

YILGARN STAR FLORA, VEGETATION AND FAUNA SURVEY

PREPARED FOR BARTO GOLD MINING PTY LTD | MARCH 2021

We design with community in mind

Revision Schedule

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
0.1	14/06/2021	Draft issued for review	GF CK JM	JM	AB	AB
1.0	30/06/21	Client comment addressed	GF	SP	AB	AB
1.2	06/07/21	Report finalised	GF	SP	AB	AB



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STATUS Final | Project No 300003290



Executive Summary

Barto Gold Mining Pty Ltd propose to develop the Yilgarn Star project area (the Survey Area) located within the Southern Cross Operations as part of their Life of Mines project. The Survey Area is approximately 828 hectares and is located 45 kilometres south-east of Southern Cross in the Eastern Goldfields region of Western Australia.

The objective of the Survey was to understand the flora, vegetation and fauna values of the Survey Area, to inform environmental approvals for the Project. The field work for the Survey was undertaken in April and October of 2020, and March of 2021 (Trip 1, Trip 2 and Trip 3 respectively). A significant rainfall event in February 2020 contributed to above-average rainfall in the three months preceding Trip 1. The survey methods comprising the establishment of quadrats, habitat assessments, mapping notes, targeted searches, opportunistic collections of flora, motion-sensing cameras, and opportunistic recording of fauna. Survey effort consisted of 13 quadrats and habitat assessments, one relevé, three mapping notes, and three motion-sensing cameras.

Floristic diversity and composition are considered typical of the Southern Cross subregion and largely consistent with previous surveys undertaken in close proximity to the Survey Area. A total of 74 vascular flora species from 29 families and 50 genera were recorded within the Survey Area. The most represented families were *Fabaceae* and *Myrtaceae*; and *Eucalyptus*, *Acacia*, and *Eremophila* were the most dominant genera. A single State-listed priority flora species, *Acacia asepala* (P2) was recorded during the Survey. *Acacia asepala* is not restricted to the Survey Area, and numerous populations are recorded outside of the Survey Area. A further four significant flora species are considered 'possible' to occur based on the post-survey likelihood of occurrence assessment; *Goodenia heatheriana* (P1), *Acacia concolorans* (P2) and *Notisia intonsa* (P3), and *Acacia merrickiae* (P4). These species were either inconspicuous and low-growing or annuals that may not have been detected during the survey, despite targeted searches.

There were four vegetation types identified in the Survey Area EIEsuMpEaEsAv, EsuEIEsMpSaEaAmAv, EIEcEyAmEiiAbEaDs and EcAaaEaMsAbAl. The vegetation in the Survey Area was broadly represented by a woodland comprised primarily of *Eucalyptus longicornis* and *Eucalyptus salubris* over *Melaleuca pauperiflora* tall open shrubland over an open shrubland to scattered shrubs over low open shrubland of mixed species. The most dominant vegetation type was EIEsuMpEaEsAv (489.96 ha), which occupied just under 60% of the Survey Area. Vegetation was not considered analogous with any Commonwealth or State listed Threatened Ecological Communities. The Survey Area is partially coincident with an area mapped as the 'Parker Range vegetation complexes' Priority Ecological Community (Priority 3), as listed in the Biodiversity Conservation Act, 2016. One vegetation type, EsuEIEsMpSaEaAmAv, was considered analogous with this PEC, showing affinities to Parker Range Community Type 3

Vegetation condition within the Survey Area ranged from 'Excellent' to 'Completely Degraded', with the majority in 'Excellent' condition (approximately 76%). Disturbances noted include historical mining, exploration-related activities and the resultant presence of access tracks. Four introduced vascular flora species were identified throughout the field surveys. None of these species represents a declared pest under Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) or are listed as a Weed of National Significance (WoNS).

Two fauna habitats, *Eucalyptus* Woodlands and *Eucalyptus* Stony Rise, were described and delineated for the Survey Area and are considered important for species of significance. *Eucalyptus* Woodlands contain large hollow-bearing trees that may provide nesting habitat for the Western Rosella (inland pop.) (P4) and the Peregrine Falcon (OS), additionally logs may provide denning habitat for the Chuditch. The *Eucalyptus* Stony Rise habitat contains moderate levels of leaf litter and scattered woody debris. Part of the stony rise contains rocky outcroppings which may provide shelter for fauna such as chuditch. *Eucalyptus* woodlands and *Eucalyptus* Stony Rise would also support a range of other significant species considered likely to occur in the Survey Area owing to the abundance of debris, shelter and foraging suitability.

No significant fauna species were recorded during the current field survey within the Survey Area. However, additional field surveys completed for the greater Life of Mines project identified the presence of significant fauna species in the vicinity of the survey area. Given this, and the presence of preferential habitat in the Survey Area, seven significant fauna species were considered 'likely' to occur. These were the Chuditch (*Dasyurus geoffroii*) (Vu, Vu), Western Brush Wallaby (*Notamacropus irma*) (P4), Malleefowl (*Leipoa ocellata*) (Vu, Vu), Western



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YILGARN STAR FLORA, VEGETATION AND FAUNA SURVEY

Rosella (*Platycercus icterotis xanthogenys*) (P4), Peregrine Falcon (*Falco peregrinus*) (OS), Woma Python (southwest pop) (*Aspidites ramsayi*) (P1) and the Tree-stem trapdoor spider (*Aganippe castellum*) (P4). One species, the Lake Cronin Snake (*Paroplocephalus atriceps*) (Priority 3) was considered to possibly occur.



Table of Contents

EXECUTIVE SUMMARY	I
1.0 INTRODUCTION.....	1
1.1 PROJECT BACKGROUND AND LOCATION.....	1
1.2 SCOPE AND OBJECTIVES	3
2.0 EXISTING ENVIRONMENT	7
2.1 BIOGEOGRAPHICAL LOCATION.....	7
2.2 LAND SYSTEMS.....	9
2.3 PRE-EUROPEAN VEGETATION	11
2.4 CLIMATE.....	13
2.5 SURFACE GEOLOGY AND SOILS.....	13
2.6 SURFACE WATER AND HYROLOGY	13
2.7 CONSERVATION RESERVES AND ENVIRONMENTALLY SENSITIVE AREAS.....	14
3.0 DESKTOP ASSESSMENT.....	15
3.1 METHODS	15
3.1.1 Database Searches.....	15
3.1.2 Literature Review	15
3.1.3 Likelihood of Occurrence.....	22
3.2 RESULTS.....	23
3.2.1 Flora.....	23
3.2.2 Vegetation.....	23
3.2.3 Terrestrial Fauna.....	25
4.0 FIELD SURVEY METHODS.....	26
4.1 FLORA AND VEGETATION SURVEY.....	26
4.1.1 Survey Timing	26
4.1.2 Survey Team and Licensing.....	27
4.1.3 Flora and Vegetation Assessment.....	28
4.1.4 Vegetation Type and Condition Mapping.....	29
4.1.5 Targeted Flora survey	29
4.1.6 Opportunistic Records.....	29
4.2 FAUNA SURVEY	29
4.2.1 Terrestrial Fauna Habitat Assessment	29
4.2.2 Opportunistic Records.....	30
4.2.3 Motion-sensing Cameras	30
4.3 TAXONOMY AND NOMENCLATURE	30
5.0 RESULTS AND DISCUSSION.....	32
5.1 FLORA	32
5.1.1 Floristic Composition.....	32
5.1.2 Flora of Significance.....	32
5.1.3 Flora of Other Significance.....	35
5.1.4 Post-Survey Likelihood of Occurrence	35
5.1.5 Introduced Flora.....	35
5.2 VEGETATION	36



5.2.1	Vegetation of Significance.....	41
5.2.2	Vegetation Condition.....	41
5.3	FAUNA.....	43
5.3.1	Fauna Habitats.....	43
5.3.2	Fauna Assemblages.....	46
5.3.3	Fauna of Significance.....	47
5.4	SURVEY LIMITATIONS AND CONSTRAINTS.....	50
	SUMMARY.....	52
6.0	ASSESSMENT AGAINST THE 10 NATIVE VEGETATION CLEARING PRINCIPLES.....	53
7.0	REFERENCES.....	57

LIST OF TABLES

Table 2-1	Extent of land systems within the Survey Area.....	9
Table 2-2:	Extent of pre-European vegetation associations remaining across four scales (State, Bioregion, and Subregion) and within the Survey Area. Vegetation system associations described by Shepherd et al (2002) correspond with that of Beard (1975a).....	11
Table 3-1	Database searches conducted for the desktop assessment.....	15
Table 3-2:	Summary of flora and vegetation surveys in the vicinity of the Survey Area.....	16
Table 3-3:	Summary of vertebrate fauna surveys in the vicinity of the Survey Area.....	20
Table 3-4:	Criteria for assessing the likely presence of significant flora and fauna.....	22
Table 3-5:	Fauna of significance identified during the desktop assessment.....	25
Table 4-1	Survey team and licensing.....	27
Table 4-2	Sampling effort within the Survey Area.....	28
Table 4-3	Summary of data recorded at each quadrat and relevé.....	29
Table 4-4:	Summary of data collected at each fauna habitat assessment site.....	30
Table 4-5:	Motion-sensing camera survey effort within the Study Area.....	30
Table 5-1:	Most represented vascular plant families and genera for the Survey Area.....	32
Table 5-2:	Introduced flora taxa identified in the Survey Area.....	35
Table 5-3:	Summary of vegetation types recorded within the Survey Area.....	38
Table 5-4:	Vegetation condition recorded in the Survey Area.....	41
Table 5-5	Vegetation condition recorded in the Survey Area.....	41
Table 5-6:	Fauna habitats recorded within the Survey Area.....	44
Table 5-7:	Vertebrate fauna species recorded in the vicinity of the Survey Area.....	46
Table 5-8:	Potential limitations and constraints of the field survey.....	50
Table 6-1:	Assessment of the proposed clearing of native vegetation within the Survey Area against the 10 Clearing Principles.....	54

LIST OF FIGURES

Figure 1-1	Regional location of the Survey Area.....	5
Figure 1-2	Survey Area locality.....	6
Figure 2-1	Survey Area in relation to IBRA bioregion and subregion.....	8
Figure 2-2	Land systems of the Survey Area.....	10
Figure 2-3	Pre-European vegetation associations mapped within the Survey Area.....	12
Figure 2-4	Long-term (1996 – 2021) rainfall (mm) and temperature (°C) data recorded at the Southern Cross Airfield weather station (station 12320).....	13



Figure 3-1: Threatened and Priority Ecological Communities mapped for the Survey Area.....	24
Figure 4-1 Long term (1996 to 2021) mean monthly rainfall (mm) at Southern Cross Airfield weather station and actual monthly rainfall (mm) in the 12 months preceding the field surveys (BoM 2021).....	27
Figure 4-2: Survey effort	31
Figure 5-1: Location of priority flora recorded in the Survey Area.....	34
Figure 5-2: Vegetation type mapping for the Survey Area.....	40
Figure 5-3: Vegetation condition mapping of the Survey Area.....	42
Figure 5-4: Fauna habitats in the Survey Area	45
Figure 5-5: Significant fauna recorded in the area.....	49

LIST OF APPENDICES

APPENDIX A	CODES AND TERMS USED TO DESCRIBE SPECIES OF SIGNIFICANCE.....	A.1
APPENDIX B	VEGETATION CONDITION SCALE FOR THE SOUTH WEST AND INTERZONE BOTANICAL PROVINCES (KEIGHERY 1994, EPA 2016A)	B.7
APPENDIX C	NVIS VEGETATION STRUCTURAL CLASSIFICATION.....	C.9
APPENDIX D	LIKELIHOOD OF OCCURRENCE OF SIGNIFICANT FLORA IN THE SURVEY AREA	D.11
APPENDIX E	FLORA QUADRATS AND RELEVÉS	1
APPENDIX F	INVENTORY OF VASCULAR FLORA RECORDED	F.1
APPENDIX G	VERTEBRATE FAUNA IDENTIFIED IN THE DESKTOP ASSESSMENT.....	G.1
APPENDIX H	LIKELIHOOD OF OCCURRENCE OF SIGNIFICANT FAUNA IN THE SURVEY AREA	H.10



1.0 INTRODUCTION

1.1 PROJECT BACKGROUND AND LOCATION

The Barto Gold Mining Pty Ltd (Barto) Life of Mines project (the Project) encompasses a number of potential project areas within Barto's Southern Cross Operations, located in the Eastern Goldfields region of Western Australia (**Figure 1-1**). As part of the planning process for the Project, Barto are currently assessing the Yilgarn Star project area (Survey

Area), which is located approximately 45 kilometres (km) south-east of Southern Cross (Figure 1-2

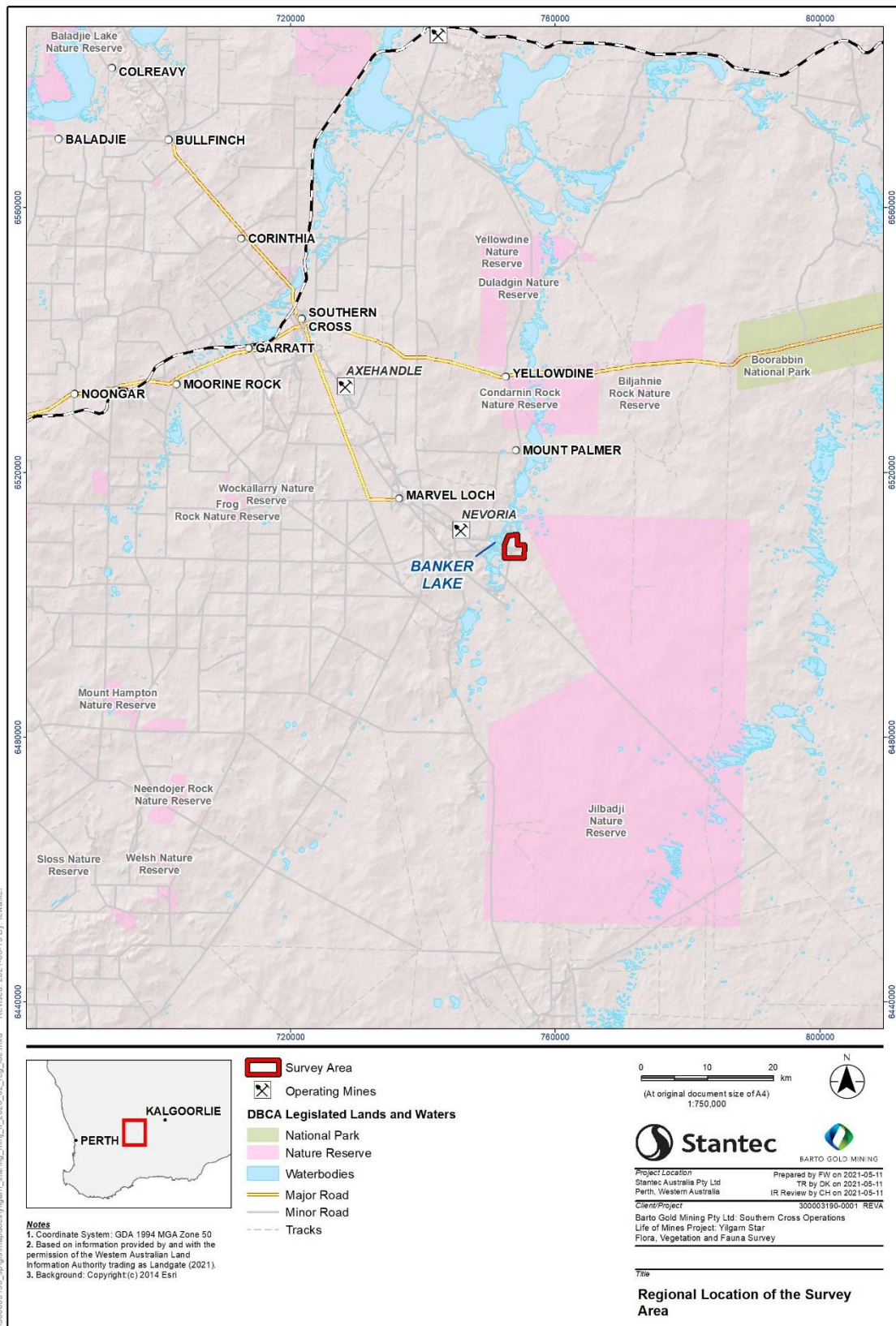


Figure 1-2). Stantec Australia Pty Ltd (Stantec) was commissioned by Barto to undertake a flora, vegetation and fauna survey with targeted significant flora and fauna searches (the Survey) for the Project, of which the Survey Area is a component, to inform future approvals for the Project. The Survey Area is 828.48 hectares (ha) in size, with approximately 689.32 ha of this area comprising native vegetation.

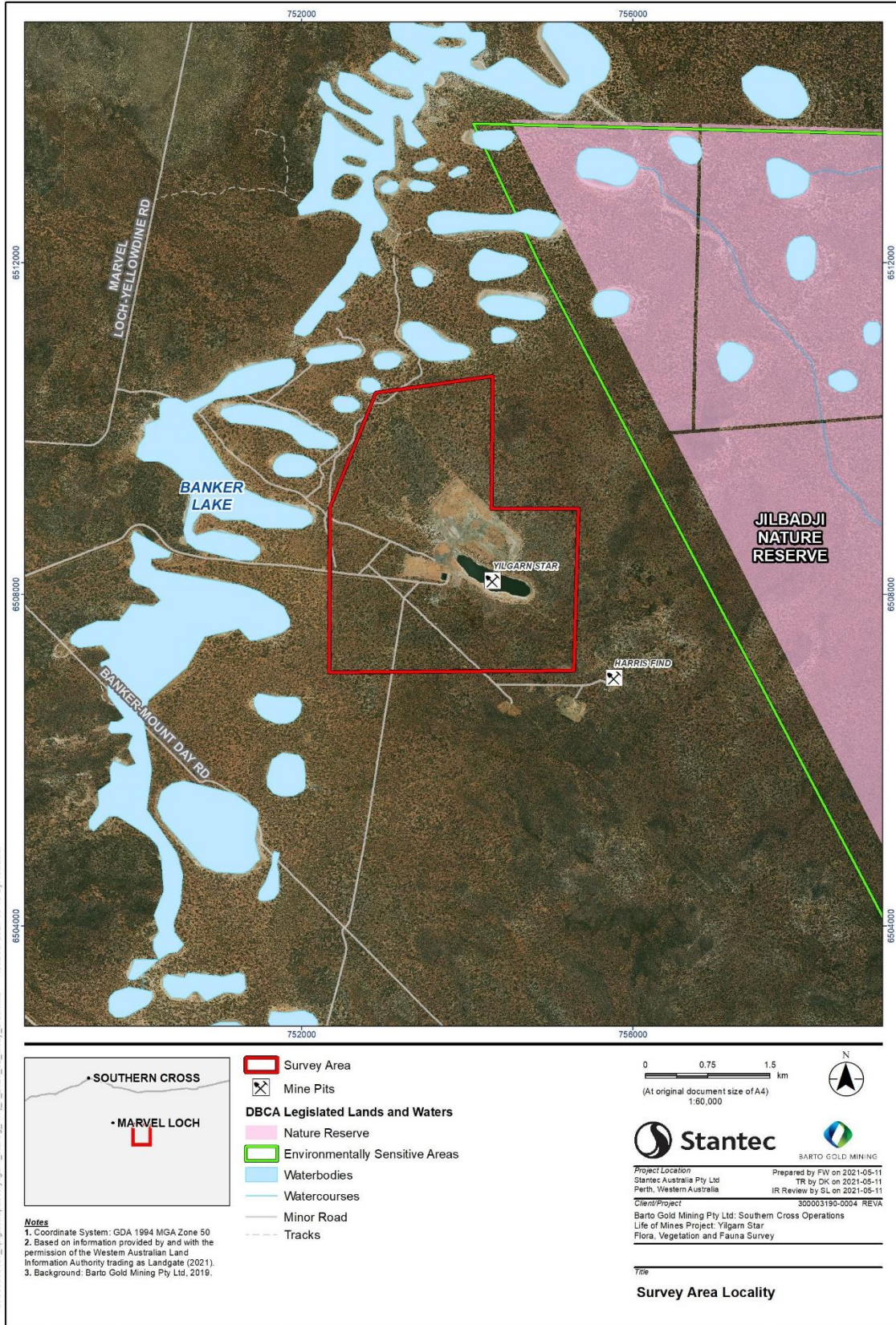
1.2 SCOPE AND OBJECTIVES

The objective was to assess the flora, vegetation and fauna values of the Survey Area through a desktop assessment and field survey. The scope of works was to:

- conduct a desktop assessment prior to the Survey, including database searches and literature review of available contextual and project related resources;
- undertake a detailed flora and vegetation survey and basic fauna survey to:
 - describe and map vegetation communities, vegetation condition and fauna habitat types; and
 - develop a list of flora and fauna species recorded within the Survey Area.
- conduct targeted searches for flora, vegetation communities and fauna of significance, including species and communities of local and regional significance that may not be listed on government databases;
- assess the survey findings in a local and regional context, by comparing the results with available data from other localities within the bioregion; and
- assess the project against the Department of Environment Regulation (now Department of Water and Environment Regulation) Native Vegetation Clearing Principles.

The objectives and methods adopted for these surveys are aligned with the following relevant State and Commonwealth guidance:

- EPA Technical Guide (2016), Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b)
- Environmental Protection Authority (EPA) (2016), Environmental Factor Guideline: Flora and Vegetation (EPA 2016d);
- EPA Technical Guide (2020), Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (DotE 2020);
- EPA Factor Guideline (2016), Environmental Factor Guideline: Terrestrial Fauna (EPA 2016a);
- EPA Factor Guideline (2016), Sampling Methods for Terrestrial Vertebrate Fauna (DPaW 2016); and
- Department of the Environment (2013), Matters of National Environmental Significance - significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (DotE 2013).



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Figure 1-1 Regional location of the Survey Area

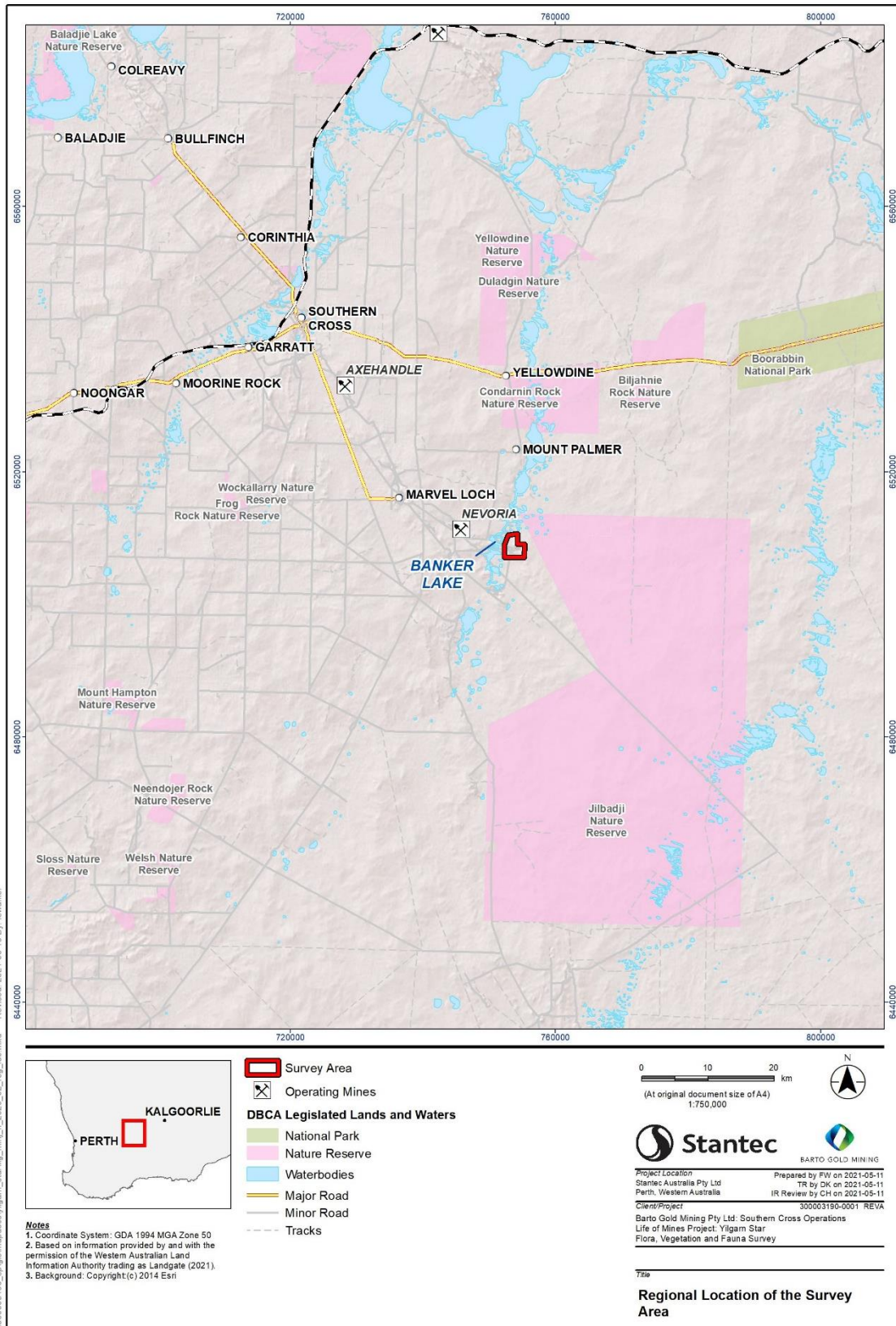


Figure 1-2 Survey Area locality

2.0 EXISTING ENVIRONMENT

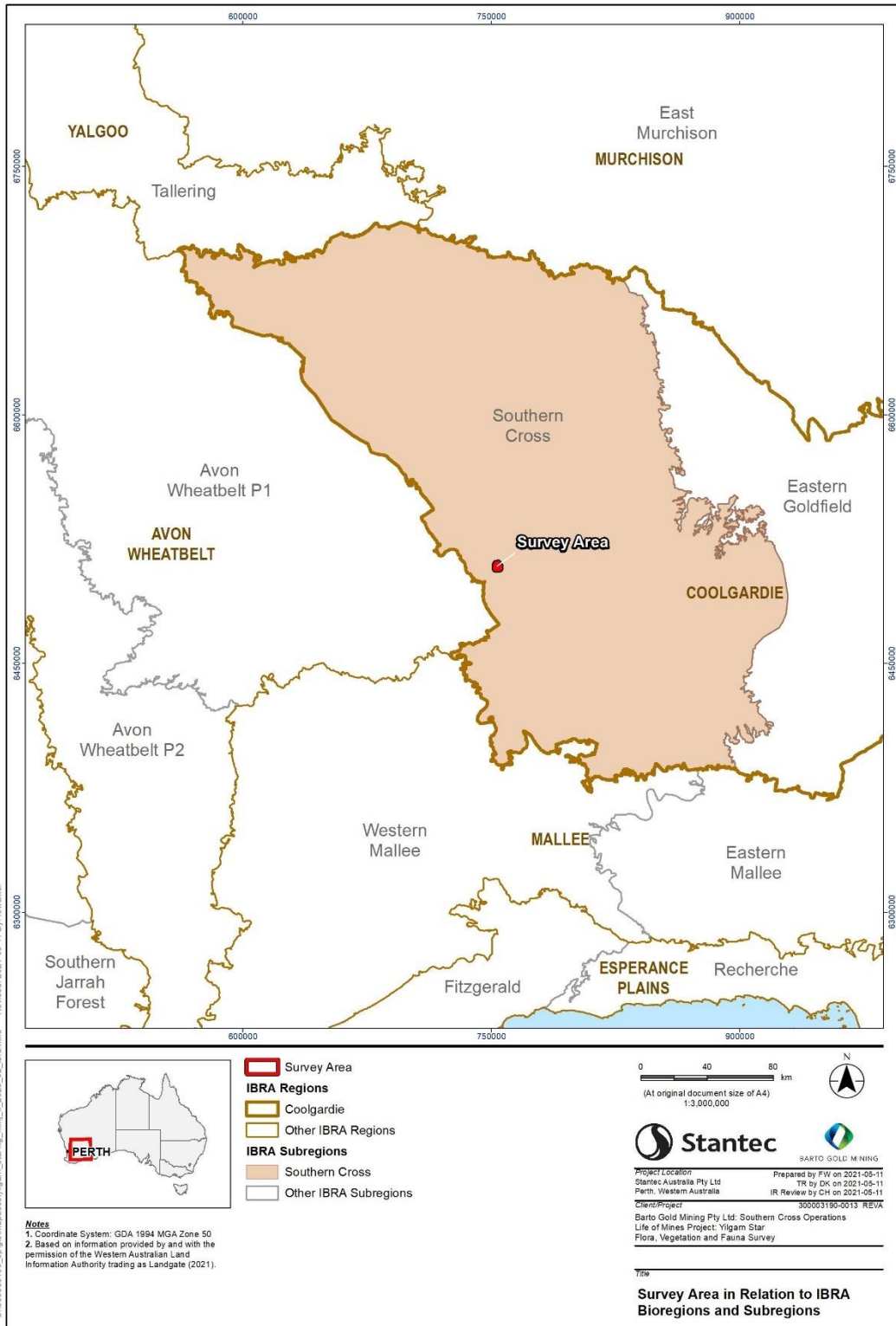
2.1 BIOGEOGRAPHICAL LOCATION

The Interim Biogeographic Regionalisation for Australia (IBRA) is a bioregional framework that divides Australia into 89 biogeographic regions and 419 subregions on the basis of climate, geology, landforms, vegetation, and fauna (Thackway and Cresswell 1995). It was developed through collaboration between state and territory conservation agencies with coordination by the Commonwealth Department of the Environment, Water, Heritage and the Arts (now the Commonwealth Department of Agriculture, Water and the Environment; DoAWE). The bioregions and subregions are the reporting unit for the systematic development of a comprehensive, adequate, and representative National Reserve System.

The Survey Area occurs entirely within the Southern Cross (COO2) subregion of the Coolgardie bioregion and borders the Avon Wheatbelt (AW01) subregion of the Avon Wheatbelt bioregion (Figure 2-1) (Adams *et al.* 1988, Cowan *et al.* 2001). The COO2 subregion is described as having subdued relief, comprising gently undulating uplands dissected by broad valleys with bands of low greenstone hills. The valleys include chains of saline playalakes. Diverse *Eucalyptus* Woodlands (*E. salmonophloia*, *E. salubris*, *E. transcontinentalis* and *E. longicornis*), rich in endemic species occur around these salt lakes, as well as on the low greenstone hills, valley alluvials and broad plains of calcareous earths (Cowan *et al.* 2001).

Dwarf shrublands of samphire are associated with salt lakes within the COO2 subregion. Granite basement outcrops occur at mid-levels in the landscape and support swards of *Borya constricta* with stands of *Acacia acuminata* and *Eucalyptus loxophleba*. The yellow sandplains, gravelly sandplains and lateritic breakaways of the uplands support mallees (*E. leptopoda*, *E. platycorys* and *E. scyphocalyx*) and scrub-heaths (*Allocasuarina corniculata*, *Callitris preissii*, *Melaleuca uncinata* and *Acacia beauverdiana*) (Cowan *et al.* 2001).

Rare vertebrate fauna that may occur include species such as the Chuditch (*Dasyurus geoffroii*), Slender-Billed Thornbill (*Acanthiza iredalei*), Carnaby's Cockatoo (*Calyptorhynchus latirostris*), Malleefowl (*Leipoa ocellata*), Carpet Python (*Morelia spilota imbricata*), Major Mitchell's Cockatoo (*Cacatua leadbeateri*), and Red-tailed Black Cockatoo (*Calyptorhynchus banksii*) (Cowan *et al.* 2001).



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Figure 2-1 Survey Area in relation to IBRA bioregion and subregion

2.2 LAND SYSTEMS

Land systems are defined as an area or group of areas throughout which there is a recurring pattern of topography, soils and vegetation (Tille 2006a). An assessment of land systems provides an indication of the occurrence and distribution of vegetation types within and surrounding the Survey Area (Purdie *et al.* 2004). Land systems across the Goldfields have been mapped by the Natural Resources Assessment Group of the Department of Primary Industries and Regional Development (formerly the Department of Agriculture and Food; DAFWA), providing a comprehensive description of biophysical resources (Purdie *et al.* 2004). The Survey Area occurs within three Land Systems, primarily within the DD15 (Atlas System) (Table 2-1; Figure 2-2).

Table 2-1 Extent of land systems within the Survey Area

Land System	Description	Extent within Survey Area	
		Area (ha)	Proportion (%)
DD15	Undulating plains with some low dunes, seasonal lakes, and clay pans: chief soils seem to be brown and grey- brown calcareous earths.	819.38	98.07
My44	Undulating ridge and low hilly terrain with some mesas and buttes and small valley plains: chief soils seem to be neutral red earths.	10.92	1.31
SV2	Saline valleys with some dunes including barchan forms-salt lake channels, mostly devoid of true soils, and their fringing areas	5.18	0.62

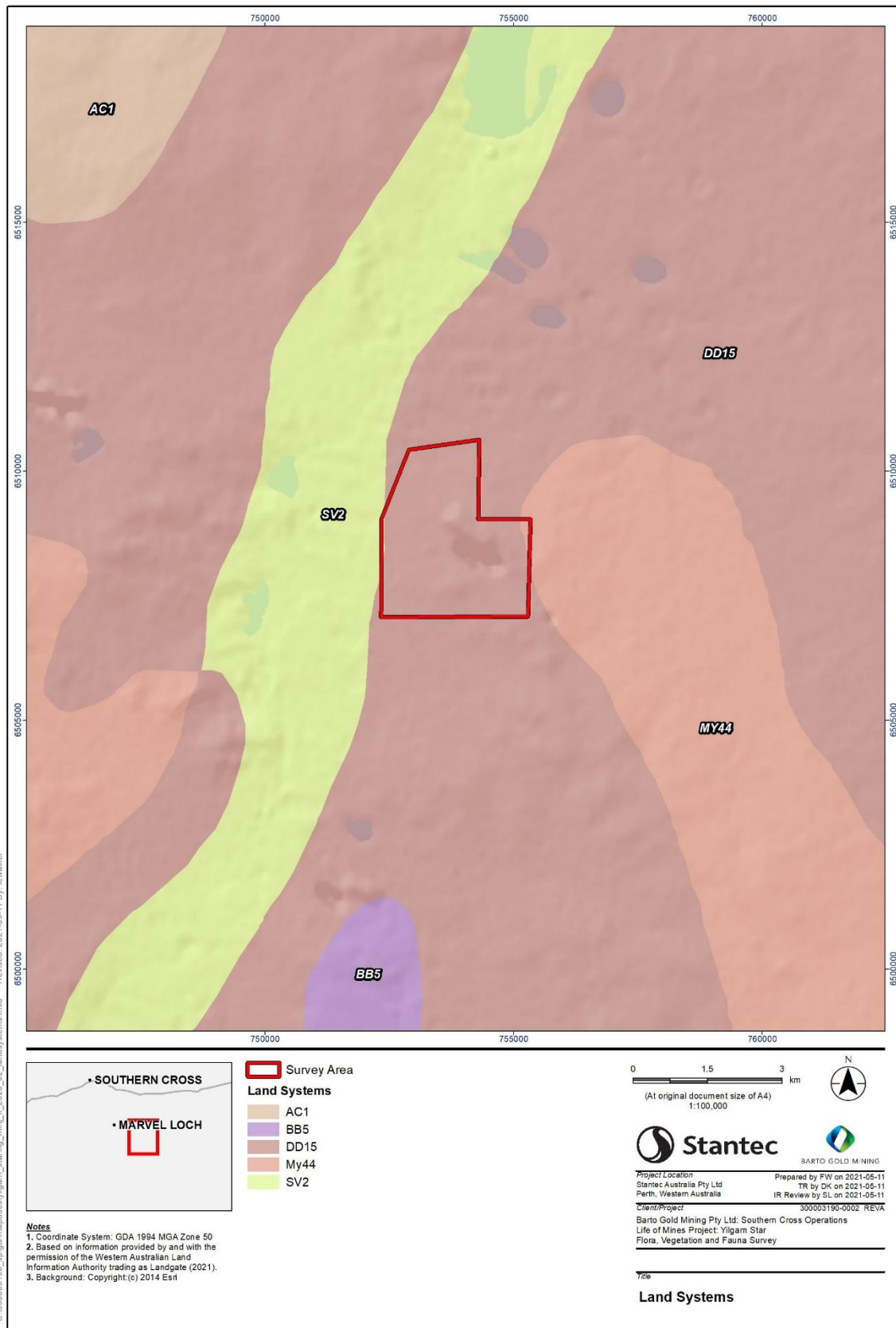


Figure 2-2 Land systems of the Survey Area

2.3 PRE-EUROPEAN VEGETATION

The Survey Area occurs within the Coolgardie Botanical District of the South-Western Interzone Botanical Province (Beard 1990), which is the transition zone between the Eremaean and South-west botanical provinces (EPA 2016b). The Coolgardie Botanical District is described as predominantly Eucalypt woodlands, becoming open with a saltbush-bluebush (*Atriplex-Maireana*) understorey on the more calcareous soils. Patches of shrub steppe occur in areas adjoining the Great Victoria Desert and scrub-heath and *Casuarina* thickets on sandplains (Beard 1990).

Vegetation mapping of Western Australia was completed on a broad scale (1:1,000,000 and 1:250,000) by Beard (1975a), classifying vegetation into broad vegetation associations. These vegetation associations were re-assessed by Shepherd *et al.* (2002b), to account for clearing in the intensive land use zone, and to divide some larger vegetation units into smaller units. In addition, Shepherd *et al.* (2002b) developed a series of systems to assist in the removal of mosaics; however, some mosaics still occur. The Survey Area is situated entirely within the Parker_1068 vegetation association, which is comprised of medium woodland containing *Eucalyptus salmonophloia* (salmon gum), *E. longicornis* (morrel), *E. salubris* (gimlet) and *Eucalyptus sheathiana* (ribbon-barked mallee) (**Table 2-2; Figure 2-3**).

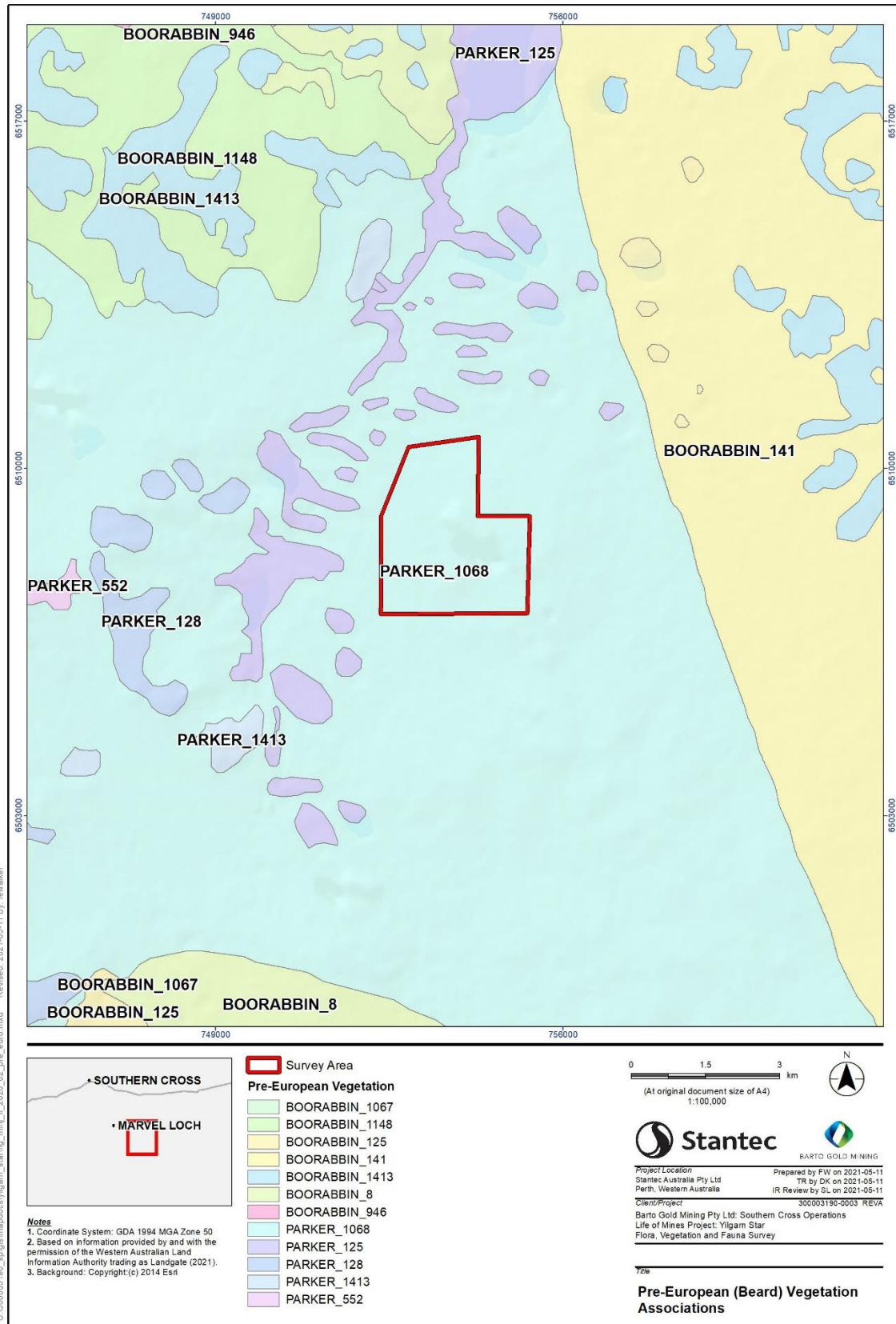
The significance of clearing a particular vegetation association can be determined by comparing current and pre-European extents. A 30% threshold level of the pre-European extent of a vegetation type is designated by the EPA's Position Statement No. 2 (EPA 2000a), as a required retention threshold; below which clearing is considered to compromise species diversity at an ecosystem level. The current extent of the vegetation associations is above the 30% threshold across all four scales of assessment (**Table 2-2**) (State, bioregion, subregion and Local Government Area; LGA) (Government of Western Australia 2020a).

Table 2-2: Extent of pre-European vegetation associations remaining across four scales (State, Bioregion, and Subregion) and within the Survey Area. Vegetation system associations described by Shepherd *et al.* (2002) correspond with that of Beard (1975a)

Vegetation Association	Scale	Pre-European extent (ha)	Current extent (ha)	Proportion remaining (%)	Current extent within IUCN Class I-IV Reserves (ha)	Proportion of current extent protected within IUCN Class I-IV Reserves (%) ¹
PARKER_1068	State-wide	268,900	142,088	53	16,761	11.80
	Coolgardie bioregion	193,988	104,804	54	14,154	13.51
	Southern Cross subregion	193,988.	104,804	54	14,154	13.51
	Shire of Yilgarn LGA	268,900	142,088.	53	16,761	11.80

¹: includes existing National Parks, Nature Reserves, Conservation Parks, 5(g) Reserves (DBCA Conservation Reserves), DBCA conservation estate, Bush Forever on DBCA managed lands and Bush Forever in regional Parks.

Note: Area values have been rounded to the nearest whole number.



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Figure 2-3 Pre-European vegetation associations mapped within the Survey Area

2.4 CLIMATE

The Coolgardie Botanical District of Western Australia has a semi-arid climate, characterised by hot summers and cool winters (Beard 1990). Long-term climate data (1996-2021) was obtained from the Bureau of Meteorology (BoM) weather station at Southern Cross Airfield (Station 12320), located approximately 42 km north of the Survey Area (BoM 2021). The wettest months of the year are typically between January to March and June to August (Figure 2-4). The hottest months of the year are the summer months (December to February), with daily maximum temperatures regularly exceeding 30 degrees Celsius (°C) and the coolest months occurring between June and August, with minimum temperatures frequently falling below 5°C (Figure 2-4).

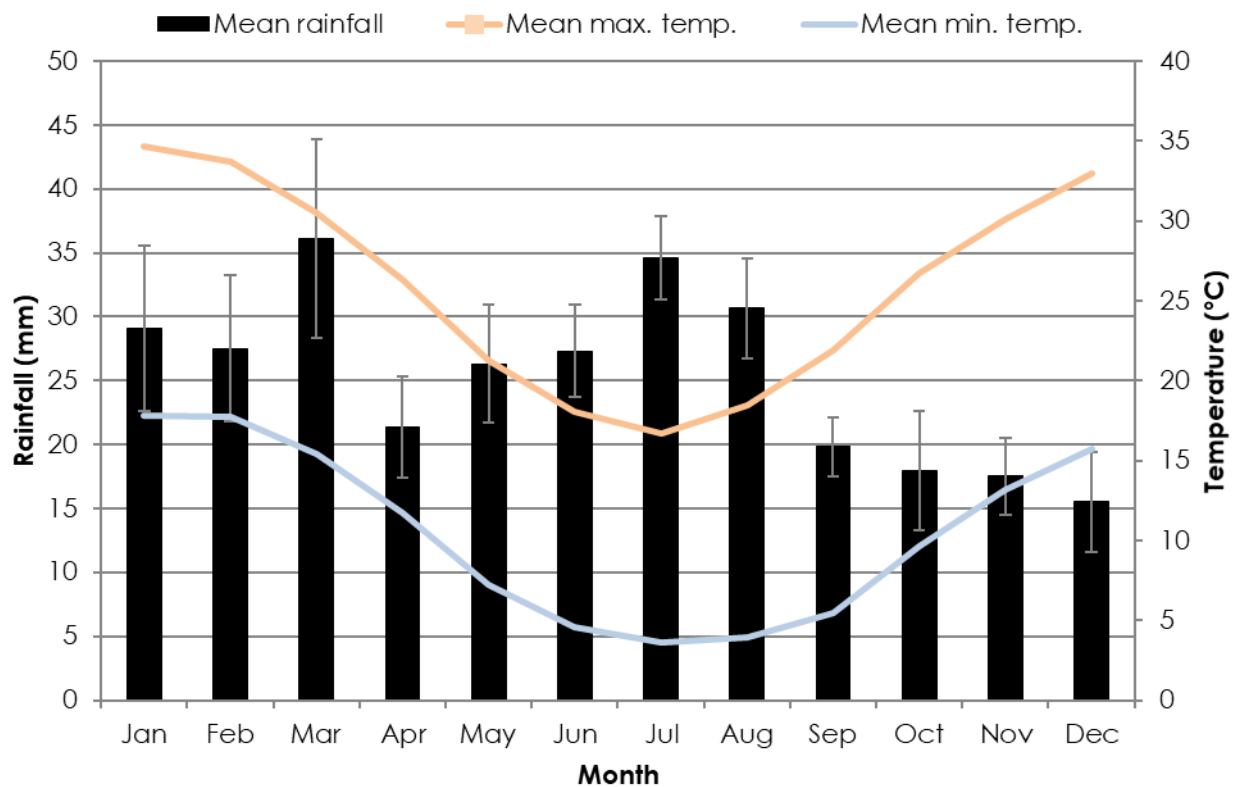


Figure 2-4 Long-term (1996 – 2021) rainfall (mm) and temperature (°C) data recorded at the Southern Cross Airfield weather station (station 12320) (BoM 2021)

2.5 SURFACE GEOLOGY AND SOILS

The Survey Area comprises three geological units; mafic extrusive rocks (74255), pelitic and psammitic sedimentary rocks (74240) and sand plain (38499) (Australian Government 2012). The Survey Area is mapped as soil landscape zone 261 – Southern Cross, in the Kalgoorlie Province (Tille 2006b). The Southern Cross soil unit is described as undulating plains and uplands, with some salt lakes and low hills, on deeply weathered mantle, colluvium and alluvium over greenstone and granite rocks of the Yilgarn Craton (Tille 2006b). Soils of this unit are varied and consist of calcareous loamy earths, red and yellow loamy earths, and alkaline deep and shallow sandy duplexes with some yellow sandy earths, salt lake soils, yellow deep sand and red shallow loamy duplexes (Tille 2006b).

2.6 SURFACE WATER AND HYROLOGY

The COO2 subregion has occluded drainage with any excess surface water after heavy rainfall draining into salt lakes (BoM 2012, Cowan 2001). The Survey Area occurs within the Yellowdine sub-catchment of the Swan-Avon River catchment (State of Western Australia 2020). Numerous ephemeral watercourses and lakes occur within proximity to the Survey Area. A chain of salt lakes border the western side of the Survey Area, including Banker lake and other unnamed lakes (Figure 1-1).

2.7 CONSERVATION RESERVES AND ENVIRONMENTALLY SENSITIVE AREAS

Under Section 51B of the Environmental Protection Act 1986 (EP Act), Environmentally Sensitive Areas (ESAs) are declared by the Minister for Environment (Government of Western Australia 2017). These areas aim to be protected from the degradation of environmental values such as declared rare flora, threatened ecological communities (TECs) or significant wetlands. The criteria for the declaration of ESAs do not include State-listed Priority Ecological Communities (PECs) which are protected under the Biodiversity Conservation Act 2016 (BC Act).

The Survey Area does not overlap with reserves or ESAs, however the nearest reserve, are Jilbadji Nature Reserve, is located in very close proximity (1.42 km from the Survey Area) (**Figure 1-1**). The Jilbadji Nature reserve is over 200,000 ha and is considered a significant area for maintaining existing ecosystem processes at a regional scale (DotEE 2019b). The next nearest Nature Reserve, Yellowdine Nature Reserve, is located 15.38 km from the Survey Area, in the transition zone between the Eremaean and South-west botanical provinces. This Nature Reserve supports a rich and diverse flora community with many species of plant and animal persisting on the extremities of their distributions (DotEE 2019a).

The nearest nationally important wetland (Lake Cronin) is located 93 km from the Survey Area. No TECs were found to have buffers that overlap the Survey Area and the nearest TEC, Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)- Critically Endangered TEC (EPBC Act), is recorded 17.68 km from the Survey Area and is discussed in further detail in **Section 3.2.2**.

3.0 DESKTOP ASSESSMENT

A desktop assessment, comprising database searches and a literature review, was undertaken prior to the field survey to gather contextual information on the Survey Area and to inform a likelihood of occurrence for significant flora, vegetation and fauna to occur within the Survey Area. Significant species and rankings used under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), the BC Act, as well as the Department of Biodiversity, Conservation and Attractions (DBCA) priority list, are defined in **Appendix A**.

3.1 METHODS

3.1.1 Database Searches

Database searches were completed to generate a list of vascular flora, vegetation communities and terrestrial fauna previously recorded within, and in the vicinity of, the Survey Area, with an emphasis on species and communities of significance and introduced species. Six searches were conducted based on either the Survey Area or a central Survey Area coordinate of 50J 729507.65 m E, 6530138.37 m S. Search buffers varied according to the technical capabilities of each database and the ecological features of the area (**Table 3-1**).

Table 3-1 Database searches conducted for the desktop assessment

Custodian/Reference	Database name	Ecological focus group	Buffer (km)	Date of receipt
Department of the Environment and Energy (DotEE 2020)	Protected Matters Search Tool (PMST)	Flora and fauna	20	13/10/20
Department of Biodiversity, Conservation and Attractions (DBCA 2019)	Threatened Ecological Community (TEC) and Priority Ecological Community (PEC)	Vegetation communities of significance	20	05/08/19
Department of Biodiversity, Conservation and Attractions (DBCA 2020d)	NatureMap	Flora and fauna	20	13/10/20
Department of Biodiversity, Conservation and Attractions (DBCA 2020e)	Threatened and Priority Flora database (TPFL)	Threatened and Priority Flora	20	08/09/20
	Western Australian Herbarium Specimen database (WAH)	Threatened and Priority Flora	20	08/09/20
Department of Biodiversity, Conservation and Attractions (DBCA 2020b)	Threatened and Priority Fauna	Threatened and Priority Fauna	15	24/04/20
Birdlife Australia (Birdlife Australia 2019)	Birdlife Bird Data	Fauna	70	18/08/19

3.1.2 Literature Review

Background information relating to the Survey Area and surrounds was compiled prior to conducting the field work. Historic vegetation mapping (Beard 1972, Shepherd *et al.* 2002a), soil and land system mapping and characteristics (Cowan *et al.* 2001, Tille 2006b), and the IBRA classification system information (Thackway and Cresswell 1995) were reviewed to provide broad contextual information. The literature review also considered 17 publicly available survey reports of relevance to the Survey Area, comprising 10 flora and vegetation and seven terrestrial fauna surveys (Error! Reference source not found. and **Table 3-3**)

Table 3-2: Summary of flora and vegetation surveys in the vicinity of the Survey Area

Reference Survey	Survey Details	Proximity to the Survey Area	Survey Effort	Vegetation Types	Flora Recorded	Species and Communities of Conservation of Significance <small>(species names and conservation status current at time of respective survey)</small>
(Stantec 2021b)	Location: Ruapheu Study Type: Targeted Flora Survey Survey Date(s): March 2021 Size of Survey Area: 124.7 ha	44.5 km northwest of Survey Area	Traverses (10 m gridlines)	EcrEI(Esu)AmAv <i>Eucalyptus corrugata</i> , <i>Eucalyptus longicornis</i> (<i>Eucalyptus salubris</i>) woodland to open forest over <i>Acacia merrallii</i> open shrubland over <i>Atriplex versicaria</i> low shrubland. E?yBss <i>Eucalyptus ? yilgarnensis</i> low open woodland over <i>Beyeria sulcata</i> var. <i>sulcata</i> open shrubland. Aa <i>Acacia acuminata</i> tall open scrub.	Flora: • Families 1 • Genera 1 • Taxa 1 Condition: N?A Majority 'Excellent' 39.85 ha (32%)	<ul style="list-style-type: none"> • TECs: None • PECs: None • Threatened species: 1 <i>Daviesia macrocarpa</i> (CR) • Priority species: None
(Stantec 2020a)	Location: Glendower Study Type: Detailed flora and vegetation survey, basic fauna survey, and targeted flora and fauna surveys. Survey Date(s): April and September 2020 Size of Survey Area: 250.6 ha	30 km northwest of Survey Area	8 quadrats Traverses	EcAaBssPtHe <i>Eucalyptus corrugata</i> woodland over <i>Acacia acuminata</i> tall open shrubland over <i>Beyeria sulcata</i> var. <i>sulcata</i> open shrubland over <i>Hibbertia exasperata</i> and <i>Phebalium tuberculosum</i> low open shrubland. EsalEsuEIMpAvAm <i>Eucalyptus salmonophloia</i> , <i>Eucalyptus salubris</i> and <i>Eucalyptus longicornis</i> open forest over <i>Melaleuca pauperiflora</i> tall shrubland over <i>Atriplex vesicaria</i> and <i>Acacia merrallii</i> open shrubland. EI(+/-Ey)MpAvEs <i>Eucalyptus longicornis</i> (+/- <i>Eucalyptus yilgarnensis</i>) woodland over <i>Melaleuca pauperiflora</i> tall open shrubland over <i>Atriplex vesicaria</i> and <i>Eremophila scoparia</i> low open shrubland.	Flora: • Families 19 • Genera 31 • Taxa 60 Condition: 'Excellent' to 'Completely Degraded' Majority 'Excellent' 196.62 ha (75.5%)	<ul style="list-style-type: none"> • TECs: None • PECs: 1 Parker Range vegetation complexes (P3). • Threatened species: None • Priority species: 2 <i>Rinzia fimbriolata</i> (P1) <i>Stenanthemum bremerense</i> (P4)
Spectrum Ecology (2020)	Location: Leviathan Study Type: Reconnaissance flora and vegetation, targeted fauna and targeted flora assessment Survey Date(s): November 2019 Size of Survey Area: 195 ha	35 km northwest of Survey Area	7 relevés Traverses	EIEs/Aa <i>Eucalyptus lesouefii</i> and/or <i>E. sheathiana</i> (+/- <i>E. vittata</i> , <i>E. longicornis</i>) open woodland, over <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> and/or <i>A. helmsii</i> and <i>Acacia acuminata</i> shrubland. Elo/Ele <i>Eucalyptus longicornis</i> (+/- <i>E. oleosa</i> subsp. <i>oleosa</i>) open woodland, over <i>Eucalyptus leptopoda</i> subsp. <i>leptopoda</i> open mallee woodland, over <i>Melaleuca pauperiflora</i> subsp. <i>fastigiata</i> sparse tall shrubland, over <i>Atriplex vesicaria</i> sparse shrubland. EloEs/Mp/Es <i>Eucalyptus longicornis</i> , <i>E. salubris</i> open woodland over (+/-) <i>Melaleuca pauperiflora</i> subsp. <i>fastigiata</i> sparse tall shrubland, over <i>Eremophila scoparia</i> or <i>E. ionantha</i> and mixed <i>Atriplex</i> species shrubland.	Flora: • Families 25 • Genera 49 • Taxa 91 Condition: 'Excellent' to 'Completely Degraded' Majority 'Excellent' 94 ha (48.2%)	<ul style="list-style-type: none"> • TECs: None • PECs: None • Threatened species: None • Priority species: None
Stantec (2019)	Location: Parker range Study Type: Reconnaissance level vegetation and flora survey, and a level 1 fauna survey Survey Date(s): 16 to 29 September 2019 Size of Survey Area: 16,429 ha	Partly intersecting Survey Area	35 relevés 76 mapping notes	EoEpEsEsuEprMpSa MmEiDs <i>Eucalyptus oleosa</i> , <i>E. polita</i> , <i>E. salmonophloia</i> , <i>E. salubris</i> and <i>E. prolixa</i> open forest over <i>Melaleuca pauperiflora</i> and <i>Santalum acuminatum</i> tall shrubland over <i>Microcybe multiflora</i> subsp. <i>multiflora</i> , <i>Eremophila interstans</i> subsp. <i>interstans</i> and <i>Dodonaea stenozyga</i> open shrubland. EsuEsMpSaExOmAeTc <i>Eucalyptus salubris</i> and <i>E. salmonophloia</i> open forest over <i>Melaleuca pauperiflora</i> , <i>Senna artemisioides</i> subsp. <i>x filifolia</i> and <i>Exocarpos aphyllus</i> tall open shrubland over <i>Olearia muelleri</i> , <i>Acacia erinacea</i> and <i>Templetonia ceracea</i> low open shrubland. EsEIEcMtSaEsEoMtEs <i>Eucalyptus salmonophloia</i> , <i>E. loxophleba</i> and <i>E. corrugata</i> open woodland over <i>Melaleuca teuthidoides</i> , <i>Santalum acuminatum</i> , <i>Eremophila scoparia</i> and <i>E. oppositifolia</i> subsp. <i>angustifolia</i> open tall open scrub over <i>Maireana trichoptera</i> and <i>Eriochiton sclerolaenoides</i> scattered low shrubs. HmAaTkGpPtGaAr <i>Hakea multilineata</i> , <i>Allocasuarina acutivalvis</i> and <i>Thryptomene kochii</i> tall open shrubland over <i>Grevillea paradoxa</i> scattered shrubs over <i>Phebalium tuberculosum</i> , <i>Grevillea acacioides</i> and <i>Acacia resinimarginea</i> scattered low shrubs. AcAaAhGoMcHe <i>Allocasuarina corniculata</i> , <i>A. acutivalvis</i> and <i>Acacia hamata</i> tall open scrub over <i>Grevillea obliquistigma</i> subsp. <i>obliquistigma</i> and <i>Melaleuca cordata</i> open heath over <i>Hibbertia eatoniae</i> low open heath. EsE?iMpEaAbTspTc <i>Eucalyptus salmonophloia</i> tall open woodland over <i>E. ?incrassata</i> scattered low mallee trees over <i>Melaleuca pauperiflora</i> , <i>Exocarpos aphyllus</i> and <i>Alyxia buxifolia</i> open shrubland over <i>Tecticornia disarticulata</i> and <i>Templetonia ceracea</i> low shrubland. EcAaAcDiPiHe <i>Eucalyptus capillosa</i> scattered trees over <i>Allocasuarina acutivalvis</i> , <i>A. campestris</i> and <i>Dodonaea inaequifolia</i> tall shrubland over <i>Prostanthera incurvata</i> , <i>Hibbertia eatoniae</i> and scattered low shrubs.	Flora: • Families 43 • Genera 133 • Taxa 279 Condition: 'Pristine' to 'Completely Degraded' Majority = 'Excellent' 12,707.3 ha (77.3%)	<ul style="list-style-type: none"> • TECs: 1 Eucalypt Woodlands of the Western Australian Wheatbelt (Cr) • PECs: 2 Highclere Hills (Mayfield) vegetation complex (banded iron formation) (P3); and Parker Range vegetation complexes (P3). • Threatened species: None • Priority species: 17 <i>Cryptandra exserta</i> (P1) <i>Grevillea lissopleura</i> (P1) <i>Hysterobaeckea ochropetala</i> subsp. <i>ochropetala</i> (P1) <i>Lepidosperma</i> sp. Mt. Caudan (N. Gibson & M. Lyons 2081) (P1) <i>Rinzia fimbriolata</i> (P1) <i>Acacia asepala</i> (P2) <i>Acacia concolorans</i> (P2) <i>Acacia crenulata</i> (P3) <i>Acacia dissona</i> var. <i>indoloria</i> (P3)

Reference Survey	Survey Details	Proximity to the Survey Area	Survey Effort	Vegetation Types	Flora Recorded Vegetation Condition	Species and Communities of Conservation of Significance (species names and conservation status current at time of respective survey)
				<p>ErCpSaHeGhG?eBs <i>Eucalyptus rigidula</i> low mallee woodland over <i>Callitris preissii</i>, <i>Santalum acuminatum</i> and <i>Hakea erecta</i> tall shrubland over <i>Grevillea hookeriana</i>, <i>Grevillea ?excelsior</i> and <i>Banksia shanklandiorum</i> low shrubland.</p> <p>EIEtAc <i>Eucalyptus livida</i> and <i>E. tenera</i> low open mallee woodland over <i>Allocasuarina campestris</i> open heath to tall open scrub over mixed low shrubland.</p> <p>EIEIoMIMaA?aPcAhOp <i>Eucalyptus loxophleba</i> subsp. <i>lissophloia</i> and <i>E. longicornis</i> open woodland over <i>Melaleuca lateriflora</i>, <i>M. acuminata</i> and <i>Acacia ?acuminata</i> tall open shrubland over <i>Phebalium canaliculatum</i>, <i>Acacia hemiteles</i> and <i>Olearia pimelioides</i> scattered low shrubs.</p> <p>ErBgViGhLsDh <i>Eucalyptus</i> sp. low mallee woodland over <i>Baeckea grandibracteata</i> subsp. Parker Range (K. Newbey 9270), <i>Verticordia</i> sp. and <i>Grevillea hookeriana</i> subsp. <i>apiculoba</i> shrubland over <i>Isopogon scabriusculus</i> subsp. <i>stenophyllus</i> and <i>Drummondita hassellii</i> low open shrubland.</p> <p>EsAbAdEmEIPt <i>Eucalyptus sheathiana</i> scattered low mallee trees over <i>Acacia beauverdiana</i> and <i>Acacia densiflora</i> tall shrubland over <i>Euryomyrtus maidenii</i>, <i>E. leptospermoides</i> and <i>Phebalium tuberosum</i> low open heath.</p> <p>EmEsuMpEaSaAaOm <i>Eucalyptus myriadena</i> and <i>E. salubris</i> woodland over <i>Melaleuca pauperiflora</i>, <i>Exocarpos aphyllus</i> and <i>Santalum acuminatum</i> tall shrubland over <i>Acacia asepala</i> and <i>Olearia muelleri</i> low shrubland.</p> <p>TsppAvFIDc <i>Tecticornia disarticulata</i>, <i>Tecticornia indica</i> subsp. <i>bidens</i> and <i>Atriplex vesicaria</i> open shrubland over <i>Frankenia irregularis</i> and <i>Disphyma crassifolium</i> open herbland.</p> <p>EsEIAaMcPbBdAc <i>Eucalyptus sheathiana</i> and <i>E. loxophleba</i> subsp. <i>supralaevis</i> woodland over <i>Allocasuarina acutivalvis</i> and <i>Melaleuca cordata</i> tall open shrubland over <i>Phebalium tuberosum</i>, <i>Bertya dimerostigma</i> and <i>Acacia</i> sp. open shrubland.</p> <p>EsuEIMpEsEaEsEiSs <i>Eucalyptus salubris</i> and <i>E. longicornis</i> woodland over <i>Melaleuca pauperiflora</i> subsp. <i>fastigiata</i>, <i>Eremophila scoparia</i> and <i>Exocarpos aphyllus</i> tall open shrubland over <i>Eremophila scoparia</i>, <i>E. ionantha</i> and <i>Scaevola spinescens</i> low shrubland.</p> <p>EsuEsEaAcMt <i>Eucalyptus salubris</i> low open woodland over <i>Eremophila scoparia</i> and <i>Eremophila alternifolia</i> scattered tall shrubs over <i>Atriplex codonocarpa</i> and <i>Maireana triptera</i> open shrubland.</p> <p>CcEcMrAbPt <i>Callitris canescens</i> and <i>Eremophila clarkei</i> tall open shrubland over <i>Micromyrtus racemosa</i>, <i>Alyxia buxifolia</i> and <i>Phebalium tuberosum</i> open shrubland.</p> <p>EtEsEcSaAtBsPs <i>Eucalyptus transcontinentalis</i>, <i>E. sheathiana</i> and <i>E. capillosa</i> woodland over <i>Santalum acuminatum</i> scattered tall shrubs over <i>Acacia tetragonophylla</i> and <i>Beyeria sulcata</i> and <i>Philothea</i> sp. scattered shrubs.</p> <p>EcBsAaAhTmPi <i>Eucalyptus corrugata</i> low mallee woodland over <i>Beyeria sulcata</i> and <i>Acacia acuminata</i> and <i>Allocasuarina helmsii</i> tall open scrub over <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i> and <i>Prostanthera incurvata</i> open shrubland over <i>Trymalium myrtillus</i> subsp. <i>myrtillus</i> and <i>Prostanthera incurvata</i> low open shrubland</p> <p>MIMpFi <i>Melaleuca lateriflora</i>, <i>M. pauperiflora</i> subsp. <i>fastigiata</i> tall shrubland over <i>Frankenia irregularis</i> scattered low shrubs.</p> <p>TspAvFspAe <i>Tecticornia</i> spp., <i>Atriplex vesicaria</i> and <i>Frankenia irregularis</i> low shrubland over <i>Austrostipa elegantissima</i> scattered bunch grass.</p> <p>EhHeAhMhTkRf <i>Eucalyptus horistes</i> low mallee woodland over <i>Hakea erecta</i>, <i>Allocasuarina helmsii</i> and <i>Melaleuca hamata</i> tall open shrubland over <i>Thryptomene kochii</i> shrubland over <i>Rinzia fimbriolata</i> low shrubland.</p> <p>EsE?cSaMtSaDsGp <i>Eucalyptus salubris</i> and <i>Eucalyptus ?celastroides</i> low woodland over <i>Santalum acuminatum</i> and <i>Melaleuca teuthioides</i> scattered tall shrubs over <i>Santalum acuminatum</i>, <i>Dodonaea stenozyga</i> and <i>Gastrolobium parviflorum</i> shrubland.</p> <p>AtSsAaSsEcPbbWa <i>Acacia tetragonophylla</i>, <i>Santalum spicatum</i>, <i>Acacia acuminata</i> tall shrubland over <i>Scaevola spinescens</i>, <i>Eremophila clarkei</i> and <i>Philothea brucei</i> subsp. <i>brucei</i> over <i>Waitzia acuminata</i> scattered herbs.</p> <p>EcE?sEeHmSaAcOm <i>Eucalyptus calycogona</i> and <i>E. ?sheathiana</i> and <i>E. eremophila</i> low mallee woodland over <i>Hakea meisneriana</i> and <i>Santalum acuminatum</i> scattered shrubs over <i>Acacia concolorans</i> and <i>Olearia muelleri</i> low open shrubland.</p> <p>EsAaHf <i>Eucalyptus sheathiana</i> low woodland over <i>Acacia acuminata</i> tall shrubland over <i>Hybanthus floribundus</i> subsp. <i>curvifolius</i> open low shrubland.</p>		<p><i>Baeckea grandibracteata</i> subsp. Parker Range (K. Newbey 9270) (P3)</p> <p><i>Hakea pendens</i> (P3)</p> <p><i>Microseris walteri</i> (P3)</p> <p><i>Teucrium</i> sp. dwarf (R. Davis 8813) (now <i>Teucrium dioabolicum</i>) (P3)</p> <p><i>Banksia shanklandiorum</i> (P4)</p> <p><i>Calamphoreus inflatus</i> (P4)</p> <p><i>Grevillea neodissecta</i> (P4)</p> <p><i>Stenanthemum ?bremerense</i> (P4)</p>
GHD (2016)	Location: Yilgarn Star North Prospect	Intersecting Survey Area	9 relevés	<p>VA01: Open forest of <i>Eucalyptus oleosa</i> subsp. <i>oleosa</i> and <i>E. salubris</i> with <i>E. myriadena</i> subsp. <i>myriadena</i>, <i>E. loxophleba</i> subsp. <i>lissophloia</i> and <i>Melaleuca sheathiana</i> over open shrubland of <i>Eremophila ionantha</i>, <i>E. scoparia</i>,</p>	Flora:	<ul style="list-style-type: none"> TECs: None

Reference Survey	Survey Details	Proximity to the Survey Area	Survey Effort	Vegetation Types	Flora Recorded Vegetation Condition	Species and Communities of Conservation of Significance (species names and conservation status current at time of respective survey)
	<p>Study Type: Desktop Assessment and Level 1 Flora and Fauna Survey</p> <p>Survey Date(s): 20 and 21 of June 2016.</p> <p>Size of Survey Area: 180.76 ha</p>			<p><i>Exocarpos aphyllus</i> and <i>Santalum acuminatum</i> over sparse hermland of <i>Atriplex stipitata</i>, <i>Lycium australe</i>, <i>Olearia muelleri</i> and <i>Zygophyllum apiculatum</i>.</p> <p>VA02: Isolated chenopod shrubs of <i>Atriplex</i> spp., <i>Maireana</i> spp. and <i>Sclerolaena diacantha</i>.</p>	<ul style="list-style-type: none"> 17 families 34 genera 62 taxa <p>Condition: From 2 to 7, mostly 3: (EPA and DPaW 2015).</p>	<ul style="list-style-type: none"> PECs: None Threatened species: None Priority species: None
Botanica (2016a)	<p>Location: Martin's Prospect</p> <p>Study Type: Reconnaissance Flora and Vegetation Survey</p> <p>Survey Date(s): 2 April 2016</p> <p>Size of Survey Area: 105.5 ha</p>	17 km northwest of Survey Area	Survey effort not specified	<p>CLP/LS-EW1: Low woodland of mixed <i>Eucalypts</i> over open scrub of <i>Exocarpos aphyllus</i>/ <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i>/ <i>Santalum acuminatum</i> and open dwarf scrub of <i>Acacia deficiens</i>/ <i>Scaevola spinescens</i> on clay-loam plain/ low slope</p> <p>CLP/LS-EW2: Low woodland of <i>Eucalyptus salubris</i> over scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i> / <i>M. pauperiflora</i> subsp. <i>fastigiata</i>/ <i>Santalum acuminatum</i> over open dwarf scrub of <i>Scaevola spinescens</i> on clay-loam plain/ low slope</p> <p>CLP/LS-MWS1: Tree mallee of <i>Eucalyptus gracilis</i> over heath of <i>Beyeria brevifolia</i> and open dwarf scrub of <i>Acacia erinacea</i>/ <i>A. merrallii</i> on clay-loam plain/ low slope.</p> <p>RH-EW1: Low woodland of <i>Eucalyptus vittadia</i> over open low scrub of <i>Beyeria brevifolia</i>/ <i>Phebalium</i> spp. and open low sedge of <i>Lepidosperma sanguinolentum</i> on rocky hillslope</p> <p>RH-MWS1: Open tree mallee of <i>Eucalyptus loxophleba</i> subsp. <i>lissophloia</i> over scrub of <i>Melaleuca pauperiflora</i> subsp. <i>pauperiflora</i> / <i>M. pauperiflora</i> subsp. <i>fastigiata</i> and open dwarf scrub of <i>Westringia cephalantha</i> on rocky hillslope</p> <p>CV: Cleared/Disturbed Vegetation</p>	<ul style="list-style-type: none"> 23 families 30 genera 51 taxa <p>Condition: Pristine</p>	<ul style="list-style-type: none"> TECs: None PECs: 1 <p>Parker Range Priority Ecological Community (P3)</p> <ul style="list-style-type: none"> Threatened species: None Priority species: None
MWH (2014)	<p>Location: Cheritons Find</p> <p>Study type: Level 1 Vegetation, Flora and Targeted Flora Survey.</p> <p>Survey Date(s): 7-9 October 2014</p> <p>Size of Survey Area: 504.6 ha (2 x 1.6 x 1.7 km)</p>	29 km south of Survey Area	16 relevés	<p>VC 1: Mid Open Mallee Woodland to Scattered Mallees of <i>Eucalyptus capillosa</i> subsp. <i>polyclada</i> (+/- scattered <i>E. ?eremophila</i>) over a Mid to Tall Open Shrubland of <i>Allocasuarina acutivalvis</i> subsp. <i>prinsepiana</i>, <i>Santalum acuminatum</i> and <i>Acacia assimilis</i> subsp. <i>assimilis</i> over a Mid to Low Open Shrubland of <i>Isopogon gardneri</i> and <i>Melaleuca cordata</i> (+/- <i>Grevillea acacioides</i>, <i>Thryptomene kochii</i> and <i>Stenanthemum stipulosum</i>) occasionally over a sparse sedgeland of <i>Lepidosperma sanguinolentum</i> on low hills and minor laterite ridges.</p> <p>VC 2 (R): Rehabilitated areas consisting of a Tall Shrubland to Open Shrubland of <i>Hakea francisiana</i>, <i>Acacia yorkrakinensis</i> subsp. <i>acrita</i> and <i>Allocasuarina campestris</i> over a Mid Sparse Shrubland of <i>Isopogon gardneri</i> and <i>Thryptomene kochii</i> over a Low Sparse Shrubland of <i>Westringia cephalantha</i> var. <i>cephalantha</i> and <i>Stenanthemum stipulosum</i> on low rocky hills.</p> <p>VC 4: Open Woodland of <i>Eucalyptus ? longicornis</i> over a Mid to Tall Sparse Shrubland of <i>Melaleuca pauperiflora</i> subsp. <i>fastigiata</i> with Scattered <i>Santalum acuminatum</i> over a Low Open Shrubland of <i>Daviesia argillacea</i>, <i>Acacia hemiteles</i> and <i>Exocarpos aphyllus</i> over isolated tussocks of <i>Austrostipa pycnostachya</i> on sandy loam flats.</p> <p>VC 5: Low to Mid Open Woodland to Woodland of <i>Eucalyptus ? eremophila</i> over a Mid Sparse Shrubland to Shrubland of <i>Melaleuca pauperiflora</i> subsp. <i>fastigiata</i> over a Mid to Low Shrubland to Sparse Shrubland of <i>Acacia merrallii</i>, <i>Dodonaea stenozyga</i> and <i>Daviesia argillacea</i> on loam flats and gentle slopes, many of which are in recovery from recent fire.</p> <p>VC 5(Dr): Open Mallee Woodland of <i>Eucalyptus ? eremophila</i> over a Mid Open shrubland of <i>Melaleuca pauperiflora</i> subsp. <i>fastigiata</i>, <i>Daviesia argillacea</i> and <i>Acacia merrallii</i> over a Low Shrubland of <i>Acacia erinacea</i> and <i>Dodonaea stenozyga</i> in broad drainage lines.</p> <p>VC 6: Mid to Low Open Shrubland of <i>Acacia merrallii</i> and <i>Daviesia argillacea</i> over a Low Open Shrubland of <i>Exocarpos aphyllus</i>, <i>Eutaxia lasiocalyx</i> and <i>Sclerolaena diacantha</i> over a Sparse Forbland of <i>Angianthus tomentosus</i> and <i>Asteridea athrixioides</i> on gritty loam flats.</p> <p>VC 7: Open Woodland of <i>Eucalyptus urna</i> over a Mid Mallee Woodland of <i>Eucalyptus sheathiana</i> over a Mid Open Shrubland of <i>Daviesia argillacea</i> and <i>Acacia hemiteles</i> over a Sparse Low Shrubland of <i>Acacia merrallii</i> on low hills.</p> <p>VC 8: Mid Mallee Woodland of <i>Eucalyptus capillosa</i> subsp. <i>polyclada</i> over a Mid Sparse Shrubland of <i>Acacia steedmanii</i>, <i>Callitris ? canescens</i> and <i>Melaleuca hamata</i> over a Low Sparse Shrubland of <i>Westringia cephalantha</i> var. <i>cephalantha</i> and <i>Gastrolobium parviflorum</i> on gently sloping white sand plain.</p> <p>VC 9: Mid Open Shrubland of <i>Acacia assimilis</i> subsp. <i>assimilis</i>, <i>Isopogon gardneri</i> and <i>Melaleuca cordata</i> over a Low Sparse Shrubland of mixed species including <i>Callitris ? canescens</i> and <i>Gastrolobium crassifolium</i> on sandy clay sloping plains</p> <p>VC 10: Scattered mallees of <i>Eucalyptus capillosa</i> subsp. <i>polyclada</i> and <i>Eucalyptus ? eremophila</i> over a Mid Sparse Shrubland of <i>Melaleuca hamata</i> and <i>Acacia acoma</i> over a Low Mixed Shrubland mostly dominated by <i>Grevillea obliquistigma</i> subsp. <i>obliquistigma</i>, <i>Acacia acanthaster</i> and <i>Stenanthemum stipulosum</i> over a Sparse Sedgeland of <i>Lepidosperma sanguinolentum</i> on low rocky hills.</p> <p>VC 11: Mid Open Mallee Woodland of <i>Eucalyptus capillosa</i> subsp. <i>polyclada</i> over a Mid Open Shrubland of <i>Acacia steedmanii</i> and <i>Acacia assimilis</i> subsp. <i>assimilis</i> over a Low Sparse Shrubland of <i>Grevillea paradoxa</i> on gravelly low hills.</p>	<ul style="list-style-type: none"> 22 families 47 genera 86 taxa <p>Condition: Excellent</p>	<ul style="list-style-type: none"> Priority species: 4 <p><i>Euryomyrtus</i> sp. Parker Range (N. Gibson & M. Lyons 2269) (P1) (now <i>Rinzia medifila</i> (P1))</p> <p><i>Hemigenia</i> sp. Newdegate (E. Bishop 75) (P1)</p> <p><i>Eutaxia lasiocalyx</i> (P2)</p> <p><i>Calamphoreus inflatus</i> (P4)</p>

Reference Survey	Survey Details	Proximity to the Survey Area	Survey Effort	Vegetation Types	Flora Recorded Vegetation Condition	Species and Communities of Conservation of Significance (species names and conservation status current at time of respective survey)
Recon Environmental (2008c)	Location: Marvel Loch TSF Extension Study Type: Vegetation Survey Survey Date(s): 24 to 25 March 2008 Size of Survey Area: 75.7 ha	15 km west of Survey Area	Survey effort not specified	ESSS: <i>Eucalyptus</i> Shrubland on Sandy Soils occurring at the base of ridges and low rises; it can generally be summarised in the Marvel Loch TSF area as an open <i>Eucalyptus eremophila</i> shrubland. Type 1 (Gibson and Lyons 1995). ELWF: <i>E. longicornis</i> woodland with <i>Exocarpos aphyllus</i> and <i>Melaleuca pauperiflora</i> emerging over <i>Eremophila</i> species with <i>Olearia muelleri</i> and <i>Acacia merrallii</i> . In the small area ELWF was encountered in this survey this habitat was a regrowth woodland with a mid to low level understorey dominated by <i>Melaleuca pauperiflora</i> and <i>Templetonia sulcata</i> . Type 2 (Gibson and Lyons (1995, 1998)(Gibson and Lyons 1995, Gibson and Lyons 1998). ESWF: Open <i>Eucalyptus salubris</i> and <i>E. salmonophloia</i> woodland above <i>Melaleuca pauperiflora</i> with <i>Santalum acuminatum</i> , <i>Exocarpos aphyllus</i> , <i>Alyxia buxifolia</i> , <i>Eremophila oppositifolia</i> over <i>Acacia merrallii</i> , <i>Scaevola spinescens</i> and <i>Microcybe minutiflora</i> . Type 3 (Gibson and Lyons 1995, Gibson and Lyons 1998). MASS: Tall closed <i>Melaleuca</i> and <i>Acacia</i> shrubland generally on sandy soils. Type 4 (Gibson and Lyons 1995, Gibson and Lyons 1998). STAM: dense thickets of <i>Allocasuarina acutivalvis</i> frequently with <i>Allocasuarina campestris</i> and <i>Melaleuca uncinata</i> on sandy soils over laterite; in the survey area areas with scattered mallees are also common. Type 5 (Gibson and Lyons 1995, Gibson and Lyons 1998).	<ul style="list-style-type: none"> 25 families 51 genera 101 taxa 	<ul style="list-style-type: none"> TECs: None PECs: 1 Parker Range Priority Ecological Community (P3). Threatened species: None Priority species: 3 <i>Acacia crenulata</i> (P3) <i>Hakea pendens</i> (P3) <i>Stenanthemum bremerense</i> (P3)
Recon Environmental (2008a)	Location: Burbidge Rare Flora Distribution & Impact Study Type: Flora and Vegetation Survey Survey Date(s): August-September 2007 Size of Survey Area: 2,025 ha	7 km west of Survey Area	Traverses and vegetation mapping.	ESSS: <i>Eucalyptus</i> Shrubland on Sandy Soils at the base of ridges/low rises: <i>Eucalyptus eremophila</i> shrubland ELWF: <i>Eucalyptus longicornis</i> Woodland on broad Flats: <i>E. longicornis</i> woodland with <i>Exocarpos aphyllus</i> and <i>Melaleuca pauperiflora</i> emerging over <i>Eremophila</i> species with <i>Olearia muelleri</i> and <i>Acacia merrallii</i> . ESWF: <i>Eucalyptus salubris</i> & <i>E. salmonophloia</i> Woodland on broad Flats: open <i>E. salubris</i> and <i>E. salmonophloia</i> woodland above <i>Melaleuca pauperiflora</i> with <i>Santalum acuminatum</i> , <i>Exocarpos aphyllus</i> , <i>Alyxia buxifolia</i> , <i>Eremophila oppositifolia</i> over <i>Acacia merrallii</i> , <i>Scaevola spinescens</i> and <i>Microcybe minutiflora</i> . EWAC: <i>Eucalyptus</i> woodland with <i>Melaleuca pauperiflora</i> subsp. <i>fastigiata</i> above <i>Acacia concolorans</i> (P2). MASS: <i>Melaleuca</i> & <i>Acacia</i> Shrubland on Sandy soils: tall closed <i>Melaleuca</i> and <i>Acacia</i> shrubland. ASSS: <i>Allocasuarina</i> Shrubland on Sandy Soils: <i>Allocasuarina corniculata</i> and <i>A. acutivalvis</i> with <i>Thryptomene kochii</i> dense shrubland. MMSS: Mallee above Mixed Shrublands on Sandy soils: mallee above mixed shrubs on yellow sands/sandy loams. DMMA: Drainage line Mallees above Mixed Shrubs: Drainage complex consisting of dense mallees (<i>Eucalyptus loxophleba</i> subsp. <i>lissophloia</i>) over <i>Alyxia buxifolia</i> and <i>Melaleuca</i> . STAM: Shrubland Thickets of <i>Allocasuarina</i> with <i>Melaleuca</i> : Dense thickets consisting of <i>Allocasuarina acutivalvis</i> frequently with <i>Allocasuarina campestris</i> and <i>Melaleuca uncinata</i> . VSAM: Varying Shrubland of <i>Allocasuarina</i> to Mallee: Varying community from <i>Allocasuarina</i> thickets with <i>Calothamnus</i> and <i>Melaleuca cordata</i> over <i>Hibbertia</i> ; to a more open <i>Allocasuarina acutivalvis</i> and <i>Hakea pendens</i> shrubland with frequently emerging mallees. CWRO: <i>Callitris</i> Woodland on Rocky Outcrops: <i>Callitris columellaris</i> open woodland (sometimes with <i>Hakea pendens</i>) on rocky outcrops.	<ul style="list-style-type: none"> 48 families 224 taxa 112 genera Condition: Not assessed	<ul style="list-style-type: none"> TECs: None PECs: 1 Parker Range Priority Ecological Community (P3) Threatened species: None Priority species: 5 <i>Goodenia heatheriana</i> (P1) <i>Acacia concolorans</i> (P2) <i>Acacia dissona</i> var. <i>indoloria</i> (P3) <i>Calamphoreus inflatus</i> (P4) <i>Eremophila caerulea</i> subsp. <i>merrallii</i> (P4)
Gibson and Lyons (1998)	Location: Parker Range Study Type: Flora and Vegetation Survey Survey Date(s): Spring 1994 Size of Survey Area: Not stated	44 km south east of Survey Area	61 quadrats	Sandy soils at base of ridges and low rises dominated by <i>Eucalyptus sheathiana</i> with <i>E. transcontinentalis</i> and/or <i>E. eremophila</i> as co-dominants. Typical understorey species were <i>Daviesia argillacea</i> and <i>Grevillea huegelii</i> . Broad flats dominated by <i>Eucalyptus longicornis</i> with co-dominants <i>E. corrugata</i> and <i>E. salubris</i> . One site was dominated by <i>E. myriadena</i> . Broad flats dominated by <i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> . Typical understorey of <i>Eremophila oppositifolia</i> , <i>Acacia concolorans</i> , <i>Dodonaea stenozyga</i> and <i>Scaevola spinescens</i> . Deeper sandy soils with <i>Allocasuarina acutivalvis</i> and <i>A. corniculata</i> . At some sites <i>Eucalyptus capillosa</i> subsp. <i>polyclada</i> and more typically <i>Baeckea elderiana</i> and <i>Thryptomene kochii</i> . <i>Allocasuarina</i> <i>campestris</i> and <i>A. acutivalvis</i> with <i>Eucalyptus capillosa</i> subsp. <i>polyclada</i> and/or <i>E. loxophleba</i> with <i>Hakea pendens</i> , <i>Phebalium tuberculatum</i> and <i>Westringia cephalantha</i> in the understorey. <i>Callitris columellaris</i> and <i>Isopogon robustus</i> on decomposing laterite and granite.	<ul style="list-style-type: none"> 253 taxa 	<ul style="list-style-type: none"> TECs: None PECs: 1 Parker Range Priority Ecological Community (P3) Threatened species: 1 <i>Isopogon robustus</i> EN Priority species: 8 <i>Hemigenia obovata</i> (P1) <i>Rinzia medifila</i> (P1) <i>Drummondia wilsonii</i> (P1) <i>Grevillea phillipsiana</i> (P1) <i>Acacia asepala</i> (P2) <i>Acacia concolorans</i> (P2) <i>Hakea pendens</i> (P2) <i>Gnephosis intonsa</i> (P3) (now <i>Notisia intonsa</i> (P3))

Table 3-3: Summary of vertebrate fauna surveys in the vicinity of the Survey Area

Reference Survey	Survey Details	Proximity to the Survey Area	Survey effort	Fauna habitats	Fauna assemblages recorded	Species of significance
(Stantec 2021a)	<p>Location: Phoenix, Bronco, Brumby and Zeus</p> <p>Study Type: Targeted Malleefowl Survey</p> <p>Survey Date(s): March 2021</p> <p>Size of Survey Area: 293 ha</p>	8.6 km west of the Survey Area	Targeted fauna Traversed on foot 4 motion-sensing cameras	<p>Eucalyptus Woodlands Gently undulating terrain, dominated by a woodland of <i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> over <i>Melaleuca</i> sp., and <i>Acacia merralli</i> shrubs. The habitat comprised of relatively open areas dominated by mature tall Eucalypts. Mallee forms of the Eucalypts also occurred within the Eucalypt Woodland habitat.</p> <p>Shrubland Plains on sandy or loamy substrates supporting a minimal upper storey of <i>Eucalyptus capillosa</i> and <i>Eucalyptus leptopoda</i> mallee over dense mid to low heath shrubs dominated by taxa such as <i>Acacia beauverdiana</i>, <i>Allocasuarina acutivalvis</i>, and <i>Thryptomene kochii</i>. Leaf litter providing shelter to small ground-dwelling fauna was moderate and generally associated with the presence of mallee. This habitat lacked large trees with the potential to form hollows or substantial woody debris.</p>	<ul style="list-style-type: none"> 10 Malleefowl mounds 4 Malleefowl 	<ul style="list-style-type: none"> Malleefowl (Vu; VU) (<i>Leipoa ocellata</i>)
(Stantec 2020a)	<p>Location: Glendower</p> <p>Study Type: Detailed flora and vegetation survey, basic fauna survey, and targeted flora and fauna surveys.</p> <p>Survey Date(s): April and September 2020</p> <p>Size of Survey Area: 250.6 ha</p>	30 km northwest of Survey Area	Targeted fauna Traversed on foot	<p>Eucalyptus Woodlands Gently undulating terrain, dominated by a woodland of <i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> over <i>Melaleuca</i> sp., <i>Allocasuarina</i> sp., and <i>Acacia</i> sp. shrubs. The habitat ranged from relatively open areas dominated by mature tall Eucalypts to densely vegetated areas with immature Eucalypts, regenerating after fire. Mallee forms of the Eucalypts also occurred within the Eucalypt Woodland habitat.</p>	<p>11 taxa:</p> <ul style="list-style-type: none"> 8 native bird species 2 reptile species 1 introduced mammal species 	Nil
Spectrum Ecology (2020)	<p>Location: Leviathan</p> <p>Study Type: Reconnaissance Flora and Vegetation, Targeted Fauna and Targeted Flora Assessment</p> <p>Survey Date(s): November 2019</p> <p>Size of Survey Area: 195 ha</p>	35 km northwest of Survey Area	Targeted fauna	<p>Semi-arid woodland and tall shrubland Semi-arid and arid habitats. Variety of Mallee woodlands and shrublands.</p>	Nil	Nil

Reference Survey	Survey Details	Proximity to the Survey Area	Survey effort	Fauna habitats	Fauna assemblages recorded	Species of significance
Stantec (2019)	<p>Location: Parker range</p> <p>Study Type: Reconnaissance Level Vegetation and Flora Survey, and a Level 1 Fauna Survey</p> <p>Survey Date(s): 16 to 29 September 2019</p> <p>Size of Survey Area: 16,429 ha</p>	Partly intersecting Survey Area	35 habitat assessments 76 mapping notes	<p>Eucalyptus Woodlands Gently undulating terrain, dominated by a woodland of <i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> over <i>Melaleuca</i> sp., <i>Allocasuarina</i> sp., and <i>Acacia</i> sp. Shrubs. The habitat ranged from relatively open areas dominated by mature tall eucalypts to densely vegetated areas with immature eucalypts, regenerating after fire. Mallee forms of the eucalypts also occurred within the Eucalypt Woodland habitat.</p> <p>Hills and Stony Rises Sloped terrain on stony lateritic substrate, dominated by dense mid storey of <i>Allocasuarina acutivalvis</i> over dense <i>Grevillea</i> spp. and <i>Acacia</i> spp. shrubland. The habitat varied in the vegetation composition with patches of; <i>Callitris canescens</i> and <i>Eremophila clarkei</i> over <i>Phebalium</i> spp., and <i>Hakea multilineata</i> and <i>Thryptomene kochii</i> over <i>Grevillea</i> spp. and <i>Phebalium tuberosum</i> within the habitat. Several patches of exposed bedrock were observed in the areas of the habitat.</p> <p>Sandplain Shrublands Relatively flat terrain on sandy substrate with mid to low dense shrub cover. The vegetation composition was dominated by <i>Eucalyptus capillosa</i> and <i>Eucalyptus sheathiana</i> over <i>Acacia</i> spp., and <i>Allocasuarina acutivalvis</i> on low shrubs. The lower shrubs varied in density from scattered to open.</p> <p>Spinifex Shrublands This habitat differed from other habitats primarily based on the presence of Spinifex. Broadly the habitat occurred on the sandplains dominated by <i>Eucalyptus rigidula</i> open mallee over <i>Callitris preissii</i> and <i>Santalum acuminatum</i> high shrubs on <i>Grevillea</i> spp., and <i>Banksia shanklandiorum</i> over <i>Triodia</i> sp. low shrubland. Substrate varied from stony to sandy loam, within the Survey Area.</p> <p>Saline Lakes and Claypans This habitat encompasses Saline Lakes and Claypans, along with their fringing vegetation. The habitat occurs low in the landscape where it may be inundated with water after heavy rainfall. The Saline Lakes and Claypans are dominated by <i>Tecticornia</i> spp., and <i>Frankenia</i> sp. The habitat ranges from more freshwater claypans with a <i>Melaleuca</i> spp. upper storey to salt lakes with gypsum crystals and tussock grass present.</p> <p>Disturbed Disturbance associated with infrastructure and clearing for exploration. Habitat considered of little to no value to fauna.</p>	<p>28 taxa:</p> <ul style="list-style-type: none"> 19 native bird species 2 native mammal species 3 reptile species 3 introduced mammal species 	<ul style="list-style-type: none"> Malleefowl (Vu; VU) (<i>Leipoa ocellata</i>)
GHD (2016)	<p>Location: North Yilgarn Star</p> <p>Study Type: Biological Assessment</p> <p>Survey Date(s): June 2016</p>	Intersecting Survey Area	Traversed on foot, Opportunistic	<p>Mixed Eucalypt woodland: <i>Eucalyptus</i> open forest</p> <p>Highly modified areas: Isolated Chenopod Shrubs (VA02) and Cleared/Highly Disturbed areas (HD)</p>	<p>19 taxa:</p> <ul style="list-style-type: none"> 14 native bird species 2 native mammals 3 introduced mammals 	Nil
Botanica (2016b)	<p>Location: Redwing Project</p> <p>Study type: Level 2 Flora & Fauna Survey - Redwing Project</p> <p>Survey Date(s): 3 to 8 April</p>	9 km south-east of Survey Area	2 person days	<p>Clay-Loam Plain - Regrowth open low woodland of <i>Eucalyptus salmonophloia</i>/ <i>E. salubris</i>/ <i>E. urna</i> over scrub of <i>Melaleuca pauperiflora</i> and mixed low scrub on clay-loam plain.</p> <p>Rocky Hillslope - Low forest of <i>E. longicornis</i> over scrub of <i>M. pauperiflora</i> and mixed low scrub on rocky plain/ basalt rise or Open shrub Mallee of <i>E. livida</i>/ <i>E. tenera</i> over heath of <i>Allocasuarina campestris</i> and mixed low scrub on laterite rise</p> <p>Rocky Plain/ Hillslope - Very open shrub mallee of <i>E. livida</i>/ <i>E. cylindriflora</i> over heath of <i>A. acutivalvis</i>/ <i>A. corniculata</i>/ <i>Acacia yorkrakinensis</i> or very open shrub mallee of <i>E. livida</i>/ <i>E. cylindriflora</i> over heath of <i>A. acutivalvis</i>/ <i>A. corniculata</i>/ <i>A. yorkrakinensis</i>; over mixed low heath on rocky plain/ laterite rise</p> <p>Existing Disturbed Areas - Parts of the survey area have been subject to varying historical disturbances such as track construction for exploration drilling, wood cutting and low level mining operations (e.g. old shafts). These areas typically contain no vegetation or are in the early stages of natural regeneration.</p>	<p>44 taxa:</p> <ul style="list-style-type: none"> 32 birds 11 mammals (including 6 bat species and 3 introduced species) one reptile 	<ul style="list-style-type: none"> Malleefowl (Vu; VU) (<i>Leipoa ocellata</i>)
Western Wildlife (2008)	<p>Location: Southern Cross Operations</p> <p>Study type: Baseline Fauna Survey (Level 2 fauna survey)</p> <p>Survey Date(s): Spring 2007 & Autumn 2008</p>	17 km north of Survey Area	14 trapping grids established. Each grid consisted of 10 pitfall traps, five funnel traps, 10 Elliott traps and one or two cage traps. The traps were open for seven or eight nights on each survey 5419 trap-nights	Nil	<p>123 taxa:</p> <ul style="list-style-type: none"> 71 birds 15 mammals 33 reptiles 4 amphibians 	<ul style="list-style-type: none"> Malleefowl (Vu;VU) (<i>Leipoa ocellata</i>) Western Peregrine Falcon (OS) (<i>Falco peregrinus</i>) Rosella (P4) (<i>Platycercus icterotis xanthogenys</i>)

3.1.3 Likelihood of Occurrence

Prior to undertaking the field work for the Project, the significant species identified from the database searches and literature review were assessed for likelihood of occurrence within the Survey Area. This was based on interpretation of habitat types from aerial imagery, known preferred habitat and the nearest known location of each species. Each species of significant flora was assessed and ranked for likelihood of occurrence in the Survey Area, according to the criteria presented in **Table 3-4**.

Table 3-4: Criteria for assessing the likely presence of significant flora and fauna

Likelihood: Confirmed
The species has been recorded unambiguously (i.e. during recent surveys of the survey area, from reliable records obtained via database searches or from current vouchered specimen at WA Herbarium) in the survey area.
Likelihood: Likely
There is a medium to high likelihood that the species occurs in the survey area as the survey area occurs within the known distribution of the species, contains suitable habitat and the species has been recorded recently nearby.
Likelihood: Possible
There is a potential for the species to occur in the survey areas, as: <ul style="list-style-type: none"> • The species has not been recorded recently nearby, however; <ul style="list-style-type: none"> ○ the species may not have been detectable during current or previous surveys (e.g. rare, patchily distributed, non-optimal survey timing). ○ the species is known to be cryptic and may not have been detectable despite extensive surveys. • The species has been recorded recently nearby and species presence cannot be ruled out due to factors such as species ecology or distribution, however; <ul style="list-style-type: none"> ○ doubt remains over taxonomic identification. ○ the majority of habitat does not appear suitable. ○ coordinates are doubtful.
Likelihood: Unlikely
The species is unlikely to occur in the survey area as: <ul style="list-style-type: none"> • the species has not been recorded locally through DBCA database searches; • the survey area lacks potential habitat, having at best marginally suitable habitat, and/or being severely degraded; • it is only recorded from a few historic record/s and no other collections in the area; and • the species has not been recorded in the survey area despite adequate survey efforts, such as a standardised methodology or targeted searching within potentially suitable habitat.

Following the Survey, the significant flora and fauna species identified from the database searches, were re-assessed to determine their likelihood of occurrence within the Survey Area (**Appendix D, Appendix H**).

3.2 RESULTS

3.2.1 Flora

The results of the desktop assessment identified 47 vascular flora taxa of significance occurring within a 20 km search radius of the Survey Area (**Appendix D**). Nine species were listed as Threatened under the provisions of the BC Act. Of these, seven were listed as endangered, and two were listed as critical under the provisions of the EPBC Act. The remaining 38 species were listed as Priority by the DBCA. Of the Priority species, 12 were P1, five were P2, 13 were P3, and eight were P4.

No significant flora species have been previously recorded within the Survey Area (DBCA 2020e, Stantec 2019). The pre-survey likelihood of occurrence identified three species were 'likely' to occur (*Grevillea phillipsiana*, *Rinzia fimbriolata* (P1), and *Hakea pendens* (P3)), 34 were 'possible' to occur, and the remaining 10 as 'unlikely' to occur in the Survey Area (**Appendix D**).

3.2.2 Vegetation

The Survey Area does not coincide with any areas mapped as a TEC. The '*Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)*'- Critically Endangered TEC (EPBC Act) has been mapped within 18 km of the Survey Area (DBCA 2019), however, is restricted to the Avon Wheatbelt bioregion (**Figure 3-1**).

The '*Parker Range vegetation complexes*' PEC, listed as priority 3 (BC Act) has also been identified during previous work in the vicinity of the Survey Area (Error! Reference source not found.) (Botanica 2016c, Gibson and Lyons 1998, 2001, Recon Environmental 2007, 2008c, a). The Survey Area partially coincides with the mapped area for this PEC (DBCA 2019) (**Figure 3-1**). The Parker Range vegetation complexes PEC is defined by six community types (DBCA 2020a, Gibson and Lyons 1998), as described below:

- **Community type 1:** occupies sandy soils at the base of ridges and low rises. It is generally dominated by *Eucalyptus sheathiana* with *E. transcontinentalis* and/or *E. eremophila* as co-dominants. Typical understorey species are *Daviesia argillacea*, *Grevillea huegelii*.
- **Community type 2:** generally dominated by *Eucalyptus longicornis*. Other eucalypts that occur as co-dominants included *E. corrugata* and *E. salubris* (occasionally dominated by *E. myriadena*). This community occupies the broad flats.
- **Community type 3:** occurs on the broad flats within the greenstone belt. Usually dominated by *Eucalyptus salmonophloia* and *E. salubris*. Typical understorey species include *Eremophila oppositifolia*, *Acacia concolorans* ms, *Dodonaea stenozyga* and *Scaevola spinescens*.
- **Community type 4:** generally dominated by *Allocasuarina acutivalvis* and *Allocasuarina corniculata*. *Eucalyptus capillosa* subsp. *polyclada* also occasionally occurred. Other species typical of this community type include *Baeckea elderiana* and *Thryptomene kochii*, further illustrating the sandy nature of these sites.
- **Community type 5:** almost totally lacks *Allocasuarina corniculata* (cf type 4), being replaced by *A. campestris*, while *Allocasuarina acutivalvis* is still a common element. *Eucalyptus capillosa* subsp. *polyclada* and/or *Eucalyptus loxophleba* tend to dominate these sites while *Hakea pendens* (P3), *Phebalium tuberculosum*, and *Westringia cephalantha* are common understorey elements. This community type is associated with laterites, breakaways and the massive gossanous caps of the Mt. Caudan area.
- **Community type 6:** restricted to a small area of a massive decomposing laterite and granite in the Parker Range. The area is dominated by low trees of *Callitris columellaris* and the previously unknown *Isopogon robustus* (T) ms.

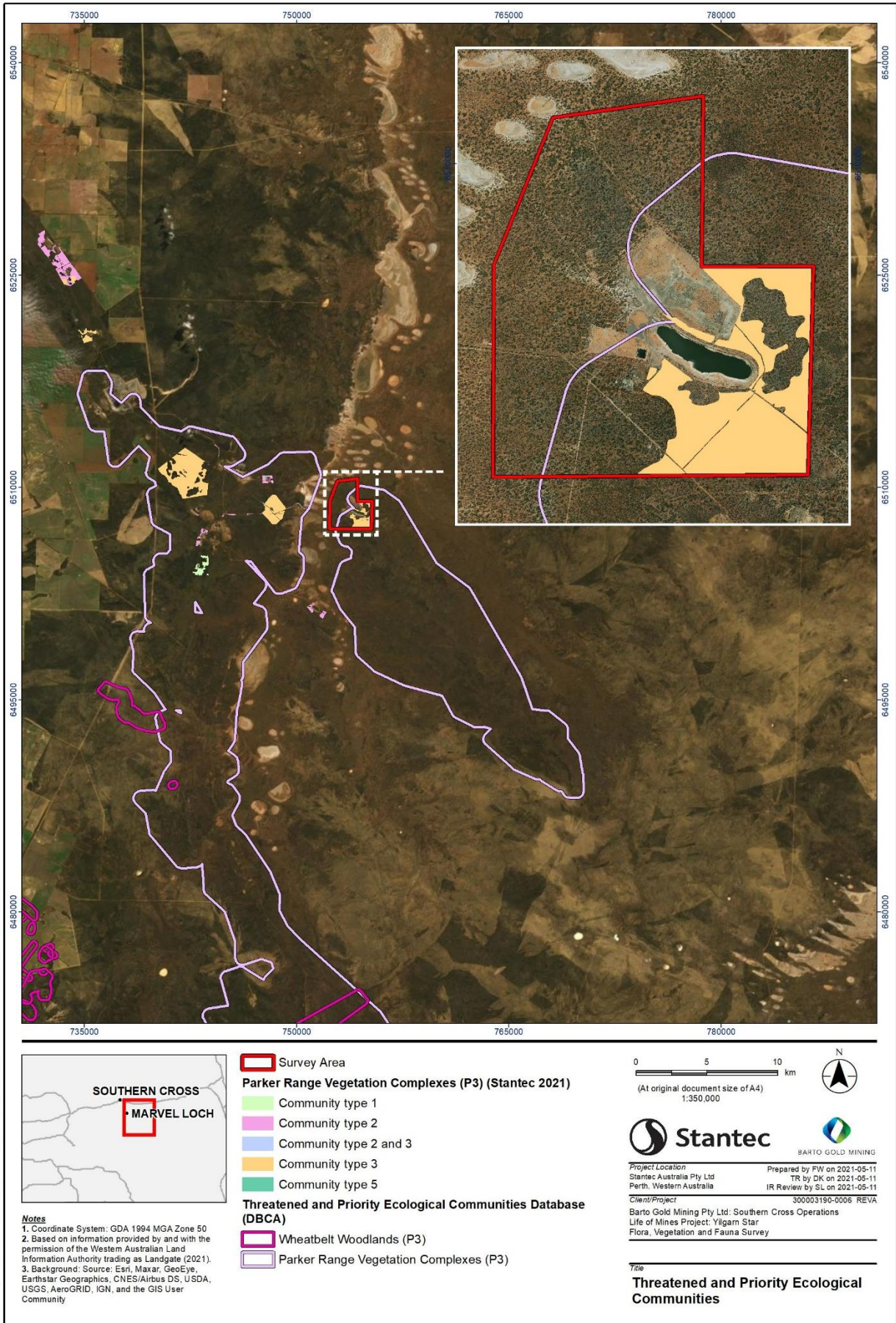


Figure 3-1: Threatened and Priority Ecological Communities mapped for the Survey Area

3.2.3 Terrestrial Fauna

The desktop assessment identified a total of 247 species of vertebrate fauna, which have been recorded and/or have the potential to occur within the Survey Area (**Appendix G**). This comprises 21 native mammal, 11 introduced mammal, 154 native bird, two introduced bird, 54 native reptile, and five amphibian species.

Of the 247 species of vertebrate fauna identified, 20 species are listed as being of significance, comprising six mammals, 12 birds, and two reptiles (**Table 3-5**). Of these, 14 are Commonwealth (EPBC Act) listed fauna (**Table 3-5**). Many of these 20 significant species are unlikely to occur as these records have been collected from a large area encompassing a wide range of habitats, many of which do not occur within the Survey Area. Furthermore, some small, common, ground-dwelling reptile and mammal species tend to be patchily distributed even where appropriate habitats are present, and many species of bird can occur as regular migrants, occasional visitors or vagrants.

One fauna species of significance, Malleefowl (*Leipoa ocellata*), was recorded historically on two occasions within the Survey area. 'Moderately certain' sightings of the species were recorded in 1999 and 2018, of two and one individuals, respectively (DBCA 2020b). The current location of the 2018 record coincides with an area of disturbance caused by mining related activities. Given the uncertainty around both records, the age of the record from 1999, and the disturbance currently impacting the site of the 2018 record, the species has been assessed as only likely to occur (**Appendix H**).

Table 3-5: Fauna of significance identified during the desktop assessment.

Species	Common name	State (BC Act)	Commonwealth (EPBC Act)
Aves			
<i>Pezoporus occidentalis</i>	Night Parrot	Cr	En
<i>Calidris ferruginea</i>	Curlew Sandpiper	Cr	Cr; Mi
<i>Leipoa ocellata</i>	Malleefowl	Vu	Vu
<i>Apus pacificus</i>	Fork-tailed Swift	Mi	Mi
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi	Mi
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi	Mi
<i>Motacilla cinerea</i>	Grey Wagtail	Mi	Mi
<i>Tringa hypoleucos</i>	Common Sandpiper	Mi	Mi
<i>Tringa nebularia</i>	Common Greenshank	Mi	Mi
<i>Falco peregrinus</i>	Peregrine Falcon	OS	
<i>Platycercus icterotis xanthogenys</i>	Western rosella (inland)	P4	
<i>Thinornis cucullatus</i>	Hooded Plover	P4	
Mammalia			
<i>Myrmecobius fasciatus</i>	Numbat	En	En
<i>Petrogale lateralis lateralis</i>	Black-footed Rock-wallaby	En	En
<i>Phascogale calura</i>	Red-tailed Phascogale	CD	Vu
<i>Dasyurus geoffroii</i>	Chuditch	Vu	Vu
<i>Macrotis lagotis</i>	Bilby	Vu	Vu
<i>Notamacropus irma</i>	Western Brush Wallaby	P4	
Reptilia			
<i>Aspidites ramsayi</i>	Woma (southwest pop)	P1	
<i>Paroplocephalus atriceps</i>	Lake Cronin Snake	P3	

4.0 FIELD SURVEY METHODS

4.1 FLORA AND VEGETATION SURVEY

4.1.1 Survey Timing

The EPA (2016b) recommends that flora and vegetation surveys be undertaken following the season of highest rainfall to optimise the likelihood of encountering flowering and fruiting taxa and capturing ephemeral species. The recommended survey timing for the South-Western Interzone Province is during spring (September to November), with supplementary surveys to be completed after autumn rains.

The recommended timing for fauna surveys to be undertaken in the South-Western Interzone is between October-December (primary survey) and February-March (secondary survey) for reptiles; May-June, July-August and November-December for amphibians; September-December and November-March for birds and September-December for mammals (DotE 2020).

The Survey was conducted over three separate trips over a 12-month period (April 2020 to March 2021) (**Figure 4-1**):

- Trip 1: 21 and 22 April 2020, following a significant rainfall event in February;
- Trip 2: 26 and 27 October 2020, during the recommended optimal time for surveys in the South-Western Interzone Province (EPA 2016b); and
- Trip 3: 24 and 25 March 2021, following a significant Autumn rainfall event.

Rainfall in the three months preceding Trip 1 was above the long-term average for the same period. Rainfall in the three months preceding Trips 2 and 3 was below the long-term average for each period (**Figure 4-1**).

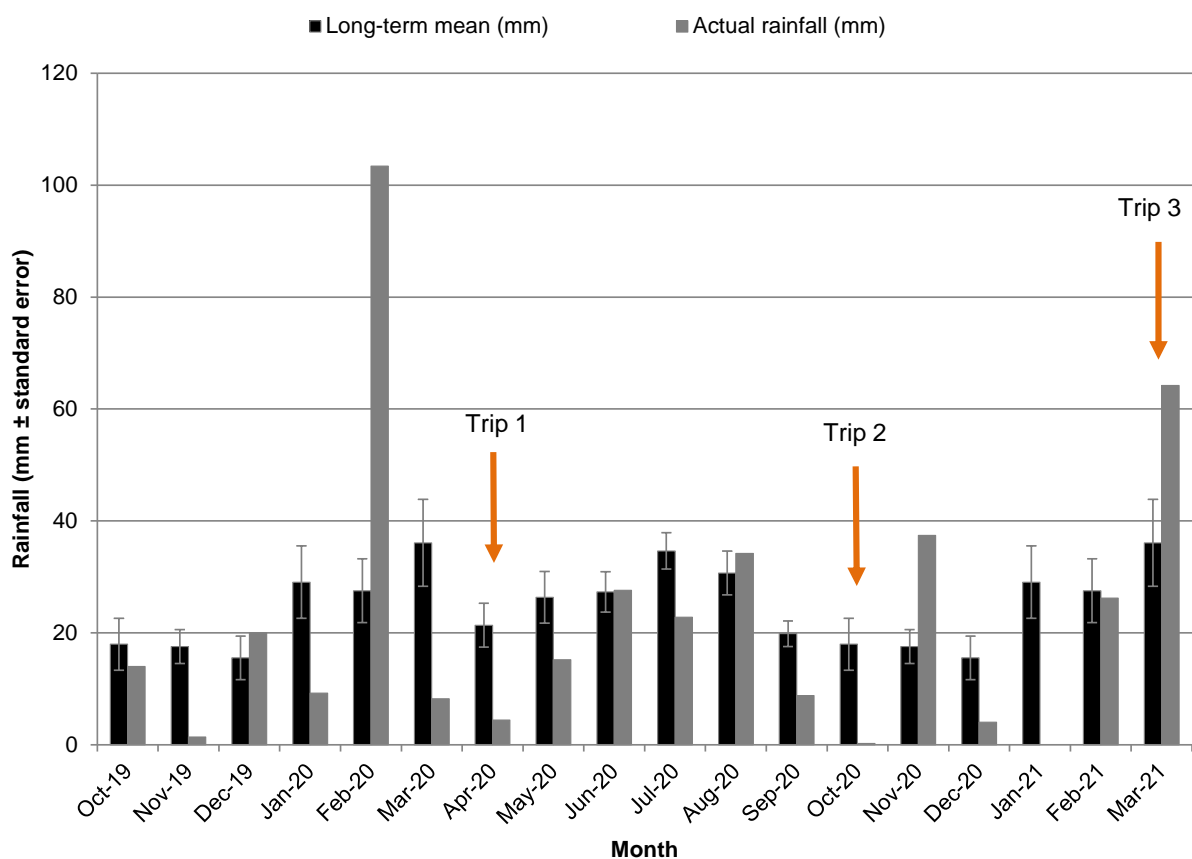


Figure 4-1 Long term (1996 to 2021) mean monthly rainfall (mm) at Southern Cross Airfield weather station and actual monthly rainfall (mm) in the 12 months preceding the field surveys (BoM 2021)

4.1.2 Survey Team and Licensing

Field survey teams and timing of each trip is provided in **Table 4-1**. All staff have technical knowledge and experience within the Coolgardie Bioregion.

Table 4-1 Survey team and licensing

Personnel	Survey	Survey Role	Years of Experience	Flora Licence
Scott Pansini	Trip 1, 2 and 3	Botanist/ecologist (team lead phase 1 & 2)	3	FB62000122 TFL 22-1920
Jeni Alford	Trip 1	Botanist/ecologist	25+	FB62000154
Julijanna Hantzis	Trip 2	Botanist/ecologist	3	FB62000132 TFL 21-1920
Jonas Mitchell	Trip 3	Botanist/ecologist	1	FB62000315 TFL 146-2021

4.1.3 Flora and Vegetation Assessment

Prior to the field surveys, broad vegetation units were identified using aerial imagery and proposed quadrat locations selected. The field survey was conducted in accordance with the requirements outlined in the EPA Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b).

A total of 13 quadrats, one relevé, and three mapping notes were sampled in the Survey Area. These were used to compile a representative species list of the Survey Area and to characterise the vegetation types present (**Table 4-2; Figure 4-2**). Ten quadrats were sampled during Trip 1 and Trip 2 and re-assessed during the Trip 3 (**Table 4-2**). Three additional quadrats were installed during Trip 3. Quadrats comprised a square of 20 m x 20 m, which was permanently marked with a galvanised steel fence dropper in the north-western corner. Relevés were sampled from an unbound area of approximately 400 m². The remainder of the Survey Area was traversed on foot and via vehicle to map vegetation types and to sample flora opportunistically.

The information collected from each quadrat and relevé is presented in **Table 4-3**. Mapping notes were also used to support the delineation of vegetation units throughout the Survey Area. The details collected at mapping note locations included coordinates, photographs, vegetation descriptions and any defining features of the mapping note location. All data was recorded using the Survey123 in-field (electronic) data collection application. The field data collected from each quadrat and relevé is provided in **Appendix E**.

Table 4-2 Sampling effort within the Survey Area

Quadrat/relevé	Trip 1	Trip 2	Trip 3
LoM01	✓		✓
LoM02	✓		✓
LoM04	✓		✓
LoM05	✓		✓
LoM06	✓		✓
LoM28	✓		✓
LoM29	✓		✓
QLoM43		✓	✓
QLoM44		✓	✓
QLoM45		✓	✓
QYs01			✓
QYs02			✓
QYs03			✓
rLoM01	✓	✓	✓

Table 4-3 Summary of data recorded at each quadrat and relevé

Parameter	Description
Site ID	The unique name that was assigned to the site that was sampled
Recorder and Date	The recorder(s) involved in sampling the quadrat and date
Site dimensions	Measured using handheld GPS device and 100 m measuring tapes
Coordinates	Measured using a handheld GPS device (in GDA94 format) from the north-west corner
Site photograph	At least one representative photograph taken of the site
Soil description	A description of the soil colour and types based on the guide in the Australian Soil and Land Survey Field Handbook (McDonald et al. 1998)
Geology type	A description of the outcropping geology (if present) and coarse fragments
Habitat type	A description of the landform type and aspect
Vascular flora species	A record of each flora species present
Height	The average height of each species in metres
Percent Foliar Cover (PFC)	An estimate of the PFC for each species will be recorded
Vegetation structure	A description of the vegetation in accordance with the National Vegetation Information System (NVIS), Level 5 – Association (ESCAVI 2003) based on height and foliar cover of strata (Appendix C)
Vegetation Condition	Assessed according to the vegetation condition scale described by Keighery (1994) (Appendix B)
Disturbances	A list of any disturbances in the quadrat if present
Time since fire	An estimation of the time since the vegetation was last burnt

4.1.4 Vegetation Type and Condition Mapping

The broad vegetation type mapping that was completed during the desktop assessment was refined on maps during the field survey, as required. Vegetation types were delineated and described in accordance with Level V (Vegetation Association) in the NVIS hierarchical structure (ESCAVI 2003) (**Appendix C**) using the quadrat, relevé and mapping note data.

Vegetation condition was mapped according to vegetation association boundaries throughout the Survey Area, using a combination of quadrat and relevé data and opportunistic observations. Vegetation condition was assigned at each survey site based on the six categories described by Keighery (1994) (**Appendix B**).

4.1.5 Targeted Flora survey

Previous significant flora records (DBCAs 2020d, e) and associated species habitat preferences were reviewed to assist in identifying vegetation associations and habitat within the Survey Area that have the potential to support threatened and priority flora. These areas were then targeted in the field, as a priority, to search for the presence of significant flora. Search effort, in the form of GPS tracklogs are presented in **Figure 4-2**.

4.1.6 Opportunistic Records

Opportunistic flora records of additional species beyond those recorded within quadrats were taken to maximise the floristic inventory of the Survey Area. Each opportunistic collection was recorded electronically and geospatially referenced. All data was entered into a customised database enabling quality management and review.

4.2 FAUNA SURVEY

4.2.1 Terrestrial Fauna Habitat Assessment

Major fauna habitat types were described and delineated based on landforms and vegetation types. Fauna habitat assessments were undertaken at each quadrat/relevé location, with the key habitat parameters recorded at each presented in **Table 4-4**.

Table 4-4: Summary of data collected at each fauna habitat assessment site

Parameter	Description
Habitat assessment ID	The unique name that was assigned to the site that was sampled
Recorder and Date	The recorder(s) involved in sampling the site and date
Coordinates	Measured using a handheld GPS device (in GDA94 format)
Site photograph	At least one representative photograph taken of the site
Tree presence	A comment on any hollow-bearing trees and stag (dead) trees (average size and abundance)
Refuges	A comment on the presence of any fauna refuges e.g. burrows
Substrate	A description of the composition of the substrate and percentage of leaf litter

In addition, the habitat was assessed on extent and level of significance according to the following criteria:

- Distribution: whether the habitat is widespread and common within the surrounding region; or whether the habitat was categorised as being of limited extent; and
- Significance: whether the habitat is considered important to species of significance or distinct fauna assemblages that are deemed significant; or whether the habitat was categorised as being of limited significance.

4.2.2 Opportunistic Records

The Survey Area was traversed on foot, and opportunistic records were made to document fauna assemblages and species of significance within the Survey Area. Any evidence of species encountered, including secondary signs such as the presence of tracks, diggings, scats, burrows and nests were recorded using the Survey123 in-field (electronic) data collection application.

4.2.3 Motion-sensing Cameras

Three motion-sensing cameras were deployed to record fauna species unlikely to be sighted opportunistically during the field surveys (**Table 4-5, Figure 4-2**). Cameras were placed in areas likely to support fauna of significance and in areas displaying fauna activity e.g. burrows, mounds and foraging evidence.

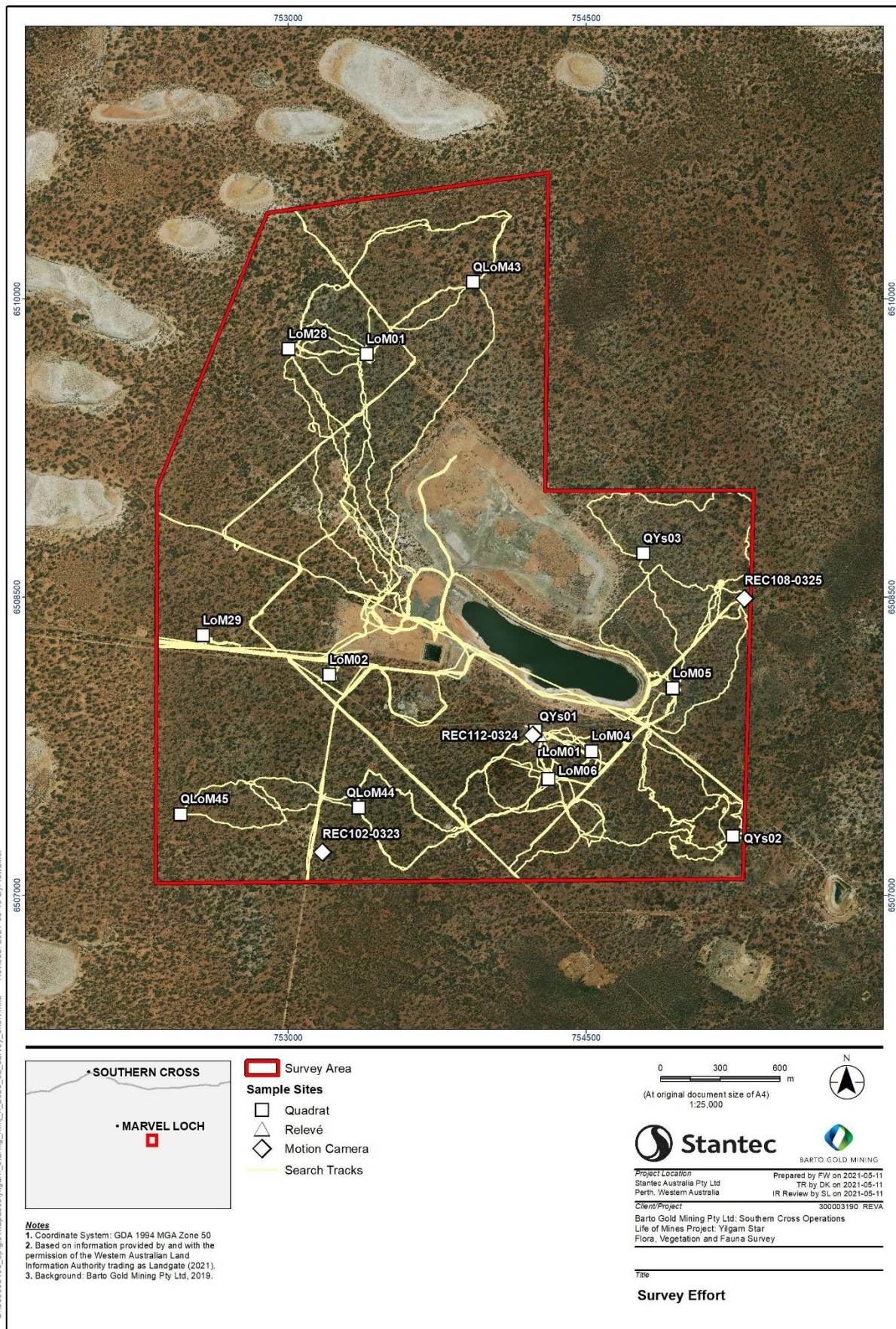
Table 4-5: Motion-sensing camera survey effort within the Study Area

Camera	Habitat	Recording nights
REC102_0323	Eucalypt Woodland	29 nights
REC108_0325	Eucalypt Woodland	27 nights
REC112_0324	Eucalypt Woodland	28 nights

4.3 TAXONOMY AND NOMENCLATURE

The flora taxa that were collected in the field were collected and pressed and taken to the WA Herbarium (WAH) for identification by senior taxonomists, Frank Obbens and Sharnya Thomson. Both taxonomists have worked extensively in Western Australia and are familiar with the flora of the region. Species nomenclature was assigned according to the current listing of scientific names recognised by the WAH. Where specimens were lacking in diagnostic characteristics or were in poor condition, they were assigned the 'sp.' epithet, indicating that identification could not be confirmed beyond family or genus level.

Introduced flora species were compared to the list of declared pests listed under Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) and the Weeds of National Significance list (WoNS) maintained by the Commonwealth Government. Nomenclature for fauna presented within this report follows the Western Australian Museum (WAM) checklist for terrestrial vertebrate fauna species (WAM 2019).



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Figure 4-2: Survey effort

5.0 RESULTS AND DISCUSSION

5.1 FLORA

5.1.1 Floristic Composition

A total of 74 vascular flora representing 29 families and 50 genera were recorded during the Survey (**Appendix F**). A further 10 could not be confidently identified beyond genus level due to a lack of diagnostic characteristics; these additional species are unlikely to represent any of the significant flora identified in the assessment of likelihood of occurrence (**Appendix D**). The dominant plant families were *Fabaceae* and *Myrtaceae*, with 10 species each. *Eucalyptus* was the most frequently recorded genus (**Table 5-1**). Floristic diversity and composition were considered typical of the COO2 subregion (Cowan et al 2001) and largely consistent with previous surveys undertaken within and in close proximity to the Survey Area (Botanica 2016a, GHD 2016, Gibson and Lyons 1998, MWH 2014, Recon Environmental 2008c, a, Spectrum Ecology 2020, Stantec 2019)..

Table 5-1: Most represented vascular plant families and genera for the Survey Area

Family	Number of taxa
<i>Fabaceae</i>	10
<i>Myrtaceae</i>	9
<i>Asteraceae</i> and <i>Chenopodiaceae</i>	8
<i>Poaceae</i> and <i>Scrophulariaceae</i>	5
Genus	Number of taxa
<i>Eucalyptus</i>	6
<i>Acacia</i> and <i>Eremophila</i>	5
<i>Austrostipa</i> , <i>Melaleuca</i> and <i>Roepera</i>	3

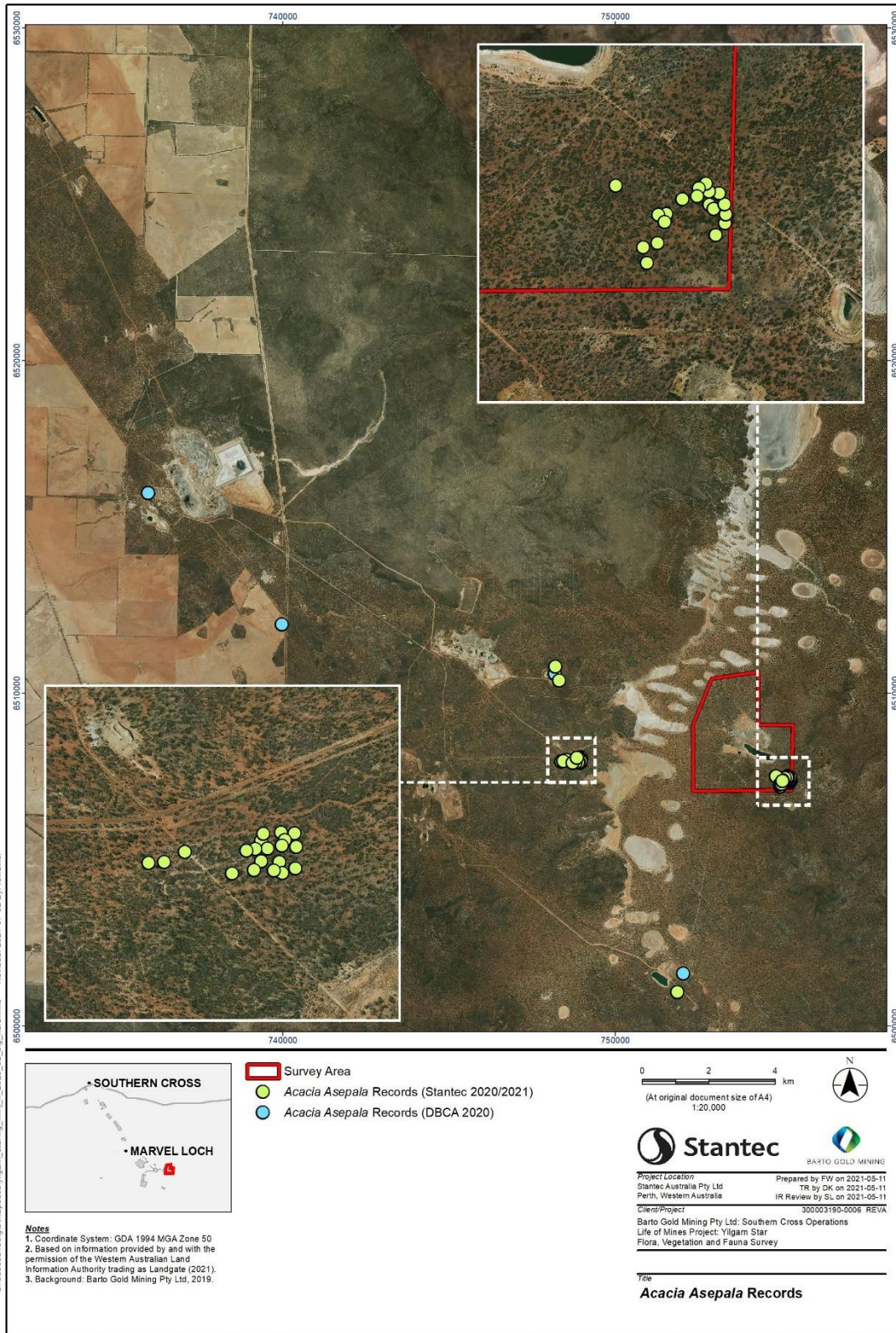
5.1.2 Flora of Significance

No Commonwealth or State-listed threatened flora were recorded within the Survey Area. A single State-listed priority flora species, *Acacia asepala* (P2), was recorded during the Survey (**Plate 5-1, Figure 5-1**). *Acacia asepala* (P2) is typically found on red-brown sandy loam on undulating plains and drainage lines and has its distribution in the Coolgardie and Mallee IBRA regions (WAH 2021). It is sometimes found on disturbed soils such as cleared areas and road verges. Within the Survey Area, *Acacia asepala* (P2) populations were recorded at 19 locations (one quadrat and 18 opportunistic recordings), with population abundances ranging from 1 – 50 individuals. (**Figure 5-1**). All populations were recorded in a single vegetation type comprised of *Eucalyptus* woodland over *Melaleuca pauperiflora* tall open shrubland over a mixed open shrubland over a low shrubland comprised of chenopods (**Figure 5-1**).

Seventeen records of *Acacia asepala* (P2) are held with the WAH, with the most recent collection in 2012. Stantec surveys in the vicinity have recorded 23 populations representing approximately 265 specimens (in abundances of 1-50 individuals) 3km west of the Survey Area (unpublished report). Locations of *Acacia asepala* (P2) outside the project area are included in Figure 5-1: Location of priority flora recorded in the Survey Area. The frequency at each record held by the WAH ranged from mostly isolated plants to a population size of 10 / m²(WAH 2021). The nearest record from database search results is 4.24 km from the Survey Area (**Table 3-2**).



Plate 5-1: *Acacia asepala* (P2) photographed from the Survey Area



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Figure 5-1: Location of priority flora recorded in the Survey Area.

5.1.3 Flora of Other Significance

The EPA advises that flora species, subspecies, varieties, hybrids and ecotypes may be considered significant for reasons other than listing as a threatened or priority flora taxa, and may include the following:

- a keystone role in a particular habitat for threatened taxa, or supporting large populations representing a significant proportion of the local regional population of a species;
- relic status;
- anomalous features that indicate a potential new discovery;
- being representative of the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- the presence of restricted subspecies, varieties, or naturally occurring hybrids;
- local endemism/a restricted distribution; and/or
- being poorly reserved.

Based on these parameters, none of the native vascular flora taxa recorded from the Survey Area are of 'other' significance. The native vascular flora taxa recorded from the Survey Area are all represented in the local and broader Coolgardie region when compared to the records held by the West Australian Herbarium (WAH 2021).

5.1.4 Post-Survey Likelihood of Occurrence

The post-survey likelihood of occurrence assessment was based on a greater understanding of the habitats and following targeted searches of the Survey Area. No species of significance were assessed as 'likely' to occur, whilst four species are considered 'possible' to occur; *Goodenia heatheriana* (P1), *Acacia concolorans* (P2) and *Notisia intonsa* (P3), and *Acacia merrickiae* (P4) (**Appendix D**). Despite suitable habitat being identified and targeted searches undertaken, none of these species were recorded during the field survey. If present, they may have been undetected due to a likely absence of flowers at the time of survey, a small growth habit, annual life cycle or a combination of these.

5.1.5 Introduced Flora

Four introduced flora species (weeds) were recorded from the Survey Area (**Table 5-2; Plate 5-2**). None of these species represents a declared pest under Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) or are listed as a Weed of National Significance (WoNS) (Commonwealth of Australia 2020).

Table 5-2: Introduced flora taxa identified in the Survey Area.

Taxon	Common name
* <i>Centaurea melitensis</i>	Maltese Cockspur
* <i>Medicago minima</i>	Small Burr Medic
* <i>Mesembryanthemum nodiflorum</i>	Slender Iceplant
* <i>Vulpia bromoides</i>	Squirrel Tail Fescue

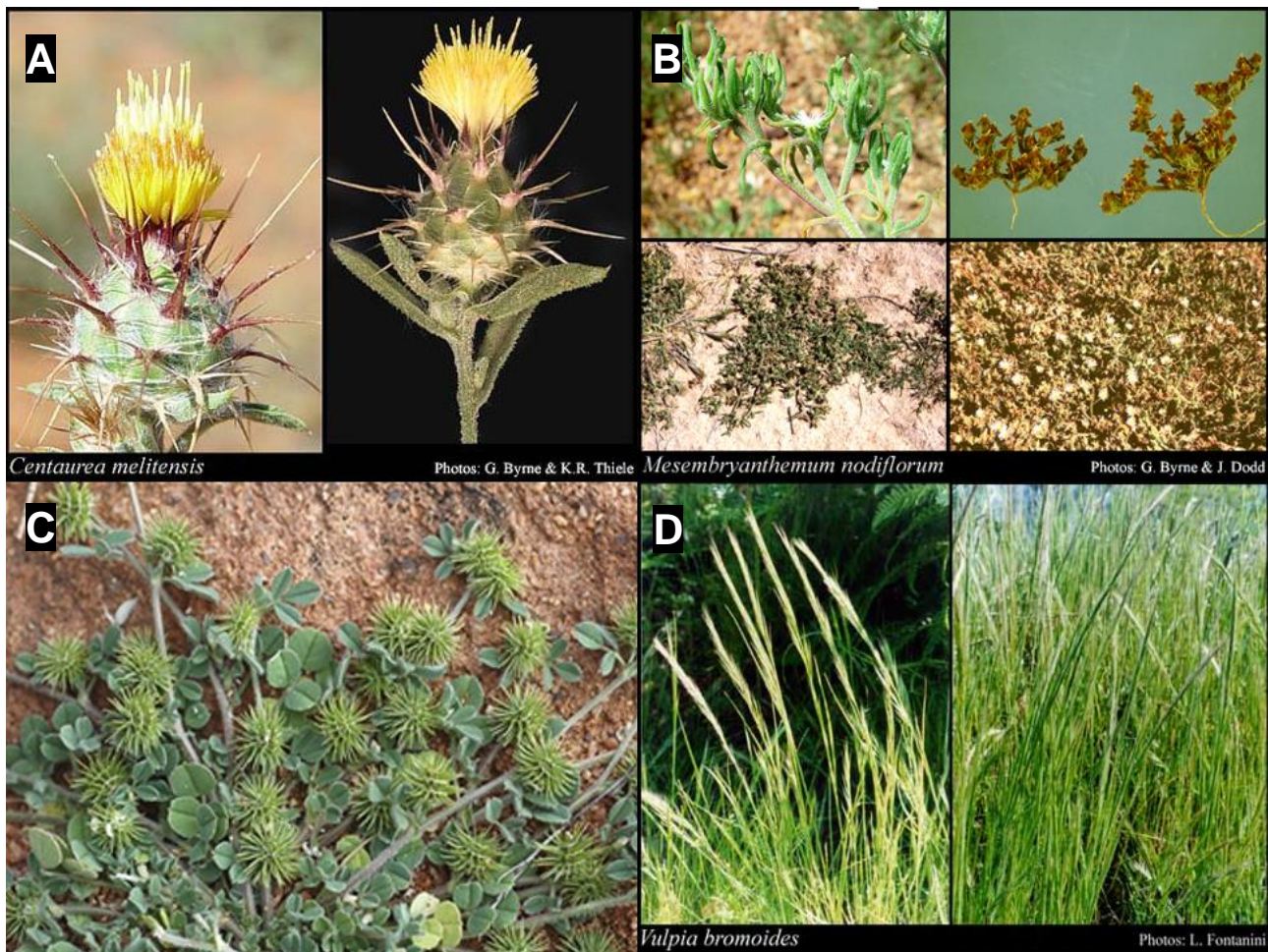


Plate 5-2: Introduced flora species recorded from the Survey Area; **Centaurea melitensis* (A), **Mesembryanthemum nodiflorum* (B), **Medicago minima* (C) and **Vulpia bromoides* (D)

Photographs of **Centaurea melitensis*, **Mesembryanthemum nodiflorum* and **Vulpia bromoides* by G. Byrne & K. R. Thiele, G. Byrne & J. Dodd and L. Fontanini, respectively. Image used with the permission of the Western Australian Herbarium, Department of Biodiversity, Conservation and Attractions (<https://florabase.dpaw.wa.gov.au/help/copyright>). Accessed on Tuesday, 18 May 2021



5.2 VEGETATION



There were four vegetation types delineated for the Survey Area (**Table 5-3**). Vegetation type mapping is presented in **Figure 5-2**, while the data collected from each quadrat and relevé is provided in **Appendix E**. The vegetation in the Survey Area was broadly represented by woodland comprised primarily of *Eucalyptus longicornis* and *Eucalyptus salubris* over *Melaleuca pauperiflora* tall open shrubland over an open shrubland to scattered shrubs over low open shrubland of mixed species. The most dominant vegetation type was EIEsuMpEaEsAv (489.96 ha), which occupied just under 60% of the Survey Area. Historic mining activities within the survey area also have also caused significant disturbance, contributing to 146 ha (17.5 %) of cleared vegetation within the Survey Area.

The least dominant vegetation type was ECAaaEaMsAbAl (5.15 ha), which occupied less than one percent of the Survey Area, followed by EIEcrEyAmEaDs (34.16 ha), which occupied just over four percent. The small areas of both vegetation types within the Survey Area restricted the potential number of monitoring sites, resulting in only one quadrat and one relevé, and two quadrats installed respectively.

The pattern of vegetation within the Survey Area is considered typical of the South-Western Interzone (Gibson and Lyons 1998, 2001, Recon Environmental 2008c, a) and also of the *Eucalyptus* Woodlands of the COO2 subregion (Cowan et al. 2001).

Table 5-3: Summary of vegetation types recorded within the Survey Area

Vegetation type code	Vegetation type description	Sample sites	Extent within Survey Area		Representative photograph
			Hectares (ha)	Proportion of Survey Area (%)	
EIEsuMpEaEsAv	<p><i>Eucalyptus longicornis</i> and <i>Eucalyptus salubris</i> woodland over <i>Melaleuca pauperiflora</i> and <i>Exocarpos aphyllus</i> tall open shrubland over <i>Eremophila scoparia</i> scattered shrubs over <i>Atriplex vesicaria</i> low open shrubland.</p> <p>Associated species <i>Acacia merrallii</i>, <i>Austrostipa elegantissima</i>, <i>Eremophila ionantha</i>, <i>Lycium austral</i>, <i>Olearia muelleri</i>, <i>Podolepis lessonii</i>, <i>Rhagodia drummondii</i>, <i>Roepera apiculata</i>, <i>Roepera glauca</i>, <i>Roepera ovata</i>, <i>Santalum acuminatum</i>, <i>Senna artemisioides</i> subsp. <i>filifolia</i></p>	<p>QLoM43 QLoM44 QLoM45 LoM01 LoM02 LoM28 LoM29</p>	489.96	58.64	
EsuEIEsMpSaEaAmAv	<p><i>Eucalyptus salubris</i>, <i>Eucalyptus longicornis</i> and <i>Eucalyptus salmonophloia</i> woodland over <i>Melaleuca pauperiflora</i> and <i>Santalum acuminatum</i> tall open shrubland over <i>Exocarpos aphyllus</i> and <i>Acacia merrallii</i> open shrubland over <i>Atriplex vesicaria</i> low open shrubland.</p> <p>Associated species <i>Austrostipa elegantissima</i>, <i>Erymophyllum ramosum</i> subsp. <i>ramosum</i>, <i>Ptilotus exaltatus</i>, <i>Ptilotus holosericeus</i>, <i>Rhagodia drummondii</i>, <i>Sclerolaena diacantha</i>, <i>Sclerolaena drummondii</i>, <i>Senna artemisioides</i> subsp. <i>filifolia</i>, <i>Templetonia ceracea</i></p>	<p>LoM04 LoM06 QYs02</p>	160.06	19.16	

Vegetation type code	Vegetation type description	Sample sites	Extent within Survey Area		Representative photograph
			Hectares (ha)	Proportion of Survey Area (%)	
EIEcEyAmEiiAbEaDs	<p><i>Eucalyptus longicornis</i> woodland over <i>Eucalyptus corrugata</i> and <i>Eucalyptus yilgarnensis</i> low open woodland over <i>Acacia merrallii</i>, <i>Eremophila interstans</i> subsp. <i>interstans</i> and <i>Alyxia buxifolia</i> tall open shrubland over <i>Exocarpos aphyllus</i> and <i>Dodonaea stenozyga</i> open shrubland.</p> <p>Associated species <i>Amyema miquelii</i>, <i>Eremophila interstans</i> subsp. <i>interstans</i>, <i>Olearia muelleri</i>, <i>Rhagodia drummondii</i>, <i>Scaevola spinescens</i>, <i>Senna artemisioides</i> subsp. <i>filifolia</i></p>	LoM05 QYs03	34.16	4.09	
EcAaaEaMsAbAl	<p><i>Eucalyptus capillosa</i> open woodland over <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> and <i>Exocarpos aphyllus</i> tall open shrubland over <i>Melaleuca scalena</i> open shrubland over <i>Alyxia buxifolia</i> and <i>Acrotriche lancifolia</i> scattered low shrubs.</p> <p>Associated species <i>Acacia erinacea</i>, <i>Austrostipa elegantissima</i>, <i>Dodonaea microzyga</i> var. <i>acrolobata</i>, <i>Eremophila granitica</i>, <i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>, <i>Lepidosperma sanguinolentum</i>, <i>Microcybe multiflora</i> subsp. <i>multiflora</i></p>	rLoM01 QYs01	5.15	0.62	
Cleared			146.16	17.49	
Total			835.48	100	

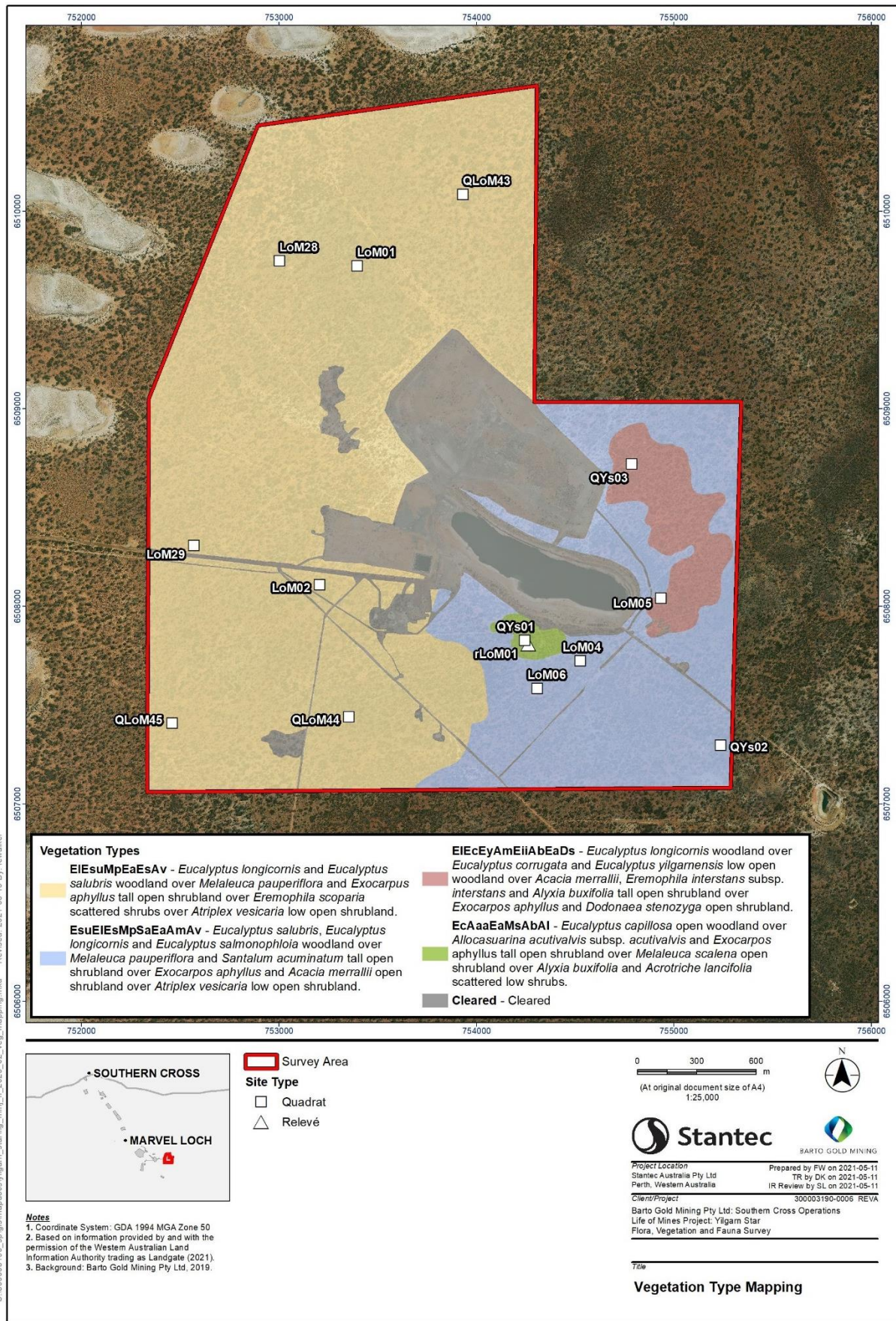


Figure 5-2: Vegetation type mapping for the Survey Area

5.2.1 Vegetation of Significance

None of the vegetation types identified and described within the Survey Area were considered analogous with Commonwealth or State-listed TECs, however, one vegetation type is considered analogous with the P3 PEC; 'Parker Range vegetation complexes' (Table 5-4, Figure 3-1). Vegetation type EsuEIEsMpSaEaAmAv, presented in Table 5-4, shows affinities with Community Type 3. Although the Survey Area partially intersects the area mapped as the 'Parker Range vegetation complexes' PEC (DBCA 2019) (Section Error! Reference source not found.), the remaining three vegetation types do not meet the requirements of the 'Parker Range vegetation complexes' PEC.

Table 5-4: Vegetation condition recorded in the Survey Area

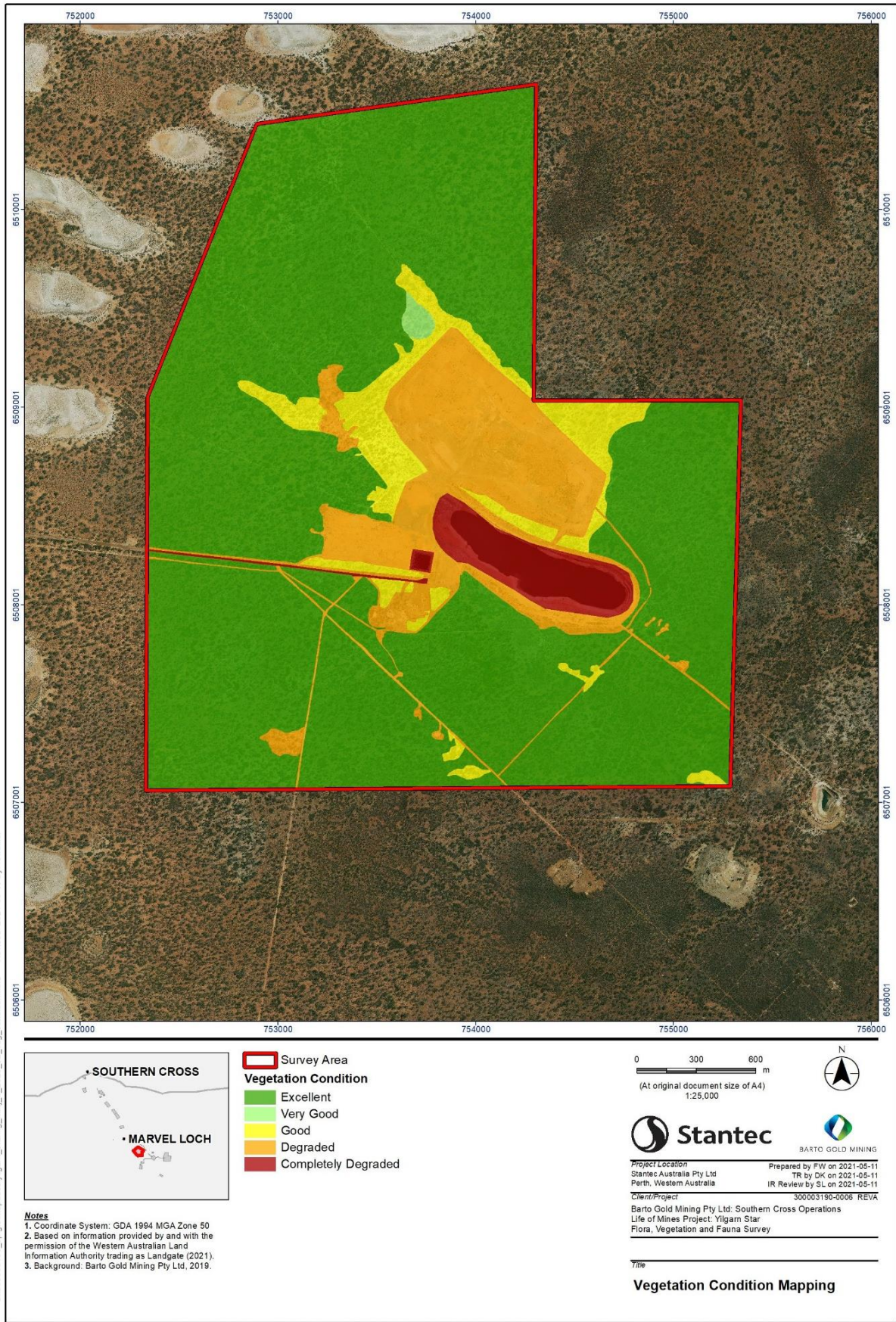
Vegetation type description	Parker Range vegetation community type	Extent within Survey Area	
		Hectares (ha)	Proportion (%)
EsuEIEsMpSaEaAmAv <i>Eucalyptus salubris</i> , <i>Eucalyptus longicornis</i> and <i>Eucalyptus salmonophloia</i> woodland over <i>Melaleuca pauperiflora</i> and <i>Santalum acuminatum</i> tall open shrubland over <i>Exocarpos aphyllus</i> and <i>Acacia merrallii</i> open shrubland over <i>Atriplex vesicaria</i> low open shrubland.	3	160.06	19.16

5.2.2 Vegetation Condition

Vegetation condition within the Survey Area ranged from 'Excellent' to 'Completely Degraded', with the majority in 'Excellent' condition (approximately 76%) (Table 5-5; Figure 5-3). These areas represented intact vegetation with minimal disturbance. Just over 17% of the Survey Area was in a 'Degraded' to 'Completely Degraded' condition due to historical mining activities, clearing for drill lines and tracks and exploration.

Table 5-5 Vegetation condition recorded in the Survey Area

Vegetation condition	Extent within Survey Area	
	Hectares (ha)	Proportion (%)
Excellent	635.38	76.04
Very Good	2.51	0.30
Degraded	115.39	13.81
Completely Degraded	30.77	3.68
Total	835.48	100



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Figure 5-3: Vegetation condition mapping of the Survey Area

5.3 FAUNA



5.3.1 Fauna Habitats

Two broad fauna habitat type were identified and delineated from fauna habitat assessments across the Survey Area, in conjunction with landforms and vegetation types. These fauna habitats were described as 'Eucalyptus Woodlands' and 'Eucalyptus Stony Rise', comprising 81.89% and 0.62% of the Survey Area respectively, while cleared/disturbed areas represented the remaining 17.50%. The fauna habitat is described in **Table 5-6** and the extent of this habitats has been mapped in **Figure 5-4**. This habitat was defined in terms of distribution and significance according to the following criteria:

- **Distribution:** Habitats that are widespread and common throughout the Survey Area are categorised as Widespread; otherwise, they are categorised to have 'Limited Extent'. A single habitat category within the Survey Area (*Eucalyptus* Woodlands) was 'Widespread' (**Table 5-6**).
- **Significance:** Habitats considered important to species of significance that were confirmed or likely to occur, or distinct fauna assemblages that were deemed Significant; otherwise, they were categorised as being of 'Limited Significance'. The *Eucalyptus* Woodlands and *Eucalyptus* Stony Rise habitats were considered 'Significant' and may support significant fauna, particularly listed threatened species or distinct assemblages (**Table 5-6**).

The *Eucalyptus* Woodlands and *Eucalyptus* Stony Rise fauna habitats were identified as important to species of significance. The large hollow bearing *Eucalyptus* trees provide important habitat for the Western Rosella (*Platycercus icterotis xanthogenys*) (inland pop.) (P4) and the Peregrine Falcon (*Falco peregrinus*) (OS). Large woody debris and logs may provide denning habitat for the Chuditch (*Dasyurus geoffroii*). In addition, the thick vegetation at some sites may also serve as suitable foraging habitat for the Western Rosella within this habitat type.

Table 5-6: Fauna habitats recorded within the Survey Area

Habitat and Category	Extent within Survey Area		Vegetation Codes	Broad Description and Value to Fauna	Reference Photographs
	Area (ha)	Proportion (%)			
<p><i>Eucalyptus</i> Woodlands</p> <ul style="list-style-type: none"> • Widespread • Significant 	684.17	81.89	<p>EIEsuMpEaEsAv EIEcEyAmEiiAbEaDs EsuEIEsMpSaEaAmAv</p>	<p>Gently undulating terrain dominated by <i>Eucalyptus</i> woodland of <i>Eucalyptus longicornis</i> and <i>Eucalyptus salubris</i> over <i>Eucalyptus corrugata</i> and <i>Eucalyptus yilgarnensis</i> low open woodland over tall shrubland over low open shrubland. The habitat ranged from relatively open areas dominated by mature tall Eucalypts to densely vegetated areas with immature Eucalypts, regenerating after fire. Mallee forms of the Eucalypts also occurred within the Eucalypt Woodland habitat.</p> <p>This habitat supports high levels of leaf litter and large woody debris, forming shelter for a range of fauna such as the Chuditch (<i>Dasyurus geoffroi</i>). While mature Eucalypt trees may contain hollows and provide suitable nesting and/or roosting habitat for a range of avifauna, including the Western Rosella (P4) and Peregrine Falcon (OS) (however the species preferentially nests in cliff faces (Menkhorst <i>et al.</i> 2017)), hollows tend to be uncommon in <i>Eucalyptus corrugata</i>. Areas of mature Eucalypt woodland with thick vegetation may serve as suitable foraging habitat for the Western Rosella which was recorded within this habitat. This habitat may also support Malleefowl mound building and the Western Brush Wallaby.</p>	
<p><i>Eucalyptus</i> Stony Rise</p> <ul style="list-style-type: none"> • Limited Extent • Significant 	5.15	0.62	<p>EcAaaEaMsAbAl</p>	<p><i>Eucalyptus capillosa</i> open woodland over <i>Allocasuarina acutivalvis</i> subsp. <i>acutivalvis</i> and <i>Exocarpos aphyllus</i> tall open shrubland over <i>Melaleuca scalena</i> open shrubland over <i>Alyxia buxifolia</i> and <i>Acrotriche lancifolia</i> scattered low shrubs.</p> <p>This habitat contains moderate levels of leaf litter and scattered woody debris, forming shelter for a range of fauna such as the Chuditch (<i>Dasyurus geoffroi</i>). While mature Eucalypt trees may contain hollows and provide suitable nesting and/or roosting habitat for a range of avifauna, including the Western Rosella (P4) and Peregrine Falcon (OS) (however the species preferentially nests in cliff faces (Menkhorst <i>et al.</i> 2017)).</p>	
Cleared	146.16	17.50	-	Degradation associated with infrastructure and clearing for exploration. Habitat considered of little to no value to fauna.	N/A
Total	835.48	100	-	-	-

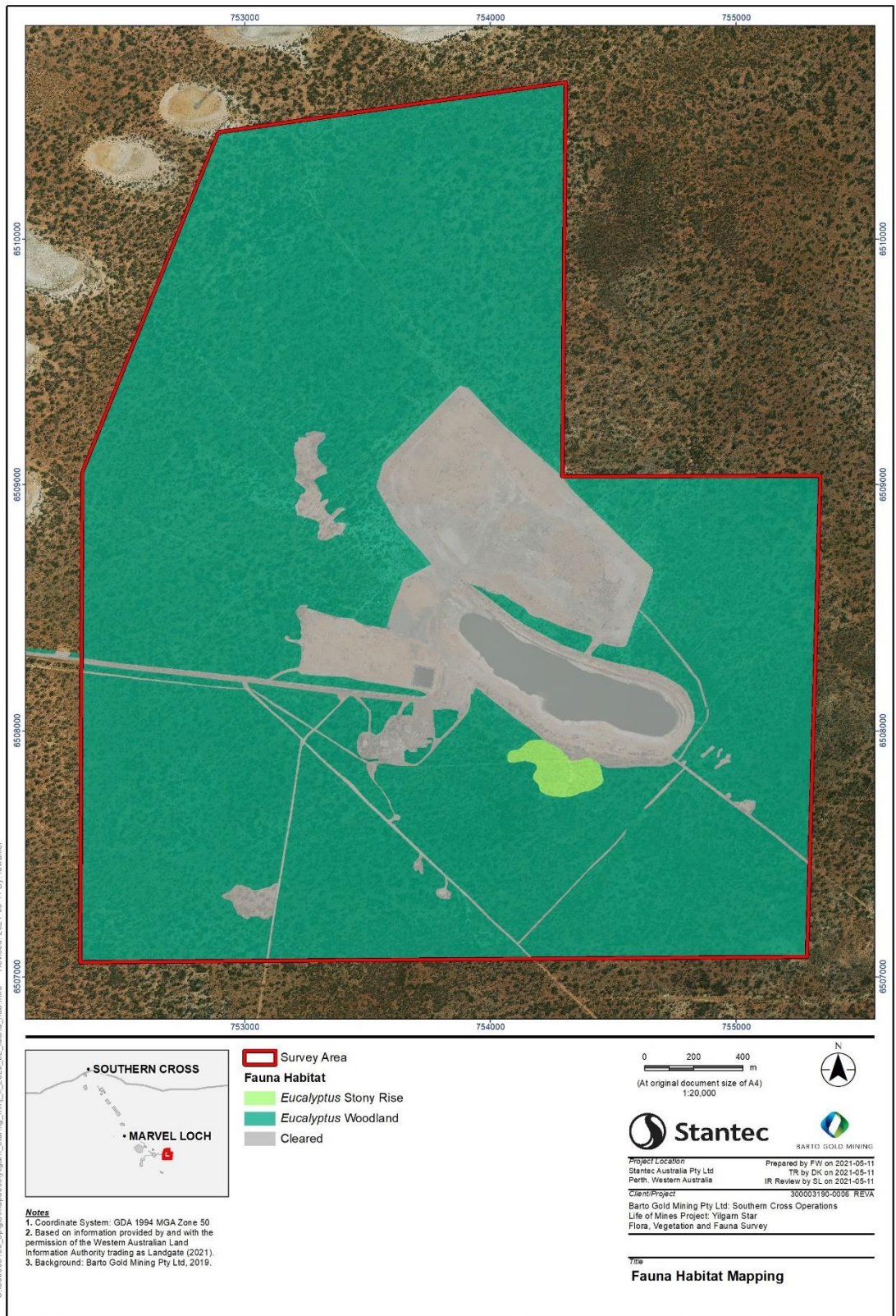


Figure 5-4: Fauna habitats in the Survey Area

5.3.2 Fauna Assemblages

In total, 31 vertebrate fauna species were recorded within or in the vicinity of the Survey Area during the current survey, and other recent surveys conducted for the greater Life of Mines project (**Table 5-7**). Two of the fauna species recorded are listed as Threatened by the Commonwealth and State; the Malleefowl (*Leipoa ocellata* [Vu, Vu]) and the Chuditch (*Dasyurus geoffroii* [Vu, Vu]). Additionally, one species is recognised by DBCA as a priority fauna; the Western Brush Wallaby (*Notamacropus irma* [P4]). Three introduced mammals were recorded within the Survey Area; the Rabbit (*Oryctolagus cuniculus*), Red Fox (*Vulpes vulpes*) and Feral Cat (*Felis catus*) (**Table 5-7**). Of these species, only the Feral Cat was captured on one of the motion-sensing cameras installed within the current Survey Area (**Plate 5-3**).

Table 5-7: Vertebrate fauna species recorded in the vicinity of the Survey Area

Species	Common name	Conservation Status	
		WA	EPBC
Aves			
<i>Leipoa ocellata</i>	Malleefowl	Vu	Vu
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar		
<i>Barnardius zonarius</i>	Australian Ringneck		
<i>Cacatua roseicapilla</i>	Galah		
<i>Cinclosoma clarum</i>	Copper-backed Quail-thrush		
<i>Climacteris rufus</i>	Rufous Treecreeper		
<i>Corvus coronoides</i>	Australian Raven		
<i>Drymodes brunneopygia</i>	Southern Scrub-robin		
<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren		
<i>Oreoica gutturalis</i>	Crested Bellbird		
<i>Ocyphaps lophotes</i>	Crested Pigeon		
<i>Pachycephala occidentalis</i>	Western Whistler		
<i>Pomatostomus superciliosus</i>	White-browed Babbler		
<i>Rhipidura leucophrys</i>	Willie Wagtail		
<i>Strepera versicolor</i>	Grey Currawong		
<i>Cracticus tibicen</i>	Australian Magpie		
<i>Dromaius novaehollandiae</i>	Emu		
<i>Grallina cyanoleuca</i>	Magpie-lark		
Mammalia			
<i>Dasyurus geoffroii</i>	Chuditch	Vu	Vu
<i>Notamacropus irma</i>	Western Brush Wallaby	P4	
<i>Osphranter robustus</i>	Euro		
<i>Notomys mitchellii</i>	Mitchell's Hopping Mouse		
<i>Felis catus</i>	*Feral Cat		
<i>Oryctolagus cuniculus</i>	*Rabbit		
<i>Vulpes vulpes</i>	*Red Fox		
<i>Sminthopsis dolichura</i>	Little Long-tailed Dunnart		
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna		
Reptilia			
<i>Ctenophorus cristatus</i>	Bicycle Dragon		
<i>Moloch horridus</i>	Thorny Devil		
<i>Tiliqua occipitalis</i>	Western Blue-tongue		
<i>Varanus gouldii</i>	Sand Monitor		

* Denotes introduced fauna species.



Plate 5-3 The Feral Cat (*Felis catus*), captured by motion-sensing camera within the Survey Area

5.3.3 Fauna of Significance

Of the 247 species of vertebrate fauna identified during the desktop assessment, 20 species are listed as being of significance, comprising six mammals, 12 birds, and two reptiles (**Appendix H, Figure 5-5**). Of these:

- eight are listed as Threatened under the EPBC Act and/or BC Act;
- five are recognised by DBCA as priority fauna (DBCA recognises several species that are not listed under the BC Act or the EPBC Act, but for which there is some conservation concern, and has produced a supplementary list of priority fauna) (**Appendix H**);
- one species, the Peregrine Falcon (*Falco peregrinus*) is recognised by the State (BC Act), as being in need of special protection;
- one species, the Red-tailed Phascogale (*Phascogale calura*), is recognised by the State (BC Act) to be conservation dependent;
- seven species are listed as Migratory under the EPBC Act or under the BC Act; and
- one species, the Bilby (*Macrotis lagotis*), is considered to be extinct in the Coolgardie and Avon Wheatbelt bioregions (Woinarski *et al.* 2014) and are therefore unlikely to occur within the Survey Area.
- Additionally, three invertebrates of significance were recorded as potentially occurring within the Survey Area, two of which are aquatic and the remainder terrestrial.

Some of the species, listed as threatened, migratory and/or priority fauna, may be included in multiple categories. The locations of all significant fauna identified within, or in the vicinity of the Survey Area are presented in **Figure 5-5**. The likelihood for species of significance occurring in the Survey Area was assessed and ranked based on the definitions described in **Section 3.1.3**. Seven species were considered likely to occur within the Survey Area comprising the Chuditch (*Dasyurus geoffroii*) (Vu, Vu), Western Brush Wallaby (*Notamacropus irma*) (P4), Malleefowl (*Leipoa ocellata*) (Vu, Vu), Western Rosella (*Platycercus icterotis xanthogenys*) (P4), Peregrine Falcon (*Falco peregrinus*) (OS), Woma Python (southwest pop) (*Aspidites ramsayi*) (P1) and the Tree-stem Trapdoor Spider (*Aganippe castellum*) (P4). One species, the Lake Cronin Snake (*Paroplocephalus atriceps*) (P3), was considered to possibly occur. The remaining 12 species were considered 'Unlikely' to occur within the Survey Area based on a lack of recent records, unsuitable habitat and/or the Survey Area occurring outside the known species range, with specific details presented in **Appendix H**.

Database search results confirm that the Red-Tailed Black-Cockatoo species *Calyptorhynchus banksii* was recorded recently nearby, with several records along Coolgardie road ~37 km from the Survey Area (Birdlife Australia 2019). Based on the location of the Survey Area, these are likely to represent the *Calyptorhynchus banksii* subsp. *samueli*

(Menkhorst *et al.* 2019), which is not a listed species. The closest records of Threatened Black Cockatoos to the Survey Area are approximately 100 km to the south of the Survey Area (DBCA 2020c). The closest breeding site (confirmed, buffered 12 km) is approximately 125 km south southwest of the central point coordinates. There were no roost sites (buffered 6 km) within a 200 km radius of the coordinates. Based on the distributions (DotEE 2017), Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) (En, En), Red-Tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) (Vu, Vu) and Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) (En, En) do not occur within the Survey Area and are therefore not considered further in this assessment (and were subsequently excluded from significant species numbers).

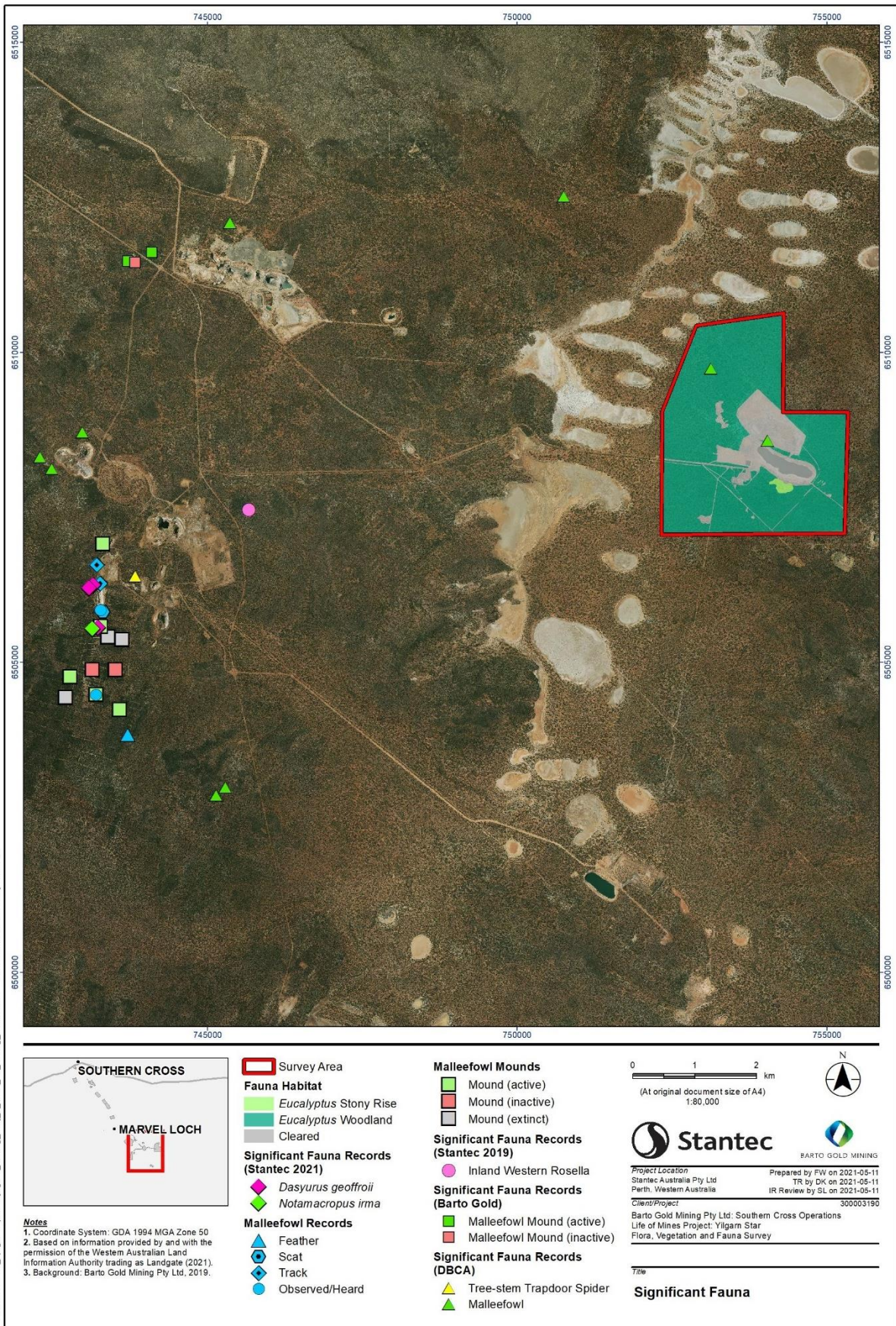


Figure 5-5: Significant fauna recorded in the area

5.4 SURVEY LIMITATIONS AND CONSTRAINTS

There are a number of potential limitations and constraints that can affect the adequacy of flora, vegetation and fauna surveys (DotE 2020, EPA 2016b). For the Survey, these have been summarised in **Table 5-8**.

Table 5-8: Potential limitations and constraints of the field survey

Factor	Constraint	Comments
Competency and experience of consultants	No	The field personnel, Scott Pansini, Jeni Alford, Julijanna Hantzis and Jonas Mitchell have appropriate qualifications and experience to undertake the relevant components of the flora, vegetation and fauna survey. The flora specimen identifications were undertaken by senior taxonomists Frank Obbens and Sharnya Thomson, both have extensive experience identifying flora from Western Australia.
Scope	Potential	Two of the four vegetation types within the Survey Area (EcAaaEaMsAbAl and ElEcEyAmEiiAbEaDs) were found to cover a small proportion of the Survey Area. As such, the survey team was only able to install a restricted number quadrats in each vegetation type, below the recommended number outlined within the EPA Technical Guidance (EPA 2016b)
Proportion of species identified	No	Field surveys were undertaken in April and September 2020, and March 2021 within the recommended timing, in accordance with EPA Technical Guidance (EPA 2016b) for the location. Of the 74 flora species recorded, 10 specimens could not be confidently identified to species level due to a lack of diagnostic characteristics and may represent additional species. None of these 10 species are likely to represent species of significance. Most taxonomic groups expected within the Survey Area were represented and the total floristic richness was considered comparable to other survey in the area conducted during similar seasonal conditions Fauna habitat was assessed at each flora quadrat site for their importance to accommodate vertebrate fauna and fauna of significance Error! Reference source not found..
Information sources (e.g. historic or recent)	No	Regional contextual information was obtained from the IBRA classification system (Thackway and Cresswell 1995), soil and landform mapping (Mitchell et al. 2002), historic vegetation mapping conducted by Beard (1975b) and Shepherd <i>et al.</i> (2002a) (Section Error! Reference source not found.) and several flora, vegetation and fauna surveys previously conducted in the wider region (Botanica 2016a, GHD 2016, Gibson and Lyons 1998, MWH 2014, Recon Environmental 2008c, a, Spectrum Ecology 2020, Stantec 2019)
Completeness and intensity	Potential	13 quadrats, one relevé and three mapping notes were sampled over two phases in the Survey Area. Targeted searches were also conducted throughout the Survey Area for significant flora species. Two vegetation types were too small to install the recommended number of replicant quadrats.
Timing / weather / season / cycle	Potential	The field surveys took place over two seasons (autumn and spring) to maximise the chance of capturing as many species as possible. Trip 1 was conducted in April to take

Factor	Constraint	Comments
		advantage of a significant rainfall event that brought above-average rainfall to the region. Trip 2 was conducted in October during the recommended optimal surveying period (EPA 2016b). Trip 3 was conducted in March following a significant Autumn rainfall event earlier in the month.
Disturbances	No	Disturbances within the Survey Area were primarily associated with previous clearing for mineral exploration. While parts of the Survey Area were disturbed, this did not limit the outcomes of this report. Much of the Survey Area was in excellent condition, and therefore this was not considered a constraint impacting on the key findings.
Resources	No	Resources were adequate to carry out the field survey and the field personnel were competent in the identification of species present. WAH specimens, taxonomic guides, and database searches were used to prepare for the field survey and to confirm flora or fauna species where identification was uncertain. Specimen identification was conducted by a senior taxonomist.
Remoteness / access problems	No	The Survey Area was easily accessible by vehicle and on foot.

SUMMARY

Field surveys were undertaken during the recommended optimum times for floristic surveys as outlined in the EPA Technical Guidance, with most genera in fruit or flower at the time of survey. The vegetation recorded within the Survey Area was representative of the South Western Interzone and consisted broadly of low to mid-height *Eucalyptus* woodlands to open forest. Floristic diversity and composition were considered typical of the COO2 subregion and was generally consistent with previous surveys of a similar scale undertaken in proximity to the Survey Area (Botanica 2016a, GHD 2016, Gibson and Lyons 1998, MWH 2014, Recon Environmental 2008c, a, Spectrum Ecology 2020, Stantec 2019).

There were 74 vascular flora species recorded from the Survey Area, representing 29 families and 50 genera. Of these, none are Commonwealth or State-listed Threatened flora. A single State-listed priority flora species, *Acacia asepala* (P2) was recorded during the Survey. This species is not considered to be restricted to the Survey Area, with numerous records of populations outside of the Survey Area. A further four species are considered 'possible' to occur based on the post-survey likelihood of occurrence assessment; *Goodenia heatheriana* (P1), *Acacia concolorans* (P2) and *Notisia intonsa* (P3), and *Acacia merrickiae* (P4). These species were either inconspicuous and low-growing or annuals that may not have been detected during the survey, despite targeted searches.

Four vegetation types were mapped across the Survey Area: EIEsuMpEaEsAv (489.96 ha; 58.64%), EsuEIEsMpSaEaAmAv (160.06 ha; 19.16%), EIEcEyAmEiiAbEaDs (34.16 ha; 4.09%) and EcAaaEaMsAbAl (5.15 ha; 0.62%). Vegetation was not considered analogous with any Commonwealth or State listed TECs, however, the Survey Area partially coincides with an area mapped as the Parker Range vegetation complexes PEC. One vegetation type, EsuEIEsMpSaEaAmAv, was considered analogous with this PEC (160.06 ha; 19.16%), showing affinities to Community Type 3 (DBCA 2020a, Gibson and Lyons 1998)

Disturbance throughout the Survey Area was predominantly associated with historical mining activities, clearing for drill lines and tracks and exploration. Disturbed areas were in a 'Degraded' to 'Completely Degraded' condition and represented just over 17% of the Survey Area. The majority of the Survey Area was in an 'Excellent' condition (76%). Four introduced vascular flora species were identified throughout the field surveys. None of these species represents a declared pest under Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) or are listed as a Weed of National Significance (WoNS).

Two fauna habitats, *Eucalyptus* Woodlands and *Eucalyptus* Stony Rise, were described and delineated for the Survey Area and are considered important for species of significance. *Eucalyptus* Woodlands contain large hollow-bearing trees that may provide nesting habitat for the Western Rosella (inland pop.) (P4) and the Peregrine Falcon (OS), additionally logs may provide denning habitat for the Chuditch. The *Eucalyptus* Stony Rise habitat contains moderate levels of leaf litter and scattered woody debris. Part of the stony rise contains rocky outcroppings which may provide shelter for fauna such as chuditch. *Eucalyptus* woodlands and *Eucalyptus* Stony Rise would also support a range of other significant species considered likely to occur in the Survey Area owing to the abundance of debris, shelter and foraging suitability.

In total, 31 vertebrate fauna species were recorded from the greater Life of Mines field surveys, of which three are species of significance; the Malleefowl (*Leipoa ocellata*) (Vu, Vu), Chuditch (*Dasyurus geoffroii*) (Vu, Vu) and the Western Brush Wallaby (*Notamacropus irma*) (P4). Based on proximity of previous records and presence of preferential habitat in the Survey Area, seven species were considered likely to occur; the Chuditch (*Dasyurus geoffroii*) (Vu, Vu), Western Brush Wallaby (*Notamacropus irma*) (P4), Malleefowl (*Leipoa ocellata*) (Vu, Vu), Western Rosella (*Platycercus icterotis xanthogenys*) (P4), Peregrine Falcon (*Falco peregrinus*) (OS), Woma Python (southwest pop) (*Aspidites ramsayi*) (P1) and the Tree-stem trapdoor spider (*Aganippe castellum*) (P4). One species, the Lake Cronin Snake (*Paroplocephalus atriceps*) (P3), was considered 'possible' to occur.

6.0 ASSESSMENT AGAINST THE 10 NATIVE VEGETATION CLEARING PRINCIPLES

This section details an assessment against the 10 Native Vegetation Clearing Principles outlined by the Department of Environmental Regulation (DER) (now the Department of Water and Environment Regulation)(2014).

The 10 Clearing Principles, listed under Schedule 5 of the Environmental Protection Act 1986, stipulate when native vegetation should not be cleared. The proposal to clear native vegetation for Barto's Yilgarn Star project area located within their Southern Cross Operations is considered in terms of these principles, in accordance with the DER assessment guidelines (2014) in **Table 6-1**. The proposed clearing footprint within the Survey Area was not available at the time of this assessment.

Table 6-1: Assessment of the proposed clearing of native vegetation within the Survey Area against the 10 Clearing Principles.

Clearing Principle	Justification of Variance	Reference/s	Variance
<p>Principle (a) Native vegetation should not be cleared if it comprises a high level of biological diversity.</p>	<p>The Survey Area is 828.48 ha in size and contains approximately 689.32 ha of native vegetation. The survey area is 45 km south of the town of Southern Cross, in the Southern Cross (COO2) subregion. A detailed flora and vegetation survey, and basic fauna survey was conducted during April and September 2020 and March 2021 by Stantec Australia Pty Ltd (Stantec) to identify the ecological values within the Survey Area.</p> <p>One priority species was recorded in the Survey Area <i>Acacia asepala</i> (P2). Four weed species *<i>Centaurea melitensis</i>, *<i>Medicago minima</i>, *<i>Mesembryanthemum nodiflorum</i> and *<i>Vulpia bromoides</i>.</p> <p>These species are not listed as a declared pest under Section 22 of the Biosecurity and Agriculture Management Act 2007 (BAM Act) or as a Weed of National Significance.</p> <p>Four vegetation types were delineated within the Survey Area. The vegetation in the Survey Area was broadly represented by low to mid height <i>Eucalyptus</i> open woodland over <i>Melaleuca</i> sp. Vegetation types were not restricted to the Survey Area and were considered comparable to that described for the Southern Cross subregion and the South-West Interzone botanical province. No threatened ecological communities (TECs) are known to occur within the Survey Area. The Survey Area partially coincides with an area mapped as the Parker Range vegetation complexes PEC. One vegetation type, EsuEIEsMpSaEaAmAv, was considered analogous with this PEC, showing affinities to the Parker Range Vegetation Complex 'Community Type 3'.</p> <p>One fauna species of significance was historically recorded within the Survey Area: two Malleefowl (<i>Leipoa ocellata</i>) (Vu, Vu) under DBCA records. Other surveys undertaken by Stantec in the vicinity of the Survey Area have identified the presence of three significant species; Chuditch (<i>Dasyurus geoffroii</i>) (Vu, Vu), Malleefowl (<i>Leipoa ocellata</i>) (Vu, Vu), and Western Brush Wallaby (<i>Notamacropus irma</i>) (P4). However, during this survey no Chuditch, Western Brush Wallaby, Malleefowl specimens, or mounds were discovered within the Survey Area. The desktop assessment identified seven terrestrial fauna species of significance as being 'likely' to occur within the Survey Area; Chuditch (<i>Dasyurus geoffroii</i>) (Vu, Vu), Western Brush Wallaby (<i>Notamacropus irma</i>) (P4), Malleefowl (<i>Leipoa ocellata</i>) (Vu, Vu), Western Rosella (<i>Platycercus icterotis xanthogenys</i>) (P4), Peregrine Falcon (<i>Falco peregrinus</i>) (OS), Woma Python (southwest pop) (<i>Aspidites ramsayi</i>) (P1) and the Tree-stem trapdoor spider (<i>Aganippe castellum</i>) (P4).</p> <p>Two fauna habitats were described in the Survey Area; <i>Eucalyptus</i> woodlands and <i>Eucalyptus</i> stony rise. These habitats are considered important for species of significance. <i>Eucalyptus</i> woodlands contain patches of dense vegetation cover, leaf litter and suitable substrates optimal for supporting Malleefowl mound building. <i>Eucalyptus</i> woodlands and areas of stony rise may also support these species. Hollows and an abundance of woody debris present in <i>Eucalyptus</i> woodlands would support potential nesting of the Peregrine Falcon and Western Rosella and denning for the Chuditch. These two habitats would also support a range of other significant species considered likely to occur in the Survey Area owing to the abundance of debris, shelter, and foraging suitability.</p> <p>Based on the survey findings and the desktop assessment, the biological diversity of the Survey Area is anticipated to be comparable to the surrounding area and the vegetation and habitats recorded are not considered restricted to the Survey Area. However, the Survey area partially coincides with an area listed as the Parker Range PEC and was found to consist of one vegetation type analogous with Community Type 3 vegetation complex of the PEC. Additionally, the Survey Area lies within an area with vegetation that supports three significant fauna species and is considered likely to support four others. As such, clearing may be at variance with this Principle.</p> <p>The proposed clearing may be at variance with this Principle.</p>	<p>Commonwealth of Australia (2020) Cowan <i>et al.</i> (2001) DoAWE (2020) DoAWE (2020) (DBCA 2019) Gibson and Lyons (1998) Recon Environmental (2008a) Recon Environmental (2008b) Recon Environmental (2008c) Stantec (2019) Stantec (2020b) Thackway and Cresswell (1995) DBCA (2020a)</p>	<p>May be at variance</p>
<p>Principle (b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.</p>	<p>The Survey Area contains two broad fauna habitats, both of which are well represented outside the Survey Area. Two historical DBCA records of fauna species of significance were recorded within the Survey Area: Malleefowl (<i>Leipoa ocellata</i>) (Vu, Vu). Other surveys undertaken by Stantec in the vicinity of the Survey Area have identified the presence of three significant species within similar habitats; Chuditch (<i>Dasyurus geoffroii</i>) (Vu, Vu), Malleefowl (<i>Leipoa ocellata</i>) (Vu, Vu), and Western Brush Wallaby (<i>Notamacropus irma</i>) (P4). However, during this survey no Chuditch, Western Brush Wallaby, Malleefowl specimens, or mounds were discovered within the Survey Area.</p> <p>The desktop assessment identified seven terrestrial fauna species of significance as being 'likely' to occur within the Survey Area; Chuditch (<i>Dasyurus geoffroii</i>) (Vu, Vu), Western Brush Wallaby (<i>Notamacropus irma</i>) (P4), Malleefowl (<i>Leipoa ocellata</i>) (Vu, Vu), Western Rosella (<i>Platycercus icterotis xanthogenys</i>) (P4), Peregrine Falcon (<i>Falco peregrinus</i>) (OS), Woma Python (southwest pop) (<i>Aspidites ramsayi</i>) (P1) and the Tree-stem trapdoor spider (<i>Aganippe castellum</i>) (P4).</p> <p>One fauna species of significance, Malleefowl (<i>Leipoa ocellata</i>), was recorded historically on two occasions within the Survey area. However, some uncertainty exists surrounding the accuracy of these records.</p> <p>The proposed clearing may be at variance with this Principle.</p>	<p>Birdlife Australia (2019) DBCA (2019) Recon Environmental (2008a) Recon Environmental (2008b) Recon Environmental (2008c) (DBCA 2020b)</p>	<p>May be at variance</p>
<p>Principle (c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.</p>	<p>No Threatened flora listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) or the <i>Biodiversity Conservation Act 2016</i> (BC Act) were recorded during the field survey or were considered to have potential to occur.</p> <p>The proposed clearing may be at variance with this Principle.</p>	<p>DBCA (2019) DoAWE (2020) WAH (2020)</p>	<p>Unlikely to be at variance</p>

Clearing Principle	Justification of Variance	Reference/s	Variance																																				
Principle (d) Native vegetation should not be cleared if it comprises the whole or a part of or is necessary for the maintenance of a Threatened ecological community.	<p>No TECs listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) or the <i>Biodiversity Conservation Act 2016</i> (BC Act) are known to occur within or adjacent to the Survey Area. The closest TEC to the Survey Area is the <i>Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)</i>, located approximately 9 km west of the Survey Area. This TEC is restricted to the Avon Wheatbelt region, outside of the Survey Area.</p> <p>The proposed clearing is not likely to be at variance with this Principle.</p>	<p>DBCA (2019) DoAWE (2020)</p>	Unlikely to be at variance																																				
Principle (e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	<p>The Survey Area occurs within the Southern Cross (COO2) subregion of the Coolgardie IBRA bioregion, and within the Shire of Yilgarn. It is comprised of one pre-European vegetation unit, Parker 1068 (Table B).</p> <p>Table B outlines the pre-European vegetation extents (measured in 2018) remaining within the IBRA bioregion, subregion, and within the local government area (LGA). The remaining proportions of the vegetation associations for the Bioregion, Subregion and Yilgarn LGA are above the 30% threshold considered to be required for maintaining ecological viability. The area of native vegetation proposed for potential clearing within the Survey Area (242 ha) will not significantly reduce the pre-European vegetation extent.</p> <p>Table B: Extent of pre-European vegetation associations remaining across four scales (State, Bioregion, Subregion and Local Government Area).</p> <table border="1"> <thead> <tr> <th>Association/ Association code</th> <th>Description</th> <th>Extent in Survey Area (ha)</th> <th>Scale</th> <th>Pre-European extent (ha)</th> <th>Current extent (ha)</th> <th>Proportion remaining (%)</th> <th>Current extent within IUCN Class I-IV reserves (ha)</th> <th>Proportion of current extent protected within IUCN Class I-IV reserves (%)¹</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Parker 1068</td> <td rowspan="4">Medium woodland; salmon gum, morrel, gimlet & <i>Eucalyptus sheathiana</i></td> <td rowspan="4">57.29</td> <td>State-wide</td> <td>268,900</td> <td>142,088</td> <td>53</td> <td>16,761</td> <td>11.80</td> </tr> <tr> <td>Coolgardie bioregion</td> <td>193,988</td> <td>104,804</td> <td>54</td> <td>14,153</td> <td>13.51</td> </tr> <tr> <td>Southern Cross subregion</td> <td>193,988</td> <td>104,804</td> <td>54</td> <td>14,153</td> <td>13.51</td> </tr> <tr> <td>Shire of Yilgarn LGA</td> <td>268,900</td> <td>142,088</td> <td>53</td> <td>16,761</td> <td>11.80</td> </tr> </tbody> </table> <p>The proposed clearing unlikely to be at variance with this Principle</p>	Association/ Association code	Description	Extent in Survey Area (ha)	Scale	Pre-European extent (ha)	Current extent (ha)	Proportion remaining (%)	Current extent within IUCN Class I-IV reserves (ha)	Proportion of current extent protected within IUCN Class I-IV reserves (%) ¹	Parker 1068	Medium woodland; salmon gum, morrel, gimlet & <i>Eucalyptus sheathiana</i>	57.29	State-wide	268,900	142,088	53	16,761	11.80	Coolgardie bioregion	193,988	104,804	54	14,153	13.51	Southern Cross subregion	193,988	104,804	54	14,153	13.51	Shire of Yilgarn LGA	268,900	142,088	53	16,761	11.80	<p>Cowan <i>et al.</i> (2001) EPA (2000b) Government of Western Australia (2020a) Shepherd <i>et al.</i> (2002b) Thackway and Cresswell (1995)</p>	Unlikely to be at variance
Association/ Association code	Description	Extent in Survey Area (ha)	Scale	Pre-European extent (ha)	Current extent (ha)	Proportion remaining (%)	Current extent within IUCN Class I-IV reserves (ha)	Proportion of current extent protected within IUCN Class I-IV reserves (%) ¹																															
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Principle (f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	<p>The Survey Area occurs within the Yellowdine sub-catchment of the Swan-Avon River catchment. Numerous ephemeral watercourses and lakes occur within proximity to the Survey Area. A band of lakes borders the north-eastern border of the Survey Area.</p> <p>No internationally or nationally significant wetlands are located within the Survey Area. The nearest nationally important wetland is Lake Cronin, located in excess of 93 km south of the Survey Area. The nearest named water course to the Survey Area is Esdaile Creek, which is 85 km north-east of the Survey Area.</p> <p>The proposed clearing may be at variance with this Principle</p>	<p>State of Western Australia (2020)</p>	May be at variance																																				
Principle (g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	<p>Land degradation includes any alteration to land capability, soil erosion, salinity, nutrient export, acidification, waterlogging and flooding that affects the present or future use of land.</p> <p>The Survey Area lies almost entirely within the Atlas System (DD55), which is characterised by undulating plains with some low dunes, seasonal lakes, and clay pans. The DD55 land system includes wetlands, salt lakes, and is likely to comprise fine loose sands or calcareous loamy earth. Consequently, soils within the Survey Area are likely to be prone to erosion. Additionally, clearing is likely to result in salinity issues where it occurs in low lying areas adjacent to the salt lakes which occur in the area. The southwestern portion of the subregion (COO2), where the Survey Area occurs, is noted as being cleared for wheatfields and experiencing emerging salinity problems. Other land systems within the survey area are the My44 and SV2.</p> <p>The proposed clearing may be at variance with this Principle</p>	<p>State of Western Australia (2020) Purdie <i>et al.</i> (2004).</p>	May be at variance																																				

Clearing Principle	Justification of Variance	Reference/s	Variance
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.	<p>The Survey Area does not occur within, or adjacent to, a conservation area. The nearest reserves are Jilbadji Nature Reserve and Yellowdine Nature Reserve, located 1.42 and 15.38 km from the Survey Area, respectively</p> <p><i>The proposed clearing is unlikely to be at variance with this Principle.</i></p>	State of Western Australia (2020)	Unlikely to be at variance
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.	<p>No internationally or nationally significant wetlands are located within, or in proximity to, the Survey Area. No watercourses intersect or occur downstream of the Survey Area.</p> <p>The Survey Area is not located within or in close proximity to a Public Drinking Water Source Area. In addition, the Survey Area does not occur within a known acid sulphate soils risk area.</p> <p><i>The proposed clearing is unlikely to be at variance with this Principle.</i></p>	Government of Western Australia (2020b)	Unlikely to be at variance
Principle (j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	<p>The proposed native vegetation clearing is unlikely to alter the hydrological regime of the area leading to an increase in the frequency or intensity flooding. As the Survey Area does not intersect any drainage areas or watercourses, clearing is unlikely to cause or exacerbate the incidence of flooding.</p> <p><i>The proposed clearing is not likely to be at variance with this Principle.</i></p>	State of Western Australia (2020)	Unlikely to be at variance

7.0 REFERENCES

- Adams, M., Reardon, T. R., Baverstock, P. R. and Watts, C. H. S. (1988) Electrophoretic resolution of species boundaries in Australian Microchiroptera. IV. The Molossidae (Chiroptera). *Australian Journal of Biological Sciences* 41(3): 315-326.
- Australian Government (2012) *Australian Stratigraphic Units Database*. Available online at <https://www.ga.gov.au/data-pubs/datastandards/stratigraphic-units>.
- Beard, J. S. (1972) *The Vegetation of the Southern Cross area, Western Australia : Map and Explanatory Memoir, 1:250,000 Series*. Vegmap Publications, Perth.
- Beard, J. S. (1975a) *Map and Explanatory Notes to Sheet 5: The Vegetation of the Pilbara Area*. University of Western Australia Press, Nedlands, Western Australia.
- Beard, J. S. (1975b) The Vegetation Survey of Western Australia. 30(3): 179-187.
- Beard, J. S. (1990) *Plant Life of Western Australia*. Kangaroo Press, Kenthurst, New South Wales.
- Benshemesh, J. (2007) *National Recovery Plan for Malleefowl *Leipoa ocellata**. Department for Environment and Heritage, South Australia.
- Birdlife Australia (2019) *Birdata: Custom Atlas Bird Lists (custom search)*. Available online at.
- BoM, Bureau of Meteorology (2021) *Climate Data Online (custom search)*. Commonwealth of Australia. Available online at <http://www.bom.gov.au/climate/data/>.
- BoM, B. o. M. (2012) *Australian Water Resources Assessment 2012*.
- Botanica, Botanica Consulting. (2016a) *Level 1 Reconnaissance Flora & Vegetation Survey of the Martin's Prospect*, Unpublished report prepared for Hanking Gold Mining Pty Ltd.
- Botanica, Botanica Consulting. (2016b) *Level 2 Flora & Fauna Survey: Redwing Project For Hanking Gold Mining Pty Ltd*, Unpublished report prepared for Hanking Gold Mining Pty Ltd.
- Botanica, C. (2016c) *Level 2 Flora & Fauna Survey: Redwing Project For Hanking Gold Mining Pty Ltd*, Unpublished report prepared for Hanking Gold Mining Pty Ltd.
- Bruton, M. (2013) Arboreality, excavation, and active foraging: novel observations of radiotracked woma pythons *Aspidites ramsayi*. *Nature* 56(2): 17.
- Colbourne, J. K., Wilson, C. C. and Herbert, P. D. N. (2006) The systematics of Australian Daphnia and Daphniopsis (Crustacea: Cladocera): a shared phylogenetic history transformed by habitat-specific rates of evolution. *Biological Journal of the Linnean Society* 89: 469-488.
- Commonwealth of Australia. (2020) *Weeds of National Significance*. Department of Agriculture, Water and Environment. Available online at <https://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>.
- Cowan, M. (2001) Coolgardie 3 (COO3 - Eastern Goldfields subregion). In: N. L. McKenzie, J. E. May and S. McKenna (eds) *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*. Department of Conservation and Land Management, Kensington, WA, pp 156-169
- Cowan, M., Graham, G. and McKenzie, N. (2001) Coolgardie 2 (COO2 - Southern Cross subregion). In: *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002*. Department of Conservation and Land Management, Kensington, W.A., pp 143-155
- DBCA, Department of Biodiversity Conservation and Attractions. (2019) *Priority Ecological Communities for Western Australia 28*, Kensington, Western Australia.
- DBCA, Department of Biodiversity Conservation and Attractions (2020a) *Priority Ecological Communities for Western Australia Version 30*. Species and Communities Program. Available online at <https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Priority%20Ecological%20Communities%20list.pdf>.
- DBCA, Department of Biodiversity Conservation and Attractions. (2020b) *Threatened and Priority Fauna List*.
- DBCA, Department of Biodiversity Conservation and Attractions. (2020c) *Threatened and Priority Fauna Database (custom search)*.
- DBCA, Department of Biodiversity Conservation and Attractions, (2020d) *NatureMap: Mapping Western Australia's Biodiversity (custom search)*. Available online at <http://naturemap.dec.wa.gov.au/default.aspx>.
- DBCA, Department of Biodiversity, Conservation and Attractions (2020e) *Threatened and Priority Flora Database (custom search)*. Available online at <http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants>.
- DEC, Department of Environment and Conservation. (2009) *Fauna Notes, Information about Western Australia's Fauna: No. 24 Western Rosella*.
- DEC, Department of Environment and Conservation. (2012a) *Chuditch (Dasyurus geoffroii) Recovery Plan: Wildlife Management Program No. 54*, Perth, Western Australia.
- DEC, Department of Environment and Conservation. (2012b) *Fauna Profiles: Western Brush Wallaby Macropus irma (Jourdan, 1837)*.

- DoAWE, Department of Agriculture, Water and the Environment (2020) *Protected Matters Search Tool (custom search)*. Commonwealth of Australia. Available online at <http://www.environment.gov.au/epbc/protected-matters-search-tool>.
- DotE, Department of Environment, (2020) *Charadrius veredus in Species Profile and Threats Database*, Canberra.
- DotE, Department of the Environment. (2013) *Significant Impact Guidelines 1.1: Matters of National Environmental Significance* Commonwealth of Australia, Canberra, Australian Capital Territory.
- DotEE, Department of the Environment and Energy. (2017) *Revised draft referral guideline for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) Calyptorhynchus latirostris, Baudin's Cockatoo (Vulnerable) Calyptorhynchus baudinii, Forest Red-tailed Black Cockatoo (Vulnerable) Calyptorhynchus banksii naso* Department of the Environment and Energy.
- DotEE, Department of the Environment and Energy. (2019a) *Australian Heritage Database Listing: Yellowdine Proposed Reserve, Yellowdine Rd, Yellowdine via Southern Cross, WA, Australia*.
- DotEE, Department of the Environment and Energy. (2019b) *Australian Heritage Database Listing: Jilbadji Nature Reserve, Forrestania - Southern Cross Rd, Barker Lake via Marvel Loch, WA, Australia*.
- DotEE, D. o. t. E. a. E. (2020) *Protected Matters Search Tool (custom search)*. Commonwealth of Australia. Available online at <http://www.environment.gov.au/epbc/protected-matters-search-tool>.
- DPaW. (2017) *Interim Guideline for Preliminary Surveys of Night Parrot (Pezoporus occidentalis) in Western Australia* Department of Parks and Wildlife.
- DPaW, Department of Parks and Wildlife. (2016) *How does Parks and Wildlife manage weeds? Species-led ranking summary results by region*. Available online at <http://www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-does-dpaw-manage-weeds>.
- DWER, Department of Water and the Environment, (2014) *A Guide to the Assessment of Applications to Clear Native Vegetation: Under Part V Division 2 of the Environmental Protection Act 1986*, 168 St Georges Terrace, Perth, Western Australia.
- EPA, Environmental Protection Agency. (2000a) *Environmental Protection of Native Vegetation in Western Australia. Clearing of native vegetation, with particular references to the agricultural area. Position Statement No. 2*.
- EPA, Environmental Protection Authority. (2016a) *Technical Guidance Sampling of Short-range Endemic Invertebrate Fauna*, Perth, Western Australia.
- EPA, Environmental Protection Authority. (2016b) *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* Environmental Protection Authority, Western Australia.
- EPA, Environmental Protection Authority. (2016c) *Technical Guidance: Sampling methods for Terrestrial vertebrate fauna*. Environmental Protection Authority, Perth, Western Australia.
- EPA, Environmental Protection Authority, (2000b) *Environmental Protection of Native Vegetation in Western Australia*, Position Statement No. 2, Perth, Western Australia.
- EPA, Environmental Protection Authority, (2016d) *Environmental Factor Guideline - Flora and Vegetation* Environmental Protection Authority, Perth, Western Australia.
- ESCAVI, Executive Steering Committee for Australian Vegetation Information. (2003) *Australian Vegetation Attribute Manual: National Vegetation Information System Version 6.0* Department of Environment and Conservation, Report prepared by the Department of Environment Executive Steering Committee for Australian Vegetation Information, Canberra, Australian Capital Territory.
- GHD. (2016) *Yilgarn Star North Prospect Biological Assessment*.
- Gibson, N. and Lyons, M. N. (1995) *Floristic Survey of the Bremer and Parker Ranges of the Eastern Goldfields of Western Australia* Department of Conservation and Land Management, Wanneroo, Western Australia.
- Gibson, N. and Lyons, M. N. (1998) *Flora and Vegetation of the Eastern Goldfields Ranges: Part 3. Parker Range. Journal of the Royal Society of Western Australia* 81: 119-129.
- Gibson, N. and Lyons, M. N. (2001) *Flora and vegetation of the Eastern Goldfields Ranges: Part 4. Highclere Hills. Journal of the Royal Society of Western Australia* 84: 71-81.
- Government of Western Australia. (2017) *Environmentally Sensitive Areas*. Available online at <https://www.der.wa.gov.au/your-environment/environmentally-sensitive-areas>.
- Government of Western Australia. (2020a) *2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report)*. WA Department of Biodiversity, Conservation and Attractions, Perth.
- Government of Western Australia (2020b) *Public Drinking Water Source Area online mapping tool*. Department of Water and Environmental Regulation. Available online at <http://water.wa.gov.au/maps-and-data/maps/public-drinking-water-source-area-mapping-tool>.
- Inglis, R. (2008) *tree-stem trapdoor spider (Aganippe castellum) conservation plan (2008-2013)* Avon Catchment Council.
- 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.
- Keighery, B. J. (1994) *Bushland Plant Survey: a Guide to Plant Community Surveys for the Community*. Wildflower Society of Western Australia (Inc.), Nedlands, Western Australia.

- Mattiske Consulting. (2001) *Declared Rare and Priority Flora Search of Hercules Prospect - Marvel Loch*, Unpublished report Prepared for Sons of Gwalia Ltd.
- Menkhorst, P., Rogers, D. I., Clarke, R., Davies, J. N., Marsack, P. and Franklin, K. (2017) *The Australian Bird Guide*. CSIRO Publishing, Clayton, South Victoria.
- Menkhorst, P., Rogers, D. I., Clarke, R., Davies, J. N., Marsack, P. and Franklin, K. (2019) *The Australian Bird Guide, Revised Edition*. CSIRO Publishing, Clayton, South Victoria.
- Mitchell, D., Williams, K. and Desmond, A. (2002) *Swan Coastal Plain 2 (SWA2 - Swan Coastal Plain subregion)*, Perth, WA.
- Murphy, S. A., Silcock, J., Murphy, R., Reid, J. and Austin, J. (2017) Movements and habitat use of the night parrot *Pezoporus occidentalis* in south-western Queensland. *Austral Ecology* 42: 10.
- MWH, Australia. (2014) *Cheritons Find Level 1 Vegetation, Flora and Targeted Flora Survey*, CHER-VO-14001.
- Pizzey, G. and Knight, E. (2007) *Field Guide to the Birds of Australia*. Harper Collins Publishers, Sydney, New South Wales.
- Purdie, B. R., Tille, P. J. and Schoknecht, N. R. (2004) *Soil-landscape mapping in south-Western Australia : an overview of methodology and outputs*. Department of Agriculture and Food, Western Australia, Perth, Perth, W.A.
- Pyke, G. H. and Ehrlich, P. R. (2014) Conservation and the Holy Grail: The Story of the Night Parrot. *Pacific Conservation Biology* 20(2): 221-226.
- Recon Environmental. (2007) *Great Victoria Gold Vegetation Survey*.
- Recon Environmental. (2008a) *Burbidge Rare Flora Distribution & Impact*.
- Recon Environmental. (2008b) *Burbidge Spring Vegetation Survey*.
- Recon Environmental. (2008c) *Marvel Loch TSF Extension Vegetation Survey*.
- Shepherd, D. P., Beeston, G. R. and Hopkins, A. J. M. (2002a) *Native Vegetation in Western Australia. Extent, Type and Status*, Department of Agriculture, Perth, Western Australia.
- Shepherd, D. P., Beeston, G. R. and Hopkins, A. J. M. (2002b) *Native Vegetation in Western Australia. Extent, Type and Status* Department of Agriculture, South Perth, Western Australia.
- Short, J. and Hide, A. (2012) Distribution and status of the Red-tailed Phascogale (*Phascogale calura*). *Australian Mammalogy* 34(1): 88-99.
- Spectrum Ecology. (2020) *Leviathan Reconnaissance Flora & Vegetation and Targeted Fauna Survey*.
- Stantec. (2021a) *Phoenix, Bronco, Brumby and Zeus Targeted Malleefowl (Leipoa ocellata) Survey Memorandum*.
- Stantec. (2021b) *Ruapheu Targeted Flora Survey*.
- Stantec, Australia. (2019) *Parker Range PEC, Flora and Fauna Reconnaissance Survey and Priority Flora Search*, Perth, Western Australia.
- Stantec, Australia. (2020a) *Glendower Flora, Vegetation and Fauna Survey*.
- Stantec, A. (2020b) *Leviathan and Victoria Vinto La Detailed Flora and Vegetation Survey and Level 1 Fauna Report*.
- Stantec, A. (2020c) *Leviathan and Victoria Vinto La Targeted Flora Survey Memorandum*.
- State of Western Australia. (2020) *Shared Location Information Platform (SLIP) Database*. Western Australia Land Information Authority (Landgate). Available online at <https://maps.slip.wa.gov.au/landgate/locate/>.
- Thackway, R. and Cresswell, I. D. (1995) *An Interim Biogeographical Regionalisation for Australia*. Australian Nature Conservation Agency, Canberra, Australian Capital Territory.
- Tille, P. (2006a) *Soil-landscapes of Western Australia's Rangelands and Arid Interior*, Department of Agriculture and Food Resource Management Technical Report 313.
- Tille, P. J. (2006b) *Soil-landscapes of Western Australia's Rangelands and Arid Interior. Technical Report No. 313*, Department of Agriculture and Food Resource Management, Perth, Western Australia.
- Timms, B. V. (2014) A review of the biology of Australian halophilic anostracans (Branchiopoda: Anostraca). *Journal of Biological Research* 21:21.
- van Dyck, S. and Strahan, R. (2008) *The Mammals of Australia*. Australian Museum Trust and Queensland Museum, Sydney, New South Wales.
- WAH, W. A. H. (2020) *FloraBase: the Western Australian Flora*. Department of Biodiversity Conservation and Attractions. Available online at.
- WAH, W. A. H. (2021) *FloraBase: the Western Australian Flora*. Department of Biodiversity Conservation and Attractions. Available online at.
- WAM, Western Australian Museum. (2019) *Checklist of the Vertebrates of Western Australia (updated April 2019)*. Available online at.
- Western Wildlife. (2008) *St Barbara Limited, Southern Cross Operations: Baseline Fauna Survey; Spring 2007 & Autumn 2008*, Unpublished report prepared for St Barbara Limited.
- Wilson, S. and Swan, G. (2013) *A Complete Guide to Reptiles of Australia*. New Holland Publishers, Sydney, New South Wales.
- Woinarski, J. C. Z., Burbidge, A. A. and Harrison, P. L. (2014) *The Action Plan for Australian Mammals 2012*. CSIRO Publishing, Collingwood, Victoria.

Appendices

We design with community in mind



Appendix A CODES AND TERMS USED TO DESCRIBE SPECIES OF SIGNIFICANCE



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix A Codes and Terms Used to Describe Species of Significance Yilgarn Star

Flora and Vegetation: The Environmental Factor Guideline for Flora and Vegetation (EPA 2016d) states that flora and vegetation may be considered significant for a range of reasons, including, but not limited to the following:

Flora: being identified as threatened or priority species, locally endemic or 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, 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, relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

Vegetation: being identified as threatened or priority ecological communities, restricted distribution, degree of historical impact from threatening processes, a role as a refuge, providing an important function required to maintain ecological integrity of a significant ecosystem.

Fauna: The Environmental Factor Guidelines for Terrestrial Fauna (EPA 2016c) states that terrestrial fauna may be significant for a range of reasons, including: being identified as a threatened or priority species; species with restricted distribution; degree of historical impact from threatening processes and providing an important function required to maintain the ecological integrity of a significant ecosystem. (EPA 2016c, d) (EPA 2016b, c)

Those flora, vegetation and fauna defined as Threatened and Priority are legislated protection under the EPBC Act and/or the BC Act, or by being listed on the DBCA Priority Species List. This Appendix presents a summary of the different rankings and listings used to describe conservation status. Some categories, such as 'extinct', 'extinct in the wild' and 'conservation dependent' (EPBC Act) are not presented here, as the table includes only the information needed to fully understand the codes presented in the preceding report. Refer to the relevant legislation for a full description of all codes in use, as well as their associated criteria.

Categories used under the EPBC Act		
Status	Code	Description
Critically Endangered	Cr	Taxa considered to be facing an extremely high risk of extinction in the wild in the immediate future
Endangered	En	Taxa considered to be facing a very high risk of extinction in the wild in the near future
Vulnerable	Vu	Taxa considered to be facing a high risk of extinction in the wild in the medium-term future
Migratory	Mi	Species that migrate to, over and within Australia and its external territories



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix A Codes and Terms Used to Describe Species of Significance Yilgarn Star

Conservation Codes used under the BC Act		
Status	Code	Description
Critically Endangered	CR	Taxa rare or likely to become extinct, as critically endangered taxa
Endangered	EN	Taxa rare or likely to become extinct, as endangered taxa
Vulnerable	VU	Taxa rare or likely to become extinct, as vulnerable taxa
Presumed Extinct	EX	Taxa presumed to be extinct
Migratory	IA	Birds subject to international agreements relating to the protection of migratory birds
Conservation Dependent	CD	Taxa of special conservation need, being species dependent on ongoing conservation intervention
Special Protection	OS	Taxa in need of special protection
Priority Flora and Fauna Under the BC Act		
Status	Code	Description
Priority 1: Poorly-known Species	P1	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2: Poorly-known Species	P2	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3: Poorly-known Species	P3	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4: Rare, Near Threatened and other species in need of monitoring	P4	(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.



Definitions, Categories and Criteria for Threatened and Priority Ecological Communities	
General Definitions 1.	
Ecological Community	A naturally occurring biological assemblage that occurs in a particular type of habitat. Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.
Threatened Ecological Community (TEC)	A threatened ecological community (TEC) is one which is found to fit into one of the following categories; “presumed totally destroyed”, “critically endangered”, “endangered” or “vulnerable”. Possible threatened ecological communities that do not meet survey criteria are added to DEC’s Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.
Assemblage	An assemblage is a defined group of biological entities.
Habitat	Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (eg. substrate and topography), and the biotic factors.
Occurrence	A discrete example of an ecological community, separated from other examples of the same community by more than 20 m of a different ecological community, an artificial surface or a totally destroyed community. By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.
Adequately Surveyed	An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts.
Community structure	The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage (eg. <i>Eucalyptus salmonophloia</i> woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, eg. dominance by feeders on detritus as distinct from feeders on live plants).



Definitions, Categories and Criteria for Threatened and Priority Ecological Communities	
General Definitions 1.	
Ecological Community	A naturally occurring biological assemblage that occurs in a particular type of habitat. Note: The scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.
Threatened Ecological Community (TEC)	A threatened ecological community (TEC) is one which is found to fit into one of the following categories; “presumed totally destroyed”, “critically endangered”, “endangered” or “vulnerable”. Possible threatened ecological communities that do not meet survey criteria are added to DEC’s Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.
Assemblage	An assemblage is a defined group of biological entities.
Habitat	Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (eg. substrate and topography), and the biotic factors.
Occurrence	A discrete example of an ecological community, separated from other examples of the same community by more than 20 m of a different ecological community, an artificial surface or a totally destroyed community. By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.
Adequately Surveyed	An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts.
Community structure	The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage (eg. <i>Eucalyptus salmonophloia</i> woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, eg. dominance by feeders on detritus as distinct from feeders on live plants).



Definitions and Criteria for Priority Ecological Communities	
Possible Threatened Ecological Communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.	
Priority 1 Poorly-known ecological communities	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2 Poorly-known ecological communities	Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority 3 Poorly-known ecological communities	<p>i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat or habitat destruction or degradation</p> <p>ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;</p> <p>iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes</p> <p>Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them</p>
Priority 4 Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring	<p>a) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.</p> <p>b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p>c) Ecological communities that have been removed from the list of threatened communities during the past five years</p>
Priority 5 Conservation Dependent ecological communities	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years



Appendix B VEGETATION CONDITION SCALE FOR THE SOUTH WEST AND INTERZONE BOTANICAL PROVINCES (KEIGHERY 1994, EPA 2016A)



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YILGARN STAR FLORA, VEGETATION**

Appendix B Vegetation Condition Scale for the South West and Interzone Botanical Provinces (Keighery 1994, EPA 2016a) Yilgarn Star

Rating	Description
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.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.
Completely Degraded	The structure of 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.



Appendix C NVIS VEGETATION STRUCTURAL CLASSIFICATION



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Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees > 30 m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland	Scattered Tall Trees
Trees 10-30 m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees < 10 m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Shrubs > 2 m	Tall Closed Scrub	Tall Open Scrub	Tall Shrubland	Tall open Shrubland	Scattered Tall Shrubs
Shrubs 1-2 m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs < 1 m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Scattered Low Shrubs
Hummock Grasses	Closed Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Very Open Hummock Grassland	Scattered Hummock Grasses
Grasses, Sedges, Herbs	Closed Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Open Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Very Open Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Scattered Tussock Grasses / Bunch Grasses / Sedges / Herbs

Based on Muir (1977), and Aplin's (1979) modification of the vegetation classification system of Specht (1970); Aplin T.E.H. (1979). The Flora. Chapter 3 In O'Brien, B.J. (ed.) (1979). Environment and Science. University of Western Australia Press; Muir B.G. (1977). Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bending Reserve. Records of the Western Australian Museum, Suppl. No. 3; Specht R.L. (1970). Vegetation. In: The Australian Environment. 4th edn (Ed. G.W. Leeper). Melbourne



Appendix D LIKELIHOOD OF OCCURRENCE OF SIGNIFICANT FLORA IN THE SURVEY AREA



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YILGARN STAR FLORA, VEGETATION

Appendix D Likelihood of Occurrence of Significant Flora in the Survey Area Yilgarn Star

Species name	Conservation code		Broad habitat	Flowering period	Nearest known location (km)	Database/s Survey Report	Likelihood of occurrence within the Survey Area	
	EPBC Act	BC Act					Pre-survey	Post-survey
<i>Acacia lanuginophylla</i>	En	T	Sandy/clay gravelly soils in broad drainage channels	July-September	71	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Acacia lobulata</i>	En	T	Gritty loam or sand. Low granitic breakaways.	July	116	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Dasymalla axillaris</i>	CR	T	Sandy soils	July-December	245	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Eremophila virens</i>	En	T	Red/brown sand. Granite hillsides.	August to October	117	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Eremophila viscida</i>	En	T	Granitic soils, sandy loam. Stony gullies, sandplains.	September to November	110	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Gastrolobium graniticum</i>	En	T	Sand, sandy loam, granite. Margins of rock outcrops, along drainage lines.	August to September	31	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Isopogon robustus</i>	Cr	T	Skeletal grey sandy loam, laterite. Ridges.	October	13.58	PMST TPFL WAHerb Gibson and Lyons (1998)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Roycea pycnophylloides</i>	En	T	Sandy soils, clay. Saline flats.	September	110	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Symonanthus bancroftii</i>	En	T	White / grey coarse sandy clay. Moist, ephemeral wetland areas.	September	107	PMST	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located well outside of the range of this species.
<i>Chamelaucium</i> sp. Parker Range (B. H. Smith 1255)		P1	Mid slopes, dry, yellow gravelly sand over laterite.	November, December	12.39	WAHerb Naturemap	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Goodenia heatheriana</i>		P1	Red crumbly clay, greenstone gravel and cobbles. Lower slopes, moderately exposed gently undulating plain, roadsides.	September to October	6.78	TPFL WAHerb NatureMap Recon Environmental (2008a)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Possible: The Survey Area is within the range of this species and does contain suitable habitat. If present in the Survey Area, this low (0.15m) annual herb, which may have been flowering at the time of survey, may not have been detectable.
<i>Grevillea lissopleura</i>		P1	Stony loam on banded ironstone. On ridges.	August	14.42	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix D Likelihood of Occurrence of Significant Flora in the Survey Area Yilgarn Star

Species name	Conservation code		Broad habitat	Flowering period	Nearest known location (km)	Database/s Survey Report	Likelihood of occurrence within the Survey Area	
	EPBC Act	BC Act					Pre-survey	Post-survey
<i>Grevillea phillipsiana</i>		P1	Red sand, stony loam, Granite hills.	July to September	2.17	WAHerb TPFL Gibson and Lyons (1998) Naturemap	Likely: This species has been recorded in close proximity to the Survey Area and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Hydrocotyle corynophora</i>		P1	Creek bed to shallow depression, red-brown cracking clay loam.	October	6.80	WAHerb NatureMap TPFL	Unlikely: The Survey Area does not contain suitable habitat for this species.	Unlikely: The Survey Area does not contain suitable habitat for this species.
<i>Lepidosperma</i> sp. Mt Caudan (N. Gibson & M. Lyons 2081)		P1	Slopes, ironstone/laterite gravel, brown/orange sandy loam.	No available information	10.05	WAHerb Stantec (2019)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this tufted sedge would have been detectable at the time of the survey.
<i>Lepidosperma</i> sp. Parker Range (N. Gibson & M. Lyons 2094)		P1	Ridge/slope, clay/gravel to stony brown sandy loam.	No available information	12.86	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this tufted sedge would have been detectable at the time of the survey.
<i>Leucopogon validus</i>		P1	Dry, brown, rocky sandy loam, brown-orange sandy clay, gravel, ironstone, sandstone. Low ranges, on and around exposed breakaways.	Not recorded	13.32	WAHerb TPFL	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Millotia newbeyi</i>		P1	Red/brown loam, red clay. Undulating plains.	September	6.81	WAHerb NatureMap TPFL	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Melaleuca grieviana</i>		P1	Well-drained orange-brown loam, brown clay. Plains, gentle slopes, edge of crop paddocks.	July	17.23	WAHerb	Unlikely: The Survey Area is located well outside of the range of this species.	Unlikely: The Survey Area is located outside of the range of this species.
<i>Rinzia fimbriolata</i>		P1	Well drained soil, Brown sandy loam. Clay with quartz.	September	10.74	WAHerb Stantec (2019) Stantec (2020c)	Likely: This species has been recorded in close proximity to the Survey Area and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Rinzia medifila</i>		P1	Red/orange/yellow brown sandy loam.	Approximately September, October	15.98	TPFL WAHerb Gibson and Lyons (1998) (MWH 2014) Botanica (2016b)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Acacia asepala</i>		P2	Red-brown sandy loam. Undulating plains, along drainage lines.	August	4.42	TPFL WAHerb NatureMap Gibson and Lyons (1998)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Confirmed: Confirmed from current Survey
<i>Acacia concolorans</i>		P2	Red/brown loam, clay. Low lateritic hills, flats.	July to August	13.22	TPFL WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Possible: The Survey Area is within the range of this species and does contain some suitable habitat. If present in the Survey Area this species

Appendix D Likelihood of Occurrence of Significant Flora in the Survey Area Yilgarn Star

Species name	Conservation code		Broad habitat	Flowering period	Nearest known location (km)	Database/s Survey Report	Likelihood of occurrence within the Survey Area	
	EPBC Act	BC Act					Pre-survey	Post-survey
						NatureMap Stantec (2019) Recon Environmental (2008a) Gibson and Lyons (1998)	Area may contain suitable habitat, although it has been recorded infrequently in the area.	may have gone undetected due to the small (0.1 – 0.5 m) and sometimes compact habit of this species, in conjunction with the survey being conducted outside of the known flowering period.
<i>Eutaxia lasiocalyx</i>		P2	Red sandy loam, laterite and quartz gravel. Gentle lower slopes.	November	14.62	TPFL WAHerb NatureMap MWH (2014) Botanica (2016b)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Lepidium merrallii</i>		P2	Unknown	Unknown	12.18	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this ephemeral shrub would have been detectable at the time of the survey.
<i>Verticordia multiflora</i> subsp. <i>solox</i>		P2	Yellow sand over gravel, sand over granite.	October to December or January	13.06	WAHerb NatureMap	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Acacia crenulata</i>		P3	Clay, sandy clay, yellow sand. Rocky rises, granite outcrops, breakaways.	March to May, October	14.85	WAHerb TPFL NatureMap Stantec (2019) Recon Environmental (2008c)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species however it does not contain suitable habitat. In addition, it is likely that, if present in the Survey Area, this perennial shrub/tree would have been detectable at the time of the survey.
<i>Acacia dissona</i> var. <i>indoloria</i>		P3	Sand, sandy loam. Undulating plains.	August to September	11	Stantec (2019) Recon Environmental (2008a) Recon Environmental (2008c)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Acacia desertorum</i> var. <i>nudipes</i>		P3	Yellow sand, lateritic gravel. Sandplains, flats.	August to October	12.04	WAHerb TPFL NatureMap	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey. The survey was also conducted during the known flowering period for this species.
<i>Baeckea grandibracteata</i> subsp. Parker Range (K. Newbey 9270)		P3	Mid slopes to sandplain, yellow silty sand to sandy loam.	November	13.19	WAHerb NatureMap Stantec (2019)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Cryptandra crispula</i>		P3	Brown sandy clay, yellow loamy sand, red soil, pebbles. Dune ridges, hills, near salt lakes.	July, August, September	15.05	WAHerb NatureMap	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species but does not contain suitable habitat.
<i>Hakea pendens</i>		P3	Stony loam, ironstone ridges.	September	2.17	WAHerb TPFL NatureMap Stantec (2019)	Likely: This species has been recorded in close proximity to the Survey Area and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this large perennial shrub would have been detectable at the time of the survey.



Appendix D Likelihood of Occurrence of Significant Flora in the Survey Area Yilgarn Star

Species name	Conservation code		Broad habitat	Flowering period	Nearest known location (km)	Database/s Survey Report	Likelihood of occurrence within the Survey Area	
	EPBC Act	BC Act					Pre-survey	Post-survey
						Recon Environmental (2008c) Recon Environmental (2008a) Mattiske Consulting (2001) Gibson and Lyons (1998)		
<i>Lepidium genistoides</i>		P3	Sandy loam.	September to October	3.81	WAHerb TPFL	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this dense, spreading shrub would have been detectable at the time of the survey.
<i>Microseris walteri</i>		P3	Samphire flats, salt lakes.	June, September, October	5.4	WAHerb TPFL	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Notisia intonsa</i>		P3	Plain to floodplain, red to brown clay to clay loam.	September, October November	6.78	WAHerb TPFL NatureMap Gibson and Lyons (1998)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat.	Possible: The Survey Area is within the range of this species and does contain some suitable habitat. If present in the Survey Area, this annual herb may have been undetected at the time of survey.
<i>Prostanthera nanophylla</i>		P3	Sand plain. Yellow sand over laterite, rocky loam.	August to November	18.7	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Rinzia torquata</i>		P3	Sand plain. Yellow loamy sand.	June, August, October	13.29	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Verticordia mitodes</i>		P3	Yellow sand. Undulating plains	October to December or January	13.29	WAHerb TPFL NatureMap	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Verticordia stenopetala</i>		P3	Yellow sand, sometimes with gravel. Undulating plains	October to December or January	14.79	WAHerb TPFL NatureMap	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Acacia merrickiae</i>		P4	Sandy loam, clay, yellow sand.	April to June	5.28	Naturemap TPFL	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Possible: The Survey Area is within the range of this species and does contain some suitable habitat. If present in the Survey Area, this annual herb may have been undetected at the time of survey.
<i>Banksia shanklandiorum</i>		P4	Open eucalypt woodland	July-August	10.04	Stantec (2019)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Calamphoreus inflatus</i>		P4	Clay loam with ironstone gravel. Flats, disturbed sites.	October to December or February to March	7.07	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it

Appendix D Likelihood of Occurrence of Significant Flora in the Survey Area Yilgarn Star

Species name	Conservation code		Broad habitat	Flowering period	Nearest known location (km)	Database/s Survey Report	Likelihood of occurrence within the Survey Area	
	EPBC Act	BC Act					Pre-survey	Post-survey
						Recon Environmental (2008a) MWH (2014) Naturemap TPFL	Area may contain suitable habitat, although it has been recorded infrequently in the area.	is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Eremophila caerulea</i> subsp. <i>merrallii</i>		P4	Sand, clay or loam. Undulating plains.	October to December	16.90	WAHerb NatureMap Recon Environmental (2008a) Recon Environmental (2007)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Grevillea neodissecta</i>		P4	Lateritic gravel to ironstone, red to yellow loamy sand.	January, February, September, October, November and December	9.76	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Grevillea prostrata</i>		P4	Yellow sand to laterite gravel	August, December or January	17.1	WAHerb	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Microcorys</i> sp. <i>Forrestania</i>		P4	Yellow sandy clay or red-brown clay. Open woodland or cleared areas.	January or April	7.5	WAHerb TPFL	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.
<i>Stenanthemum bremerense</i>		P4	Orange-brown sandy loam, skeletal red loam, orange-red gravelly loam, laterite, ironstone. Outcrops, breakaways	May, June, September, November	15.78	WAHerb TPFL NatureMap Stantec (2019) (Stantec 2020c) Recon Environmental (2008c)	Possible: The Survey Area is within the distribution range of this species and the Survey Area may contain suitable habitat, although it has been recorded infrequently in the area.	Unlikely: The Survey Area is within the range of this species and does contain some suitable habitat, however if present in the Survey Area, it is likely that this perennial shrub would have been detectable at the time of the survey.




Appendix E FLORA QUADRATS AND RELEVÉS



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type			Site Name	Date	Site Photograph
Quadrat	LoM01	21/04/2020			
Dimensions	20m x 20 m				
Described by	Scott Pansini and Jeni Alford				
Location (UTM)					
Easting	753396	mE			
Northing	6509721	mN			
Site Characteristics					
Landform	Sandy/Stony Plain				
Slope	Flat (0°)				
Aspect	None				
Condition					
Vegetation Condition	Excellent				
Disturbance Type	Mining exploration				
Disturbance Fauna	None discernible				
Fire Age	Old (6+ yrs)				
Fire Notes	Bare ground				
Water Presence	None				
Soils					
Soil Texture	Loamy sand				
Soil Colour	Red/Brown				
Rock Type	Quartz				
Coarse Surface Particles					
Maximum Size (mm)	Gravel (1-4 cm)				
Abundance (%)	Moderate				
Exposed Bedrock (%)	Negligible (<5%)				
Vegetation Description	<i>Eucalyptus salubris</i> and <i>Eucalyptus longicornis</i> woodland over <i>Melaleuca pauperiflora</i> tall open shrubland over <i>Acacia merrallii</i> open shrubland over <i>Eremophila scoparia</i> open shrubland over <i>Atriplex vesicaria</i> low open shrubland.				



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Eucalyptus salubris</i>	13	10
<i>Eucalyptus longicornis</i>	11	5
<i>Melaleuca pauperiflora</i>	5	8
<i>Acacia merrallii</i>	2.5	2
<i>Santalum acuminatum</i>	1.9	0.1
<i>Eremophila scoparia</i>	1.4	9
<i>Exocarpos aphyllus</i>	1.4	0.1
<i>Templetonia ceracea</i>	1.1	0.1
<i>Lycium australe</i>	0.7	0.1
<i>Atriplex vesicaria</i>	0.4	6
<i>Austrostipa elegantissima</i>	0.2	0.1
Poaceae sp.	0.15	0.1
<i>Roepera glauca</i>	0.05	0.1
<i>Roepera ovata</i>	0.05	0.1
<i>Podolepis lessonii</i>	0.01	0.1



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	LoM02	21/4/2020	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Jeni Alford and Julijanna Hantzis		
Location (UTM)			
Easting	753206	mE	
Northing	6508108	mN	
Site Characteristics			
Landform	Sandy/Stony Plain		
Slope	Flat (0°)		
Aspect	None		
Condition			
Vegetation Condition	Very good		
Disturbance Type	Mining exploration/ Litter		
Disturbance Fauna	None discernible		
Fire Age	Old (6+yrs)		
Fire Notes	Bare ground		
Water Presence	None		
Soils			
Soil Texture	Clay loam sandy		
Soil Colour	Grey		
Rock Type	Sandstone		
Coarse Surface Particles			
Maximum Size (mm)	Gravel (1-4 cm)		
Abundance (%)	Moderate		
Exposed Bedrock (%)	Negligible (<5%)		
Vegetation Description	<i>Eucalyptus longicornis</i> and <i>Eucalyptus salubris</i> woodland over <i>Melaleuca pauperiflora</i> (<i>Exocarpos aphyllus</i>) tall open shrubland over <i>Eremophila scoparia</i> scattered shrubs over <i>Atriplex vesicaria</i> low open shrubland.		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Eucalyptus longicornis</i>	12	15
<i>Eucalyptus salubris</i>	10	3
<i>Melaleuca pauperiflora</i>	4	9
<i>Exocarpos aphyllus</i>	2.1	1
<i>Eremophila scoparia</i>	1.9	1
<i>Atriplex vesicaria</i>	0.5	3
<i>Roepera glauca</i>	0.01	0.1



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type			Site Name	Date	Site Photograph
Quadrat	LoM04	20/04/2020			
Dimensions	20m x 20 m				
Described by	Scott Pansini, Jeni Alford				
Location (UTM)					
Easting	754256	mE			
Northing	6507723	mN			
Site Characteristics					
Landform	Sandy/Stony Plain				
Slope	Flat (0°)				
Aspect	None				
Condition					
Vegetation Condition	Excellent				
Disturbance Type	Mining exploration				
Disturbance Fauna	None discernible				
Fire Age	Unknown				
Fire Notes	Bare ground				
Water Presence	None				
Soils					
Soil Texture	Loamy sand				
Soil Colour	Red/Brown				
Rock Type	Ironstone				
Coarse Surface Particles					
Maximum Size (mm)	Gravel (1-4 cm)				
Abundance (%)	Common				
Exposed Bedrock (%)	Negligible (<5%)				
Vegetation Description	<i>Eucalyptus salubris</i> and <i>Eucalyptus salmonophloia</i> open woodland over <i>Melaleuca pauperiflora</i> and <i>Santalum acuminatum</i> tall open shrubland over ? <i>Hemigenia westringioides</i> , <i>Acacia merrallii</i> and <i>Exocarpos aphyllus</i> open shrubland over <i>Atriplex vesicaria</i> low open shrubland.				



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Acacia merrallii</i>	1.6	1
<i>Alyxia buxifolia</i>	0.3	0.1
<i>Atriplex vesicaria</i>	0.4	4
<i>Austrostipa elegantissima</i>	0.6	0.1
<i>Eremophila scoparia</i>	0.6	0.1
<i>Erymophyllum ramosum</i> subsp. <i>ramosum</i>	0.01	0.1
<i>Eucalyptus salmonophloia</i>	18	3
<i>Eucalyptus salubris</i>	18	5
<i>Exocarpos aphyllus</i>	1.6	1
? <i>Hemigenia westringioides</i>	1.9	2
<i>Lycium australe</i>	0.3	0.1
<i>Melaleuca pauperiflora</i>	5	5
<i>Ptilotus holosericeus</i>	0.01	0.1
<i>Santalum acuminatum</i>	3	2
<i>Sclerolaena diacantha</i>	0.1	0.1
<i>Sclerolaena drummondii</i>	0.1	0.1
<i>Senna artemisioides</i> subsp. <i>filifolia</i>	0.9	0.1
<i>Senna stowardii</i>	0.8	0.1
<i>Templetonia ceracea</i>	1.1	1



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type			Site Name	Date	Site Photograph
Quadrat	LoM05	20/04/2020			
Dimensions	20m x 20 m				
Described by	Scott Pansini, Jeni Alford				
Location (UTM)					
Easting	754935	mE			
Northing	6508040	mN			
Site Characteristics					
Landform	Hillslope				
Slope	Low (1-20°)				
Aspect	North-west				
Condition					
Vegetation Condition	Excellent				
Disturbance Type	Mining exploration, road access tracks				
Disturbance Fauna	None discernible				
Fire Age	Old (6+yrs)				
Fire Notes	Dead branches				
Water Presence	None				
Soils					
Soil Texture	Sandy loam				
Soil Colour	Grey				
Rock Type	Granite				
Coarse Surface Particles					
Maximum Size (mm)	Small rocks (11-20cm)				
Abundance (%)	Moderate				
Exposed Bedrock (%)	Negligible (<5%)				
Vegetation Description	<i>Eucalyptus longicornis</i> woodland over <i>Eucalyptus E.1orrugate</i> and <i>Eucalyptus yilgarnensis</i> low open woodland over <i>Acacia merrallii</i> scattered tall shrubs over <i>Exocarpos aphyllus</i> and <i>Dodonaea stenozyga</i> open shrubland.				



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Acacia merrallii</i>	18	20
<i>Alyxia buxifolia</i>	9	4
<i>Amyema miquelii</i>	8	4
<i>Austrostipa</i> sp.	2.2	1
<i>Beyeria sulcata</i> var. <i>brevipes</i>	1.7	0.1
<i>Dodonaea stenozyga</i>	1.7	0.1
<i>Eremophila interstans</i> subsp. <i>interstans</i>	1.5	0.5
<i>Eucalyptus corrugata</i>	1.3	2
<i>Eucalyptus longicornis</i>	1.1	2
<i>Eucalyptus yilgarnensis</i>	0.6	0.1
<i>Exocarpos aphyllus</i>	0.4	0.1
<i>Olearia muelleri</i>	0.4	0.1
<i>Rhagodia drummondii</i>	0.3	0.5
<i>Scaevola spinescens</i>	0.1	0.1
<i>Senna artemisioides</i> subsp. <i>filifolia</i>	0	0.1



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	LoM06	20/04/2020	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Jeni Alford		
Location (UTM)			
Easting	754309	mE	
Northing	6507583	mN	
Site Characteristics			
Landform	Sandy/Stony Plain		
Slope	Flat (0°)		
Aspect	None		
Condition			
Vegetation Condition	Excellent		
Disturbance Type	Mining exploration, road access tracks		
Disturbance Fauna	None discernible		
Fire Age	Unknown		
Fire Notes	Bare ground		
Water Presence	None		
Soils			
Soil Texture	Loamy sand		
Soil Colour	Red/Brown		
Rock Type	Ironstone		
Coarse Surface Particles			
Maximum Size (mm)	Gravel (1-4 cm)		
Abundance (%)	Moderate		
Exposed Bedrock (%)	Negligible (<5%)		
Vegetation Description	<i>Eucalyptus longicornis</i> , <i>Eucalyptus salmonophloia</i> and <i>Eucalyptus salubris</i> woodland over <i>Melaleuca pauperiflora</i> and <i>Santalum acuminatum</i> tall open shrubland over <i>Templetonia ceracea</i> and <i>Atriplex versicaria</i> low open shrubland.		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Acacia merrallii</i>	0.5	0.1
<i>Atriplex nummularia</i> subsp. <i>spathulata</i>	0.3	0.1
<i>Atriplex vesicaria</i>	0.6	3
<i>Austrostipa elegantissima</i>	0.5	0.1
<i>Austrostipa scabra</i> subsp. <i>scabra</i>	0.1	0.1
* <i>Centaurea melitensis</i>	0.01	0.1
<i>Erymophyllum ramosum</i> subsp. <i>ramosum</i>	0.05	0.1
<i>Eucalyptus longicornis</i>	18	5
<i>Eucalyptus salmonophloia</i>	16	1
<i>Eucalyptus Salubris</i>	15	6
<i>Lawrencia diffusa</i>	0.01	0.1
<i>Melaleuca pauperiflora</i>	3	3
<i>Ptilotus exaltatus</i>	0.01	0.1
<i>Ptilotus holosericeus</i>	0.01	0.1
<i>Ptilotus sp.</i>	0.01	0.1
<i>Rhagodia drummondii</i>	0.3	0.1
<i>Santalum acuminatum</i>	2.1	2
<i>Sclerolaena diacantha</i>	0.1	0.1
<i>Sclerolaena drummondii</i>	0.1	0.1
<i>Senna artemisioides</i> subsp. <i>filifolia</i>	0.2	0.1
<i>Templetonia ceracea</i>	0.6	4



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type			Site Name	Date	Site Photograph
Quadrat	LoM28	21/04/2020			
Dimensions	20m x 20 m				
Described by	Scott Pansini, Jeni Alford				
Location (UTM)					
Easting	753002	mE			
Northing	6509747	mN			
Site Characteristics					
Landform	Sandy/Stony Plain				
Slope	Flat (0°)				
Aspect	None				
Condition					
Vegetation Condition	Pristine				
Disturbance Type	None discernable				
Disturbance Fauna	None discernible				
Fire Age	Unknown				
Fire Notes	Dead branches				
Water Presence	None				
Soils					
Soil Texture	Sandy loam				
Soil Colour	Red/Brown				
Rock Type	Sandstone				
Coarse Surface Particles					
Maximum Size (mm)	Gravel (1-4 cm)				
Abundance (%)	Moderate				
Exposed Bedrock (%)	Negligible (<5%)				
Vegetation Description	<p><i>Eucalyptus longicornis</i> and <i>Eucalyptus salubris</i> woodland over <i>Melaleuca pauperiflora</i> tall open shrubland over <i>Exocarpos aphyllus</i>, <i>Acacia merrallii</i> and <i>Santalum acuminatum</i> tall open shrubland over <i>Eremophila scoparia</i> scattered shrubs over <i>Atriplex vesicaria</i> low open shrubland.</p>				



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Acacia merrallii</i>	2.2	2
<i>Atriplex vesicaria</i>	0.4	3
<i>Austrostipa sp.</i>	0.35	0.1
<i>Eremophila scoparia</i>	1.4	1
<i>Eucalyptus longicornis</i>	18	15
<i>Eucalyptus salubris</i>	15	10
<i>Exocarpos aphyllus</i>	3	2
<i>Lycium australe</i>	0.8	0.1
<i>Melaleuca pauperiflora</i>	3.5	5
<i>Olearia muelleri</i>	0.25	0.1
<i>Rhagodia drummondii</i>	0.2	0.1
<i>Santalum acuminatum</i>	2.2	1
<i>Scaevola spinescens</i>	0.2	0.1



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type			Site Name	Date	Site Photograph
Quadrat	LoM29	20/04/2020			
Dimensions	20m x 20 m				
Described by	Scott Pansini, Jeni Alford				
Location (UTM)					
Easting	752569	mE			
Northing	6508306	mN			
Site Characteristics					
Landform	Other				
Slope	Flat (0°)				
Aspect	None				
Condition					
Vegetation Condition	Very good				
Disturbance Type	Mining exploration, road access tracks				
Disturbance Fauna	None discernible				
Fire Age	Unknown				
Fire Notes	Bare ground				
Water Presence	None				
Soils					
Soil Texture	Loamy sand				
Soil Colour	Red/Brown				
Rock Type	None discernable				
Coarse Surface Particles					
Maximum Size (mm)	Negligible				
Abundance (%)	None				
Exposed Bedrock (%)	Negligible (<5%)				
Vegetation Description	<i>Eucalyptus salubris</i> low open woodland over <i>Melaleuca pauperiflora</i> (<i>Santalum acuminatum</i>) tall open shrubland over <i>Exocarpos aphyllus</i> scattered shrubs over <i>Atriplex vesicaria</i> (<i>Acacia nyssophylla</i>) low open shrubland.				



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Acacia merrallii</i>	1.8	0.5
<i>Acacia nyssophylla</i>	0.4	1
<i>Alyxia buxifolia</i>	1.1	0.1
<i>Atriplex vesicaria</i>	0.5	2
<i>Austrostipa elegantissima</i>	0.3	0.1
<i>Eremophila ionantha</i>	1.9	0.1
<i>Eremophila scoparia</i>	1.8	0.1
<i>Eucalyptus salubris</i>	18	8
<i>Exocarpos aphyllus</i>	1.8	1
<i>Grevillea acuaria</i>	0.4	0.1
<i>Lomandra effusa</i>	0.2	0.1
<i>Lycium australe</i>	1.1	0.1
<i>Melaleuca pauperiflora</i>	4	4
<i>Olearia muelleri</i>	0.2	0.1
<i>Poaceae sp.</i>	0.01	0.1
<i>Rhagodia drummondii</i>	0.1	0.1
<i>Roepera apiculata</i>	0.4	0.1
<i>Santalum acuminatum</i>	2.1	1
<i>Senna artemisioides subsp. filifolia</i>	1.4	0.1
<i>Senna stowardii</i>	1.4	0.1
<i>Waitzia fitzgibbonii</i>	0.1	0.1



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	QLoM43	26/09/2020	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Julijanna Hantzis		
Location (UTM)			
Easting	753931	mE	
Northing	6510083	mN	
Site Characteristics			
Landform	Sandy/Stony Plain		
Slope	Flat (0°)		
Aspect	None		
Condition			
Vegetation Condition	Pristine		
Disturbance Type	None discernable		
Disturbance Fauna	None discernable		
Fire Age	Old (6+yrs)		
Fire Notes	Bare ground, dead branches		
Water Presence	None		
Soils			
Soil Texture	Sandy loam		
Soil Colour	Red/Brown		
Rock Type	Ironstone		
Coarse Surface Particles			
Maximum Size (mm)	Negligible		
Abundance (%)	None		
Exposed Bedrock (%)	Negligible (<5%)		
Vegetation Description	<i>Eucalyptus ? longissima</i> and <i>Eucalyptus salubris</i> open forest over <i>Melaleuca lanceolata</i> tall open shrubland over <i>Eremophila</i> sp. scattered shrubs over <i>Eremophila ionantha</i> low open shrubland.		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Eremophila ionantha</i>	0.9	2
<i>Eremophila scoparia</i>	0.6	0.1
<i>Eremophila sp.</i>	1.6	1.5
<i>Eucalyptus ? longissima</i>	20	40
<i>Eucalyptus salubris</i>	15	10
<i>Exocarpos aphyllus</i>	0.3	0.1
<i>Melaleuca lanceolata</i>	5	5
<i>Olearia muelleri</i>	0.3	0.1
<i>Roepera glauca</i>	0.01	0.1
<i>Roepera glauca</i>	0.05	0.1
<i>Senna artemisioides</i> subsp. <i>filifolia</i>	0.6	0.1



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	QLoM44	27/09/2020	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Julijanna Hantzis		
Location (UTM)			
Easting	753354	mE	
Northing	6507438	mN	
Site Characteristics			
Landform	Sandy/Stony Plain		
Slope	Low (1-20°)		
Aspect	South		
Condition			
Vegetation Condition	Excellent		
Disturbance Type	Mining exploration		
Disturbance Fauna	None discernible		
Fire Age	Old (6+yrs)		
Fire Notes	Bare ground, dead branches		
Water Presence	None		
Soils			
Soil Texture	Sandy clay loam		
Soil Colour	Brown		
Rock Type	Laterite		
Coarse Surface Particles			
Maximum Size (mm)	Negligible		
Abundance (%)	None		
Exposed Bedrock (%)	Negligible (<5%)		
Vegetation Description	<i>Eucalyptus longicornis</i> and <i>Eucalyptus salubris</i> woodland over <i>Melaleuca pauperiflora</i> and <i>Santalum acuminatum</i> tall open shrubland over <i>Acacia merrallii</i> and <i>Eremophila scoparia</i> open shrubland over <i>Atriplex vesicaria</i> low open shrubland.		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Acacia merrallii</i>	1.8	1
<i>Atriplex vesicaria</i>	0.6	2
<i>Austrostipa elegantissima</i>	0.4	0.1
<i>Eremophila scoparia</i>	1.6	5
<i>Eucalyptus longicornis</i>	18	20
<i>Eucalyptus salubris</i>	10	5
<i>Exocarpos aphyllus</i>	50	0.1
<i>Melaleuca pauperiflora</i>	6	1
<i>Olearia muelleri</i>	0.2	0.1
<i>Podolepis lessonii</i>	0.05	0.1
<i>Roepera glauca</i>	0.05	0.1
<i>Roepera ovata</i>	0.05	0.1
<i>Santalum acuminatum</i>	2.9	3



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	QLoM45	27/09/2020	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Julijanna Hantzis		
Location (UTM)			
Easting	752458	mE	
Northing	6507406	mN	
Site Characteristics			
Landform	Sand plain		
Slope	Low (1-20°)		
Aspect	South-east		
Condition			
Vegetation Condition	Excellent		
Disturbance Type	Mining exploration, road access tracks		
Disturbance Fauna	None discernible		
Fire Age	Old (6+yrs)		
Fire Notes	Bare ground, dead branches		
Water Presence	None		
Soils			
Soil Texture	Sandy loam		
Soil Colour	Red/Brown		
Rock Type	Ironstone		
Coarse Surface Particles			
Maximum Size (mm)	Negligible		
Abundance (%)	None		
Exposed Bedrock (%)	Negligible (<5%)		
Vegetation Description	<i>Eucalyptus longicornis</i> and <i>Eucalyptus salubris</i> woodland over <i>Exocarpos aphyllus</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> and <i>Eremophila ionantha</i> open shrubland over <i>Olearia muelleri</i> scattered herbs.		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Acacia colletioides</i>	0.3	0.1
<i>Acacia merrallii</i>	0.6	0.1
<i>Austrostipa elegantissima</i>	0.3	0.1
<i>Austrostipa trichophylla</i>	0.05	0.1
<i>Eremophila ionantha</i>	1.4	3
<i>Eremophila scoparia</i>	0.8	0.1
<i>Eucalyptus longicornis</i>	18	10
<i>Eucalyptus salubris</i>	12	16
<i>Exocarpos aphyllus</i>	1.5	2
<i>Lycium australe</i>	1.1	0.1
<i>Olearia muelleri</i>	0.4	1
<i>Podolepis lessonii</i>	0.05	0.1
<i>Roepera apiculata</i>	0.15	0.1
<i>Senna artemisioides</i> subsp. <i>filifolia</i>	1.5	1



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	QYs01	24/03/2021	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Jonas Mitchell		
Location (UTM)			
Easting	754243	mE	
Northing	6507826	mN	
Site Characteristics			
Landform	Ironstone outcrops		
Slope	Low (1-20°)		
Aspect	South		
Condition			
Vegetation Condition	Excellent		
Disturbance Type	Mining exploration, rubbish/litter		
Disturbance Fauna	None discernible		
Fire Age	Unknown		
Fire Notes	Dead branches		
Water Presence	None		
Soils			
Soil Texture	Loamy sand		
Soil Colour	Brown		
Rock Type	Laterite		
Coarse Surface Particles			
Maximum Size (mm)	Small rocks (11-20cm)		
Abundance (%)	Very common		
Exposed Bedrock (%)	Extensive (70%+)		
Vegetation Description	<i>Eucalyptus capillosa</i> open woodland over <i>Allocasuarina acutivalvis</i> and <i>Melaleuca scalena</i> tall open shrubland over <i>Phebalium</i> sp. and <i>Alyxia buxifolia</i> scattered shrubs over <i>Acrotriche lancifolia</i> , <i>Dodonaea microzyga</i> var. <i>acrolobata</i> and <i>Eremophila granitica</i> low open shrubland		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Eucalyptus capillosa</i>	12	5
<i>Allocasuarina acutivalvis</i>	3	3
<i>Melaleuca scalena</i>	3	3
<i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>	3	0.1
<i>Alyxia buxifolia</i>	1.6	0.5
<i>Phebalium</i> sp.	1.5	1
<i>Eremophila granitica</i>	0.9	1
<i>Acrotriche lancifolia</i>	0.5	2
<i>Dodonaea microzyga</i> var. <i>acrolobata</i>	0.5	1
<i>Austrostipa elegantissima</i>	0.4	0.1
<i>Microcybe multiflora</i> subsp. <i>multiflora</i>	0.4	0.1
<i>Grevillea acuaria</i>	0.3	0.1
<i>Lepidosperma sanguinolentum</i>	0.3	0.1
<i>Acacia erinacea</i>	0.15	0.1



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	QYs02	24/03/2021	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Jonas Mitchell		
Location (UTM)			
Easting	755237	mE	
Northing	6507295	mN	
Site Characteristics			
Landform	Sandy/Stony Plain		
Slope	Low (1-20°)		
Aspect	North-west		
Condition			
Vegetation Condition	Excellent		
Disturbance Type	Mining exploration, road access tracks		
Disturbance Fauna	None discernible		
Fire Age	Old (6+yrs)		
Fire Notes	Dead branches		
Water Presence	None		
Soils			
Soil Texture	Clay loam sand		
Soil Colour	Red/Brown		
Rock Type	Laterite		
Coarse Surface Particles			
Maximum Size (mm)	Pebbles (5-10cm)		
Abundance (%)	Very common		
Exposed Bedrock (%)	Negligible (<5%)		
Vegetation Description	<i>Eucalyptus salmonophloia</i> and <i>Eucalyptus salubris</i> woodland over <i>Eremophila interstans</i> subsp. <i>interstans</i> and <i>Santalum acuminatum</i> tall open shrubland over <i>Acacia asepala</i> , <i>Acacia merrallii</i> , <i>Templetonia ceracea</i> and <i>Exocarpos aphyllus</i> low shrubland		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star


Species List

Species	Height (m)	Cover (%)
<i>Eucalyptus salmonophloia</i>	30	5
<i>Eucalyptus salubris</i>	20	15
<i>Eremophila interstans</i> subsp. <i>interstans</i>	4	1
<i>Santalum acuminatum</i>	2.1	2
<i>Acacia asepala</i>	0.9	5
<i>Acacia merrallii</i>	0.9	2.5
<i>Templetonia ceracea</i>	0.9	2
<i>Exocarpos aphyllus</i>	0.9	1
<i>Atriplex vesicaria</i>	0.4	0.5
<i>Olearia muelleri</i>	0.3	0.1
<i>Austrostipa elegantissima</i>	0.2	0.1
<i>Rhagodia drummondii</i>	0.2	0.1
<i>Scaevola spinescens</i>	0.1	0.1
<i>Sclerolaena diacantha</i>	0.1	0.1
<i>Sclerolaena drummondii</i>	0.1	0.1
<i>Ptilotus exaltatus</i>	0.01	0.1



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star

Site Type	Site Name	Date	Site Photograph
Quadrat	QYs03	25/03/2021	
Dimensions	20m x 20 m		
Described by	Scott Pansini, Jonas Mitchell		
Location (UTM)			
Easting	754786	mE	
Northing	6508718	mN	
Site Characteristics			
Landform	Hillslope		
Slope	Low (1-20°)		
Aspect	North		
Condition			
Vegetation Condition	Excellent		
Disturbance Type	Mining exploration, road access tracks		
Disturbance Fauna	None discernible		
Fire Age	Old (6+ yrs)		
Fire Notes	Bare ground, dead branches		
Water Presence	None		
Soils			
Soil Texture	Sandy loam		
Soil Colour	Brown		
Rock Type	Granite		
Coarse Surface Particles			
Maximum Size (mm)	Pebbles (5-10cm)		
Abundance (%)	Moderate		
Exposed Bedrock (%)	Limited (5-10%)		
Vegetation Description	<i>Eucalyptus longicornis</i> and <i>Eucalyptus corrugata</i> woodland over <i>Eucalyptus yilgarnensis</i> low open woodland over <i>Eremophila interstans</i> subsp. <i>interstans</i> and <i>Alyxia buxifolia</i> tall open shrubland over <i>Exocarpos aphyllus</i> , <i>Acacia merrallii</i> and <i>Dodonaea stenozyga</i> open shrubland over <i>Scaevola spinescens</i> and <i>Templetonia ceracea</i> low open shrubland		



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix E Flora Quadrats and Relevés Yilgarn Star

Species List

Species	Height (m)	Cover (%)
<i>Eucalyptus longicornis</i>	20	5
<i>Eucalyptus corrugata</i>	18	12
<i>Eucalyptus yilgarenensis</i>	6	5
<i>Eremophila interstans</i> subsp. <i>interstans</i>	5	1
<i>Alyxia buxifolia</i>	2.1	3
<i>Exocarpos aphyllus</i>	1.7	2
<i>Acacia merrallii</i>	1.5	2
<i>Senna artemisioides</i> subsp. <i>filifolia</i>	1.5	0.5
<i>Dodonaea stenozyga</i>	1.3	2
<i>Eremophila scoparia</i>	1.2	0.1
<i>Rhagodia drummondii</i>	0.5	0.1
<i>Scaevola spinescens</i>	0.4	5
<i>Templetonia ceracea</i>	0.4	1
<i>Acacia erinacea</i>	0.3	0.5
<i>Eremophila ionantha</i>	0.2	0.1
<i>Olearia muelleri</i>	0.2	0.1
<i>Grevillea huegelii</i>	0.1	0.5
<i>Amyema miquelii</i>	0	0.5



Appendix F INVENTORY OF VASCULAR FLORA RECORDED



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix F Inventory of Vascular Flora Recorded Yilgarn Star

Family	Species
Aizoaceae	*Mesembryanthemum nodiflorum
Amaranthaceae	Ptilotus exaltatus
	Ptilotus holosericeus
Apiaceae	Daucus glochidiatus
Apocynaceae	Alyxia buxifolia
Asparagaceae	Lomandra effusa
	Thysanotus manglesianus
Asteraceae	*Centaurea melitensis
	Erymophyllum ramosum subsp. ramosum
	Olearia muelleri
	Olearia pimeleoides
	Panaetia lessonii
Waitzia fitzgiibbonii	
Boraginaceae	Halgania andromedifolia
Casuarinaceae	Allocasuarina acutivalvis
	Allocasuarina acutivalvis subsp. acutivalvis
Chenopodiaceae	Atriplex nummularia subsp. spathulata
	Atriplex vesicaria
	Maireana carnososa
	Rhagodia drummondii
	Sclerolaena diacantha
Sclerolaena drummondii	
Convolvulaceae	Wilsonia humilis
Cyperaceae	Lepidosperma sanguinolentum
Ericaceae	Acrotriche lancifolia
Euphorbiaceae	Beyeria sulcata var. brevipes
Fabaceae	*Medicago minima
	Acacia asepala
	Acacia colletioides
	Acacia erinacea
	Acacia merrallii
	Acacia nyssophylla
	Bossiaea walkeri
	Senna artemisioides subsp. filifolia
	Senna stowardii
Templetonia ceracea	
Frankeniaceae	Frankenia desertorum
Goodeniaceae	Scaevola spinescens
Lamiaceae	Prostanthera semiteres subsp. semiteres
Loranthaceae	Amyema miquelii



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix F Inventory of Vascular Flora Recorded Yilgarn Star

Malvaceae	<i>Lawrenzia diffusa</i>
Myrtaceae	<i>Eucalyptus capillosa</i>
	<i>Eucalyptus corrugata</i>
	<i>Eucalyptus longicornis</i>
	<i>Eucalyptus salmonophloia</i>
	<i>Eucalyptus salubris</i>
	<i>Eucalyptus yilgarnensis</i>
	<i>Melaleuca lanceolata</i>
	<i>Melaleuca pauperiflora</i>
	<i>Melaleuca scalena</i>
Poaceae	* <i>Vulpia bromoides</i>
	<i>Amphipogon caricinus</i>
	<i>Austrostipa elegantissima</i>
	<i>Austrostipa scabra</i> subsp. <i>scabra</i>
	<i>Austrostipa trichophylla</i>
Proteaceae	<i>Grevillea acuaria</i>
	<i>Grevillea huegelii</i>
Rhamnaceae	<i>Trymalium myrtillus</i> subsp. <i>myrtillus</i>
Rutaceae	<i>Microcybe multiflora</i> subsp. <i>multiflora</i>
	<i>Phebalium tuberculosum</i>
Santalaceae	<i>Exocarpos aphyllus</i>
	<i>Santalum acuminatum</i>
Sapindaceae	<i>Dodonaea microzyga</i> var. <i>acrolobata</i>
	<i>Dodonaea stenozyga</i>
Scrophulariaceae	<i>Eremophila granitica</i>
	<i>Eremophila interstans</i> subsp. <i>interstans</i>
	<i>Eremophila ionantha</i>
	<i>Eremophila oppositifolia</i> subsp. <i>angustifolia</i>
	<i>Eremophila scoparia</i>
Solanaceae	<i>Lycium australe</i>
	<i>Solanum hoplopetalum</i>
Zygophyllaceae	<i>Roepera apiculata</i>
	<i>Roepera glauca</i>
	<i>Roepera ovata</i>



Appendix G VERTEBRATE FAUNA IDENTIFIED IN THE DESKTOP ASSESSMENT

Legend:

Database Searches:

- A** Birddata: Custom Atlas Bird List (Birdlife Australia 2019)
- B** Threatened and Priority Fauna Search (DBCA 2020b)
- C** NatureMap Database (DBCA 2020d)
- D** Protected Matters Search Tool (DotEE 2020)

Literature Review:

- E** Parker Range PEC, Flora and Fauna Reconnaissance Survey and Priority Flora Search (Stantec 2019)
- F** Level 2 Flora & Fauna Survey: Redwing Project For Hanking Gold Mining Pty Ltd (Botanica 2016b)
- G** Yilgarn Star North Prospect Biological Assessment (GHD 2016)
- H** Southern Cross Operations: Baseline Fauna Survey; Spring 2007 & Autumn 2008 (Western Wildlife 2008)

Current Survey

- I** Lennenburg Flora, Vegetation and Fauna Survey



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
Amphibia												
<i>Myobatrachidae</i>												
<i>Pseudophryne guentheri</i>	Crawling Toadlet					x						
<i>Pseudophryne occidentalis</i>	Western Toadlet					x					x	
<i>Limnodynastidae</i>												
<i>Heleioporus albopunctatus</i>	Western Spotted Frog					x					x	
<i>Neobatrachus albipes</i>	White-footed Trilling Frog					x					x	
<i>Neobatrachus kunapalari</i>	Kunapalari Frog					x					x	
Aves												
<i>Acanthizidae</i>												
<i>Acanthiza apicalis</i>	Inland Thornbill			x	x			x			x	
<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill			x	x					x	x	
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill			x	x						x	
<i>Aphelocephala leucopsis</i>	Southern Whiteface			x								
<i>Calamanthus campestris</i>	Rufous Fieldwren			x								
<i>Calamanthus cauta</i>	Shy Heathwren			x	x			x			x	
<i>Gerygone fusca</i>	Western Gerygone			x	x					x	x	
<i>Pyrrholaemus brunneus</i>	Redthroat			x	x			x			x	
<i>Sericornis frontalis</i>	White-browed Scrubwren			x								
<i>Smicronis brevirostris</i>	Weebill			x	x			x	x	x		
<i>Accipitridae</i>												
<i>Elanus caeruleus axillaris</i>	Australian Black-shouldered Kite			x								
<i>Hieraaetus morphnoides</i>	Little Eagle			x								
<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk			x								
<i>Accipiter fasciatus</i>	Brown Goshawk			x							x	
<i>Aquila audax</i>	Wedge-tailed Eagle			x	x		x	x			x	
<i>Circus assimilis</i>	Spotted Harrier			x								
<i>Haliastur sphenurus</i>	Whistling Kite			x								
<i>Hamirostra isura</i>	Square-tailed Kite			x	x						x	
<i>Milvus migrans</i>	Black Kite			x								
<i>Aegothelidae</i>												
<i>Aegotheles cristatus</i>	Australian Owlet-nightjar			x	x						x	
<i>Alcedinidae</i>												
<i>Todiramphus pyrrhopygius</i>	Red-backed Kingfisher			x								
<i>Todiramphus sanctus</i>	Sacred Kingfisher			x								
<i>Anatidae</i>												
<i>Anas gracilis</i>	Grey Teal			x								
<i>Anas superciliosa</i>	Pacific Black Duck			x								
<i>Aythya australis</i>	Hardhead			x								



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
<i>Chenonetta jubata</i>	Australian Wood Duck			x		x						
<i>Malacorhynchus membranaceus</i>	Pink-eared Duck			x								
<i>Tadorna tadornoides</i>	Australian Shelduck			x								
Apodidae												
<i>Apus pacificus</i>	Fork-tailed Swift	Mi	Mi				x					
Ardeidae												
<i>Ardea ibis</i>	Cattle Egret						x					
<i>Ardea modesta</i>	Eastern Great Egret						x					
<i>Ardea novaehollandiae</i>	White-faced Heron			x								
<i>Ardea pacifica</i>	White-necked Heron			x								
Artamidae												
<i>Artamus cinereus</i>	Black-faced Woodswallow			x		x			x		x	
<i>Artamus cyanopterus</i>	Dusky Woodswallow			x		x					x	
<i>Artamus personatus</i>	Masked Woodswallow			x		x						
Cacatuidae												
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo			x								
<i>Cacatua roseicapilla</i>	Galah			x		x		x	x		x	x
<i>Cacatua sanguinea</i>	Little Corella			x								
<i>Calyptorhynchus banksii</i>	Red-Tailed Black Cockatoo			x								
<i>Nymphicus hollandicus</i>	Cockatiel			x								
Campephagidae												
<i>Coracina maxima</i>	Ground Cuckoo-shrike										x	
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike			x		x		x	x		x	
<i>Lalage tricolor</i>	White-winged Triller			x							x	
Caprimulgidae												
<i>Eurostopodus argus</i>	Spotted Nightjar			x		x						
Charadriidae												
<i>Charadrius melanops</i>	Black-fronted Dotterel			x								
<i>Thinornis cucullatus</i>	Hooded Plover	P4					x					
<i>Vanellus tricolor</i>	Banded Lapwing			x								
Climacteridae												
<i>Climacteris rufa</i>	Rufous Treecreeper			x							x	
Columbidae												
<i>Columba livia</i>	*Domestic Pigeon			x			x					
<i>Ocyphaps lophotes</i>	Crested Pigeon			x		x		x			x	x
<i>Phaps chalcoptera</i>	Common Bronzewing			x		x		x	x		x	
<i>Phaps elegans</i>	Brush Bronzewing									x		
<i>Streptopelia senegalensis</i>	*Laughing Turtle-Dove			x			x					
Corvidae												



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
<i>Corvus bennetti</i>	Little Crow			x		x				x		
<i>Corvus coronoides</i>	Australian Raven			x		x		x	x		x	x
<i>Corvus orru</i>	Torresian Crow			x							x	
Cracticidae												
<i>Cracticus nigrogularis</i>	Pied Butcherbird			x		x		x			x	
<i>Cracticus tibicen</i>	Australian Magpie			x		x		x		x	x	
<i>Cracticus torquatus</i>	Grey Butcherbird			x		x			x		x	
<i>Strepera versicolor</i>	Grey Currawong			x		x		x	x	x	x	
Cuculidae												
<i>Cacomantis flabelliformis</i>	Fan-tailed Cuckoo			x		x					x	
<i>Cacomantis pallidus</i>	Pallid Cuckoo			x								
<i>Chrysococcyx basalus</i>	Horsfield's Bronze Cuckoo			x							x	
<i>Chrysococcyx lucidus</i>	Shining Bronze Cuckoo			x								
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo			x			x				x	
Dicaeidae												
<i>Dicaeum hirundinaceum</i>	Mistletoebird			x							x	
Dromaiidae												
<i>Dromaius novaehollandiae</i>	Emu			x		x		x	x	x	x	
Estrildidae												
<i>Taeniopygia guttata</i>	Zebra Finch			x								
Falconidae												
<i>Falco berigora</i>	Brown Falcon			x		x		x			x	
<i>Falco cenchroides</i>	Australian Kestrel			x		x		x	x		x	
<i>Falco longipennis</i>	Australian Hobby			x								
<i>Falco peregrinus</i>	Peregrine Falcon	OS		x	x						x	
Hirundinidae												
<i>Cheramoeca leucosternus</i>	White-backed Swallow			x		x					x	
<i>Hirundo neoxena</i>	Welcome Swallow			x		x						
<i>Petrochelidon ariel</i>	Fairy Martin			x								
<i>Petrochelidon nigricans</i>	Tree Martin			x		x			x		x	
Locustellidae												
<i>Megalurus cruralis</i>	Brown Songlark			x								
<i>Megalurus mathewsi</i>	Rufous Songlark			x								
Maluridae												
<i>Malurus lamberti</i>	Variiegated Fairy-wren			x					x			
<i>Malurus leucopterus</i>	White-winged Fairy-wren			x							x	
<i>Malurus pulcherrimus</i>	Blue-breasted Fairy-wren			x		x					x	
<i>Malurus splendens</i>	Splendid Fairy-wren			x								
<i>Stipiturus malachurus</i>	Southern Emu-wren			x								
Meliphagidae												



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater			x		x					x	
<i>Acanthorhynchus superciliosus</i>	Western Spinebill									x		
<i>Anthochaera carunculata</i>	Red Wattlebird			x		x		x	x	x	x	
<i>Certhionyx variegatus</i>	Pied Honeyeater			x								
<i>Epthianura albifrons</i>	White-fronted Chat			x							x	
<i>Epthianura tricolor</i>	Crimson Chat			x								
<i>Gavicalis virescens</i>	Singing Honeyeater			x							x	
<i>Glyciphila melanops</i>	Tawny-crowned Honeyeater			x		x			x			
<i>Lichenostomus cratitius</i>	Purple-gaped Honeyeater			x								
<i>Lichenostomus leucotis</i>	White-eared Honeyeater			x		x			x		x	
<i>Lichmera indistincta</i>	Brown Honeyeater			x		x					x	
<i>Manorina flavigula</i>	Yellow-throated Miner			x		x					x	
<i>Melithreptus brevirostris</i>	Brown-headed Honeyeater			x		x				x	x	
<i>Phylidonyris nigra</i>	White-cheeked Honeyeater			x								
<i>Ptilotula ornatus</i>	Yellow-plumed Honeyeater			x							x	
<i>Purnella albifrons</i>	White-fronted Honeyeater			x		x			x			
<i>Sugomel niger</i>	Black Honeyeater			x								
Meropidae												
<i>Merops ornatus</i>	Rainbow Bee-eater			x		x	x				x	
Monarchidae												
<i>Grallina cyanoleuca</i>	Magpie-lark			x				x			x	
Motacillidae												
<i>Anthus australis</i>	Australian Pipit			x							x	
<i>Motacilla cinerea</i>	Grey Wagtail	Mi	Mi				x					
Neosittidae												
<i>Daphoenositta chrysoptera</i>	Varied Sittella			x		x			x		x	
Oreoicidae												
<i>Oreoica gutturalis</i>	Crested Bellbird			x		x			x		x	x
Otididae												
<i>Ardeotis australis</i>	Australian Bustard			x								
Pachycephalidae												
<i>Colluricincla harmonica</i>	Grey Shrike-thrush			x		x			x		x	
<i>Falcunculus frontatus</i>	Crested Shrike-tit			x								
<i>Pachycephala inornata</i>	Gilbert's Whistler			x		x					x	
<i>Pachycephala occidentalis</i>	Western Whistler			x					x		x	x
<i>Pachycephala rufiventris</i>	Rufous Whistler			x		x				x	x	
Pardalotidae												
<i>Pardalotus punctatus</i>	Spotted Pardalote			x		x						
<i>Pardalotus striatus</i>	Striated Pardalote			x		x			x		x	



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
<i>Petroicidae</i>												
<i>Drymodes brunneopygia</i>	Southern Scrub-robin			x		x			x		x	
<i>Eopsaltria australis griseogularis</i>	Western Yellow Robin			x		x			x		x	
<i>Melanodryas cucullata</i>	Hooded Robin			x						x		
<i>Microeca fascinans</i>	Jacky Winter			x		x					x	
<i>Petroica boodang</i>	Scarlet Robin			x								
<i>Petroica goodenovii</i>	Red-capped Robin			x		x				x	x	
<i>Phalacrocoracidae</i>												
<i>Phalacrocorax melanoleucos</i>	Little Pied Cormorant			x								
<i>Phasianidae</i>												
<i>Coturnix pectoralis</i>	Stubble Quail			x								
<i>Podargidae</i>												
<i>Podargus strigoides</i>	Tawny Frogmouth			x								
<i>Podicipedidae</i>												
<i>Poliiocephalus poliocephalus</i>	Hoary-headed Grebe			x								
<i>Tachybaptus novaehollandiae</i>	Australasian Grebe			x								
<i>Pomatostomidae</i>												
<i>Pomatostomus superciliosus</i>	White-browed Babbler			x		x			x		x	
<i>Psittacidae</i>												
<i>Melopsittacus undulatus</i>	Budgerigar			x								
<i>Neophema elegans</i>	Elegant Parrot			x							x	
<i>Parvipsitta porphyrocephala</i>	Purple-crowned Lorikeet			x				x	x		x	
<i>Pezoporus occidentalis</i>	Night Parrot	Cr	En				x					
<i>Platycercus icterotis xanthogenys</i>	Western Rosella (inland)	P4		x	x	x					x	
<i>Platycercus varius</i>	Mulga Parrot			x								
<i>Platycercus zonarius</i>	Australian Ringneck			x		x		x			x	x
<i>Polytelis anthoepus</i>	Regent Parrot			x		x		x			x	
<i>Psophodidae</i>												
<i>Cinclosoma clarum</i>	Copper-backed Quail-thrush			x					x			
<i>Rallidae</i>												
<i>Fulica atra</i>	Eurasian Coot			x								
<i>Tribonyx ventralis</i>	Black-tailed Native-hen			x								
<i>Rhipiduridae</i>												
<i>Rhipidura albiscapa</i>	Grey Fantail			x		x					x	
<i>Rhipidura leucophrys</i>	Willie Wagtail			x		x		x	x		x	x
<i>Scolopacidae</i>												
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi	Mi				x					
<i>Calidris ferruginea</i>	Curlew Sandpiper	Cr	Cr; Mi				x					



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi	Mi				x					
<i>Tringa hypoleucos</i>	Common Sandpiper	Mi	Mi	x			x					
<i>Tringa nebularia</i>	Common Greenshank	Mi	Mi	x	x							
Strigidae												
<i>Ninox boobook</i>	Boobook Owl			x							x	
Threskiornithidae												
<i>Threskiornis molucca</i>	Australian White Ibis			x								
Turnicidae												
<i>Turnix varia</i>	Painted Button-quail			x								
<i>Turnix velox</i>	Little Button-quail			x								
Tytonidae												
<i>Tyto alba</i>	Barn Owl			x								
Megapodiidae												
<i>Leipoa ocellata</i>	Malleefowl	Vu	Vu	x	x	x	x	x	x			x
Recurvirostridae												
<i>Himantopus himantopus</i>	Black-winged Stilt			x								
<i>Cladorhynchus leucocephalus</i>	Banded Stilt			x								
<i>Recurvirostra novaehollandiae</i>	Red-necked Avocet			x								
Laridae												
<i>Larus novaehollandiae</i>	Silver Gull			x								
Zosteropidae												
<i>Zosterops lateralis</i>	Silvereye			x		x						
Mammalia												
Bovidae												
<i>Capra hircus</i>	*Goat						x					
<i>Ovis aries</i>	*Sheep							x				
Canidae												
<i>Canis lupus</i>	*Dog						x			x		
<i>Vulpes vulpes</i>	*Red Fox						x	x	x		x	
Dasyuridae												
<i>Dasyurus geoffroii</i>	Chuditch	Vu	Vu		x		x					
<i>Phascogale calura</i>	Red-tailed Phascogale	CD	Vu			x						
<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart										x	
<i>Sminthopsis dolichura</i>	Little long-tailed Dunnart					x						
<i>Sminthopsis granulipes</i>	White-tailed Dunnart					x						
Equidae												
<i>Equus asinus</i>	*Donkey						x					
<i>Equus caballus</i>	*Horse						x					
Felidae												
<i>Felis catus</i>	*Cat						x		x		x	
Leporidae												



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
<i>Oryctolagus cuniculus</i>	*Rabbit						x	x	x	x	x	x
Macropodidae												
<i>Macropus fuliginosus</i>	Western Grey Kangaroo							x	x	x	x	
<i>Notamacropus irma</i>	Western Brush Wallaby	P4			x							
<i>Osphranter robustus</i>	Euro					x					x	
<i>Petrogale lateralis lateralis</i>	Black-footed Rock-wallaby	En	En		x							
Molossidae												
<i>Austronomus australis</i>	White-striped Freetail-bat								x		x	
<i>Ozimops kitcheneri</i>	Western Free-tailed Bat								x			
Muridae												
<i>Leporillus conditor</i>	Greater Stick-nest Rat	CD	Vu		x							
<i>Mus musculus</i>	*House Mouse					x	x			x	x	
<i>Notomys mitchellii</i>	Mitchell's Hopping-mouse					x			x		x	
Tachyglossidae												
<i>Tachyglossus aculeatus</i>	Short-beaked Echidna							x		x	x	
Thylacomyidae												
<i>Macrotis lagotis</i>	Bilby	Vu	Vu			x						
Vespertilionidae												
<i>Chalinolobus gouldii</i>	Gould's Wattled Bat					x			x		x	
<i>Chalinolobus morio</i>	Chocolate Wattled Bat								x			
<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat					x			x			
<i>Scotorepens balstoni</i>	Inland Broad-nosed Bat										x	
<i>Vespadelus regulus</i>	Southern Forest Bat								x		x	
Burramyidae												
<i>Cercartetus concinnus</i>	Western Pygmy-possum					x					x	
Suidae												
<i>Sus scrofa</i>	*Pig						x					
Camelidae												
<i>Camelus dromedarius</i>	*Camel								x			
Reptilia												
Agamidae												
<i>Ctenophorus cristatus</i>	Bicycle Dragon					x					x	x
<i>Ctenophorus maculatus griseus</i>	Spotted Military Dragon					x						
<i>Ctenophorus reticulatus</i>	Western Netted Dragon					x						
<i>Ctenophorus salinarum</i>	Salt Pan Dragon										x	
<i>Ctenophorus scutulatus</i>	Lozenge-marked Dragon					x					x	



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

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<i>Moloch horridus</i>	Thorny Devil					x					x	
<i>Pogona minor</i>	Dwarf Bearded Dragon					x					x	
<i>Tympanocryptis cephalus</i>	Coastal Pebble-mimic dragons					x					x	
Carphodactylidae												
<i>Underwoodisaurus milii</i>	Southern Barking Gecko					x					x	
Diplodactylidae												
<i>Crenadactylus ocellatus</i>	Clawless Gecko					x					x	
<i>Diplodactylus granariensis</i>	Western Stone Gecko					x					x	
<i>Diplodactylus pulcher</i>	Pretty Gecko					x					x	
<i>Hesperoedura reticulata</i>	Reticulated Velvet Gecko					x					x	
<i>Lucasium maini</i>	Main's Ground Gecko					x					x	
Elapidae												
<i>Brachyurophis semifasciatus</i>	Southern Shovel-nosed Snake					x					x	
<i>Parasuta gouldii</i>	Gould's Hooded Snake					x					x	
<i>Paroplocephalus atriceps</i>	Lake Cronin Snake	P3			x							
<i>Pseudechis australis</i>	Mulga Snake					x						
<i>Pseudonaja affinis</i>	Dugite					x		x			x	
<i>Pseudonaja mengdeni</i>	Western Brown Snake					x						
<i>Pseudonaja modesta</i>	Ringed Brown Snake					x						
<i>Pseudonaja nuchalis</i>	Gwardar; Northern Brown Snake										x	
<i>Simoselaps bertholdi</i>	Jan's Banded Snake					x					x	
<i>Suta fasciata</i>	Rosen's Snake					x						
Gekkonidae												
<i>Christinus marmoratus</i>	Marbled Gecko					x						
<i>Gehyra variegata</i>	Variiegated Dtella					x					x	
<i>Heteronotia binoei</i>	Bynoe's Gecko					x					x	
Pygopodidae												
<i>Delma fraseri</i>	Fraser's Delma					x					x	
<i>Lialis burtonis</i>	Burton's Legless Lizard					x						
<i>Pygopus lepidopodus</i>	Common Scaly Foot					x		x			x	
Pythonidae												
<i>Aspidites ramsayi</i>	Woma (south west pop)	P1			x	x						
<i>Morelia spilota</i>	Carpet Python					x					x	
Scincidae												
<i>Cryptoblepharus buchananii</i>	Buchanan's Snake-eyed Skink					x						
<i>Cryptoblepharus plagiocephalus</i>	Peron's Snake-eyed Skink					x					x	
<i>Ctenotus leonhardii</i>	Common Desert Ctenotus					x						



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix G Vertebrate Fauna Identified in the Desktop Assessment Yilgarn Star

Species	Common name	WA	EPBC	A	B	C	D	E	F	G	H	I
<i>Ctenotus schomburgkii</i>	Barred Wedge-snouted Ctenotus					x						
<i>Ctenotus uber</i>	Western Spotted Ctenotus					x					x	
<i>Egernia depressa</i>	Southern Pygmy Spiny-tailed Skink					x						
<i>Egernia richardi</i>	Richard's Crevice Skink					x						
<i>Hemiergis initialis</i>	Western Earless Skink										x	
<i>Lerista gerrardii</i>	Bold-striped Robust Slider										x	
<i>Lerista kingi</i>	King's Three-toed Slider					x						
<i>Lerista muelleri</i>	Mueller's Three-toed Slider										x	
<i>Liopholis inornata</i>	Desert Skink					x						
<i>Liopholis multiscutata</i>	Bull Skink					x			x		x	
<i>Menetia greyii</i>	Common Dwarf Skink					x					x	
<i>Morethia butleri</i>	Butler's Snake-eyed Skink					x					x	
<i>Tiliqua multifasciata</i>	Central Blue-tongue							x				
<i>Tiliqua occipitalis</i>	Western Bluetongue							x			x	x
<i>Tiliqua rugosa</i>	Shingleback/Bobtail					x					x	
Typhlopidae												
<i>Anilius australis</i>	Southern Blind Snake										x	
<i>Anilius bicolor</i>	Dark-spined Blind Snake										x	
Varanidae												
<i>Varanus gouldii</i>	Sand Monitor					x						
<i>Varanus tristis</i>	Racehorse Monitor					x					x	



Appendix H LIKELIHOOD OF OCCURRENCE OF SIGNIFICANT FAUNA IN THE SURVEY AREA



BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION

Appendix H Likelihood of Occurrence of Significant Fauna in the Survey Area Yilgarn Star

Common name (<i>Scientific name</i>)	Conservation status		Habitat Preferences	Likelihood of occurrence and justification
	EPBC	WA		
Mammalia				
Chuditch (<i>Dasyurus geoffroii</i>)	Vu	Vu	Inhabits a range of forest, shrub and desert habitats, currently inhabits sclerophyll forest, dry woodland, heath and Mallee shrubland in southwest Australia (van Dyck and Strahan 2008). Den in hollow logs, burrows or rock crevices (DEC 2012a).	Likely While the Survey Area sits on the edge of the species current distribution (DEC 2012a, Woinarski <i>et al.</i> 2014), the species was recorded recently nearby. 140 records from 2017 and 2016 were detected in an area >40km south of the Survey Area (DBCA 2020d). Remaining records of the species, located near Southern Cross and the Great Eastern highway, are over 20 years old (DBCA 2020d). Furthermore the range of <i>Eucalyptus</i> woodlands and Mallee shrubland found within the Survey Area would provide suitable habitat. While trees in the Survey Area are unlikely to form hollows, areas supporting large woody debris or burrows may provide denning habitat. As such, the species is considered likely to occur.
Western Brush Wallaby (<i>Notamacropus irma</i>)		P4	Inhabits open woodland and forest, mallee and heath (DEC 2012b). The species also preferentially utilise open seasonally wet flats and scrub thickets (DEC 2012b).	Likely The Survey Area contains suitable habitat and occurs within the species range. 27 records from 2017 and 2016 were detected in one area >40km south of the Survey Area (DBCA 2020d). As such, the species is considered likely to occur.
Black-footed Rock-wallaby (<i>Petrogale lateralis lateralis</i>)	En	En	Species is largely confined to granitic outcrops in mallee scrub (van Dyck and Strahan 2008).	Unlikely The Survey Area does not contain large areas of granite outcropping suitable for supporting the species, and the species was only recorded once ~36km southwest of the Study Area during 2007 (DBCA 2020d). As such, the species is considered unlikely to occur.
Red-tailed Phascogale (<i>Phascogale calura</i>)	Vu	CD	Inhabits dense, tall forests, with a preference for Rock Sheoak (<i>Allocasuarina huegeliana</i>) and Wandoo woodlands with hollows for nesting sites (van Dyck and Strahan 2008).	Unlikely A single record of the species occurs in the immediate surrounds, however this dates back to 1998 (DBCA 2020d). The Survey Area contains suitable habitat such as <i>Eucalyptus</i> Woodlands, however falls on the edge of the species known distribution (Short and Hide 2012). Consequently, the species is considered unlikely to occur.
Numbat (<i>Myrmecobius fasciatus</i>)	En	En	Habitat dominated by Eucalypts providing hollow logs and woody debris for shelter and termites for foraging (van Dyck and Strahan 2008).	Unlikely While the Survey Area may contain suitable habitat, the species is restricted to isolated known populations that do not occur in the Survey Area (van Dyck and Strahan 2008). The species was only recorded at one undated location (DBCA 2020d).



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YILGARN STAR FLORA, VEGETATION

Appendix H Likelihood of Occurrence of Significant Fauna in the Survey Area Yilgarn Star

Common name (<i>Scientific name</i>)	Conservation status		Habitat Preferences	Likelihood of occurrence and justification
	EPBC	WA		
Bilby (<i>Macrotis lagotis</i>)	Vu	Vu	Occupies a range of habitats including sandplains and dune fields with spinifex, acacia shrubland on red soils and stony downs and Mitchell Grass near cracking clay (van Dyck and Strahan 2008).	Unlikely While the Survey Area contains suitable habitat, the species is considered extinct from the Coolgardie and Avon Wheatbelt bioregions (Woinarski <i>et al.</i> 2014) and was not recorded recently. The current known range of the species is from the Tanami Desert west to Broome and south to Warburton in Western Australia (van Dyck and Strahan 2008). Consequently, the species is considered unlikely to occur within the Survey Area.
Aves				
Malleefowl (<i>Leipoa ocellata</i>)	Vu	Vu	Mainly scrubs and thickets of Mallee, Boree and Bowgada, but also other litter forming shrublands (Johnstone and Storr 1998). Sandy substrates and an abundance of leaf litter are required for the construction incubator mounds (Benshemesh 2007).	Likely Malleefowl were recorded from numerous records in the surrounds, see Figure 5-5 for details. Two historic records of Malleefowl are present within the Survey Area. However, there is uncertainty around the accuracy of historic records, the record from 1999 is quite old, and there is disturbance currently impacting the site of the 2018 record. As a result, the species has been assessed as only likely to occur.
Western Rosella (inland pop.) (<i>Platycercus icterotis xanthogenys</i>)		P4	Open forest and woodlands of Eucalypt and Sheoak with scrub, particularly those containing Wandoo, Flooded Gum, Salmon Gum, tall Mallee and <i>Allocasuarina huegeliana</i> (DEC 2009). The species nests in hollows of Mallee, Wandoo, York Gum, Flooded Gum and Salmon Gum trees (DEC 2009).	Likely The Western Rosella (inland pop.) occurs in the wheatbelt region east of Northam of Southwest WA, whilst the south-west population is found towards the south-west coast (DEC 2009, Menkhorst <i>et al.</i> 2017). Therefore, all records near the Survey Area are that of the Western Rosella (inland pop.). The subspecies was recorded under 7 km west of the Survey Area in 2008 (Western Wildlife 2008) and regularly in the surrounds between 2013 and 2019 (Birdlife Australia 2019, DBCA 2020d). Hollow forming <i>Eucalyptus</i> species were found in the Survey Area, as such, the Western Rosella has been assessed as likely to occur.
Peregrine Falcon (<i>Falco peregrinus</i>)		OS	The species occurs along cliffs, gorges, wooded rivers, wetlands, plains and open woodlands, as well as in association with pylons and buildings. Nests on cliffs, in crevices, large tree hollows or on building ledges (Pizzey and Knight 2007).	Likely The species was recorded in the surrounds, including records in 2013 - 2015 and 2017 ~40km from the Survey Area (Birdlife Australia 2019, DBCA 2020d). The species is considered likely to forage but unlikely to breed in the Survey Area. Hollow forming <i>Eucalyptus</i> species were found in the Survey Area, as such, the Peregrine Falcon has been assessed as likely to occur.



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix H Likelihood of Occurrence of Significant Fauna in the Survey Area Yilgarn Star

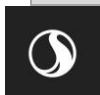
Common name (<i>Scientific name</i>)	Conservation status		Habitat Preferences	Likelihood of occurrence and justification
	EPBC	WA		
Fork-tailed Swift (<i>Apus pacificus</i>)	Mi	Mi	An aerial species, which forages high above the tree canopy and rarely lower (Johnstone and Storr 1998). Occurs over a range of habitats including islands, open country, coasts, semi-deserts, urban, forests (Pizzey and Knight 2007).	Unlikely This species is identified as occurring outside of the Survey Area using the protected matters search tool (DotEE 2020), however was not recorded recently nearby. The species forages over a range of habitats including those in the Survey Area, however is unlikely to rely on particular areas. As such, the species is considered unlikely to occur.
Curlew Sandpiper (<i>Calidris ferruginea</i>)	Cr; Mi	Cr	Small to large sized shore birds. Inhabit shallow aquatic areas on coasts, mudflats, saltmarshes, estuaries, lake margins and other inland waters and bore or grassy plains (Johnstone and Storr 1998, Menkhorst <i>et al.</i> 2017).	Unlikely No suitable habitat occurs within the Survey Area, and the species was flagged by the PMST (DotEE 2020) but was not recorded nearby, and the Survey Area occurs outside the species regular range (Menkhorst <i>et al.</i> 2017). As such the species is considered unlikely to occur within the Survey Area.
Four species from the family Scolopacidae <ul style="list-style-type: none"> Sharp-tailed Sandpiper (<i>Calidris acuminata</i>) Pectoral Sandpiper (<i>Calidris melanotos</i>) Common Sandpiper (<i>Tringa hypoleucos</i>) Common Greenshank (<i>Tringa nebularia</i>) 	Mi	Mi		Unlikely Four species from this family were identified in the database searches as having potential to occur, however only the Common Greenshank (2007 and 2011) was recorded in the surrounds near Southern Cross (Birdlife Australia 2019, DBCA 2020d). The Sharp-tailed Sandpiper, Common Sandpiper and Pectoral Sandpiper have no records within or near the Survey Area, but were flagged by the PMST (DotEE 2020). Furthermore, the Survey Area occurs in the irregular range of the Sharp-tailed Sandpiper and outside of the range of the Pectoral Sandpiper (Menkhorst <i>et al.</i> 2017). As the Survey Area does not contain any suitable habitat, these four species are considered unlikely to occur.



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix H Likelihood of Occurrence of Significant Fauna in the Survey Area Yilgarn Star

Common name (<i>Scientific name</i>)	Conservation status		Habitat Preferences	Likelihood of occurrence and justification
	EPBC	WA		
Hooded Plover (<i>Thinornis cucullatus</i>)		P4	A small shore bird species, inhabiting coastal beaches and lakes, and the margins of inland salt lake sin the southwest of Australia (Menkhorst <i>et al.</i> 2017)	Unlikely No suitable habitat occurs within the Survey Area, and the species was flagged by the PMST (DotEE 2020) but was not recorded nearby. As such the species is considered unlikely to occur within the Survey Area.
Night Parrot (<i>Pezoporus occidentalis</i>)	En	Cr	Known to inhabit treeless or sparsely wooded long unburnt spinifex hummock plains often interspersed with chenopods (Pyke and Ehrlich 2014).	Unlikely This species, or its habitats were identified as potentially occurring within the Survey Area using the PMST (DotEE 2020). However, the Survey Area does not contain spinifex, or other suitable roosting vegetation associated with drainage/ low lying areas that promote foraging (DPaW 2017, Murphy <i>et al.</i> 2017). While there are no records of the species nearby, there is limited information available regarding the species range and the species is elusive and seldomly recorded. However the Survey Area occurs outside priority areas for species surveys and the species range (DPaW 2017, Menkhorst <i>et al.</i> 2017).
Grey Wagtail (<i>Motacilla cinerea</i>)	Mi	Mi	Grey Wagtails are listed as rare vagrants to the Australian continent from the North. Inhabit areas associated with water including running water/ streams, sewage ponds, swamp margins and saltmarshes and lawns, ploughed fields and airfields (Pizzey and Knight 2007).	Unlikely This species, or its habitats were identified as potentially occurring within the Survey Area using the PMST (DotEE 2020). No records of the species exist near the Survey Area and there is minimal habitat suitable for the species. As such, the species is considered unlikely to occur.
Reptilia				
Woma Python (southwest pop) (<i>Aspidites ramsayi</i>)		P1	Woodlands, heaths and shrublands, often with spinifex. Shelters mainly in abandoned monitor and mammal burrows and in soil cracks (Wilson and Swan 2013), with evidence of arboreal behaviour identified (Bruton 2013).	Likely Database searches returned six records for the species occurring within approximately 50 km of the Survey Area, however, all records are undated vouchered specimens (DBCA 2020d, c). Despite this, as the Survey Area contains suitable habitat and occurs within the species range, the species is considered likely to occur.
Lake Cronin Snake (<i>Paroplocephalus atriceps</i>)		P3	Occurs in a relatively restricted area, found in the vicinity of Lake Cronin and on a granite outcrop called Peak Eleonora	Possible The species was recorded on one occasion in the surrounds in 2007, ~30km south of the Survey Area (DBCA 2020d). As the Survey Area occurs just north of the species predicted range, which is relatively restricted, the species is considered to possibly occur.
Invertebrates				



**BARTO GOLD MINING PTY LTD
YILGARN STAR FLORA, VEGETATION**

Appendix H Likelihood of Occurrence of Significant Fauna in the Survey Area Yilgarn Star

Common name (<i>Scientific name</i>)	Conservation status		Habitat Preferences	Likelihood of occurrence and justification
	EPBC	WA		
Brine shrimp (<i>Parartemia contracta</i>)		P1	Inland acidic salt lakes to pH 3.5 in the northern, central and southern Wheatbelt of Western Australia (Timms 2014).	Unlikely The species was recorded in the Threatened and Priority Fauna database four times between 1997 and 2007 at Moorine South Lake over 45km from the Survey Area (DBCA 2020d). However, the Survey Area does not contain suitable habitat and as such the species is considered unlikely to occur.
Water flea (<i>Daphnia jollyi</i>)		P1	Restricted to shallow, soft-water, granite-rock domes in the wheatbelt region of Western Australia (Colbourne <i>et al.</i> 2006).	Unlikely This species was recorded from 1990 to 2007 over 25km from the Survey Area (DBCA 2020d). No areas of granite rock occur within the Survey Area; thus the species is considered unlikely to occur.
Tree-stem trapdoor spider (<i>Aganippe castellum</i>)		P4	Flood-prone depressions and flats which support myrtaceous shrub communities. areas with Broombush (<i>Melaleuca uncinata</i>) and Sheoaks (such as <i>Allocasuarina acutivalvis</i>) in sandy loam soils are important habitat for the species (Inglis 2008).	Likely This species was recently recorded within 200m of the Survey Area in 2007 and from two locations >40km south of the Survey Area in 2009 (DBCA 2020d). Based on the proximity of records and similar habitat to the current Survey Area, this species is considered likely to occur.



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