snake			X			X	X	X	
<i>Anilius waitii</i>	Common Beaked Blind Snake							X		
Boidae										
Pythons, Boas										
<i>Antaresia stimsoni</i>	Stimson's Python			X				X		

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Elapidae Elapid Snakes										
<i>Brachyuropis fasciolata</i>	Narrow-banded Shovel-nosed Snake							X		
<i>Brachyuropis semifasciata</i>	Southern Shovel-nosed Snake			X				X		
<i>Demansia psammophis</i>	Yellow-faced Whipsnake									X
<i>Furina ornata</i>	Moon Snake			X				X	X	
<i>Parasuta monachus</i>	Monk Snake			X		X	X	X		X
<i>Pseudechis australis</i>	Mulga Snake							X	X	
<i>Pseudechis butleri</i>	Spotted Mulga Snake									
<i>Pseudonaja mengdeni</i>	Western Brown Snake									
<i>Pseudonaja modesta</i>	Ringed Brown Snake						X	X		X
<i>Simoselaps bertholdi</i>	Jan's Banded Snake			X			X	X	X	X
<i>Suta fasciata</i>	Rosen's Snake							X		

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Aves										
Casuariidae										
Emus, Cassowaries										
<i>Dromaius novaehollandiae</i>	Emu	LC	X	X	X	X	X	X	X	X
Accipitridae										
Kites, Goshawks, Eagles, Harriers										
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk	LC		X		X	X	X		X
<i>Accipiter fasciatus</i>	Brown Goshawk	LC		X				X		X
<i>Aquila audax</i>	Wedge-tailed Eagle	LC			X	X	X	X	X	X
<i>Aquila morphnoides</i>	Little Eagle	LC			X	X		X	X	
<i>Circus assimilis</i>	Spotted Harrier	LC							X	X
<i>Elanus caeruleus</i>	Black-shouldered Kite	LC		X	X	X		X		X
<i>Haliastur sphenurus</i>	Whistling Kite	LC		X				X		X
<i>Hamirostra isura</i>	Square-tailed Kite	LC								
<i>Hamirostra melanosternon</i>	Black-breasted Buzzard	LC		X			X	X		
<i>Milvus migrans</i>	Black Kite	LC		X		X				

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Falconidae										
Falcon										
<i>Falco berigora</i>	Brown Falcon	LC		X	X	X	X	X	X	X
<i>Falco cenchroides</i>	Australian Kestrel	LC		X	X	X	X	X	X	X
<i>Falco hypoleucos</i>	Grey Falcon	P4 VU								X
<i>Falco longipennis</i>	Australian Hobby	LC		X		X		X	X	X
<i>Falco peregrinus</i>	Peregrine Falcon	S7 LC		X			X			X
Otididae										
Bustards										
<i>Ardeotis australis</i>	Australian Bustard	LC		X			X	X	X	X
Turnicidae										
Button-quails										
<i>Turnix velox</i>	Little Button-quail	LC					X	X		X
Burhinidae										
Stone Curlews										
<i>Burhinus grallarius</i>	Bush Stone-curlew	LC		X		X				

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Charadriidae										
Lapwings, Plovers, Dotterels										
<i>Vanellus tricolor</i>	Banded Lapwing	LC		X				X	X	X
Columbidae										
Pigeons, Doves										
<i>Geopelia cuneata</i>	Diamond Dove	LC		X	X	X	X	X	X	X
<i>Ocyphaps lophotes</i>	Crested Pigeon	LC	X	X	X	X	X	X	X	X
<i>Phaps chalcoptera</i>	Common Bronzewing	LC		X	X	X	X	X	X	X
Psittacidae										
Parrots										
<i>Cacatua roseicapilla</i>	Galah	LC		X	X	X	X	X	X	X
<i>Cacatua sanguinea</i>	Little Corella	LC		X		X				
<i>Melopsittacus undulatus</i>	Budgerigar	LC		X	X	X	X	X	X	X
<i>Neophema bourkii</i>	Bourke's Parrot	LC			X		X	X	X	
<i>Nymphicus hollandicus</i>	Cockatiel	LC		X	X	X			X	X
<i>Platycercus varius</i>	Mulga Parrot	LC	X	X	X	X	X	X	X	X
<i>Platycercus zonarius</i>	Australian Ringneck	LC	X	X	X	X	X	X	X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Cuculidae										
Parasitic Cuckoos										
<i>Chrysococcyx basalis</i>	Horsfield's Bronze Cuckoo	LC		X	X			X	X	X
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	LC			X		X	X		X
<i>Cuculus pallidus</i>	Pallid Cuckoo	LC		X	X			X	X	
Strigidae										
Hawk Owls										
<i>Ninox novaeseelandiae</i>	Boobook Owl	LC								
Tytonidae										
Barn Owls										
<i>Tyto alba</i>	Eastern Barn Owl	LC		X						
Podargidae										
Frogmouths										
<i>Podargus strigoides</i>	Tawny Frogmouth	LC		X	X	X			X	
Caprimulgidae										
Nightjars										
<i>Eurostopodus argus</i>	Spotted Nightjar	LC		X	X	X				X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria> for others

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Aegothelidae										
Owlet-nightjars										
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar	LC		X		X	X	X	X	X
Halcyonidae										
Tree Kingfishers										
<i>Todiramphus pyrrhopygia</i>	Red-backed Kingfisher	LC			X		X		X	
Meropidae										
Bee-eaters										
<i>Merops ornatus</i>	Rainbow Bee-eater	JA LC						X		X
Climacteridae										
Trecreepers										
<i>Climacteris affinis</i>	White-browed Trecreeper	LC			X			X	X	
Maluridae										
Fairy Wrens, GrassWrens										
<i>Malurus lamberti</i>	Variiegated Fairy-wren	LC		X	X	X		X	X	X
<i>Malurus leucopterus</i>	White-winged Fairy-wren	LC		X	X	X		X	X	X
<i>Malurus splendens</i>	Splendid Fairy-wren	LC		X	X	X	X	X		X
<i>Stipiturus ruficeps</i>	Rufous-crowned Emu-wren	LC		X				X		

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria> for others

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Acanthizidae										
Thornbills, Geryones, Fieldwrens & Whitefaces										
<i>Acanthiza apicalis</i>	Broad-tailed Thornbill	LC		X	X		X	X	X	X
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	LC		X	X		X	X	X	X
<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill	LC		X	X	X	X	X		X
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill	LC			X	X	X	X	X	X
<i>Aphelocephala leucopsis</i>	Southern Whiteface	LC			X		X	X	X	X
<i>Calamanthus campestris</i>	Rufous Fieldwren	LC		X				X		
<i>Gerygone fusca</i>	Western Gerygone	LC		X				X		X
<i>Pyrholaemus brunneus</i>	Redthroat	LC		X	X	X	X	X		
<i>Smicronnis brevirostris</i>	Weebill	LC		X		X	X	X	X	X
Pardalotidae										
Pardalotes										
<i>Pardalotus rubricatus</i>	Red-browed Pardalote	LC								
<i>Pardalotus striatus</i>	Striated Pardalote	LC						X	X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Meliphagidae Honeyeaters, Chats										
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater	LC			X	X	X	X	X	X
<i>Certhionyx niger</i>	Black Honeyeater	LC						X	X	
<i>Certhionyx variegatus</i>	Pied Honeyeater	LC		X	X			X	X	X
<i>Epthianura aurifrons</i>	Orange Chat	LC		X						
<i>Epthianura tricolor</i>	Crimson Chat	LC		X	X	X	X	X	X	X
<i>Lichenostomus keartlandi</i>	Grey-headed Honeyeater	LC				X				
<i>Lichenostomus leucotis</i>	White-eared Honeyeater	LC								
<i>Lichenostomus ornatus</i>	Yellow-plumed Honeyeater	LC				X				
<i>Lichenostomus penicillatus</i>	White-plumed Honeyeater	LC		X		X		X		
<i>Lichenostomus plumulus</i>	Grey-fronted Honeyeater	LC		X	X	X		X	X	
<i>Lichenostomus virescens</i>	Singing Honeyeater	LC		X	X	X	X	X	X	
<i>Lichmera indistincta</i>	Brown Honeyeater	LC		X		X		X	X	X
<i>Manorina flavigula</i>	Yellow-throated Miner	LC		X	X	X	X	X	X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
<i>Phylidonyris albifrons</i>	White-fronted Honeyeater	LC		X	X			X	X	
Petroicidae Australian Robins										
<i>Microeca fascinans</i>	Jacky Winter	LC							X	
<i>Petroica cucullata</i>	Hooded Robin	LC			X		X	X	X	
<i>Petroica goodenovii</i>	Red-capped Robin	LC	X	X	X	X	X	X	X	X
Pomatostomidae Babblers										
<i>Pomatostomus superciliosus</i>	White-browed Babbler	LC		X	X	X	X	X	X	
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	LC		X	X		X	X		X
Cinclosomatidae Whipbirds, Wedgebills, Quail Thrushes										
<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush	LC			X		X	X		X
<i>Cinclosoma castanotus</i>	Chestnut Quail-thrush	LC		X		X		X		
<i>Psophodes occidentalis</i>	Chiming Wedgebill	LC		X		X				

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Neosittidae										
Sitellas										
<i>Daphoenositta chrysoptera</i>	Varied Sittella	LC			X		X	X		
Pachycephalidae										
Crested Shrike-tit, Crested Bellbird, Shrike Thrushes, Whistlers										
<i>Colluricincla harmonica</i>	Grey Shrike-thrush	LC		X	X	X	X	X	X	X
<i>Oreoica gutturalis</i>	Crested Bellbird	LC		X	X	X	X	X	X	X
<i>Pachycephala rufiventris</i>	Rufous Whistler	LC		X	X	X	X	X	X	X
Dicruridae										
Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo										
<i>Grallina cyanoleuca</i>	Magpie-lark	LC		X	X	X	X	X	X	X
<i>Rhipidura fuliginosa</i>	Grey Fantail	LC								
<i>Rhipidura leucophrys</i>	Willie Wagtail	LC		X	X	X	X	X	X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Campephagidae										
Cuckoo-shrikes, Trillers										
<i>Coracina maxima</i>	Ground Cuckoo-shrike	LC		X			X	X	X	
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	LC	X	X	X	X	X	X	X	X
<i>Lalage tricolor</i>	White-winged Triller	LC		X	X	X	X	X	X	X
Artamidae										
Woodswallows, Butcherbirds, Currawongs										
<i>Artamus cinereus</i>	Black-faced Woodswallow	LC		X	X	X	X	X	X	X
<i>Artamus minor</i>	Little Woodswallow	LC					X	X		
<i>Artamus personatus</i>	Masked Woodswallow	LC		X	X		X	X	X	X
Cracticidae										
Currawongs, Magpies & Butcherbirds										
<i>Cracticus nigrogularis</i>	Pied Butcherbird	LC		X	X	X	X	X	X	X
<i>Cracticus tibicen</i>	Australian Magpie	LC		X	X	X	X	X	X	X
<i>Cracticus torquatus</i>	Grey Butcherbird	LC		X	X	X	X	X	X	X
<i>Strepera versicolor</i>	Grey Currawong	LC					X	X	X	

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Corvidae Ravens, Crows										
<i>Corvus bennetti</i>	Little Crow	LC		X		X	X	X	X	X
<i>Corvus orru</i>	Torresian Crow	LC		X	X		X	X		X
Ptilonorhynchidae Bowerbirds										
<i>Ptilonorhynchus maculatus</i>	Western Bowerbird	LC		X	X	X	X	X		X
Motacillidae Old World Pipits, Wagtails										
<i>Anthus australis</i>	Australian Pipit	LC	X	X	X	X	X	X	X	X
Estrilidae Grass Finches & Mannikins										
<i>Taeniopygia guttata</i>	Zebra Finch	LC		X	X	X	X	X	X	X
Dicaeidae Flowerpeckers										
<i>Dicaeum hirundinaceum</i>	Mistletoebird	LC					X		X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Hirundinidae										
Swallows, Martins										
<i>Cheramoeca leucosternus</i>	White-backed Swallow	LC		X		X	X	X	X	
<i>Hirundo ariel</i>	Fairy Martin	LC						X		
<i>Hirundo neoxena</i>	Welcome Swallow	LC		X	X	X	X	X		X
<i>Hirundo nigricans</i>	Tree Martin	LC		X				X	X	
Sylviidae										
Old World Warblers										
<i>Cincloramphus cruralis</i>	Brown Songlark	LC		X				X	X	
<i>Cincloramphus mathewsi</i>	Rufous Songlark	LC						X	X	
<i>Eremiornis carteri</i>	Spinifex-bird	LC		X						
Zosteropidae										
White-eyes										
<i>Zosterops lateralis</i>	Silvereye	LC								
Mammalia										
Tachyglossidae										
Echidnas										
<i>Tachyglossus aculeatus</i>	Echidna	LC		X	X	X	X	X	X	

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Dasyuridae										
Carnivorous Marsupials										
<i>Antechinomys laniger</i>	Kultarr	LC					X	X		
<i>Dasyercus blythi</i>	Brush-tailed Mulgara	P4 LC		X			X	X		X
<i>Ningai ridei</i>	Wongai Ningai	LC		X		X	X	X	X	X
<i>Pseudantechinus woolleyae</i>	Woolley's Pseudantechinus	LC					X	X		X
<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart	LC		X				X	X	
<i>Sminthopsis dolichura</i>	Little long-tailed Dunnart	LC					X	X		X
<i>Sminthopsis hirtipes</i>	Hairy-footed Dunnart	LC						X	X	
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart	LC		X		X	X	X	X	X
<i>Sminthopsis ooldea</i>	Ooldea Dunnart	LC		X		X		X	X	X
Macropodidae										
Kangaroos, Wallabies										
<i>Macropus robustus</i>	Euro	LC		X	X	X	X	X	X	X
<i>Macropus rufus</i>	Red Kangaroo	LC	X	X	X	X	X	X	X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Emballonuridae										
Sheath-tailed Bats										
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	LC						X		
<i>Taphozous hilli</i>	Hill's Sheathtail-bat	LC		X	X	X	X	X		
Molossidae										
Freetail Bats										
<i>Austronomus australis</i>	White-striped Freetail-bat	LC		X		X		X	X	
<i>Mormopterus beccarii</i>	Beccari's Freetail-bat	LC					X			
<i>Ozimops petersi</i>	Inland Freetail-bat	LC		X	X	X	X	X	X	
Vespertilionidae										
Ordinary Bats										
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	LC		X	X	X	X	X	X	X
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat	LC		X		X	X	X	X	X
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat	LC		X		X	X	X	X	X
<i>Vespadelus baverstocki</i>	Inland Forest Bat	LC						X		
<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat	LC		X	X	X	X	X		
<i>Vespadelus regulus</i>	Southern Forest Bat	LC						X		

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Muridae										
Rats, Mice										
<i>Mus musculus</i>	House Mouse	Introduced		X		X	X	X	X	X
<i>Notomys alexis</i>	Spinifex Hopping-mouse	LC		X		X	X	X	X	
<i>Pseudomys bolami</i>	Bolam's Mouse	LC						X		
<i>Pseudomys desertor</i>	Desert Mouse	LC		X		X		X		X
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	LC		X		X	X	X	X	X
Canidae										
Dogs, Foxes										
<i>Canis lupus</i>	Dog/Dingo	Introduced		X	X	X	X	X		
<i>Vulpes vulpes</i>	Red Fox	Introduced		X		X			X	
Felidae										
Cats										
<i>Felis catus</i>	Cat	Introduced		X	X	X	X		X	X

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>

Class Family Species	Common Name	Conservation Status	Botanica 2020	Engenium 2015	Harewood 2015	Outback 2009	Ninox 2007	Biota 2017	Hall et al. 1994	DBCA 2020
Bovidae										
Horned Ruminants										
<i>Bos taurus</i>	European Cattle	Introduced		X	X	X	X	X		
<i>Capra hircus</i>	Goat	Introduced			X			X		
Camelidae										
Camels										
<i>Camelus dromedarius</i>	Camel	Introduced			X		X	X	X	
Leporidae										
Rabbits, Hares										
<i>Oryctolagus cuniculus</i>	Rabbit	Introduced		X	X	X	X	X	X	

BC Act Status - S1 to S7, EPBC Act Status - CR - Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, Mig = Migratory, DBCA Priority Status - P1 to P4, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, IUCN Red List Category Definitions - LC =Least Concern, see Appendix A and <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria-for-others>