

Appendix C. Vegetation Clearing Application



PURPOSE CLEARING PERMIT SUPPORTING INFORMATION

FOR

ABRA BASE METALS PROJECT

MINING PROPOSAL

Revision 4

M52/776; G52/292; L52/194; L52/198 L52/205; L52/206; L52/207

12 JUNE 2019

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1. BACKGROUND INFORMATION

Galena Mining Limited (Galena) acquired exploration tenements in the Peak Hill mineral field in the Gascoyne region of Western Australia in 2017. These tenements contained the Abra base metals deposit. Exploration drilling further defined the mineral resource to the point that Galena prepared a Pre-Feasibility Study and then a Definitive Feasibility Study, to develop the deposit into an operational mine.

On 12 April 2019, Galena provided an announcement to the Australian Stock Exchange that Toho Zinc Co. Ltd (Toho), via its wholly owned subsidiary CBH Western Australia Pty Ltd (CBHWA), had invested in a 40% joint venture in Abra Mining Pty Ltd (AMPL), to develop the Abra base metals project.

The project, known as the Abra base metals mine, involves underground mining, base metals (lead /silver) concentrate production via floatation processing and road transport of the concentrate to the Port of Geraldton for export. The Abra project is located in the eastern Gascoyne region, approximately 180 kilometres north of Meekatharra (**Figure 1**). There are three occupied pastoral lease homesteads around the Abra project; Tangadee – approximately 40 km north east; Woodlands – approximately 40 km west south west and Mingah Springs- approximately 40 km south east. The Mulgul pastoral station homestead is unoccupied. The mine has an approximate life span of 15 years based on the planned production rate.

The initial project Mining Proposal ID 76773 was approved on xxxx

Due to a number of factors, some components of the project could not be included in the initial mining project scope and required new tenements to be lodged. For this reason, this infrastructure was excluded from Mining Proposal ID 76773 while the tenement lodgment and grant process occurred.

Now that grant of this tenure has either occurred or is expected to occur within the assessment timeframe of the application, this Mining Proposal amendment seeks to add these infrastructure components in to the overall Abra project EGS.

This clearing permit application does not include clearing on the communications tenements (L52/205; L52/206 and L52/207). These tenements are very small, with the communication facility component occupying an area of only 50m x 50 m. The extent of infrastructure and possible disturbance required on the tenement is likely to be even smaller. **Figure 2** and **Figure 3** show examples of the type of containerised and modular infrastructure required to be located on these tenements occupies the approximate footprint of a passenger car. This can usually be located on the tenement with little or no clearing. In any event, there is an exemption for miscellaneous clearing on a tenement of up to 10 hectares per year. In the case of the communication tenements, the total area of the tenement is 0.25 ha. Any clearing required on these tenements will be well under the exemption threshold.

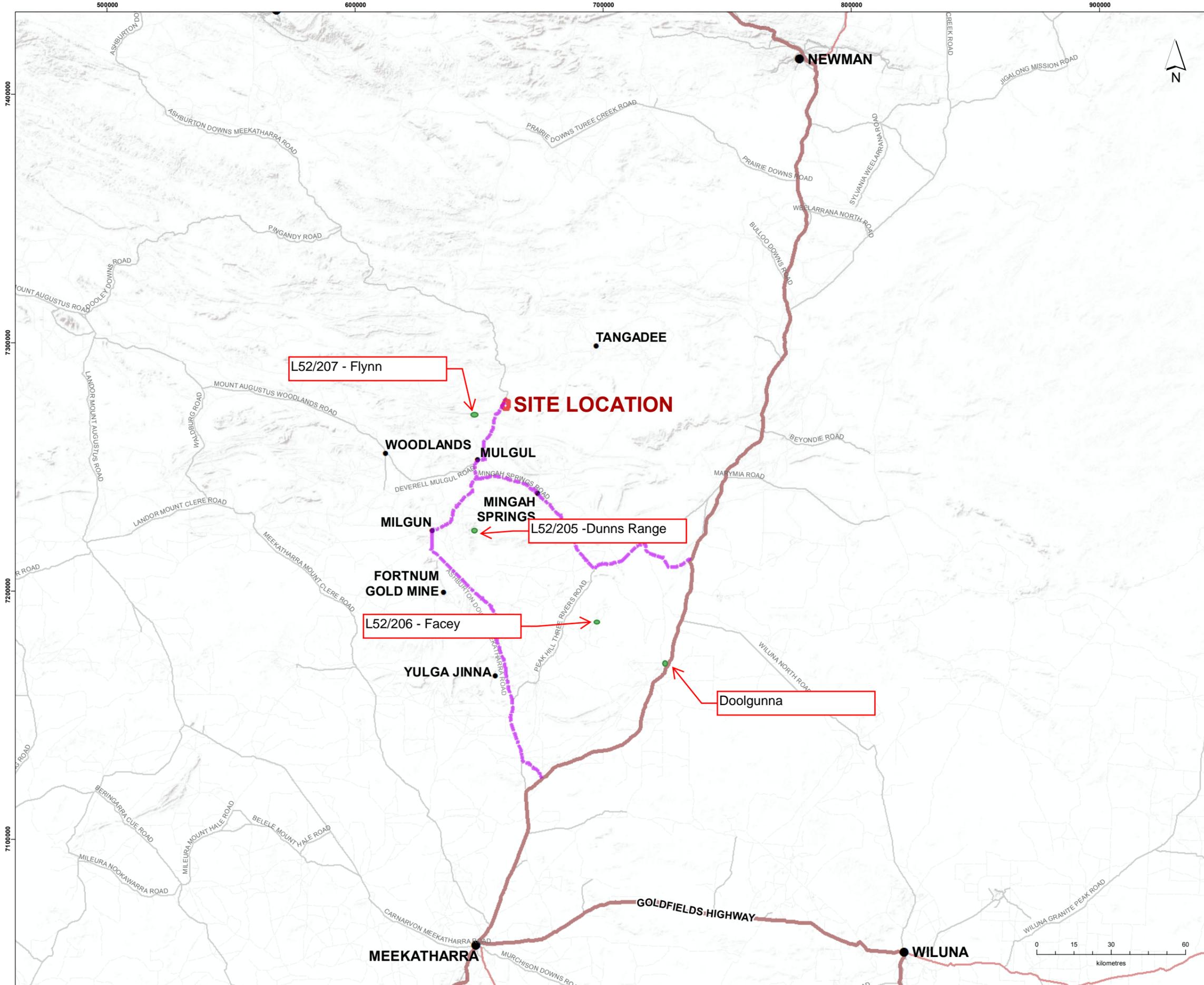
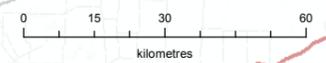
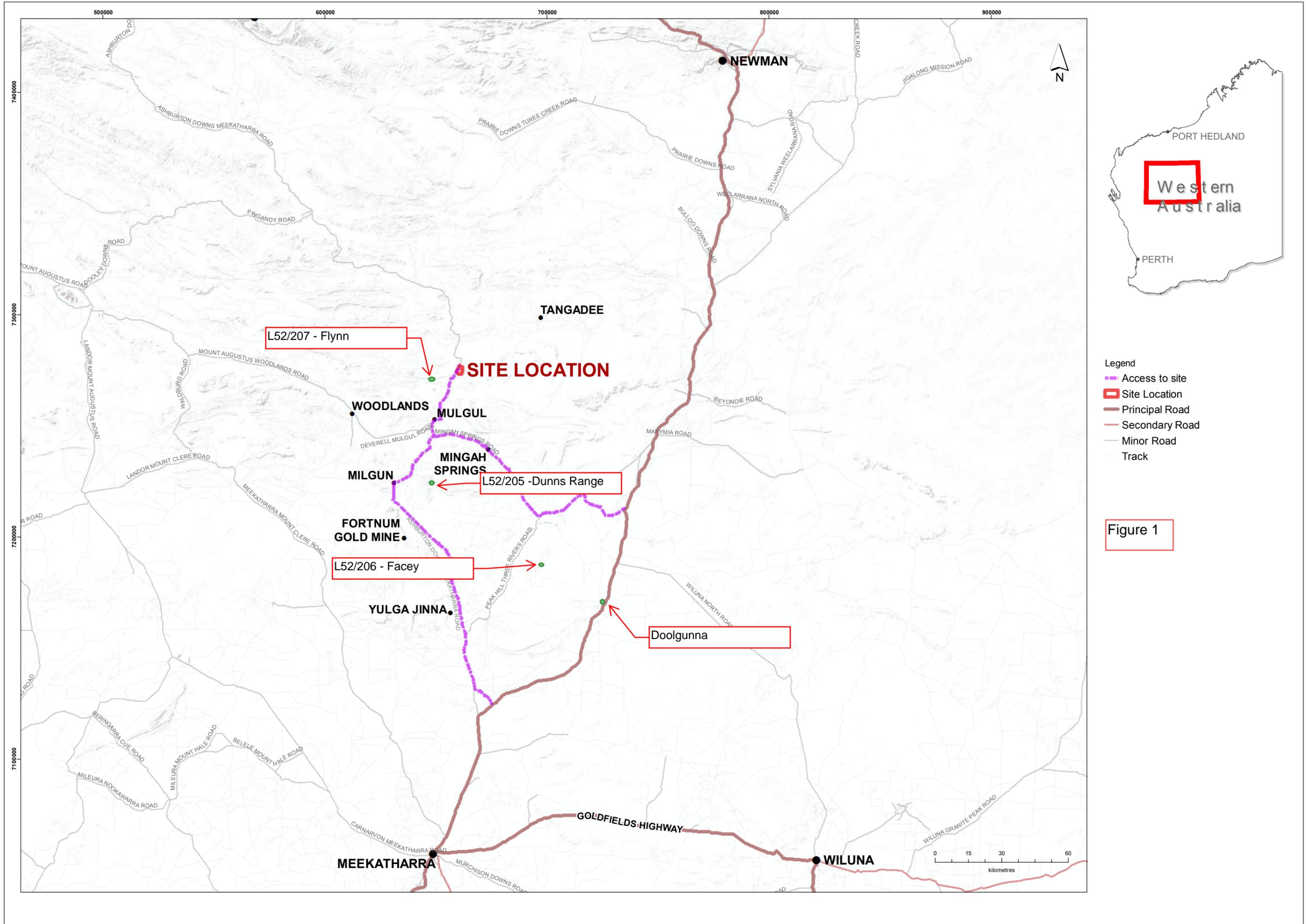




Figure 2: Communications Infrastructure



Figure 3: Communications Infrastructure 2

1.1 SCOPE AND PURPOSE

This clearing permit application document has been prepared to support a mining proposal amendment application to the Department of Mines, Industry Regulation and safety (DMIRS).

This document has been developed in support of a Purpose native vegetation clearing permit application. It has been prepared in accordance with requirements of the Environmental Protection Authority (EPA), the Department of Water and Environmental Regulation (DWER) and DMIRS. Clearing will be required to be undertaken from time to time to support the construction and operation of an aerodrome. Clearing will occur across mining tenement L52/198.

A clearing area of up to 45.00 ha within a disturbance envelope of 265.00 ha is required to locate all project components. **Figure 4** shows tenement L52/198 and the preliminary design of the aerodrome.

1.2 LAND OWNERSHIP

The tenement covering this clearing permit application is L52/198. Holder- Abra Mining Pty Ltd. Status – Live. Expiry 30/1/2040.

The address for AMPL is:

Ground Floor, 1 Centro Avenue

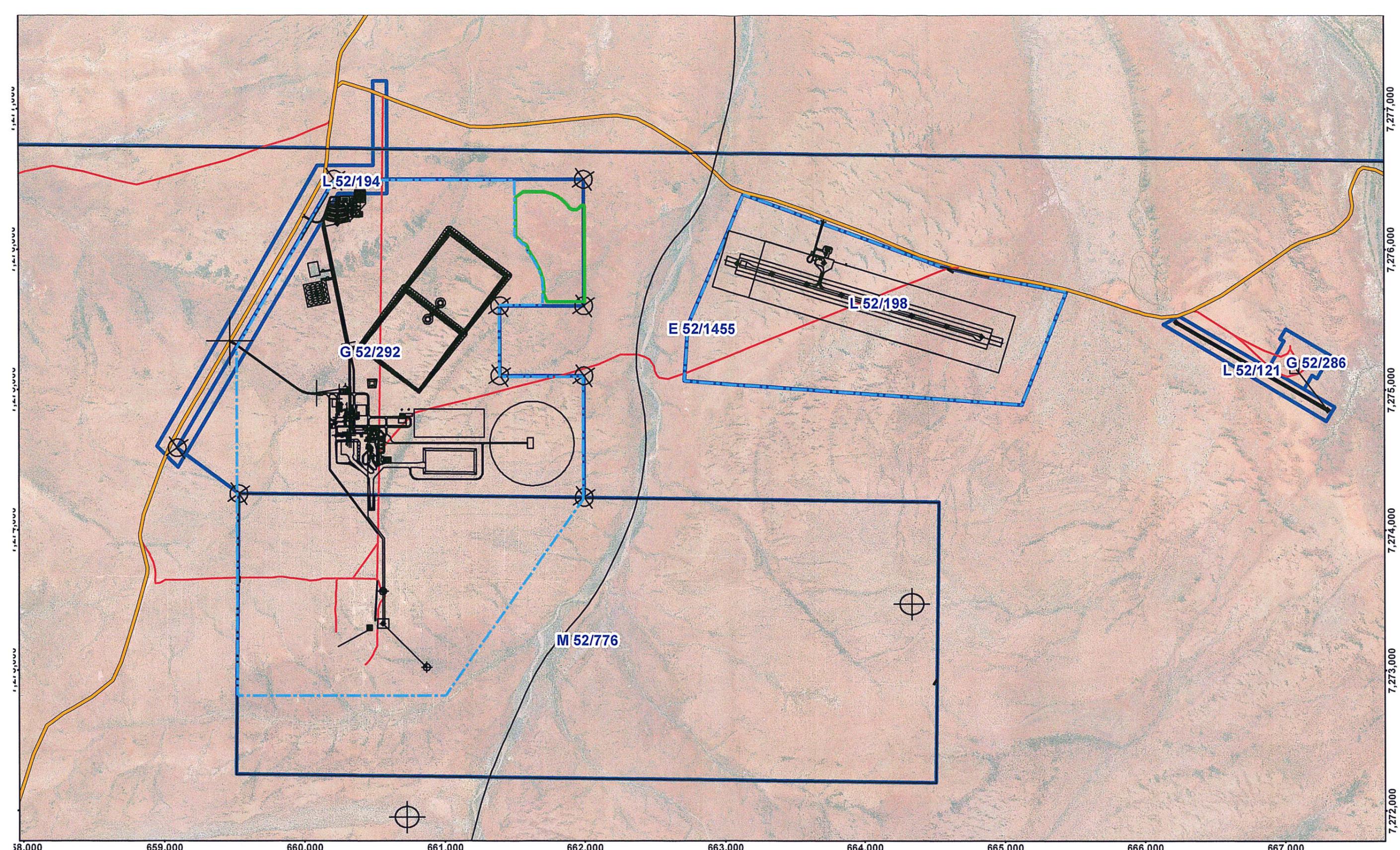
Subiaco, WA 6008

Proponent contact is

Troy Flannery

Chief Executive Officer

(08) 6166 3750 (m) 0417 966 926



LEGEND

Tenements_Live

N

0 250 500 750 1,000m

GDA94, MGA Zone 50N

Figure 4

GALENA

ABRA PROJECT
Site layout

Project: ABRA	Scale: 1:25,000
Drafted by: AS	Date: 12/02/2019

2. DESCRIPTION OF CLEARING ACTIVITIES

Vegetation clearing will be required for the following activities:

- Construct aerodrome runway and apron area
- Construct clearways, surface drainage and perimeter fence
- Construct ancillary services: departure/arrival building, roads, carpark, septic system, aircraft refueling facility, power and water services.

Clearing of native vegetation will be undertaken using standard earthmoving equipment, such as bulldozers and front end loaders, to provide a surface free of vegetative matter, though some roots may remain. **Table 1** and **Figure 4** show the disturbance area required for the project, infrastructure layout and contour information for the site.

A shapefile of the disturbance envelope will be provided to DMIRS with the clearing application.

Table 1: Disturbance Area

Mine Feature	Type	L52/198 (ha)
Aerodrome and ancillary infrastructure	Minor	44.3
Fuel storage	Minor	0.2
Roads	Minor	0.5
subtotal		45.00

3. BASELINE ENVIRONMENT

A number of baseline studies and assessments have been undertaken for this application. These comprise:

- Flora, vegetation and terrestrial fauna survey;
- Aboriginal heritage survey;

As the scope of work for this mining proposal amendment is confined to surface infrastructure, subterranean fauna or groundwater studies are not considered relevant.

Surface water studies undertaken for the main Abra mining project are considered equally relevant for the aerodrome scope of work. No additional surface water study has been undertaken.

3.1 CLIMATE

Table 2 provides Bureau of Meteorology (BoM) rainfall information from Three Rivers Station (Station number 007080), located approximately 45 km south east of the Abra project site. The data shows the local area has rainfall falling in all months of the year, with amounts of 20 mm/month or above falling over a six month period from January to June. **Figure 5** and **Figure 6** show annual wind roses for 9am and 3pm respectively.

Table 2: Rainfall Data Tangadee Station (BoM 2018)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean	35.5	44.7	37.2	20.6	22.4	23.6	11.7	7.1	2.1	5.8	10.2	18	238.9

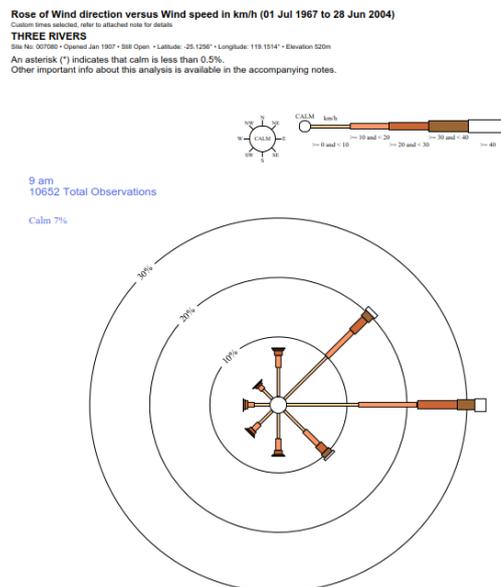


Figure 5: Annual Wind Rose- 9am

Rose of Wind direction versus Wind speed in km/h (01 Jul 1967 to 28 Jun 2004)
Custom times selected; refer to attached note for details
THREE RIVERS
 Site No: 007080 • Opened Jan 1907 • Still Open • Latitude: -25.1256° • Longitude: 119.1514° • Elevation 520m
 An asterisk (*) indicates that calm is less than 0.5%.
 Other important info about this analysis is available in the accompanying notes.

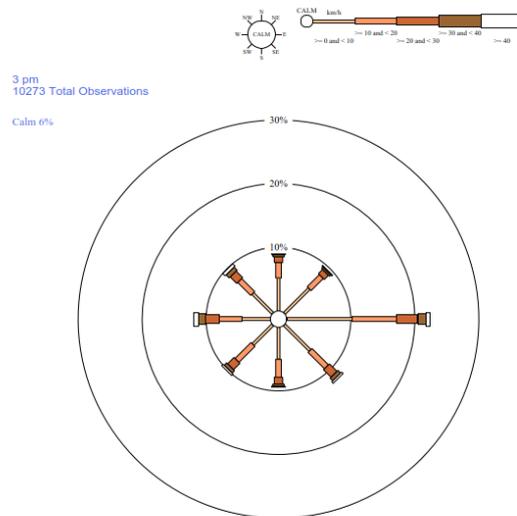


Figure 6: Annual Wind Rose- 3pm

3.2 BIODIVERSITY AND ECOSYSTEM

Stantec (2019) completed a Reconnaissance flora and vegetation survey and Level 1 fauna survey of a proposed air strip, located east of the main project site. The study area is located on Exploration Licence E52/1455, covers the area of miscellaneous licence L52/198 and comprises an area of 278 ha.

The complete report is provided in Appendix 1. A summary of key points from the report is provided below.

1. The field survey took place between the 2nd and 5th of October 2018.
2. No Threatened or Priority flora taxa were recorded during the field survey and none are considered likely to occur.
3. No introduced flora species were recorded during the survey.
4. Five vegetation types were identified, including two that overlapped with the adjacent Abra base metals mine project area.
5. None of these vegetation types are analogous to any Threatened or Priority Ecological Communities.
6. The nearest Priority Ecological Community is the Diorite Land System (Priority 3) located 16 km to the southwest.
7. The vegetation types recorded represent what would be expected from similar landforms in the broader Augustus subregion in which the study area occurs.
8. Vegetation condition was 'excellent' throughout the study area, with disturbances restricted to clearing for tracks and impacts from non-native fauna.
9. No fauna species of conservation significance were recorded during the current survey.
10. Three broad fauna habitats were identified; (i) open shrubland on sandy plain, (ii) open shrubland on stony plain and (iii) drainage. All are considered widespread and of limited significance for conservation significant vertebrate fauna.
11. One species of conservation significance, the Peregrine Falcon (S7), was considered 'possible' to occur based on species range and previous records. Although the study area does not contain

suitable nesting habitat for the species, it may forage over the study area from time to time without being dependent on any particular habitat.

12. The remaining species of conservation significance were assessed as ‘unlikely’ to occur in the study area.
13. The Study Area has been mapped as ‘low woodland; mulga (*Acacia aneura*), of the Gascoyne Ranges. The current extent of this vegetation system association suggests that minimal land clearing has occurred across four scales of assessment (State, bioregion, subregion and Local Government Area (LGA) (Shire of Meekatharra) (**Table 3**).

Table 3: Vegetation system associations (Stantec 2018)

System	Scale	Pre-European Extent	Current Extent	% Remaining	Current extent within IUCN Class I-IV Reserves (ha)	% of current extent protected within IUCN Class I-IV Reserves
Gascoyne ranges	State-wide	1,812,659.31	1,811,127.15	99.92	16,344.03	0.9
	Bioregion	1,794,574.24	1,793,131.87	99.92	16,344.03	0.9
	Sub – region	1,777,829.40	1,776,387.03	99.92	16,344.03	0.9
	LGA	918,276.87	916,753.77	99.83	16,214.53	1.77

3.3 SURFACE WATER RESOURCES

Figure 7, taken from Google Earth, shows the aerodrome tenement (L52/198) located on a broad, flat to gently sloping landform in between two drainage lines, Five Mile creek to the west and Ethel creek to the east.

Rockwater undertook two assessments of surface water components for the Abra mine site in 2018 that are also relevant for the aerodrome mining proposal amendment. These two reports are attached in **Appendix 2**.

The first report assessed probable maximum flood (PMF) levels in Five mile creek as it passes the main mine tenements (M52/776 and G52/292). **Figure 8** shows the width of the PMF (red line) at specific points along the creek length. The scope of the first study did not extend down to the creek intersection with Tangadee road. This study concluded the main project infrastructure was not at risk of inundation during major flood events.

The second report assessed the PMF levels at the Five mile creek/Tangadee road crossing point and provided a conceptual design for a floodway crossing, to enable vehicle trafficability under certain rainfall conditions. **Figure 9** shows the catchment of Five mile creek above the Tangadee road crossing point and the width of the PMF level at this point.

The current level of design indicates the location of the aerodrome will not be affected by floodwater from Five mile creek. “For Construction” level of design has not yet been completed. There is room within the tenement for minor aerodrome realignment and also design of drains and levee banks etc, to ensure the aerodrome is not at risk of flooding.

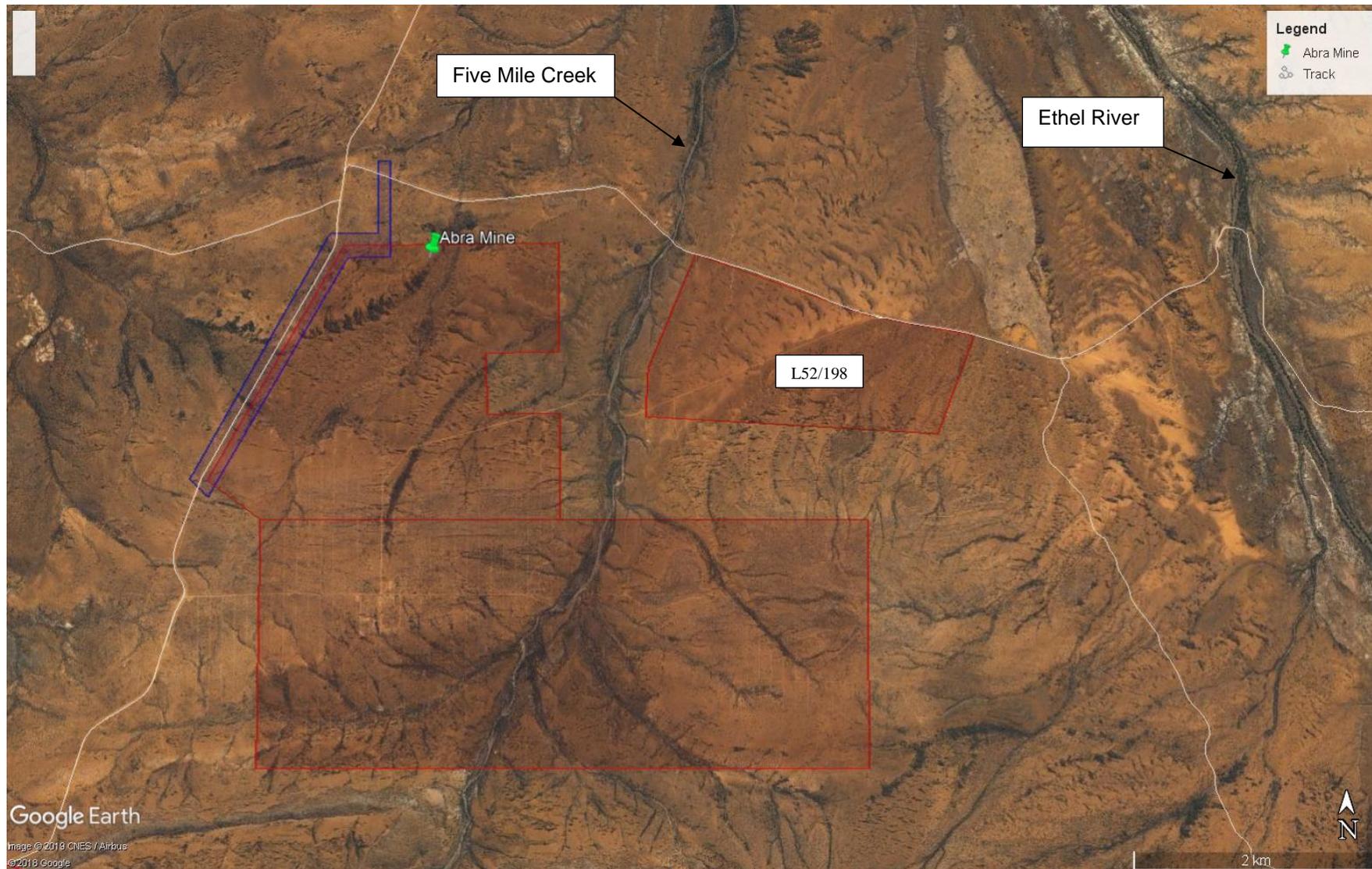


Figure 7: Aerodrome tenement location

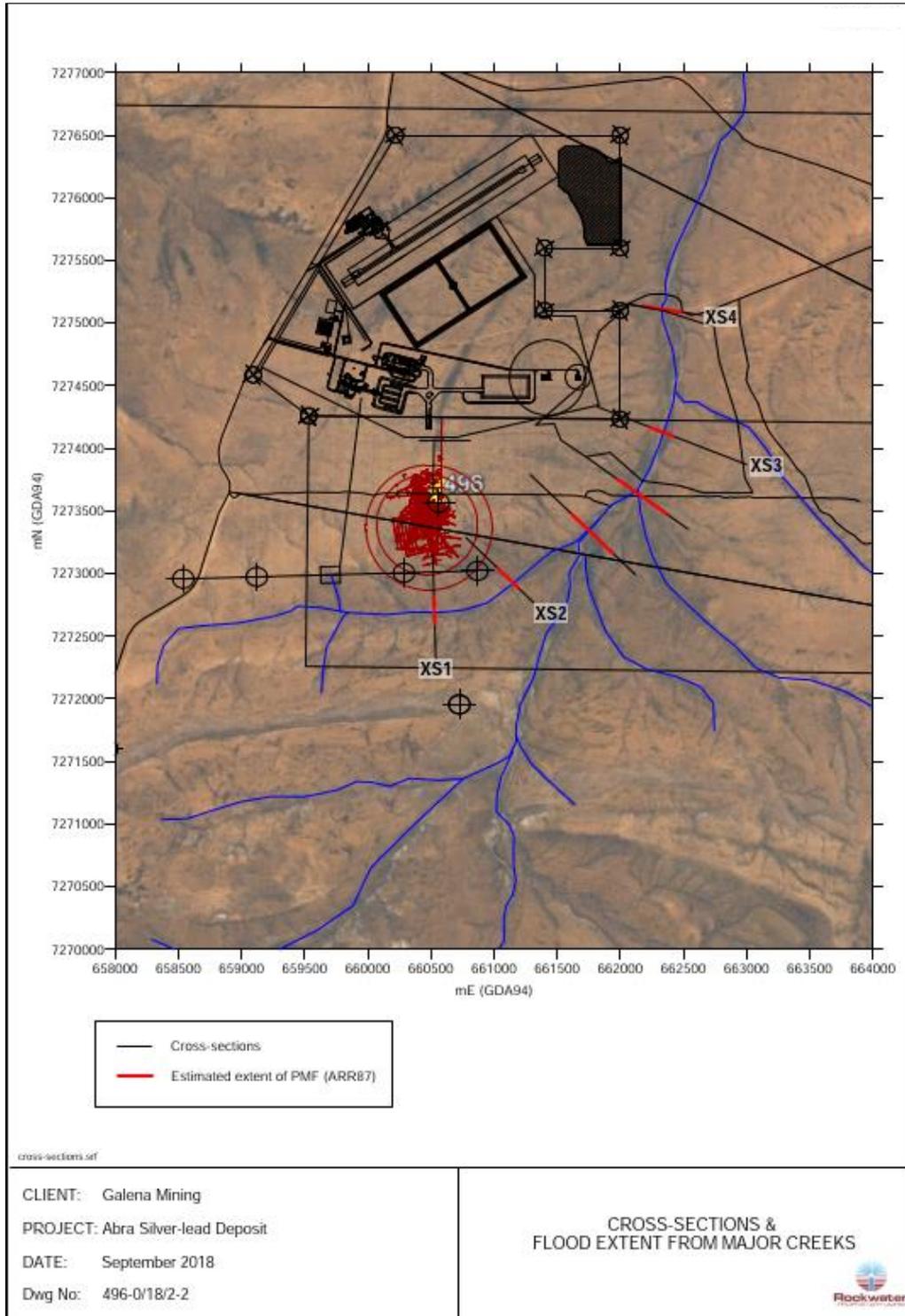


Figure 8: Five Mile Creek PMF

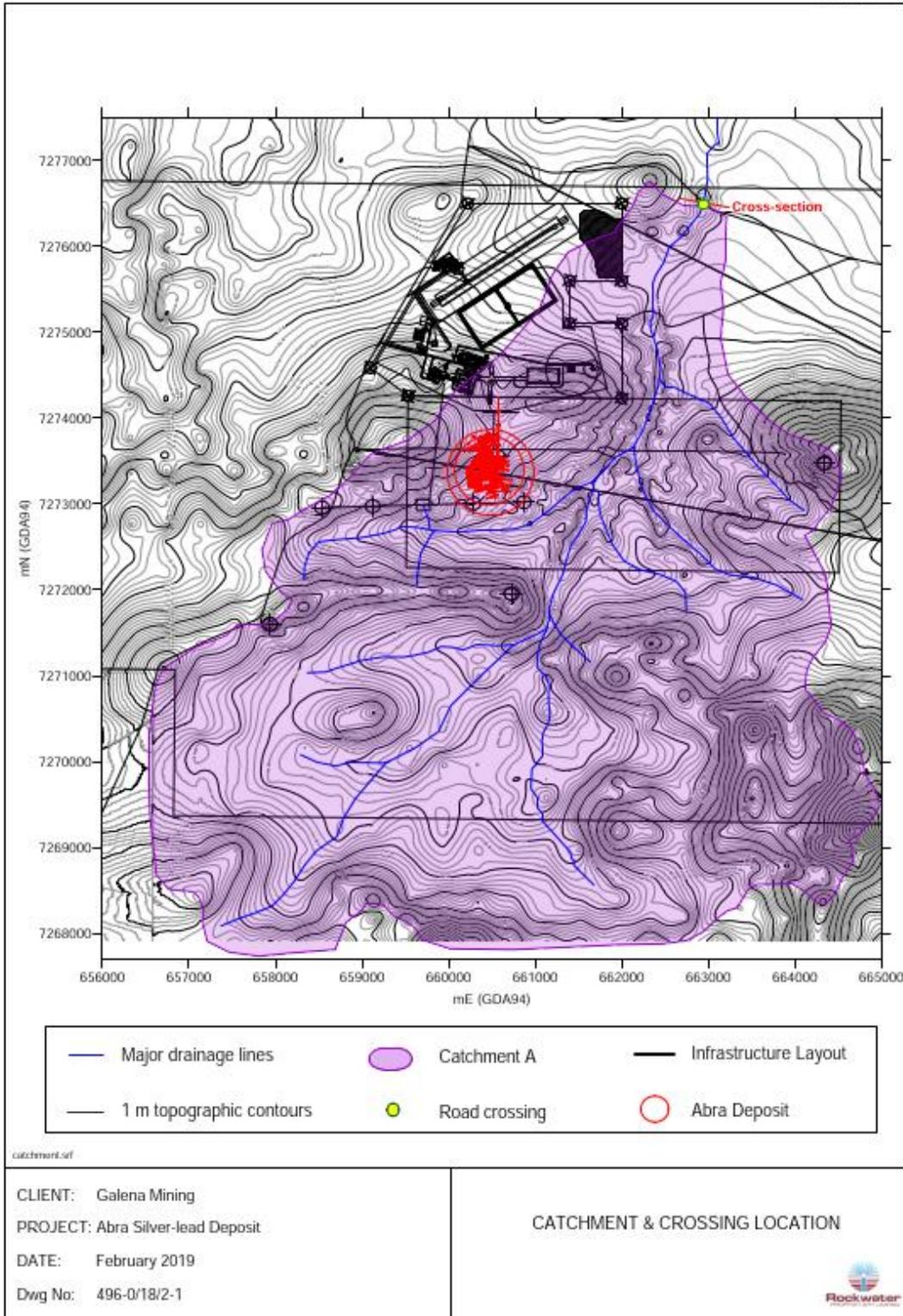


Figure 9: Tangadee Road creek crossing

3.4 ABORIGINAL HERITAGE

Terra Rosa (2018) conducted an archaeological and ethnographic survey of the aerodrome tenement in October 2018. The heritage survey was conducted to a work area clearance standard. The objective of a work area clearance assessment is to establish the existence of any archaeological and ethnographic values within the project area, to establish avoidance boundaries around sites likely to be impacted by the proposed works, and to address any heritage concerns arising from discussions with the Traditional Owners present

The surveyed area was assessed as heritage clear by the Nharnuwangga Wajarri and Ngarlawangga Traditional Owner representatives for the airstrip works to proceed. **Figure 10**, reproduced from the Terra Rosa report, shows the results of the survey. The survey confirms project components will be located on land that has been surveyed to be clear of Aboriginal heritage material.

Further work area clearance surveys will be undertaken on the communications tenements prior to any site works, to ensure there is no disturbance to any heritage site

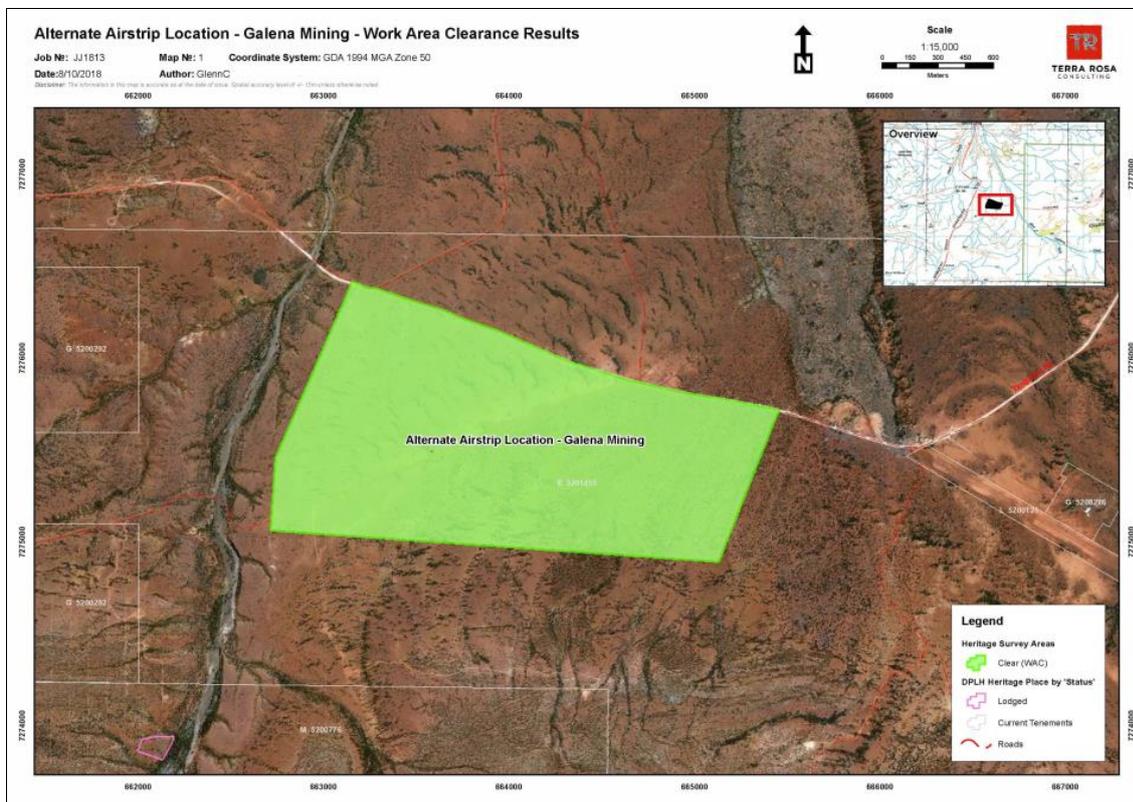


Figure 10: Heritage survey results

4. ASSESSMENT AGAINST THE 10 CLEARING PRINCIPLES

Table 4 provides an assessment against the 10 clearing principles. The assessment indicates the clearing proposed will not be at variance with any of the clearing principles.

Table 4: Clearing Principles

No.	Principle	Existing Environment	Potential Impact	Management Action	Outcome
	Native vegetation should not be cleared if-				
Biodiversity Significance					
1.	it comprises a high level of biological diversity.	Vegetation communities and flora species in the project area are also well represented in the wider region. The flora and fauna survey recorded generally low biodiversity flora values and no unique or high quality fauna habitat values	The project will result in only minor biodiversity loss through localised clearing	Implement clearing procedure. If available, collect seed from the cleared area for use in rehabilitation programmes	Project is not at variance with this principle
2.	it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	Fauna surveys have not identified significant fauna habitat unique to the project area.	The project will result in only minor local habitat loss in a region that is well covered in native vegetation.	Rehabilitation at the completion of operations will return habitat to all of the disturbed area.	Project is not at variance with this principle
3.	it includes, or is necessary for the continued existence of, rare flora.	No Declared Rare Flora (DRF) has been located in the project area	No impact to DRF	No specific management measures necessary for this principle	Project is not at variance with this principle
4.	it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.	No Threatened Ecological Community (TEC) is located in the project area	No impact to TEC	No specific management measures necessary for this principle	Project is not at variance with this principle
5.	it is significant as a remnant of native vegetation in an area that has been extensively cleared.	The region is predominantly covered by native vegetation (see Table 3).	No remnant vegetation communities in the project area	No specific management measures necessary for this principle	Project is not at variance with this principle
6.	it is growing in, or in association with, an environment associated with a watercourse or wetland.	There are no permanent watercourses or wetlands in the region. The project will not disturb riparian vegetation	The project has been designed to avoid major local drainage lines and watercourses.	No specific management measures necessary for this principle	Project is not at variance with this principle
Land Degradation					
7.	the clearing of vegetation is likely to cause appreciable land degradation.	The region is predominantly covered by native vegetation.	The 45 hectares of clearing associated with the project, in a region extensively covered by native vegetation, is unlikely to cause appreciable land degradation.	Clearing procedure is to be implemented as a control measure.	Project is not at variance with this principle
Conservation Estate					
8.	the clearing of vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The nearest gazetted conservation area (Collier Range National Park (R 35104)) is approximately 4.0 km to the east of the aerodrome and outside the tenements associated with this mining proposal	No impact to the conservation estate	No specific management measures necessary for this principle	Project is not at variance with this principle
Ground and Surface Water Quality					
9.	the clearing of vegetation is likely to cause deterioration in the quality of surface or underground water.	There are no permanent surface water bodies in the vicinity. Short duration surface water flows follow intermittent heavy rainfall. Local water table levels range from 16 to 54 m below ground level (depending on local elevation).	Turbid water from intense rainfall events may enter local watercourses.	Detention basins contain sediment off disturbed areas prior to discharge to the environment. Management measures include: EMS: Monthly inspection of mine areas Monitoring programme implemented. EMS Water Monitoring Procedure	Project is not at variance with this principle
10.	clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.	The project is located in an arid climate, on a local topographic high.	The project is unlikely to cause or exacerbate the incidence of flooding.	Detention basins contain sediment off disturbed areas prior to water discharge to the environment.	Project is not at variance with this principle

5. ENVIRONMENTAL MANAGEMENT

AMPL has developed an EMS to manage environmental impacts associated with its mining operations. This EMS was included with mining proposal ID 76773 and clearing permit CPS 8234/1. This EMS will also be used to manage environmental issues at the aerodrome.

6. REFERENCES

Stantec (2019) Abra Airstrip: Flora Vegetation and Fauna Surveys. Prepared for Galena Minerals Ltd.

Terra Rosa Consulting (2018). Report on an Archaeological and Ethnographic Work Area Clearance survey of a miscellaneous licence area for an airstrip (within 52/1455) with Nharnuwangga Wajarri and Ngarlawangga Traditional Owners, and prepared for Galena Mining Pty Ltd.

APPENDICES

**APPENDIX 1:
ECOLOGY REPORT**

ABRA AIRSTRIP: FLORA, VEGETATION AND FAUNA SURVEYS

PREPARED FOR **GALENA MINERALS LTD**

25 March 2019

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REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
v.01	30/01/2019	Draft report for comment	CH & SL	PB	AB	AB
V1.0	25/03/2019	Final report issued to client	CH & SL	PB	AB	AB

Executive Summary

Galena Mining Limited proposes to develop a lead mining operation in the Gascoyne Region of Western Australia, entitled the Abra Base Metals Project. The Project is located approximately 220 kilometres north of Meekatharra and 180 kilometres southwest of Newman. Stantec Australia Pty Ltd has previously completed a Detailed flora and vegetation survey and Level 1 fauna survey of the Project area and has been appointed to undertake a Reconnaissance flora and vegetation survey and Level 1 fauna survey of a proposed air strip (the Study Area), located east of the Project. The Study Area covers 278 hectares and is located on Exploration Lease E52/1455, overlapping partially with the Project.

The desktop assessment identified 22 flora and 26 fauna species of conservation significance with potential to occur in the Study Area. No Threatened or Priority Ecological Communities were identified within the Study Area, and the nearest Priority Ecological Community is the Diorite Land System (Priority 3) located 16 km to the southwest.

The field survey took place between the 2nd and 5th of October 2018 and the Study Area was sampled by way of opportunistic collections, vegetation and fauna mapping and data collected from 16 relevés and two mapping notes. There were 55 vascular flora taxa recorded from the Study Area, representing 19 families and 26 genera, with no introduced flora recorded. The most represented plant families were Fabaceae (legumes), Poaceae (grasses) and Malvaceae (malvas) and the most represented genera were *Acacia* and *Eremophila*. No Threatened or Priority flora taxa were recorded during the field survey and none are considered 'likely' to occur.

Five vegetation types were identified, including two that overlapped with the adjacent Project. None of these vegetation types are analogous to any Threatened or Priority Ecological Communities. Vegetation condition was 'excellent' throughout the Study Area, with disturbances restricted to clearing for tracks and impacts from non-native fauna. No introduced flora species were recorded during the survey. The vegetation types recorded represent what would be expected from similar landforms in the broader Augustus subregion in which the Study Area occurs.

Three broad fauna habitats were identified within the Study Area; open shrubland on sandy plain, open shrubland on stony plain and drainage. All are considered widespread and of limited significance for potential conservation significant vertebrate fauna.

No fauna species of conservation significance were recorded during the current survey. One species of conservation significance, the Peregrine Falcon (S7), was considered 'possible' to occur based on species range and previous records. Although the Study Area does not contain suitable nesting habitat for the species, it may forage over the Study Area from time to time without being dependent on any particular habitat. The remaining species of conservation significance were assessed as 'unlikely' to occur in the Study Area.

Galena Minerals Ltd

Abra Airstrip: Flora, Vegetation and Fauna Surveys

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1. Introduction

1.1 Project Background and Location

Galena Mining Limited (Galena) propose to develop a lead mining operation entitled; the Abra Base Metals Project, located within the Gascoyne Region of Western Australia (WA), 220 kilometres (km) north of Meekatharra and 180 km southwest of Newman (**Figure 1-1**) (the Project). Stantec Australia Pty Ltd (Stantec) previously completed a Detailed flora and vegetation survey and Level 1 fauna survey of the Project area, covering 1,357 hectares (ha)(Stantec 2018). Subsequently, Galena has appointed Stantec to complete a Reconnaissance flora and vegetation survey and Level 1 fauna survey of a proposed air strip (the Study Area), located east of the Project, to inform an application for a Miscellaneous Licence. The Study Area is located on Exploration Lease E52/1455 and covers an area of 278 ha (**Figure 1-2**).

1.2 Report Scope and Objectives

The principal objectives of the Reconnaissance flora and vegetation survey and Level 1 fauna survey were to investigate and define the environmental values of the Study Area and to describe their conservation significance in relation to the Project. To achieve these objectives, the specific scope is detailed below:

- complete a desktop review (database searches and literature review), to develop a list of flora and fauna species and vegetation communities that have been previously recorded within, or in the vicinity of, the Project, including species and communities with the potential to be of conservation significance;
- conduct a Reconnaissance -level field survey to identify, describe and map vegetation types, vegetation condition and fauna habitats within the Study Area;
- conduct targeted searches for flora, vegetation communities and fauna of conservation significance, including species and communities of local and regional significance;
- develop a list of flora and fauna species recorded as occurring within the Project, including introduced flora and fauna species and
- assess the survey findings in a local and regional context by comparing them with available data from other localities within the bioregion.

The objectives and methods adopted for these surveys are aligned with the following relevant regulatory guidelines:

- Environmental Protection Authority (EPA) Environmental Factor Guideline: Flora and Vegetation (EPA 2016d);
- EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016f);
- EPA Environmental Factor Guideline: Terrestrial Fauna (EPA 2016e);
- EPA Technical Guidance – Terrestrial Fauna Surveys (EPA 2016c);
- EPA Factor Guideline: Sampling Methods for Terrestrial Vertebrate Fauna (EPA 2016b);
- Department of Environment Regulation (DER), A guide to the assessment of applications to clear native vegetation (DER 2014); and
- Department of the Environment (DoE), Matters of National Environmental Significance - Significant Impact Guidelines 1.1 EPBC Act (DoE 2013).

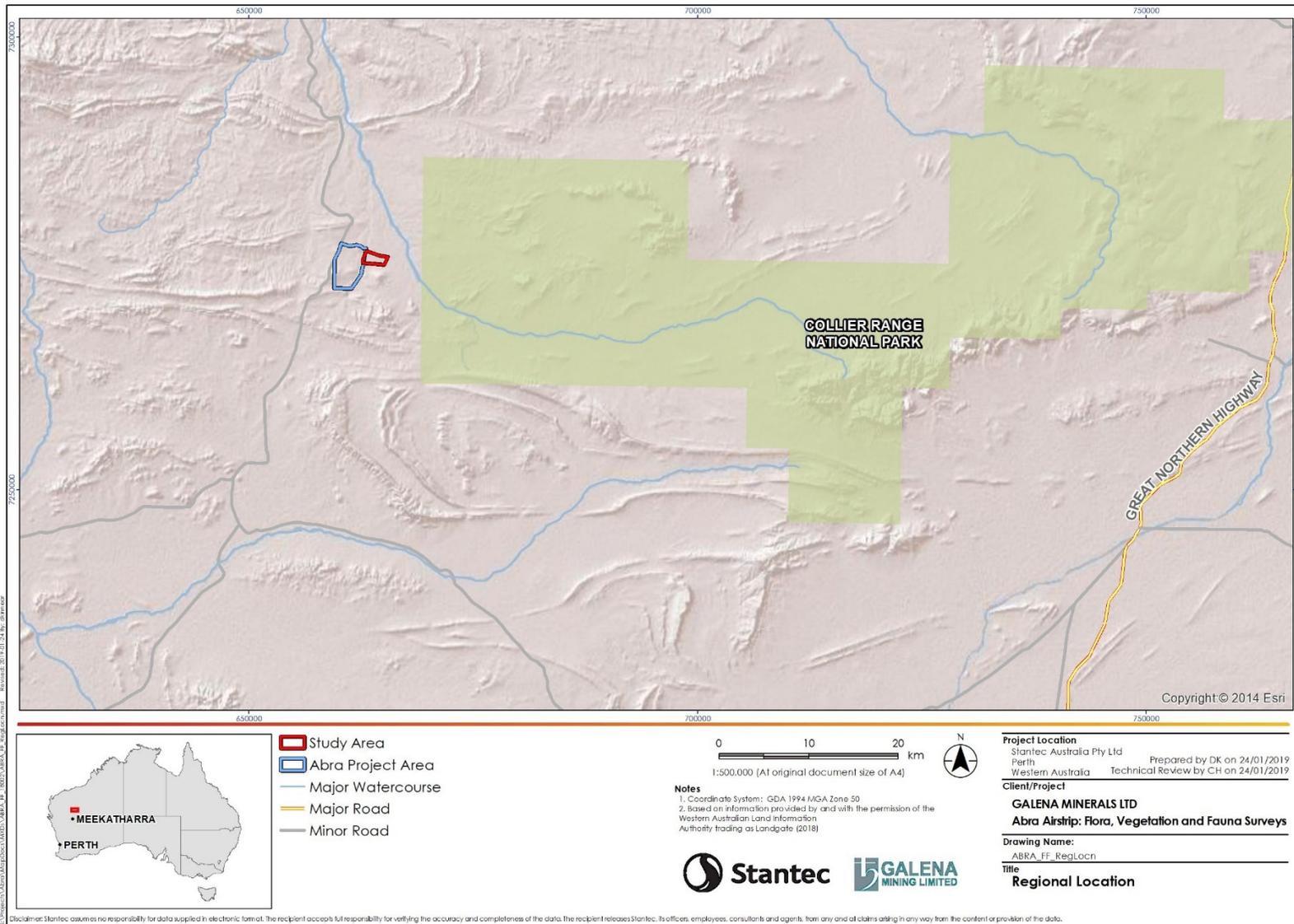


Figure 1-1: Regional locality of the Study Area

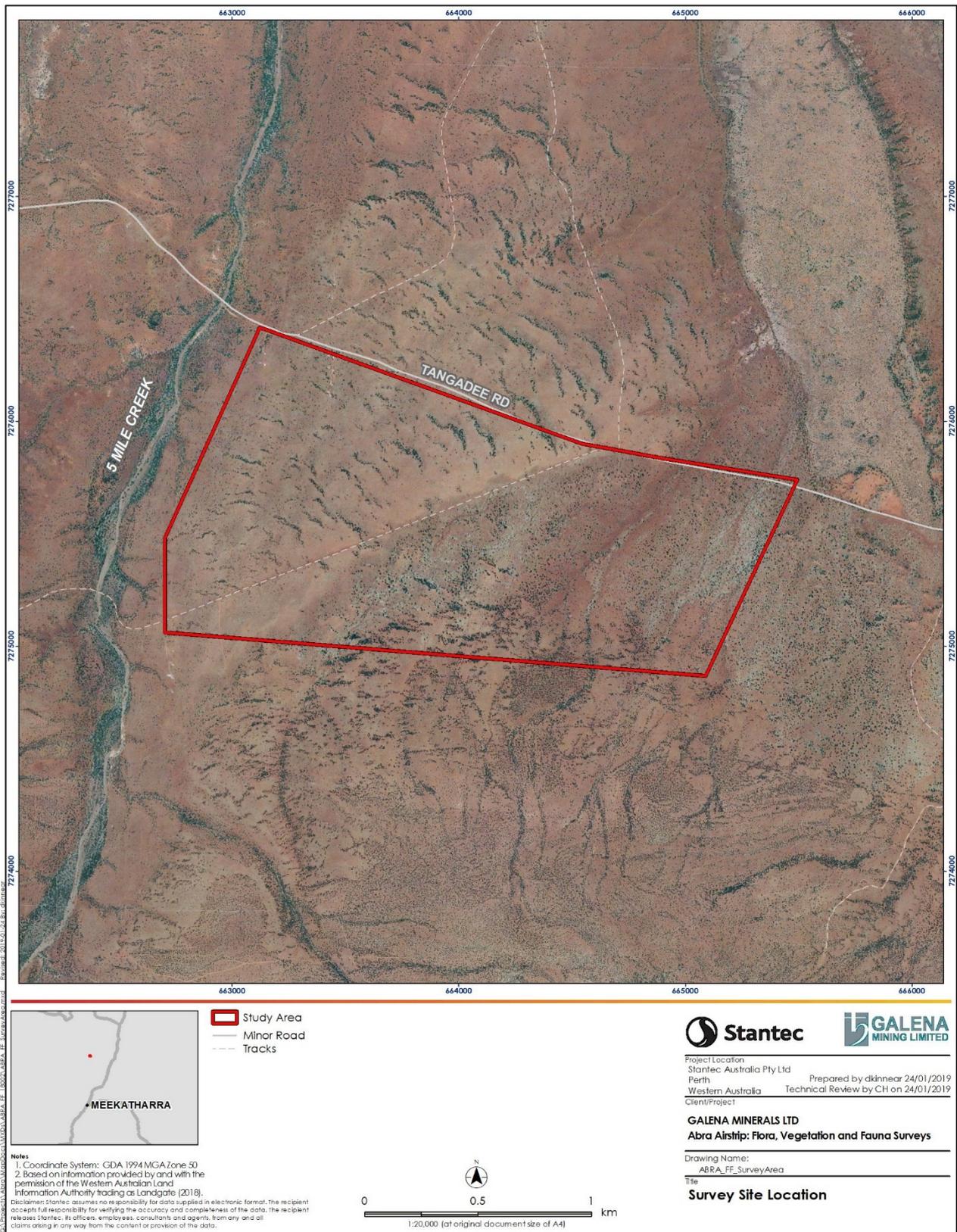


Figure 1-2: The Study Area

2. Existing Environment

2.1 Climate

The Study Area is located 178 km southwest of Newman within the Gascoyne region of Western Australia. The Gascoyne region typically receives low amounts of variable rainfall influenced by northern cyclonic events (GDC 2015).

Long-term rainfall data was collated from Neds Creek (007103) weather station for the period 1947 to 2018, approximately 139 km southeast of the Study Area and long-term temperature records have been collated from Newman Aerodrome (007176) weather station for the period 1966 to 2018 and Meekatharra Airport (007045) for the period 1950 to 2018, approximately 178 km northeast and 219 km south of the Study Area respectively (BoM 2018). The mean annual rainfall recorded at the Neds Creek weather station is 239 mm, with the majority received between January and March each year (**Figure 2-1**). Newman Aero has an annual average maximum temperature of 32.1°C and an annual average minimum temperature of 16.4°C (**Figure 2-1**). Meekatharra Airport has an annual average maximum temperature of 29.0°C and an annual average minimum temperature of 15.9°C (**Figure 2-2**).

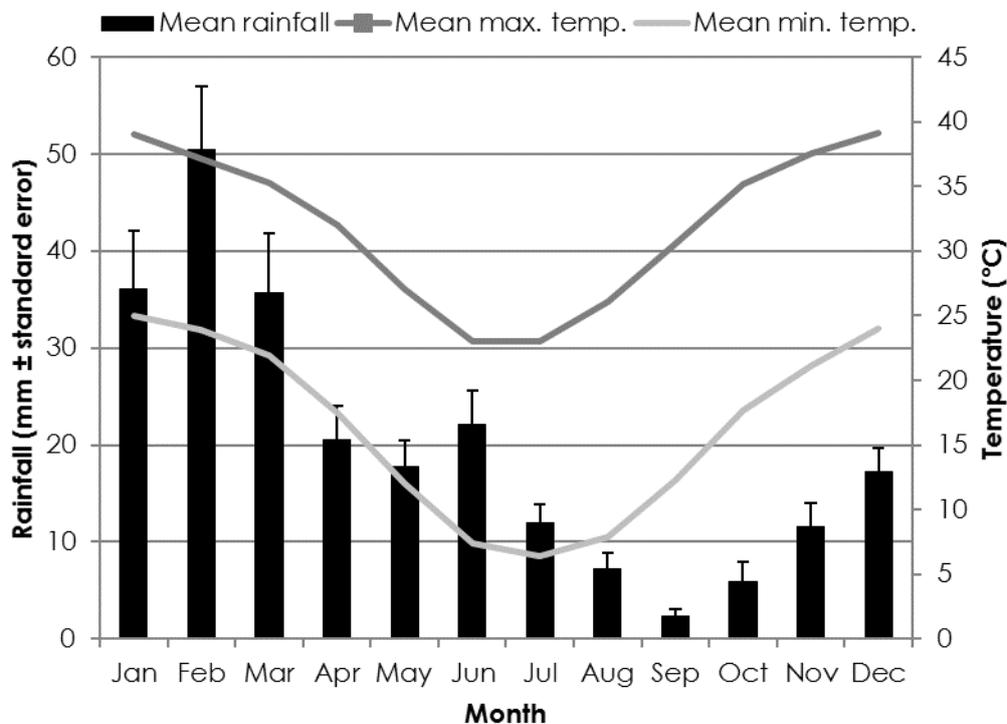


Figure 2-1: Long-term mean rainfall (mm) recorded at Neds Creek station (007103) and long-term maximum and minimum temperatures recorded at Newman Aero station (007176) (BoM 2018)

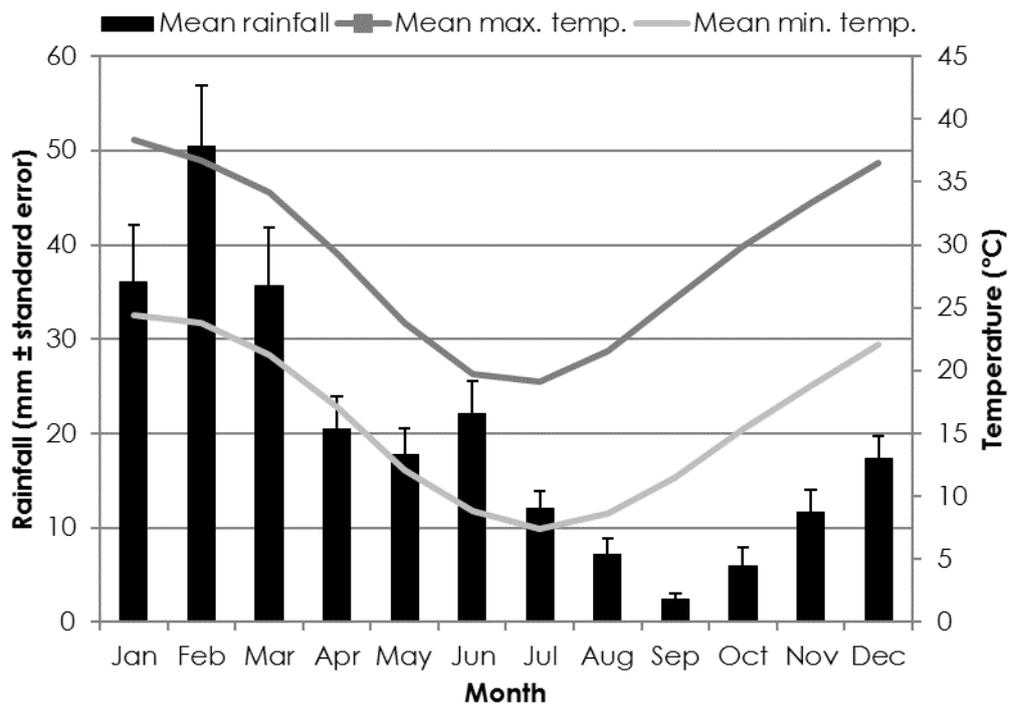


Figure 2-2: Mean rainfall (mm) recorded at Neds Creek station (007103) and long-term maximum and minimum temperatures recorded at Meekatharra Airport station (007045) (BoM 2018).

2.2 Landforms, Geology and Soils

The Study Area is located within the Mesoproterozoic Bangemall Basin and is the youngest of a series of sedimentary basins that unconformably lie over the Capricorn Orogen, a metamorphic terrain that represents amalgamation of the Yilgarn and Pilbara Cratons during the Paleoproterozoic (Payne *et al.* 1988). The Study Area lies within the south-eastern boundary of the Bangemall Geomorphic Province, as described by Payne *et al.* (1988). This province is 18,590 km² in size and forms the watershed between the Ashburton and Gascoyne Rivers. It consists predominantly of rugged mountains and hill and ridge country of Bangemall series Middle Proterozoic sedimentary rocks (Payne *et al.*, 1988).

The more weather-resistant rocks of the area, such as sandstone, form massive parallel ridges and ranges, predominantly trending northwest. The lower slopes, restricted valley plains and floors associated with the hills are covered with a dense surface strew of rock fragments of variable lithology. The sediments are frequently intruded by dolerite dykes and sills which are now exposed to form rounded hills and ridges. Soils include red shallow loams (often with hardpans), red loamy earths, stony soils and red deep sands with some red shallow sands (Tille 2006).

2.3 Land Systems

Land systems across the Gascoyne have been mapped by the Natural Resources Assessment Group of the former Department of Agriculture (now Department of Primary Industries and Regional Development, DPIRD) and provide a comprehensive description of biophysical resources within the area (Payne *et al.* 1988). The Study Area falls primarily within the Jamindie and Three Rivers Systems, with a small proportion occurring in the Collier System (Table 2-1; Figure 2-3).

Table 2-1: Land systems and their extent within the Study Area

Land System	Description	Extent within Study Area	
		Hectare (ha)	Percentage (%)
Jamindie System	Stony hardpan plains and rises supporting groved mulga shrublands, occasionally with spinifex understorey.	123.73	44.5
Three Rivers System	Hardpan plains and minor sandy banks supporting sparse mulga shrublands.	146.22	52.6
Collier System	Undulating stony uplands, low hills, ridges, stony plains and drainage floors supporting mulga shrublands and some spinifex.	8.22	3
Total	-	278.17	100

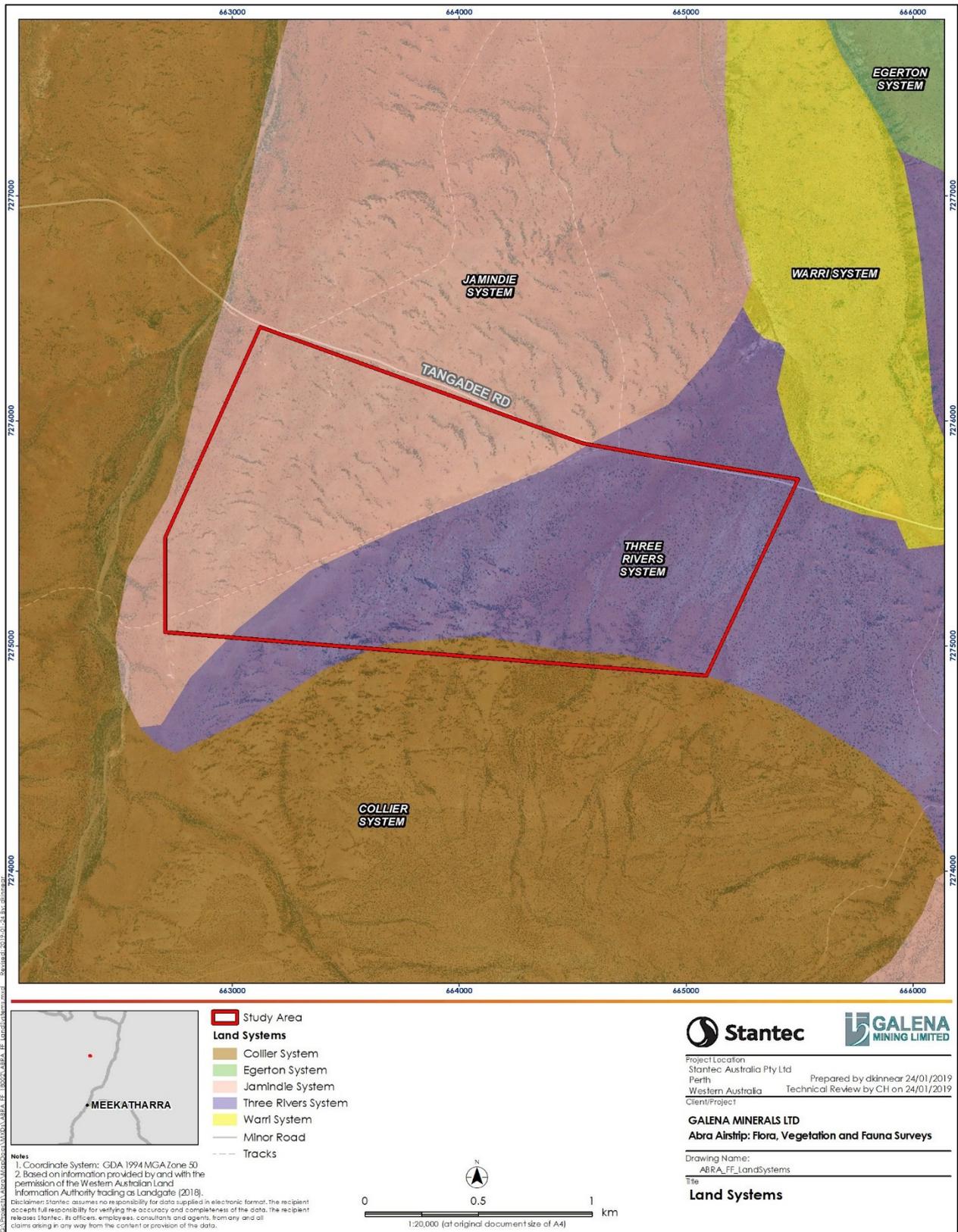


Figure 2-3: Land systems within and surrounding the Study Area

2.4 Surface Water and Hydrology

The main source of drainage within the Augustus subregion is the Gascoyne River system, however drainage is also provided by the Ashburton and Fortescue River headwaters (Desmond *et al.* 2001). The Gascoyne River reaches 760 km, flowing westward to drain into the Indian Ocean.

The Ashburton River and Ethel Creek, located immediately north and east of the survey area respectively, are seasonal watercourses with several permanent pools. A small tributary of the Ethel River, 5 Mile Creek, runs south to north to the west of the Study Area, coinciding with the Abra Project Area.

The drilling at the Project has some generalisations that can be made regarding the slope of the water table and the variable permeability of the lithologies. The relative elevation of the water table is estimated to slope gently from south to north from a range of <5 m to <15 m (Whitford *et al.* 1994). There appears to be some consistent spatial variation in the depth of the water table. It is relatively high in the southwest and appears to drop to the north and northeast. The mean groundwater flow should follow this slope, although on more local scales the anisotropic permeability of the rocks will probably result in a more complex pattern of groundwater movement (Whitford *et al.* 1994).

2.5 Biogeographic Region

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 the Environment and Energy, DoEE).

The Study Area is located in the Augustus subregion (GAS3) within the Gascoyne bioregion. The Augustus subregion makes up 10,687,739 ha and is classified as a Desert and Xeric Shrubland ecoregion, characterised by ranges separated by wide flat valleys (Desmond *et al.* 2001, DoEE 2013). Vegetation mainly consists of Mulga woodland over *Triodia* species on shallow stony loams and rises, and Mulga on shallow earthy loams over hardpan on plains (Hughes and Jones 2010).

2.6 Flora and Vegetation

The Study Area lies within the Ashburton Botanical District, as classified by Beard (1990). This district is almost entirely mulga (*Acacia aneura*) shrublands, sometimes with snakewood (*Acacia xiphophylla*) and other *Acacia* species as scrub on the hills, and as low woodland on the plains. Areas of dwarf scrub of *Eremophila* and *Senna* species also occur (Beard 1990).

2.6.1 Pre-European Vegetation

Vegetation mapping of Western Australia was completed on a broad scale (1:1,000,000 and 1:250,000) by Beard (1975a), who classified vegetation into broad vegetation associations. These vegetation associations were re-assessed by Shepherd *et al.* (2002) to account for clearing in the intensive land use zone, and to divide some larger vegetation units into smaller units. Additionally, Shepherd *et al.* (2002) developed a series of systems to assist in the removal of mosaics; however, some mosaics still occur. The Study Area has been mapped as 'low woodland; mulga (*Acacia aneura*), of the Gascoyne Ranges (Beard 1975a, Shepherd *et al.* 2002) (**Table 2-2; Figure 2-4**) (vegetation system associations described by Shepherd *et al.* (2002) correspond with that of Beard (1975a)). The current extent of this vegetation system association suggests that minimal land clearing has occurred across four scales of assessment (State, bioregion, subregion and Local Government Area (LGA) (Shire of Meekatharra) (**Table 2-3**).

Table 2-2: Vegetation system associations and their extent within the Study Area

System	System Code	Extent	Description
Gascoyne Ranges	18.5	278.17	Low woodland; mulga (<i>Acacia aneura</i>)

Table 2-3: Vegetation system association extent remaining across four scales (State, Bioregion, Subregion and Local Government Area)

System	Scale	Pre-European Extent	Current Extent	% Remaining	Current extent within IUCN Class I-IV Reserves (ha)	% of current extent protected within IUCN Class I-IV Reserves
Gascoyne Ranges 18	State-wide	1,812,659.31	1,811,127.15	99.92	16,344.03	0.9
	Bioregion	1,794,574.24	1,793,131.87	99.92	16,344.03	0.9
	Sub-region	1,777,829.40	1,776,387.03	99.92	16,344.03	0.9
	LGA	918,276.87	916,753.77	99.83	16,214.53	1.77

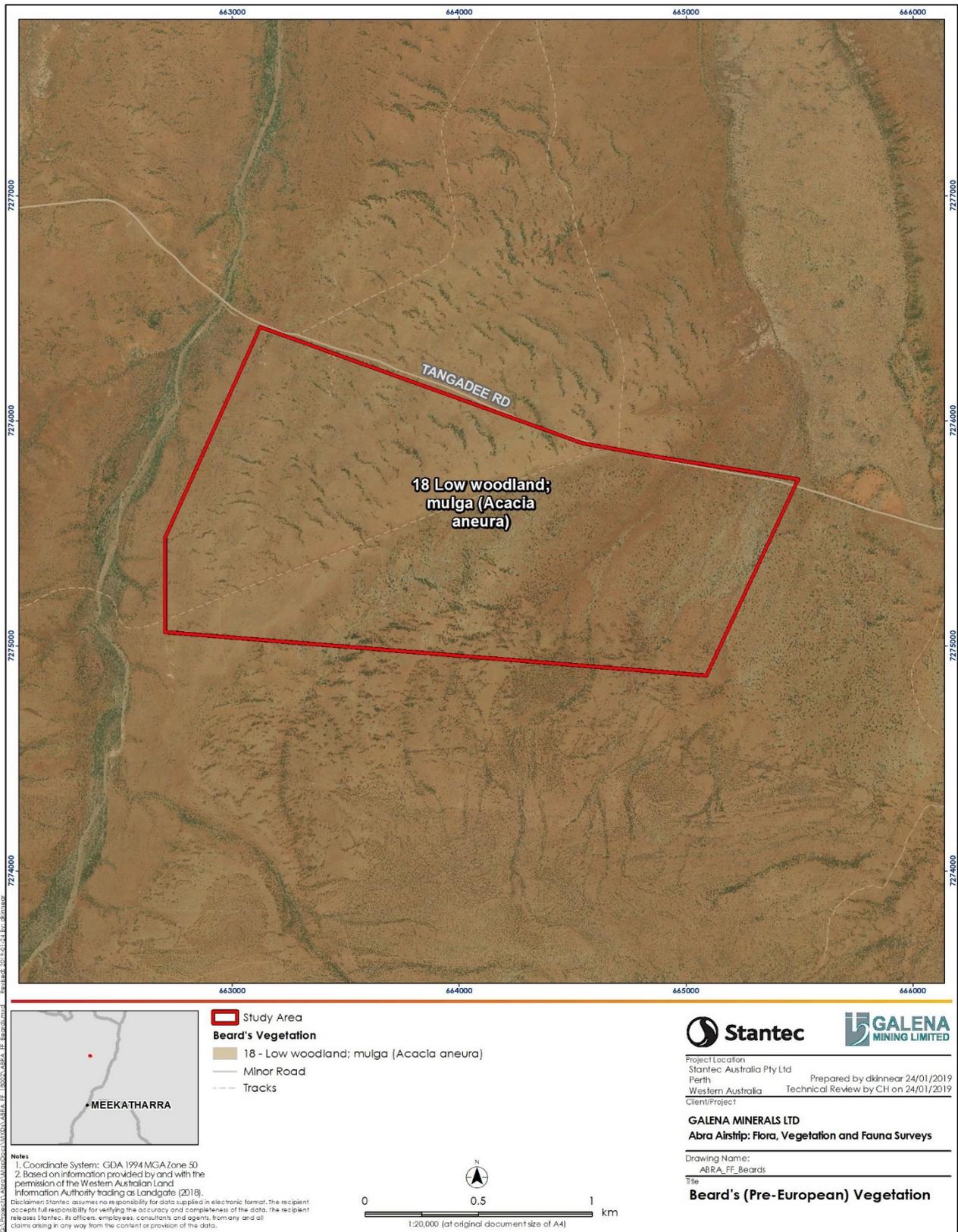


Figure 2-4: Pre-European vegetation associations of the Study Area

2.7 Land Use and Tenure

2.7.1 Land Use

The majority of land within the Gascoyne is used for pastoral purposes, with leases covering 84% of the area (GDC 2015) and only smaller areas serving horticultural or mining purposes (GDC 2015). The Study Area lies within the Mulgul Pastoral Lease with cattle grazing occurring across Galena's leases. The Project was previously known as the Mulgul which was acquired by Galena from Abra Mining Limited.

2.7.2 Conservation Reserves and Environmentally Sensitive Areas

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

The Study Area lies approximately 3.8 km west of Collier Range National Park, which is managed by the Department of Biodiversity, Conservation and Attractions (DBCA). The reserve was established due to the potential value of hills and freshwater pools serving as refuge from fire and harsh arid conditions (Desmond *et al.* 2001). Collier Range National Park receives annual baiting for wild dogs and is visited by staff, however there is limited information available regarding the biodiversity of the area (Desmond *et al.* 2001). Significant damage has been recorded from feral donkeys and cattle and there is no current fire regime (Desmond *et al.* 2001).

3. Methodology

3.1 Desktop Assessment

A desktop assessment, comprising a review of database searches and a literature review, was undertaken prior to the field surveys to gather contextual information on the Study Area. The purpose of the desktop assessment was to identify flora, vegetation and terrestrial fauna potentially occurring in the Study Area, in particular species of conservation significance.

3.1.1 Database Searches

Database searches, conducted in January 2018 for the Project (Stantec 2018), were utilised to generate a list of vascular flora, vegetation communities and vertebrate fauna previously recorded within, and in the vicinity of the Study Area.

Eight database searches were conducted from a central coordinate (50J, 660525 m E, 7273300 m S) (**Table 3-1**). Appropriate search buffers were selected based on the technical capabilities of each of the databases and the ecological features of the area.

Conservation significance and conservation rankings used under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act), as well as by the DBCA, are defined in **Appendix A**.

Table 3-1: Database searches conducted for the desktop assessment

Custodian	Database	Ecological Group	Reference	Buffer (km)
DoEE	Protected Matters Search Tool (PMST)	Matters of National Environmental Significance (MNES) flora and fauna	DoEE (2018a)	100
DBCA	NatureMap	Flora and fauna	(DBCA 2018b)	40
DBCA	Threatened and Priority Ecological Communities	Vegetation communities	(DBCA 2018a)	50
DBCA	Threatened and Priority Flora Database	Flora	(DBCA 2018d)	50
DBCA	Threatened and Priority Species List (TP List)	Flora	(DBCA 2018a)	50
DBCA	Western Australian herbarium Flora	Flora	(DBCA 2018e)	50
DBCA	Threatened and Priority Fauna Database	Fauna	(DBCA 2018a)	100
Birdlife Australia	Birdlife Bird data	Fauna	(Birdlife Australia 2018)	50

3.1.2 Literature Review

Background information on the Study Area and surrounds was compiled to provide broad, contextual knowledge of the vegetation and habitats likely to be encountered in the Study Area. Historic vegetation mapping conducted by Beard (1975b, 1990), Shepherd *et al.* (2002), soil and landform mapping (Payne *et al.* 1988), IBRA classification system information (Desmond *et al.* 2001) and previous flora and fauna surveys conducted in the area. Previous survey reports were only considered if they were publicly available and undertaken in close proximity to the Study Area. As available relevant and recent literature for the locality was relatively limited, studies that preceded more recent work were reviewed to supplement the literature review.

3.1.3 Likelihood of Occurrence of Flora and Fauna

Prior to undertaking the field survey, the conservation significant species identified from the database searches and literature review were assessed for likelihood of occurrence within the Study Area, based on interpretation of habitat types from aerial imagery and the nearest known location of each species. Each species of conservation significant flora and vertebrate fauna in the Study Area was assessed and ranked for occurrence in the Study Area according to the following definitions:

Confirmed – the presence of the species in the Study Area has been recorded unambiguously during the last ten years (i.e. during recent surveys of the Study Area or from reliable records obtained via database searches);

Very Likely – the Study Area lies within the known distribution of the species and is likely to contain suitable habitat(s), the species generally occurs in suitable habitat and has been recorded nearby within the last 20 years;

Likely – the Study Area lies within the known distribution of the species and the species has been recorded nearby within the last 20 years; however, either:

- the Study Area is likely to contain only a small area of suitable habitat, or habitat that is only marginally suitable; or
- the species is generally rare and patchily distributed in suitable habitat;

Possible – there is an outside chance of occurrence, because:

- the Study Area is just outside the known distribution of the species, but is likely to contain suitable and sufficient habitat (the species may be common, rare, or patchily distributed); or
- the Study Area lies within the known distribution of the species, but the species is very rare and/or patchily distributed; or
- the Study Area lies on the edge of, or within, the known distribution and is likely to contain suitable habitat, but the species has not been recorded in the area for over 20 years;

Unlikely – the Study Area lies outside the known distribution of the species, the Study Area is unlikely to contain suitable habitat, and the species has not been recorded in the area for over 20 years.

Following the field survey, the conservation significant flora species identified from the database searches and literature review were re-assessed to determine the likelihood of occurrence within the Study Area.

3.2 Survey Methodology

3.2.1 Survey Timing

The EPA (EPA 2016f) 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 Eremaean botanical province, within which the Study Area lies, is six to eight weeks following the wet season (March to June). The field survey was undertaken between the 2nd and 5th of October 2018, which falls outside of the recommended survey season for the region. Annual rainfall in the 12 months preceding the field survey was 51.2 mm below the average annual rainfall of 187.8 mm (1947 to 2018) (**Figure 3-1**).

It is possible that some of the annual and ephemeral flora taxa that could potentially occur in the Study Area may not have been recorded during the field survey, as they may have senesced or lacked flowering and fruiting parts needed for identification. However, there were no flora of conservation significance that were considered as 'likely' to occur, based on the desktop assessment, that could not be identified from vegetative material owing to their perennial life form.

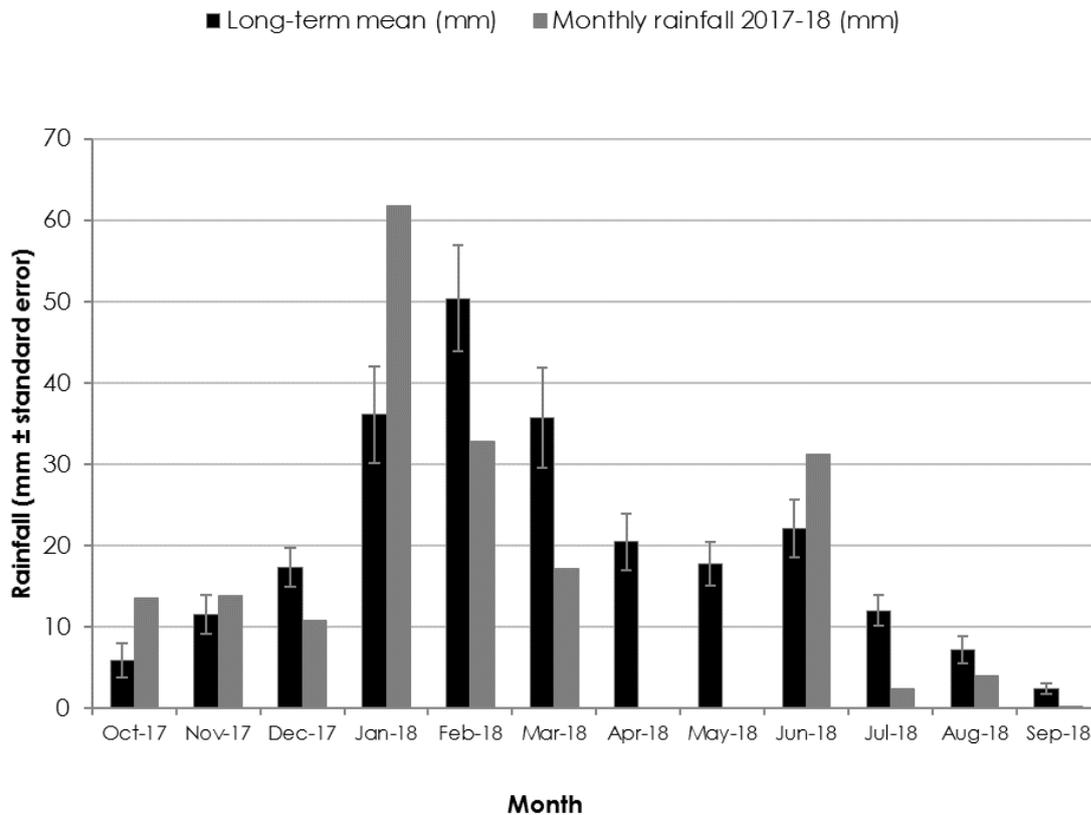


Figure 3-1: Long-term mean monthly rainfall (1947 to 2018) and actual rainfall received at Neds Creek weather station (007103) in the six months preceding the field survey (October)

3.2.2 Survey Team and Licensing

The field survey was led by Alice Bott (senior botanist) with support from Shane Chalwell (senior botanist). Alice is an experienced arid-zone botanist, with extensive experience spanning over nine years conducting vegetation and flora surveys in WA and was the technical lead for the field survey. All plant collections were taken under flora collecting permit SL012377 pursuant to the Biodiversity Conservation Act 2016. In addition, Alice holds a permit to collect Declared Rare Flora (license no. 145A-1718) for herbarium identification purposes.

3.2.3 Flora and Vegetation Assessment

Prior to the field survey, broad vegetation types were mapped on aerial imagery based on vegetation signatures and landscape features. Proposed sampling locations were identified prior to the field survey and according to the estimated number of vegetation types within the Study Area. These habitats were assessed in the field and a reconnaissance-level flora and vegetation survey, consistent with EPA (2016a), was employed to sample the flora and vegetation within the Study Area.

Sixteen relevés (unbounded sampling sites) and two mapping notes were sampled to compile a representative species list and to characterise the vegetation types identified. Where possible, vegetation types were reconciled to the vegetation types previously identified in (Stantec 2018) for the Abra Project. The remainder of the Study Area was traversed on foot and via vehicle to map vegetation types and to sample flora opportunistically. **Table 3-2** presents the information that was recorded at each relevé.

Table 3-2: Summary of data recorded at each relevé

Parameter	Description
Relevé ID	The unique name that was assigned to the site that was sampled
Recorder and Date	The recorder(s) involved in sampling the relevé and date
Coordinates	Measured using a handheld GPS device in GDA94 format
Site photograph	At least one landscape 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
Geology type	A description of the outcropping geology (if present) and course fragments
Habitat type	A description of the landform type and aspect
Vegetation Condition	Assessed according to the Trudgen vegetation condition scale (Appendix B).
Vascular flora species	A record of each flora species present
Height	The average height of each species in meters
Percent Foliar Cover (PFC)	An estimate of the PFC for each species will be recorded
Reconciled vegetation type	Where applicable, the vegetation will be assigned to a vegetation code from previous surveys undertaken adjacent to the Study Area
Vegetation structure	A description of the vegetation in accordance with the National Vegetation Information System (NVIS), Level 5 – Association (NVISTWG 2017) based on height and foliar cover of strata (Appendix C).
Disturbances	A list of any disturbances in the relevé area, if present.
Time since fire	An estimation of the time since the vegetation was last burnt.

3.2.3.1 Targeted Survey

Targeted searches were conducted for conservation significant flora identified from the desktop assessment (**Section 3**). Field personnel familiarised themselves with photographs, reference samples and descriptions of these taxa before the survey and actively searched for them in and around relevés and while traversing the Study Area. Where flora of conservation significance was identified, a record was collected. The following information was collected for each population of conservation significant flora identified in the field:

Table 3-3: Summary of data collected for conservation significant flora species encountered

Parameter	Description
Coordinates	Measured using a handheld GPS device in GDA94 format
Recorder and Date	The recorder(s) involved in sampling the site and date.
ID of individual or pop	The unique name that was assigned to the individual or population that was sampled
Species	Species name
Specimen ID	A unique identifier code will be assigned to any species that cannot be identified in the field.
Abundance	A count of the species in a 50 m x 50 m area or; Estimate of density (PFC) within a mapped polygon (for large populations)
Reproductive characteristics	Whether the species is fruiting, flowering or vegetative.
Photograph	A photograph of the species showing reproductive characteristics (if present) and habitat/form

3.2.3.2 Vegetation Type and Condition Mapping

The broad vegetation type mapping that was completed during the desktop assessment was refined on maps in the field, where necessary, as a result of ground-truthing. Vegetation types were delineated and described from aerial imagery utilising the quadrat and mapping note data. The vegetation types have been described to Level V (Vegetation Association) in the NVIS hierarchical structure (ESCAVI 2003) (**Appendix C**). Vegetation condition was assigned based on the six categories described by (Trudgen 1988) (**Appendix B**).

3.2.4 Terrestrial Fauna Assessment

Broad fauna habitat assessments were undertaken at the flora sampling locations. **Table 3-4** presents the following key habitat parameters that were recorded at each fauna habitat assessment site.

Table 3-4: Summary of data collected at fauna habitat assessment sites

Parameter	Description
Habitat ID	The unique name that was assigned to the site that was sampled
Recorder and Date	The recorder(s) involved in sampling the relevé and date
Coordinates	Measured using a handheld GPS device in GDA94 format
Site photograph	At least one landscape photograph taken of the site
Fauna habitat features	An estimation of the amount of woody debris, leaf litter, peeling bark, burrowing suitability, tree hollows and SRE potential

The Study Area was traversed on foot with searches undertaken for fauna taxa of conservation significance.

4. Results and Discussion

4.1 Desktop Results

The results of the literature review are summarised in **Table 4-1** and **Table 4-2** for flora and fauna respectively. The literature review includes a summary of methods, size of the area surveyed, proximity to the current Study Area and year of the survey, along with key findings that may be relevant to the current study.

Table 4-1: Key findings of flora studies conducted within the vicinity of the Study Area

Reference	Study details	Proximity to Study Area	Vegetation Units	Flora Recorded	Vegetation Condition	Species and communities of conservation significance
Stantec (2018)	<u>Location:</u> the Project <u>Study Type:</u> Detailed flora and vegetation survey <u>Survey date:</u> May 2018 <u>Size of survey area:</u> 1, 357 ha	Immediately west of Study Area	Seven vegetation types comprised of: <ul style="list-style-type: none"> • <i>Grevillea berryana</i> open low woodland over <i>Acacia ?ramulosa</i> var. <i>ramulosa</i> and <i>Acacia incurvaneura</i> tall shrubland to open scrub over <i>Eremophila forrestii</i> subsp. <i>?forrestii</i> open low shrubland. • <i>Acacia pruinocarpa</i> open tall shrubland to open low woodland over <i>Ptilotus obovatus</i> open low shrubland. • <i>Eucalyptus victrix</i> and <i>Acacia citrinoviridis</i> woodland to open tall woodland over <i>Tephrosia rosea</i> var. <i>clementii</i> low shrubland over <i>Cymbopogon ambiguus</i> and <i>Eulalia aurea</i> very open tussock grassland. • <i>Acacia citrinoviridis</i> open tall shrubland to open low woodland over <i>Acacia pyrifolia</i> open shrubland over <i>Tephrosia rosea</i> var. <i>clementii</i>, <i>Corchorus crozophorifolius</i> and <i>Senna artemisioides</i> subsp. <i>helmsii</i> low shrubland. • <i>Acacia citrinoviridis</i> and <i>Corymbia ?ferriticola</i> open low woodland over <i>Eriachne benthamii</i>, <i>Eriachne mucronata</i> and <i>Themeda triandra</i> very open tussock grassland. • Vegetation mosaic of mulga groves (<i>Acacia aneura</i> complex) and plains • <i>Grevillea berryana</i> open low woodland over <i>Acacia ?ramulosa</i> hybrid open shrubland to tall open shrubland over <i>Eremophila exillifolia</i> and <i>Eremophila jucunda</i> subsp. <i>jucunda</i> low shrubland over <i>Eriachne mucronata</i> very open tussock grassland to open tussock grassland. 	Taxa: 101 Families: 25 Genera: 58	'Degraded' to 'Excellent'	None
G & G Environmental Pty Ltd (2011)	<u>Location:</u> North-east of Newman – includes a rail corridor <u>Study Type:</u> Level 2 survey <u>Survey date:</u> October 2010 and March 2011 <u>Size of survey area:</u> 79 km (linear)	Approximately 200 km north-east of the Study Area	Forty-one vegetation formations were identified, comprised broadly of: <ul style="list-style-type: none"> • Hummock Grasslands • Acacia forests and woodlands • Acacia open woodlands • Acacia shrublands • Other shrublands • Eucalypt woodlands • Tussock grasslands • Grasslands. 	Taxa: 340 Families: 46 Genera: 147	Very Good to Pristine (96% of vegetation was considered as Excellent to Pristine)	None
Outback Ecology (2006)	<u>Location:</u> Mining tenement M52/766; exploration tenement E52/1455. <u>Study Type:</u> Level 2 survey for M52/766 and level 1 reconnaissance survey for E52/1455. <u>Survey Date:</u> 26-30 June 2006 <u>Survey area size:</u> 1, 000 ha	Immediately west of Study Area	Twenty-one vegetation associations grouped according to the following landforms: major creekline, minor creeklines, stony plain and stony hills/ridgeline.	Taxa: 133 Families: 38 Genera: 81	Excellent to Degraded	None

Reference	Study details	Proximity to Study Area	Vegetation Units	Flora Recorded	Vegetation Condition	Species and communities of conservation significance
Desmond et al. (2001)	<p><u>Location:</u> Augustus subregion</p> <p><u>Study Type:</u> Government report (overview of priority flora in Augustus subregion)</p> <p><u>Survey Date:</u> Published 2001</p>	Regional assessment	N/A	N/A	N/A	<ul style="list-style-type: none"> • <i>Acacia wilcoxii</i> (P1); • <i>Eremophila arguta</i> (P1); • <i>Eremophila flaccida</i> subsp. <i>attenuata</i>; • <i>Eremophila gracillima</i> (P3); • <i>Eremophila lanata</i> (P3); • <i>Eremophila prolata</i> (P1); • <i>Eremophila rigida</i> (P3); • <i>Goodenia berringbinensis</i> (P4); • <i>Hemigenia pachyphylla</i> (P1); • <i>Homalocalyx chapmanii</i> (P2); • <i>Pityrodia augustensis</i> (VU); • <i>Ptilotus luteolus</i> (P3); • <i>Ptilotus lazaridis</i> (P3); • <i>Ptilotus trichocephalus</i> (P4); • <i>Rhodanthe frenchii</i> (P2) and • <i>Stylidium weeliwolli</i> (P3).
Dames and Moore (1988)	<p><u>Location:</u> Fortnum Project, 40km northwest of Peak Hill</p> <p><u>Study Type:</u> Level 1 survey</p> <p><u>Survey Date:</u> 28-30 September 1988</p> <p><u>Size of survey area:</u> 1, 200 ha</p>	80 km south of Study Area	N/A	Taxa: 59	N/A	None

Table 4-2: Key findings of fauna studies conducted within the vicinity of the Study Area

Reference	Study Details	Proximity to Study Area	Fauna Habitats	Fauna Assemblages Recorded	Species of Conservation Significance
Stantec (2018)	<u>Location</u> : the Project <u>Study Type</u> : Level 1 fauna survey <u>Survey date</u> : May 2018 <u>Size of survey area</u> : 1, 357 ha	Immediately west of Study Area	Five fauna habitats were identified: <ul style="list-style-type: none"> • Banded mulga on plain; • Riparian; • Open shrubland on stony plain; • Drainage; and • Gully. 	27 taxa including: <ul style="list-style-type: none"> • 22 families • 26 genera 	None
Phoenix (2017)	<u>Location</u> : Beyondie Potash Project <u>Study Type</u> : Level 2 survey including systematic trapping, motion cameras, bat recording units, and targeted searches <u>Survey Date</u> : 13-23 April 2015 <u>Size of survey area</u> : 19, 588.5 ha	170 km east of Study Area	Ten fauna habitats were identified: <ul style="list-style-type: none"> • Shrubland and Grassland on Sandplain; • Woodland on Stony Plain; • Salt Lake; • Rocky Hill; • Shrubland and Grassland Mosaic on Sandplain and Dune; • Shrubland and Grassland on Dune; • Freshwater Lake; • Creek and Drainage Line; • Shrubland and Grassland on Calcrete; and • Woodland on Dune. 	128 taxa including: <ul style="list-style-type: none"> • 55 families • 98 genera 	<ul style="list-style-type: none"> • Brush-tailed Mulgara (P4) • Bilby (Vu, S3) • Northern Marsupial Mole (P4) • <i>Lerista macropisthopus remota</i> (P2)
Outback Ecology (2006)	<u>Location</u> : Mining tenement M52/776. <u>Study Type</u> : Level 1 survey. <u>Survey Date</u> : 26-30 June 2006 <u>Survey area size</u> : 1, 000 ha	Immediately west of Study Area	Four fauna habitats were identified: <ul style="list-style-type: none"> • Hills and Ridges; • Stony Uplands; • Stony Plains and • Drainage lines. 	41 taxa including: <ul style="list-style-type: none"> • 31 families • 37 genera 	<ul style="list-style-type: none"> • Western Pebble-mound Mouse (P4, disused mounds recorded)
Desmond et al. (2001)	<u>Location</u> : Augustus subregion <u>Study Type</u> : Government report (overview of priority fauna in Augustus subregion) <u>Survey Date</u> : Published 2001	Overview of Augustus subregion	Habitats associated with priority fauna include: <ul style="list-style-type: none"> • Low Mulga Woodland; • Open Mulga Woodland; • Sparse, low Mulga Woodland; • Mulga Scrublands; • Hummock Grassland (Mulga and <i>Eucalyptus</i> over <i>Triodia</i>) 	6 taxa including: <ul style="list-style-type: none"> • 6 families • 6 genera 	<ul style="list-style-type: none"> • Crest-tailed Mulgara (Vu, P4) • Bilby (Vu, S3) • Peregrine Falcon (S7) • Princess Parrot (Vu, P4) • Yinnietharra Rock Dragon (Vu, S3)
Dames and Moore (1988)	<u>Location</u> : Fortnum Project, 40km northwest of Peak Hill <u>Study Type</u> : Level 1 survey <u>Survey Date</u> : 28-30 September 1988 <u>Size of survey area</u> : 1, 200 ha	78.9 km south of Study Area	Two fauna habitats were identified: <ul style="list-style-type: none"> • Low Mulga Woodland on Hills; and • Sparse Mulga Woodland on Plains. 	53 taxa including: <ul style="list-style-type: none"> • 38 families • 47 genera 	<ul style="list-style-type: none"> • Western Pebble-mound Mouse (P4, disused mounds recorded)

4.1.1 Flora

A total of 22 flora taxa of conservation significance were recorded from the desktop assessment (**Appendix D**). One taxon, *Pityrodia augustensis*, is listed as Vulnerable under the BC Act, seven taxa were listed as Priority 1, three were listed as Priority 2, nine were listed as Priority 3 and two were listed as Priority 4. The likelihood of occurrence of these taxa within the Study Area was assessed based on the criteria detailed in **Section 3.1.3**. Two taxa were considered 'likely' to occur (*Eremophila gracillima* [P3] and *Eremophila humilis* [P31]), four taxa were considered as 'possible' to occur (two P1 taxa and two P3 taxa) and the remaining 16 taxa of conservation significance were considered 'unlikely' to occur within the Study Area.

The threatened species, *Pityrodia augustensis*, was detected via the PMST, which listed the species or species habitat as 'likely to occur within the area' (DoEE 2018a). A review of the recorded specimens of this taxa held by the WA Herb indicates that the closest record of this species is over approximately 150 km west of the Study Area (WAH 2018). The species was not recorded during previous surveys within the vicinity of the Study Area, however, was included in the subregion overview, which provides context rather than data specific to the Study Area (**Section 3.1.2**).

The species *Acacia tuberculata*, *Eremophila appressa*, *Eremophila coacta*, *Owenia acidula*, *Ptilotus actinocladius* T.Hammer & R.W.Davis and *Thysanotus* sp. Desert East of Newman (R.P. Hart 964) were listed on the DBCA TP List, which is searched according to place names rather than coordinates. A review of the recorded specimens held by the WA Herb indicates that all of the above taxa records within the last 20 years do not occur in close proximity to the Study Area; the closest of these occurs greater than 90 km from the Study Area, with some occurring over 200 km from the Study Area (WAH 2018). Further to this, these species have not been recorded during any previous surveys within the vicinity of the Project or Study Area (**section 3.1.2**)

4.1.2 Vegetation

No TECs or PECs were identified from the Threatened and Priority Ecological Community database (DBCA 2018a) or the DoEE PMST (DoEE 2018a) as occurring within the Project or Study Area. One PEC occurs in close proximity to the Study Area, the Diorite Land System (P3), which is located just under 16 km to the southwest (Figure 1-1). The Diorite Land System consists of low bald or sparse *Acacia* shrublands on basaltic domes and low rough hills. Desmond *et al.* (2001) lists 19 ecosystems that are at risk within the Augustus subregion. Several of the ecosystems include invertebrate assemblages of river pools and springs that are restricted and do not occur in the Study Area (Desmond *et al.* 2001). The remaining ecosystems include terrestrial vegetation, however they are restricted to landforms or habitat that do not occur within the Study Area (e.g. plant assemblages of Robinson Range) (Desmond *et al.* 2001).

4.1.3 Fauna

The desktop study identified 219 species of vertebrate fauna which have been recorded and/or have the potential to occur within the Study Area (**Appendix E**). This total comprises 27 native mammal, nine introduced mammal, 112 native bird, 63 native reptile, and eight amphibian species. Many of these species are unlikely to occur in the Study Area because, as is leading practice, these records have been collected from a large area encompassing a wide range of habitats, many of which do not occur within the Study 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.

Of the 219 species of vertebrate fauna identified during the desktop, 26 species are listed as being of conservation significance, comprising eight mammals, 15 birds and three reptiles (**Table 4-3**).

Table 4-3: Fauna of conservation significance identified during the desktop assessment

Species Name	Common Name	EPBC ¹	WA ¹
Birds			
<i>Anas querquedula</i>	Garganey	Mi	S5
<i>Apus pacificus</i>	Fork-tailed Swift	Mi	S5
<i>Charadrius veredus</i>	Oriental Plover	Mi	S5
<i>Falco peregrinus</i>	Peregrine Falcon		S7
<i>Hirundo rustica</i>	Barn Swallow	Mi	S5
<i>Motacilla cinerea</i>	Grey Wagtail	Mi	S5
<i>Motacilla flava</i>	Yellow Wagtail	Mi	S5
<i>Pezoporus occidentalis</i>	Night Parrot	En	S1
<i>Polytelis alexandrae</i>	Princess Parrot	Vu	P4
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi	S5
<i>Calidris ferruginea</i>	Curlew Sandpiper	Cr; Mi	S3; S5
<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi	S5
<i>Calidris ruficollis</i>	Red-necked Stint	Mi	S5
<i>Tringa hypoleucos</i>	Common Sandpiper	Mi	S5
<i>Tringa nebularia</i>	Common Greenshank	Mi	S5
Mammals			
<i>Dasyercus blythi</i>	Brush-tailed Mulgara		P4
<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara	Vu	P4
<i>Dasyurus hallucatus</i>	Northern Quoll	En	S2
<i>Macroderma gigas</i>	Ghost Bat	Vu	S3
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse		P4
<i>Notoryctes caurinus</i>	Northern Marsupial Mole		P4
<i>Rhinonicteris aurantius Pilbara form'</i>	Pilbara Leaf-nosed Bat	Vu	S3
<i>Macrotis lagotis</i>	Bilby	Vu	S3
Reptiles			
<i>Ctenophorus yinnietharra</i>	Yinnietharra Rock Dragon	Vu	S3

Species Name	Common Name	EPBC ¹	WA ¹
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	Vu	S3
<i>Lerista macropisthopus remota</i>			P2

1= Conservation codes and descriptions are detailed within **Appendix A**.

4.2 Field Survey Results

4.2.1 Flora Composition

A total of 55 flora taxa (including subspecies, varieties and forms) were recorded from the Study Area, representing 19 families and 26 genera (**Appendix F**). Of these, five could not be identified confidently beyond family level and two could not be identified confidently to genus level, due to insufficient material for identification. The most represented families were Fabaceae (legumes), Poaceae (grasses) and Malvaceae (malvas) and the most represented genera were *Acacia* (wattles) with ten individuals, *Eremophila* (poverty bush) with eight individuals and *Dodonaea*, *Eriachne*, *Senna* and *Ptilotus* with three individuals (**Table 4-4**). Three of the *Acacia* species recorded within the Study Area belong to the Western Australian Mulga Flora Group (*Acacia aneura* F.Muell. ex Benth. and its close relatives) (Maslin and Reid 2012).

Table 4-4: Families and genera most represented in the Study Area

Family	Total taxa
Fabaceae	13
Poaceae	10
Malvaceae	8
Genus	Total taxa
<i>Acacia</i>	10
<i>Eremophila</i>	8
<i>Dodonaea</i> , <i>Eriachne</i> , <i>Senna</i> and <i>Ptilotus</i>	3

4.2.2 Flora of Conservation Significance

Despite extensive sampling and targeted searching, no state or Commonwealth listed Threatened flora or DBCA listed Priority flora were recorded within the Study Area.

4.2.2.1 Post-survey Likelihood of Occurrence of Conservation Significant Flora

Following the field survey, with a greater understanding of the habitat types that occur within the Study Area, all Threatened and Priority flora species recorded from the desktop assessment are considered as 'unlikely' to occur. Species that were considered as 'likely' or 'possible' to occur in the desktop assessment have a perennial lifeform and it is unlikely that, if present, they would have gone unnoticed at the time of the survey. In addition, none of these species would be restricted to the Study Area as indicated by the vouchered records listed by the WAH (WAH 2018).

4.2.2.2 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 Study Area during the field survey are of 'other' significance. The native vascular flora taxa recorded from the Study Area are all represented in the local and regional area and no unique taxa were recorded.

4.2.2.1 Introduced Flora

Introduced flora species were compared to the Western Australian Organisms List (WAOL) (Department of Agriculture and Food WA (DAFWA)) to determine if any have been listed as declared pest and the Weeds of National Significance (WoNS) list. No introduced flora taxa were recorded from the Study Area.

4.2.3 Vegetation

A total of five vegetation types were identified in the Study Area (**Table 4-5; Figure 4-1**). In general, the vegetation of the Study Area consisted of mixed *Acacia* open shrublands over a mid-layer of predominantly *Eremophila* spp. over a very open tussock grass layer on stony to sandy plains. The most extensive vegetation type was a mosaic of two vegetation types also recorded in the Abra Project Area: GbArrAiEf/GbArrExEjjEm and occupied just under 50% of the Study Area.

Minor branches of the Five Mile Creek, a small tributary of the Ethel River, occurs in the north-western border of the Study Area, representing the AcAcPISpSchs vegetation type also recorded in the Abra Project Area. The AiAcEspp occurs in ephemeral drainage that runs through the eastern section of the Study Area.

4.2.3.1 Vegetation Condition

With the exception of a previously cleared access track (3%), vegetation condition of the Study Area was assessed as 'excellent' (**Figure 4-2**). Minor disturbances were identified in the form of feral scats, trampling and grazing, however, vegetation structure remained intact and no weed species were recorded.

Table 4-5: Summary of Vegetation Types recorded in the Survey Area

Vegetation type code	Vegetation Type Description	Relevés & Mapping Notes	Extent		Representative Photograph
			Hectares	Proportion of Survey Area (%)	
AcAcPISpSchs	<p><i>Acacia citrinoviridis</i> (<i>Grevillea berryana</i>) low woodland over <i>Acacia citrinoviridis</i> and <i>Psydrax latifolia</i> (<i>Acacia aneura</i> and <i>Acacia ?ramulosa</i> var. <i>ramulosa</i>) tall shrubland over <i>Sida ?sp.</i> spiciform panicles (E. Leyland 14/08/90), <i>Senna cuthbertsonii</i> and <i>Hibiscus sturtii</i> var. <i>forrestii</i> open shrubland to shrubland</p> <p><u>Associated species:</u> <i>Acacia incurvaneura</i>, <i>Acacia kempeana</i>, <i>Aristida contorta</i>, <i>Cheilanthes sieberi</i>, <i>Eremophila forrestii</i> subsp. <i>?forrestii</i>, <i>Eriachne benthamii</i>, <i>Eriachne pulchella</i> subsp. <i>pulchella</i>, <i>Fimbristylis dichotoma</i>, <i>Hibiscus coatesii</i>, and <i>Solanum lasiophyllum</i>.</p>	AAr02 AAr03 AAr04	1.53	0.6	
AiAcEspp	<p><i>Acacia incurvaneura</i> and <i>Acacia citrinoviridis</i> tall open shrubland over <i>Eremophila</i> spp. open shrubland.</p> <p><u>Associated species:</u> <i>Acacia ramulosa</i> var. <i>ramulosa</i>, <i>Acacia rhodophloia</i>, <i>Acacia tetragonophylla</i>, <i>Eragrostis eriopoda</i>, <i>Grevillea berryana</i>, <i>Psydrax latifolia</i>, <i>Ptilotus schwartzii</i> and <i>Senna</i> sp. Meekatharra (E. Bailey 1-26).</p>	AAr12 AAr13 AAr14 AAmn02	7.35	2.6	

Vegetation type code	Vegetation Type Description	Relevés & Mapping Notes	Extent		Representative Photograph
			Hectares	Proportion of Survey Area (%)	
GbArrAiEf/GbArrExEjEm	<p>Mosaic of:</p> <p>A- <i>Grevillea berryana</i> open low woodland over <i>Acacia ?ramulosa</i> var. <i>ramulosa</i> and <i>Acacia incurvaneura</i> tall shrubland to open scrub over <i>Eremophila forrestii</i> subsp. <i>?forrestii</i> open low shrubland and;</p> <p>B- <i>Grevillea berryana</i> open low woodland over <i>Acacia ?ramulosa</i> hybrid open shrubland to tall open shrubland over <i>Eremophila exilifolia</i> and <i>Eremophila jucunda</i> subsp. <i>jucunda</i> low shrubland over <i>Eriachne mucronata</i> very open tussock grassland to open tussock grassland.</p> <p><u>Associated species:</u> <i>Acacia citrinoviridis</i>, <i>Acacia kempeana</i>, <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>Acacia rhodophloia</i>, <i>Aristida contorta</i>, , <i>Eriachne pulchella</i> subsp. <i>pulchella</i> and <i>Ptilotus schwartzii</i></p>	AAr01 AAr05 AAr06	131.44	47.3	
AiArrEfEe	<p><i>Acacia incurvaneura</i> and <i>Acacia ramulosa</i> var. <i>ramulosa</i> tall open shrubland over <i>Eremophila forrestii</i> open shrubland over <i>Eragrostis eriopoda</i> very open tussock grassland.</p> <p><u>Associated species:</u> <i>Acacia citrinoviridis</i>, <i>Acacia kempeana</i>, <i>Acacia pruinocarpa</i>, <i>Acacia pteraneura</i>, <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>Acacia rhodophloia</i>, <i>Aristida contorta</i>, <i>Eremophila ?granitica</i>, <i>Eremophila citrina</i>, <i>Eremophila fraseri</i>, <i>Eremophila spectabilis</i>, <i>Eriachne mucronata</i>, <i>Eriachne pulchella</i> subsp. <i>pulchella</i>, <i>Grevillea berryana</i>, <i>Marsdenia australis</i>, <i>Psyrax latifolia</i>, <i>Ptilotus obovatus</i>, <i>Ptilotus schwartzii</i>, <i>Senna</i> sp. <i>Meekatharra</i> (E. Bailey 1-26), <i>Sida</i> sp. <i>Golden calyces</i> and <i>Solanum lasiophyllum</i>.</p>	AAr07 AAr08 AAr09 AAr15	74.94	26.9	

Vegetation type code	Vegetation Type Description	Relevés & Mapping Notes	Extent		Representative Photograph
			Hectares	Proportion of Survey Area (%)	
ArlApEsppEe	<p><i>Acacia ramulosa</i> var. <i>linophylla</i> and <i>Acacia pteraneura</i> tall shrubland over <i>Eremophila</i> spp. low shrubland over <i>Eragrostis eriopoda</i> open tussock grassland.</p> <p><u>Associated species:</u> <i>Acacia incurvaneura</i>, <i>Acacia ramulosa</i> var. <i>ramulosa</i>, <i>Acacia rhodophloia</i>, <i>Aristida contorta</i>, <i>Grevillea berryana</i>, <i>Senna artemisioides</i> subsp. <i>helmsii</i>, <i>Senna</i> sp. Meekatharra (E. Bailey 1-26) and <i>Triodia basedowii</i>.</p>	AAr10 AAr11 AAr16	62.91	22.6	
			278.17	100	

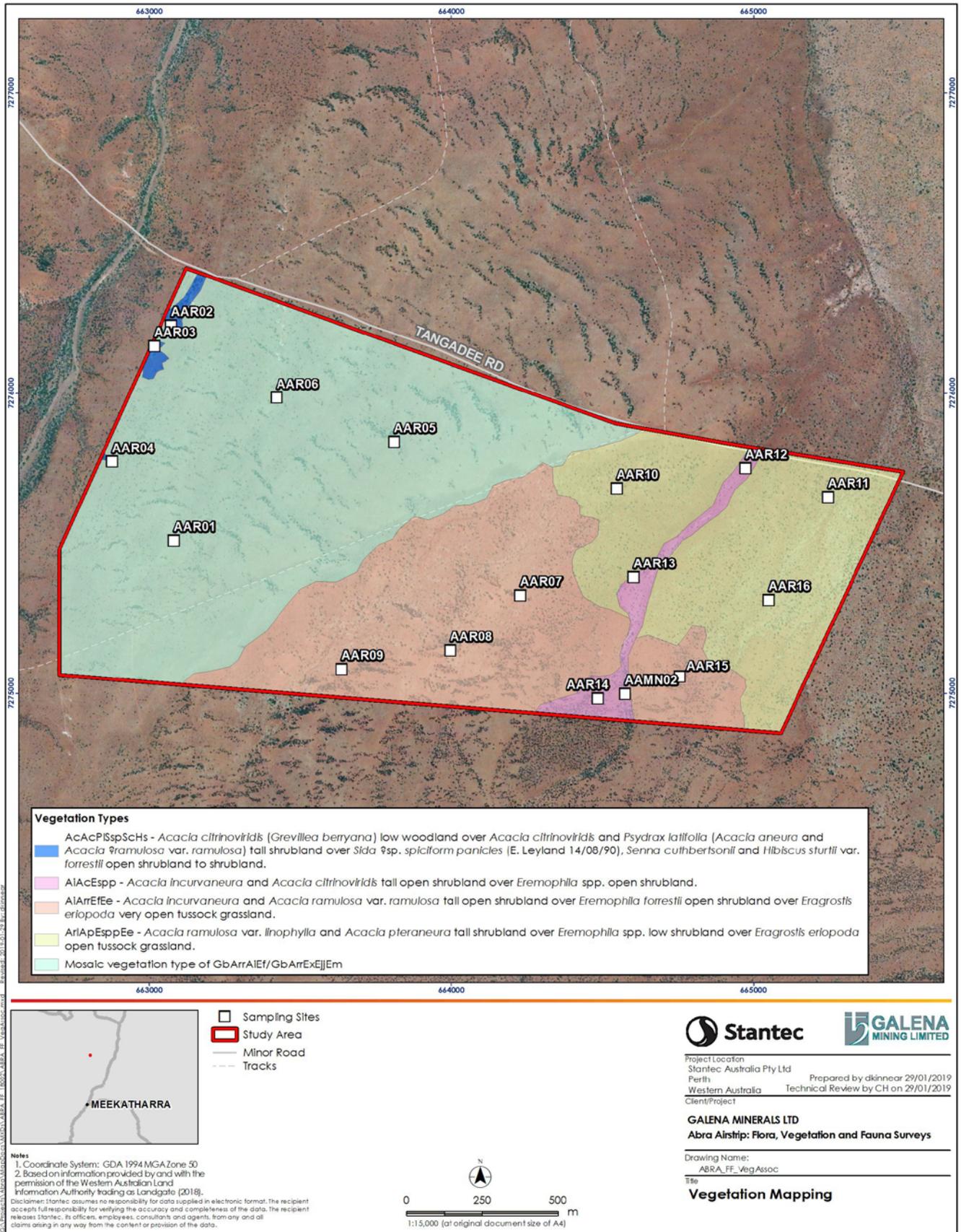


Figure 4-1: Vegetation types identified in the Study Area

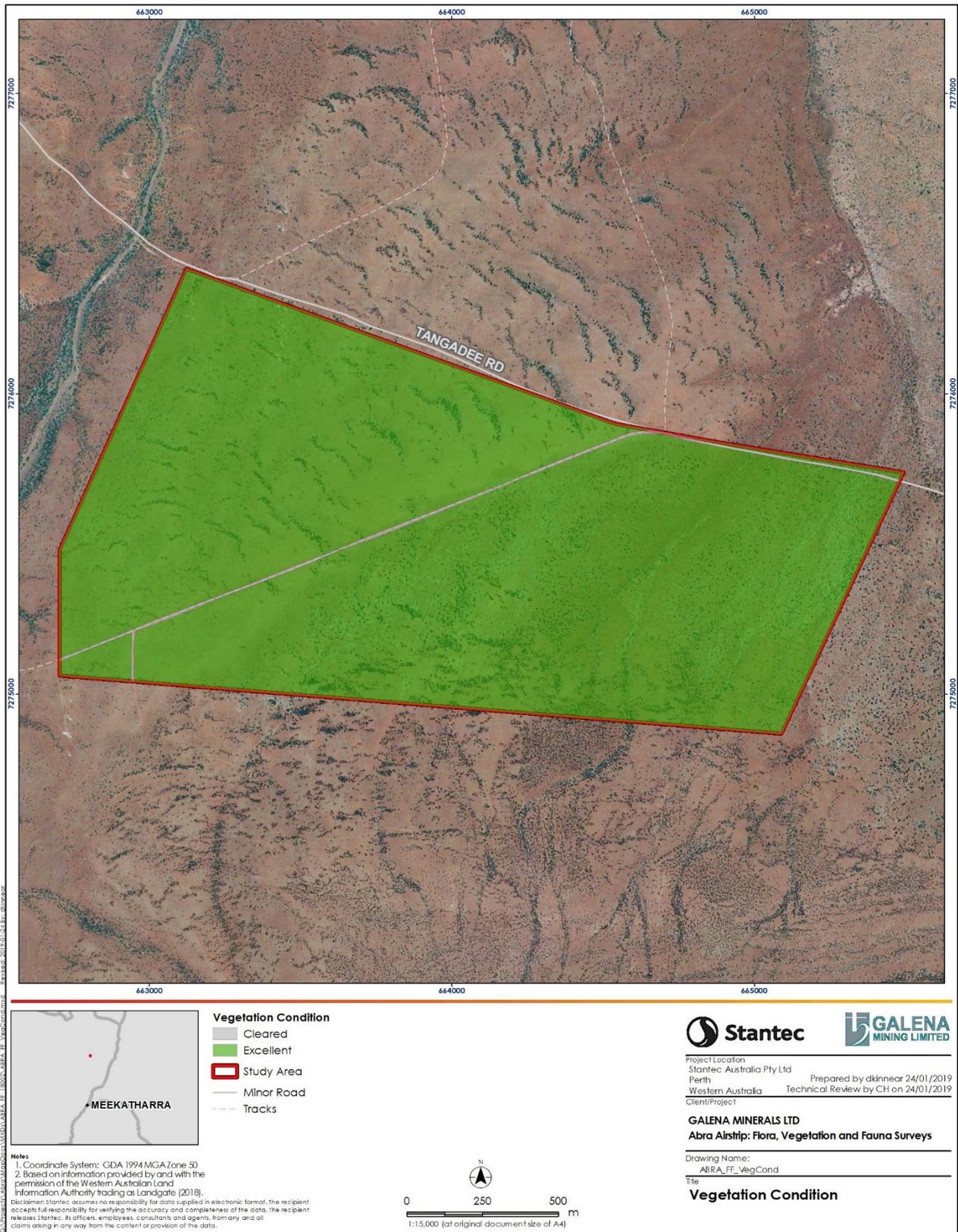


Figure 4-2: Vegetation condition of the Study Area

4.2.4 Terrestrial Fauna

4.2.4.1 Fauna Habitat

Three broad fauna habitats were identified and delineated from fauna habitat assessments conducted across the Study Area (**Table 4-6**). These comprised;

- Drainage;
- Open shrubland on sandy plain; and
- Open shrubland on stony plain.

These habitats differed primarily in the composition of their vegetation and substrate, particularly presence of rocky fragments, alcoves and the likelihood of seasonal water inundation. Most habitats contained rocky substrates. The habitat types in the Study Area were assessed on their extents and levels of significance according to the following criteria:

- **Distribution:** those habitats widespread and common within the surrounding regions were categorised as widespread; otherwise they were categorised as being of limited extent. All fauna habitats were considered widespread.
- **Significance:** those habitats considered important to species of conservation significance or distinct fauna assemblages are deemed significant; otherwise they were categorised as being of limited significance. No habitats were classified as significant.

Table 4-6: Broad fauna habitats identified within the Study Area

Habitat Type	Proportion of Study Area		Associated Vegetation Types	Condition	Value to Fauna	Reference Photograph
	Ha	%				
Drainage • Widespread • Limited Significance	8.8	3.2	AiAcEsp AcAcPISpSchs	Excellent	<p>Drainage areas tended to have increased vegetation cover compared to other habitat types and were prone to flooding. This comprised of an upper <i>Acacia</i> sp. storey over <i>Dodonaea</i> sp., <i>Eremophila</i> sp. and tussock grasses. The increased vegetation cover provided woody debris, and on the rare occasion peeling bark. Some drainage areas comprised sandy substrates (left), while others comprised clay loams with rocky fragments and minor gullies (right). Drainage areas were affected by cattle trampling and grazing.</p> <p>Drainage areas would provide suitable habitat for a range of mammals, reptiles and birds owing to increased shelter availability (vegetation cover, woody debris). This is particularly prevalent in minor gully drainages, where erosion and rocky substrates provided crevices and alcoves. The upper storey may provide nesting and/ or roosting for bird species, and when inundated drainage habitats may support wetland birds and amphibians.</p>	
Open shrubland on sandy plain • Widespread • Limited Significance	62.91	22.6	ArlApEspEe	Excellent	<p>Comprised <i>Acacia</i> sp. shrubland over <i>Eremophila</i> sp. and open tussock grasses on sandy clay loam plains. These areas contained woody debris, termite mounds and occasionally peeling bark, and were affected by feral trampling and grazing.</p> <p>Tall vegetation within sandy shrublands may provide nesting and/ or roosting for bird species, and areas with woody debris would provide shelter for reptiles and mammals.</p>	

Habitat Type	Proportion of Study Area		Associated Vegetation Types	Condition	Value to Fauna	Reference Photograph
	Ha	%				
Open shrubland on stony plain <ul style="list-style-type: none"> • Widespread • Limited Significance 	206.38	74.2	GbArrAIef/GbArrExEjEm AiArrEfEe	Excellent	<p>Varied from open stony plains with a sparse cover of low shrubs and tussock grasses (left) to areas comprising <i>Acacia</i> sp. and <i>Grevillea berryana</i> over <i>Eremophila</i> sp., <i>Ptilotus</i> sp. and tussock grasses (right). Vegetation occurred over stony substrates, and this habitat contained woody debris, minimal peeling bark and termite mounds. Areas were disturbed by cattle trampling and grazing.</p> <p>Areas with sparse vegetation are unlikely to serve as significant habitat for fauna owing to the lack of shelter. However, areas with tall vegetation may provide nesting and/ or roosting for bird species, and areas with woody debris would provide shelter for reptiles and mammals.</p>	

4.2.4.2 Fauna of Conservation Significance

Of the 219 species of vertebrate fauna identified during the desktop study, 26 species are listed as being of conservation significance, comprising eight mammals, 15 birds and three reptiles (**Table 4-3**). Of the 26-vertebrate species in the desktop study:

- Ten are listed as Threatened under the EPBC Act and/or BC Act;
- Six 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;
- One species is listed as recognised by state (BC Act) to be in need of special protection; and
- Twelve species are listed as Migratory under the EPBC Act and/or Schedule 5 under the BC Act.

Some of the species referred to above, listed as Threatened, Migratory and/or Priority fauna, may be included in multiple groups. The likelihood for species of conservation significance occurring in the Study Area was assessed and ranked (**Table 4-3**).

The rankings were assigned following definitions described in the desktop study methodology (**Section 3.1.3**) and conservation significance codes were determined using DBCA and EPBC Act guidelines (**Appendix A**). Of the conservation significant fauna, one species was considered 'possible' to occur; the Peregrine Falcon (S7), the remaining were assessed as 'unlikely' to occur.

Table 4-7: Conservation significant fauna identified during desktop assessment and likelihood of occurrence within the Study Area

Common name (<i>Scientific name</i>)	Conservation status		Broad habitat type	Likelihood of occurrence Reason for likelihood
	EPBC	WA		
Mammals				
Brush-tailed Mulgara (<i>Dasyercus blythi</i>)		P4	Known to inhabit spinifex grasslands (van Dyck and Strahan 2008).	Unlikely The Study Area occurs within the species range, however there are no nearby records of the species since 1993 (DBCA 2018b, van Dyck and Strahan 2008) The species was trapped in an area ~170km east of the Study Area, and numerous signs of activity were noted in suitable sandplain habitat (Phoenix 2017). However, the Study Area lacks spinifex sandplains, and therefore the species is considered unlikely to occur.
Crest-tailed Mulgara (<i>Dasyercus cristicauda</i>)	Vu	P4	Known to inhabit open sand dunes with limited canegrass cover and near salt lakes with Nitre Bush (van Dyck and Strahan 2008).	Unlikely Although two species of Mulgara are known to occur in Australia, it is now recognised that only the Brush-tailed Mulgara (<i>Dasyercus blythi</i>) (Priority 4 DBCA) occurs within Western Australia (DoEE 2018, (DoEE 2018b, van Dyck and Strahan 2008). The Crest-tailed Mulgara (<i>Dasyercus cristicauda</i>) (Vulnerable EPBC Act) is restricted in its distribution to the eastern portion of the Northern Territory, South Australia and potentially Queensland (DoEE 2018b, van Dyck and Strahan 2008).
Northern Quoll (<i>Dasyurus hallucatus</i>)	En	S2	Favour rocky habitats, also found in eucalyptus woodlands and forests and near settlements (van Dyck and Strahan 2008).	Unlikely While the species or species habitat was listed as 'likely to occur' (DoEE 2018a), the Study Area occurs well outside of the species current range and the species has not been recorded nearby (van Dyck and Strahan 2008).
Bilby (<i>Macrotis lagotis</i>)	Vu	S3	Patchily distributed in the northern arid to semi-arid regions (van Dyck and Strahan 2008).	Unlikely The Study Area lies outside of the species current range, and the species has not been recorded nearby since 1970 (DBCA 2018b, van Dyck and Strahan 2008). As such, the species is considered unlikely to occur.
Northern Marsupial Mole (<i>Notoryctes caurinus</i>)		P4	Sand dune deserts, particularly the Great and Little Sandy Deserts (van Dyck and Strahan 2008).	Unlikely The Study Area occurs well outside of the species current range, and the species has not been recorded nearby (van Dyck and Strahan 2008). The species was recorded ~170km east of the Study Area within suitable dune habitat, however as the Study Area does not contain dunes the species is considered unlikely to occur (Phoenix 2017).

Common name (<i>Scientific name</i>)	Conservation status		Broad habitat type	Likelihood of occurrence Reason for likelihood
	EPBC	WA		
Western Pebble-mound Mouse (<i>Pseudomys chapmanii</i>)		P4	Gentle rocky spinifex slopes (van Dyck and Strahan 2008).	Unlikely The Study Area lies outside of the species current range, which is largely restricted to the central and southern Pilbara, Little Sandy Desert and an isolated population in the Gascoyne recorded in 1997 (van Dyck and Strahan 2008). The closest sighting of the species occurred in 1995 55km east of the Study Area (Strahan 2004). Only inactive mounds were recorded within the adjacent area in 2006 (Outback Ecology 2006). Furthermore, no mounds were detected during the 2018 Stantec survey of the same area (Stantec 2018). As such, the species is considered unlikely to occur.
Pilbara Leaf-nosed Bat (<i>Rhinionicteris aurantius</i> Pilbara form')	Vu	S3	Inhabit humid roosts, which occur in rocky gorges or abandoned mine shafts (van Dyck and Strahan 2008).	Unlikely The Study Area lies outside the species current range, which is restricted to the Pilbara, and lacks suitable gorge habitat (van Dyck and Strahan 2008). The closest record of the species lies 56km to the northwest and was recorded in 1999 (DBCA 2018c). As such, the species is considered unlikely to occur.
Ghost Bat (<i>Macroderma gigas</i>)	Vu	S3	Inhabits a wide range of habitats, from arid areas of the Pilbara to northern rainforests (van Dyck and Strahan 2008).	Unlikely The species or species habitat was listed as 'likely to occur' (DoEE 2018a). However the Study Area lies outside of the species range, which occurs within the Pilbara and Kimberley in WA (van Dyck and Strahan 2008). The species has not been recorded nearby, and is considered unlikely to occur.
Birds				
Garganey (<i>Anas querquedula</i>)	Mi	S5	Sewage ponds and well vegetated freshwater wetlands (Pizzey and Knight 2007).	Unlikely The species has not been recorded nearby since 1980, and the Study Area does not contain suitable habitat (DBCA 2018c, Pizzey and Knight 2007). The species is uncommon within Australia, migrating to Northern tropical areas in summer and remaining vagrant elsewhere (Pizzey and Knight 2007).
Fork-tailed Swift (<i>Apus pacificus</i>)	Mi	S5	The species has an aerial habitat mainly over open areas ranging from coasts to semi-deserts, and may also occur over forests and urban areas (Pizzey and Knight 2007).	Unlikely The species or species habitat was listed as 'likely to occur', and the Study Area lies within the known species range (Pizzey and Knight 2007). However the species has not been recorded in the area.

Common name (<i>Scientific name</i>)	Conservation status		Broad habitat type	Likelihood of occurrence Reason for likelihood
	EPBC	WA		
Oriental Plover (<i>Charadrius veredus</i>)	Mi	S5	Large open areas including plains, muddy and sandy wastes near swamps and mudflats, ploughed land, claypans and open turf e.g. airfields (Pizzey and Knight 2007).	Unlikely The species or species habitat was listed as 'may occur', however the Study Area does not contain suitable habitat (DoEE 2018a, Pizzey and Knight 2007). The species has not been recorded nearby, and the Study Area lies outside of the species range (Pizzey and Knight 2007).
Peregrine Falcon (<i>Falco peregrinus</i>)		S7	The species occurs along cliffs, gorges, wooded rivers, wetlands, plains and open woodlands, as well as in association with pylons and buildings (Pizzey and Knight 2007). Nests on cliffs, in crevices, large tree hollows, in nests of other large birds or on building ledges (Pizzey and Knight 2007).	Possible The Study Area occurs within the species range and the species has been recorded between 90 and 95km from the Study Area, most recently in 2012 (DBCA 2017, Pizzey and Knight 2007). However three of the four records occur along the Great Northern Highway, where the species is likely to rest on pylons (DBCA 2017, Pizzey and Knight 2007). While the Study Area does not contain trees large enough to serve as suitable nesting habitat, the species may still forage over the area from time to time. As such the species is considered as 'possible' to occur but would not be dependent on any of the habitats in the Study Area.
Barn Swallow (<i>Hirundo rustica</i>)	Mi	S5	Open areas, particularly near water, such as agricultural land, also in urban areas and rail yards (Pizzey and Knight 2007).	Unlikely Species or species habitat was listed as may occur, however the Study Area occurs outside of the species range, does not contain suitable habitat and the species has not been recorded nearby (DoEE 2018a, Pizzey and Knight 2007).
Yellow Wagtail (<i>Motacilla flava</i>) and Grey Wagtail (<i>Motacilla cinerea</i>)	Mi	S5	Both species inhabit sewage ponds and lawn fields, however the Grey Wagtail also occurs along streams in escarpments, rainforests and unused quarries while the Yellow Wagtail occurs in swamp edges, short grass, bare ground and saltmarshes (Pizzey and Knight 2007).	Unlikely The species or species habitat was listed as 'may occur', however the species are summer vagrants that inhabit areas well outside the Study Area (closest range occurs along the northern coast) (Pizzey and Knight 2007). The species have not been recorded nearby and are considered unlikely to occur.
Night Parrot (<i>Pezoporus occidentalis</i>)	En	S1	Known to inhabit treeless or sparsely wooded long unburnt spinifex hummock plains often interspersed with chenopods (Pyke and Ehrlich 2014).	Unlikely The Study Area does not contain suitable habitat and the species is rare and has not been recorded nearby since 1912 (DBCA 2017, Strahan 2004). As such, the species is considered unlikely to occur.

Common name (<i>Scientific name</i>)	Conservation status		Broad habitat type	Likelihood of occurrence Reason for likelihood
	EPBC	WA		
Princess Parrot (<i>Polytelis alexandrae</i>)	Vu	P4	Areas with spinifex or near succulents around salt lakes, usually far from freshwater (Pizzey and Knight 2007).	Unlikely The Study Area occurs within the species irregular range, does not contain suitable habitat and the species has not been recorded nearby since 1919 (DBCA 2017, Pizzey and Knight 2007). As such, the species is considered unlikely to occur.
Sandpipers, stints and greenshanks from the family <i>Scolopacidae</i> .	Mi	S5	Habitats associated with water including wetland and lake margins, floodwaters, mudflats, saltmarshes and salt fields, swamps, intertidal flats and estuaries (Pizzey and Knight 2007).	Unlikely Six species were listed within this family. However, these species favour shallow aquatic habitats not present within the Study Area, and the species have not been recorded recently nearby (DBCA 2017, Pizzey and Knight 2007). Due to this, they are considered unlikely to occur.
Reptiles				
Yinnietharra Rock Dragon (<i>Ctenophorus yinnietharra</i>)	Vu	S3	Low weathered granite outcrops; basks on low rocks and shrubs (Wilson and Swan 2013).	Unlikely The species is limited to granite outcrops near Yinnietharra Station (outside of the Study Area), and has not been recorded nearby (Wilson and Swan 2013).
Unpatterned robust slider (subsp.) <i>Lerista macropisthopus remota</i>		P2	Acacia shrublands and woodlands in semi-arid and arid areas (Wilson and Swan 2013).	Unlikely The Study Area may contain suitable habitat, however the subspecies is restricted to a small range to the east of the Study Area (Wilson and Swan 2013). The species has also not been recorded nearby, and is therefore considered unlikely to occur.
Pilbara Olive Python (<i>Liasis olivaceus barroni</i>)	Vu	S3	Gorges and escarpments, often associated with water (Wilson and Swan 2013).	Unlikely The subspecies is restricted to the Pilbara, the Study Area contains unsuitable habitat and the subspecies has not been recorded nearby (Wilson and Swan 2013).

4.3 Survey Limitations and Constraints

There are a number of possible limitations and constraints that can impinge on the adequacy of vegetation, flora and fauna survey (DPaW 2016a, EPA 2016). These are summarised in **Table 4-8**, with respect to the survey of the Study Area.

Table 4-8: Potential limitations and constraints of the field survey

Factor	Constraint	Comments
Competency and experience of consultants	No	The field personnel, Alice Bott and Shane Chalwell have appropriate qualifications and experience to undertake the relevant components of the flora, vegetation and fauna survey. The specimen identifications were undertaken by Alice Bott and Crystal Heydenrych, who have extensive experience in WA.
Scope	No	The scope was well-defined and the flora, vegetation, fauna and their habitats were surveyed using standardised and well-established techniques. The desktop study was undertaken prior to the surveys to inform surveyors of the potential occurrence of factors of environmental significance.
Proportion of species identified	No	<p>Given the relatively small extent of the Study Area (217 ha) and the uniformity of the landscapes within the Study Area, the flora taxa inventory is comparable to counts obtained during previous surveys of a similar scope in the vicinity of the Study Area (Section 4.1).</p> <p>Survey sampling, timing, and intensity was considered adequate for the identification of most perennial species. Of the flora taxa recorded from the Study Area, five could not be identified confidently beyond family level and two could not be identified confidently to genus level. None of taxa that could not be identified resembled any of the potential flora of conservation concern that occur in the area.</p> <p>All vertebrate fauna encountered were identified and habitats were assessed for their importance to vertebrate fauna and fauna of conservation significance.</p>
Information sources (e.g. historic or recent)	Partial	<p>There is a paucity of information in the immediate vicinity of the Study Area, aside from the surveys undertaken by Outback Ecology in 2006 and Stantec in 2018 of the Abra Project Area. The literature review considered surveys that had been undertaken within a wide radius of the Study Area to account for this. Information was additionally supplemented by from database searches, which considered large search areas i.e. 40 to 100 km.</p> <p>Regional contextual information was also obtained from historic vegetation mapping conducted by Beard (1975b, 1990), Shepherd <i>et al.</i> (2002), soil and landform mapping (Payne <i>et al.</i> 1988), IBRA classification system information (Desmond <i>et al.</i> 2001) and previous flora and fauna surveys conducted in the wider region.</p>
Completeness and intensity	No	A total of 16 relevés and fauna habitat assessments and two mapping notes were sampled across the Study Area. This was sufficient to adequately sample all broad vegetation types, fauna habitats and flora within the Study Area.

Factor	Constraint	Comments
Timing / weather / season / cycle	No	The survey took place outside of the recommended season for flora and vegetation surveys within the Gscoyne bioregion EPA (2016a) and seasonal conditions were sub-optimal, with below average rainfall received in the 12 months preceding the survey. Most flora taxa, however, could be identified from vegetative material and this was not regarded as a significant limitation.
Disturbances	No	Vegetation condition is presented within Section 4.2.3.1 and shows that the Study Area was in 'excellent' condition. Minimal disturbance had been noted as a result of clearing for access tracks and impacts from feral fauna, however, none of these disturbances limited the outcomes of this report.
Resources	No	Resources were adequate to carry out the survey and the survey participants were competent in identification of species present. WAH herbarium specimens, taxonomic guides, DBCA database searches and the FloraBase database were all used to prepare for the survey and used for the confirmation of any flora or fauna species where identification was uncertain.
Remoteness / access problems	No	All survey sites were easily accessible by vehicle and on foot.

5. Summary

The field survey was undertaken outside of the recommended timeframe for the bioregion, following below average rainfall preceding the field survey. Despite dry seasonal conditions, the Study Area was adequately surveyed through a combination of relevés, mapping notes and fauna habitat assessments to compile a representative species list of the Study Area and to characterise the vegetation types and habitat types present.

It is possible that some of the annual and ephemeral flora taxa that occur in the Study Area may not have been recorded during the field survey, however, it is unlikely that any Threatened or Priority flora species would have gone unnoticed. Three Priority flora species were assessed as 'possible' to occur within the Study Area, based on the post-survey assessment of likelihood of occurrence; all three of these species are perennial and are easily recognisable.

Five vegetation types were mapped within the Study Area, including two vegetation types that were reconciled to previous mapping undertaken for the adjacent Abra Project. The vegetation types recorded represent what would be expected from similar landforms in the broader Augustus subregion and none are analogous to any Commonwealth or State listed TECs or PECs. Due to minimal disturbance of vegetation present, the vegetation condition was 'excellent' throughout the Study Area.

Three broad fauna habitats were identified within the Study Area; open shrubland on sandy plain, open shrubland on stony plain and drainage. All were considered widespread and of limited significance for potential conservation significant vertebrate fauna.

No species of conservation significance were recorded during the current survey. One species of conservation significance was considered 'possible' to occur based on species range and previous records; the Peregrine Falcon (*S7*). The Study Area does not contain suitable nesting habitat for the species, however it may forage over the Study Area from time to time without being dependent on any particular habitat. The remaining species of conservation significance were assessed as 'unlikely' to occur in the Study Area.

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A close-up photograph of a hand reaching out from the left side of the frame. The hand is silhouetted against a bright, golden sunset sky. The sun is low on the horizon, creating a strong lens flare and illuminating the scene with a warm, orange glow. The background is filled with the soft, out-of-focus stalks of a wheat field. The overall mood is serene and contemplative.

Appendices

Appendix A Codes and Terms Used to Describe Species of Conservation Significance

Flora and fauna may be accorded legislative protection by being listed under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBC Act) and/or the Biodiversity Conservation Act 2016 (WA) (BC Act), or by being listed on the WA Department of Environment and Conservation's 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.

Definitions of codes and terms used to describe flora and fauna of conservation significance.

Categories used under the EPBC Act		
Status	Code	Description
Critically Endangered	Cr	Taxa that is considered to be facing an extremely high risk of extinction in the wild in the immediate future
Endangered	En	Taxa that is considered to be facing a very high risk of extinction in the wild in the near future
Vulnerable	Vu	Taxa that is 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

Schedules used under the BC Act			Description
Status	Code	Schedule	
Critically Endangered	Cr	S1	Taxa that is rare or likely to become extinct, as critically endangered taxa
Endangered	En	S2	Taxa that is rare or likely to become extinct, as endangered taxa
Vulnerable	Vu	S3	Taxa that is rare or likely to become extinct, as vulnerable taxa
Presumed Extinct	Ex	S4	Taxa that is presumed to be extinct
Migratory	Mi	S5	Birds that are subject to international agreements relating to the protection of migratory birds
Conservation Dependent	CD	S6	Taxa that are of special conservation need being species dependent on ongoing conservation intervention
Special Protection	SP	S7	Taxa that is in need of special protection

Appendix B **Vegetation Condition Scale: Eremaean Province**

Code	Description
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered obvious signs of disturbance. For example, 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. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires, or aggressive weeds.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, 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 or shrubs.

Appendix C **Vegetation Structure Scale**

NVIS Vegetation Structural Classifications							
Cover Characteristics							
Foliage cover *	70-100	30-70	10-30	<10	≈0	0-5	unknown
Crown cover **	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
% Crown cover ***	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
Cover code	d	c	i	r	bi	bc	unknown

Growth Form	Height ranges (m)	Structural Formation Classes						
tree, palm	>30 Tall	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
	10-30 Mid							
	<10 Low							
tree mallee	10-30 Tall	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees
	<10 Mid							
	<3 Low							
shrub, cycad, grass-tree, fern	>2 Tall	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs
	1-2 Mid							
	<1 Low							
mallee shrub	10-30 Tall							mallee shrubs

Growth Form	Height ranges (m)	Structural Formation Classes						
	<10 Mid	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	
	<3 Low							

Growth Form	Height ranges (m)	Structural Formation Classes						
heath shrub	>2 Tall	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs
	1-2 Mid							
	<1 Low							
chenopod shrub	>2 Tall	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs
	1-2 Mid							
	<1 Low							
samphire shrub	>0.5 Mid	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrubs
	<0.5 Low							
hummock grass	>2 Tall	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses
	<2 Low							
tussock grass	>0.5 Mid	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grasses
	<0.5 Low							
other grass	>0.5 Mid	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses
	<0.5 Low							
sedge	>0.5 Mid	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges
	<0.5 Low							
rush	>0.5 Mid	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes
	<0.5 Low							

Growth Form	Height ranges (m)	Structural Formation Classes						
forb	>0.5 Mid	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forbs
	<0.5 Low							
fern	>2 Tall	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	ferns
	1-2 Mid							
	<1 Low							
bryophyte	<0.5	closed bryophyte land	bryophyte land	open bryophyte land	sparse bryophyte land	isolated bryophytes	isolated clumps of bryophytes	bryophytes
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens
vine	>30 Tall	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines
	10-30 Mid							
	<10 Low							
aquatic	<1 Tall	closed aquatic bed	aquatic bed	open aquatic bed	sparse aquatics	isolated aquatics	isolated clumps of aquatics	aquatics
	0-0.5 Low							
seagrass	<1 Tall	closed seagrass bed	Seagrass bed	open seagrass bed	sparse seagrass bed	isolated seagrasses	isolated clumps of seagrasses	seagrasses

Appendix D Likelihood of Occurrence of Conservation Significant Flora in the Study Area

Species	Conservation Code			Habitat	Life Form	Nearest known locality (km)	Pre-survey likelihood of occurrence	Post-survey likelihood of occurrence	Source
	EPBC Act	BC Act	DBCA						
<i>Pityrodia augustensis</i>	VU	VU	VU	Amongst rocks on slopes or in drainage lines.	Perennial	112	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies outside of the known distribution for this species.	Desmond <i>et al.</i> (2001)
<i>Acacia wilcoxii</i>			1	Granitic soils. Along creeks & adjacent stony plains & granite outcrops.	Perennial	44	Unlikely: No granite outcrops are known to occur in the study area.	Unlikely: The Study Area does not contain suitable habitat for this species.	TPFL, TP List; WAHerb
<i>Eremophila appressa</i>			1	Ironstone gravel. Ridge slopes.	Perennial	116	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies outside of the known distribution for this species and does not contain suitable habitat.	TP List
<i>Eremophila arguta</i>			1	The edge of floodplains, in dry creek beds and on road verges.	Perennial	98	Possible: The Study Area lies outside of the known distribution but may contain suitable habitat	Unlikely: The Study Area lies outside of the known distribution for this species and does not contain suitable habitat.	Desmond <i>et al.</i> (2001)
<i>Eremophila humilis</i>			1	Stony clay, loam. Rocky ridges.	Perennial	1.6	Likely: The Study Area contains suitable habitat for this species and known records are located within proximity.	Unlikely: The Study Area does not contain suitable habitat for this species. If present, this species could have been identified from vegetative material, however, despite extensive searches, it was not recorded.	TP List; WAHerb
<i>Eremophila prolata</i>			1	Red stony clay. Flats & rises.	Perennial	82	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies outside of the known distribution for this species.	Desmond <i>et al.</i> (2001)
<i>Hemigenia pachyphylla</i>			1	Watercourses, minor creeks, red sandy soils with rocks.	Perennial	270	Unlikely: The Study Area lies well outside of the known distribution for this species.	Unlikely: The Study Area lies well outside of the known distribution for this species.	Desmond <i>et al.</i> (2001)
<i>Ptilotus actinocladus</i> <i>T.Hammer & R.W.Davis</i>			1	Bare areas, flat, seasonally inundated areas.	Annual	130	Possible: There is limited information available regarding the distribution and habitat requirements for this species.	Unlikely: The Study Area does not contain suitable habitat for this species. If present, this species could have been identified from vegetative material, however, despite extensive searches, it was not recorded.	TP List
<i>Acacia tuberculata</i>			2	Granite outcrops	Perennial	530	Unlikely: The Study Area lies outside of the known distribution range for this species and there are no granite outcrops known to occur in the Study Area.	Unlikely: The Study Area is located well outside of the known distribution range of this species and does not contain granite outcrops.	TP List
<i>Rhodanthe frenchii</i>			2	Stony hills, rocky river banks & outcrops.	Annual	285	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies well outside of the known distribution for this species.	Desmond <i>et al.</i> (2001)
<i>Thysanotus sp. Desert East of Newman</i> <i>(R.P. Hart 964)</i>			2	Red-brown loamy sand or red sand, sometimes silty. Sand plain, pisolitic buckshot plain.	Perennial	445	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies well outside of the known distribution for this species.	TP List
<i>Eremophila coacta</i>			3	Laterite, shale soils. Ironstone hills, creeklines.	Perennial	155	Possible: The Study Area lies outside of the known distribution for this species but may contain suitable habitat.	Unlikely: The Study Area lies outside of the known distribution for this species and does not contain suitable habitat.	TP List
<i>Eremophila flaccida subsp. attenuata</i>			3	Stony clay over quartzite. Hillslopes, ridges.	Perennial	270	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies well outside of the known distribution for this species and does not contain suitable habitat.	TP List
<i>Eremophila gracillima</i>			3	Stony flats	Perennial	3	Likely: The Study Area contains suitable habitat for this species and known records are located within proximity.	Unlikely: If present, this species could have been identified from vegetative material, however, despite extensive searches, it was not recorded.	Desmond <i>et al.</i> (2001)
<i>Eremophila lanata</i>			3	Stony red clayey sand.	Perennial	117	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies outside of the known distribution for this species.	TPFL, TP List; WAHerb

Species	Conservation Code			Habitat	Life Form	Nearest known locality (km)	Pre-survey likelihood of occurrence	Post-survey likelihood of occurrence	Source
	EPBC Act	BC Act	DBCA						
<i>Eremophila rigida</i>			3	Red sand alluvium. Hardpan plains, stony clay depressions.	Perennial	29	Possible: The Study Area lies just outside of the known distribution of this species but may contain suitable habitat	Unlikely: The Study Area does not contain suitable habitat for this species. If present, this species could have been identified from vegetative material, however, despite extensive searches, it was not recorded.	Desmond <i>et al.</i> (2001)
<i>Owenia acidula</i>			3	Clay plains.	Perennial	371	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies well outside of the known distribution for this species and does not contain suitable habitat.	TPFL; TP List; WAHerb
<i>Ptilotus lazaridis</i>			3	Clay loam. Floodplains.	Perennial	230	Unlikely: The Study Area does not contain suitable habitat for this species.	Unlikely: The Study Area lies well outside of the known distribution for this species and does not contain suitable habitat.	TP List
<i>Ptilotus luteolus</i>			3	Rocky slopes, screes and ridges.	Perennial	132	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies outside of the known distribution for this species and does not contain suitable habitat.	Desmond <i>et al.</i> (2001)
<i>Stylidium weeliwoilli</i>			3	Gritty sand soil, sandy clay. Edge of watercourses.	Annual	180	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies outside of the known distribution for this species.	Desmond <i>et al.</i> (2001)
<i>Ptilotus trichocephalus</i>			4	Sandy soils. Colluvial plains.	Perennial	51	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area does not contain suitable habitat for this species. If present, this species could have been identified from vegetative material, however, despite extensive searches, it was not recorded.	WAHerb
<i>Goodenia berringbinensis</i>			4	Red sandy loam. Along watercourses.	Annual	135	Unlikely: The Study Area lies outside of the known distribution for this species.	Unlikely: The Study Area lies outside of the known distribution for this species.	Desmond <i>et al.</i> (2001)

Appendix E Vertebrate Fauna Identified in the Desktop Assessment

Legend:

Desktop Searches:

- A Galena Minerals Ltd: Abra Flora, Fauna and Vegetation Survey (Stantec 2018)
- B Birddata: Custom Atlas Bird List (Birdlife Australia 2017)
- C Threatened and Priority Fauna Database (DBCA 2017)
- D NatureMap Database (DBCA 2018b)
- E Protected Matters Search Tool (DoEE 2018a)

Literature Review

- F Gascoyne 3 (GAS3 - Augustus subregion) (Desmond *et al.* 2001)
- G Flora and Fauna Survey: Fortnum Project for Homestake Australia Limited (Dames and Moore 1988)
- H Desktop Vertebrate Fauna Assessment and Reconnaissance Survey of the Mulgul Project (Outback Ecology 2006)
- I Terrestrial fauna survey for the Beyondie Potash Project, Prepared for Kalium Lakes Ltd, Draft Report (Phoenix 2017)

Family	Species Name	Common Name	EPBC	WA	A	B	C	D	E	F	G	H	I
Amphibians													
Hylidae	<i>Cyclorana maini</i>	Sheep Frog			x								x
	<i>Cyclorana platycephala</i>	Western Water-holding Frog						x					x
	<i>Litoria rubella</i>	Little Red Tree Frog			x			x					x
Limnodynastidae	<i>Neobatrachus aquilonius</i>	Northern Burrowing Frog											x
	<i>Neobatrachus sudellae</i>	Desert Trilling Frog											x
	<i>Neobatrachus sutor</i>	Shoemaker Frog											x
	<i>Notaden nichollsi</i>	Desert Spadefoot											x
Myobatrachidae	<i>Uperoleia micromeles</i>	Tanami Toadlet											x
Birds													
Acanthizidae	<i>Acanthiza apicalis</i>	Inland Thornbill			x	x		x				x	
	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill				x		x					
	<i>Acanthiza iredalei iredalei</i>									x			
	<i>Acanthiza robustirostris</i>	Slaty-backed Thornbill				x		x					x
	<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				x		x			x		x
	<i>Aphelocephala leucopsis</i>	Southern Whiteface				x		x					
	<i>Gerygone fusca</i>	Western Gerygone			x			x					x
	<i>Pyrrholaemus brunneus</i>	Redthroat				x		x					x
	<i>Smicronis brevirostris</i>	Weebill				x		x			x	x	x
Accipitridae	<i>Accipiter cirrocephalus</i>	Collared Sparrowhawk				x		x					
	<i>Accipiter fasciatus</i>	Brown Goshawk											x
	<i>Aquila audax</i>	Wedge-tailed Eagle				x		x			x		x
	<i>Elanus caeruleus</i>	Black-shouldered Kite											x
	<i>Haliastur sphenurus</i>	Whistling Kite				x		x					x
	<i>Hamirostra isura</i>	Square-tailed Kite									x		
	<i>Hamirostra melanosternon</i>	Black-breasted Buzzard				x		x					x
	<i>Hieraaetus morphnoides</i>	Little Eagle											x
Alaudidae	<i>Mirafra javanica</i>	Horsfield's Bushlark											x
Alcedinidae	<i>Todiramphus sanctus</i>	Sacred Kingfisher									x		
Anatidae	<i>Anas gracilis</i>	Grey Teal											x
	<i>Anas querquedula</i>	Garganey	Mi	S5			x						
	<i>Anas superciliosa</i>	Pacific Black Duck									x		
	<i>Cygnus atratus</i>	Black Swan											x
Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	Mi	S5					x				
Ardeidae	<i>Ardea modesta</i>	Eastern Great Egret					x		x				
	<i>Ardea novaehollandiae</i>	White-faced Heron									x		
	<i>Ardea pacifica</i>	White-necked Heron				x		x					x
Artamidae	<i>Artamus cinereus</i>	Black-faced Woodswallow			x	x		x				x	x
	<i>Artamus minor</i>	Little Woodswallow				x		x					
	<i>Artamus personatus</i>	Masked Woodswallow											x
Cacatuidae	<i>Cacatua roseicapilla</i>	Galah				x		x				x	x
	<i>Cacatua sanguinea</i>	Little Corella											x
	<i>Nymphicus hollandicus</i>	Cockatiel				x		x					
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike				x		x					x

Family	Species Name	Common Name	EPBC	WA	A	B	C	D	E	F	G	H	I
	<i>Coracina novaehollandiae subpallida</i>							x					
	<i>Lalage tricolor</i>	White-winged Triller				x						x	
Caprimulgidae	<i>Eurostopodus argus</i>	Spotted Nightjar			x	x		x					
Charadriidae	<i>Charadrius melanops</i>	Black-fronted Dotterel						x					
	<i>Charadrius veredus</i>	Oriental Plover	Mi	S5					x				
	<i>Vanellus tricolor</i>	Banded Lapwing											x
Columbidae	<i>Geopelia cuneata</i>	Diamond Dove						x			x	x	
	<i>Geopelia striata</i>	Peaceful Dove				x		x					
	<i>Ocyphaps lophotes</i>	Crested Pigeon			x	x		x			x	x	x
	<i>Phaps chalcoptera</i>	Common Bronzewing			x	x		x					
Corvidae	<i>Corvus bennetti</i>	Little Crow									x	x	
	<i>Corvus orru</i>	Torresian Crow			x						x		
Cracticidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird			x	x		x				x	x
	<i>Cracticus tibicen</i>	Australian Magpie			x	x		x			x		
	<i>Cracticus torquatus</i>	Grey Butcherbird				x		x			x		
Cuculidae	<i>Cacomantis pallidus</i>	Pallid Cuckoo									x		
	<i>Chrysococcyx basalis</i>	Horsfield's Bronze Cuckoo									x		
Dromaiidae	<i>Dromaius novaehollandiae</i>	Emu				x		x			x		x
Estrildidae	<i>Taeniopygia guttata</i>	Zebra Finch			x	x		x			x	x	x
Falconidae	<i>Falco berigora</i>	Brown Falcon				x		x				x	
	<i>Falco cenchroides</i>	Australian Kestrel			x	x		x			x	x	x
	<i>Falco peregrinus</i>	Peregrine Falcon		S7			x			x			
Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	Mi	S5					x				
	<i>Petrochelidon nigricans</i>	Tree Martin				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
	<i>Malurus leucopterus</i>	White-winged Fairy-wren											x
	<i>Malurus splendens</i>	Splendid Fairy-wren				x		x				x	
Meliphagidae	<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater				x		x			x	x	x
	<i>Certhionyx variegatus</i>	Pied Honeyeater				x		x				x	x
	<i>Epthianura tricolor</i>	Crimson Chat				x		x					
	<i>Gavicalis virescens</i>	Singing Honeyeater			x	x		x					x
	<i>Lacustroica whitei</i>	Grey Honeyeater						x					
	<i>Lichmera indistincta</i>	Brown Honeyeater									x		
	<i>Manorina flavigula</i>	Yellow-throated Miner				x		x					x
	<i>Melithreptus gularis</i>	Black-chinned Honeyeater											x
	<i>Ptilotula keartlandi</i>	Grey-headed Honeyeater											x
	<i>Ptilotula penicillatus</i>	White-plumed Honeyeater				x							x
	<i>Purnella albifrons</i>	White-fronted Honeyeater				x		x			x		x
	<i>Sugomel niger</i>	Black Honeyeater				x							x
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater					x		x		x		x
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark				x		x			x	x	x
Motacillidae	<i>Anthus australis</i>	Australian Pipit				x					x	x	x

Family	Species Name	Common Name	EPBC	WA	A	B	C	D	E	F	G	H	I
	<i>Motacilla cinerea</i>	Grey Wagtail	Mi	S5					x				
	<i>Motacilla flava</i>	Yellow Wagtail	Mi	S5					x				
Neosittidae	<i>Daphoenositta chrysoptera</i>	Varied Sittella										x	
Oreoicidae	<i>Oreoica gutturalis</i>	Crested Bellbird			x	x		x			x	x	x
Otididae	<i>Ardeotis australis</i>	Australian Bustard						x			x		x
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey Shrike-thrush			x	x		x				x	
	<i>Pachycephala rufiventris</i>	Rufous Whistler				x		x			x	x	x
Petroicidae	<i>Melanodryas cucullata</i>	Hooded Robin			x	x		x					x
	<i>Microeca fascinans</i>	Jacky Winter											x
	<i>Petroica goodenovii</i>	Red-capped Robin				x		x				x	
Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	Little Black Cormorant				x		x					
Phasianidae	<i>Coturnix pectoralis</i>	Stubble Quail				x		x					
Pomatostomidae	<i>Pomatostomus superciliosus</i>	White-browed Babbler				x		x			x	x	
	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler				x		x					x
Psittacidae	<i>Melopsittacus undulatus</i>	Budgerigar				x		x				x	x
	<i>Neophema bourkii</i>	Bourke's Parrot									x		
	<i>Pezoporus occidentalis</i>	Night Parrot	En	S1			x	x	x				
	<i>Platycercus varius</i>	Mulga Parrot			x	x					x	x	
	<i>Platycercus zonarius</i>	Australian Ringneck			x	x		x			x	x	
	<i>Polytelis alexandrae</i>	Princess Parrot	Vu	P4			x		x	x			
Psophodidae	<i>Cinclosoma clarum</i>	Western Chestnut Quail-thrush						x				x	
	<i>Cinclosoma marginatum</i>	Western Quail-thrush						x					
	<i>Cinclosoma castaneothorax</i>	Chestnut-breasted Quail-thrush			x	x							
Ptilonorhynchidae	<i>Ptilonorhynchus maculatus guttatus</i>	Western Bowerbird										x	
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail			x	x		x			x	x	x
Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	Mi	S5					x				
	<i>Calidris ferruginea</i>	Curlew Sandpiper	Cr; Mi	S3; S5					x				
	<i>Calidris melanotos</i>	Pectoral Sandpiper	Mi	S5					x				
	<i>Calidris ruficollis</i>	Red-necked Stint	Mi	S5			x						
	<i>Tringa hypoleucos</i>	Common Sandpiper	Mi	S5					x				
	<i>Tringa nebularia</i>	Common Greenshank	Mi	S5			x						
Strigidae	<i>Ninox boobook boobook</i>	Southern Boobook									x		
Turnicidae	<i>Turnix velox</i>	Little Button-quail											x
Mammals													
Bovidae	<i>Bos taurus</i>	*European Cattle			x							x	x
Camelidae	<i>Camelus dromedarius</i>	*Camel							x		x		x
Canidae	<i>Canis familiaris</i>	*Dog			x			x	x				
	<i>Vulpes vulpes</i>	*Red Fox						x	x			x	x
Dasyuridae	<i>Dasyercus blythi</i>	Brush-tailed Mulgara		P4				x					x
	<i>Dasyercus cristicauda</i>	Crest-tailed Mulgara	Vu	P4						x			
	<i>Dasykaluta rosamondae</i>	Little Red Kaluta											x
	<i>Dasyurus hallucatus</i>	Northern Quoll	En	S2					x				
	<i>Ningai ridei</i>	Wongai Ningai											x
	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart											x

Family	Species Name	Common Name	EPBC	WA	A	B	C	D	E	F	G	H	I	
	<i>Sminthopsis macroura</i>	Stripe-faced Dunnart											x	
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat											x	
Equidae	<i>Equus asinus</i>	*Donkey							x			x	x	
	<i>Equus caballus</i>	*Horse							x					
Felidae	<i>Felis catus</i>	*Cat			x				x		x	x	x	
Leporidae	<i>Oryctolagus cuniculus</i>	*Rabbit							x		x	x	x	
Macropodidae	<i>Osphranter robustus erubescens</i>											x		
	<i>Osphranter rufus</i>	Red Kangaroo			x						x	x	x	
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	Vu	S3					x					
Molossidae	<i>Austronomus australis</i>	White-striped Freetail-bat									x		x	
	<i>Chaerephon jobensis</i>	Greater Northern Freetail-bat											x	
	<i>Ozimops lumsdenae</i>	Northern Free-tailed Bat											x	
Muridae	<i>Mus musculus</i>	*House Mouse									x		x	
	<i>Notomys alexis</i>	Spinifex Hopping-mouse											x	
	<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse		P4			x	x				x		
	<i>Pseudomys desertor</i>	Desert Mouse											x	
	<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse											x	
	<i>Zyomys argurus</i>	Common Rock-rat										x		
Notoryctidae	<i>Notoryctes caurinus</i>	Northern Marsupial Mole		P4									x	
Rhinonycteridae	<i>Rhinonycteris aurantius Pilbara form'</i>	Pilbara Leaf-nosed Bat	Vu	S3			x		x					
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna									x		x	
Thylacomyidae	<i>Macrotis lagotis</i>	Bilby	Vu	S3			x	x		x			x	
Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat						x			x		x	
	<i>Nyctophilus geoffroyi</i>	Lesser Long-eared Bat											x	
	<i>Scotorepens greyii</i>	Little Broad-nosed Bat											x	
	<i>Vespadelus finlaysoni</i>	Finlayson's Cave Bat											x	
Reptiles														
Agamidae	<i>Ctenophorus caudicinctus caudicinctus</i>						x							
	<i>Ctenophorus caudicinctus mensarum</i>				x		x							
	<i>Ctenophorus isolepis gularis</i>												x	
	<i>Ctenophorus nuchalis</i>	Central Netted Dragon										x	x	
	<i>Ctenophorus reticulatus</i>	Western Netted Dragon						x						
	<i>Ctenophorus scutulatus</i>											x	x	
	<i>Ctenophorus yinnietharra</i>	Yinnietharra Rock Dragon	Vu	S3						x				
	<i>Diporiphora paraconvergens</i>	Grey-striped Western Desert Dragon												x
	<i>Diporiphora valens</i>	Southern Pilbara Tree Dragon												x
	<i>Gowidon longirostris</i>	Long-nosed Dragon							x					x
	<i>Moloch horridus</i>	Thorny Devil										x		
	<i>Pogona minor minor</i>	Western Bearded Dragon												x
Carphodactylidae	<i>Nephrurus laevis</i>												x	
	<i>Nephrurus levis</i>												x	
Cheluidae	<i>Chelodina steindachneri</i>	Flat-shelled Turtle						x						
Diplodactylidae	<i>Diplodactylus conspicillatus</i>	Variable Fat-tailed Gecko											x	

Family	Species Name	Common Name	EPBC	WA	A	B	C	D	E	F	G	H	I
	<i>Diplodactylus laevis</i>	Desert Fat-tailed Gecko											X
	<i>Lucasium stenodactylum</i>										X		X
	<i>Rhynchoedura ornata</i>	Western Beaked Gecko											X
	<i>Strophurus ciliaris aberrans</i>												X
	<i>Strophurus elderi</i>							X					X
Elapidae	<i>Pseudechis australis</i>	Mulga Snake									X		X
	<i>Pseudonaja mengdeni</i>	Western Brown Snake											X
	<i>Simoselaps anomalus</i>	Desert Banded Snake											X
	<i>Simoselaps bertholdi</i>	Jan's Banded Snake									X		
	<i>Suta fasciata</i>	Rosen's Snake						X					
Gekkonidae	<i>Gehyra punctata</i>							X					
	<i>Gehyra variegata</i>				X						X		X
	<i>Heteronotia binoei</i>	Bynoe's Gecko						X					X
Pygopodidae	<i>Delma nasuta</i>							X					
	<i>Lialis burtonis</i>							X					X
Pythonidae	<i>Aspidites melanocephalus</i>	Black-headed Python									X		
	<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	Vu	S3					X				
Scincidae	<i>Ctenotus brooksi</i>												X
	<i>Ctenotus calurus</i>												X
	<i>Ctenotus grandis grandis</i>												X
	<i>Ctenotus hanloni</i>												X
	<i>Ctenotus inornatus</i>												X
	<i>Ctenotus leae</i>												X
	<i>Ctenotus leonhardii</i>												X
	<i>Ctenotus pantherinus ocellifer</i>										X		X
	<i>Ctenotus quattuordecimlineatus</i>												X
	<i>Ctenotus schomburgkii</i>										X		X
	<i>Cyclodomorphus melanops</i>	Slender Blue-tongue						X					
	<i>Cyclodomorphus melanops melanops</i>												X
	<i>Egernia depressa</i>	Southern Pygmy Spiny-tailed Skink											X
	<i>Eremiascincus musivus</i>	Mosaic Desert Skink											X
	<i>Eremiascincus pallidus</i>	Western Narrow-banded Skink											X
	<i>Eremiascincus richardsonii</i>	Broad-banded Sand Swimmer											X
	<i>Lerista bipes</i>												X
	<i>Lerista ips</i>												X
	<i>Lerista macropisthopus remota</i>				P2								X
	<i>Lerista muelleri</i>											X	
<i>Lerista neander</i>								X					
<i>Lerista timida</i>								X					
<i>Morethia ruficauda exquisita</i>								X					
<i>Tiliqua multifasciata</i>	Central Blue-tongue												X
Typhlopidae	<i>Anilius endoterus</i>												X
Varanidae	<i>Varanus eremius</i>	Pygmy Desert Monitor											X
	<i>Varanus giganteus</i>	Perentie									X		

Family	Species Name	Common Name	EPBC	WA	A	B	C	D	E	F	G	H	I
	<i>Varanus gouldii</i>	Sand Monitor									x	x	
	<i>Varanus panoptes</i>	Yellow-spotted Monitor											x
	<i>Varanus tristis tristis</i>	Racehorse Monitor									x		

Appendix F Inventory of Vascular Flora Recorded

Family	Species
	<i>Ptilotus aervoides</i>
	<i>Ptilotus obovatus</i>
Amaranthaceae	<i>Ptilotus schwartzii</i>
Apocynaceae	<i>Marsdenia australis</i>
Caryophyllaceae	<i>Polycarpaea corymbosa</i>
Chenopodiaceae	<i>Rhagodia eremaea</i>
Cyperaceae	<i>Fimbristylis dichotoma</i>
Euphorbiaceae	<i>Euphorbia boophthona/ tannensis</i>
	<i>Acacia ?macraneura</i>
	<i>Acacia citrinoviridis</i>
	<i>Acacia incurvaneura</i>
	<i>Acacia kempeana</i>
	<i>Acacia pruinocarpa</i>
	<i>Acacia pteraneura</i>
	<i>Acacia ramulosa</i> var. <i>linophylla</i>
	<i>Acacia ramulosa</i> var. <i>ramulosa</i>
	<i>Acacia rhodophloia</i>
	<i>Acacia tetragonophylla</i>
	<i>Senna artemisioides</i> subsp. <i>helmsii</i>
	<i>Senna cuthbertsonii</i>
Fabaceae	<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)
Goodeniaceae	<i>Goodenia ? tenuiloba</i>
	<i>Hibiscus burtonii</i>
	<i>Hibiscus coatesii</i>
	<i>Sida</i> sp. Golden calyces
Malvaceae	<i>Sida</i> sp.
	Myrtaceae sp.
Myrtaceae	<i>Calytrix desolata</i>
Nyctaginaceae	<i>Boerhavia coccinea</i>
	<i>Aristida contorta</i>
	<i>Cymbopogon ambiguus</i>
	<i>Enneapogon robustissimus</i>
	<i>Eragrostis eriopoda</i>
	<i>Eriachne benthamii</i>
	<i>Eriachne mucronata</i>
	<i>Eriachne pulchella</i> subsp. <i>pulchella</i>
	Poaceae sp.
Poaceae	<i>Triodia basedowii</i>
Proteaceae	<i>Grevillea berryana</i>
Pteridaceae	<i>Cheilanthes sieberi</i>
	<i>Psydrax latifolia</i>
Rubiaceae	<i>Psydrax suaveolens</i>
Santalaceae	<i>Santalum spicatum</i>
	<i>Dodonaea pachyneura</i>
Sapindaceae	<i>Dodonaea petiolaris</i>

	<i>Dodonaea sp.</i>
	<i>Eremophila ?granitica</i>
	<i>Eremophila citrina</i>
	<i>Eremophila exillifolia</i>
	<i>Eremophila forrestii</i> subsp. ? <i>forestii</i>
	<i>Eremophila fraseri</i> subsp. <i>fraseri</i>
	<i>Eremophila jucunda</i> subsp. <i>jucunda</i>
	<i>Eremophila margarethae</i>
Scrophulariaceae	<i>Eremophila spectabilis</i>
Solanaceae	<i>Solanum lasiophyllum</i>

Appendix G Floristic Data - Flora Sampling Sites

Abra Airstrip – AAr01

Site Details:

Described by: AB
Date: 2/10/2018
Type: Relevé
MGA Zone: 50J 663084mE
 7275507mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Tracks, Grazing
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia incurvaneura*, *Grevillea berryana* and *Acacia ramulosa* var. *ramulosa* open tall shrubland, over *Senna* sp. Meekatharra open shrubland, over *Solanum lasiophyllum*, *Ptilotus schwartzii*, *Eremophila fraseri* subsp. *fraseri* open low shrubland.

Veg Condition: Excellent
Fire Age: 5 to 15 years
Weeds: None
Fire Notes: N/A

Table A: Species list

Species	Height	Cover
<i>Acacia incurvaneura</i>	4	1
<i>Acacia kempeana</i>	1.5	0.5
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	2	4
<i>Acacia rhodophloia</i>	2	1
<i>Aristida contorta</i>	0.2	0.1
<i>Eremophila ?granitica</i>	0.25	0.1
<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	0.8	0.5
<i>Eremophila margarethae</i>	2	0.5
<i>Eriachne mucronata</i>	0.3	0.5
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.1	0.5
<i>Grevillea berryana</i>	3.5	1
<i>Ptilotus schwartzii</i>	0.4	0.5
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.6	0.5
<i>Solanum lasiophyllum</i>	0.7	0.5



Abra Airstrip – AAr02

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 663073mE
 7276224mN

Environmental Variables:

Landform: Minor gully
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: Laterite

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: N/A
Introduced species: N/A

FLORA AND VEGETATION DATA

Description: *Acacia rhodophloia* tall open shrubland over *Eremophila citrina* and *Senna* sp. Meekatharra open shrubland over *Eriachne benthamii*, *Eriachne mucronata* and *Aristida contorta* very open tussock grassland.

Veg Condition: Excellent

Fire Age: 5 to 15 years

Weeds: None

Fire Notes: N/A

Table B: Species list

Species	Height	Cover
<i>Acacia rhodophloia</i>	4	8
<i>Psyrax latifolia</i>	2.1	1
<i>Eriachne mucronata</i>	0.4	1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.15	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.8	0.1
<i>Fimbristylis dichotoma</i>	0.05	0.1
<i>Hibiscus coatesii</i>	0.4	0.1
<i>Eremophila citrina</i>	2.2	1
<i>Rhagodia eremaea</i>	0.4	0.1
<i>Cheilanthes sieberi</i>	0.15	0
<i>Dodonaea</i> sp.	2.1	1
<i>Aristida contorta</i>	0.2	0.1
<i>Eriachne benthamii</i>	0.4	0.1
<i>Grevillea berryana</i>	3	1
<i>Boerhavia coccinea</i>	0.45	0.1
<i>Solanum lasiophyllum</i>	0.4	0.1
<i>Hibiscus burtonii</i>	0.5	0.1
<i>Sida</i> sp. Golden calyces	0.4	0.1

Species	Height	Cover
<i>Enneapogon robustissimus</i>	0.45	0.1
<i>Eremophila ?granitica</i>	1.2	0.1
<i>Polycarpaea corymbosa</i>	0.1	0.1
<i>Eremophila ?granitica</i>	0.35	0.1



Abra Airstrip – AAr03

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 663018mE
 7276155mN

Environmental Variables:

Landform: Minor gully
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: Laterite

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: Grazing
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia citrinoviridis*, *Acacia rhodophloia* open tall shrubland over *Dodonaea* sp., *Eremophila citrina*, *Eremophila ?granitica* open shrubland over *Eriachne benthamii*, *Poaceae* sp., *Enneapogon robustissimus* very open tussock grassland.

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table C: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	3.5	4
<i>Acacia incurvaneura</i>	2.4	1
<i>Acacia rhodophloia</i>	3	3
<i>Acacia tetragonophylla</i>	2.2	0.1
<i>Aristida contorta</i>	0.2	0.1
<i>Cheilanthes sieberi</i>	0.2	0.1
<i>Cymbopogon ambiguus</i>	0.7	0.1
<i>Dodonaea</i> sp.	1.6	0.1
<i>Enneapogon robustissimus</i>	0.4	0.5
<i>Eragrostis ?eriopoda</i>	0.5	1
<i>Eremophila ?granitica</i>	1.2	0.1
<i>Eremophila ?granitica</i>	0.3	0.1
<i>Eremophila citrina</i>	1.8	0.1
<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	1.2	0.5
<i>Eremophila jucunda</i> subsp. <i>jucunda</i>	0.5	0.1
<i>Eremophila spectabilis</i>	3	0.1
<i>Eriachne benthamii</i>	0.5	1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.15	0.1
<i>Fimbristylis dichotoma</i>	0.2	0.1
<i>Hibiscus coatesii</i>	0.2	0.1

Species	Height	Cover
<i>Psydrax latifolia</i>	1.8	0.1
<i>Santalum spicatum</i>	2.2	0.1
<i>Solanum lasiophyllum</i>	0.45	0.1



Abra Airstrip – AAr04

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 662879mE
 7275770mN

Environmental Variables:

Landform: Minor gully
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: Laterite

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: N/A
Introduced species: N/A

FLORA AND VEGETATION DATA

Description: *Acacia citrinoviridis*, *Acacia incurvaneura* tall open shrubland over *Acacia rhodophloia*, *Dodonaea* sp., *Dodonaea pachyneura* open shrubland over *Eriachne mucronata*, *Eriachne benthamii* very open tussock grassland.

Veg Condition: Excellent
Fire Age: 3 to 5 years
Weeds: None
Fire Notes: N/A

Table D: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	6	3
<i>Acacia incurvaneura</i>	4	1.5
<i>Acacia incurvaneura</i>	2.4	0.1
<i>Acacia rhodophloia</i>	2	0.5
<i>Acacia tetragonophylla</i>	0.9	0.1
<i>Aristida contorta</i>	0.2	0.1
<i>Dodonaea pachyneura</i>	1.2	0.5
<i>Dodonaea</i> sp.	1.6	1
<i>Eremophila ?granitica</i>	1.2	0.1
<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	0.8	0.1
<i>Eriachne benthamii</i>	0.5	0.5
<i>Eriachne mucronata</i>	0.3	0.5
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.5	0.1
<i>Grevillea berryana</i>	0.1	0.1
<i>Hibiscus coatesii</i>	0.9	0.1
<i>Psyrax latifolia</i>	2.2	0.1
<i>Psyrax suaveolens</i>	0.4	0.1
<i>Ptilotus obovatus</i>	0.6	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.1	0.1



Abra Airstrip – AAr05

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 663812mE
 7275836mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Tracks, Feral scats
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia incurvaneura* and *Acacia kempeana* tall open shrubland over *Acacia rhodophloia* and *Psyrdrax suaveolens* open shrubland over *Ptilotus schwartzii* and *Ptilotus obovatus* scattered low shrubs

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table E: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	4	0.5
<i>Acacia incurvaneura</i>	2.2	0.1
<i>Acacia incurvaneura</i>	4	1
<i>Acacia kempeana</i>	3.5	2
<i>Acacia kempeana</i>	5	1
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	1.53	0.5
<i>Acacia rhodophloia</i>	1.8	0.5
<i>Aristida contorta</i>	0.08	0.1
<i>Eremophila ?granitica</i>	0.25	0.1
<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	0.8	0.1
<i>Eremophila spectabilis</i>	0.8	0.1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.08	0.1
<i>Euphorbia boophthona/ tannensis</i>	0.2	0.1
<i>Goodenia ? tenuiloba</i>	0.08	0.1
<i>Grevillea berryana</i>	5	1
<i>Myrtaceae</i> sp.	0.9	0.1
<i>Poaceae</i> sp.	0.8	0.1
<i>Polycarpaea corymbosa</i>	0.05	0.1
<i>Psyrdrax latifolia</i>	2.2	0.5
<i>Psyrdrax suaveolens</i>	1.5	0.1
<i>Ptilotus obovatus</i>	1.1	0.1

Species	Height	Cover
<i>Ptilotus schwartzii</i>	0.25	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.9	0.1
<i>Sida</i> sp. Golden calyces	0.25	0.1
<i>Solanum lasiophyllum</i>	0.4	0.1



Abra Airstrip – AAr06

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 663423mE
 7275984mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Feral scats, Grazing, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia pruinocarpa*, *Acacia incurvaneura* and *Grevillea berryana* (*Psyrax latifolia*) tall open shrubland over *Eremophila spectabilis* and *Senna* sp. Meekatharra open shrubland over *Eremophila ?granitica* and *Ptilotus schwartzii* scattered low shrubs with scattered Poaceae sp. tussock grasses.

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table F: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	2.8	0.1
<i>Acacia incurvaneura</i>	4	3
<i>Acacia pruinocarpa</i>	4	1
<i>Acacia ramulosa</i> var. <i>linophylla</i>	0.8	0.1
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	2.5	0.5
<i>Acacia rhodophloia</i>	1.1	0.1
<i>Aristida contorta</i>	0.15	0.1
<i>Eragrostis eriopoda</i>	0.5	0.1
<i>Eremophila ?granitica</i>	0.3	0.1
<i>Eremophila citrina</i>	1.1	0.1
<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	0.9	0.1
<i>Eremophila spectabilis</i>	1.1	0.1
<i>Eriachne mucronata</i>	0.25	0.1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.1	0.1
<i>Grevillea berryana</i>	3	1
Poaceae sp.	0.5	0.1
<i>Psyrax latifolia</i>	2.2	1
<i>Psyrax suaveolens</i>	0.8	0.1
<i>Ptilotus schwartzii</i>	0.25	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.6	0.1

Species	Height	Cover
<i>Solanum lasiophyllum</i>	0.4	0.1



Abra Airstrip – AAr07

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 664228mE
 7275325mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Sandy clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Grazing, Feral trampling, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia pteraneura*, *Acacia incurvaneura* and *Acacia ramulosa* var. *ramulosa* tall open shrubland over *Senna artemisioides* subsp. *helmsii*, *Eremophila forrestii* and *Ptilotus obovatus* open shrubland over Poaceae sp. and *Eragrostis eriopoda* scattered tussock grasses.

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table G: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	4	0.5
<i>Acacia incurvaneura</i>	4	2
<i>Acacia kempeana</i>	1.8	0.5
<i>Acacia pteraneura</i>	5	4
<i>Acacia ramulosa</i> var. <i>linophylla</i>	1.6	1
<i>Acacia rhodophloia</i>	5	1
<i>Aristida contorta</i>	0.15	0.1
<i>Cheilanthes sieberi</i>	0.1	0.1
<i>Eragrostis eriopoda</i>	0.5	1
<i>Eremophila ?granitica</i>	0.9	0.1
<i>Eremophila citrina</i>	1.4	0.1
<i>Eremophila forrestii</i>	0.9	1.5
<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	1.1	0.1
<i>Eremophila spectabilis</i>	0.6	1
<i>Grevillea berryana</i>	4	1
<i>Hibiscus coatesii</i>	0.4	0.1
<i>Marsdenia australis</i>	0	0.1
<i>Psyrax latifolia</i>	0.4	0.1
<i>Ptilotus obovatus</i>	0.9	0.1
<i>Senna artemisioides</i> subsp. <i>helmsii</i>	1.4	0.1

Species	Height	Cover
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.2	1
<i>Sida</i> sp. Golden calyces	0.25	0.1
<i>Solanum lasiophyllum</i>	0.4	0.1
<i>Ptilotus obovatus</i>	0.9	0.1



Abra Airstrip – AAr08

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 663996mE
 7275142mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Sandy clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Grazing, Feral trampling, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia incurvaneura*, *Acacia kempeana* and *Acacia ramulosa* var. *linophylla* and *Psyrdrax latifolia* tall open shrubland over *Eremophila forrestii* open shrubland over Poaceae sp. and *Eragrostis eriopoda* open tussock grassland.

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table H: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	8	0.5
<i>Acacia incurvaneura</i>	5	6.5
<i>Acacia kempeana</i>	7	2
<i>Acacia pruinocarpa</i>	0.4	0.1
<i>Acacia ramulosa</i> var. <i>linophylla</i>	1.5	1.5
<i>Dodonaea petiolaris</i>	1.7	0.1
<i>Eragrostis eriopoda</i>	0.5	1
<i>Eremophila forrestii</i>	1.2	0.5
<i>Eremophila spectabilis</i>	0.4	0.1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.15	0.1
<i>Grevillea berryana</i>	6	0.5
<i>Marsdenia australis</i>	0	0.1
Poaceae sp.	0.5	1
<i>Psyrdrax latifolia</i>	4	0.5
<i>Ptilotus obovatus</i>	0.8	0.1
<i>Ptilotus schwartzii</i>	0.4	0.1
<i>Senna cuthbertsonii</i>	1.6	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	0.5	0.5
<i>Sida</i> sp. Golden calyces	0.2	0.1
<i>Solanum lasiophyllum</i>	0.5	0.1



Abra Airstrip – AAr09

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 663639mE
 7275079mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Sandy clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Grazing, Feral trampling, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia pteraneura*, *Acacia kempeana* and *Acacia ramulosa* var. *linophylla* (*Grevillea berryana* and *Psyrax latifolia*) over *Eremophila forrestii* open shrubland over Poaceae sp. (*Eragrostis eriopoda*) very open tussock grassland

Veg Condition: Excellent
Fire Age: 3 to 5 years
Weeds: None
Fire Notes: N/A

Table I: Species list

Species	Height	Cover
<i>Acacia kempeana</i>	4	3
<i>Acacia pruinocarpa</i>	5	0.5
<i>Acacia pteraneura</i>	5	3
<i>Acacia ramulosa</i> var. <i>linophylla</i>	2.1	1
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	4	0.5
<i>Acacia rhodophloia</i>	2.6	0.1
<i>Aristida contorta</i>	0.2	0.1
<i>Eragrostis eriopoda</i>	0.4	0.5
<i>Eremophila forrestii</i>	1.2	1.5
<i>Eriachne mucronata</i>	0.25	0.1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.1	0.1
<i>Grevillea berryana</i>	3.5	0.5
Poaceae sp.	0.5	1
<i>Psyrax latifolia</i>	3	1
<i>Ptilotus obovatus</i>	0.5	0.5
<i>Ptilotus schwartzii</i>	0.3	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.2	0.1
<i>Solanum lasiophyllum</i>	0.4	0.1



Abra Airstrip – AAr10

Site Details:

Described by: AB
Date: 3/10/2018
Type: Relevé
MGA Zone: 50J 664548mE
 7275681mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Sandy clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Feral trampling, Feral scats, Grazing, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia ramulosa* var. *linophylla*, *Acacia incurvaneura* and *Acacia pteraneura* tall shrubland over *Eremophila forrestii* and *Eremophila spectabilis* shrubland over *Poaceae* sp. and *Eragrostis eriopoda* very scattered tussock grasses.

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table J: Species list

Species	Height	Cover
<i>Acacia ?macraneura</i>	1.7	0.1
<i>Acacia incurvaneura</i>	5	2
<i>Acacia kempeana</i>	2.5	0.1
<i>Acacia pteraneura</i>	4	2
<i>Acacia ramulosa</i> var. <i>linophylla</i>	2.5	12
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	1.1	0.1
<i>Acacia rhodophloia</i>	2.2	0.5
<i>Eragrostis eriopoda</i>	0.5	0.5
<i>Eremophila forrestii</i>	1.2	7
<i>Eremophila spectabilis</i>	1.2	5
<i>Grevillea berryana</i>	3	0.1
<i>Poaceae</i> sp.	0.5	1
<i>Psyrax latifolia</i>	0.25	0.1
<i>Ptilotus obovatus</i>	1.1	0.1
<i>Senna artemisioides</i> subsp. <i>helmsii</i>	1.6	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	2.1	0.5



Abra Airstrip – AAr11

Site Details:

Described by: AB
Date: 4/10/2018
Type: Relevé
MGA Zone: 50J 665247mE
 7275652mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Sandy clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Never
Disturbance: Feral trampling, Feral scats
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia ramulosa* var. *linophylla*, *Acacia pteraneura* (*Grevillea berryana*) tall shrubland over *Eremophila forrestii* shrubland over *Eremophila spectabilis* low shrubs with scattered Poaceae sp. and *Eragrostis eriopoda* tussock grasses

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table K: Species list

Species	Height	Cover
<i>Acacia incurvaneura</i>	4	0.5
<i>Acacia pteraneura</i>	4	4
<i>Acacia ramulosa</i> var. <i>linophylla</i>	2.4	4
<i>Acacia rhodophloia</i>	2	0.1
<i>Aristida contorta</i>	0.15	0.1
<i>Eragrostis eriopoda</i>	0.4	0.5
<i>Eremophila forrestii</i>	1.6	15
<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	1.6	0.1
<i>Eremophila spectabilis</i>	0.6	1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.1	0.1
<i>Grevillea berryana</i>	3	0.5
Poaceae sp.	0.4	1
<i>Psyrax suaveolens</i>	3	0.1
<i>Senna artemisioides</i> subsp. <i>helmsii</i>	1.1	0.5
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	2.2	0.1
<i>Triodia basedowii</i>	0.4	0.1



Abra Airstrip – AAr12

Site Details:

Described by: AB
Date: 4/10/2018
Type: Relevé
MGA Zone: 50J 664973mE
 7275749mN

Environmental Variables:

Landform: Minor flowline, not incised
Slope: Level (0-3°)

Soils:

Soil Texture: Sand
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: Feral trampling, Grazing, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia incurvaneura*, *Acacia citrinoviridis* and *Acacia rhodophloia* tall open shrubland over *Calytrix desolata* scattered shrubs over *Eremophila citrina* scattered low shrubs and very scattered tussock grasses.

Veg Condition: Excellent
Fire Age: 3 to 5 years
Weeds: None
Fire Notes: N/A

Table L: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	5	1.5
<i>Acacia incurvaneura</i>	3.5	3
<i>Acacia kempeana</i>	1.1	0.1
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	1.3	0.1
<i>Acacia rhodophloia</i>	3.5	1
<i>Aristida contorta</i>	0.15	0.1
<i>Calytrix desolata</i>	1.3	0.5
<i>Eragrostis eriopoda</i>	0.35	0.1
<i>Eremophila citrina</i>	0.7	1.5
<i>Eremophila exilifolia</i>	0.6	0.1
<i>Eriachne pulchella</i> subsp. <i>pulchella</i>	0.08	0.1
Poaceae sp.	0.4	0.1
<i>Psyrax latifolia</i>	2.2	0.1
<i>Ptilotus schwartzii</i>	0.25	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.2	0.1



Abra Airstrip – AAr13

Site Details:

Described by: AB
Date: 4/10/2018
Type: Relevé
MGA Zone: 50J 664604mE
 7275385mN

Environmental Variables:

Landform: Minor flowline, not incised
Slope: Level (0-3°)

Soils:

Soil Texture: Sand
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: Feral scats, Feral trampling, Grazing
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia citrinoviridis*, *Acacia incurvaneura* and *Psyrax latifolia* tall open shrubland over *Eremophila citrina* and *Eremophila spectabilis* open shrubland over very scattered tussock grasses.

Veg Condition: Excellent
Fire Age: 3 to 5 years
Weeds: None
Fire Notes: N/A

Table M: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	5	4
<i>Acacia incurvaneura</i>	4	4
<i>Acacia rhodophloia</i>	3.5	1
<i>Acacia tetragonophylla</i>	0.4	0.1
<i>Eragrostis eriopoda</i>	0.4	0.1
<i>Eremophila ?granitica</i>	1.1	0.1
<i>Eremophila citrina</i>	0.5	0.5
<i>Eremophila spectabilis</i>	1.1	0.5
<i>Eriachne mucronata</i>	0.2	0.1
<i>Euphorbia boophthona/ tannensis</i>	0.3	0.1
<i>Grevillea berryana</i>	1.5	0.1
<i>Hibiscus coatesii</i>	0.4	0.1
Poaceae sp.	0.5	0.1
<i>Psyrax latifolia</i>	2.5	1.5
<i>Sida</i> sp.	0.9	0.1



Abra Airstrip – AAr14

Site Details:

Described by: AB
Date: 4/10/2018
Type: Relevé
MGA Zone: 50J 664484mE
 7274981mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: Grazing, Feral scats, Feral trampling, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia ramulosa* var. *ramulosa*, *Grevillea berryana* (*Acacia citrinoviridis*) tall shrubland over *Eremophila citrina*, *Solanum lasiophyllum* and *Senna* sp. Meekatharra open shrubland.

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A

Table N: Species list

Species	Height	Cover
<i>Acacia citrinoviridis</i>	7	0.5
<i>Acacia incurvaneura</i>	2.2	0.1
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	2.4	12
<i>Acacia tetragonophylla</i>	3	0.1
<i>Eremophila citrina</i>	1.8	1
<i>Eremophila jucunda</i> subsp. <i>jucunda</i>	0.4	0.1
<i>Grevillea berryana</i>	2.1	0.1
<i>Psyrax latifolia</i>	3.2	1
<i>Ptilotus schwartzii</i>	0.25	0.1
<i>Senna artemisioides</i> subsp. <i>helmsii</i>	1.1	0.1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.4	0.5
<i>Sida</i> sp. Golden calyces	0.25	0.1
<i>Solanum lasiophyllum</i>	1.1	1



Abra Airstrip – AAr15

Site Details:

Described by: AB
Date: 4/10/2018
Type: Relevé
MGA Zone: 50J 664756mE
 7275054mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: Grazing, Feral scats, Feral trampling, Tracks
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia ramulosa* var. *ramulosa*, *Acacia incurvaneura* and *Grevillea berryana* tall shrubland over *Eremophila citrina* and *Eremophila spectabilis* low shrubland over very scattered tussock grasses.

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: -

Fire Notes: N/A

Table O: Species list

Species	Height	Cover
<i>Acacia incurvaneura</i>	2.5	1
<i>Acacia pruinocarpa</i>	4.5	0.1
<i>Acacia ramulosa</i> var. <i>linophylla</i>	1.8	1
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	2.8	15
<i>Acacia rhodophloia</i>	3	0.5
<i>Eragrostis eriopoda</i>	0.25	0.1
<i>Eremophila citrina</i>	0.8	1
<i>Eremophila forrestii</i>	1.2	0.1
<i>Eremophila spectabilis</i>	0.8	1
<i>Eriachne mucronata</i>	0.2	0.1
<i>Grevillea berryana</i>	5	1
<i>Ptilotus schwartzii</i>	0.25	0.1
<i>Sida</i> sp. Golden calyces	0.25	0.1
<i>Solanum lasiophyllum</i>	1.1	0.1
<i>Triodia basedowii</i>	0.25	0.1



Abra Airstrip – AAr16

Site Details:

Described by: AB
Date: 4/10/2018
Type: Relevé
MGA Zone: 50J 665050mE
 7275309mN

Environmental Variables:

Landform: Plain
Slope: Level (0-3°)

Soils:

Soil Texture: Sandy clay loam
Soil Colour: Reddish brown
Rock Type: N/A

Impacts:

Waterlogging: No - Prone to Flooding
Disturbance: Grazing, Feral scats, Feral trampling
Introduced species: Cattle

FLORA AND VEGETATION DATA

Description: *Acacia ramulosa* var. *ramulosa*, *Grevillea berryana* and *Acacia rhodophloia* tall open shrubland over *Eremophila spectabilis*, *Eremophila forrestii* and *Senna artemisioides* subsp. *helmsii* low shrubland over *Eriachne eriopoda* open tussock grassland.

Veg Condition: Excellent
Fire Age: 3 to 5 years
Weeds: None
Fire Notes: N/A

Table P: Species list

Species	Height	Cover
<i>Acacia incurvaneura</i>	4	1
<i>Acacia ramulosa</i> var. <i>linophylla</i>	2.1	1
<i>Acacia ramulosa</i> var. <i>ramulosa</i>	1.2	0.1
<i>Acacia rhodophloia</i>	4	2
<i>Aristida contorta</i>	0.15	0.1
<i>Eragrostis eriopoda</i>	0.4	2.5
<i>Eremophila forrestii</i>	1.1	5
<i>Eremophila spectabilis</i>	1.2	7
<i>Grevillea berryana</i>	4	1
<i>Senna artemisioides</i> subsp. <i>helmsii</i>	1.8	1
<i>Senna</i> sp. Meekatharra (E. Bailey 1-26)	1.8	0.1
<i>Triodia basedowii</i>	0.25	0.1



Abra Airstrip – AAmn02

Site Details:

Described by: AB

Date: 4/10/2018

Type: Mapping note

MGA Zone: 50J 664576mE
7274997mN

Environmental Variables:

Landform: Minor flowline

Slope: Level (0-3°)

FLORA AND VEGETATION DATA

Description: *Acacia incurvaneura*, *Acacia citrinoviridis* and *Acacia rhodophloia* tall open shrubland over *Calytrix desolata* scattered shrubs over *Eremophila citrina* scattered low shrubs and very scattered tussock grasses

Veg Condition: Excellent

Fire Age: 3 to 5 years

Weeds: None

Fire Notes: N/A



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