NORTON GOLD FIELDS

Native Vegetation Clearing Permit – Supporting Document

Wattlebird Mine Area

Tenements

M16/44 and M16/396



January 26

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Executive Summary

Norton Gold Fields Pty Ltd (Norton) is proposing to undertake native vegetation clearing to support mining activities at the Wattlebird Mine Area, located approximately 45 km northwest of Kalgoorlie–Boulder in the Goldfields region of Western Australia.

Norton is seeking approval to clear up to 200ha of native vegetation within a 737.2ha application area under a purpose native vegetation clearing permit. Approximately 57.1ha of the application area has already been disturbed by mining and exploration activities. Where practicable, clearing will be minimised through the use of previously disturbed areas and adjustments to site layout.

The application area lies within the Coolgardie IBRA region, in the Eastern Goldfields subregion (COO3). The vegetation within the application area is entirely within vegetation sub-association 462, which retains more than 99% of its pre-European extent at a regional scale, and more than 91% within the application area.

Flora and vegetation surveys were undertaken between 2011 and 2025. These surveys identified vegetation communities that are commonly found in the surrounding landscape. No threatened or priority flora species were recorded in the application area. No threatened or priority ecological communities were identified within or near the application area. Vegetation condition across the surveyed areas is predominantly classified as "good" (Botanica Consulting, 2011; 2025a; 2025b).

Fauna surveys conducted between 2011 and 2025 identified common fauna habitats that occur widely across the region. No threatened or priority fauna species were recorded during field surveys (360 Environmental, 2011; Botanica Consulting, 2025a; 2025b). Targeted Malleefowl surveys undertaken in 2014 and 2025 found no evidence of Malleefowl presence in the application area (Botanica Consulting, 2014; Terrestrial Ecosystems, 2025).

Surface water within the application area is limited to ephemeral drainage lines that flow only after rainfall events and drain towards salt lakes and clay pans. No permanent watercourses or wetlands were identified. Groundwater in the area is naturally hypersaline (Norton, 2014).

An assessment of the proposal against the ten clearing principles outlined in Schedule 5 of the *Environmental Protection Act 1986* indicates that the proposed clearing is not likely to be at variance with any of the principles. The vegetation and fauna values are common and well represented in the region, with no conservation-significant species or ecological communities identified. The potential environmental impacts are expected to be localised and manageable through the proposed management measures.

1 Introduction

1.1 Location, Ownership and Tenure

Norton Gold Fields Pty Ltd (Norton), through its wholly owned subsidiaries Kalgoorlie Mining Company Pty Ltd and Paddington Gold Pty Ltd, is the owner and proponent of the Wattlebird Mine Area (Wattlebird). Wattlebird is located approximately 45km northwest of the City of Kalgoorlie – Boulder (CKB), within the Mt Burges pastoral station, in the Goldfields region of Western Australia. The project can be accessed via a combination of existing private and public roads branching off the Goldfields Highway. Evidence of authority for each tenement is provided in Appendix 1.

Table 1 - Wattlebird Tenements

Tenement	Area (ha)	Tenement Holder	Granted	Expiry
M 16/44	593.35	Kalgoorlie Mining Company (Bullant) Pty Ltd	03/11/1987	02/11/2029
M 16/396	143.91	Paddington Gold Pty Limited	20/04/2010	19/04/2031

1.2 Proposal Description

The site operation involves the recovery of gold from a single open pit – Wattlebird Open Pit. Wattlebird will comprise an Open Pit, Waste Rock Landform (WRL), Mineralised Waste Rock Dump (MWRD), ROM pad, workshop, topsoil stockpiles and other non-key mining activities to support mining activities. The recovered ore will be transported off-site for processing, and no ore processing infrastructure is required on-site. The proposed expansion is expected to extend the life of the mine by approximately four years. A summary of the Wattlebird proposed operation and clearing is provided in Table 2.

Table 2 – Proposal Summary.

Site Details	
Project Name	Wattlebird Mine Area
Description of Operation	• Open-pit mining • Waste Rock Landform • ROM Pad • Laydown • Workshop • Offices • Low Grade Ore Stockpiles • Topsoil Stockpiles • Haul Roads • Access Roads
Commencement Date	Q3 2026
Clearing Details	
Total Clearing Proposed	200 ha
Clearing Method	Mechanical clearing
Purpose of Clearing	Mine Development
Proponent Details	
Company	Norton Gold Fields Pty Ltd
ABN	23 112 287 797
Address	Paddington Gold Mine Goldfields Highway, 40km North of Kalgoorlie, Kalgoorlie, WA 6430
Postal Address	PO Box 1653, Kalgoorlie, WA 6430
Key Contact	Tari Laatz Contract Approvals Coordinator tari.laatz@contractor.padgold.com.au (08) 9080 6800

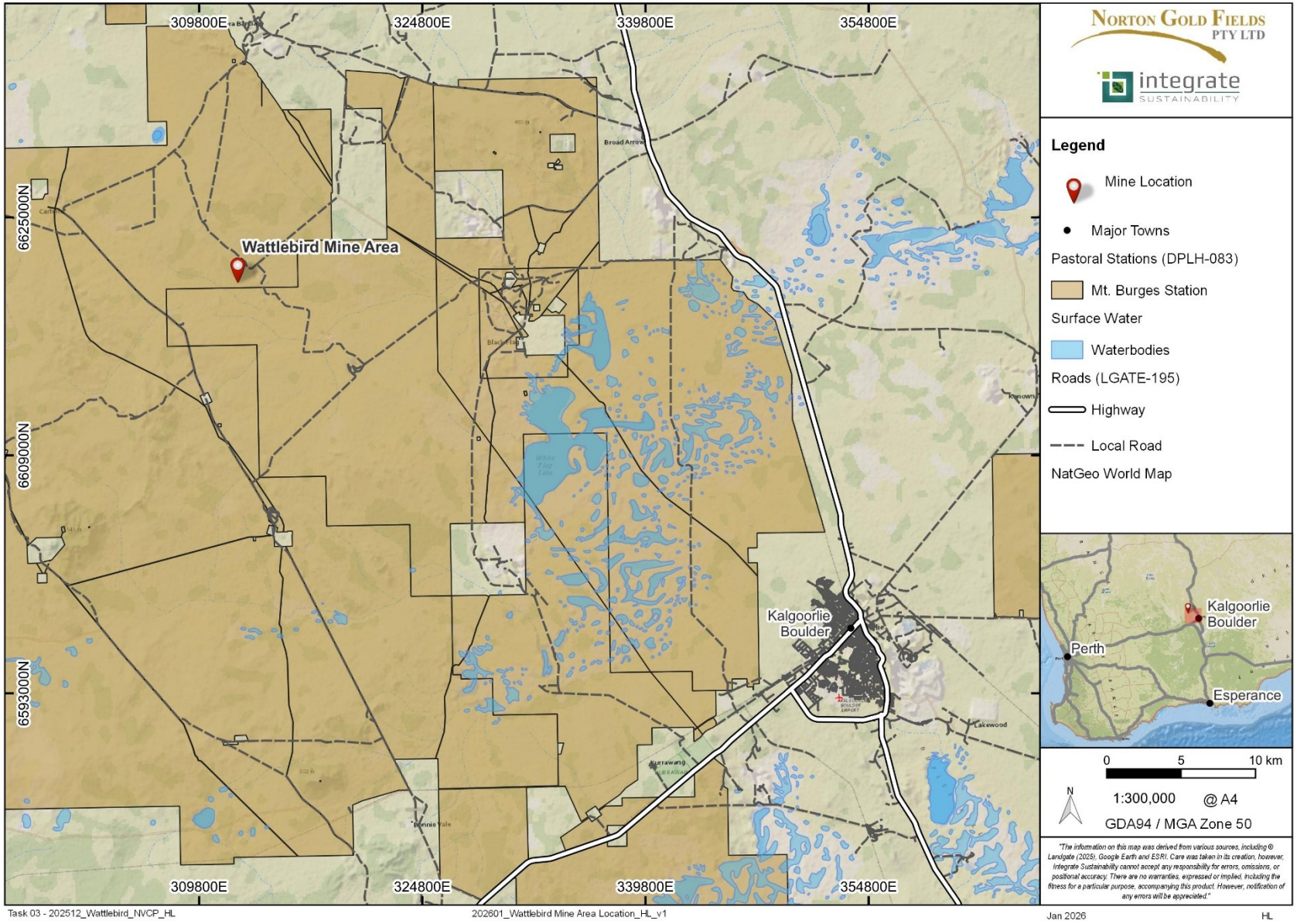


Figure 1-1 Wattlebird Mine Area location

1.3 Proposed Clearing

Norton is applying to clear up to 200ha of native vegetation over two tenements (Table 1) under a purpose permit within the application area. The application area is 737.2 ha (Figure 1-2). Clearing is necessary to develop the following proposed activities and infrastructure:

- Expansion of the existing Wattlebird Open-pit
- Establishment of a Waste Rock Landform
- Establishment of supporting infrastructure activities, including but not restricted to ROM Pad, Laydown, Workshop, Offices, Pipeline, Low Grade Ore Stockpiles, Topsoil Stockpiles, Haul Roads and Access Roads.

The proposed infrastructure and layout (Figure 1-2) are indicative at this stage, and modifications may occur as part of the Mine Development and Closure Plan approval process. Where possible, clearing will be kept to a minimum by utilising previously disturbed areas. Where this cannot occur, Norton will minimise the cleared area as much as practicable, considering safety requirements.

1.4 Previous Disturbance

Historic disturbance is present within the application area as a result of previous mining and exploration activities in the application area. The existing mining activities within the area are the Wattlebird Open Pit, Wattlebird Waste Rock Dump and other mining support infrastructure. The total previous disturbance covers approximately 57.1ha and accounts for 7.7% of the application area.

Further disturbance exists in the southeast of the application area, where the Bullant Open Pit, San Peblo Open Pit, Bullant Underground mine and other supporting activities are located.

1.5 Other Approvals

The proposed application does not form part of an existing *Environmental Protection Act 1986* (EP Act) Part IV proposal and is not envisaged to require an assessment under Part IV of the EP Act.

Additionally, this application does not require referral under the *Environment Protection and Biodiversity Act 1999* as no Matters of National Significance (MNES) have been recorded in the application area.

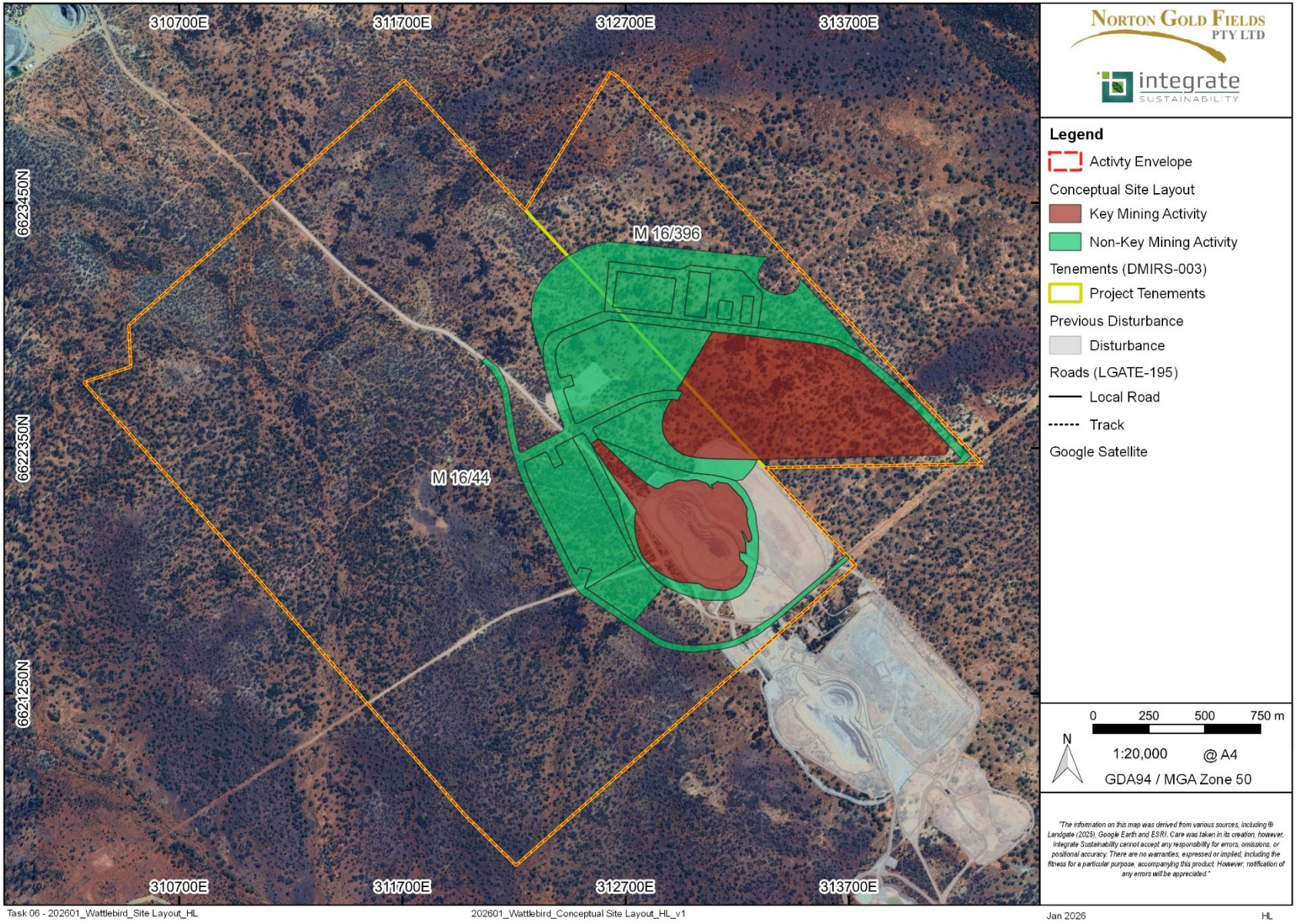


Figure 1-2 Application Area with indicative Layout

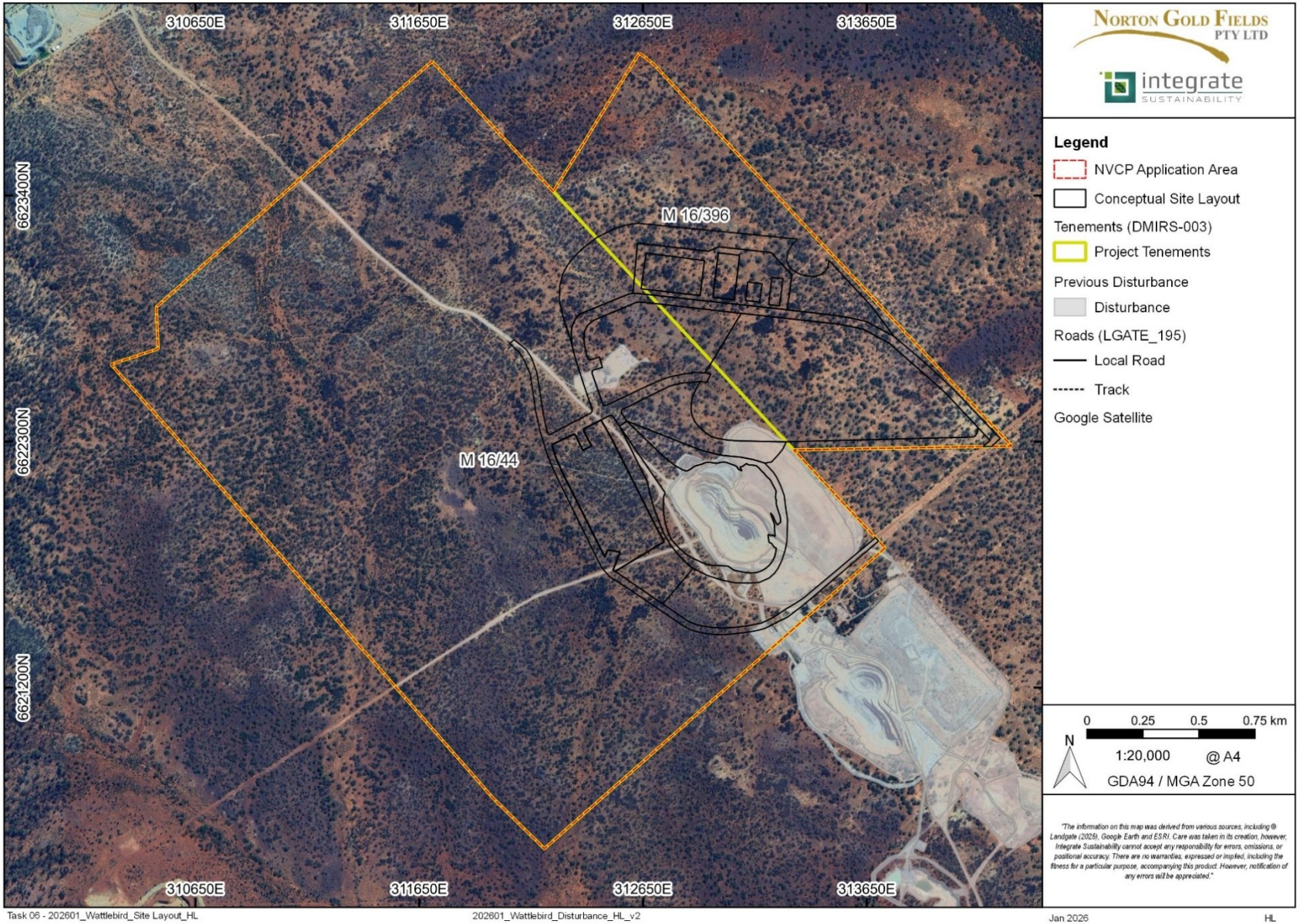


Figure 1-3 Previous disturbance at Wattlebird.

2 Baseline Environmental Data

2.1 Climate

Wattlebird is located in the semi-arid region of Western Australia, characterised by hot, dry summers and mild winters typical of a Mediterranean climate. Long-term climate data from the Bureau of Meteorology's Kalgoorlie-Boulder Airport station (Station No. 12038) indicates mean temperatures ranging from 33.7°C/18.4°C in January to 17.6°C/6.3°C in June (BOM, 2025). The station records an average annual rainfall of approximately 266 mm, with the lowest monthly totals typically occurring in September and the highest in February (Figure 2-1).

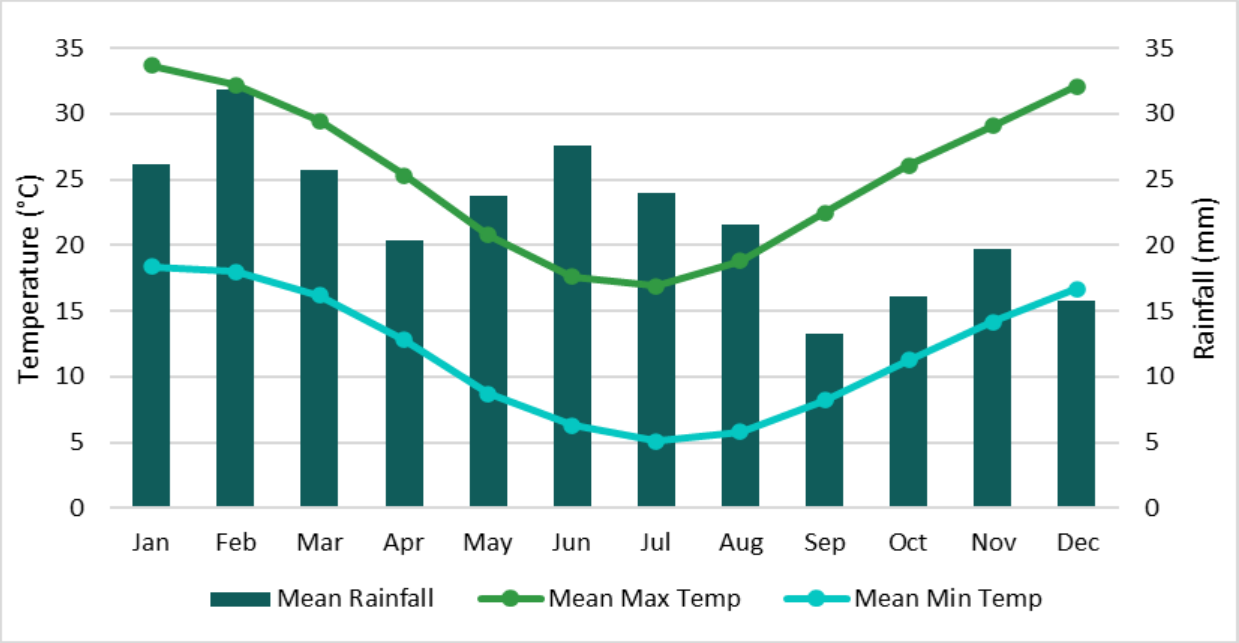


Figure 2-1 Monthly mean temperature and rainfall recorded at Kalgoorlie Airport Weather Station (1939-2025)

2.2 Regional Environment

Wattlebird is situated within the Coolgardie Interim Biogeographic Regionalisation for Australia (IBRA) region. This region is characterised by broad plains, low greenstone hills, laterite uplands, granite rocky outcrops and salt lakes. It forms an interzone between eucalypt environments and mulga–spinifex country (Committee & Bastin, 2008).

The Coolgardie IBRA region contains three subregions: Southern Cross, Eastern Goldfields and Mardabilla. The Project lies within the Eastern Goldfields (COO3) subregion, which consists of undulating plains bordered by low hills and Archaean greenstone ridges to the west and Proterozoic basic granulite to the east. Large playa lakes occur in the western portion of this subregion, representing remnants of an ancient major drainage system. Surrounding the salt lakes are woodlands dominated by diverse Eucalyptus species and dwarf samphire shrublands, while the sandplains support Mallees, Acacia thickets and shrub heaths (DBCA, 2003).

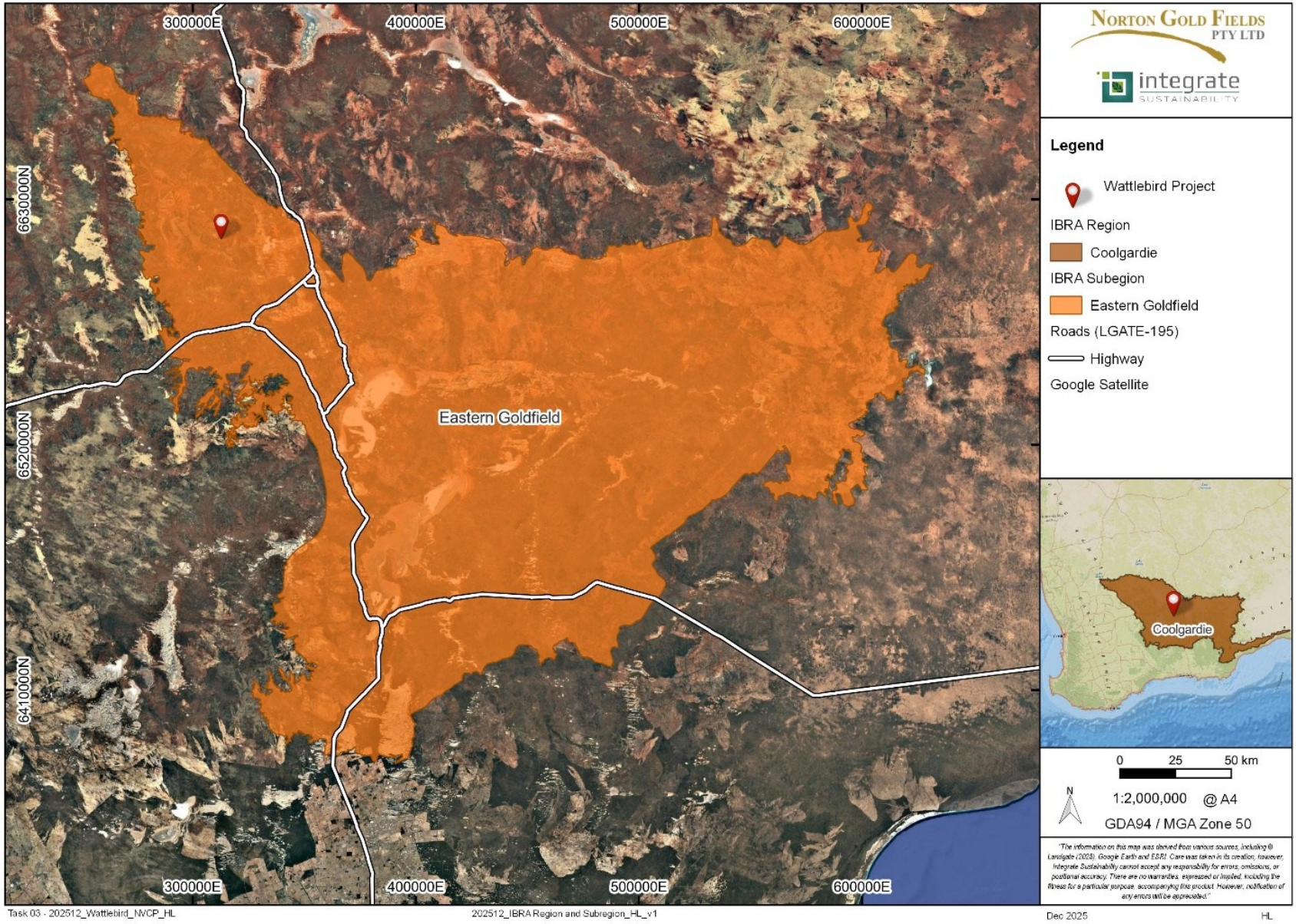


Figure 2-2 IBRA Region and Subregion location.

2.3 Geology

Wattlebird is located on the western contact of the Zuleika Shear Zone, a structural divide between brecciated talc-chlorite-altered komatiite and fine-grained, high-magnesium pillow basalt. Thin bodies of felsic porphyry intrude the ultramafic rocks, and a 5-15 m thick mylonitic zone marks the main Zuleika Shear Zone and the basalt/ultramafic contact (Norton, 2014)

The surface geology mapping indicates that four surface geology units occur within the application area, as shown in Table 3 and Figure 2-3. Three units are dominant in the application area. Unit Afv represents 31.7% of the area and is described as felsic volcanic and volcaniclastic rocks. Unit Czc comprises 31.6% of the area, and is characterised by colluvium consisting of gravel, sand, and silt deposited as sheetwash or talus. The Auk unit accounts for 28.9% of the area and is characterised by komatiite with relict olivine spinifex texture.

Table 3 - Surface geology units in application area (DMIRS, 2024).

Code	Description	Area (ha)	% Application Area
Afv	Felsic volcanic and volcaniclastic rocks	233.9	31.7%
Auk	Komatiite with relict olivine spinifex texture	213.0	28.9%
Czc	Colluvium - gravel, sand, and silt as sheetwash or talus	233.3	31.6%
Czl	Laterite and reworked products	57.6	7.8%

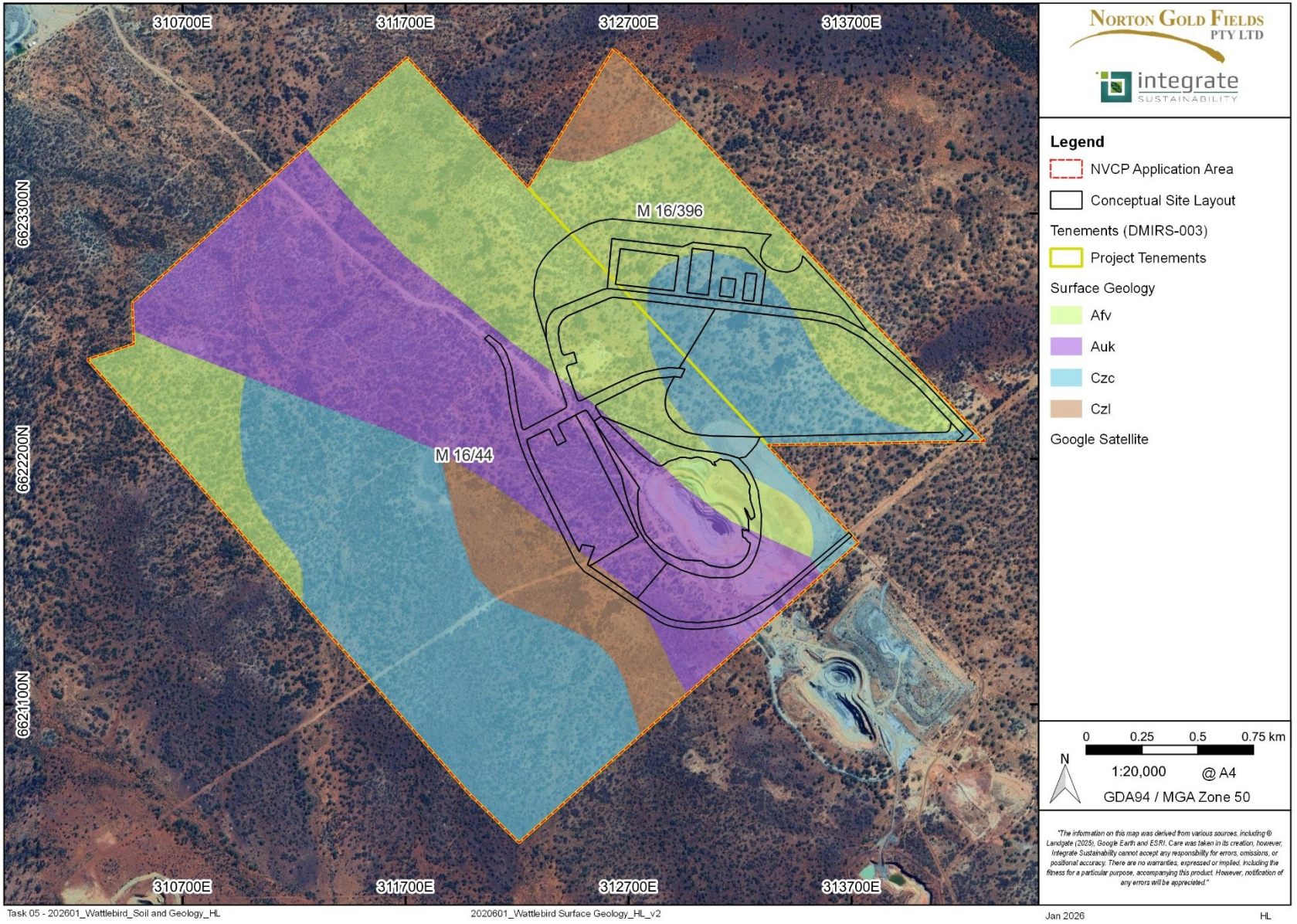


Figure 2-3 Surface geology in the application area.

2.4 Soils and Landscape Systems

Wattlebird lies within the Kambalda soil and landform zone of the Kalgoorlie Province, which occupies the southern Goldfields region. The landscape is characterised predominantly by flat to gently undulating plains with occasional narrow rocky ridges and low hills associated with granitic terrain. Common surface features include silcrete crusts, claypans, salt lakes with peripheral dunes and lunettes, gilgai formations, remnant sand plains, and isolated small dune systems. Low breakaway slopes with saline footslopes also occur intermittently. Soils in the province typically comprise calcareous and red loamy earths, red deep sands, and occurrences of red and yellow loamy earths, alongside shallow and deep sandy duplexes and hardpan shallow loams (Tille, 2006).

In 2025, Mine Earth Pty Ltd was commissioned by Norton to conduct a Soil Resource Assessment over the proposed layout for Wattlebird (Appendix 2). Samples were collected at 14 sites and from three depth intervals (0-10cm, 10-20cm and 40-50cm). A total of 42 samples were collected, 28 from topsoil (0-10cm and 10-20cm depths) and 14 from subsoil (40-50cm depth).

The topsoils ranged from loam to silty loam in texture and showed a slight tendency to disperse when disturbed. They generally had moderate hydraulic conductivity and a low likelihood of hard-setting. The subsoils were predominantly loam to silty clay loam and contained a higher clay fraction than the topsoil. Their dispersion behaviour and hydraulic conductivity varied across the soil profile. While most subsoils were not prone to hard-setting, some layers had the potential to hard-set under certain conditions (Mine Earth , 2025).

Chemically, the topsoils varied between neutral and moderately alkaline and non-sodic, with low organic carbon and phosphorus but elevated nitrogen, sulphur, and potassium. Total concentrations of As, Cd, Cr, Pb, Se and Co were found to exceed average crustal abundance (ACA) levels. Salinity ranged from non-saline to extremely saline, with samples from six sites classified as extremely saline. Subsoils were found to be predominantly moderately alkaline and sodic, with low organic carbon and phosphorus, moderate potassium and nitrogen, and higher sulphur concentrations than the topsoils. Total concentrations of As, Cd, Cr, Mo, Pb, Se and Co were recorded above ACA levels. Salinity ranged from non-saline to extremely saline, with nine sites classified as extremely saline (Mine Earth , 2025).

2.5 Hydrology

Surface water flow in the area is limited and only occurs for short periods after rainfall events, with three sections of ephemeral drainage lines occurring in the application area (Figure 2-4). The area has an internal drainage system, with water flowing to salt lakes and clay pans. Local flooding may occur, particularly after heavy or intense cyclonic thunderstorms (Norton, 2014).

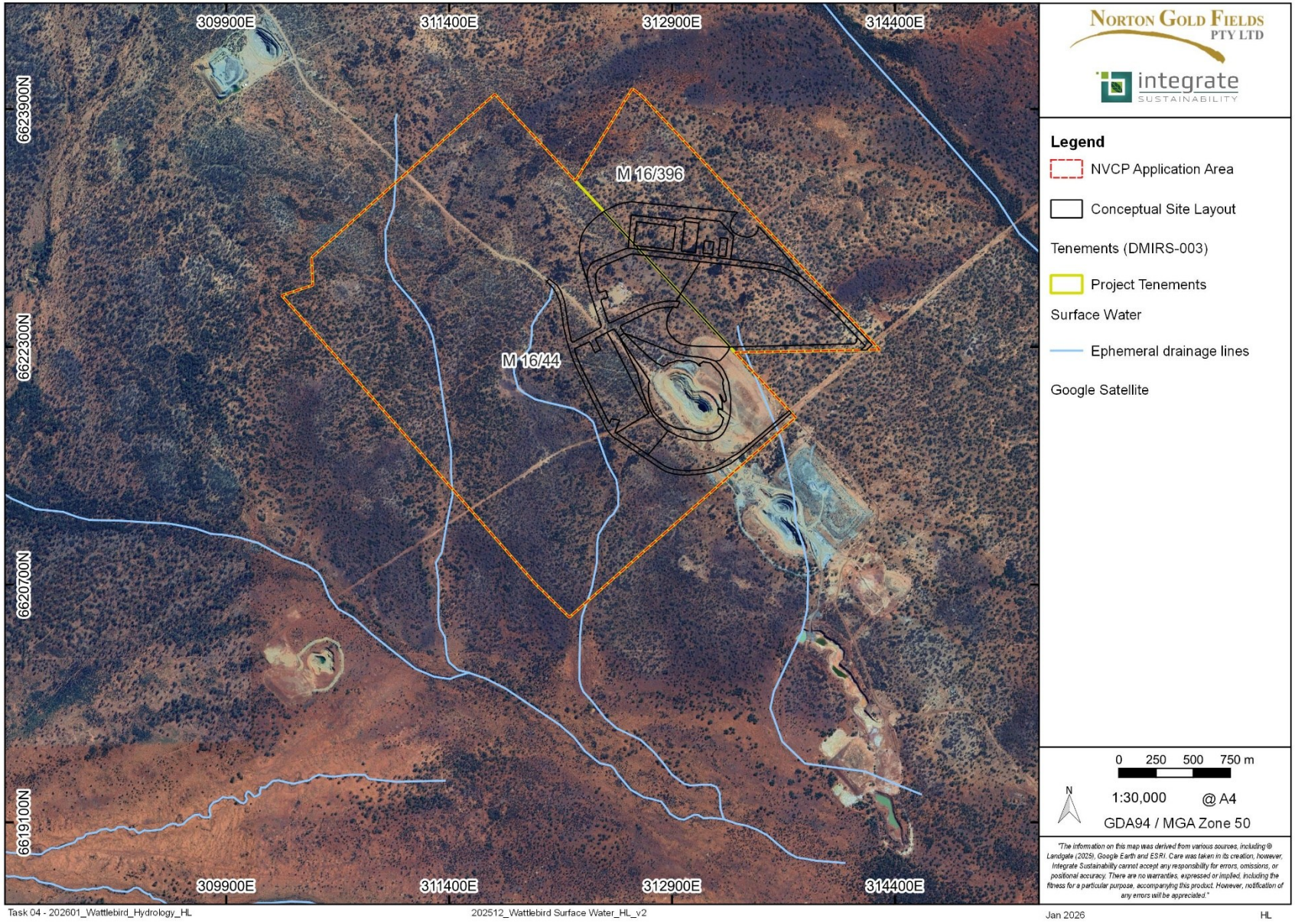


Figure 2-4 Local hydrology in the application area.

2.6 Hydrogeology

The Kalgoorlie region is underlain by highly weathered and fractured Archean bedrock, which is locally overlain by palaeochannel sediments and more widespread alluvial and lake deposits. This geological setting forms part of the Yilgarn Goldfields fractured-rock groundwater province (Kern, 1995).

Groundwater within the application area is representative of background conditions associated with the Roe Palaeochannel System and is naturally hypersaline. The ionic composition is predominantly characterised by elevated sodium and chloride concentrations, with magnesium and sulphate also present at lower proportions (Norton, 2014).

Groundwater recharge across the region is generally low due to high evaporation rates, heavy soils, and dense vegetation, with most recharge occurring during infrequent but intense rainfall events (Kern, 1995). The groundwater moves under gravity through cracks in the underlying bedrock, the weathered rock profile, and shallow alluvial sediments, particularly those linked to ancient palaeochannel drainage systems. These layers are connected and allow groundwater to move between them. The main water-bearing zones in the region occur within north–south oriented fractures in shale units, particularly the Black Flag Beds formation, composed of clay (arenite) and mudstone/siltstone deposits, as well as within fractured basalt and dolerite that contain quartz veins (Norton, 2014).

Groundwater parameters for Wattlebird were measured for samples from the San Peblo and Wattlebird Open Pits taken in 2025. Groundwater has been measured to be hypersaline, with TDS ranging from 17,800 to 98,800 mg/L, and to be slightly alkaline with a pH varying between 7.11 and 8.07.

2.7 Flora and Vegetation

In 2011, Botanica (2011) conducted a level 1 flora and vegetation survey of the Bullant mining area (Appendix 3), which covered a total area of approximately 1200ha, including tenement M16/44 (Figure 2-5). In support of this application, Botanica was commissioned to conduct reconnaissance flora and basic fauna surveys in 2024 (Appendix 4) and 2025 (Appendix 5) over the proposed activity area.

The 2024 survey covered an area of approximately 288ha on M16/44 and M16/396 (Botanica Consulting, 2025a), while the 2025 survey covered approximately 150ha over M16/44 and M16/396 (Botanica Consulting, 2025b).

Norton acknowledges that while the entire application area has been previously surveyed, the Level 1 survey undertaken by Botanica in 2011 is now more than five years old. Based on the conceptual site layout, it is expected that the proposed clearing will occur within the areas surveyed in 2024 and 2025, as shown in Figure 2-5. If clearing is proposed in areas not covered by the 2024 and 2025 surveys, the need for additional surveys will be considered before clearing.

2.7.1 Conservation Significant Flora

The flora survey conducted by Botanica Consulting in 2011 included a desktop assessment comprising searches of the former Department of Environment and Conservation (DEC) Declared Rare and Priority Flora databases to identify species with the potential to occur in or near the survey area (Botanica Consulting, 2011). While several Priority Flora taxa and one Declared Rare Flora species were identified as having the potential to occur, no priority or threatened flora species were recorded during the field survey.

Desktop assessments were also undertaken as part of the 2024 and 2025 surveys and included a literature review, together with searches of the Flora and Conservation Significance database and the Protected Matters Search Tool (Botanica Consulting, 2025a; 2025b). The desktop assessments did not identify threatened or priority flora species likely to occur within the survey areas, which was confirmed by the 2024/2025 fieldwork.

Based on the outcomes of the surveys conducted, it is considered unlikely that any conservation-significant flora species listed under Commonwealth or Western Australian legislation occur within the application area.

2.7.2 Weeds

The flora survey conducted by Botanica Consulting in 2011 recorded four weed species, comprising *Dittrichia graveolens*, *Salvia verbenaca*, *Centaurea melitensis* and *Lysimachia arvensis* (Botanica Consulting, 2011). The 2024 survey recorded two weed species (*Dittrichia graveolens* and *Salvia verbenaca*) within the survey area (Botanica Consulting, 2025a), while no weed species were observed during the 2025 survey (Botanica Consulting, 2025b). None of the weed species recorded across these surveys is currently listed as Declared Pests on the Western Australian Organism List (WAOL) pursuant to the Biosecurity and Agriculture Management Act 2007, nor are they listed as Weeds of National Significance.

2.7.3 Regional Vegetation Units

Pre-European vegetation in Western Australia was first mapped by Beard et al (2013) and later updated to align with the Native Vegetation Information System (NVIS) at 1:250,000 scale. State-wide data on the pre-European and current extent of each vegetation association, including areas within DBCA-managed lands, can be used to determine if a vegetation association is rare or of conservation significance (DBCA, 2019).

The application area is entirely within vegetation sub-association 462, which occurs predominantly in the Coolgardie IBRA region, with small patches in the Murchison region. A review of the publicly available DPIRD-005 (DPIRD, 2025a) and DPIRD-006 (DPIRD, 2025b) spatial layers indicates that vegetation sub-association 462 retains more than 99% per cent of its pre-European extent of 442,134 ha, with the current mapped extent estimated at approximately 438,249 ha.

Clearing has previously occurred as part of previous mining and exploration activities. Despite this, the current extent within the application area remains above 91% of its original pre-European extent, indicating that excessive clearing has not occurred.

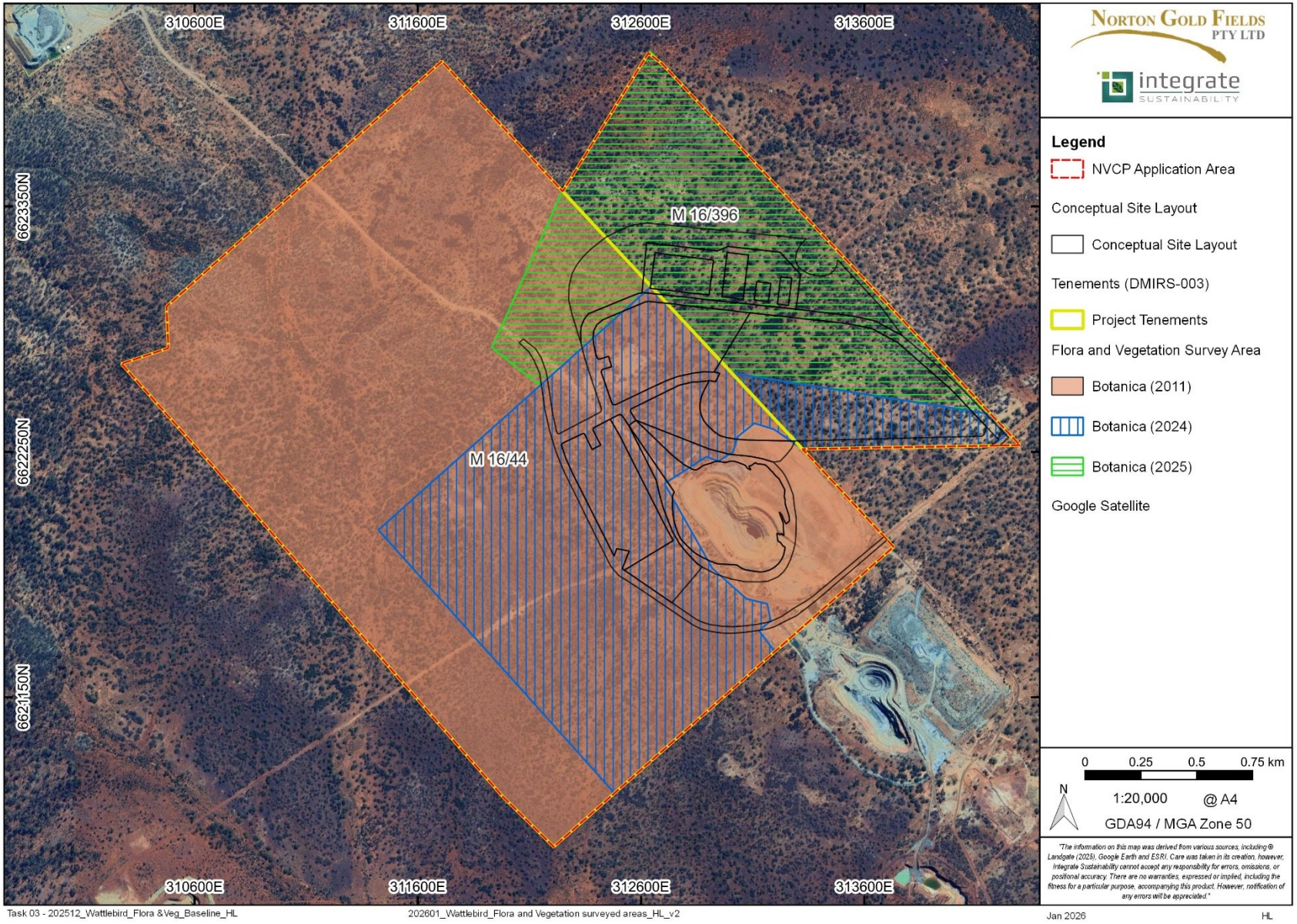


Figure 2-5 Flora and vegetation survey areas.

2.7.4 Local Vegetation Communities

The 2011 survey identified a total of seven vegetation communities, with two vegetation communities located within the application area. The vegetation communities identified in the application area are detailed in Table 4 and Figure 2-6.

Table 4 –Vegetation Communities in the application area (Botanica Consulting, 2011).

Veg Community	Area (ha)	Application Area (%)
Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia mueller*	483.21	81.3%
Eucalyptus ravida thicket over *Eremophila scoparia* and *Olearia muelleri* shrubland	89.25	15%
Cleared Area	21.54	3.75
Total	594	100%

The 2024 and 2025 surveys conducted by Botanica (Botanica Consulting, 2025a; 2025b) identified a total of five vegetation communities within three landform types and comprised a single major vegetation group according to the National Vegetation Information System (NVIS) Major Vegetation Group definition. The identified vegetation communities description, area and representation in surveyed areas are detailed in Table 5 and Figure 2-7.

Table 5 – Local Vegetation Communities in survey areas (Botanica Consulting, 2025a; 2025b).

Veg Community	Description	Area (ha)	Application Area (%)
CLP-EW1	Mid woodland of *Eucalyptus salmonophloia* over mid open shrubland of *Acacia hemiteles/ Eremophila scoparia* and low open shrubland of *Ptilotus obovatus* on clay-loam plain.	118.1	27%
RH-EW1	Mid woodland *Eucalyptus clelandiorum/E. oleosa* over mid open shrubland of *Eremophila caperata* and low sparse shrubland of *Cratystylis conocephala/ Eremophila pustulata* on hillslope.	243.6	55.7%
RH-EOW1	Mid open woodland of *Eucalyptus salubris/E. clelandiorum* over mid sparse shrubland of *Eremophila sp*. Mt Jackson (G.J. Keighery 4372) and low sparse shrubland of *Cratystylis subspinescens* on hillslope.	10	2.3%
OD-EW1	Mid woodland of *Eucalyptus salmonophloia* over mid open shrubland of *Acacia hemiteles/ Eremophila scoparia* and low open shrubland of *Ptilotus obovatus* in drainage depression	46.8	10.7%
CLP-EW3	Low woodland of *Eucalyptus ravida* over mid open shrubland of *Eremophila scoparia* over low chenopod shrubland of *Maireana sedifolia* and *Atriplex vesicaria* on clay-loam plain.	9	2%
Cleared Area	N/A	10.5	2.3%
Total		438	100%

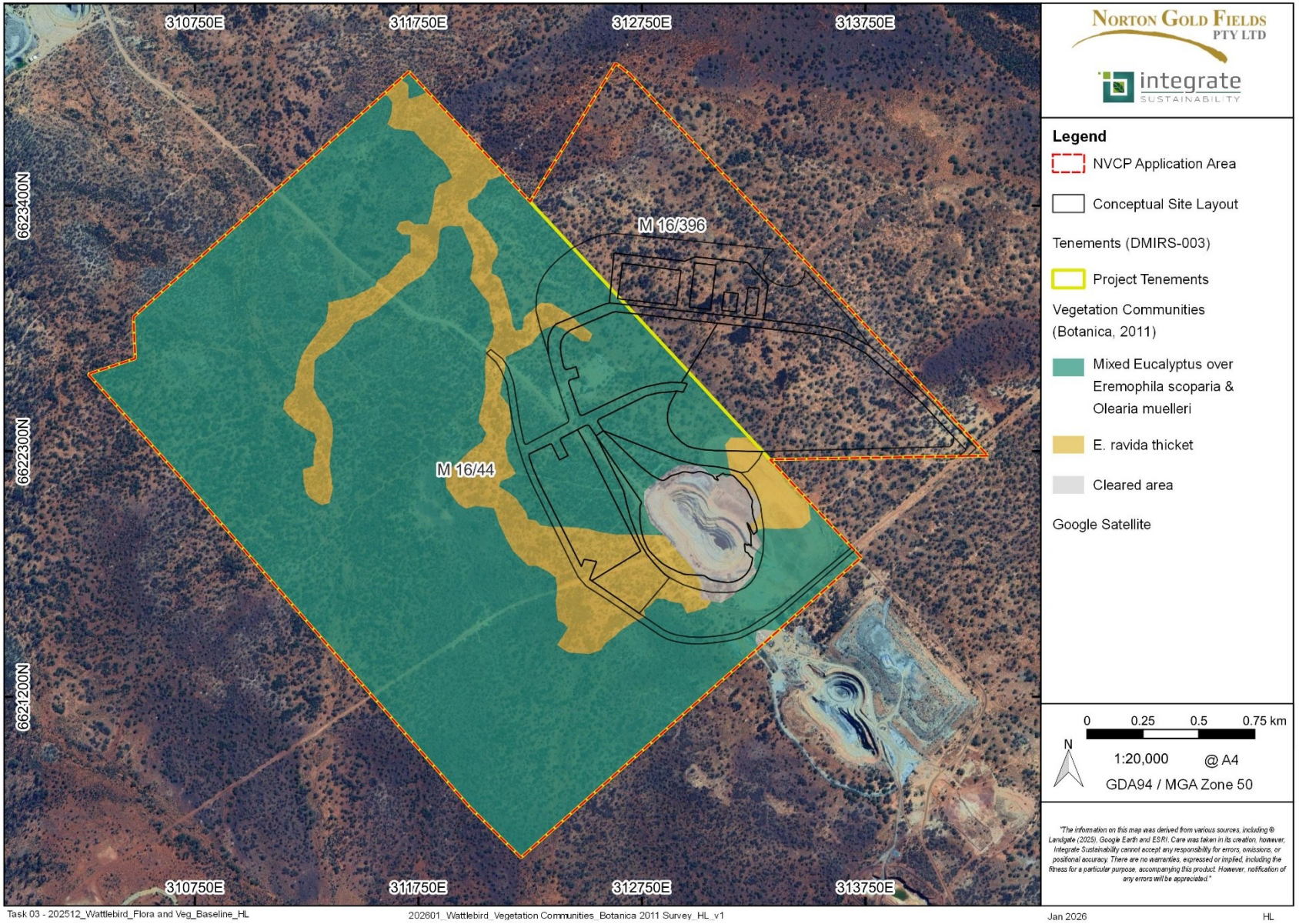


Figure 2-6 Vegetation communities within Botanica (2011) surveyed areas.

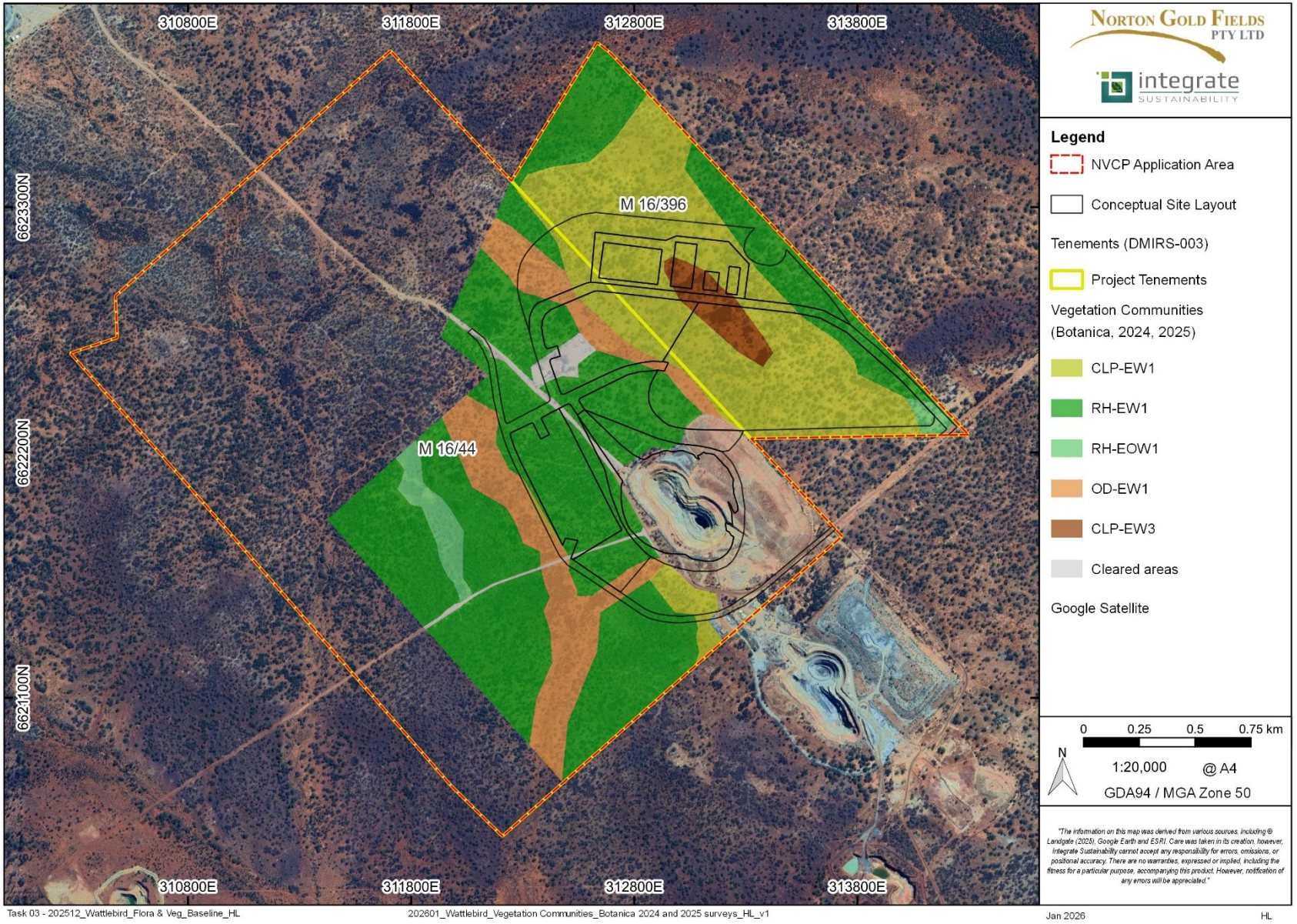


Figure 2-7 Vegetation communities within Botanica (2025a; 2025b) surveyed areas.

2.7.5 Vegetation Condition

The 2011 survey used the vegetation condition scale from Keighery (1994), and found that all vegetation communities identified were in "very good" condition, which is defined as "altered due to obvious signs of disturbance" (Botanica Consulting, 2011).

Botanica (2025a; 2025b) used the vegetation condition scale adapted from Keighery (1994) and Trudgen (1988) as recommended by the Environmental Protection Authority (EPA) (2016) to evaluate the vegetation condition in the Wattlebird mine area. The native vegetation condition within the survey areas varied between "completely degraded" to "very good", with 93.8% of the vegetation being classified as "good", as detailed in Table 6.

Table 6 – Summary of local vegetation condition.

Veg Unit	Description	Area (ha)	Application Area (%)
Very Good	Vegetation structure altered, with obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	17ha	3.9%
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure, such as that caused by low levels of grazing or slightly aggressive weeds.	411	93.8%
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration, but not to a state approaching good condition without intensive management.	9	2%
Completely Degraded	The structure of the vegetation is no longer intact, and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.	<1	0.3%
Total		438	100%

2.7.6 Conservation Significant Vegetation Communities

None of the recorded vegetation units were identified to be a Threatened Ecological Community (TEC) or Priority Ecological Community (PEC), restricted distribution vegetation, vegetation providing important refuge, or significant ecological function was identified in the surveys conducted by Botanica (2011; 2025a; 2025b).

A search of the publicly available DBCA-038 (DBCA, 2024) spatial layer confirmed the results of the survey and found no TECs in the region and no PECs less than 30km from the survey areas.

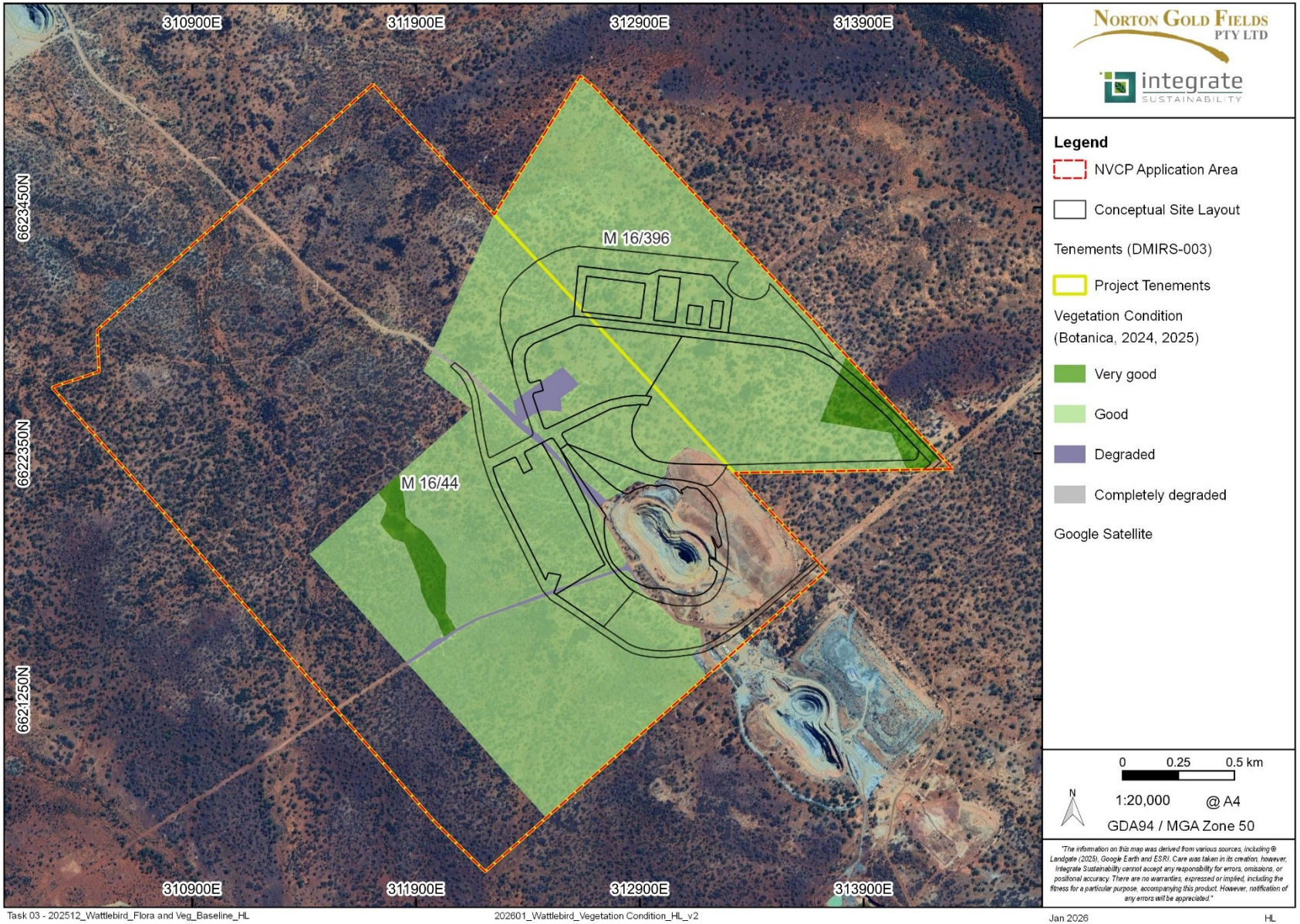


Figure 2-8 Vegetation condition within survey areas.

2.8 Terrestrial Fauna

Terrestrial fauna surveys have been undertaken over and near Wattlebird from 2011 to 2025 by 360 Environmental, Botanica, and Terrestrial Ecosystems.

In 2011, 360 Environmental (2011) conducted a Level 1 vertebrate fauna survey covering small areas within the application area in M16/44 (Appendix 6). Targeted Malleefowl mound searches covering M16/44 were conducted in 2014 by Botanica (2014) (Appendix 7).

In support of this application, Botanica was commissioned to conduct reconnaissance flora and basic fauna surveys over the Wattlebird area, located within the application area (Botanica Consulting, 2025a; 2025b). The 2024 survey covered approximately 288ha on tenements M16/44 and M16/396 (Appendix 4), while the 2025 survey covered approximately 150ha on tenements M16/44 and M16/396 (Appendix 5).

Additionally, Terrestrial Ecosystems (2025) conducted a targeted Malleefowl mound search area of approximately 288ha on tenements M16/44 and M16/396 (Appendix 8), as detailed in Figure 2-9.

Terrestrial fauna surveys have been undertaken across the application area between 2011 and 2025. While parts of the application area were surveyed more than five years ago, based on the conceptual site layout, it is expected that the proposed clearing will occur within the areas surveyed by Botanica in 2024 and 2025, as shown in Figure 2-9. Norton acknowledges that parts of the application area have not been surveyed within timeframes typically regarded as current and notes that additional surveys may be required, before clearing outside the areas surveyed in 2024 and 2025 if there is a likelihood of impacts to Conservation Significant Fauna.

2.8.1 Fauna Habitat

The 2024 and 2025 surveys conducted by Botanica (2025a; 2025b) identified a total of four fauna habitats (Table 7). The survey area includes three types of eucalypt woodland: rocky slopes, clay loam plains, and open depressions, with rocky slopes being the most common habitat in the surveyed area (Figure 2-10).

The rocky slopes have hard ground that is generally unsuitable for burrowing animals, but small fauna like reptiles can find shelter under rocks. Vegetation is of moderate diversity, supporting a modest number of birds.

The clay loam plains and open depressions have soils that are moderately suitable for burrowing in some areas. Both have moderate vegetation cover and leaf litter, providing refuge for reptiles. Vegetation diversity is low to moderate, supporting small to moderate numbers of birds. Open depressions are the most valuable habitat, as they can hold water after rainfall, supporting a greater variety of birds and small fauna.

Table 7 – Summary of fauna habitats.

Fauna Habitat	Attributes	Area (ha)	Application Area (%)
Eucalypt woodlands on rocky slope	• Ground not particularly suited to burrowing species. • Moderate diversity vegetation strata supporting a lower avifauna assemblage. • Potential refuge for small fauna under rocks, for example reptile fauna	253.6	58.0
Eucalypt woodland on clay loam plain	• Ground moderately suited to burrowing species. • Low to Moderate diversity vegetation strata supporting avifauna assemblage.	127.1	29.0

Fauna Habitat	Attributes	Area (ha)	Application Area (%)
	• - Moderate vegetation density and leaf litter, providing some refuge for reptiles.		
Eucalypt woodland in open depression	• Ground moderately suited to burrowing species in some areas. • Moderate diversity vegetation strata supporting a good avifauna assemblage. • Moderate vegetation density and moderate leaf litter supporting small reptiles. • - Source of water after rainfall events.	46.8	10.7
Cleared Area	• Ground not suited to burrowing species. • Very low diversity vegetation strata supporting minimal avifauna assemblage. • - Very low vegetation density and very low leaf litter.	10.5	2.3
Total		438	100%

2.8.2 Terrestrial Fauna

The Level 1 vertebrate survey conducted in 2011 by 360 Environmental (2011) field survey recorded 26 bird species and one native mammal species within the survey area, with no frogs or reptiles observed. None of the species recorded at the time is currently listed as specially protected under State or Commonwealth legislation.

Botanica (2025a; 2025b) recorded a total of eight bird species and three mammals in the survey area. No priority or threatened fauna species were identified. However, the surveys noted that the following species may visit the area for short periods as infrequent vagrants:

- Malleefowl (Leipoa ocellata) - Vulnerable (EPBC Act and BC Act)
- Southern Whiteface (*Aphelocephala leucopsis*) - Vulnerable (EPBC Act)
- Arid bronze azure butterfly (*Ogyris subterrestris petrina*) – Critically Endangered (EPBC Act and BC Act)
- Inland hairstreak (*Jalmenus aridus*) – Priority 1 (DBCA)

2.8.3 Conservation Significant Vertebrate Fauna

The 2011 survey conducted by 360 Environmental (360 Environmental, 2011) did not identify threatened or priority species in the survey area. However, the desktop assessment did show that twelve bird species, ten mammals (including Malleefowl), three reptile and four mammal invasive species listed under WA or Commonwealth legislation were found to possibly occur in the region.

Botanica (2014) conducted a targeted Malleefowl survey in 2014 covering M16/44 and did not record any Malleefowl or evidence of Malleefowl activity, including active or inactive mounds. The survey also concluded that the vegetation structure is unlikely to support Malleefowl given its relatively open structure. Terrestrial Ecosystems (2025) conducted a targeted Malleefowl search in 2025 (Figure 2-11) and did not find Malleefowl mounds, and concluded that there is no evidence that Malleefowl are utilising the surveyed area.

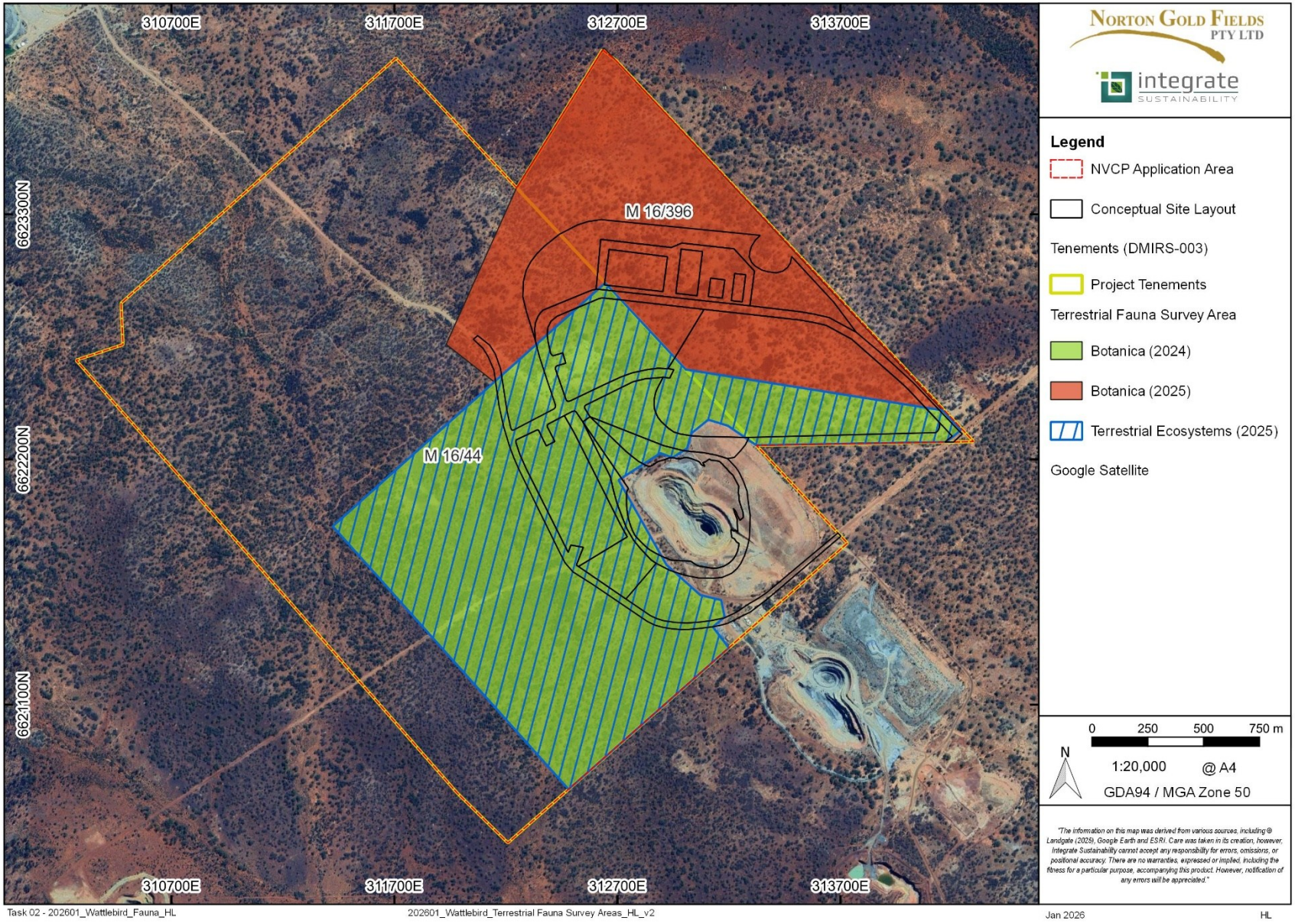


Figure 2-9 Terrestrial fauna surveyed areas.

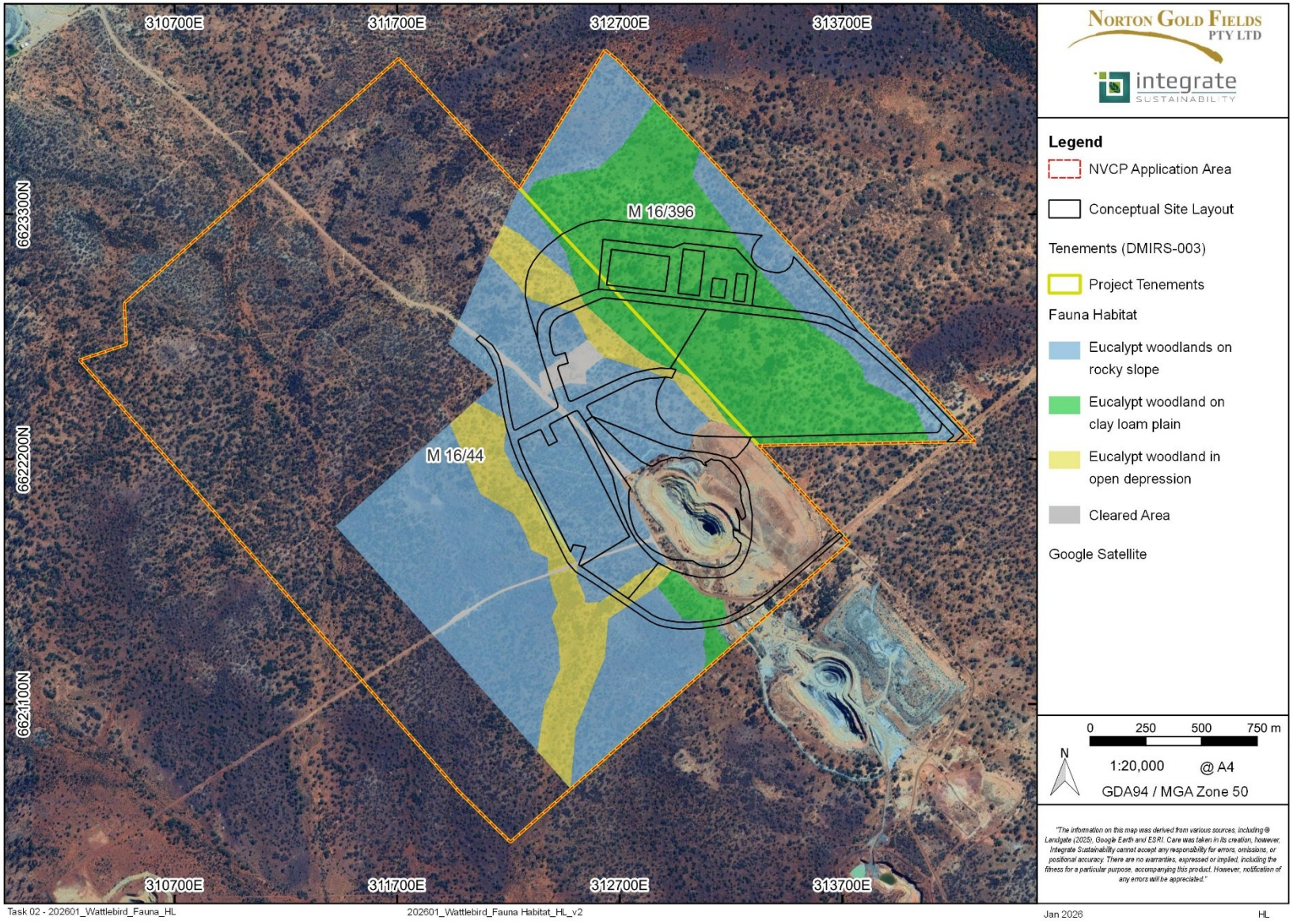


Figure 2-10 Fauna habitats identified in surveyed areas.

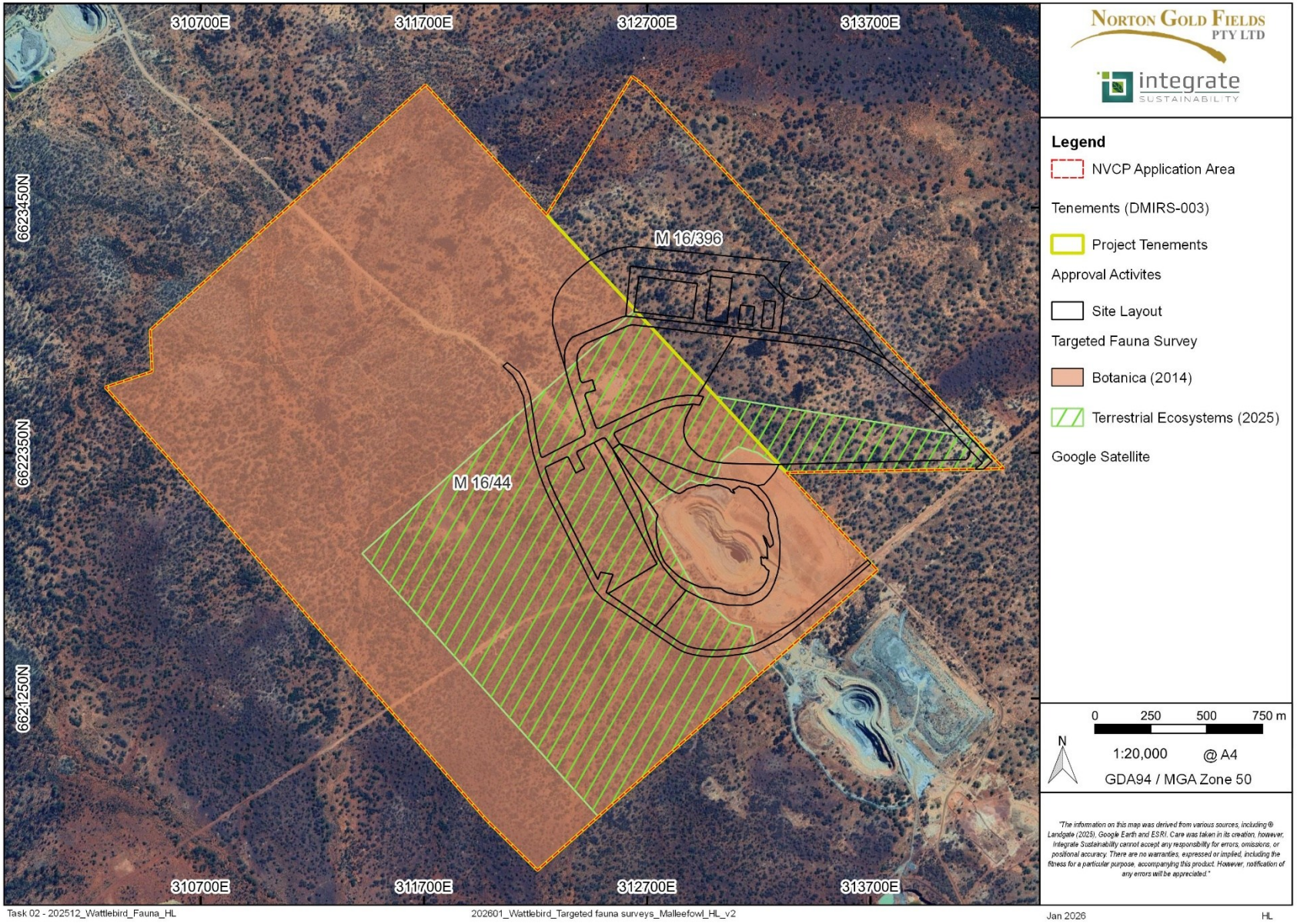


Figure 2-11 Targeted fauna (Malleefowl) survey area.

2.8.4 Introduced Fauna

The surveys conducted in 2024 and 2025 by Botanica (2025a; 2025b) did not identify the introduced fauna species in the surveyed areas.

2.9 Subterranean Fauna

The geology of the Wattlebird area consists mainly of dense, fine-grained basalt and ultramafic rocks that have been strongly altered along narrow shear zones. These rocks are hard and compact, with fractures filled by clay and alteration minerals, which limits the presence of open spaces or pathways underground (Norton, 2014).

The regolith profile includes shallow transported soils overlying clay-rich weathered rock (saprolite) and competent saprock. The saprolite contains high clay content, which reduces pore space and restricts water movement. The underlying saprock is relatively impermeable and does not provide stable underground spaces. Overall, the subsurface materials do not provide the voids, permeability, or stable conditions required to support subterranean fauna, and for that reason, subterranean fauna surveys were not conducted.

2.10 Social Surroundings

The application area is situated within the Marlinyu Ghoorlie native title determination area (WAD647/2017; WC2017/007). A search of the publicly aboriginal heritage inquire system spatial layers (DPLH-099) (DPLH, 2026a)and DPLH-100 (DPLH, 2026b) showed that no registered or lodged Aboriginal heritage sites were identified within 4km from the application area (Figure 2-12).

Heritage surveys have been undertaken over part of the application area in consultation with Marlinyu Ghoorlie between 2024 and 2025. The proposed clearing is expected to occur within the current conceptual site layout, which has been heritage surveyed and adjustments made to accommodate heritage values identified. Norton acknowledges that not all parts of the application area have been surveyed and notes that further heritage surveys may be considered before clearing within unsurveyed areas.

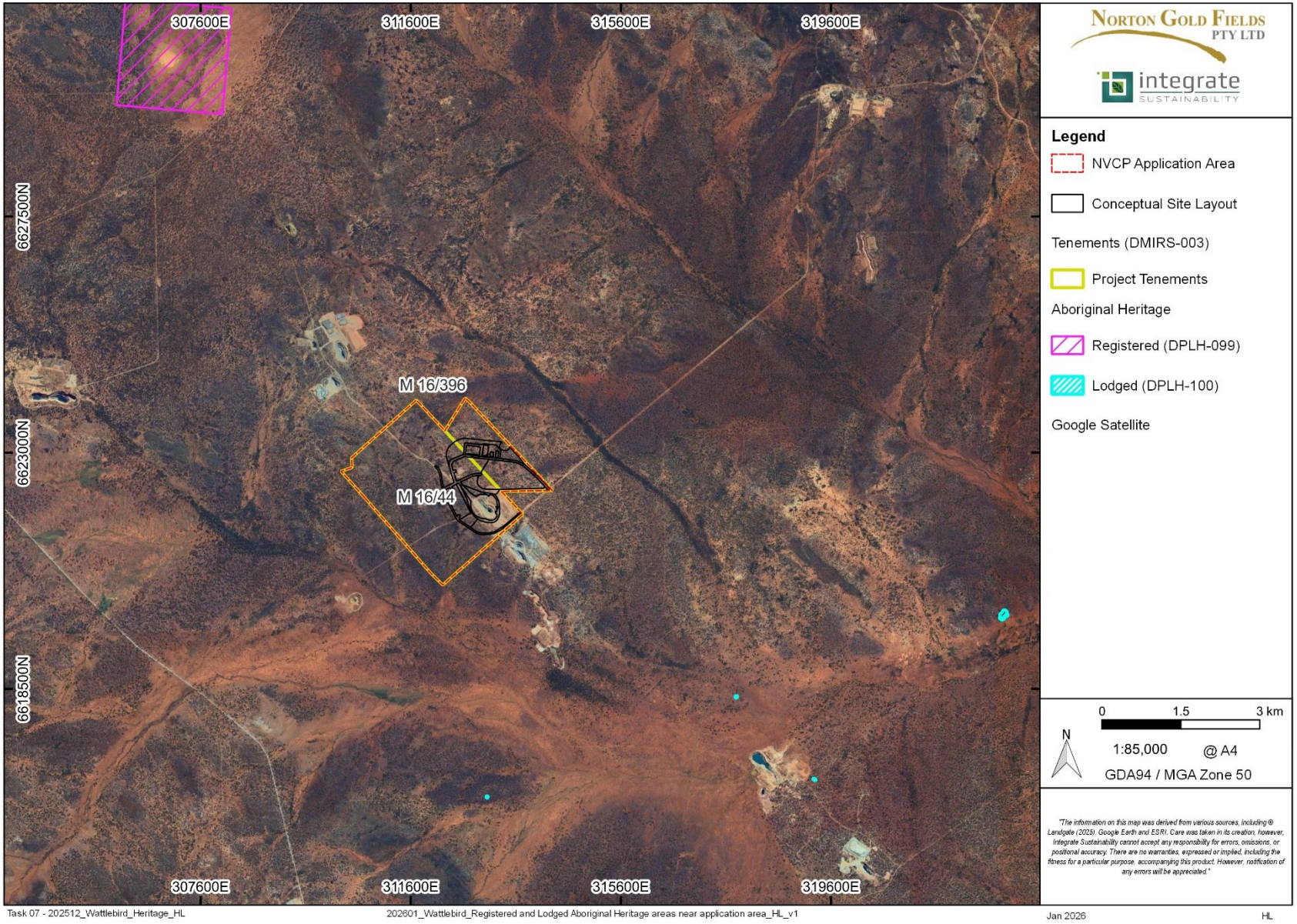


Figure 2-12 Registered and Lodged Aboriginal heritage sites close to the application area.

3 Environmental Impacts and Management

3.1 Potential Impacts to Flora and Vegetation

3.1.1 Direct Loss of vegetation

Norton is proposing to clear up to 200ha of native vegetation within the 737.7ha application area. Where possible, Norton will utilise previously disturbed areas to preserve existing vegetation.

3.1.2 Direct Loss of Conservation Significant Flora

No threatened or priority species have been identified within the application area. Based on the outcomes of the surveys conducted, it is unlikely that flora species listed as threatened or priority under Commonwealth or Western Australian legislation occur within the application area, and it is not envisaged that the proposed clearing to have a significant impact on flora species.

3.1.3 Degradation of Vegetation

Degradation of vegetation can happen as a result of direct and indirect impacts of the proposed up to 200ha clearing. The possible impacts include:

- Uncontrolled vehicle access leading to physical damage of vegetation;
- Land clearing and construction activities deposit dust on vegetation;
- Vehicles and/or equipment spreading or introducing weeds;
- Leaks from containment structures, pipes, vehicles or equipment leading to contaminated soils, surface water or groundwater;
- Hydrocarbon or chemical spills contaminating soils, surface water or groundwater;
- Inappropriate disposal of domestic waste or waste hydrocarbons and chemicals leading to contamination of soils, surface water or groundwater; or
- Clearing and associated activities accidentally causing a fire.

3.2 Potential Impacts to Fauna

3.2.1 Fragmentation of Habitat

Previous exploration and mining activities have already caused habitat fragmentation within the application area, particularly within tenement M16/44, and this has been considered in the planning of the proposed site layout. Additionally, the habitat types mapped by Botanica (2025a; 2025b) extend beyond the application area and occur widely across the surrounding region. Accordingly, the additional fragmentation associated with the proposed clearing is unlikely to result in significant impacts on fauna species.

3.2.2 Loss of Foraging Area or Habitat

Vegetation clearing will result in a reduction of available foraging habitat. However, no habitat type will be entirely removed from the application area under the proposed site layout. The mapped fauna habitats are well represented across the wider region, and no unique habitats have been identified within the application area.

3.2.3 Increased Vehicle Strikes

An increased risk of fauna mortality from vehicle strikes is anticipated where roads or tracks are constructed or upgraded, particularly for slow-moving or easily startled species, as well as scavenging fauna attracted to roadkill. The likelihood of vehicle–fauna collisions is higher during nighttime operations due to reduced visibility and increased animal activity.

3.2.4 Fire

Clearing and associated activities may inadvertently cause fire, which represents a key threatening process for conservation-significant species, as many small mammals and birds depend on long-unburnt vegetation. Given the presence of moderately sparse vegetation within the Wattlebird area, there is a risk that fire could spread beyond the application area into adjacent habitats.

3.3 Potential Impacts to Surface Water

3.3.1 Increased Turbidity

Vegetation clearing may temporarily increase the amount of sediment in surface water when soils are disturbed and rainfall occurs. However, surface water in the application area only flows for short periods after rain, and is limited to ephemeral drainage lines that drain toward nearby salt lakes and clay pans. During heavy or intense rainfall events, short-term increases in water turbidity may occur, but any impacts are expected to be short-lived and confined to the immediate area due to the lack of permanent watercourses.

3.3.2 Altered Surface Water Flows

Vegetation clearing may result in minor changes to surface water flow by altering natural ground cover and drainage patterns during rainfall events. However, surface water in the application area is limited and only occurs for short periods after rain, with small ephemeral drainage lines present.

4 Management Measures

4.1 Threatened and Priority Flora

In case the proposed works unexpectedly intercept Threatened or Priority flora, Norton will cease work and seek independent management advice.

4.2 Threatened and Priority Fauna

In the instance where the proposed works unexpectedly, intercept Threatened or Priority fauna, Norton will cease work and seek independent management advice.

4.3 Weed Species

To prevent the introduction of weeds, vehicles and machinery will be inspected, where practicable, before entering the site. Any seeds or weeds found will be removed, contained, and disposed of appropriately.

4.4 Hydrocarbon Spills

As heavy machinery and vehicles will be used during the proposed works, there is a potential for minor hydrocarbon spills. Storage, handling, disposal, and spill response will be managed in accordance with Norton's existing hydrocarbon management procedures. Spill kits will be available on site to address any incidents, and any contaminated material will be collected, contained, and disposed of appropriately.

4.5 Dust

Due to exposure of the ground surface as a result of the proposed works, there is a potential for fugitive dust to be generated on site. Dust will be managed through the application of dust-suppressing techniques, including the application of saline water via the use of water carts. A water cart will be available for use as required.

5 Stakeholder Engagement

5.1 Ongoing Community and Stakeholder Engagement

The application area is located in a remote part of the Goldfields region, north west of Kalgoorlie-Boulder and does not have any immediate neighbouring landholders or sensitive receptors. Ongoing community and stakeholder engagement for Wattlebird is limited. Engagement will be undertaken as required with relevant government agencies, Traditional Owners, and other stakeholders, particularly if project activities change or any other relevant matters are identified during the life of the project.

6 Assessment Against Clearing Principles

An assessment of the proposed native vegetation clearing against the ten clearing principles outlined in Schedule 5 of the EP Act is provided in Table 8. This assessment was undertaken based on the information provided in the supporting studies attached to this application.

The assessment shows that the proposed clearing does not conflict with any of the ten principles, and, where necessary, management measures will be implemented to minimise any potential unacceptable environmental impacts.

Table 8 – Assessment against clearing principles.

Clearing Principle	Not at Variance	Likely at Variance
a) Native vegetation should not be cleared if it comprises a high level of biological diversity	X	
b) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA	X	
c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora	X	
d) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a Threatened Ecological Community	X	
e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	X	
f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	X	
g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	X	
h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	X	
i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	X	
j) Native vegetation should not be cleared if clearing of the vegetation is likely to cause, or exacerbate, the incidence of flooding	X	

a) Native vegetation should not be cleared if it comprises a high level of biological diversity

Flora and vegetation surveys undertaken in 2011, 2024 and 2025 identified vegetation communities that are common within the Coolgardie IBRA region and are not restricted to the application area (Botanica Consulting, 2011; 2025a; 2025b). The vegetation communities occur widely in the surrounding landscape and are well represented beyond the proposed application area. While most vegetation is in "good" condition, it does not display characteristics of unusually high diversity.

b) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA

Fauna surveys conducted in 2024 and 2025 identified common fauna habitats, including eucalypt woodland on rocky slopes, clay loam plains and open depressions. These habitats occur widely in the surrounding region and are not unique to the application area. No threatened or priority fauna species were recorded during field surveys, and targeted Malleefowl surveys found no evidence of use of the area (Botanica Consulting, 2025a; 2025b; Terrestrial Ecosystems, 2025).

c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of rare flora

Desktop assessments and field surveys did not identify any threatened or priority flora species within the application area (Botanica Consulting, 2011; 2025a; 2025b). Survey results indicate that such species are unlikely to occur within the proposed clearing footprint.

d) Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a Threatened Ecological Community

No Threatened Ecological Communities or Priority Ecological Communities were identified within the application area. This was confirmed through field surveys and a review of available spatial data (Botanica Consulting, 2025a; 2025b).

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared

The application area lies within vegetation sub-association 462, which retains more than 99% of its pre-European extent at a regional scale. Despite previous mining and exploration disturbance, more than 91% of the original vegetation remains within the application area. This indicates that excessive clearing has not occurred or that the vegetation is not an isolated remnant of native vegetation.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland

Surface water within the application area is limited to small ephemeral drainage lines that only flow briefly after rainfall events. No permanent watercourses, wetlands or vegetation communities associated with permanent aquatic environments were identified.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation

Soils in the application area include loams and clay loams, with some areas showing salinity or sodicity (Mine Earth , 2025). While clearing will disturb soils locally, no evidence suggests that clearing will result in widespread or long-term land degradation. Management measures are proposed to minimise soil disturbance and erosion.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area

There are no conservation areas adjacent to or near the application area.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water

Surface water in the application area is ephemeral and limited, and groundwater is naturally hypersaline. Potential risks such as sediment movement and hydrocarbon spills are acknowledged, with management measures proposed to minimise impacts.

j) Native vegetation should not be cleared if clearing of the vegetation is likely to cause, or exacerbate, the incidence of flooding

The application area has an internal drainage system and experiences surface water flows only after rainfall events. Clearing may result in minor local changes to runoff, but there is no indication that clearing would cause or exacerbate flooding.

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Appendix 2 – Soil Resource Assessment (Mine Earth , 2025)

Wattlebird Pit Cutback - Soil Resource Assessment

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11 September 2025



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Executive Summary

Mine Earth was commissioned by Norton Gold Fields Pty Ltd (NGF) to complete a soil resource assessment for the proposed Wattlebird pit cutback at the Wattlebird Gold Mine (the Project). The Project is located approximately 35 km north of Kalgoorlie, within NGF's Paddington Operations in the Goldfields region of Western Australia. The Study area comprised the disturbance areas associated with the proposed pit cutback and waste rock landform. The study area is approximately 158.4 hectares in area.

Assessment of the physical and chemical characteristics of soil resources within the Study area is required to identify soil management requirements, develop rehabilitation prescriptions, and fulfil requirements for future regulatory approval.

The objectives of the assessment were to:

- Review regional soil and land system information.
- Assess the physical and chemical characteristics of the various soil units present within the Study area, with particular focus on the soils within the proposed disturbance footprints, in accordance with the Environmental Factor Guideline: Terrestrial Environmental Quality (EPA, 2018) and the Draft Guidance: Materials Characterisation Baseline Data Requirements for Mining Proposals (DMP, 2016).
- Identify potentially problematic soils within the disturbance area which may require selective handling and management to minimise potential impacts during mining and for rehabilitation.
- Develop preliminary soil management and rehabilitation recommendations (e.g. topsoil stripping and handling guidelines, soil placement on rehabilitated landforms etc).

Soil characteristics

The physical and chemical characteristics of the soils within the Study area were assessed from 14 locations, with samples and relevant field-based information collected by NGF personnel.

The soil profiles, as identified by the field sampling regime and sampling and analysis program typically consisted of loamy, moderate to well-structured soils, with minor amounts of coarse fragments (>2 mm) and increasing clay content with depth.

The topsoils (approximately 0-20cm) had a loamy texture, had a propensity for dispersion of the clay fraction following severe disturbance, typically had a moderate hydraulic conductivity and had a generally low potential to hard-set. The topsoils were predominantly moderately alkaline, non-sodic, had low concentrations of organic carbon, moderate plant-available phosphorus, high plant-available potassium, nitrogen and sulfur and typically total concentrations of As, Cd, Cr, Se and Co that were above the average crustal abundance (ACA). The salinity of the topsoils was variable, ranging from non-saline to extremely saline, with the majority being extremely saline.

The subsoils predominantly had a loam or silty loam texture with higher clay content than the topsoils, had more of a propensity to disperse following disturbance than topsoils, typically had variable hydraulic conductivity and were mostly non-hard-setting but some with potential to hard-set. The subsoils were predominantly moderately alkaline, sodic, had low organic carbon and phosphorus, variable nitrogen and high sulfur, potassium and total concentrations of As, Cd, Cr, Se and Co above the ACA. The salinity of the subsoils ranged from non-saline to extremely saline, with the majority being extremely saline.

Suitability for rehabilitation and soil management recommendations

The topsoil (0 to 20 cm) from all disturbance areas is considered suitable for use as a rehabilitation resource and should be stripped (where possible) and placed in stockpiles for use as a surface rehabilitation medium.

The topsoils are somewhat prone to dispersion upon disturbance, therefore care should be taken to minimise the handling of these soil materials where possible, particularly when wet. Where utilised as a surface rehabilitation medium on the sloped batters of waste rock landforms, the surface soils will require ripping into underlying competent waste rock to armour the surface and minimise erosion as far as practicable. Adequate surface water management on constructed landforms will be required to minimise the potential for surface water concentration / flow. Many of the topsoils were identified as being extremely or very saline, which may impact the germination and growth of species sensitive to salinity. Salt tolerant species should be used for rehabilitation to maximise rehabilitation outcomes.

The subsoils had higher clay content, were more sodic, had more likelihood of hard-setting and were not as free-draining as the topsoils. The subsoils are likely to be more erodible than the topsoils and are not recommended for use as a near-surface material for rehabilitation.

Introduction

1. Introduction

Norton Gold Fields Pty Ltd is proposing further development of the existing Wattlebird Project (the Project), located approximately 50 km north-west of Kalgoorlie in the Goldfields region of Western Australia (WA) (Figure 1). Mine Earth was commissioned to complete a soil resource assessment for disturbance areas associated with a proposed pit cutback and waste rock landform at the Project.

An assessment of soil within the proposed disturbance areas was undertaken to support regulatory approvals, to identify soil management requirements and potential utilisation of soil resources in rehabilitation activities, and to facilitate mine closure planning.

This report includes:

- A description of the Study area.
- A description of the materials and methods used for sample collection and analysis.
- Surface soil profile descriptions.
- A description of soil physical characteristics including surface soil profile morphology, soil texture, soil structure, structural stability and hydraulic conductivity.
- A description of soil chemical characteristics including pH, electrical conductivity, organic matter, exchangeable cations, exchangeable sodium percentage, plant-available nutrients and total metal concentrations.
- Soil management recommendations for topsoil stripping, handling and placement as a rehabilitation resource.

250000
300000
350000
400000
6700000
6650000
6600000
6550000
6500000
6450000

Mt Magnet
Geraldton
Kalgoorlie
Perth
Norseman
Bunbury
Esperance
Albany

Legend

- Townsites
- State Highway
- National Highway
- Study Area
- DBCA Legislated Lands

Goongarrie National Park

Study Area

Goldfields Hwy

Kalgoorlie

Great Eastern Hwy

Goldfields Woodlands National Park

Regional Location

Figure 1

N

0 12.5 25 50 75

Kilometers

Scale: 1:750,000 at A3

Spatial Reference
PCS: GDA 1994 MGA Zone 51
GCS: GCS GDA 1994
Datum: GDA 1994

Author: S. Parnaby
Reviewed by: S. Perry
Date:28.02.2025

Earthstar Geographics

Description of Study Area

2. Description of Study Area

2.1 Project Description

Norton Gold Fields Pty Ltd is proposing further development of the site within the study area, which will include a cutback of an existing open pit and the creation of a new waste rock landform (WRL). The region has been historically disturbed by exploration and mining since the 1890s. The study area includes the proposed footprints of Wattlebird pit cutback and WRL (Figure 2).

312000
313000
314000
315000
6623000
6622000

Legend

Disturbance type

- Access Roads
- Carpark
- Goline
- Office
- ROM Pad
- Topsoil Stockpile
- Wattlebird Min Waste
- Wattlebird Pit
- Wattlebird WRD
- Workshop

MINE EARTH

Project layout

Figure 2

N

0 200 400 800

Meters

Scale: 1:8,000 at A3

Spatial Reference
PCS: GDA 1994 MGA Zone 51
GCS: GCS GDA 1994
Datum: GDA 1994

Author: S. Parnaby
Reviewed by: S. Perry
Date:04.08.2025

Maxar

2.2 Climate

The closest Bureau of Meteorology (BOM) weather station to the study area with comprehensive data is located at Kalgoorlie-Boulder. The climate in Kalgoorlie is classified as local steppe (summer drought) desert, with hot, dry summers and cold winters (BOM, 2025).

The nearby Kalgoorlie-Boulder meteorological station records a mean monthly maximum temperature ranging from 33.7° C in January to 16.9° C in July (BOM, 2025). The mean minimum temperature is 18.4° C in January and 5.1° C during July (Figure 3). Mean total annual rainfall for this region is 264.9 mm, ranging between a maximum average rainfall of 31.7 mm in February and a minimum of 13.4 mm in September (Figure 3). The average annual number of days with rainfall over 1 mm is 39.2.

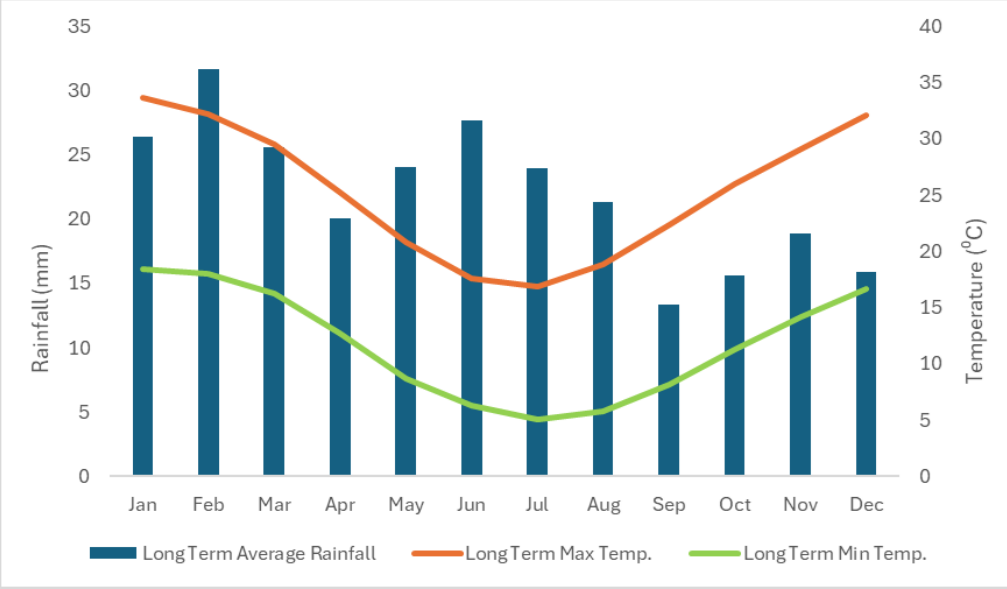


Figure 3: Monthly rainfall, monthly mean and maximum temperatures as recorded by Kalgoorlie-Boulder weather station

2.3 Bioregion

The study area is situated within the Eastern Goldfield subregion of the Coolgardie bioregion according to the Interim Biogeographic Regionalisation for Australia (IBRA) (McKenzie, N.I., May, J.E. and McKenna, S., 2003). This sub-region lies on the Yilgarn Craton's 'Eastern Goldfield Terranes' (Figure 4), it is characterised by a granite basement outcropping at mid-levels in the landscape. Upper levels are the eroded remnants of a lateritic duricrust yielding sandplains, gravelly sandplains and laterite breakaways.

Valleys have Quaternary duplex and graduational soils and include chains of salt lakes. Parallel bands of greenstone intrude through the granite basement and are exposed as low ranges. Drainage is occluded. Diverse Eucalyptus woodlands occur around salt lakes, on ranges, and in valleys. *Acacia* thickets and scrub-heaths occur on sandplains. Salt lakes support dwarf shrublands of samphire. Woodlands and *Dodanaea* scrub occur on granites of the Fraser Range.

250000
300000
350000
400000
6650000
6600000

Legend

Study Area

IBRA Sub-regions

Eastern Goldfield

Eastern Murchison

Southern Cross

Study area

MINE EARTH

IBRA sub-regions of the study area

Figure 4

N

0 12,500 25,000 50,000

Meters

Scale: 1:500,000 at A3

Spatial Reference
PCS: GDA 1994 MGA Zone 51
GCS: GCS GDA 1994
Datum: GDA 1994

Author: S. Parnaby
Reviewed by: S. Perry
Date:04.03.2025

Earthstar Geographics

2.4 Land systems

Land systems of the north-eastern Goldfields were mapped in 1994 (Pringle, Van Vreeswyck, & Gilligan, 1994), the 'Mx40 Atlas' land system covers the proposed pit disturbance areas and the entirety of the rest of the site. The land system is described as flat to undulating valley plains and pediments; some rocky outcrops (DPIRD, 2022).

2.5 Surface geology

The surface geology mapping for the region indicates that there are four surface geology units within the Study area as outlined in Table 1 and Figure 5. The largest surface geology unit of the Study area (40.6%) is comprised of the Czc surface geology unit, described as Colluvium; gravel, sand, and silt as sheetwash or talus.

Table 1 Surface geology units within the Study area (DMIRS, 2024)

Code	Description	Area (ha)	% of Study area
Auk	Komatiite with relict olivine spinifex texture	42.1	26.6
Afv	Felsic volcanic and volcaniclastic rocks	50.7	32.0
Czl	Laterite and reworked products	1.3	0.8
Czc	Colluvium - gravel, sand, and silt as sheetwash or talus	64.3	40.6

312000
313000
314000
6623000
6622000

Legend

Geology unit

- Afv - Felsic volcanic and volcaniclastic rocks
- Auk - Komatiite with relict olivine spinifex texture
- Czc - Colluvium; Gravel, sand, and silt as sheetwash or talus
- Czl - Laterite and reworked products

MINE EARTH

Surface geology of the study area

Figure 5

N

0 175 350 700

Meters

Scale: 1:8,000 at A3

Spatial Reference
PCS: GDA 1994 MGA Zone 51
GCS: GCS GDA 1994
Datum: GDA 1994

Author: S. Parnaby
Reviewed by: S. Perry
Date:04.08.2025

Maxar

Methods and Materials

3. Methods and Materials

3.1 Sampling Regime

Soil samples were collected by Norton Gold Fields Pty Ltd staff from fourteen sites within the Study area in December 2024 and July 2025 (Figure 6 and Table 2). Sampling was conducted using a hand auger and shovel at three depth intervals (0-10 cm, 10-20 cm and 40-50 cm) at each site.

Field based observations made during the sampling program included a description of soil surface characteristics, texture, colour, structure, rock fragment shape/sizes, consistency and root growth at each soil sampling site, as per the Australian Soil and Land Survey guidelines (CSIRO, 2009).

Table 2 Sample Point Locations

Sample Point	Easting	Northing
S01	312648	6621587
S02	312446	6621833
S03	312925	6622254
S04	312553	6622087
S05	313023	6621377
S06	312763	6621938
S07	312756	6622212
S08	313094	6622470
S09	313541	6622784
S10	313733	6622560
S11	313350	6623098
S12	312965	6622755
S13	312968	6623134
S14	313501	6622406

312000 313000 314000 315000

6623000

6622000

Legend

- Sample points
- Proposed disturbance

S13 S11 S09 S12 S10 S08 S14 S03 S07 S04 S06 S02 S01 S05

Maxar

MINE EARTH

Sample site locations

Figure 6

N

0 200 400 800

Meters

Scale: 1:8,000 at A3

Spatial Reference
PCS: GDA 1994 MGA Zone 51
GCS: GCS GDA 1994
Datum: GDA 1994

Author: S. Parnaby
Reviewed by: S. Perry
Date:04.08.2025

312000 313000 314000 315000

3.2 Test Work and Procedures

Laboratory test work on the sampled soils was conducted at the Mine Earth in-house laboratory for physical parameters and sent to the CSBP Soil and Plant Laboratory for analysis of chemical parameters.

Laboratory based soil analyses included:

- Physical characteristics:
  - Soil texture / particle size distribution
  - Soil structural stability (Emerson Dispersion Test)
  - Saturated hydraulic conductivity
  - Modulus of rupture (soil strength)
- Chemical characteristics:
  - Soil pH
  - Electrical conductivity
  - Organic carbon
  - Exchangeable cations
  - Plant available nutrients (N, P, K and S)
  - Total metal concentrations

All soil test work procedures were conducted in accordance with standard analytical procedures to assess potential soil erodibility and soil properties related to the support of plant growth (Rayment & Lyons, 2010). Descriptions of relevant soil classification categories are detailed in Appendix A. All external laboratory results for the soils sampled are provided in Appendix C.

Results and Discussion

4. Results and Discussion

The findings of the soil survey and laboratory test work program are presented and discussed in the following sections.

4.1 Soil Physical Characteristics

The physical characteristics of the surface soils within the Study area, as determined by the field investigation and laboratory analysis of collected samples, are discussed in the following sections.

4.1.1 Soil Profile Morphology

The soil profiles within the Study area had consistent morphological characteristics. The surface soils 0 to 50 cm were moderately to well-structured and had a low (approximately 10-20%) coarse fraction (>2mm). Soils had a loose consistence and had roots present throughout the profile. Soil profile descriptions are summarised in Appendix B.

4.1.2 Soil Texture

Soil texture describes the proportions of sand, silt and clay (the particle size distribution) within the <2 mm fraction of a soil. The particle size distribution and resulting textural class of a soil is an important factor influencing most physical, and many chemical and biological, properties. Soil structure, water holding capacity, hydraulic conductivity, soil strength, fertility, erodibility and susceptibility to compaction are some of the factors closely linked to the texture of a soil material.

The sampled soils had variable texture (ranging from loamy sand to clay) but were predominantly loamy (Figure 8) (Table 3). Percentage clay ranged from 3.2% to 39.5%, averaging 22.4% (Table 3) and clay content increased with depth (Figure 7).

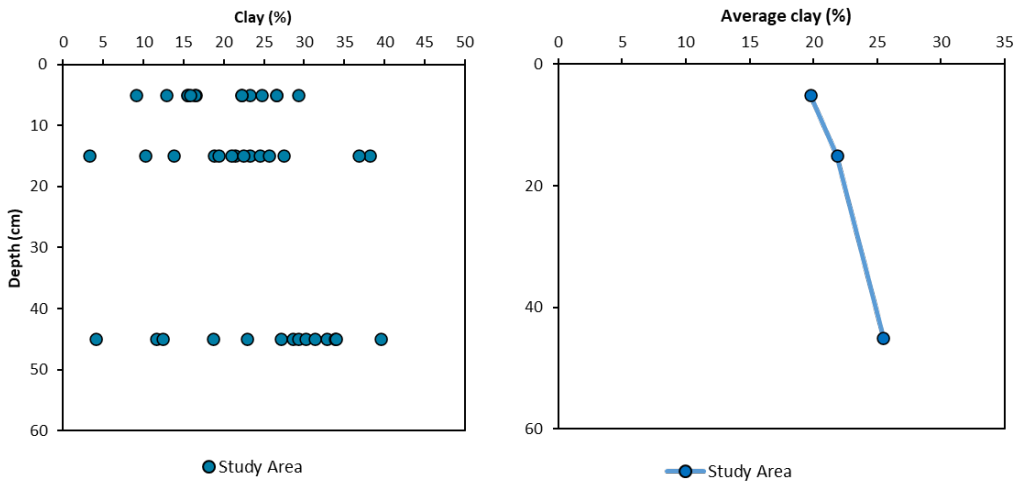


Figure 7: Clay content (%) individual values and average clay content (%) with depth

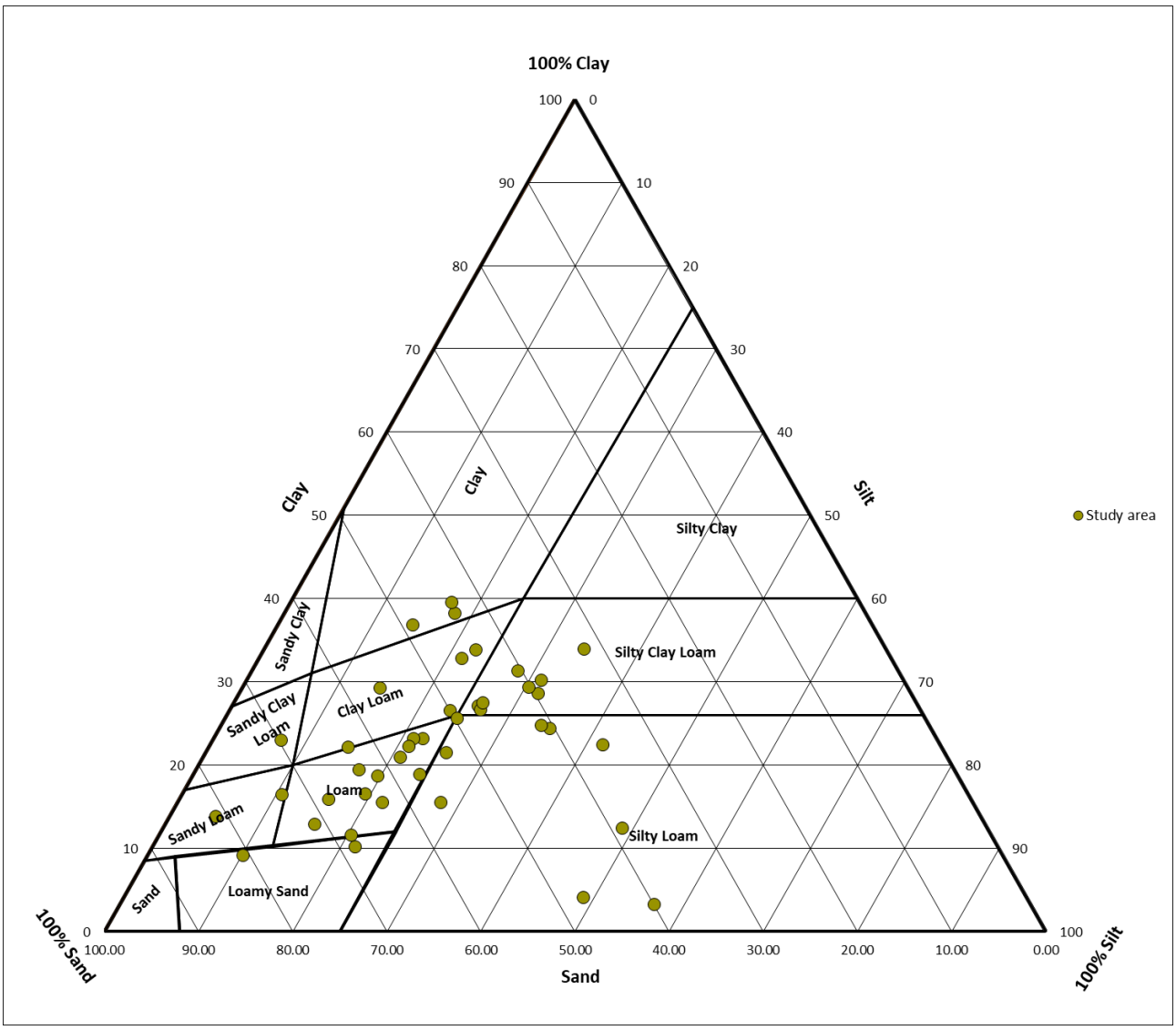


Figure 8: Soil texture of all samples

4.1.3 Soil Structure

Soil structure describes the arrangement of solid particles and void space in a soil. It is an important factor influencing the ability of soil to support plant growth, store and transmit water and resist erosional processes. A well-structured soil is one with a range of different sized aggregates; with component particles bound together to give a range of pore sizes facilitating root growth and the transfer of air and water.

Soil structure can be influenced by the particle size distribution, chemical composition and organic matter content of a soil. Soil structure is often affected by root growth, vehicle compaction and, with respect to reconstructed soil profiles, the methods of soil handling and deposition. When a soil material is disturbed, the breakdown of aggregates into primary particles can lead to structural decline (Moore, 1998). This can result in hard-setting and crusting at the soil surface and a 'massive' soil structure at depth, potentially reducing the ability of seeds to germinate, roots to penetrate the soil matrix and water to infiltrate to the root zone.

The structure of the surface soils within the Study area was consistent, with majority of the soils at the sampling locations moderately to well-structured to 50 cm depth. A weak, thin cryptogammic crust was present at some of the sites.

4.1.4 Structural Stability

The structural stability of a soil and its susceptibility to structural decline is complex and depends on the net effect of a number of properties, including the amount and type of clay present, organic matter content, soil chemistry and the nature of disturbance. Soil aggregates that slake and, particularly those that disperse, indicate a weak soil structure that is easily degraded. These soils should be seen as potentially problematic when used as a rehabilitation medium, particularly if left exposed at the surface.

The Emerson Aggregate Test identifies the potential slaking and dispersive properties of soil aggregates. The dispersion test identifies the properties of the soil materials under a worst-case scenario, where severe stress is applied to the soil material. Generally, samples allocated into Emerson Classes 1 and 2 are those most likely to exhibit dispersion of the clay sized fraction and therefore be the most problematic.

Soils from the Study area were variable, identified as Emerson Classes 2, 3a/b, 5 or 6. Soils classified as Emerson Class 5 slake but are not prone to dispersion of the clay fraction in their natural state and are considered relatively structurally stable. Class 6 soil aggregates slake but do not disperse; remoulded soil does not disperse, with a 1:5 suspension remaining flocculated and are not prone to dispersion. Soils that were identified as Emerson Class 3a or 3b slake in their natural state, with partial or complete dispersion of remoulded soil (Table 3). Emerson Class 2 is prone to partial dispersion of the clay fraction in their natural state.

These results indicate that the majority soils from the Study area (Class 3a/b and 5) are not prone to dispersion of the clay fraction in their natural state but may exhibit dispersion following severe disturbance (e.g. earthworks). Some soil samples from sites S05, S08, S10 and S12 were identified as Emerson Class 2, indicating that they are prone to partial dispersion of the clay fraction in their natural state. Care should be taken to minimise the handling of all soil materials where possible, particularly when wet, to preserve soil structure as far as possible.

Table 3 Soil texture and Emerson test call for all soil samples

Site #	Depth (cm)	Soil texture (< 2 mm soil fraction)	Clay content (%)[1]	Emerson Test Class [2]
S01	10	Loam	23.2	5
	20	Loam	23.2	3b
	50	Silty Clay Loam	27.1	5
S02	10	Loam	12.9	5
	20	Clay	38.2	5
	50	Clay Loam	32.8	6
S03	10	Loam	16.5	3b
	20	Loamy Sand	10.2	5
	50	Loam	11.6	5
S04	10	Silty Loam	15.5	3a
	20	Loam	18.8	5
	50	Loam	18.7	5
S05	10	Loamy Sand	9.1	2
	20	Sandy Loam	13.8	2
	50	Sandy Clay Loam	22.9	2
S06	10	Clay Loam	29.2	3a
	20	Clay	36.8	3a
	50	Clay	39.5	3a
S07	10	Loam	15.5	3a
	20	Silty Loam	21.4	3a
	50	Clay Loam	33.8	3b
S08	10	Sandy Loam	16.5	2
	20	Loam	19.5	2
	50	Silty Clay Loam	28.5	5
S09	10	Clay Loam	26.5	3b
	20	Silty Loam	24.5	5
	50	Silty Clay Loam	34	5
S10	10	Loam	16	2
	20	Loam	21	5
	50	Silty Loam	4	5
S11	10	Silty Loam	24.5	5
	20	Silty Loam	22.5	5
	50	Silty Loam	12.5	5
S12	10	Silty Clay Loam	26.5	5
	20	Silty Loam	3	2
	50	Silty Clay Loam	29.5	5
S13	10	Loam	22	5
	20	Silty Clay Loam	27.5	3b
	50	Silty Clay Loam	30	5

Site #	Depth (cm)	Soil texture (< 2 mm soil fraction)	Clay content (%)[1]	Emerson Test Class [2]
S14	10	Loam	22	5
	20	Silty Loam	25.5	5
	50	Silty Clay Loam	31.5	5

[1] As measured through an analysis of particle size distribution
[2] Class 2 – dry aggregate slakes and partially disperses
Class 3a - aggregate slakes but does not disperse, complete dispersion of remoulded soil
Class 3b - aggregate slakes but does not disperse, partial dispersion of remoulded soil
Class 5 - aggregate slakes but does not disperse, no dispersion of remoulded soil, soil:water suspension remains dispersed
Class 6 - aggregate slakes but does not disperse, no dispersion of remoulded soil, soil:water suspension remains flocculated

4.1.5 Hydraulic Conductivity

Hydraulic conductivity (Ksat) refers to the saturated permeability of soil, or the ability of water to infiltrate and drain through the soil matrix and is dependent on soil properties such as texture and structure (Moore, 1998). Freely draining soils with high Ksat values will generally be less susceptible to surface runoff and erosion. Slow draining soils with low Ksat values, are more likely to experience waterlogging, increased runoff and erosion.

Saturated hydraulic conductivity was determined for all soil samples from the Study area (Table 4). Drainage classes were determined for each sample according to their Ksat (Hunt & Gilkes, 1992). Soil Ksat and the average Ksat values for the surface soils with depth are presented in Figure 9. On average, there was an increase in the average Ksat with depth.

The drainage class of the samples tested show a variable range between ‘extremely slow’ and ‘very rapid’ (Table 4). Most of the surface soils from the Study area are considered to be free-draining however the Ksat values may decrease if the soils are compacted during salvage and rehabilitation operations. Soils from sites S02, S05 and S08 exhibited low Ksat values and may be susceptible to increased surface runoff and erosion.

Table 4 Ksat values and drainage classes for soil samples

Site #	Depth (cm)	Soil texture (< 2 mm soil fraction)	K_{sat} (mm/hr)	Drainage Class[1]
S01	10	Loam	37.1	Moderate
	20	Loam	207.3	Rapid
	50	Silty Clay Loam	67.7	Moderately rapid
S02	10	Loam	15.2	Moderately slow
	20	Clay	0.2	Extremely slow
	50	Clay Loam	0.2	Extremely slow
S03	10	Loam	9.1	Moderately slow
	20	Loamy Sand	28.7	Moderate
	50	Loam	19.9	Moderately slow
S04	10	Silty Loam	1.9	Slow
	20	Loam	45.9	Moderate
	50	Loam	115.4	Moderately rapid
S05	10	Loamy Sand	4.1	Slow
	20	Sandy Loam	1.5	Slow
	50	Sandy Clay Loam	0.5	Very slow
	10	Clay Loam	51.5	Moderate

Site #	Depth (cm)	Soil texture (< 2 mm soil fraction)	K_{sat} (mm/hr)	Drainage Class[1]
S06	20	Clay	60.6	Moderate
	50	Clay	156.8	Rapid
S07	10	Loam	27.4	Moderate
	20	Silty Loam	39.3	Moderate
	50	Clay Loam	66.7	Moderately rapid
S08	10	Sandy Loam	5.3	Moderately slow
	20	Loam	7.6	Moderately slow
	50	Silty Clay Loam	58.4	Moderate
S09	10	Clay Loam	71.9	Moderately rapid
	20	Silty Loam	177.4	Rapid
	50	Silty Clay Loam	40.7	Moderate
S10	10	Loam	21.4	Moderate
	20	Loam	77.2	Moderately rapid
	50	Silty Loam	111.5	Moderately rapid
S11	10	Silty Loam	118.1	Moderately rapid
	20	Silty Loam	320.2	Very rapid
	50	Silty Loam	66.3	Moderately rapid
S12	10	Silty Clay Loam	35.9	Moderate
	20	Silty Loam	111.1	Moderately rapid
	50	Silty Clay Loam	72.7	Moderately rapid
S13	10	Loam	28.3	Moderate
	20	Silty Clay Loam	179.7	Rapid
	50	Silty Clay Loam	210.9	Rapid
S14	10	Loam	32.2	Moderate
	20	Silty Loam	49.9	Moderate
	50	Silty Clay Loam	47.1	Moderate

[1] (Hunt & Gilkes, 1992)

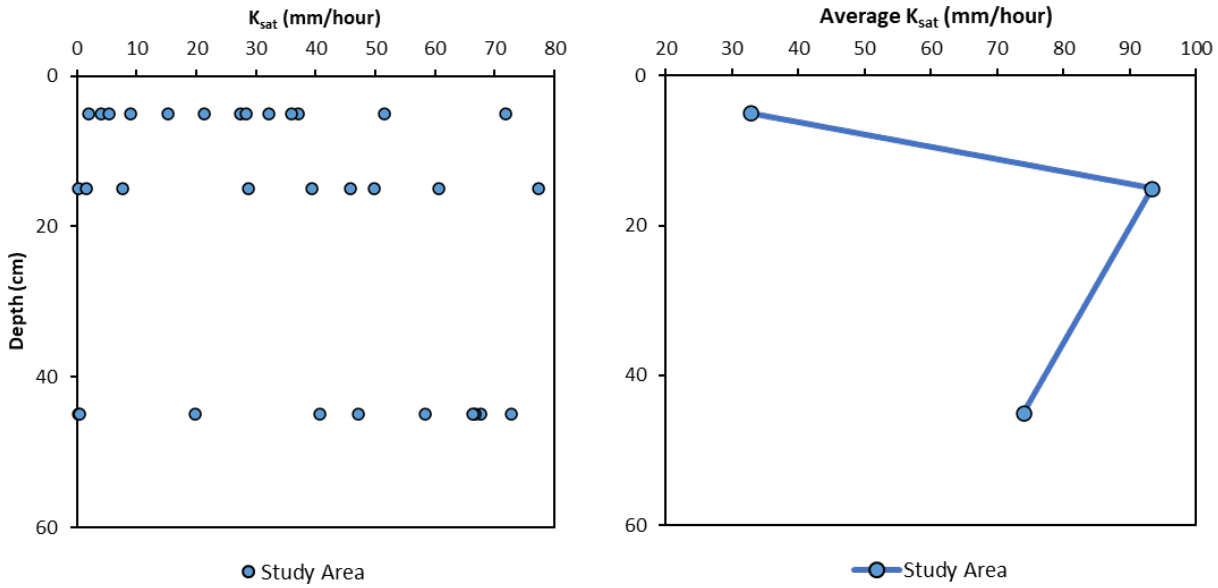


Figure 9: Ksat individual values and averages with depth

4.1.6 Soil Strength

A modified Modulus of Rupture (MOR) test was conducted on all samples. This test is a measure of soil strength and identifies the tendency of a soil to hard-set as a direct result of soil slaking and dispersion. An MOR of over 60 kPa has been described as the critical value for distinguishing potentially problematic soils in agricultural scenarios (Cochrane & Alymore, 1997). Restricted root penetration into the soil matrix is a likely consequence of a high modulus of rupture. In reconstructed soil profiles, materials normally deep within the profile that may have a high MOR can often be re-deposited closer to the surface, leading to germination / emergence and root penetration problems.

As this test is conducted on reconstructed soil blocks composed of the < 2 mm soil fraction, it does not take into account the effect of soil structure on soil strength, nor any degree of compaction that may be present in the field. It does, however, provide insight into the potential for soils to hard-set and compact with repeated wetting and drying cycles, and the ability of roots to fracture the soil and penetrate crack faces.

The majority of the soils sampled from the Study area recorded low MOR values, indicating a low propensity to hard-set with repeated wetting / drying cycles (Table 5). However, samples from sites S02, S07, S10 and S11 recorded MOR values above the 60 kPa threshold (shown in bold), indicating a high propensity to hard-set with repeated wetting and drying cycles.

Table 5: Modulus of rupture results

Site #	Depth (cm)	Modulus of Rupture (kPa)[1]
S01	10	1.1
	20	0.0
	50	2.1
S02	10	2.1
	20	**157.4**
	50	**229.0**
S03	10	14.3
	20	20.4
	50	26.0
S04	10	46.7
	20	13.2
	50	26.0
S05	10	11.9
	20	25.7
	50	58.8
S06	10	3.8
	20	20.1
	50	16.3
S07	10	**63.1**
	20	29.1
	50	**99.8**
S08	10	34.0
	20	29.3
	50	26.6
S09	10	1.3
	20	1.4
	50	53.1
S10	10	**71.7**
	20	**76.9**
	50	**106.9**
S11	10	8.7
	20	6.9
	50	**179.1**

Site #	Depth (cm)	Modulus of Rupture (kPa)[1]
S12	10	17.5
	20	10.2
	50	25.6
S13	10	32.5
	20	21.7
	50	22.0
S14	10	35.0
	20	15.1
	50	**78.9**

4.2 Soil Chemical Characteristics

4.2.1 Soil pH and Electrical Conductivity

Soil pH (H_2O) measures the acidity or alkalinity of the soil in relation to suitability for plant growth. Ratings for soil pH are based on the Land Evaluation Standards for Land Resource Mapping categories (van Gool, 2005). Soil pH (H_2O) ranged from pH 7.4 (classified as 'neutral') to pH 9.5 ('very strongly alkaline'), with the majority of samples classified as 'moderately alkaline'. On average, soil pH was relatively stable with depth (Figure 10).

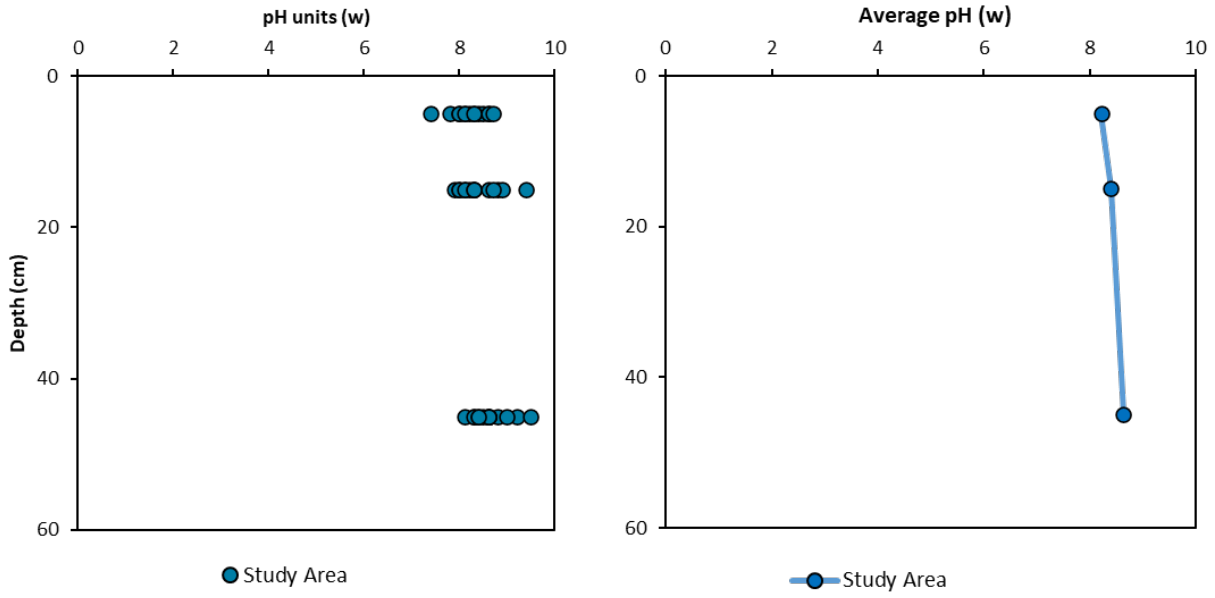


Figure 10: Individual and average pH (H2O) of soils with depth

Electrical conductivity (EC) is a measurement of the soluble salts in soils or water. Soil salinity results from natural processes of landscape evolution, hydrological processes and rainfall (Hunt, N and Gilkes, R, 1992). Individual EC values of the soils sampled from the Study area ranged between 0.081 dS/m (non-saline) and 9.06 dS/m (extremely saline) (Figure 11), based on the standard USDA and CSIRO electrical conductivity categories (Appendix A).

Salinity of the sampled soils was variable, however the majority were classified as 'extremely saline'. 'Extremely saline' values were present at sites S01, S02, S03, S05 and S08-S14. On average, there was an increase in EC with sample depth (Figure 11).

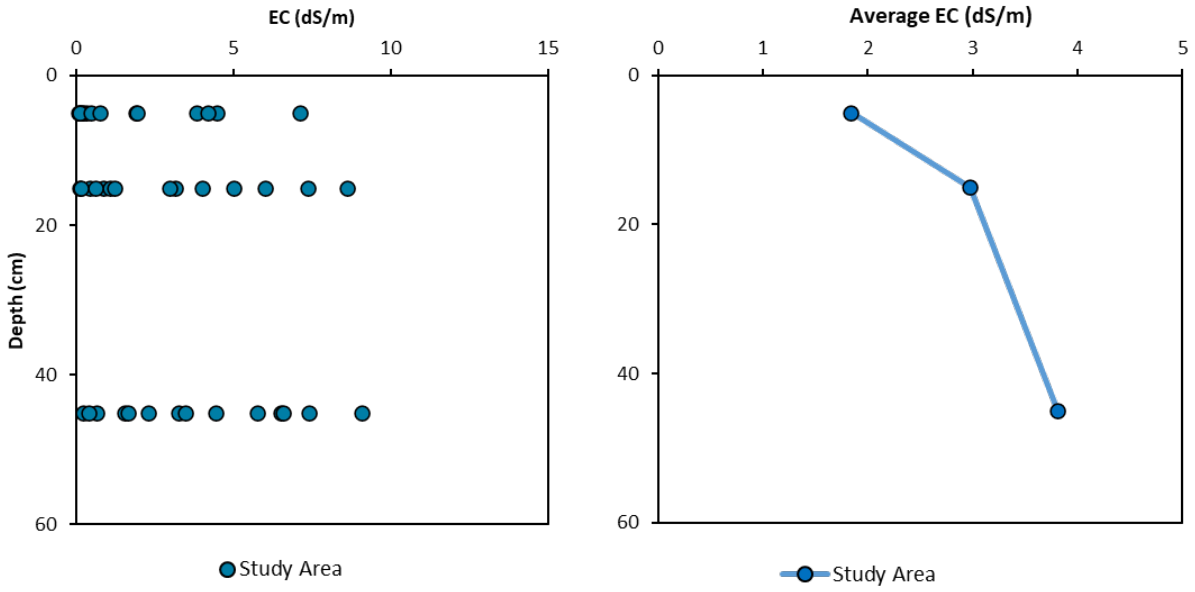


Figure 11: Individual and average EC values (dS/m) of soils with depth

4.2.2 Soil Organic Matter

The organic matter content of soil is an important factor influencing many physical, chemical and biological soil characteristics. Directly derived from plants and animals, its functions in soil include supporting the micro and macro fauna and flora populations, increasing the water retention capacity, buffering pH and improving soil structure.

The organic matter content of the soils within the Study area was determined as a measure of the Soil Organic Carbon percentage (SOC %). The SOC % of the soil samples was low, as is typical of most highly weathered soils in the Goldfields, ranging between 0.17 % and 1.96 % (Figure 12).

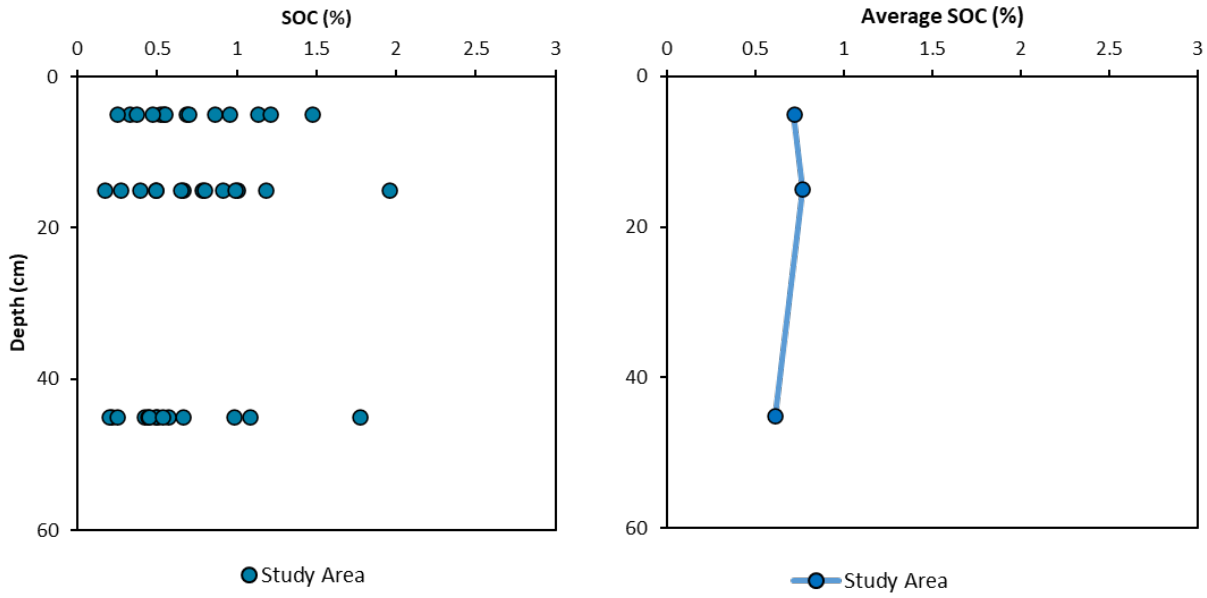


Figure 12: Individual and average Organic C concentration (%) of soils with depth

4.2.3 Exchangeable Cations and Exchangeable Sodium Percentage

Exchangeable cations, held on clay surfaces and within organic matter, are an important source of soil fertility and can influence the physical properties of soil. Generally, if cations such as Ca2+, Mg2+ and K+ are dominant on the clay exchange surfaces, the soil will typically display increased physical structure and stability, leading to increased aeration, drainage and root growth (Moore, 1998). If Na cations (Na+) are dominant on exchange surfaces and the exchangeable sodium percentage (ESP) exceeds more than 6 % of the total exchangeable cations, then the soil is considered to be 'sodic', which can lead to poor physical properties (i.e. dispersion, hardsetting and erosion in clay-rich soils). ESP values over 15 % are classified as 'highly sodic'.

The exchangeable cation concentration, effective cation exchange capacity (eCEC) and ESP results for the sampled soils were variable. Four samples were identified as 'strongly sodic' (site S05 and S08) (Table 6), nineteen samples were identified as 'sodic' and nineteen 'non-sodic'. This combined with the Emerson test results (4.1.4 Structural Stability), indicate that some of these soils are likely to be dispersive, particularly following repeated, severe disturbance.

Table 6: **Exchangeable cations and ESP (%) for collected samples. Shading of ESP values denotes non-sodic, sodic and highly sodic classifications**

Site #	Depth (cm)	Exchangeable cations (meq/100g)				eCEC (meq/100g)	ESP (%)
		Ca	Mg	K	Na		
S01	10	9.49	5.69	0.66	0.52	16.4	3.2
	20	10.68	7.72	0.45	0.90	19.75	4.56
	50	9.01	10.33	0.17	1.74	21.3	8.2
S02	10	10.58	4.38	0.36	0.10	15.4	0.6
	20	8.36	5.47	0.17	1.87	15.87	11.78
	50	7.89	5.87	0.16	1.77	15.7	11.3
S03	10	10.64	2.89	0.29	0.23	14.05	1.64
	20	14.37	5.07	0.27	0.94	20.7	4.6
	50	13.80	6.74	0.21	1.71	22.5	7.6
S04	10	9.10	2.47	0.44	0.05	12.06	0.41
	20	11.79	4.09	0.32	0.21	16.4	1.3
	50	12.04	5.52	0.24	0.40	18.2	2.2
S05	10	2.27	2.92	0.31	0.83	6.33	13.11
	20	2.21	3.48	0.24	2.25	8.2	27.5
	50	3.05	6.24	0.22	3.67	13.2	27.8
S06	10	7.39	6.56	0.29	0.90	15.14	5.94
	20	8.09	7.29	0.18	1.32	16.9	7.8
	50	10.07	8.36	0.12	1.78	20.33	8.76
S07	10	10.40	2.10	0.35	0.05	12.9	0.4
	20	12.02	4.72	0.33	0.13	17.2	0.8
	50	8.61	6.05	0.17	1.02	15.85	6.44
S08	10	2.40	0.31	1.85	0.90	5.5	16.5
	20	3.79	0.38	3.37	1.50	9.0	16.6
	50	8.34	0.29	7.86	2.63	19.12	13.76
S09	10	7.62	0.36	5.55	1.13	14.7	7.7
	20	11.05	0.22	7.86	1.22	20.35	6.00
	50	9.95	0.13	7.72	1.73	19.5	8.9
S10	10	7.69	0.18	2.94	0.63	11.44	5.51
	20	10.98	0.15	4.69	1.13	17.0	6.7
	50	13.01	0.11	5.26	1.52	19.90	7.64

S11		10.25	0.26	6.93	0.92	18.4	5.0
		11.20	0.16	8.28	1.59	21.23	7.49
		11.02	0.14	7.34	2.03	20.5	9.9
S12		15.62	0.65	2.88	1.04	20.19	5.15
		16.17	0.48	3.85	1.31	21.8	6.0
		11.46	0.25	6.25	1.82	19.78	9.20
S13		6.50	0.30	3.72	0.42	10.9	3.8
		11.98	0.27	7.46	0.98	20.69	4.74
		11.10	0.11	7.52	1.53	20.26	7.55
S14		11.41	0.21	3.69	0.77	16.08	4.79
		15.03	0.13	4.80	1.26	21.22	5.94
		10.40	0.10	6.82	1.59	18.91	8.41

4.2.4 Soil Nutrients

The most important macro-nutrients for plant growth are nitrogen (N), phosphorus (P), potassium (K), and sulphur (S). These nutrients are largely derived from the soil mineral component and organic matter. Native plant species have a number of physiological adaptations that enable them to be productive in areas where the supply of macronutrients is limited. There is limited information available which details the specific nutritional requirements for native plant species in the semiarid zone of WA.

Most (>98%) N in soils is organic (Moore, 1998). Plant-available forms of inorganic N (nitrate and ammonium) are produced via mineralisation of soil organic matter. The plant-available N concentrations of the soils from the Study area were variable but included some high values, ranging from 1 mg/kg to 594 mg/kg nitrate and averaging 93.3 mg/kg (Figure 13). Ammonium values ranged from below detection (>1 mg/kg) to 38 mg/kg, averaging 5.8 mg/kg (Figure 14).

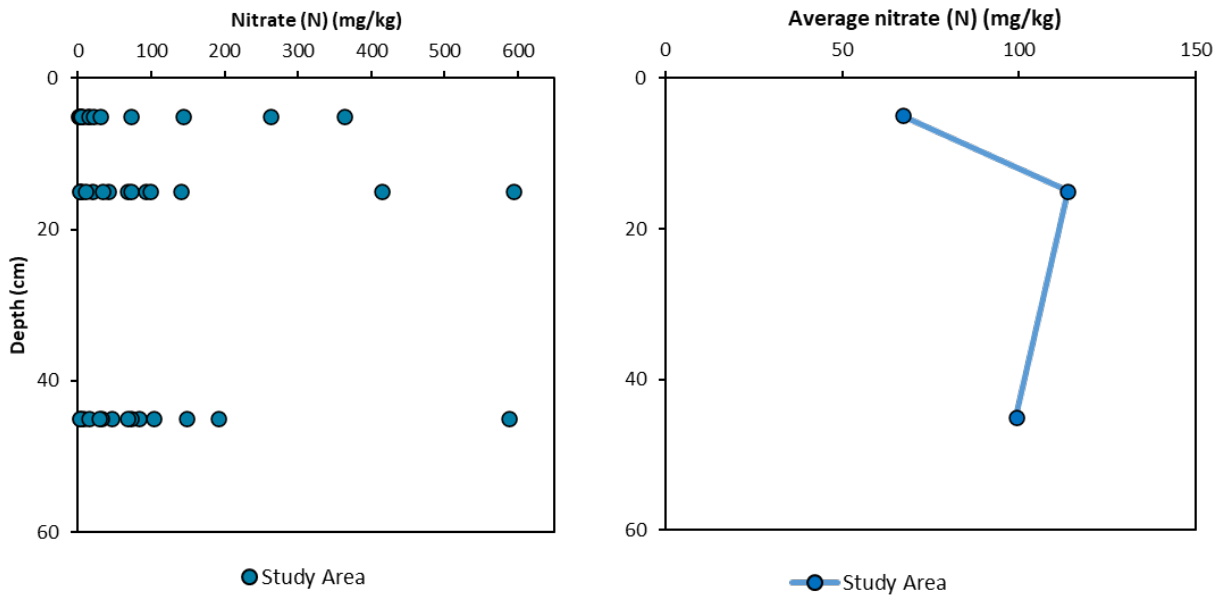


Figure 13: Individual and average Nitrate-N (mg/kg) of soils with depth

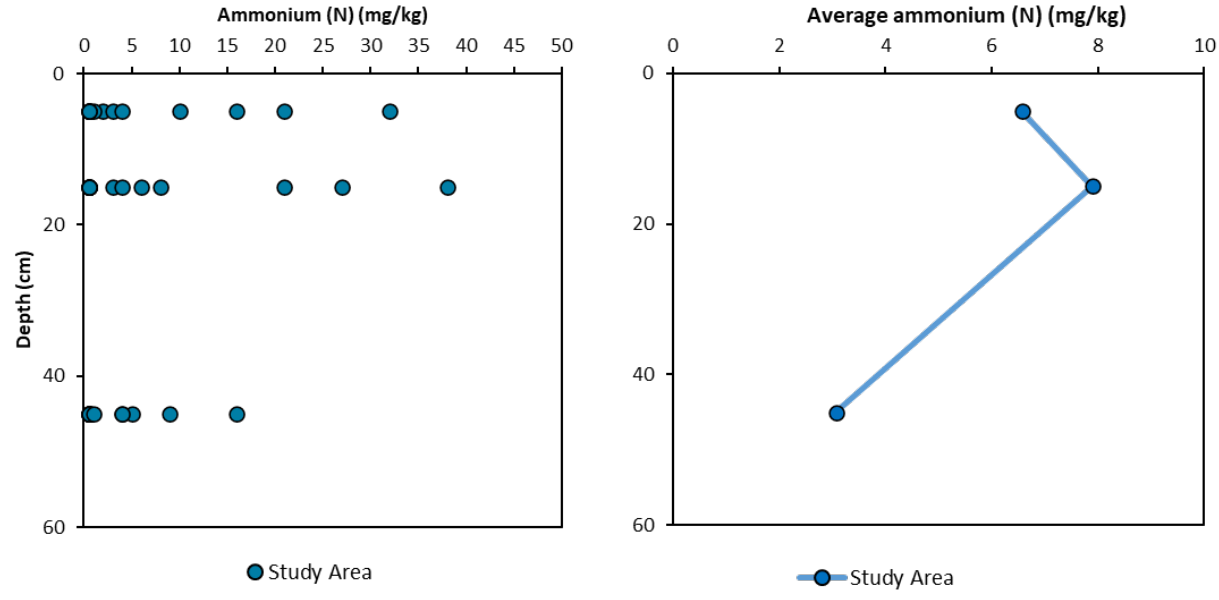


Figure 14: Individual and average Ammonium-N (mg/kg) of soils with depth

Phosphorus (P) is essential for the growth of vegetation as it plays a key role in the formulation of energy producing organic compounds. Adequate phosphorus nutrition enhances many aspects of plant physiology, including the fundamental processes of photosynthesis, nitrogen fixation, flowering, fruiting (including seed production), and maturation (Brady & Weil, 2002).

The plant-available P concentrations of the soils from the Study area were classed as 'low' to 'high' with concentrations ranging from below detection (>2 mg/kg) to 20 mg/kg and averaging 5.6 mg/kg which is considered to be 'low' (Hazelton & Murphy, 2007), this is typical of the highly weathered native soils in the region (Moore, 1998) (Figure 15). On average, plant-available P decreased with depth through the surface profile.

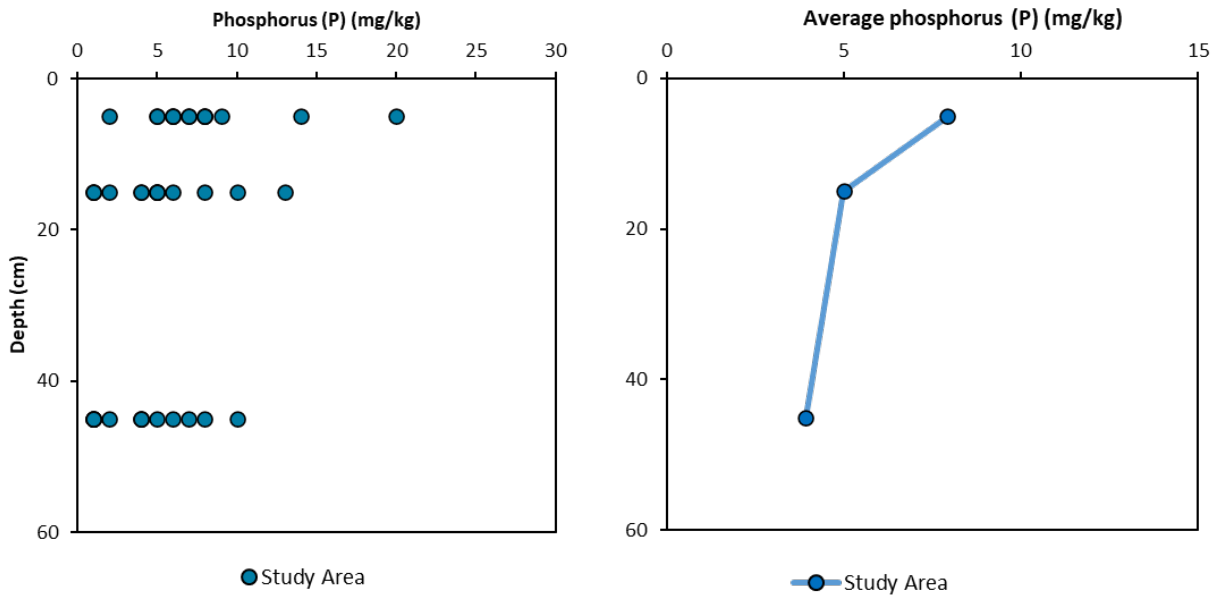


Figure 15: Individual and average plant-available phosphorus concentrations (mg/kg) of soils with depth

Potassium (K) plays a critical role in a number of plant physiological processes. Adequate amounts of K have been linked to improved drought tolerance, better resistance to certain fungal diseases and greater tolerance to insect pests (Brady & Weil, 2002).

The plant-available K concentrations of the soils from the Study area were variable, ranging from 25 mg/kg (low rating: <70 mg/kg) to 309 mg/kg (high rating: >200 mg/kg) (Moore, 1998). On average, plant-available K decreased with depth through the surface profile (Figure 16).

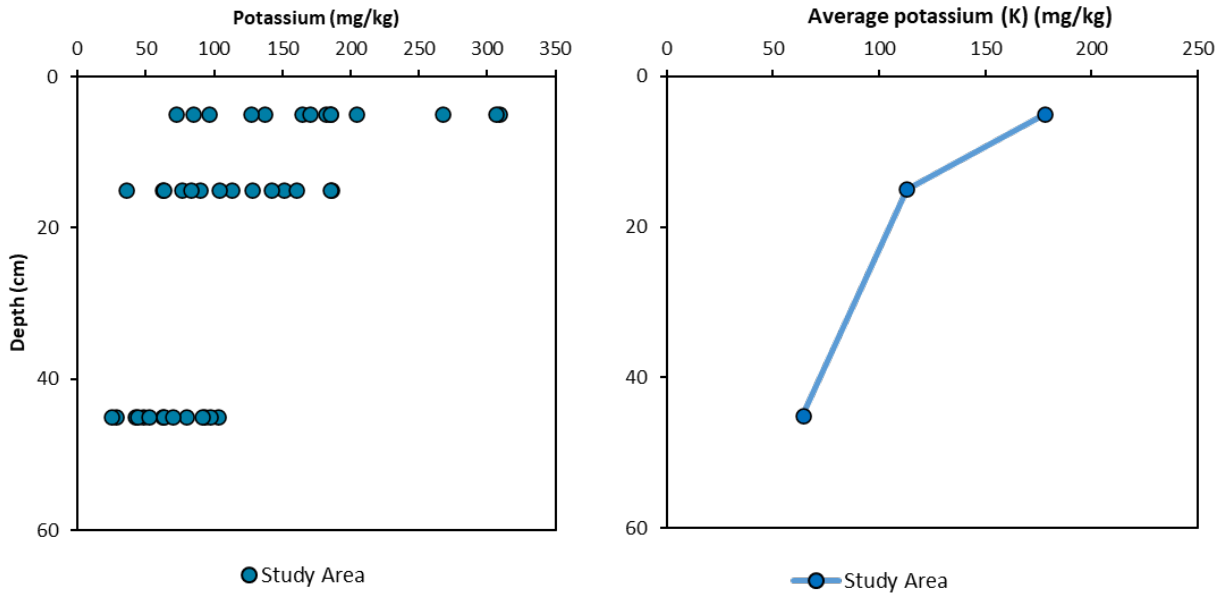


Figure 16: Individual and average plant-available potassium concentration (mg/kg) of soils with depth

Plant-available sulfur (S) (i.e. sulphate) concentrations measured for soils from the Study area were variable, ranging from 2.1 mg/kg to a very high outlier of 3667.4 mg/kg (Moore, 1998) (Figure 17). On average, plant-available S increased with depth through the surface profile.

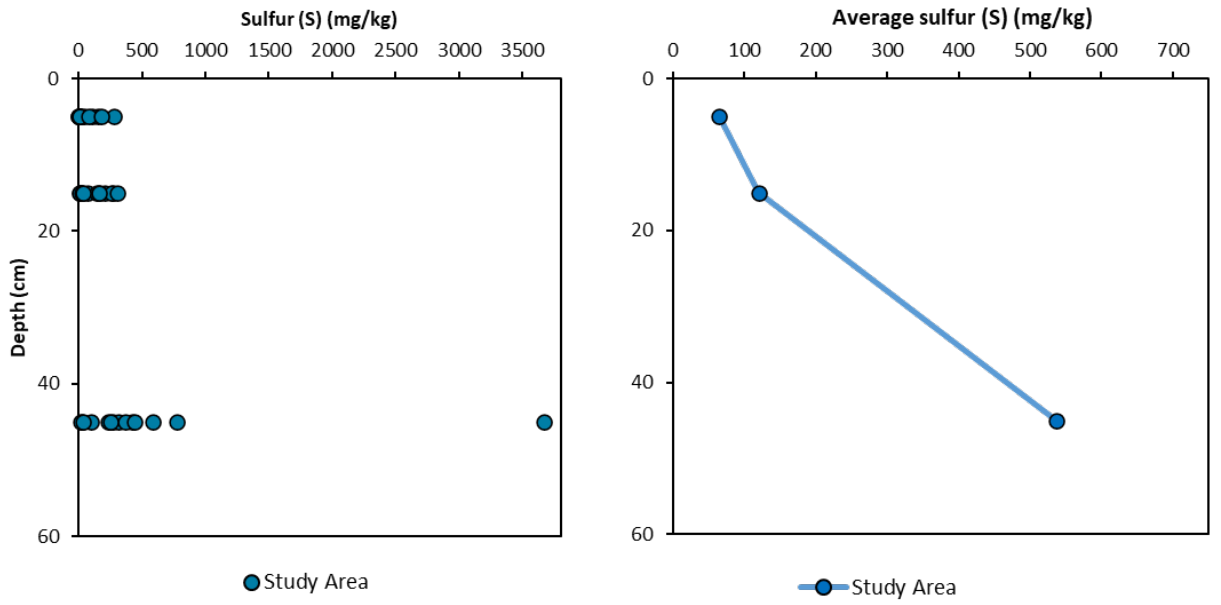


Figure 17: Individual plant-available sulfur concentration (mg/kg) of soils with depth and average plant-available sulfur with depth

4.2.5 Total metal concentrations

The total concentration of selected metals was measured for all soil samples, with the results presented in Table 7. As a point of comparison, the average crustal abundance (ACA) (Reimann & de Caritat, 1998) for each metal is also provided in Table 7. Concentrations of As, Cd, Cr, Co and Se above the ACA, were present in many of the soils tested, indicating naturally high concentrations present in the surface soils.

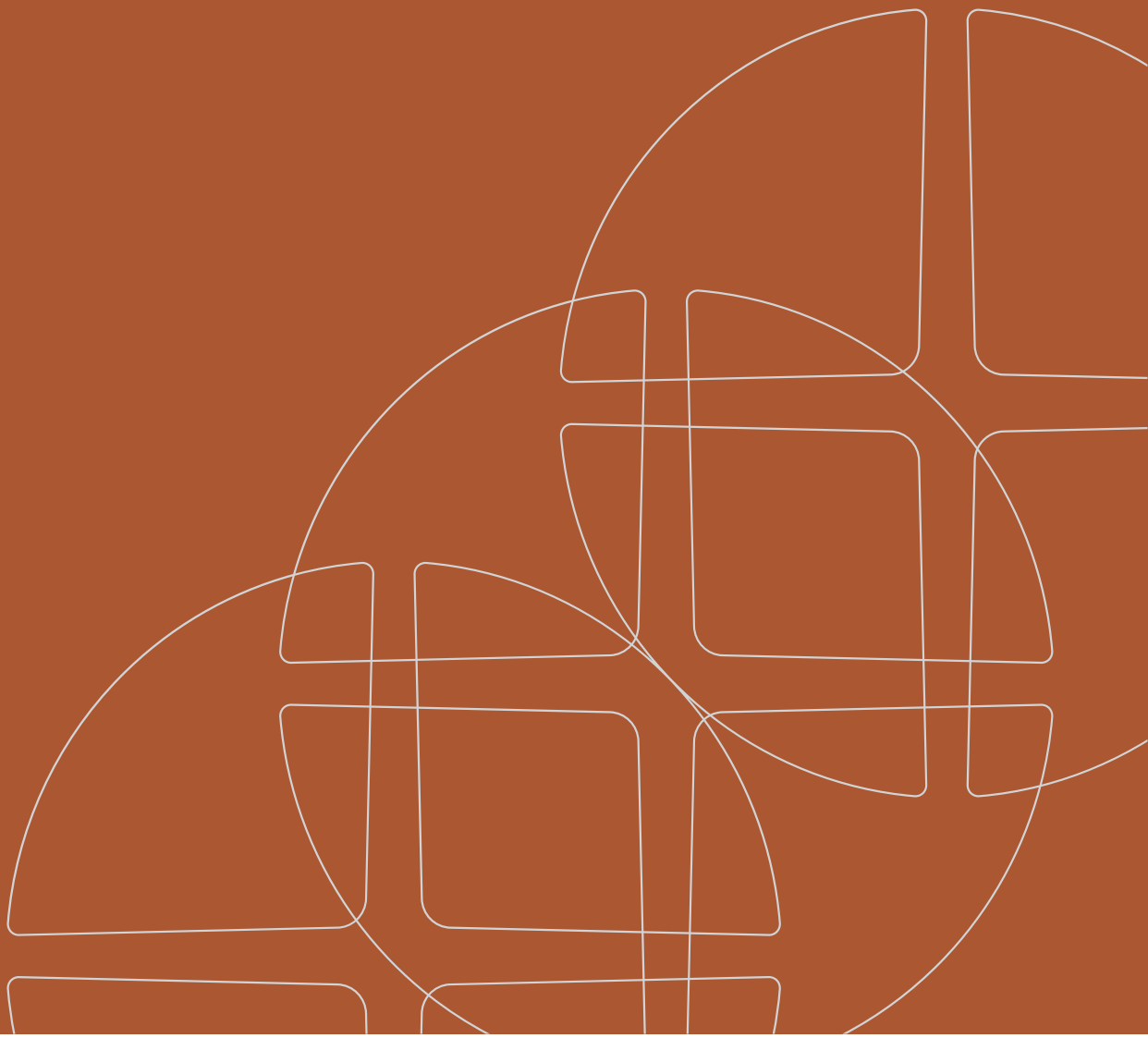
Table 7 Total metal concentrations for collected samples. Concentrations above the ACA are denoted in bold font

Site #	Depth (cm)	Total metal concentrations (µg/kg)						
		As	Cd	Cr	Co	Pb	Mo	Se
S01	10	**21,200**	**108**	**755,200**	**36,876**	10,400	292	28
	20	**22,200**	**108**	**834,800**	**42,240**	10,800	288	32
	50	**20,320**	**108**	**522,400**	**31,968**	8,760	256	49
S02	10	**22,560**	92	**722,000**	**43,200**	10,436	388	35
	20	**28,320**	**104**	**556,400**	**35,308**	7,764	272	80
	50	**33,280**	**108**	**963,600**	**42,360**	9,924	460	112
S03	10	**63,600**	**136**	**265,080**	23,368	7,736	376	40
	20	**70,000**	**112**	**210,800**	21,028	6,144	324	100
	50	**82,400**	96	**169,320**	18,808	4,936	268	118
S04	10	**48,000**	96	**1,158,400**	**47,240**	7,500	228	21
	20	**49,600**	92	**991,600**	**44,320**	6,124	248	37
	50	**45,200**	80	**939,200**	**40,880**	5,900	196	45
S05	10	**24,720**	**104**	**860,400**	**26,656**	10,292	396	38
	20	**26,000**	**148**	**1,329,600**	**28,568**	13,396	648	43
	50	**32,560**	**116**	**1,188,800**	**38,084**	11,656	592	67
S06	10	**46,000**	72	**968,400**	**50,800**	9,048	344	31
	20	**50,000**	80	**999,200**	**53,800**	9,760	360	37
	50	**46,000**	60	**921,600**	**49,960**	9,604	316	26
S07	10	**39,760**	**124**	**269,840**	**34,664**	13,072	384	57
	20	**34,600**	**180**	**229,160**	**36,016**	10,952	392	54
	50	**46400**	**232**	**201,040**	**35,648**	11,148	**2,584**	100
S08	10	**17,959**	**104**	**384,826**	22,062	10,243	578	**1,085**
	20	**15,707**	**105**	**453,147**	**26,605**	12,829	562	**1,183**
	50	**14,530**	**149**	**250,350**	**32,958**	12,875	504	**938**
S09	10	**13,859**	45	**216,346**	7,445	14,447	655	**666**
	20	**15,411**	36	**169,769**	7,732	14,315	677	**820**
	50	**14,375**	52	**133,778**	6,815	11,035	622	**859**

Site #	Depth (cm)	Total metal concentrations (µg/kg)						
S10	10	**20,636**	48	**192,196**	5,717	13,844	636	**930**
	20	**18,366**	50	**161,496**	6,369	12,831	597	**901**
	50	**22,874**	49	122,454	5,408	9,564	486	**934**
S11	10	**23,604**	41	**186,664**	7,562	14,069	689	**670**
	20	**24,328**	42	**180,925**	7,959	14,280	710	**656**
	50	**26,066**	60	**152,578**	6,643	11,860	695	**980**
S12	10	**14,586**	**169**	**261,706**	**25,850**	14,749	815	**766**
	20	**10,734**	**174**	**182,751**	23,836	11,412	614	**572**
	50	**11,559**	**121**	**160,027**	21,121	10,143	519	**586**
S13	10	**12,617**	64	**218,387**	7,828	13,389	552	**653**
	20	**19,581**	**127**	**232,194**	10,949	**16,272**	559	**741**
	50	**16,656**	**100**	**145,812**	8,954	14,685	373	**768**
S14	10	**11,296**	37	**133,389**	8,537	**18,402**	539	**493**
	20	**11,176**	63	125,701	9,232	**17,497**	498	**829**
	50	**17,315**	75	104,201	7,693	**15,532**	466	**727**
Average crustal abundance[1]		**1,700**	**100**	**126,000**	**24,000**	**14,800**	**1,100**	**120**

1. (Reimann, C. and de Caritat, P, 1998)

Conclusions and Recommendations



5. Conclusions and Recommendations

5.1 Summary of soil characteristics and suitability of soil for rehabilitation

The soil profiles, as identified by the field sampling regime and sampling and analysis program typically consisted of loam to silty loam, moderately to well-structured soils, with minor amounts of coarse fragments (>2 mm) and increasing clay content with depth.

A summary of the topsoil (0 – 20 cm) characteristics is included in Table 8. The topsoils typically had a loamy to silty loam texture, had some propensity to disperse following disturbance, typically had a moderate hydraulic conductivity and had a generally low potential to hard-set. The topsoils were predominantly moderately alkaline, non-sodic, had low organic carbon and phosphorus, with high nitrogen, sulfur and potassium concentrations. Total metal concentrations of As, Cd, Cr, Pb, Se and Co were found above ACA). The salinity of the topsoils ranged from non-saline to extremely saline, with many extremely saline values identified.

The topsoils are considered suitable for use as a rehabilitation resource however are prone to dispersion, particularly following severe disturbance. Therefore, care should be taken to minimise the handling of these soil materials where possible, particularly when wet. Where utilised as a surface rehabilitation medium on the sloped batters of waste rock landforms, the surface soils will require ripping into underlying competent waste rock to armour the surface and minimise erosion as far as practicable. Many of the topsoils were identified as being extremely saline, which may impact the germination and growth of species sensitive to salinity. Salt tolerant species should be used for rehabilitation to maximise rehabilitation outcomes.

Table 8 Summary of topsoil characteristics (0-20cm)

Site ID	Soil texture	Structural stability	Hydraulic conductivity	Soil strength	pH	EC	Sodicity	Soil nutrients	Metals over ACA
S01	Loam	Potential to disperse following disturbance	Moderate to rapid	Non-hardsetting	Neutral	Extremely saline	Non-sodic	Low P, Moderate S, Amm, High N, K	As, Cd, Cr, Co
S02	Loam/ Clay	Potential to disperse following severe disturbance	Moderately slow to extremely slow	Potential to hard-set	Moderately to strongly alkaline	Slightly saline to moderately saline	Non-sodic to sodic	Low P, N, Amm, Moderate S, High K	As, Cd, Cr, Co
S03	Loam/ Loamy Sand	Potential to disperse following disturbance	Moderate to moderately slow	Non-hardsetting	Moderately alkaline	Slightly to extremely saline	Non-sodic	Low P, Amm, Moderate N, K, High S	As, Cd, Cr
S04	Silty Loam/ Loam	Potential to disperse following disturbance	Slow to moderate	Non-hardsetting	Moderately alkaline	Non saline to moderately saline	Non-sodic	Low P, S, Amm, Moderate N, High K	As, Cr, Co
S05	Loamy sand/ Sandy Loam	Prone to dispersion	Slow	Non-hardsetting	Neutral to moderately alkaline	Slightly saline to moderately saline	Sodic to highly sodic	Low P, S, Amm, N, Moderate K	As, Cd, Cr, Co

Site ID	Soil texture	Structural stability	Hydraulic conductivity	Soil strength	pH	EC	Sodicity	Soil nutrients	Metals over ACA
S06	Clay Loam/ Clay	Potential to disperse following disturbance	Moderate	Non-hardsetting	Moderately alkaline	Non-saline	Non-sodic to sodic	Low P, N, S, Amm, Moderate K	As, Cr, Co
S07	Silty Loam/ Loam	Potential to disperse following disturbance	Moderate	Non-hardsetting	Moderately alkaline	Non-saline	Non-sodic	Low N, P, S, Amm, Moderate K	As, Cd, Cr, Co,
S08	Loam/ Silty loam/ Clay loam/ Silty Clay loam/ sandy loam	Prone to dispersion	Moderately slow	Non-hardsetting	Moderately alkaline	Moderately saline to very saline	Highly sodic	Low P, N, S, Amm, Moderate K	As, Cd, Cr, Co, Se
S09	Clay loam/ Silty loam	Potential to disperse following disturbance	Moderately rapid to rapid	Non-hardsetting	Moderately alkaline	Moderately saline to extremely saline	Non-sodic to sodic	Low P, S, Amm, High N, Moderate K	As, Cr, Se
S10	Loam	Potential to disperse following disturbance	Moderate to rapid	Potential to hard-set	Moderately alkaline	Extremely saline	Non-sodic to sodic	Low P, N, Amm, Moderate K, High S	As, Cr, Se
S11	Silty loam	Potential to disperse following severe disturbance	Moderately rapid to very rapid	Non-hardsetting	Moderately alkaline	Extremely saline	Non-sodic to sodic	Low P, Amm, High N, Moderate K, S	As, Cr, Se
S12	Silty loam/ Silty clay loam	Potential to disperse following disturbance	Moderate to moderately rapid	Non-hardsetting	Moderately alkaline	Extremely saline	Non-sodic	Low P, High S, N, K, Amm	As, Cd, Cr, Co, Se
S13	Loam / silty clay loam	Potential to disperse following disturbance	Moderate to rapid	Non-hardsetting	Moderately alkaline	Extremely saline	Non-sodic	Low P, Amm, Moderate N, K, S	As, Cd, Cr, Pb, Se
S14	Loam / silty loam	Potential to disperse following disturbance	Moderate	Non-hardsetting	Moderately alkaline	Extremely saline	Non-sodic	Moderate P, Amm, High N, S, Low K	As, Cr, Pb, Se

A summary of the subsoil (20 – 50 cm) characteristics is included in Table 9. The subsoils predominantly had a loamy to silty clay loam texture with higher clay content than the topsoils, had a variable propensity to disperse following disturbance, had variable hydraulic conductivity and were mostly non-hard-setting with some with potential to hard-set. The subsoils were predominantly moderately alkaline, sodic, had low organic

carbon and phosphorus, moderate potassium and nitrogen with higher sulfur concentrations than topsoils. Total metal concentrations of As, Cd, Cr, Mo, Pb, Se and Co above ACA were recorded. The salinity of the subsoils ranged from non-saline to extremely saline, with many extremely saline values recorded.

The subsoils had higher clay content, were more sodic, had a higher likelihood of hard-setting and were less free-draining than the topsoils. Due to these factors, the subsoils are likely to be more erodible than the topsoils and are not recommended for use as a near-surface material for rehabilitation.

Table 9 Summary of subsoil characteristics (20-50cm)

Site ID	Soil texture	Structural stability	Hydraulic conductivity	Soil strength	pH	EC	Sodicity	Soil nutrients	Metals over ACA
S01	Silty clay loam	Potential to disperse following severe disturbance	Moderately rapid	Non-hardsetting	Moderately alkaline	Extremely saline	Sodic	Low P, K, Amm, High S, N	As, Cd, Cr, Co
S02	Clay loam	Not prone to dispersion	Extremely slow	Potential to hard-set	Strongly alkaline	Very saline	Sodic	Low P, N, Amm, Moderate K, High S	As, Cd, Cr, Co
S03	Loam	Potential to disperse following severe disturbance	Moderately slow	Non-hardsetting	Moderately alkaline	Extremely saline	Sodic	Low P, Amm, K, Moderate N, High K	As, Cr
S04	Loam	Potential to disperse following severe disturbance	Moderately rapid	Non-hardsetting	Moderately alkaline	Moderately saline	Non-sodic	Low P, S, Amm, Moderate K, High N	As, Cr, Co
S05	Sandy clay loam	Prone to dispersion	Very slow	Non-hardsetting	Neutral to moderately alkaline	Very saline	Highly sodic	Low P, S, Amm, N, Moderate K, S	As, Cd, Cr, Co
S06	Clay	Potential to disperse following disturbance	Rapid	Non-hardsetting	Moderately alkaline	Non-saline	Non-sodic to sodic	Low N, P, S, Amm, K	As, Cr, Co
S07	Clay loam	Potential to disperse following disturbance	Moderately rapid	Potential to hard-set	Strongly alkaline	Slightly saline	Sodic	Low N, Amm, P, S, Moderate K	As, Cd, Cr, Co, Mo

Site ID	Soil texture	Structural stability	Hydraulic conductivity	Soil strength	pH	EC	Sodicity	Soil nutrients	Metals over ACA
S08	Silty clay loam	Potential to disperse following severe disturbance	Moderate	Non-hardsetting	Moderately alkaline	Extremely saline	Highly sodic	Low P, S, Amm, N , Moderate K, High S	As, Cd, Cr, Co, Se
S09	Silty clay loam	Potential to disperse following severe disturbance	Moderate	Non-hardsetting	Moderately alkaline	Extremely saline	Sodic	Low P, Amm, Moderate K, High N, S	As, Cr, Se
S10	Silty loam	Potential to disperse following severe disturbance	Moderately rapid	Potential to hard-set	Strongly alkaline	Extremely saline	Sodic	Low P, Amm, K, N, High S	As, Se
S11	Silty loam	Potential to disperse following severe disturbance	Moderately rapid	Potential to hard-set	Moderately alkaline	Extremely saline	Sodic	Low Amm, P, K, High N, S	As, Cr, Se
S12	Silty clay loam	Potential to disperse following severe disturbance	Moderately rapid	Non-hardsetting	Moderately alkaline	Extremely saline	Sodic	Low K, High S, N, Moderate P, Amm	As, Cd, Cr, Se
S13	Silty clay loam	Potential to disperse following severe disturbance	Rapid	Non-hardsetting	Moderately alkaline	Extremely saline	Sodic	Low P, Amm, N, K, High S	As, Cd, Cr, Se
S14	Silty clay loam	Potential to disperse following severe disturbance	Moderate	Potential to hard-set	Moderately alkaline	Extremely saline	Sodic	Low Amm, P, K, Moderate N, High S	As, Pb, Se

5.2 Soil management and handling

Specific topsoil management and handling recommendations which can optimise the success of future rehabilitation are as follows:

- It is recommended that the topsoil portion of the soil profiles (0 – 20 cm) within all of the proposed disturbance areas is stripped (where possible) and placed in stockpiles for use as a surface rehabilitation medium.
- Subsoils (>20 cm) should not be used as a near surface rehabilitation material.
- Any rock fragments and surface litter present within the soil profiles should be collected and stockpiled with the topsoil.
- Machinery operators should minimise the frequency and intensity of disturbance, so they minimise disturbance to the structural integrity of the material.
- Soil stripping should occur as close as possible to the time when the proposed disturbance is scheduled to commence.
- Where possible, all stripped soil should be paddock-dumped into piles no greater than two metres in height. The piles should have adequate distance between them to create a series of mounds and troughs.
- Excessive traffic and disturbance of the stockpiles should be minimised to minimise erosion and degradation of soil structure. Care should be taken to minimise the handling of the soils where possible, particularly when wet.
- As a general rule, topsoil rehabilitation materials should not be placed at depths greater than 20 cm on rehabilitated areas. This is particularly the case for sloped areas of rehabilitation.
- Where utilised as a surface rehabilitation medium on the sloped batters of waste rock landforms, the surface soils will require ripping into underlying competent waste rock to armour the surface and minimise erosion as far as practicable
- Given that the topsoil has been identified as extremely saline across a lot of the site, salt tolerant species should be used in rehabilitation to maximise rehabilitation outcomes.

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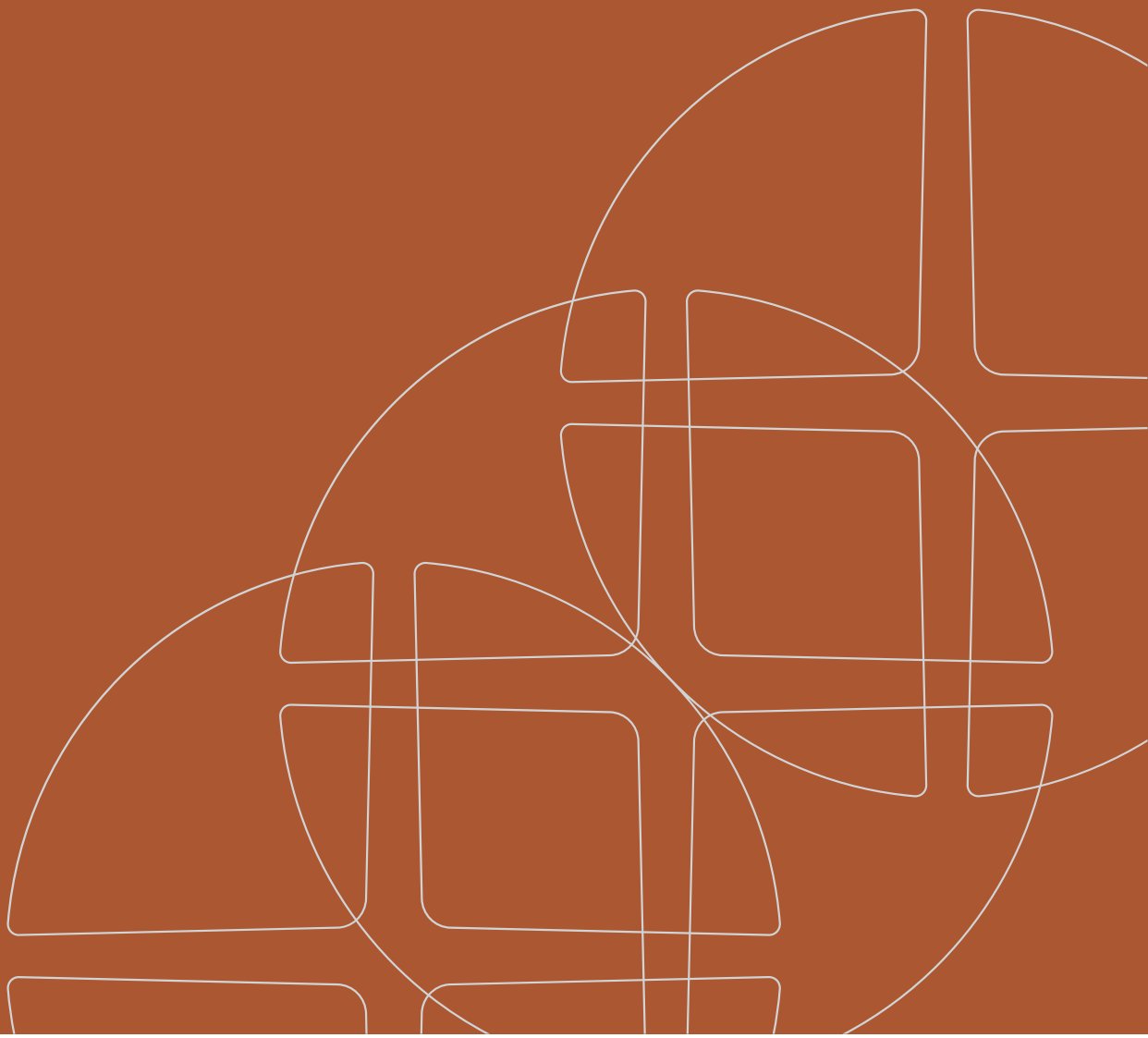
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Appendix A

Soil standards and classifications



A.1 Soil standards and classifications

A.1.1 Emerson dispersion test classes (Moore, 1998)

Class	Description
Class 1	Dry aggregate slakes and completely disperses
Class 2	Dry aggregate slakes and partly disperses
Class 3a	Dry aggregate slakes but does not disperse; remoulded soil disperses completely
Class 3b	Dry aggregate slakes but does not disperse; remoulded soil partly disperses
Class 4	Dry aggregate slakes but does not disperse; remoulded soil does not disperse; carbonates and gypsum are present
Class 5	Dry aggregate slakes but does not disperse; remoulded soil does not disperse; carbonates and gypsum are absent; 1: suspension remains dispersed
Class 6	Dry aggregate slakes but does not disperse; remoulded soil does not disperse; carbonates and gypsum are absent; 1:5 suspension remains flocculated
Class 7	Dry aggregate does not slake; aggregate swells
Class 8	Dry aggregate does not slake; aggregate does not swell

A.1.2 Soil electrical conductivity classes (based on standard USDA and CSIRO categories)

EC (1:5) (dS/m)						
Salinity class	**Sand**	**Sandy loam**	**Loam**	**Clay loam**	**Light / medium clay**	**Heavy clay**
Non-saline	<0.13	<0.17	<0.20	<0.22	<0.25	<0.33
Slightly saline	0.13 – 0.26	0.17 – 0.33	0.20 – 0.40	0.22 – 0.44	0.25 – 0.50	0.33 – 0.67
Moderately saline	0.26 – 0.52	0.33 – 0.67	0.40 – 0.80	0.44 – 0.89	0.50 – 1.00	0.67 – 1.33
Very saline	0.52 – 1.06	0.67 – 1.33	0.80 – 1.60	0.89 – 1.78	1.00 – 2.00	1.33 – 2.67
Extremely saline	>1.06	>1.33	>1.60	>1.78	>2.00	>2.67

A.1.3 Soil pH classes

	Soil pH rating						
	Very strongly acid (Vsac)	**Strongly acid (Sac)**	**Moderately acid (Mac)**	**Slightly acid (Slac)**	**Neutral (N)**	**Moderately alkaline (Malk)**	**Strongly alkaline (Salk)**
pH_w	**<5.3**	**5.3 – 5.6**	**5.6 – 6.0**	**6.0 – 6.5**	**6.5 – 8.0**	**8.0 – 9.0**	**>9.0**
pH_{Ca}	**<4.2**	**4.2 – 4.5**	**4.5 – 5.0**	**5.0 – 5.5**	**5.5 – 7.0**	**7.0 – 8.0**	**>8.0**

Appendix B
Soil profile descriptions

Site Ref:	**S01**	**Datum:**	**GDA94 z51**
Site Description:	Adjacent to proposed access road	**Easting:**	312648
		Northing:	6621587



Plate A1: Soil profile at Site S01

Soil profile description:

0-10cm: Moderately to well-structured red-orange soil with a loose consistence and approximately 10 to 15% coarse fragments, 2 to 60mm in size and sub-angular shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured red-orange soil with a loose consistence and approximately 5 to 10% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as ''none'.

40-50cm: Moderately to well-structured red soil with a loose consistence and approximately 0 to 5% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as ''none'.

Soil surface:
5% cover of coarse fragments 2 to 60 mm in size.

Vegetation:
Eucalyptus woodland, sparse ground cover with some leaf litter.



Plate A2: Vegetation/landscape at Site S01

Site Ref:	**S02**	**Datum:**	**GDA94 z51**
Site Description:	Adjacent to proposed access road	**Easting:** **Northing:**	312446 6621833



Soil profile description:

0-10cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-angular shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured yellow-orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-angular shape. Root growth classified as ''none'.

40-50cm: Moderately to well-structured orange-white soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-angular shape. Root growth classified as ''none'.

Plate A3: Soil profile at Site S02

Soil surface:
5% cover of coarse fragments 2 to 50 mm in size with approximately 40 to 50% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A4: Vegetation/landscape at Site S02

Site Ref:	**S03**	**Datum:**	**GDA94 z51**
Site Description:	Proposed topsoil stockpile area	**Easting:** **Northing:**	312925 6622252



Soil profile description:

0-10cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-angular shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-angular in shape. Root growth classified as 'few'.

40-50cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as 'few' but thicker than near surface.

Plate A5: Soil profile at Site S03

Soil surface:
Weak cryptogammic crust, with 5% cover of coarse fragments 2 to 60 mm in size and approximately 20 to 30% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A6: Vegetation/landscape at Site S03

Site Ref:	**S04**	**Datum:**	**GDA94 z51**
Site Description:	Proposed ROM Pad	**Easting:**	312553
		Northing:	6622087



Soil profile description:

0-10cm: Moderately to well-structured orange soil with a loose consistence and approximately 5 to 10% coarse fragments, 2 to 60mm in size and sub-angular shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured orange soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-angular in shape. Root growth classified as 'few'.

40-50cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-angular in shape. Root growth classified as 'none'.

Plate A7: Soil profile at Site S04

Soil surface:
Weak cryptogammic crust, with 5% cover of coarse fragments 2 to 60 mm in size and approximately 20 to 30% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A8: Vegetation/landscape at Site S04

Site Ref:	**S05**	**Datum:**	**GDA94 z51**
Site Description:	Adjacent to proposed access road	**Easting:**	313023
		Northing:	6621377



Soil profile description:

0-10cm: Moderately to well-structured orange soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-angular shape. Root growth classified as 'none'.

10-20cm: Moderately to well-structured red-orange soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-angular in shape. Root growth classified as 'none'.

40-50cm: Moderately to well-structured red soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-angular in shape. Root growth classified as 'none'.

Plate A9: Soil profile at Site S05

Soil surface:
70% cover of coarse fragments 2 to 60 mm in size with approximately 5-10% cover of leaf litter

Vegetation:
Sparse Eucalyptus woodland.



Plate A10: Vegetation/landscape at Site S05

Site Ref:	**S06**	**Datum:**	**GDA94 z51**
Site Description:	Adjacent to proposed pit cutback	**Easting:** **Northing:**	312763 6621938



Plate A11: Soil profile at Site S06

Soil profile description:

0-10cm: Moderately to well-structured yellow-orange soil with a loose consistence and approximately 5 to 10% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as 'none'.

40-50cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as 'none'.

Soil surface:
Weak, thin crust with 5 to 10% cover of coarse fragments 2 to 60 mm in size and approximately 10-20% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A12: Vegetation/landscape at Site S06

Site Ref:	**S07**	**Datum:**	**GDA94 z51**
Site Description:	Proposed pit cutback	**Easting:**	312756
		Northing:	6622212



Plate A13: Soil profile at Site S07

Soil profile description:

0-10cm: Moderately to well-structured orange-brown soil with a loose consistence and approximately 15 to 20% coarse fragments, 2 to 60mm in size and sub-rounded/sub-angular shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as 'abundant'.

40-50cm: Moderately to well-structured orange soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as 'few'.

Soil surface:
50 to 60% cover of coarse fragments 2 to 60 mm in size with approximately 40-50% cover of leaf litter .

Vegetation:
Eucalyptus woodland.



Plate A14: Vegetation/landscape at Site S07

Site Ref:	**S08**	**Datum:**	**GDA94 z51**
Site Description:	Proposed WRD	**Easting:**	313094
		Northing:	6622470



Soil profile description:

0-10cm: Moderately to well-structured red-brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured red-brown soil with a moderate consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as 'few'.

40-50cm: Moderately to well-structured red-brown soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-rounded in shape. Root growth classified as ''none'.

Plate A15: Soil profile at Site S08

Soil surface:
10% cover of coarse fragments 2 to 10 mm in size with approximately 20 to 30% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A16: Vegetation/landscape at Site S08

Site Ref:	**S09**	**Datum:**	**GDA94 z51**
Site Description:	Proposed WRD	**Easting:**	313541
		Northing:	6622784



Soil profile description:

0-10cm: Moderately to well-structured red-brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

10-20cm: Well-structured red-brown soil with a moderate consistence and approximately 10 to 20% coarse fragments, 2 to 50mm in size and sub-rounded shape. Root growth classified as 'few'.

40-50cm: Well-structured red-brown soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 40mm in size and sub-rounded shape. Root growth classified as ''none'.

Plate A17: Soil profile at Site S09

Soil surface:
10% cover of coarse fragments 2 to 30 mm in size with approximately 40 to 50% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A18: Vegetation/landscape at Site S09

Site Ref:	**S10**	**Datum:**	**GDA94 z51**
Site Description:	Proposed WRD	**Easting:**	313733
		Northing:	6622560



Soil profile description:

0-10cm: Well-structured brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 80mm in size and sub-rounded shape. Root growth classified as 'few'.

10-20cm: Well-structured brown soil with a moderate consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

40-50cm: Well-structured brown soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as ''none'.

Plate A19: Soil profile at Site S10

Soil surface:
5% cover of coarse fragments 2 to 20 mm in size with approximately 50 to 60% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A20: Vegetation/landscape at Site S10

Site Ref:	**S11**	**Datum:**	**GDA94 z51**
Site Description:	Proposed topsoil stockpile	**Easting:** **Northing:**	313350 6623098



Soil profile description:

0-10cm: Well-structured red-brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as ‘none’.

10-20cm: Moderately to well-structured red-brown soil with a moderate consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and rounded shape. Root growth classified as ‘few’.

40-50cm: Moderately to well-structured orange-white soil with a moderate consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and rounded shape. Root growth classified as ‘‘none’.

Plate A21: Soil profile at Site S11

Soil surface:
10% cover of coarse fragments 2 to 50 mm in size with approximately 20 to 30% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A22: Vegetation/landscape at Site S11

Site Ref:	**S12**	**Datum:**	**GDA94 z51**
Site Description:	Proposed mineral waste	**Easting:** **Northing:**	313965 6622755



Soil profile description:

0-10cm: Moderately to well-structured red-brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured yellow-orange soil with a moderate consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

40-50cm: Moderately to well-structured orange-white soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

Plate A23: Soil profile at Site S12

Soil surface:
10% cover of coarse fragments 2 to 30 mm in size with approximately 10 to 20% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A24: Vegetation/landscape at Site S12

Site Ref:	**S13**	**Datum:**	**GDA94 z51**
Site Description:	Adjacent to proposed workshop	**Easting:** **Northing:**	312968 6623134



Soil profile description:

0-10cm: Moderately to well-structured red-brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

10-20cm: Well-structured red-brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'abundant'.

40-50cm: Well-structured red-brown soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

Plate A25: Soil profile at Site S13

Soil surface:
5% cover of coarse fragments 2 to 10 mm in size with approximately 10 to 20% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A26: Vegetation/landscape at Site S13

Site Ref:	**S14**	**Datum:**	**GDA94 z51**
Site Description:	Proposed WRD	**Easting:** **Northing:**	313501 6622406



Soil profile description:

0-10cm: Moderately to well-structured red-brown soil with a loose consistence and approximately 30 to 40% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

10-20cm: Moderately to well-structured red-brown soil with a loose consistence and approximately 10 to 20% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

40-50cm: Well-structured red-brown soil with a loose consistence and approximately 20 to 30% coarse fragments, 2 to 60mm in size and sub-rounded shape. Root growth classified as 'few'.

Plate A27: Soil profile at Site S14

Soil surface:
10% cover of coarse fragments 2 to 40 mm in size with approximately 50 to 60% cover of leaf litter

Vegetation:
Eucalyptus woodland.



Plate A28: Vegetation/landscape at Site S14

Appendix C
Laboratory results

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2410
Dates Rec'd: 15/01/2025

	Lab Number	1DYS25007	1DYS25008	1DYS25009	1DYS25010	1DYS25011	1DYS25012	1DYS25013	1DYS25014
	Date Received	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025
	Sample Name 1	10 cm	20 cm	50 cm	10 cm	20 cm	50 cm	10 cm	20 cm
	Sample Name 2	S01	S01	S01	S02	S02	S02	S03	S03
	Sample Name 3	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
	Depth	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
Colour		DKBR	DKBR	DKBR	BRGR	BRGR	BRGR	LTGR	DKBR
Gravel	%	15-20	10-15	15-20	35-40	45-50	25-30	15-20	15-20
Texture		2.5	2.5	2.5	2.0	2.5	2.0	2.5	2.5
Ammonium Nitrogen	mg/kg	10	8	4	2	< 1	< 1	< 1	< 1
Nitrate Nitrogen	mg/kg	143	140	103	1	4	3	13	41
Phosphorus Colwell	mg/kg	8	4	< 2	5	< 2	< 2	5	5
Potassium Colwell	mg/kg	309	186	62	204	90	63	137	128
Sulfur	mg/kg	46.9	73.3	238.0	6.7	141.5	270.2	19.0	202.8
Organic Carbon	%	0.54	0.49	0.50	1.47	0.49	0.42	1.13	1.96
Conductivity	dS/m	4.476	5.020	4.442	0.210	0.881	1.564	0.342	1.086
pH Level (CaCl2)		7.1	7.7	7.5	7.7	8.0	8.0	7.8	8.0
pH Level (H2O)		7.4	7.9	8.3	8.4	9.4	9.2	8.5	8.8
% Clay	%	23.21	23.21	27.12	12.86	38.22	32.84	16.50	10.21
% Course Sand	%	32.06	29.17	20.48	40.93	24.22	25.03	39.53	26.67
% Fine Sand	%	22.48	26.39	26.28	30.33	19.48	20.55	24.49	41.57
% Sand	%	54.54	55.56	46.76	71.26	43.70	45.58	64.02	68.24
% Silt	%	22.25	21.23	26.12	15.88	18.08	21.58	19.47	21.54
Prewash exch. Ca	meq/100g	9.49	10.68	9.01	10.58	8.36	7.89	10.64	14.37
Prewash exch. K	meq/100g	0.66	0.45	0.17	0.36	0.17	0.16	0.29	0.27
Prewash exch. Mg	meq/100g	5.69	7.72	10.33	4.38	5.47	5.87	2.89	5.07

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2410
Dates Rec'd: 15/01/2025

	Lab Number	1DYS25015	1DYS25016	1DYS25017	1DYS25018	1DYS25019	1DYS25020	1DYS25021	1DYS25022
	Date Received	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025
	Sample Name 1	50 cm	10 cm	20 cm	50 cm	10 cm	20 cm	50 cm	10 cm
	Sample Name 2	S03	S04	S04	S04	S05	S05	S05	S06
	Sample Name 3	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
	Depth	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
Colour		DKBR	BRYW	BRGR	BRGR	BR	BR	DKBR	DKBR
Gravel	%	25-30	35-40	35-40	25-30	15-20	15-20	15-20	35-40
Texture		2.5	2.5	2.0	2.0	2.5	2.5	2.5	2.5
Ammonium Nitrogen	mg/kg	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Nitrate Nitrogen	mg/kg	83	2	92	148	6	20	46	1
Phosphorus Colwell	mg/kg	4	7	< 2	< 2	6	2	< 2	2
Potassium Colwell	mg/kg	103	267	151	93	185	113	80	127
Sulfur	mg/kg	426.0	5.0	20.1	29.2	2.1	14.2	99.5	2.5
Organic Carbon	%	1.77	0.68	1.00	0.98	0.33	0.17	0.21	0.37
Conductivity	dS/m	2.295	0.118	0.430	0.665	0.185	0.606	1.658	0.081
pH Level (CaCl2)		7.8	7.7	7.8	7.8	7.0	7.1	7.5	7.0
pH Level (H2O)		8.8	8.6	8.6	8.6	7.8	8.2	8.6	8.3
% Clay	%	11.61	15.48	18.83	18.66	9.12	13.77	22.94	29.23
% Course Sand	%	22.37	30.57	26.78	34.17	52.10	67.88	56.99	33.59
% Fine Sand	%	45.62	25.99	30.27	27.47	28.59	13.42	12.75	22.54
% Sand	%	67.99	56.56	57.05	61.64	80.69	81.30	69.74	56.13
% Silt	%	20.40	27.96	24.13	19.69	10.19	4.93	7.32	14.64
Prewash exch. Ca	meq/100g	13.80	9.10	11.79	12.04	2.27	2.21	3.05	7.39
Prewash exch. K	meq/100g	0.21	0.44	0.32	0.24	0.31	0.24	0.22	0.29
Prewash exch. Mg	meq/100g	6.74	2.47	4.09	5.52	2.92	3.48	6.24	6.56

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2410
Dates Rec'd: 15/01/2025

Lab Number		1DYS25023	1DYS25024	1DYS25025	1DYS25026	1DYS25027
Date Received		15/01/2025	15/01/2025	15/01/2025	15/01/2025	15/01/2025
Sample Name 1		20 cm	50 cm	10 cm	20 cm	50 cm
Sample Name 2		S06	S06	S07	S07	S07
Sample Name 3		Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
Depth		0-10	0-10	0-10	0-10	0-10
Colour		DKBR	DKBR	BRGR	BRGR	BRGR
Gravel	%	15-20	25-30	15-20	25-30	35-40
Texture		2.5	2.5	2.5	2.5	2.5
Ammonium Nitrogen	mg/kg	< 1	< 1	1	< 1	< 1
Nitrate Nitrogen	mg/kg	2	7	2	3	3
Phosphorus Colwell	mg/kg	< 2	< 2	8	5	2
Potassium Colwell	mg/kg	76	48	164	142	70
Sulfur	mg/kg	6.1	14.2	3.1	4.6	33.0
Organic Carbon	%	0.39	1.08	1.21	0.91	0.66
Conductivity	dS/m	0.120	0.219	0.110	0.150	0.400
pH Level (CaCl2)		6.9	6.8	7.7	7.9	8.0
pH Level (H2O)		8.1	8.1	8.6	8.9	9.5
% Clay	%	36.82	39.53	15.50	21.44	33.81
% Course Sand	%	25.78	24.87	34.64	23.56	17.83
% Fine Sand	%	23.06	18.48	28.08	29.42	25.78
% Sand	%	48.84	43.35	62.72	52.98	43.61
% Silt	%	14.34	17.12	21.78	25.58	22.58
Prewash exch. Ca	meq/100g	8.09	10.07	10.40	12.02	8.61
Prewash exch. K	meq/100g	0.18	0.12	0.35	0.33	0.17
Prewash exch. Mg	meq/100g	7.29	8.36	2.10	4.72	6.05

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2410
Dates Rec'd: 15/01/2025

	Lab Number	1DYS25007	1DYS25008	1DYS25009	1DYS25010	1DYS25011	1DYS25012	1DYS25013	1DYS25014
Prewash exch. Na	meq/100g	0.52	0.90	1.74	0.10	1.87	1.77	0.23	0.94
Arsenic	ug/kg	21200.00	22200.00	20320.00	22560.00	28320.00	33280.00	63600.00	70000.00
Cadmium	ug/kg	108.00	108.00	108.00	92.00	104.00	108.00	136.00	112.00
Chromium	ug/kg	755200.00	834800.00	522400.00	722000.00	556400.00	963600.00	265080.00	210800.00
Cobalt	ug/kg	36876.00	42240.00	31968.00	43200.00	35308.00	42360.00	23368.00	21028.00
Lead	ug/kg	10400.00	10800.00	8760.00	10436.00	7764.00	9924.00	7736.00	6144.00
Molybdenum	ug/kg	292.0	288.0	256.0	388.0	272.0	460.0	376.0	324.0
Selenium	ug/kg	27.86	32.90	49.46	34.70	80.78	112.46	40.82	99.86

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2410
Dates Rec'd: 15/01/2025

	Lab Number	1DYS25015	1DYS25016	1DYS25017	1DYS25018	1DYS25019	1DYS25020	1DYS25021	1DYS25022
Prewash exch. Na	meq/100g	1.71	< 0.10	0.21	0.40	0.83	2.25	3.67	0.90
Arsenic	ug/kg	82400.00	48000.00	49600.00	45200.00	24720.00	26000.00	32560.00	46000.00
Cadmium	ug/kg	96.00	96.00	92.00	80.00	104.00	148.00	116.00	72.00
Chromium	ug/kg	169320.00	1158400.00	991600.00	939200.00	860400.00	1329600.00	1188800.00	968400.00
Cobalt	ug/kg	18808.00	47240.00	44320.00	40880.00	26656.00	28568.00	38084.00	50800.00
Lead	ug/kg	4936.00	7500.00	6124.00	5900.00	10292.00	13396.00	11656.00	9048.00
Molybdenum	ug/kg	268.0	228.0	248.0	196.0	396.0	648.0	592.0	344.0
Selenium	ug/kg	117.86	21.02	36.50	45.14	38.66	42.98	67.10	31.46

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2410
Dates Rec'd: 15/01/2025

	Lab Number	1DYS25023	1DYS25024	1DYS25025	1DYS25026	1DYS25027
Prewash exch. Na	meq/100g	1.32	1.78	< 0.10	0.13	1.02
Arsenic	ug/kg	50000.00	46000.00	39760.00	34600.00	46400.00
Cadmium	ug/kg	80.00	60.00	124.00	180.00	232.00
Chromium	ug/kg	999200.00	921600.00	269840.00	229160.00	201040.00
Cobalt	ug/kg	53800.00	49960.00	34664.00	36016.00	35648.00
Lead	ug/kg	9760.00	9604.00	13072.00	10952.00	11148.00
Molybdenum	ug/kg	360.0	316.0	384.0	392.0	2584.0
Selenium	ug/kg	36.50	26.42	57.02	54.14	100.58

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2506
Dates Rec'd: 23/07/2025

	Lab Number	2LHS25081	2LHS25082	2LHS25083	2LHS25084	2LHS25085	2LHS25086	2LHS25087	2LHS25088
	Date Received	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
	Sample Name 1	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506
	Sample Name 2	S08	S08	S08	S09	S09	S09	S10	S10
	Sample Name 3	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
	Depth	0-10	10-20	40-50	0-10	10-20	40-50	0-10	10-20
Colour		OR	OR	BRRD	OR	BRRD	OR	BROR	BROR
Gravel	%	5	5	5	5	5	5	0	0
Texture		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ammonium Nitrogen	mg/kg	< 1	< 1	< 1	< 1	3	5	3	4
Nitrate Nitrogen	mg/kg	5	10	15	15	68	73	22	33
Phosphorus Colwell	mg/kg	6	5	5	6	4	4	9	8
Potassium Colwell	mg/kg	170	160	97	182	83	42	85	62
Sulfur	mg/kg	8.4	24.0	312.9	7.3	39.7	371.6	156.5	269.2
Organic Carbon	%	0.25	0.27	0.20	0.52	0.78	0.44	0.55	0.66
Conductivity	dS/m	0.475	1.220	3.275	0.751	3.147	5.759	1.903	2.970
pH Level (CaCl2)		6.8	6.9	7.8	7.2	7.9	7.9	8.0	8.0
pH Level (H2O)		8.0	8.0	8.3	8.1	8.3	8.5	8.7	8.7
% Clay	%	16.40	19.39	28.64	26.51	24.43	33.95	15.86	20.94
% Course Sand	%	34.16	30.56	16.09	23.73	13.68	11.13	31.85	24.86
% Fine Sand	%	38.78	32.66	23.51	26.26	26.75	20.91	36.39	33.20
% Sand	%	72.94	63.22	39.60	49.99	40.43	32.04	68.24	58.06
% Silt	%	10.65	17.39	31.76	23.50	35.13	34.01	15.91	21.00
Prewash exch. Ca	meq/100g	2.40	3.79	8.34	7.62	11.05	9.95	7.69	10.98
Prewash exch. K	meq/100g	0.31	0.38	0.29	0.36	0.22	0.13	0.18	0.15
Prewash exch. Mg	meq/100g	1.85	3.37	7.86	5.55	7.86	7.72	2.94	4.69

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2506
Dates Rec'd: 23/07/2025

	Lab Number	2LHS25089	2LHS25090	2LHS25091	2LHS25092	2LHS25093	2LHS25094	2LHS25095	2LHS25096
	Date Received	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
	Sample Name 1	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506
	Sample Name 2	S10	S11	S11	S11	S12	S12	S12	S13
	Sample Name 3	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
	Depth	40-50	0-10	10-20	40-50	0-10	10-20	40-50	0-10
Colour		BROR	BRRD	BRRD	BROR	BRRD	BRRD	BRRD	BROR
Gravel	%	5	0	0	5	0	0	0	0
Texture		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ammonium Nitrogen	mg/kg	< 1	21	27	9	32	38	16	4
Nitrate Nitrogen	mg/kg	32	363	594	588	262	414	191	31
Phosphorus Colwell	mg/kg	8	7	5	4	20	13	10	8
Potassium Colwell	mg/kg	44	96	63	52	306	185	91	185
Sulfur	mg/kg	3667.4	111.0	159.4	437.0	275.6	258.2	585.7	82.9
Organic Carbon	%	0.49	0.70	0.65	0.25	0.86	0.99	0.57	0.47
Conductivity	dS/m	6.499	3.822	7.365	9.068	7.129	8.607	7.400	1.951
pH Level (CaCl2)		8.6	7.8	7.7	8.2	7.9	7.9	8.1	7.6
pH Level (H2O)		9.0	8.0	8.0	8.6	8.2	8.1	8.4	8.1
% Clay	%	4.10	24.74	22.41	12.41	26.59	3.22	29.32	22.18
% Course Sand	%	18.12	14.33	11.36	12.09	13.60	16.91	13.74	34.75
% Fine Sand	%	28.99	26.86	24.52	26.71	33.11	23.06	26.52	28.24
% Sand	%	47.11	41.19	35.88	38.80	46.71	39.97	40.26	62.99
% Silt	%	48.79	34.08	41.71	48.79	26.69	56.82	30.42	14.82
Prewash exch. Ca	meq/100g	13.01	10.25	11.20	11.02	15.62	16.17	11.46	6.50
Prewash exch. K	meq/100g	0.11	0.26	0.16	0.14	0.65	0.48	0.25	0.30
Prewash exch. Mg	meq/100g	5.26	6.93	8.28	7.34	2.88	3.85	6.25	3.72

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2506
Dates Rec'd: 23/07/2025

Lab Number		2LHS25103	2LHS25104	2LHS25105	2LHS25106	2LHS25107
Date Received		23/07/2025	23/07/2025	23/07/2025	23/07/2025	23/07/2025
Sample Name 1		WTL-2506	WTL-2506	WTL-2506	WTL-2506	WTL-2506
Sample Name 2		S13	S13	S14	S14	S14
Sample Name 3		Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd	Mine Earth Pty Ltd
Depth		10-20	40-50	0-10	10-20	40-50
Colour		BRRD	BROR	BROR	LTBR	BROR
Gravel	%	0	0	0	0	0
Texture		3.0	3.0	3.0	3.0	3.0
Ammonium Nitrogen	mg/kg	6	1	16	21	4
Nitrate Nitrogen	mg/kg	72	29	72	99	68
Phosphorus Colwell	mg/kg	6	6	14	10	7
Potassium Colwell	mg/kg	104	28	72	36	25
Sulfur	mg/kg	163.2	254.5	179.8	302.1	777.2
Organic Carbon	%	0.80	0.45	0.95	1.18	0.53
Conductivity	dS/m	3.998	3.478	4.202	6.012	6.592
pH Level (CaCl2)		7.8	7.9	8.0	7.8	7.9
pH Level (H2O)		8.3	8.6	8.3	8.3	8.4
% Clay	%	27.44	30.22	22.22	25.64	31.29
% Course Sand	%	16.62	10.12	16.88	16.18	12.39
% Fine Sand	%	29.46	28.38	39.63	33.49	28.01
% Sand	%	46.08	38.50	56.51	49.67	40.40
% Silt	%	26.48	31.28	21.26	24.70	28.31
Prewash exch. Ca	meq/100g	11.98	11.10	11.41	15.03	10.40
Prewash exch. K	meq/100g	0.27	0.11	0.21	0.13	0.10
Prewash exch. Mg	meq/100g	7.46	7.52	3.69	4.80	6.82

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2506
Dates Rec'd: 23/07/2025

	Lab Number	2LHS25081	2LHS25082	2LHS25083	2LHS25084	2LHS25085	2LHS25086	2LHS25087	2LHS25088
Prewash exch. Na	meq/100g	0.90	1.50	2.63	1.13	1.22	1.73	0.63	1.13
Arsenic	ug/kg	17959.05	15706.69	14530.23	13859.19	15411.94	14374.79	20636.88	18366.23
Cadmium	ug/kg	104.17	105.47	149.25	44.67	36.97	51.81	48.65	50.20
Chromium	ug/kg	384825.72	453147.22	250350.58	216345.76	169769.46	133778.31	192196.98	161495.66
Cobalt	ug/kg	22061.69	26605.44	32958.61	7444.96	7732.84	6815.43	5717.81	6369.43
Lead	ug/kg	10243.47	12829.36	12875.60	14446.71	14315.10	11034.59	13844.92	12830.73
Molybdenum	ug/kg	578.2	561.9	504.6	654.9	677.2	622.3	636.3	596.6
Selenium	ug/kg	1084.71	1183.18	938.90	666.26	820.29	858.84	930.98	900.97

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2506
Dates Rec'd: 23/07/2025

	Lab Number	2LHS25089	2LHS25090	2LHS25091	2LHS25092	2LHS25093	2LHS25094	2LHS25095	2LHS25096
Prewash exch. Na	meq/100g	1.52	0.92	1.59	2.03	1.04	1.31	1.82	0.42
Arsenic	ug/kg	22874.49	23603.71	24328.60	26066.30	14586.39	10734.43	11559.94	12616.68
Cadmium	ug/kg	49.74	40.52	42.67	59.73	169.99	173.91	121.60	63.86
Chromium	ug/kg	122454.80	186664.44	180925.71	152577.50	261706.97	182750.84	160027.47	218387.04
Cobalt	ug/kg	5408.63	7562.33	7959.40	6643.02	25850.29	23836.12	21121.64	7828.38
Lead	ug/kg	9564.74	14068.66	14280.81	11860.37	14749.78	11411.79	10143.57	13388.60
Molybdenum	ug/kg	486.4	689.1	710.8	694.9	815.2	613.5	519.2	552.3
Selenium	ug/kg	934.24	669.53	656.92	979.56	766.99	571.91	586.42	653.47

CSBP Lab. Extract Value.

Analysis Results

CSBP Soil and Plant Analysis Laboratory

Customer: Mine Earth Pty Ltd (90423)
PO/Job Name: WTL-2506
Dates Rec'd: 23/07/2025

	Lab Number	2LHS25103	2LHS25104	2LHS25105	2LHS25106	2LHS25107
Prewash exch. Na	meq/100g	0.98	1.53	0.77	1.26	1.59
Arsenic	ug/kg	19581.65	16656.01	11296.75	11176.47	17315.81
Cadmium	ug/kg	127.89	100.66	37.48	63.99	75.05
Chromium	ug/kg	232194.92	145812.37	133389.25	125701.99	104201.46
Cobalt	ug/kg	10949.08	8954.12	8537.22	9232.46	7693.19
Lead	ug/kg	16272.92	14685.17	18402.84	17497.37	15532.71
Molybdenum	ug/kg	559.8	373.2	539.1	498.5	466.8
Selenium	ug/kg	741.93	768.81	493.83	829.34	727.80

CSBP Lab. Extract Value.

Appendix 3 – Level 1 Flora & Vegetation Survey: Bullant (Botanica Consulting, 2011)

Level 1 Flora & Vegetation Survey:

Bullant

Final Report

Tenements: M16/44, M16/45

Prepared For

Kalgoorlie Mining Company Ltd





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Executive Summary

Botanica Consulting was commissioned by Kalgoorlie Mining Company Ltd to undertake a Level 1 flora and vegetation survey of the Bullant survey area located adjacent to the Coolgardie North Road, approximately 43km north-west of Kalgoorlie-Boulder in WA. The survey covered an area of approximately 1200ha and was conducted on the 9th and 16th of August 2011.

Seven vegetation communities were identified within the survey area, Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*, *Eucalyptus clelandii* woodland over *Maireana sedifolia*, *Eucalyptus salubris* woodland over mixed shrubs, *Casuarina pauper* woodland over *Acacia colletioides, Eucalyptus salmonophloia* woodland over *Eremophila alternifolia*, *Eucalyptus clelandii* woodland over *Triodia scariosa* and *Eucalyptus ravida* thicket. These communities were represented by a total of 23 Families, 43 Genera and 83 Species (including subspecies and variants).

No Declared Rare Flora pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)*, and listed by the Department of Environment and Conservation were identified during the survey. There were no Priority Flora species identified within the Bullant survey area. Four weed species, *Centaurea melitensis, Dittrichia graveolens, Salvia verbenaca and Lysimachia arvensis*, were identified within the survey area. According to the Department of Agriculture and Food of Western Australia these species are not listed as declared Plants.

According to the Department of Sustainability, Environment, Water, Population and Communities the Bullant survey area does not have National Environmental Significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

No Threatened Ecological Communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* are known to occur in the survey area. No Priority Ecological Communities as listed by the Department of Environment and Conservation occur within the survey area.

All seven vegetation communities identified in the survey were classed as in ‘very good’ health according to the Keighery health rating scale (1994). A very good health condition is defined as “altered due to the obvious signs of disturbance”. Disturbance in this case was in the form of historic drill lines and tracks.

1 Introduction

1.1 Project Description

Kalgoorlie Mining Company Ltd (KMC) commissioned Botanica Consulting (BC) to conduct a Level 1 flora and vegetation survey within the Bullant survey area within tenements M16/44 & M16/45. Within the Bullant survey area there is currently mining operations and KMC propose to build a permanent crusher, CIL plant and Tailings Storage Facility (TSF). The Bullant survey area is located approximately 43km north-west of Kalgoorlie-Boulder.

The area surveyed is shown in Figure 1 and Appendix 1. The aim of the survey was to produce a vegetation map (Appendix 2) and species list (Appendix 3) as well as to document and map locations of any Declared Rare or Priority listed flora species identified within the survey area which covers an area of approximately 1200 ha.

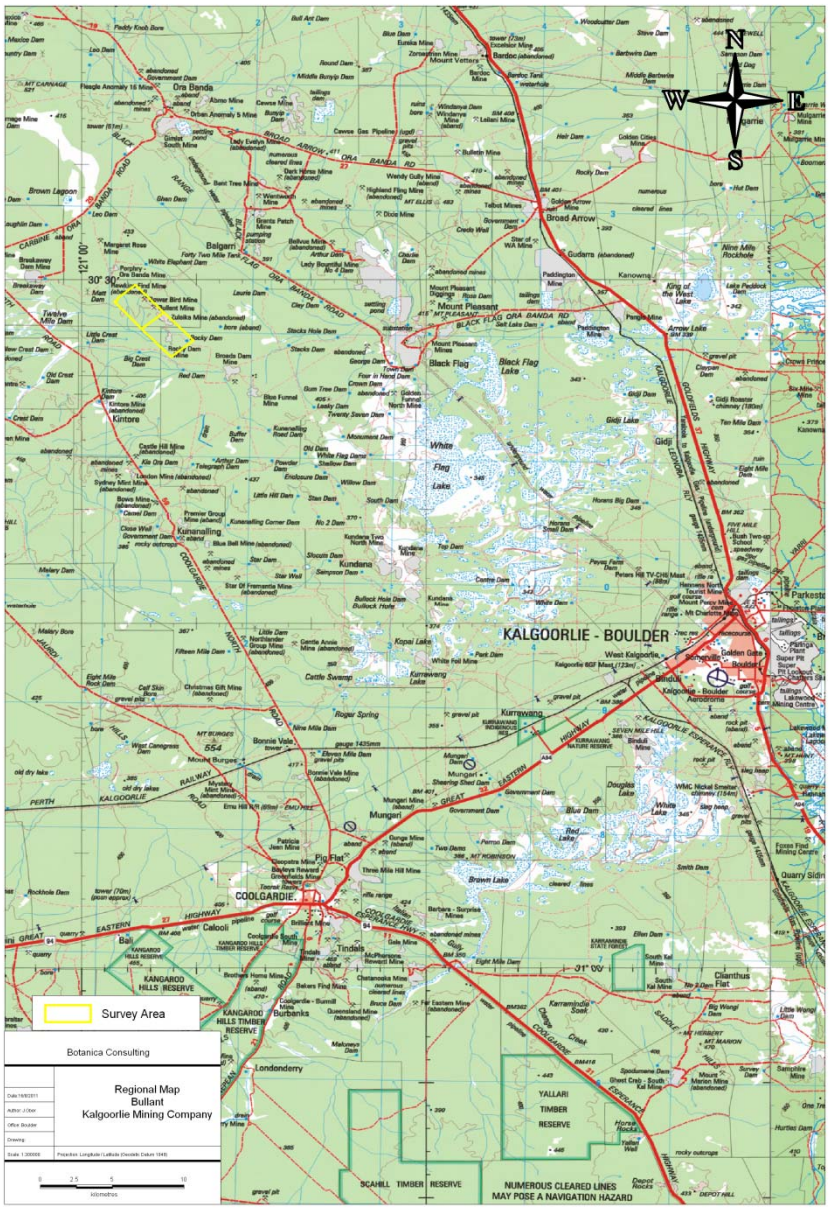


Figure 1: Regional map of the Bullant Flora and Vegetation survey (survey area not to scale)

1.2 Previous relevant flora surveys

Flora and Vegetation survey, Bullant area (M16/45), October 2005, Jims Seeds, Weeds and Trees.

Jim Seeds, Weeds and Trees (JSWT) was commissioned by Paddington Gold Pty Ltd to undertake a flora and vegetation assessment of approximately 641 ha, approximately 43km north-west of Kalgoorlie-Boulder. The flora survey was conducted on 25th and 26th October 2005. This survey area covers part of the proposed survey area.

No Declared Rare Flora (DRF) pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)* and listed by the Department of Environment and Conservation (DEC) were located during the survey. No Priority Flora species were located in the survey area.

Four broad vegetation communities were identified within the survey area, *Eucalyptus salubris* woodland*, Eucalyptus clelandii* woodland*, Eucalyptus salubris* clay pan and *Psydrax rigidula* clay pan. These groups were represented by a total of 26 Families, 45 Genera and 77 Species.

The survey area did not have regional environmental significance as defined by the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999.* Six weed species were identified within the survey area; *Carthamus lanatus* (Saffron thistle)*, Centaurea melitensis* (Maltese Cockspur), *Cuscuta epithymum* (Lesser Dodder)*, Mentha suaveolens* (Apple Mint)*, Medicago minima* (Small Burr Medic) and *Solanum hystrix* (Afghan thistle)*.* One of these weed species, Saffron thistle, was found on the Department of Agriculture's noxious weed list for Australian States and Territories (2005). Saffron thistle is the only declared weed of the introduced plants with a priority rating of 1 for the whole State and priority rating of 4 for the Kalgoorlie region.

2 Regional Biophysical Environment

2.1 Regional Environment

The survey area lies within the South-Western Interzone of Western Australia (WA) in a region known as the Coolgardie Botanical District. The area is predominantly eucalypt woodlands with saltbush-bluebush understorey on the more calcareous soils with patches of shrub steppe adjoining the Great Victoria Desert and scrub-heath and *Casuarina* thickets on sandplains (Beard, 1990). Based on the Interim Biogeographic Regionalisation of Australia (IBRA), the Bullant survey area is located within the Eastern Goldfields (C003) subregion (Cowan, 2001).

2.2 Topography & Soils

The geology of the Southwestern Interzone is comprised of Archaean granites with interfolded metamorphic rock of the Yilgarn Block. The undulating plateau on which they are situated contains remnants of prior land surfaces, giving rise to catenary sequences of soils (Beard, 1990). The dominant soil group is Calcareous earth and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line.

The Coolgardie Botanical District is predominantly *Eucalypt* woodlands, becoming open towards the more calcareous soils, where a cover of saltbush-bluebush is evident. The Eastern Goldfields subregion has subdued relief, comprising gently undulating plains interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite (Cowan, 2001).

2.3 Climate

The climate of the Eastern Goldfields subregion is characterised as arid to semi-arid with annual rainfall totals of 200-300 mm (Cowan, 2001). Figure 2 shows the mean monthly rainfall data for the Ora Banda Weather Station located 15 km north of the Bullant survey area.

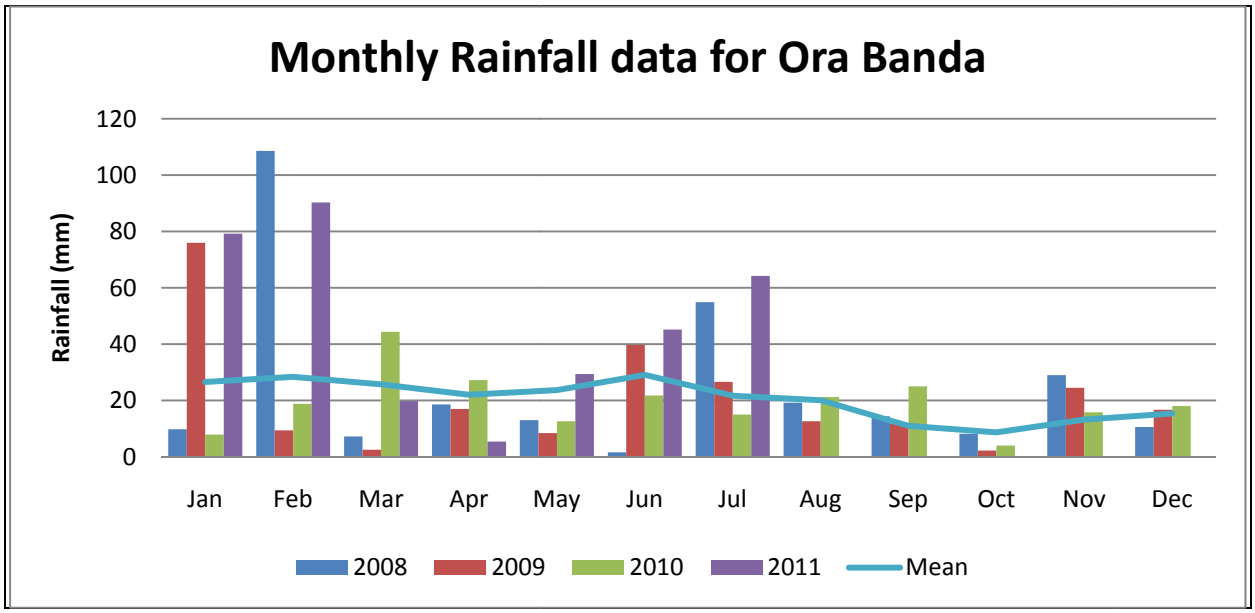


Figure 2: Mean monthly rainfall for the Ora Banda Weather Station (#12066) from January 2008 to July 2011 (BOM, 2011)

2.4 Vegetation

Beard (1990) locates the survey area within the Coolgardie Botanical District of the Southwestern Interzone. The typical sequences of vegetation within the Coolgardie Botanical District comprise of predominantly eucalypt woodlands, becoming open and with saltbush-bluebush understorey on the more calcareous soils. Patches of shrub steppe adjoin the Great Victorian Desert and scrub-heath and *Casuarina* thickets on sandplains (Beard, 1990). The Department of Agriculture and Food WA map file places the survey area within Pre-European Beard vegetation association 468 (Table 1).

Table 1: Pre-European Beard Vegetation Associations within the survey area (DAFWA, 2007)

Veg association no.	Pre-European Extent (ha)	Current Extent (ha)	Current extent remaining (%)	% of Current extent within DEC managed lands	Vegetation Description (Beard, 1990)
Kununulling 468	209,934	209,934	100	48.23	Medium Woodland; Salmon gum and goldfields blackbutt

2.5 Great Western Woodlands

The Bullant survey area lies within the Great Western Woodlands, an area considered by the Wilderness Society of WA to be of global biological and conservation importance as one of the largest and healthiest temperate woodlands on Earth containing many endemic species. The region covers almost 16 million hectares, 160,000 square kilometres, from the southern edge of the Western Australian Wheatbelt to the pastoral lands of the Mulga country in the north, the inland deserts to the northeast, and the treeless Nullarbor Plain to the east. The area provides an eastward connection between southwest forests and inland deserts (Gondwana Link) as well as linking the north-west passage to Shark Bay. The majority of the Great Western Woodlands is unallocated crown land (61.1%) with other interests including pastoral leases (20.4%), conservation reserves (15.4%) unallocated crown land ex pastoral managed by the DEC (2%) and private land (approximately 1%) (Watson *et. al*., 2008).

No specific management strategy applies to the Great Western Woodlands, rather an approach to conservation which occurs across all land tenures and when different stakeholders work together with biodiversity in mind. The central component of this approach is to identify and conserve key large-scale, long term ecological processes that drive connectivity between ecosystems and species. The Great Western Woodlands currently includes towns, highways, roads, railways, private property, Crown Reserves, agricultural activities and mining tenements. Figure 4 shows the different land uses of the Great Western Woodlands.

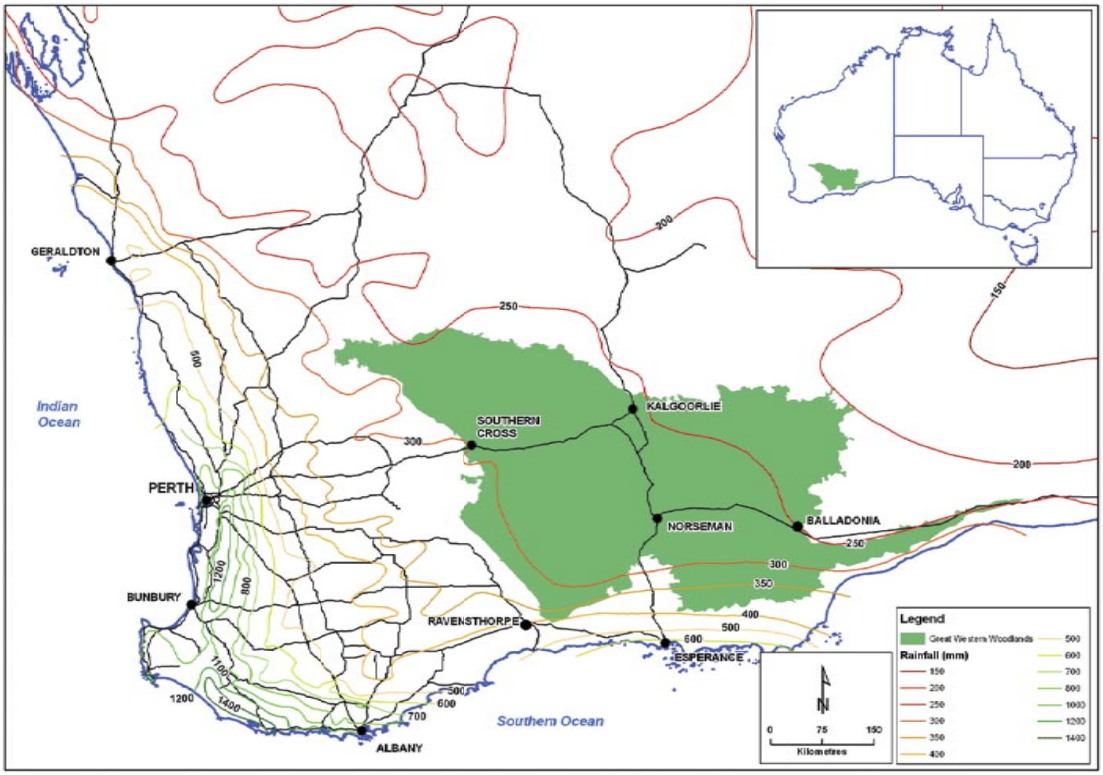


Figure 3: Location map of the Great Western Woodlands (DEC, 2010).

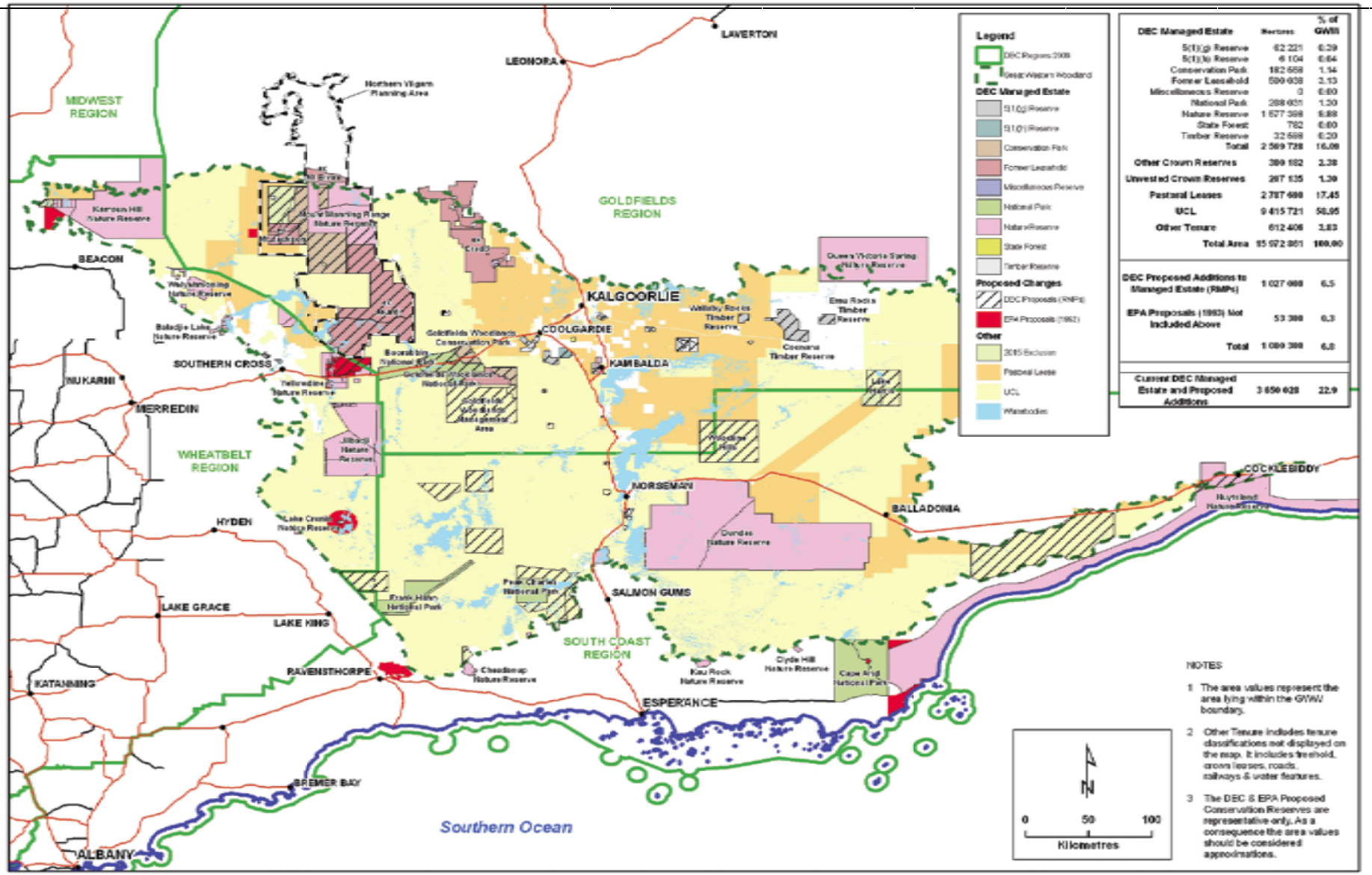


Figure 4: Different land uses of the Great Western Woodlands (DEC, 2010).

2.6 Land Use

According to the DEC the Eastern Goldfields subregion land uses include Grazing-Native pastures-leasehold (37.8%), Unallocated Crown Land & Crown Reserves, Freehold (7.15%), conservation and Mining leases (Cowan, 2001).

2.7 Survey Objectives

The objectives of this survey were to:

1. Prepare a vegetation map and species list for the survey area;
2. Create a list of threatened plant species and ecological communities that have potential to occur within the survey area;
3. Assess the status of introduced plant species within the survey area; and
4. Assess the regional and local conservation status of plant species and ecological communities within the survey area.

3 Survey Methodology

3.1 Desktop Assessment

Prior to the field survey, the results of the combined search of the DEC Declared Rare and Priority Flora databases (DEC, 2011a), were obtained by BC. These significant flora species were examined on the Western Australian Herbarium's web page (WAHERB, 2011) prior to the survey to familiarise staff with their appearance. Locations of Declared Rare Flora and Priority Flora species revealed in the databases search were overlaid on aerial photography of the area. Vegetation descriptions of locations and available pictures of the Priority Flora were obtained from Florabase.

Priority Flora and their respective vegetation types were targeted in the survey area and all areas of occurrence were traversed on foot specifically looking for the threatened flora associated with that vegetation description.

Table 2 lists the definitions of Declared Rare and Priority ratings under the *Wildlife Conservation Act (1950)* as extracted from Florabase (WAHERB, 2011).

Table 2: **Definitions of Rare and Priority Flora Species (WAHERB, 2011)**

T: Declared Rare Flora – Extant Taxa Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.
X: Declared Rare flora – Presumed Extinct Taxa Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
1: Priority One – Poorly known Taxa Taxa that are known from one or a few collections or sight records (generally <five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes
2: Priority Two – Poorly Known Taxa Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Species may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes
3: Priority Three – Poorly known Taxa Taxa which are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4: Priority Four – Rare, near threatened or other species in need of monitoring **Rare**. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. **Near Threatened.** Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. **Species** that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5: Priority Five – Conservation Dependant Species Species that are not threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years

3.2 Sampling and Analysis Methods

The survey area was traversed by Four Wheel Drive (FWD) All-Terrain Vehicle (ATV) and on foot where appropriate. Prior to the field work, aerial images were analysed in order to determine the existing vegetation communities. These different vegetation communities were then visited during the field survey to assess their validity. A handheld GPS unit was used to obtain the co-ordinates of the boundaries between existing vegetation communities.

During the inspection of each vegetation community the survey team observed and collected specimens from the entire area(s) in order to create a species list. Photographs were also taken within each vegetation community. Unknown specimens collected during the survey were identified with the aid of samples housed at the BC Herbarium and the Western Australian Herbarium.

3.2.1 Personnel involved

Jim Williams- Environmental Consultant/Botanist (Diploma of Horticulture)

Jesse Ober – Environmental Consultant (BSc Env Science, Env Management, Env Restoration)

3.2.2 Scientific licences

Table 3: Scientific licenses of Botanica staff co-ordinating the survey

Licensed staff	Permit Number	Valid Until
Jim Williams	SL009438	3-4-2012

3.3 Flora survey limitations and constraints

It is important to note that there are limitations involved with conducting flora surveys, despite the careful planning that is put into their design. Such limitations that can occur are listed in Table 4 below.

Table 4: Limitations and constraints associated with the flora and vegetation survey.

Variable	Impact on Survey outcomes
Access problems	Access was not a problem as the survey was conducted via 4WD, all terrain vehicle and on foot
Experience levels	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. **Coordinating Botanist:** Jim Williams **Field Staff:** Jim Williams & Jesse Ober **Data Interpretation:** Jim Williams & Jesse Ober
Timing of survey, weather & season	Fieldwork was carried out in August a few weeks prior to the DEC's recommended timing for flora surveys (i.e. spring 1st September to 30th November) however due to the above average rainfall received in the area many species were in flower and also seeding. Therefore the timing of the survey was appropriate based on the seasonal conditions experienced in the region.
Sources of information	BC were able to obtain information about the area from previous research conducted within the Eastern Goldfields (C003) subregion which enabled adequate background information about the region.
Mapping reliability	BC were able to obtain high quality ortho aerial images from KMC in order to reliably determine changes in vegetation within the survey area.
Area disturbance	The survey area has been subject to historical clearing which has resulted in minor alterations in vegetation. Majority of the area was comprised of native vegetation that has not been disturbed. Disturbance was in the form of exploration tracks, prospecting, active and historic underground and open pit mining operations.
Survey Intensity	A level 1 flora and vegetation survey completed at the end of winter (the area has received above average rainfall). A reconnaissance survey was conducted in order to identify vegetation communities and any Priority Flora species.
Resources	The DEC provided threatened flora information which was used to complete the survey.
Completeness	In the opinion of BC the survey area was covered sufficiently in order to identify vegetation assemblages. Several plants were already in flower due to the timing of the survey and the higher than average rainfall received in the area preceding the survey. The vegetation communities for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities outside the study area is not known, however vegetation communities identified were categorized via comparison to vegetation distributions throughout WA given on Australian Natural Resources Atlas (ANRA, 2011).

4 Results

4.1 Summary

Seven vegetation communities were identified within the survey area, Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*, *Eucalyptus clelandii* woodland over *Maireana sedifolia*, *Eucalyptus salubris* woodland over mixed shrubs, *Casuarina pauper* woodland over *Acacia colletioides, Eucalyptus salmonophloia* woodland over *Eremophila alternifolia*, *Eucalyptus clelandii* woodland over *Triodia scariosa* and *Eucalyptus ravida* thicket. These vegetation communities were represented by a total of 23 Families, 43 Genera and 83 Species (including subspecies and variants (Appendix 3)).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010), were found in the area surveyed. No Priority Flora species as listed by the DEC (2011a) were identified within the survey area.

No Threatened Ecological Communities (TEC) as defined by the *EPBC Act 1999* or listed by the DEC were recorded within the survey area (DEC, 2011b; DSEWPaC, 2011). There are no Priority Ecological Communities (PEC) as listed by the DEC recorded within the survey area (DEC, 2011b). The survey area is located approximately 17km south-east of the Clear-Muddy Lake Nature Reserve and Rowles Lagoon Conservation Park which are managed by the DEC as a Class C conservation reserve and conservation park respectively both of which are vested by the Conservation Commission (Appendix 1). The Rowles Lagoon Conservation Park covers an area of 400ha and is surrounded by the Clear-Muddy Lake Nature Reserve which covers an area of 2,000ha (CALM, 2000).

Based on the Keighery vegetation health rating scale (1994), the seven vegetation communities within the area surveyed were classed as being in 'very good' health (i.e. vegetation structure altered, obvious signs of disturbance, in this instance as a result of the establishment gridlines). Four weed species, *Centaurea melitensis, Dittrichia graveolens, Salvia verbenaca and Lysimachia arvensis*, were identified within the survey area. According to the Department of Agriculture and Food of Western Australia these species are not listed as Declared Plants.

4.2 Desktop Assessment

The results of the combined search of the Department of Environment and Conservation's (DEC) Declared Rare and Priority Flora databases (DEC, 2011a) revealed many Priority Flora species near the area and one Declared Rare Flora (Appendix 1). The closest recorded DEC flora is just over 10km from the survey area. Table 5 lists the priority flora present within a 30km radius of the Bullant survey area, which have the potential to occur in the area, based on similar habitat requirements. No Priority Flora were identified within the survey area.

Table 5: **Priority Flora with the potential to occur within the survey area (WAHERB, 2011)**

Species	Cons Code	Description (WAHERB, 2011)
Angianthus prostratus	P3	Prostrate annual, herb. Fl. white, yellow, red clay or loamy soils. Saline depressions.
Elachanthus pusillus	P2	Ascending or decumbent annual, herb, to 0.15 m high. Fl. yellow, green
Eremophila praecox	P1	Broom-like shrub, 1.5–3 m high. Fl. purple, red/brown sandy loam. Undulating plains.
Gnephosis intonsa	P1	Prostrate to ascending annual, herb, 0.01–0.04 m high. Fl. yellow, brown, red/brown clay, stony saline loam.
Gnephosis sp. Norseman (K.R. Newbey 8096)	P3	Low spreading annual, herb, 0.03–0.07 m high, 0.08-0.18 m wide. Sub saline loam. Moderately exposed flat.
Ptilotus procumbens	P1	Spreading procumbent annual, herb, ca 0.1 m high. Fl. pink, white, red clay
Ptilotus rigidus	P1	No description available
Xanthoparmelia dayiana	P3	No Description available.

4.3 Conservation Significant Flora Species

No DRF species or Priority Flora species were identified during the survey.

4.4 Vegetation Communities

Seven broad vegetation communities were identified within the survey area;

1. Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*;
2. *Eucalyptus clelandii* woodland over *Maireana sedifolia*;
3. *Eucalyptus salubris* woodland over mixed shrubs;
4. *Casuarina pauper* woodland over *Acacia colletioides;*
5. *Eucalyptus salmonophloia* woodland over *Eremophila alternifolia*;
6. *Eucalyptus clelandii* woodland over *Triodia scariosa;* and
7. *Eucalyptus ravida* thicket.

These communities were represented by a total of 23 Families, 43 Genera and 83 Species (including subspecies and variants) (Appendix 3). A map showing the vegetation communities present in the survey area is provided in Appendix 2.

Table 6: Summary of vegetation communities and their areas

vegetation community	Area (ha)
Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*	680
Eucalyptus clelandii woodland over *Maireana sedifolia*	75
Eucalyptus clelandii woodland over *Triodia scariosa*	25
Eucalyptus ravida thicket	80
Eucalyptus salmonophloia woodland over *Eremophila alternifolia*	25
Casuarina pauper woodland over *Acacia colletioides*	55
Eucalyptus salubris woodland over mixed shrubs	110
Disturbed area / Mining Operations	150
Total	**1200**

4.5 Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*

4.5.1 Flora

Flora recorded in the Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri* vegetation community were represented by 14 Families, 21 Genera and 37 Species.

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010) were identified within the survey area. No Priority Flora species were identified within this vegetation community. No weed species were identified within this vegetation community.

4.5.2 Vegetation

The flora recorded in this vegetation community was representative of Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*. The species in the upper storey included *Eucalyptus salmonophloia, Eucalyptus clelandii, Eucalyptus griffithsii, Eucalyptus salubris, Casuarina pauper* and *Eucalyptus ravida.* The mid-storey species included *Eremophila interstans* subsp. *interstans, Atriplex nummularia, Exocarpos aphyllus, Acacia* sp. narrow phyllode*, Santalum acuminatum* and *Santalum spicatum*. The understorey species included *Senna artemisioides* subsp. *filifolia, Eremophila scoparia, Olearia muelleri, Templetonia incrassata, Acacia tetragonophylla* and *Maireana pentatropis.* Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 7. The Muir Life Form and Height Class sheet is located in Appendix 5.

Table 7: Vegetation assemblage for Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri* within the survey area (Muir, 1977)

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	10-30% 10-30% 2-10% 10-30%	*Eucalyptus salmonophloia* *Eucalyptus clelandii* *Eucalyptus ravida* *Eucalyptus salubris*
Mallee Tree Form	10-30%	*Eucalyptus griffithsii*
Shrub 1-1.5m	10-30%	*Eremophila interstans* subsp. *interstans*
Shrub 0.5-1m	10-30%	*Senna artemisioides* subsp. *filifolia*
Shrub 0-0.5m	30-70%	*Eremophila scoparia* *Olearia muelleri*

No broad scale clearing for agricultural purposes has occurred in this vegetation community. According to Australian Natural Resources Atlas (ANRA) this vegetation community is best represented by the *Eucalyptus* open woodlands vegetation community, which covers 1.3% of Western Australia (ANRA, 2011).



Plate 1: Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*

4.6 *Eucalyptus clelandii* woodland over *Maireana sedifolia*

4.6.1 Flora

Flora recorded in the *Eucalyptus clelandii* woodland over *Maireana sedifolia* vegetation community were represented by 10 Families, 13 Genera and 23 Species.

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010) were identified within the survey area. No Priority Flora species were identified within this vegetation community. Two weed species, *Centaurea melitensis* and *Salvia verbenaca* were found in this vegetation community. Neither of these species are listed by the DAFWA as Declared Plants (DAFWA, 2011).

4.6.2 Vegetation

The flora recorded in this vegetation community was representative of *Eucalyptus clelandii* woodland over *Maireana sedifolia*. The species in the upper storey included *Eucalyptus clelandii, Eucalyptus transcontinentalis, Eucalyptus salmonophloia, Eucalyptus salubris and Eucalyptus yilgarnensis.* The mid-storey comprised of *Maireana sedifolia, Eremophila alternifolia, Maireana pyramidata, Eremophila decipiens, Acacia tetragonophylla and Exocarpos aphyllus.* The understorey species included *Sclerolaena drummondii, Maireana triptera, Ptilotus obovatus, Erodium cygnorum, Olearia muelleri and Atriplex vesicaria.* Dominant species from the vegetation assemblage, according to Muir (1977), are shown in Table 8.

Table 8: Vegetation assemblage for *Eucalyptus clelandii* woodland over *Maireana sedifolia* within the survey area (Muir, 1977).

Life Form/Height Class	Canopy Cover	Dominant species present
Trees 5 - 15m	10-30% 2-10%	*Eucalyptus clelandii* *Eucalyptus transcontinentalis*
Shrub 1.5-2m Shrub 1.5-2m	10-30% 10-30%	*Eremophila alternifolia* *Maireana sedifolia*

No broad scale clearing has occurred for agricultural purposes in this vegetation community within the survey area. This vegetation community is best represented by the *Eucalyptus* open woodlands vegetation community according to Australian Natural Resources Atlas (ANRA), which covers 1.3% of the State of Western Australia (ANRA, 2011).



Plate 2: *Eucalyptus clelandii* woodland over *Maireana sedifolia*

4.7 *Eucalyptus clelandii* woodland over *Triodia scariosa*

4.7.1 Flora

Flora recorded in the *Eucalyptus clelandii* woodland over *Triodia scariosa* vegetation community was represented by 8 Families, 9 Genera and 14 Species (Appendix 3).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010) were identified within the survey area. No Priority Flora species were identified within this vegetation community. No weed species were identified within this vegetation community.

4.7.2 Vegetation

The flora recorded in this vegetation community was representative of *Eucalyptus clelandii* woodland over *Triodia scariosa*. The species in the upper storey included *Eucalyptus clelandii, Eucalyptus oleosa and Eucalyptus transcontinentalis.* The mid-storey species included *Acacia* sp. narrow phyllode, *Eremophila oldfieldii*, *Dodonaea lobulata*, *Acacia colletioides*, *Grevillea nematophylla* and *Alectryon oleifolius*. The understorey species included *Triodia scariosa, Scaevola spinescens and Olearia.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 9.

Table 9: Vegetation assemblage for *Eucalyptus clelandii* woodland over *Triodia scariosa* within the survey area (Muir, 1977).

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	10-30%	*Eucalyptus clelandii* *Eucalyptus oleosa*
Shrubs 1.5 - 2m	30-70%	*Acacia* sp. narrow phyllode
Shrubs 1-1.5m	10-30%	*Scaevola spinescens*
Hummock Grass	30-70%	*Triodia scariosa*

No broad scale clearing has occurred for agricultural purposes in this vegetation community within the survey area. This vegetation community is best represented by the *Eucalyptus* open woodlands vegetation community according to Australian Natural Resources Atlas (ANRA), which covers 1.3% of the State of Western Australia (ANRA, 2011).



Plate 3: *Eucalyptus clelandii* woodland over *Triodia scariosa*

4.8 *Eucalyptus ravida* thicket

4.8.1 Flora

Flora recorded in the *Eucalyptus ravida* thicket vegetation community were represented by 9 Families, 13 Genera and 20 Species.

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010) were identified within the survey area. No Priority Flora species were identified within this vegetation community. No weed species were identified within this vegetation community.

4.8.2 Vegetation

The flora recorded in this vegetation community was representative of *Eucalyptus ravida* thicket. This vegetation community had an upper storey comprised of *Eucalyptus clelandii and Eucalyptus ravida.* The mid-storey species included *Eremophila scoparia, Maireana sedifolia, Atriplex vesicaria, Santalum acuminatum, Exocarpos aphyllus and Eremophila ionantha*. The understorey species included *Olearia muelleri, Maireana trichoptera, Ptilotus exaltatus, Zygophyllum eremaeum, Dysphania melanocarpa and Euphorbia drummondii.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 10.

Table 10: **Vegetation assemblage for *Eucalyptus ravida* thicket within the survey area (Muir, 1977).**

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 4 - 5m	30-70% 10-30%	*Eucalyptus ravida* *Eucalyptus clelandii*
Shrub 1.5 - 2m	10-30%	*Eremophila scoparia*
Shrubs 0 -0.5m	10-30%	*Olearia muelleri*

No broad scale clearing has occurred for agricultural purposes in this vegetation community within the survey area. This vegetation community is best represented by the *Eucalyptus* woodlands vegetation community according to Australian Natural Resources Atlas (ANRA), which covers 3.5% of the State of Western Australia (ANRA, 2011).



Plate 4: *Eucalyptus ravida* thicket

4.9 *Eucalyptus salmonophloia* woodland over *Eremophila alternifolia.*

4.9.1 Flora

Flora recorded in the *Eucalyptus salmonophloia* woodland over *Eremophila alternifolia* vegetation community was represented by 14 Families 19 Genera and 26 Species (Appendix 3).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010) were identified within the survey area. No Priority Flora species were identified within this vegetation community. One weed species, *Lysimachia arvensis*, was recorded in this vegetation community. According to the DAFWA this species is not listed as a Declared Plant (DAFWA, 2011).

4.9.2 Vegetation

The flora recorded in this vegetation community was representative of *Eucalyptus salmonophloia* woodland over *Eremophila alternifolia*. This vegetation community had an upper storey comprised of *Eucalyptus salmonophloia, Eucalyptus yilgarnensis, Eucalyptus clelandii, Casuarina pauper and Eremophila longifolia.* The mid-storey species included *Eremophila alternifolia, Acacia tetragonophylla, Exocarpos aphyllus, Pimelea microcephala and Eremophila decipiens.* The understorey species included *Grevillea acuaria, Rhodanthe charsleyae, Scaevola spinescens, Rhagodia eremaea, Ptilotus obovatus and Senna artemisioides* subsp. *filifolia.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 11.

Table 11: Vegetation assemblage for *Eucalyptus salmonophloia* woodland over *Eremophila alternifolia* within the survey area (Muir, 1977).

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 8m	70-90%	*Eucalyptus salmonophloia*
Mallee Tree Form	10-30%	*Eucalyptus yilgarnensis*
Shrub >2m	30-70%	*Eremophila alternifolia*
Shrub 0.5 - 1m	30-70%	*Grevillea acuaria*

No broad scale clearing has occurred for agricultural purposes in this vegetation community within the survey area. This vegetation community is best represented by the *Eucalyptus* woodlands vegetation community according to Australian Natural Resources Atlas (ANRA), which covers 3.5% of the State of Western Australia (ANRA, 2011).



Plate 5: *Eucalyptus salmonophloia* woodland over *Eremophila alternifolia*

4.10 *Casuarina pauper* woodland over *Acacia colletioides.*

4.10.1 Flora

Flora recorded in the *Casuarina pauper* woodland over *Acacia colletioides* vegetation community was represented by 12 Families 13 Genera and 20 Species (Appendix 3).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010) were identified within the survey area. No Priority Flora

species were identified within this vegetation community. No weed species were identified within this vegetation community.

4.10.2 Vegetation

The flora recorded in this vegetation community was representative of *Casuarina pauper* woodland over *Acacia colletioides.* The upper storey included *Casuarina pauper, Eucalyptus salmonophloia, Eucalyptus salubris and Acacia* sp. narrow phyllode*.* The mid-storey species included *Eremophila georgei, Acacia colletioides, Maireana sedifolia, Scaevola spinescens, Dodonaea lobulata and Atriplex bunburyana.* The understorey species included *Maireana triptera, Ptilotus obovatus*, *Erodium cygnorum* and *Frankenia setosa.* Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 12.

Table 12: **Vegetation assemblage for *Casuarina pauper* woodland over *Acacia colletioides* within the survey area (Muir, 1977).**

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	10-30% 2-10% 2-10%	*Casuarina pauper* *Eucalyptus salmonophloia* *Eucalyptus salubris*
Shrub 1 – 1.5m	30-70%	*Eremophila georgei* *Acacia colletioides*
Shrub 0-0.5m	10-30%	*Maireana triptera* *Ptilotus obovatus*

No broad scale clearing has occurred for agricultural purposes in this vegetation community within the survey area. This vegetation community is best represented by the *Casuarina* forest and woodlands vegetation community according to Australian Natural Resources Atlas (ANRA), which covers 0.1% of the State of Western Australia (ANRA, 2011).



Plate 6: *Casuarina pauper* woodland *over Acacia colletioides*

4.11 *Eucalyptus salubris* woodland over mixed shrubs

4.11.1 Flora

Flora recorded in the *Eucalyptus salubris* woodland over mixed shrubs vegetation community was represented by 16 Families 29 Genera and 45 Species (Appendix 3).

No DRF species, pursuant to subsection (2) of section 23F of the *Wildlife Conservation Act (1950)* and as listed by the DEC (Atkins, 2010) were identified within the survey area. No Priority Flora species were identified within this vegetation community. Three weed species, *Dittrichia graveolens, Salvia verbenaca* and *Lysimachia arvensis,* were recorded in this vegetation community. According to the DAFWA none of these species are listed as a Declared Plant (DAFWA, 2011).

4.11.2 Vegetation

The flora recorded in this vegetation community was representative of *Eucalyptus salubris* woodland over mixed shrubs. The upper storey included *Eucalyptus salubris, Eucalyptus clelandii, Eucalyptus celastroides, Casuarina pauper, Eremophila longifolia and Pittosporum angustifolium.* The mid-storey species included *Maireana sedifolia, Maireana pyramidata, Atriplex nummularia, Tecticornia disarticulata, Eremophila scoparia and Atriplex bunburyana.* The understorey species included *Maireana trichoptera, Atriplex codonocarpa, Sclerolaena obliquicuspis, Ptilotus exaltatus,*

Dysphania melanocarpa and Brachyscome ciliaris. Dominant species from the vegetation assemblage according to Muir (1977) is shown in Table 12.

Table 13: **Vegetation assemblage for *Eucalyptus salubris* woodland over mixed shrubs within the survey area (Muir, 1977).**

Life Form/Height Class	Canopy Cover	Dominant species present
Tree 5-15m	10-30%	*Eucalyptus salubris*
Shrub 1 – 1.5m	10-30%	*Maireana sedifolia* *Maireana pyramidata* *Atriplex nummularia*
Shrub 0.5 - 1m	10-30%	*Maireana trichoptera*

No broad scale clearing has occurred for agricultural purposes in this vegetation community within the survey area. This vegetation community is best represented by the *Eucalyptus* open woodlands vegetation community according to Australian Natural Resources Atlas (ANRA), which covers 1.3% of the State of Western Australia (ANRA, 2011).



Plate 7: *Eucalyptus salubris* woodland over mixed shrubs

4.12 Vegetation of Conservation Significance

None of the seven vegetation communities have national environmental significance as defined by the Commonwealth *EPBC Act 1999*. There were no DRF, Priority Flora Species, TEC listed under Commonwealth legislation or PEC as defined by the DEC found within the survey area (DEC, 2011a; DEC, 2011b).

4.13 Vegetation condition

All seven vegetation communities identified in the survey were classed as in 'very good' health according to the Keighery health rating scale (1994), (Appendix 6). A very good health condition is defined as "altered due to obvious signs of disturbance". Disturbance in the case was in the form of historic drill lines and tracks.

5 Introduced Plant Species

Four weed species, *Centaurea melitensis, Dittrichia graveolens, Salvia verbenaca and Lysimachia arvensis,* were identified within the Bullant survey area. Three of the seven vegetation communities recorded weed species. The *Eucalyptus clelandii* woodland over *Maireana sedifolia* vegetation community contained *Centaurea melitensis* and *Salvia verbenaca*. The *Eucalyptus salmonophloia* woodland over *Eremophila alternifolia* only had *Lysimachia arvensis* present. Recorded in the *Eucalyptus salubris* woodland over mixed shrubs community were the *Dittrichia graveolens, Salvia verbenaca and Lysimachia arvensis*. None of these four weed species are classified as Declared Plants by the (2011).

- ***Salvia verbenaca* (Wild Sage)**

The weed species *Salvia verbenaca* is a slightly aromatic perennial herb that can grow to heights of between 0.1-1m. It flowers from April to October and comes in blue, pink and purple varieties. Its preferred habitats include amongst low trees, grassland, in gravely soil, sand, loam, clay, occupying roadsides, railways, townsites, homesteads and growing in disturbed natural vegetation (WAHERB, 2011).



Plate 8: *Salvia verbenaca* (Wild sage)

- ***Dittrichia graveolens* (Stinkwort)**

This species is described as an erect, bushy, viscid, aromatic annual, herb, which grows between 0.1–0.5 metres high. It produces yellow or white flowers from January to November. It occurs on a variety of soils and is a weed of waste grounds, along rivers and roadsides (WAHERB, 2011).



Plate 9: *Dittrichia graveolens* (Stinkwort)

- ***Centaurea melitensis* (Maltese Cockspur)**

The weed species *Centaurea melitensis* is an erect annual or biennial herb that can grow to heights of 0.2-1m. It has yellow flowers from September to March and prefers roadsides, cultivated areas and other disturbed areas as a habitat (WAHERB, 2011).

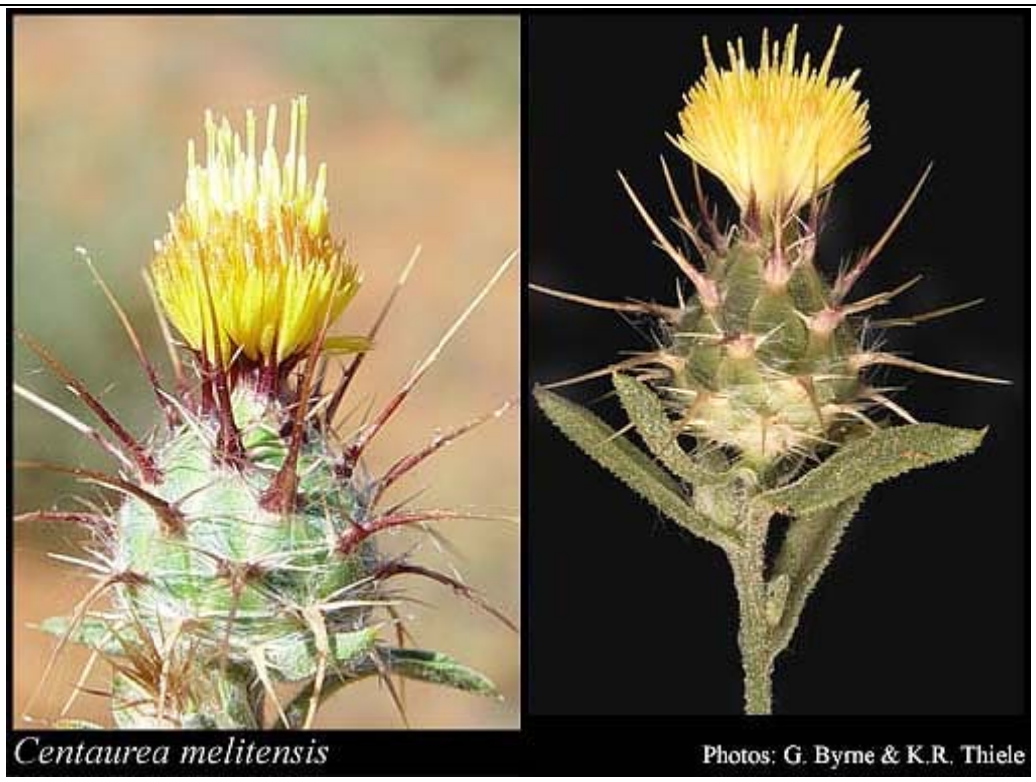


Plate 10: *Centaurea melitensis* (Maltese Cockspur)

- ***Lysimachia arvensis* (Pimpernel)**

A hairless spreading annual, with more or less square stems and opposite ovate stalkless leaves. A weed of horticulture, disturbed bushland and a native of Europe.



Plate 11*: Lysimachia arvensis* (Pimpernel)

6 Relevant Legislation and Compliance with Recognised Standards

6.1 Commonwealth Legislation

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*

The aim of this Act is to protect matters of national environmental significance, and is used by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) to list threatened species and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance.

The survey area has no national environmental significance as defined by the Act. It does not contain any DRF or TEC's.

6.2 State Legislation

Clearing of Native Vegetation

The *Environmental Protection (Clearing of Native Vegetation) Regulations WA* 2004 dictate that any clearing of native vegetation in Western Australia requires a permit from the Department of Environment and Conservation. Native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent (*Environmental Protection Act WA-Section 51A, 1986*). The *Environmental Protection Act WA 1986* Section 51A, defines clearing as: "the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above"

Under the *Environmental Protection (Clearing of Native Vegetation) Regulations WA 2004* - Regulation 6 – Environmentally sensitive areas (ESA) are "the area covered by vegetation within 50 m of Rare Flora, to the extent to which the vegetation is continuous with the vegetation in which the Rare Flora is located". Ministerial approval must be granted prior to any clearing of Declared Rare Flora, including a minimum of 50 m surrounding all populations of Rare Flora. (The area covered by a threatened ecological community is also considered an environmentally sensitive area and therefore non-permitted, unless Ministerial approval is granted.

Exploration Activities are exempt from requiring clearing permits when undertaken via a Mining Act approval process such as "Programme of Work" provided the area does not occur in an ESA.

The survey area is not in an ESA. The nearest ESA is located approximately 14.5km north west of the survey area which encompasses the Clear and Muddy Lakes Nature Reserve which is managed by the DEC as a Class C conservation reserve. Given the distance to this reserve and the localised nature of disturbance within the survey area development of a crusher, CIL and TSF in the Bullant area is not likely to impact on the ESA.

Environmental Protection Act WA 1986

This Act pertains to the assessment of applications for clearing permits and aims to protect Declared Rare Flora and Threatened Ecological Communities from clearing. Threatened Ecological Communities are protected even where exemptions for a clearing permit may apply. The act enforces both financial and/or imprisonment penalties on those who unlawfully damage a Threatened Ecological Community. The survey area contains no TEC's as listed by the *EPBC Act 1999* (DSEWPaC, 2011) and the DEC (2011b). It also does not contain any Declared Rare Flora (DEC, 2011a).

Wildlife Conservation Act WA 1950

This Act is used by the Western Australian DEC to list flora taxa as being protected and the level of protection needed for such flora. Flora species are classified as 'Declared Rare Flora' when their populations are geographically restricted or are threatened by local processes. Under this Act all native flora (spermatophytes, pteridophytes, bryophytes and thallophytes) are protected throughout the State. Financial penalties are enforced under this Act if threatened plant species are collected without an appropriate licence.

DEC Priority lists

The DEC lists 'Priority' flora species which are under consideration for declaration as Rare Flora. Species classed as Priority 1-3 are in urgent need of further survey, whereas Priority 4 species are considered to have been adequately surveyed but may become vulnerable or rare in future years. Priority 4 species are also species that have been removed from the threatened species list in the past 5 years. Priority 5 species are taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years. The DEC also lists Priority Ecological Communities, which identifies those communities that may need monitoring before possible nomination for TEC status. These priority species and communities have no formal legal protection until they are endorsed by the Minister as being Declared Rare Flora and TEC's respectively.

Results of the DEC data bases search revealed eight Priority Flora species which have the potential to occur within the survey boundaries (Table 5). None of the eight potential priority species were identified within the survey area. The survey contained no TECs or DRF.

6.3 EPA Position Statements

The EPA develops Position Statements to inform the public about environmental issues facing Western Australia, and the plans for the future to ensure protection and ecological sustainability of environmentally important ecosystems. It provides a set of principles to assist the public and decision-makers on their responsibilities for managing land with care. These principles also provide the basis for the Environmental Protection Authority to evaluate and report upon achieving environmental and ecological sustainability, and the protection of natural resources.

Position Statement No. 2 *Environmental Protection of Native Vegetation in Western Australia* (EPA 2000) outlines EPA policy on the protection of native vegetation in Western Australia, particularly in the agricultural area. It identifies basic elements that the EPA should consider when assessing proposals that impact on biological diversity. These include the following: comparison of all proposal options; avoidance of species and community extinctions; an expectation that implementing the proposal will not take a vegetation type below the "threshold level" of 30%; and that proponents should demonstrate that on- and off-site impacts can be managed.

The survey area does not contain any DRF or TECs suggesting that clearing within the survey area will meet the EPA standards outlined in Position statement no. 2.

Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* outlines that the EPA has adopted the definition of Biological Diversity and the Principles as defined in the *National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia 1996); that the quality of information and scope of field surveys should meet standards, requirements and protocols as determined and published by the EPA; and the Interim Biogeographic Regionalisation of Australia (IBRA) should be used as the largest unit for EIA decision-making in relation to the conservation of biodiversity. The IBRA has identified 26 bioregions in the State which are affected by a range of different threatening processes and have varying levels of sensitivity to impact. Terrestrial biological surveys should provide sufficient information to address both biodiversity conservation and ecological function values within the context of proposals and the results of surveys should be publicly available.

The flora survey of the study area was planned and implemented as far as practicable according to the Environmental Protection Authority (EPA) Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004). Also as suggested in the above Position Statement, the Interim Biogeographic Regionalisation of Australia was used in preparing the report to identify the Conservation status of the area and identify the main threats to the biodiversity of plant species in the region.

7 Conclusions and Recommendations

7.1 Conclusions

The Bullant survey area (1200 ha) contained seven vegetation communities; Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*, *Eucalyptus clelandii* woodland over *Maireana sedifolia*, *Eucalyptus salubris* woodland over mixed shrubs, *Casuarina pauper* woodland over *Acacia colletioides, Eucalyptus salmonophloia* woodland over *Eremophila alternifolia*, *Eucalyptus clelandii* woodland over *Triodia scariosa* and *Eucalyptus ravida* thicket. These vegetation communities were represented by a total of 23 Families, 43 Genera and 83 Species (including subspecies and variants).

No DRF pursuant to Subsection 2 of Section 23F of the *Wildlife Conservation Act (1950)*, and listed by the DEC were identified during the survey. There were no Priority Flora Species identified in the Bullant survey area. Four weed species, *Centaurea melitensis, Dittrichia graveolens, Salvia verbenaca and Lysimachia arvensis,* were identified within the Bullant survey area. None of these four weed species are classified as a Declared Plant by the DAFWA.

The Bullant survey area does not have national environmental significance as defined by the Commonwealth *EPBC Act 1999.* No TEC listed under the *EPBC Act 1999* are known to occur in the survey area. No PEC as listed by the DEC are known to occur within the survey area.

The survey area is not in an ESA. The nearest ESA is located approximately 14.5km north west of the survey area and occurs near the Clear and Muddy Lakes Nature Reserve and Rowles Lagoon Conservation Park which are managed by the DEC as a Class C conservation reserve/conservation park. Given the distance to this reserve and the localised nature of disturbance within the survey area development of a crusher, CIL and TSF within the Bullant area is not likely to impact on the ESA.

All of the seven vegetation communities identified in the survey were classed as in ‘very good’ health according to the Keighery health rating scale (Keighery, 1994). A very good health condition is defined as “altered due to obvious signs of disturbance”. Disturbance in this case was in the form of historic drill lines and tracks.

7.2 Recommendations

- If the required clearing of vegetation in the survey area is to exceed 50 hectares then further survey work may be required. Consultation with the DMP is recommended prior to any clearing of vegetation
- Weed management plan be developed as declared weeds have been recorded in a prior survey

For the purpose of this vegetation survey, BC submits the following comments for the clearing principals listed below:

a. **Native vegetation should not be cleared if it comprises a high level of biological diversity.**
This survey revealed diverse flora that are not restricted to the survey area but occur across the same and other regions.

b. **Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.**
No DRF species were recorded within the survey area.

c. **Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community (TEC).**
No TEC listed under the Commonwealth *EPBC Act 1999* (DSEWPC, 2011) or by the DEC (2011b) occur within the survey area.

d. **Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.**
No vegetation is considered as a significant remnant of extensively cleared vegetation was recorded in the survey area. According to DAFWA (2007) the survey area occurs in the pre-European Beard vegetation association Kununulling 468 which has 100% remaining vegetation.

e. **Native vegetation should not be cleared if it is growing, in, or in association with, an environment associated with a watercourse or wetland**
No vegetation identified within the survey area is growing in, or in association with a watercourse or wetland.

f. **Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.**
The survey area is not located within a conservation area. The nearest Conservation areas are located approximately 17km north-west of the survey area, and are known as the Clear and Muddy Lakes Nature Reserve and Rowles Lagoon Conservation Park which are managed by the DEC as a Class C conservation reserve and conservation park respectively. Given the distance to these reserves and the localised nature of disturbance within the survey area development of a crusher, CIL and TSF within the Bullant area is not likely to impact on the conservation values of these reserves.

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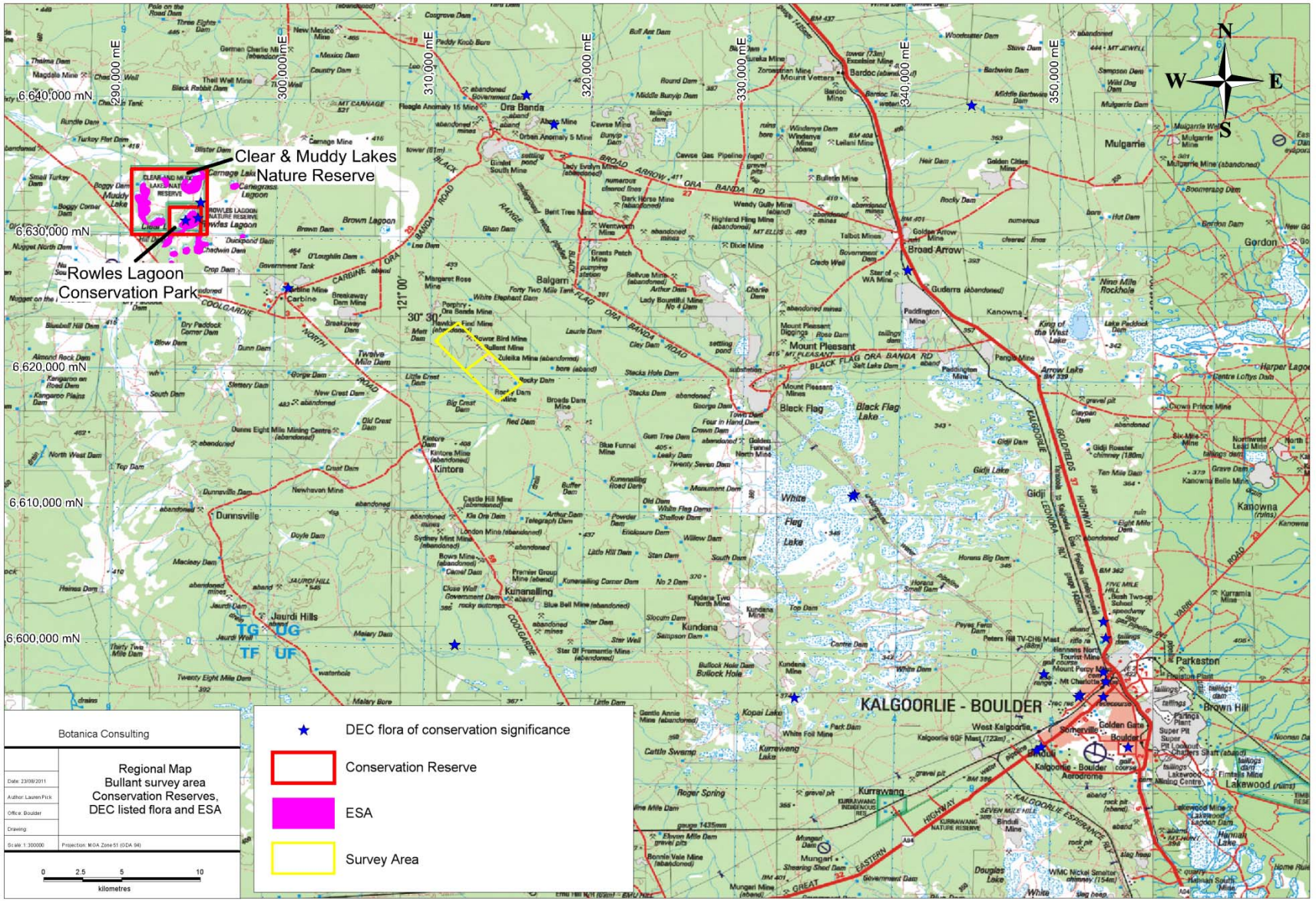
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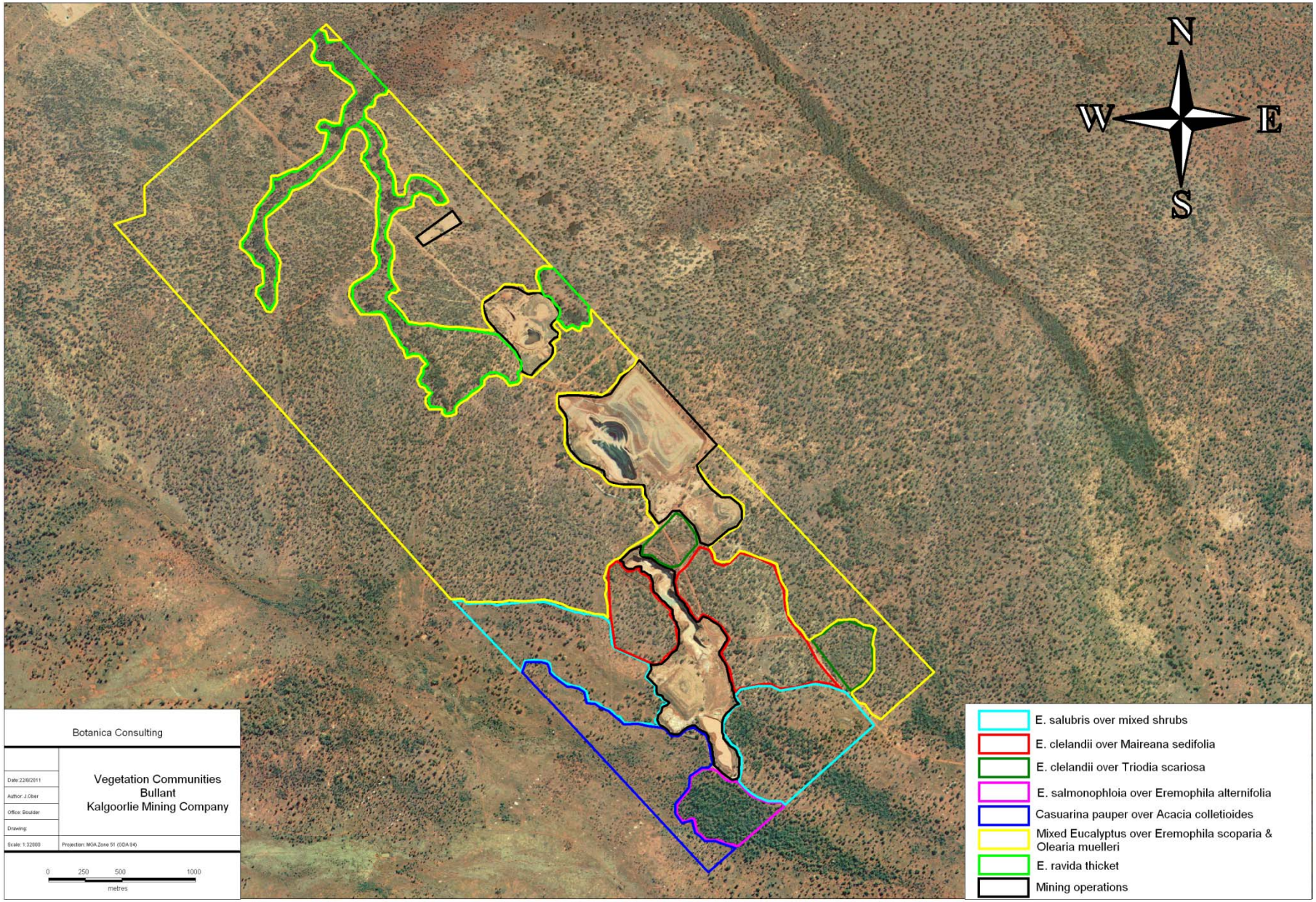
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Appendix 1: Regional map of the survey area including DEC Flora of Conservation Significance, ESA and Conservation Reserves (survey area not to scale).



Appendix 2: Vegetation map of the Bullant Survey Area



Appendix 3: List of species identified within each vegetation community

Family	Genus	Species	Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*	*E. clelandii* woodland over *Maireana sedifolia*	*E. clelandii* woodland over *Triodia scariosa*	*E. ravida* thicket	*E. salmonophloia* woodland over *Eremophila alternifolia*	*Casuarina pauper* woodland over *Acacia colletioides*	*E. salubris* woodland over mixed shrubs
Amaranthaceae	*Ptilotus*	*aervoides*							*
Amaranthaceae	*Ptilotus*	*exaltatus*	*			*			*
Amaranthaceae	*Ptilotus*	*obovatus*		*			*	*	*
Apocynaceae	*Marsdenia*	*australis*					*		
Asteraceae	*Brachyscome*	*ciliaris*							*
Asteraceae	*Centaurea*	*melitensis (W)*		*					
Asteraceae	*Cratystylis*	*conocephala*	*						
Asteraceae	*Cratystylis*	*subspinescens*					*		*
Asteraceae	*Dittrichia*	*graveolens (W)*							*
Asteraceae	*Olearia*	*muelleri*	*	*	*	*	*		
Asteraceae	*Rhodanthe*	*charsleyae*					*		*
Casuarinaceae	*Casuarina*	*pauper*	*				*	*	*
Chenopodiaceae	*Atriplex*	*bunburyana*		*				*	*
Chenopodiaceae	*Atriplex*	*codonocarpa*							*
Chenopodiaceae	*Atriplex*	*nummularia*	*			*			*
Chenopodiaceae	*Atriplex*	*vesicaria*	*	*		*			
Chenopodiaceae	*Dysphania*	*kalpari*							*
Chenopodiaceae	*Dysphania*	*melanocarpa*				*			*
Chenopodiaceae	*Enchylaena*	*tomentosa*							*
Chenopodiaceae	*Eriochiton*	*sclerolaenoides*							*
Chenopodiaceae	*Maireana*	*georgei*						*	*
Chenopodiaceae	*Maireana*	*pentatropis*	*						
Chenopodiaceae	*Maireana*	*pyramidata*	*	*		*	*		*
Chenopodiaceae	*Maireana*	*sedifolia*		*		*	*	*	*
Chenopodiaceae	*Maireana*	*tomentosa*		*					*
Chenopodiaceae	*Maireana*	*trichoptera*	*			*	*		*
Chenopodiaceae	*Maireana*	*triptera*		*		*	*	*	

Family	Genus	Species	Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*	*E. clelandii* woodland over *Maireana sedifolia*	*E. clelandii* woodland over *Triodia scariosa*	*E. ravida* thicket	*E. salmonophloia* woodland over *Eremophila alternifolia*	*Casuarina pauper* woodland over *Acacia colletioides*	*E. salubris* woodland over mixed shrubs
Chenopodiaceae	*Rhagodia*	*eremaea*					*		*
Chenopodiaceae	*Tecticornia*	*disarticulata*	*						*
Chenopodiaceae	*Sclerolaena*	*cuneata*				*			
Chenopodiaceae	*Sclerolaena*	*diacantha*							*
Chenopodiaceae	*Sclerolaena*	*drummondii*	*	*					
Chenopodiaceae	*Sclerolaena*	*obliquicuspis*							*
Cucurbitaceae	*Cucumis*	*myriocarpus*							*
Euphorbiaceae	*Euphorbia*	*drummondii*				*			
Fabaceae	*Acacia*	*colletioides*			*			*	
Fabaceae	*Acacia*	sp. narrow phyllode	*		*			*	
Fabaceae	*Acacia*	*tetragonophylla*	*	*			*	*	*
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*	*				*		*
Fabaceae	*Swainsona*	*canescens*							*
Fabaceae	*Templetonia*	*incrassata*	*						
Frankeniaceae	*Frankenia*	*setosa*						*	
Geraniaceae	*Erodium*	*cygnorum*		*				*	*
Goodeniaceae	*Scaevola*	*spinescens*	*		*		*	*	
Lamiaceae	*Salvia*	*verbenaca (W)*		*					*
Myrtaceae	*Eucalyptus*	*celastroides*							*
Myrtaceae	*Eucalyptus*	*clelandii*	*	*	*	*	*		*
Myrtaceae	*Eucalyptus*	*griffithsii*	*			*			
Myrtaceae	*Eucalyptus*	*salmonophloia*	*	*			*	*	*
Myrtaceae	*Eucalyptus*	*salubris*	*	*				*	*
Myrtaceae	*Eucalyptus*	*transcontinentalis*		*	*				
Myrtaceae	*Eucalyptus*	*yilgarnensis*		*			*		
Myrtaceae	*Eucalyptus*	*oleosa*	*		*				
Myrtaceae	*Eucalyptus*	*celastroides*	*						
Myrtaceae	*Eucalyptus*	*ravida*	*			*			
Pittosporaceae	*Pittosporum*	*angustifolium*							*

Family	Genus	Species	Mixed *Eucalyptus* woodland over *Eremophila scoparia* and *Olearia muelleri*	*E. clelandii* woodland over *Maireana sedifolia*	*E. clelandii* woodland over *Triodia scariosa*	*E. ravida* thicket	*E. salmonophloia* woodland over *Eremophila alternifolia*	*Casuarina pauper* woodland over *Acacia colletioides*	*E. salubris* woodland over mixed shrubs
Poaceae	*Triodia*	*scariosa*	*	*	*				
Poaceae	*Austrostipa*	*nitida*				*			*
Primulaceae	*Lysimachia*	*arvensis (W)*					*		*
Proteaceae	*Grevillea*	*acuaria*	*				*		
Proteaceae	*Grevillea*	*nematophylla*			*				
Santalaceae	*Exocarpos*	*aphyllus*	*	*		*	*		*
Santalaceae	*Santalum*	*acuminatum*	*			*			
Santalaceae	*Santalum*	*spicatum*	*						
Sapindaceae	*Alectryon*	*oleifolius*			*				
Sapindaceae	*Dodonaea*	*lobulata*	*		*			*	
Scrophulariaceae	*Eremophila*	*alternifolia*		*			*	*	*
Scrophulariaceae	*Eremophila*	*decipiens*		*			*	*	
Scrophulariaceae	*Eremophila*	*georgei*						*	
Scrophulariaceae	*Eremophila*	*glabra*	*						
Scrophulariaceae	*Eremophila*	*interstans* subsp. *interstans*	*						
Scrophulariaceae	*Eremophila*	*ionantha*			*	*			*
Scrophulariaceae	*Eremophila*	*longifolia*					*		*
Scrophulariaceae	*Eremophila*	*oldfieldii*	*		*				
Scrophulariaceae	*Eremophila*	*parvifolia*	*						
Scrophulariaceae	*Eremophila*	*pustulata*	*						
Scrophulariaceae	*Eremophila*	*scoparia*	*	*		*			*
Solanaceae	*Solanum*	*hoplopetalum*							*
Solanaceae	*Solanum*	*lasiophyllum*					*		
Solanaceae	*Lycium*	*australe*	*				*	*	*
Thymelaeaceae	*Pimelea*	*microcephala*					*		
Zygophyllaceae	*Zygophyllum*	*eremaeum*	*			*			*

Appendix 4: DEC Threatened Flora Database search results within 30km of Survey Area (DEC, 2010a)

Species	Cons Code
Acacia epedunculata	P1
Alyxia tetanifolia	P3
Angianthus prostratus	P3
Astartea sp. Bungalbin Hill (KR Newbey 8989)	P3
Atriplex lindleyi subsp. *conduplicata*	P3
Baeckea sp. Bulla Bulling (DJE Whibley 4648)	P1
Elachanthus pusillus	P2
Eremophila praecox	P1
Eucalyptus crucis subsp. *crucis*	T
Eucalyptus x brachyphylla	P4
Eucalyptus jutsonii	P2
Gompholobium cinereum	P3
Gnephosis intonsa	P1
Gnephosis sp. Norseman (K.R. Newbey 8096)	P3
Hakea rigida	P2
Lepidium fasciculatum	P3
Melaleuca coccinea	P3
Parmeliopsis macrospora	P3
Ptilotus procumbens	P1
Ptilotus rigidus	P1
Rhagodia sp. Yeelirrie Station (K.A. Shepherd et al. KS 1396)	P1
Rumex crystallinus	P2
Xanthoparmelia dayiana	P3

Appendix 5: Muir Life Form/Height Class (Muir, 1977).

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70% -100%	**MID DENSE 30% - 70%**	**SPARSE 10% -30%**	**VERY SPARSE 2% - 10%**
Trees > 30m Trees 15 – 30m Trees 5 – 15m Trees < 5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee Tree Form Mallee Shrub Form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs > 2m Shrubs 1.5 – 2m Shrubs 1 – 1.5m Shrubs 0.5 – 1m Shrubs 0 – 0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat Plants Hummock Grass Bunch grass >0.5m Bunch grass < 0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-dense Hummock Grass Tall Grass Low Gras Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges > 0.5m Sedges < 0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverworts	Dense ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Appendix 6: Keighery Health rating scale (1994).

Health Rating	Health Description	Definition
6	Pristine	No obvious signs of disturbance
5	Excellent	Vegetation intact despite disturbance affect, weeds are non-aggressive individual species
4	Very Good	Vegetation altered due to obvious signs of disturbance
3	Good	Structure affected multiple disturbances. Retains basic structure, has ability to regenerate
2	Degraded	Structure severely disturbed. Can regeneration to good condition, but requires intensive management
1	Completely Degraded	Completely bare no native species

Appendix 4 – Reconnaissance Flora and Basic Fauna Assessment (Botanica Consulting, 2025a).

WATTLEBIRD PROJECT

Reconnaissance Flora and Basic Fauna Assessment

Prepared for Norton Goldfields Pty Ltd
January 2025



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

Cover Photo: Eucalypt Woodlands within the Wattlebird Project survey area taken on the 5th of September 2024.

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EXECUTIVE SUMMARY

Botanica Consulting Pty Ltd (Botanica) was commissioned by Norton Gold Fields Pty Ltd. to undertake a reconnaissance flora/ vegetation survey and basic fauna survey of their Wattlebird Project (referred to as the 'survey area'). The survey area is located approximately 45 km northwest of Kalgoorlie-Boulder in the City of Kalgoorlie-Boulder and covers an area of 288 ha.

The survey area lies within the Eastern Goldfields (COO3) subregion of the Coolgardie Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA). There are no gazetted or proposed conservation reserves within the survey area.

Botanica conducted a flora/ vegetation and basic fauna survey on the 5th of September 2024. The area was surveyed by Jim Williams (Principal Botanist) and Kiefer Millet (Field Technician). The area was traversed on foot and all-terrain vehicle.

The field survey identified 75 vascular flora taxa within the survey area. These taxa represented 36 genera across 21 families, with the most diverse families being Chenopodiaceae (17 species). Dominant genera include Eucalyptus (9 species) and Eremophila (11 species). Four annual species were observed during the survey.

Two weed species were recorded within the survey. These species are not listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management* (BAM) *Act 2007* or as a Weed of National Significance.

No Threatened or Priority species were identified in the survey area.

A total of four broad-scale vegetation communities were identified within the survey area. Native vegetation was categorized as 'Good,' 'Very Good' or 'Degraded.' Impacts to vegetation include access tracks, historical and current mining and exploration activities.

No Threatened, Priority or otherwise significant ecological communities were identified within the survey area. No Environmentally Sensitive Areas, wetlands of international importance (Ramsar Wetlands) or national importance (Australian Nature Conservation Agency Wetlands) are found within the survey area. There are no known or potential terrestrial Groundwater Dependant Ecosystem (GDE) within the survey area.

Based on vegetation and associated landforms identified during the flora and vegetation assessment, three broad scale terrestrial fauna habitats were identified as occurring within the survey area. No evidence of significant fauna species, including Malleefowl, were observed.

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of the EP Act. The assessment found that the proposed vegetation clearing activities are unlikely to be at variance with any clearing principle.

1 INTRODUCTION

Botanica Consulting Pty Ltd (Botanica) was commissioned by Norton Gold Fields Pty Ltd. to undertake a reconnaissance flora/vegetation survey and basic fauna survey of their Wattlebird project area (referred to as the 'survey area'). The survey area is approximately 288 ha in extent and is located approximately 45 km northwest of Kalgoorlie-Boulder and 91 km south of Menzies in the City of Kalgoorlie-Boulder (Figure 1-1).

The purpose of survey is to support the submission of a clearing permit for the Wattlebird Project area.

1.1 Objectives

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

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

The fauna assessment was conducted in accordance with the requirements of a basic terrestrial fauna survey as defined in *Technical Guidance – Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2020). The objectives of the assessment were to:

- Undertake a literature review, including map-based information searches of all current and relevant literature sources and databases relating to the survey area;

- Undertake a desktop investigation to identify any previously recorded occurrences of or potentially occurring Threatened and Priority listed fauna within the survey area;
- Undertake searches on available databases for details relating to any Threatened and Priority listed fauna previously identified as occurring or potentially occurring within the survey area;
- Conduct fauna habitat mapping and identify habitat types which are suitable for each significant fauna considered likely or possible to occur, or fauna recorded in the survey area;
- Undertake opportunistic, low intensity sampling of fauna; and
- Report on the conservation status of species present using the Western Australian Museum and *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) databases for presence of Threatened and Priority listed fauna species within the survey area.

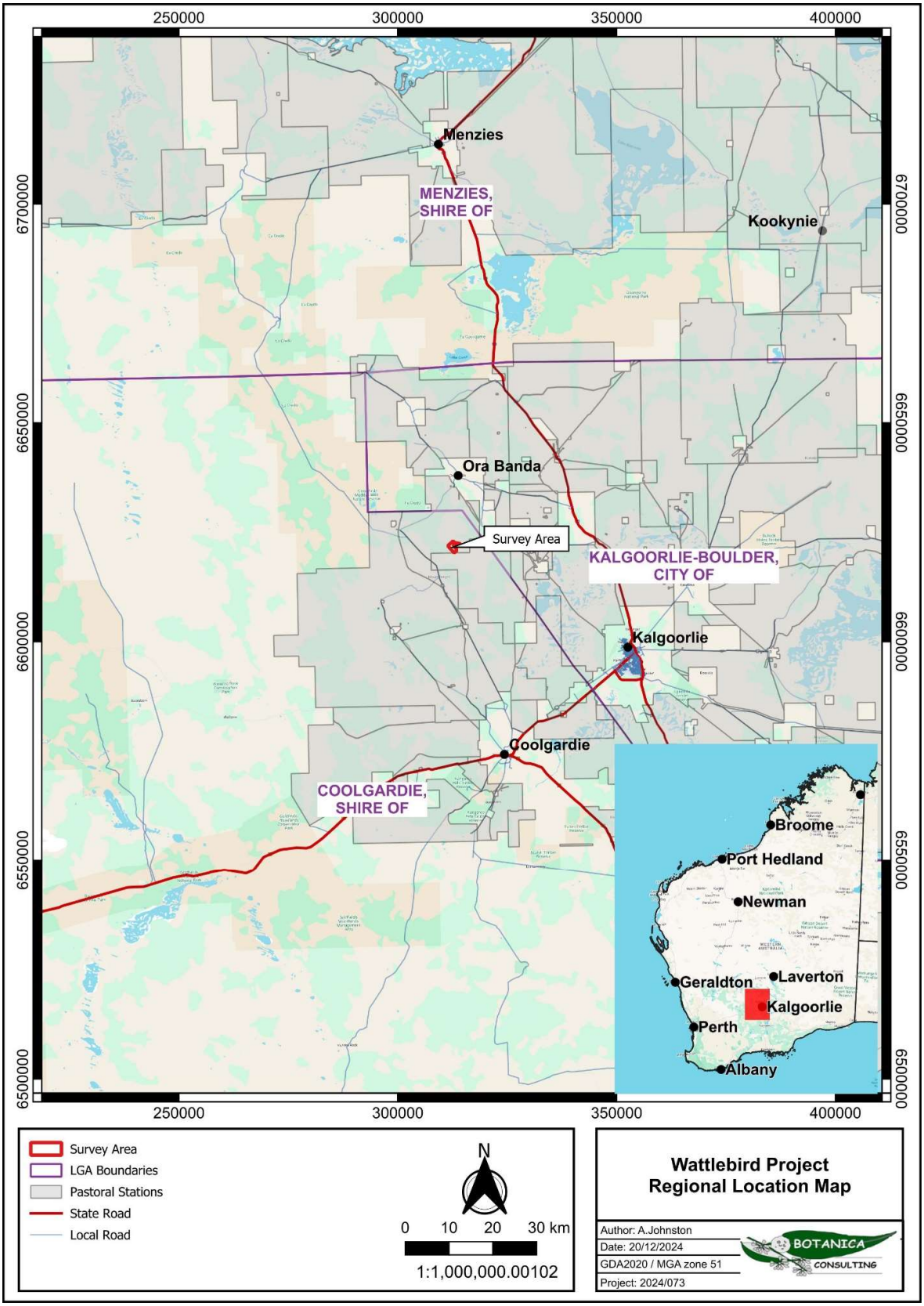


Figure 1-1: Regional map of the survey area

2 BIOPHYSICAL ENVIRONMENT

2.1 Regional Environment

Based on the Interim Biogeographic Regionalisation of Australia (IBRA, Version 7) (DCCEEW, 2020) the survey area is located on the western edge of within the Coolgardie Bioregion of WA. This bioregion is further divided into subregions with the survey area located in the Eastern Goldfields subregion (COO3) (Figure 2-1).

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

The Eastern Goldfields subregion (5,102,428 ha) lies on the Yilgarn Craton's Eastern Goldfields Terrain, which is described as gently undulating plains with a subdued relief, interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line (Cowan, 2001).

2.2 Land Use

The dominant land uses of the Eastern Goldfields subregion include UCL and Crown reserves, grazing native pastures (37.8%), freehold (7.15%), conservation (1.4%) and mining leases (Cowan, 2001). The survey area is located on the Mt Burges pastoral station.

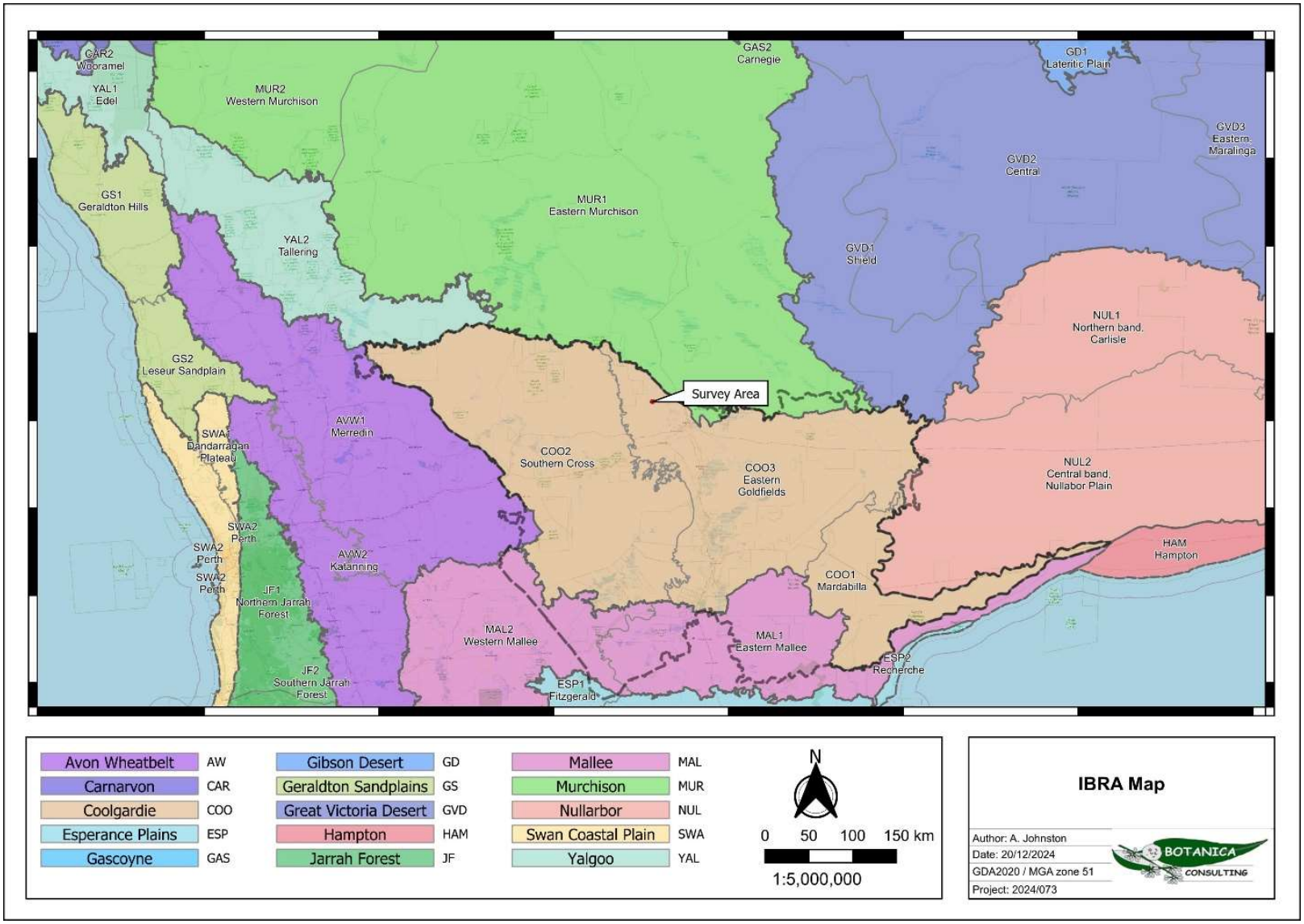


Figure 2-1: Map of IBRA Bioregions in relation to the survey area

2.3 Soil Landscape Systems

The survey area lies within the Kalgoorlie Province, located in the southern Goldfields between Paynes Find, Menzies, Southern Cross and Balladonia. The landscape consists of undulating plains (with some sandplains, hills and salt lakes) on the granitic rocks and greenstone of the Yilgarn Craton. Soils range from calcareous loamy earths and red loamy earths with some Salt Lake soils to red deep sands, yellow sandy earths, shallow loams and loamy duplexes. Vegetation communities are predominately Eucalypt woodlands with some acacia-casuarina thickets, mulga shrublands, halophytic shrublands and spinifex grasslands (Tille, 2006).

The Kalgoorlie Province is further divided into six soil-landscape zones, with the survey area located within the Kambalda zone (265).

The Kambalda zone (265) is in the south-eastern Goldfields between Menzies, Norseman and the Fraser Range and contains flat to undulating plains (with hills, ranges and some salt lakes and stony plains) on greenstone and granitic rocks of the Yilgarn Craton. Soils consist of calcareous loamy earths and red loamy earths with salt lakes soils and some red brown hardpan shallow loams and red sandy duplexes. Vegetation includes red mallee, blackbutt-salmon gum-gimlet woodlands with mulga and halophytic shrublands and some spinifex grasslands (Tille, 2006).

In accordance with soil landscape system mapping data (Government of Western Australia, 2019), the soil landscape zones are divided into soil landscape systems. The survey area is located within the Mx40 Atlas landscape system, as described in Table 2-1 and shown in Figure 2-2.

Table 2-1: Soil landscape systems within the survey area

Soil Landscape System	Description	Extent within Survey Area
Mx40 Atlas System	Flat to undulating valley plains and pediments; some rock outcrop	288 ha (100%)
Total		288 ha (100%)

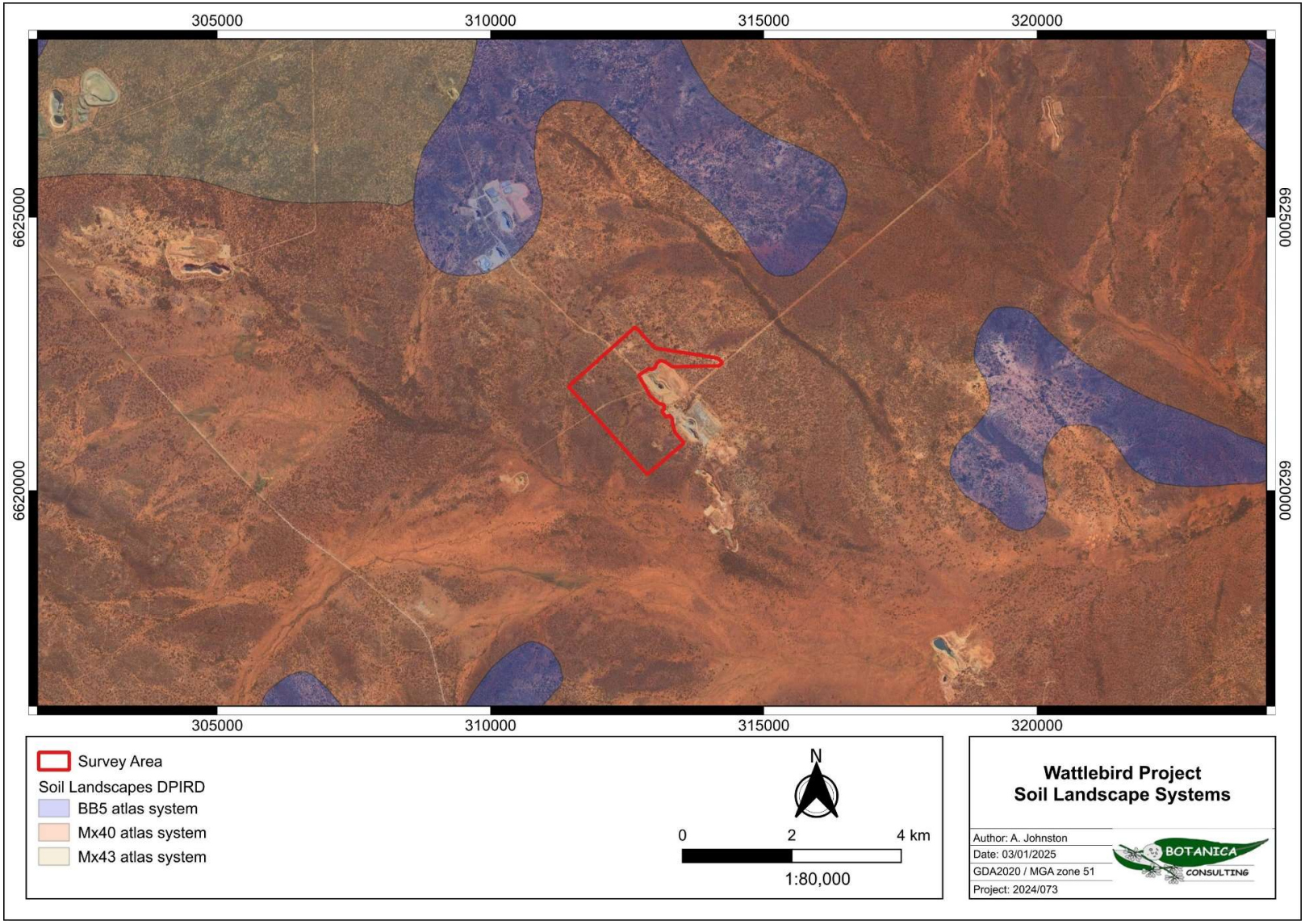


Figure 2-2: Map of soil landscape systems within the survey area

2.4 Regional Vegetation

The vegetation of the Kalgoorlie Province is described by Tille (2006) as woodlands of redwood (*Eucalyptus transcontinentalis*), red mallee (*E. oleosa*), Dundas blackbutt (*E. dundasii*), merrit (*E. flocktoniae*) and salmon gum (*E. salmonophloia*), found on undulating plains over granite. There are also some hummock grasslands with red mallee over spinifex (*Triodia scariosa*) and thickets of Acacia, Casuarina and Melaleuca spp. Plains on greenstone have woodlands of York gum (*E. loxophleba*), salmon gum and gimlet (*E. salubris*). The valley plains have woodlands of salmon gum, red mallee, Goldfields blackbutt (*E. lesouefii*), gimlet, York gum and morrel (*E. longicornis*). These sometimes have an understorey of saltbush (*Atriplex* spp.), pearl bluebush (*Maireana sedifolia*), sago bluebush (*M. pyramidata*) and *Eremophila* spp. There are areas of spinifex grasslands with red mallee, mallees (e.g. *E. youngiana*) and marble gum (*E. gongylocarpa*). Low woodlands of mulga (*Acacia aneura*) and black sheoak (*Casuarina pauper*) over bluebush and saltbush are also present. Apart from the bare salt lake surfaces, saline valley floors have shrublands of samphire (*Tecticornia* spp.) and *Frankenia* spp. in lower areas, shrublands of saltbush and bluebush on red deep sandy duplexes, and woodlands of salmon gum, merrit, red mallee, gimlet and York gum. *Acacia neurophylla, A. beauverdiana* and *A. resinimarginea* thickets grow on gently sloping uplands on granite, with thickets of acacia, casuarina and melaleuca. There are also scrub-heaths and York gum-salmon gum-gimlet woodlands on these uplands. The hilly terrain on greenstone supports woodlands of salmon gum, Goldfields blackbutt, coral gum (*E. torquata*), York gum, gimlet, morrel, Dundas blackbutt and black sheoak. Thickets of granite wattle (*Acacia quadrimarginea*) are also present. The stony plains support scattered woodlands of Goldfields blackbutt, gimlet and salmon gum, along with shrublands of saltbush and bluebush. Sandplains in the west have acacia (*A. coolgardiensis, A. ramulosa, A. aneura, A. burkittii* and *A. tetragonophylla*) shrublands, commonly with patchy native pine (*Callitris columellaris, C. preissii*) and mallees (*E. leptopoda, E. longicornis and E. loxophleba*). Native box (*Bursaria occidentalis*), *Melaleuca uncinata* and *Hakea recurva* may also be present. Hard spinifex (*T. basedowii*) grasslands with mulga, marble gum and mallees (e.g. *E. kingsmillii*) are found on sandplains to the east. The sandy-surfaced plains support acacia, casuarina and melaleuca thickets; woodlands of York gum, cypress pine (*Callitris columellaris*), salmon gum, gimlet and mulga; and shrublands of bowgada (*A. ramulosa*) (Tille, 2006).

2.4.1 Pre-European Vegetation

The Pre-European vegetation association spatial mapping dataset (DPIRD, 2019) identified one vegetation association occurring within the survey area (Figure 2-3). The association description and their remaining extent, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019) are provided in Table 2-2. Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered “endangered” (EPA, 2000). The vegetation associations retain >97% of their pre-

European extent, and development within the survey area will not significantly reduce the current extent of these vegetation associations.

Table 2-2: Pre-European vegetation associations within the survey area

Vegetation Association	Pre-European extent remaining	% Protected for Conservation	Floristic Description	Extent within Survey Area
Kununulling 468	89.55%	0%	Woodland other	288 ha (100%)
Total				288 ha (100%)

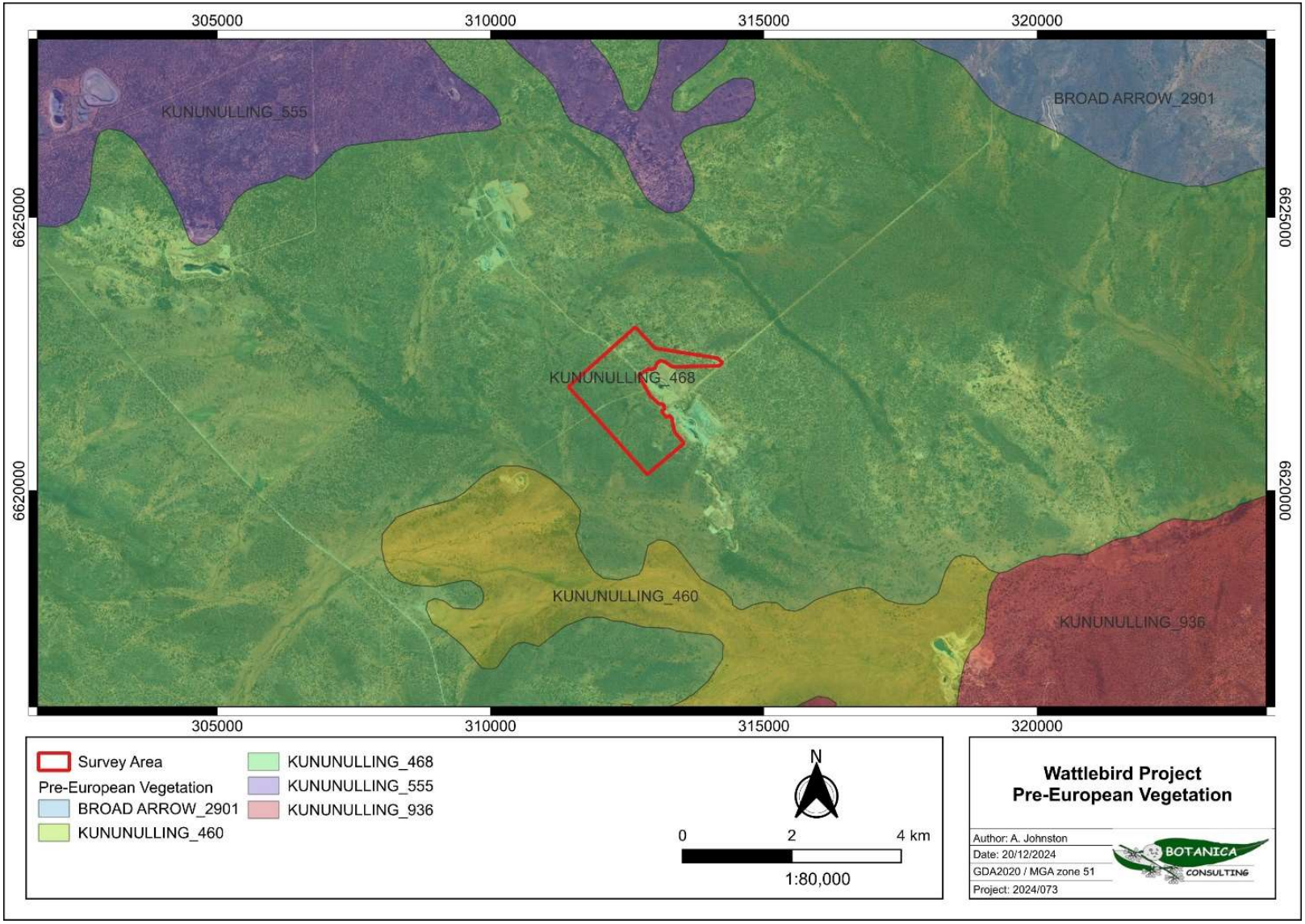
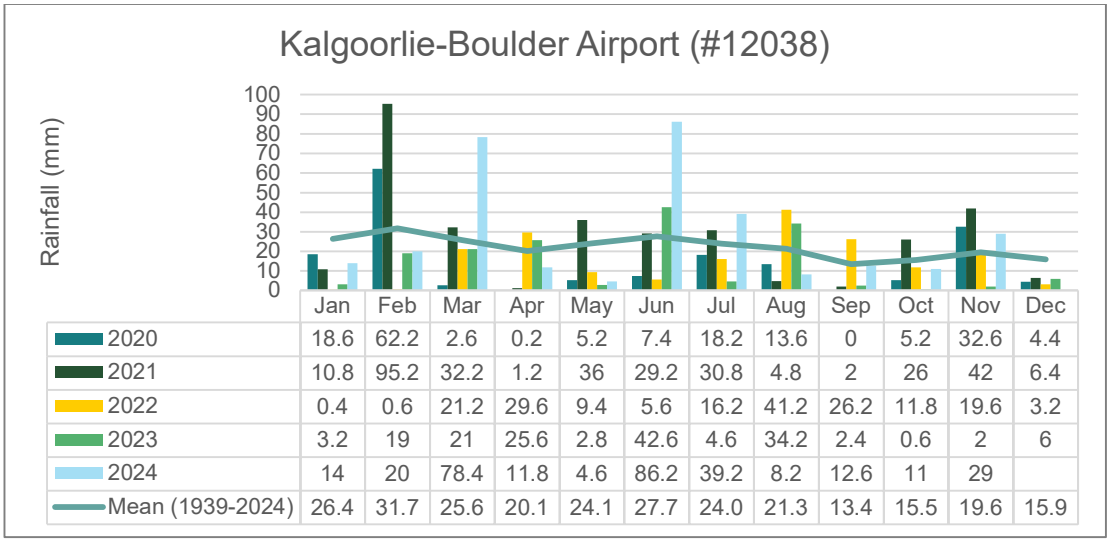


Figure 2-3: Pre-European vegetation systems within the survey area

2.5 Climate

The climate of the Eastern Goldfields subregion is characterised as an arid to semi-arid climate approximately 200-300mm of rainfall, sometimes in summer but usually in winter (Cowan, 2001). Rainfall data for the Kalgoorlie-Boulder Airport weather station (#12038), located approximately 45 km southeast of the survey area, is shown in

Figure 2-4 (BoM, 2024). Kalgoorlie-Boulder receives a mean annual rainfall of 264.6 mm. The data shows rainfall in 2024 exceeded the mean, particularly in the months of March, June and July.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	18.6	62.2	2.6	0.2	5.2	7.4	18.2	13.6	0	5.2	32.6	4.4
2021	10.8	95.2	32.2	1.2	36	29.2	30.8	4.8	2	26	42	6.4
2022	0.4	0.6	21.2	29.6	9.4	5.6	16.2	41.2	26.2	11.8	19.6	3.2
2023	3.2	19	21	25.6	2.8	42.6	4.6	34.2	2.4	0.6	2	6
2024	14	20	78.4	11.8	4.6	86.2	39.2	8.2	12.6	11	29	
Mean (1939-2024)	26.4	31.7	25.6	20.1	24.1	27.7	24.0	21.3	13.4	15.5	19.6	15.9

Figure 2-4: Climate data for Kalgoorlie-Boulder (#12038) (BoM, 2024)

2.6 Conservation Values

There are two wetlands of national importance (ANCA Wetlands) in the Coolgardie Bioregion, including the Rowles Lagoon System and Lake Cronin.

No Threatened Ecological Communities (TEC) listed under the Commonwealth EPBC Act, or the Western Australian BC Act are known to occur within the survey area or within 40 km of the survey area. There were no DBCA listed Priority Ecological Communities (PEC) occurring within the survey area, however two PECs are known to occur within 40 km of the survey area (Table 2-3, Figure 2-5).

Table 2-3: Priority Ecological Communities within a 40 km radius of the survey area

Priority Ecological Community	Conservation Status	Description	Location
Emu Land System	Priority 3	The Emu Land System PEC is defined as a paperbark shrubland and wetland system. It contains fresh or brackish ephemeral lakes and swamps with cane grass, lignum and paperbark shrublands.	This PEC is 35 km northwest of the survey area.
Emu Land System	Priority 3		This PEC is 39 km northeast of the survey area.

There are no Ramsar wetlands within the survey area or within 40 km of the survey area. There are no Environmentally Sensitive Areas (ESA) as listed under the EP Act within the survey area, however 18 km north-west of the survey area is the Rowles Lagoon Wetland system. This system is listed as a Wetland of National Importance (ANCA Wetlands) and as an Environmentally Sensitive Area (ESA) as listed under the EP Act. (Figure 2-5). Disturbances within the survey area are unlikely to impact these areas.

There are no DBCA-managed lands, gazetted or proposed reserves within the survey area. Two Gazetted Reserves are within 40 km of the Survey area. These are the Clear and Muddy Lakes Nature Reserve (19 km North-West) and the Rowles Lagoon Conservation Park. There are also proposed extensions to these reserves, and the DBCA-managed Credo proposed Conservation Park extends across the northwestern section of the 40 km buffer. The DBCA-managed proposed extension to the Goongarrie National Nark occurs approximately 40 km north of the survey area. Disturbances within the survey area are unlikely to impact these areas. The location of Conservation Reserves, ESA's and Nationally Important Wetlands in relation to the survey area is provided in Figure 2-5.

2.6.1 Great Western Woodlands

The survey area is located just inside the northeastern edge of the Great Western Woodlands (Figure 2-5). The Great Western Woodlands is considered by The Wilderness Society of WA to be of global biological and conservation importance as one of the largest and healthiest temperate woodlands on Earth, containing many endemic taxa. The region covers almost 16 million hectares (160,000 square kilometres), from the southern edge of the Western Australian Wheatbelt to the pastoral lands of the Mulga country in the north, the inland deserts to the northeast, and the treeless Nullarbor Plain to the east.

The Great Western Woodlands provides a connection between southwest forests and inland deserts (Gondwana Link) as well as linking the north-west passage to Shark Bay. The majority of the Great Western Woodlands is unallocated crown land (61.1%) with other interests including pastoral leases (20.4%), conservation reserves (15.4%) unallocated crown land, ex pastoral (2%) managed by the Department of Biodiversity, Conservation and Attractions (DBCA) and private land (approximately 1%).

No specific management strategy or formal conservation status applies to the Great Western Woodlands. The Great Western Woodlands currently includes towns, highways, roads, railways, private property, Crown Reserves, agricultural activities and mining tenements.

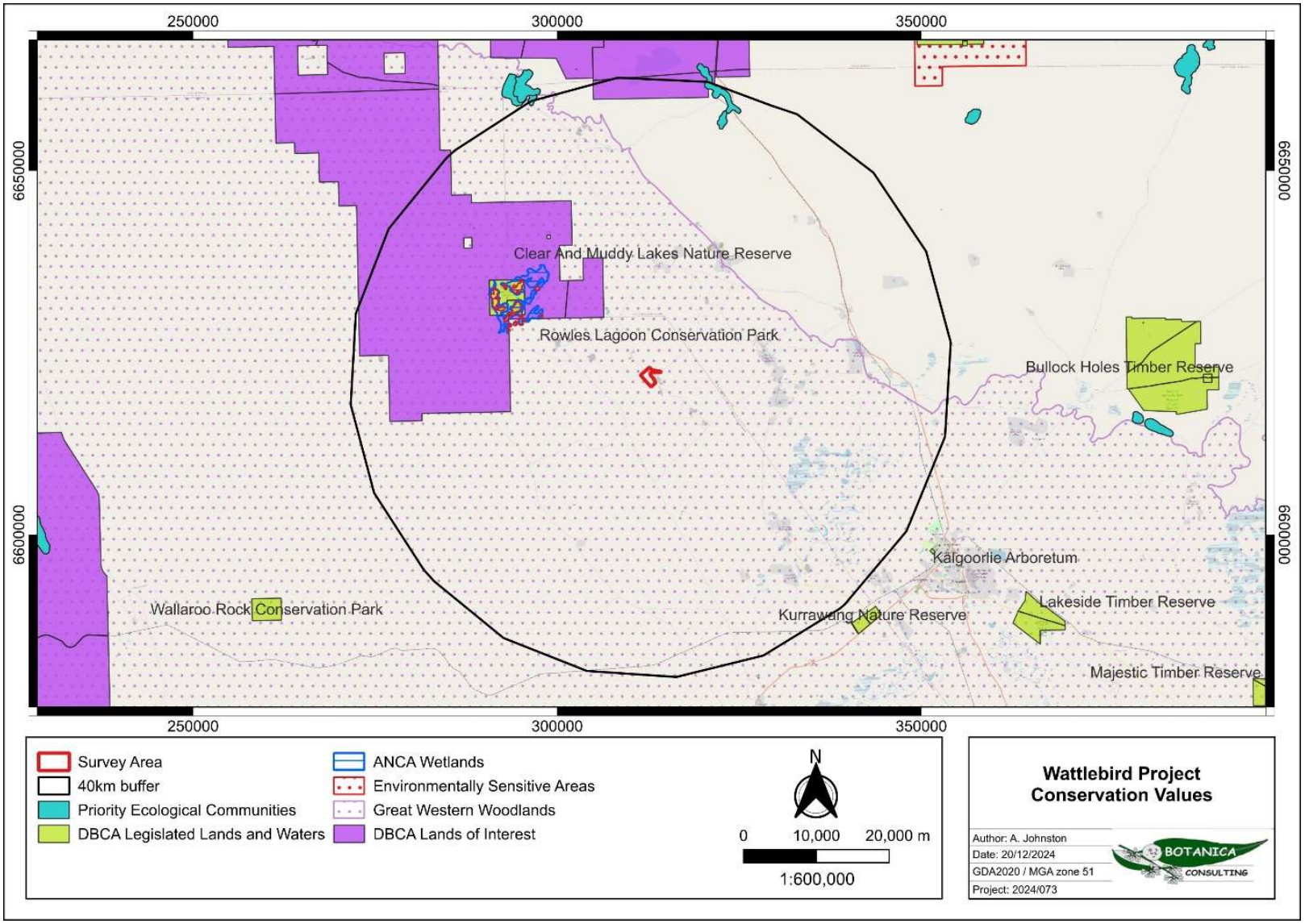


Figure 2-5: Conservation areas in relation to the survey area

2.7 Hydrology

According to the Geoscience Australia database (2015) there are no inland waters (salt lakes) within the survey area. There are two minor ephemeral drainage lines occurring through the survey area (Figure 2-6).

Groundwater Dependent Ecosystems (GDE) includes biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. In accordance with the BoM *Atlas of Groundwater Dependent Ecosystems* (BoM, 2021) database, there are no known or potential aquatic or terrestrial GDEs within the survey area, as shown Figure 2-6.

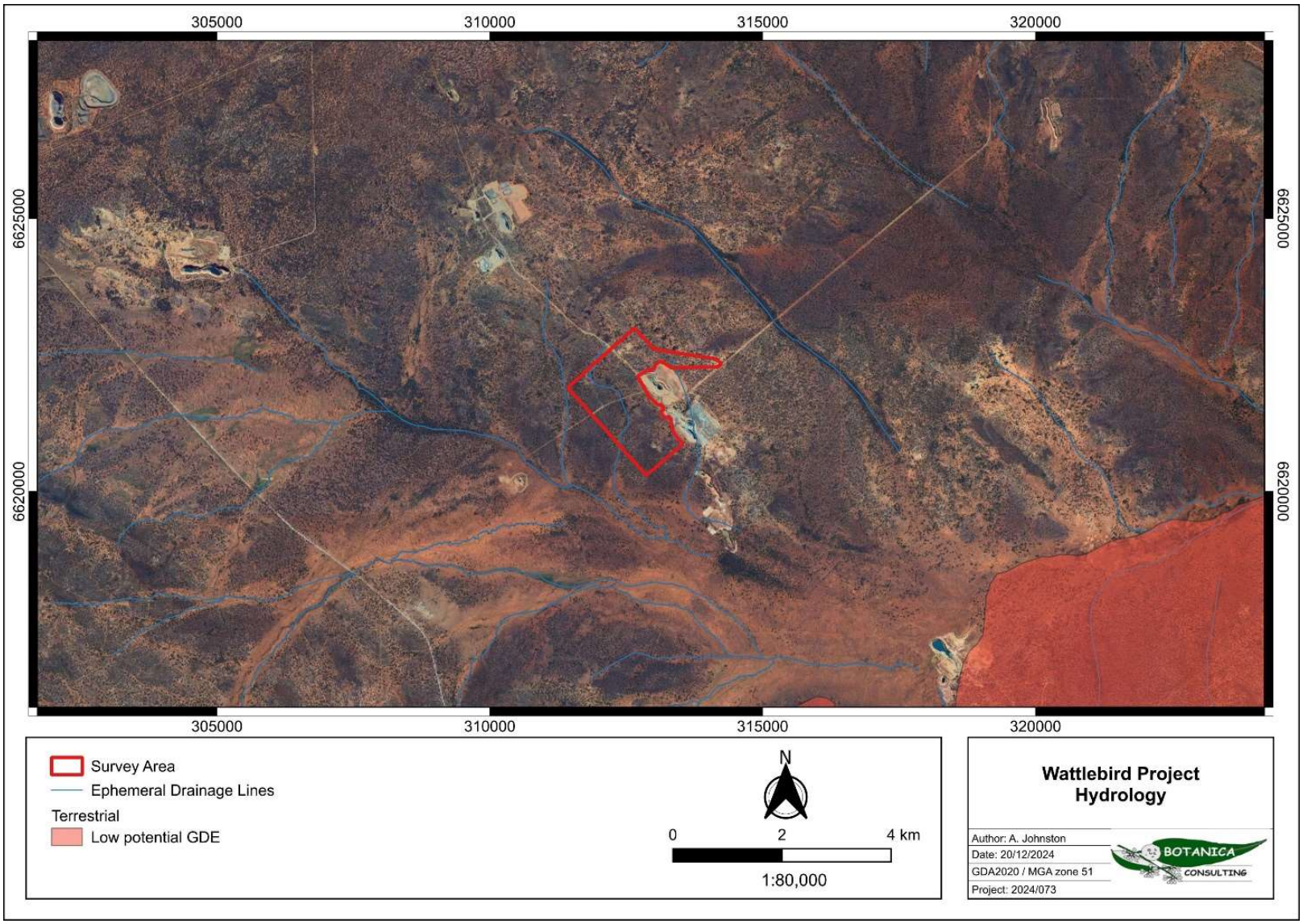


Figure 2-6: Regional hydrology of the survey area

3 SURVEY METHODOLOGY

3.1 Desktop Assessment

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

- Botanica Consulting (2015). *Level 1 Flora & Vegetation Survey of the Carbine and Paradigm area.* Unpublished report prepared for Northern Star Resources Ltd., October 2015.
- Botanica Consulting (2018). *Reconnaissance Flora and Fauna Survey, Carbine - Paradigm*. Unpublished report prepared for Northern Star Resources Ltd., June 2018.
- Botanica Consulting (2020). *Ant Hill Project Reconnaissance Flora/ Vegetation Survey and Basic Fauna Survey.* Unpublished report prepared for Northern Star Resources Ltd., December 2020.
- Botanica Consulting (2024b). *Solar Farm Project Reconnaissance Flora and Fauna Report.* Prepared for Norton Goldfields Pty Ltd.
- Newbey, K.R., and Hnatiuk R.J. (1985). WA Museum, Supplement Number 23, The Biological Survey of The Eastern Goldfields of Western Australia, Part 3 Jackson – Kalgoorlie Study Area: III Vegetation and Flora. Prepared for the WA Museum.
- Terrestrial Ecosystems (2023). *Basic and Targeted Vertebrate Fauna Survey, Carbine/Paradigm Haul Roads*. Unpublished report prepared for Evolution Mining Ltd, July 2023.
- Waddell, P. A., and Galloway, P. D. (2023). *Land systems, soils and vegetation of the southern Goldfields and Great Western Woodlands of Western Australia.* Technical bulletin 99, vol 1, Department of Primary Industries and Regional Development, Western Australian Government.

In addition to the literature review, online database search requests were also undertaken (using the survey area as centre-point and 40 km buffer) to aid in the compilation of a list of potential significant flora and fauna within the survey area:

- NatureMap database search (DBCA, 2024a)
- DBCA request for significant flora (DBCA, 2024b);
- DBCA request for ecological communities (DBCA, 2024d).
- DBCA request for significant fauna (DBCA, 2023)
- EPBC Protected Matters search tool (DCCEEW, 2024a).

Database record results list conservation significant flora and fauna but do not give locations.

Significant flora species identified by the desktop review were assessed with regards to their population extent and distribution and preferred habitat to determine their likelihood of occurrence within the survey area. The assessment categorised flora species as follows:

- **Unlikely:** Suitable habitat is not expected to occur and/or the survey area is outside the known range of the species.
- **Possible:** Suitable habitat may be present, and the area is within the known range of the species. This option is also used when there is insufficient information to determine the preferred habitat of a species.
- **Likely:** Suitable habitat is expected to occur and there are records within 10 km of the survey area.
- **Previously Recorded:** A record for this species is located within the survey area. Field survey will ground-truth currently occurring individuals and populations.

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

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

- Environment Protection and Biodiversity and Conservation (EPBC) Act 1999. Administered by the Australian Government (DCCEEW);
- Biodiversity Conservation (BC) Act 2016. Administered by the WA Government (DBCA);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List – the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and
- Priority Flora list. A non-legislative list maintained by DBCA for management purposes (released November 2024).

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

- Japan Australia Migratory Bird Agreement 1981 (JAMBA)[1];
- China Australia Migratory Bird Agreement 1998 (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and

- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

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

3.2 Flora and Vegetation Field Assessment

Botanica conducted a reconnaissance flora/ vegetation and basic fauna surveys on the 5th of September 2024. This was conducted by Jim Williams (Principal Botanist). The area was traversed on foot and all-terrain vehicle. Jim Williams has a Diploma of Horticulture and has been conducting flora and fauna in the Goldfields of Western Australia for more than 20 years.

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

The survey was conducted using a series of survey sites (relevés) as shown in Figure 3-1. At each relevé site, the area was walked on foot to observe and record all flora species. The distance surveyed at each relevé varied dependent on the diversity/ variability of species and landforms/ vegetation types. At each relevé, the following information was recorded:

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

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

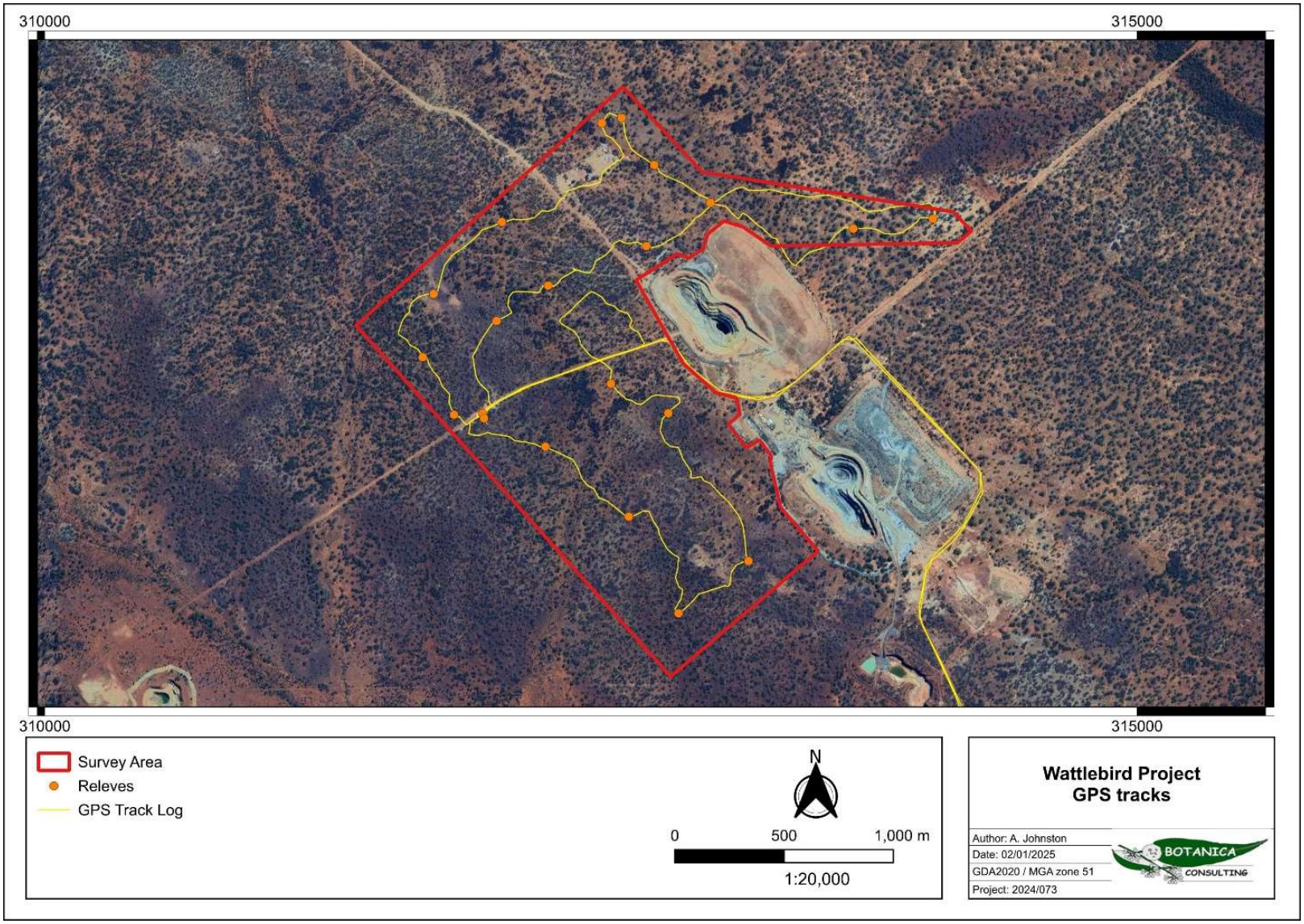


Figure 3-1: Map showing GPS tracklogs and relevés of the 2024 survey effort

3.3 Data Analysis Tools

Following field assessments, vegetation types and condition were mapped using the GIS program QGIS, and the hectare area/ percentage area of each vegetation type and condition within the survey area was calculated. Spatial maps illustrating the location of vegetation types, and any significant flora/ vegetation and fauna were generated using QGIS.

3.4 Terrestrial Fauna Field Assessment

Fauna habitat types were identified across the survey area based on broad major vegetation groups and associated landform. A handheld GPS unit was used to record the coordinates of the boundaries between fauna habitats and each habitat was photographed.

The main aim of the fauna habitat assessment was to determine the likelihood of a species of conservation significance utilising habitat within the survey area. The habitat information obtained was also used to aid in finalising the overall potential fauna list.

Available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area (determined from the desktop assessment) was researched. During the field survey, the habitats within the survey area were assessed and specific elements identified, if present, to determine the likelihood of listed Threatened and Priority species utilising habitat within the survey area.

Fauna of conservation significance identified during the literature review and database searches as previously being recorded in the general area were assessed and ranked for their likelihood of occurrence within the survey area. The rankings and criteria used were:

- **Would Not Occur:** There is no suitable habitat for the species in the survey area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).
- **Locally Extinct:** Populations no longer occur within a small part of the species natural range, in this case within 10 or 20 km of the survey area. Populations do however persist outside of this area.
- **Regionally Extinct:** Populations no longer occur in a large part of the species natural range, in this case within the Eastern Murchison subregion. Populations do however persist outside of this area.
- **Unlikely to Occur:** The survey area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the site itself would not support a population or part population of the species.

- **Possibly Occurs:** Survey area is within the known distribution of the species in question and habitat of at least marginal quality was identified as likely to be present during the field survey and literature review, supported in some cases by recent records being documented in literature from within or near the survey area. In some cases, while a species may be classified as possibly being present at times, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

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

3.5 Scientific Licences

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

Licensed Staff	Permit Number	Date of Expiry
Jim Williams	FB62000457 (Licence to take flora for scientific purposes)	04/08/2025

3.6 Survey Limitations and Constraints

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

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

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

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

Table 3-2: Limitations and constraints associated with the flora/ vegetation and fauna survey

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted using an all-terrain vehicle and on foot. There were no access constraints.
Competency/ Experience	Not a constraint	The Botanica personnel that conducted the survey were regarded as suitably qualified and experienced. **Coordinating Staff**: Jim Williams (Principal Botanist) has 30 years' experience doing flora and fauna surveys in WA. **Data Interpretation**: Jim Williams (Botanist), Amy Johnston and Jennifer Jackson.
Timing of survey, weather & season	Not a constraint	Fieldwork was undertaken within the EPA's recommended primary survey time period for the Interzone Province (i.e., Spring). Above average rainfall was received in June and July 2024.
Area disturbance	Not a constraint	The area has been disturbed from previous mining and exploration, cattle grazing and other human impacts; however, vegetation was mostly intact and comprised of native vegetation.
Survey Effort/ Extent	Not a constraint	Survey intensity was appropriate for the size/significance of the area with a reconnaissance survey completed to identify vegetation types/fauna habitats and conservation significant species/communities.
Availability of contextual information at a regional and local scale	Not a constraint	BoM, DWER, DPIRD, DBCA and DCCEEW databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region. Botanica has conducted numerous surveys within the Coolgardie bioregion and was also able to obtain information about the area from previous research conducted within the area. Results of previous assessments in the local area were reviewed to provide context on the local environment.
Completeness	Not a constraint	In the opinion of Botanica, the survey area was covered sufficiently in order to identify vegetation assemblages. All observed flora individuals were able to be identified to species level. The vegetation associations for this study were based on visual descriptions of locations in the field. The distribution of these vegetation associations outside the survey area is not known, however vegetation associations identified were categorised via comparison to vegetation distributions throughout WA based on NVIS classification (DotEE, 2017).

4 RESULTS

4.1 Desktop Assessment

4.1.1 Flora

The NatureMap database search (DBCA, 2024d) identified 650 vascular flora species as occurring within 40 km of the survey area. The full list of vascular flora identified by the desktop search is contained in Appendix B.

4.1.2 Introduced Flora

The desktop review identified 38 introduced flora (weed) species as known to occur within 40 km of the survey area. One of the species is listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management* (BAM) *Act* 2007 and is also listed as a Weed of National Significance (WoNS) (Table 4-1).

Table 4-1: Declared and WONs species of weeds known to occur within 40 km of the survey area

Taxon	Common Name	Declared	WoNS
Opuntia elata	Riverian pear	Y	Y

4.1.3 Significant Flora

Assessment of the DBCA's Threatened and Priority Flora database records (Ref: 07-0124FL) (DBCA, 2024b), EPBC Protected Matters (DCCEEW, 2024a) and previous relevant literature identified no Threatened or Priority Flora were previously recorded within the survey area. No Threatened taxa were identified as occurring within the 40km buffer, and twenty-eight Priority Flora were identified as occurring within a 40 km radius of the survey area.

These taxa were assessed for distribution and known habitat to determine their likelihood of occurrence within the survey area (Table 4-2). The locations of the DBCA database records are illustrated spatially in Figure 4-1

Table 4-2: Significant flora previously recorded within 40km of the survey area

Taxon	Conservation Status			Habitat Description (WA Herbarium, 1998-)	Likelihood to occur in survey area
	EPBC	BC Act	DBCA		
Acacia cylindrica	-	-	3	Yellow/brown sand, gravelly soils. Undulating plains, flats.	Unlikely
Acacia epedunculata	-	-	1	Yellow sand. Sandplains.	Unlikely
Allocasuarina eriochlamys subsp. *grossa*	-	-	3	Stony loam, laterite clay. Granite outcrops.	Unlikely
Angianthus prostratus	-	-	3	Red clay or loamy soils. Saline depressions.	Unlikely
Atriplex lindleyi subsp. *conduplicata*	-	-	3	Crabhole plains.	Unlikely
Austrostipa burgesiana	-	-	1	Flow line in a calcareous plain.	Unlikely
Calandrinia lefroyensis	-	-	1	Flat plain near track, orange clayey sand with fine quartz.	Unlikely
Chamelaucium sp. Parker Range (B.H. Smith 1255)	-	-	1	Sandplain.	Unlikely
Eleocharis papillosa	-	-	3	Winter wet claypan. Red brown clay loam.	Unlikely
Eremophila praecox	-	-	2	Plain. Red / brown sandy loam / clay loam.	Possible
Eucalyptus educta	-	-	2	Rocky slope of brown loam above gully.	Possible
Eucalyptus jutsonii subsp. *jutsonii*	-	-	4	Red to pale orange deep sands. Undulating areas and on dunes.	Unlikely
Eucalyptus urna subsp. *xesta*			3	Small depression, calcrete with pale brown loam.	Unlikely
Gompholobium cinereum	-	-	3	Yellow sand, clayey sand, brown loam, sandy gravel, laterite. Well-drained open sites, slopes, plains, roadsides.	Unlikely
Hakea rigida	-	-	2	Sandy soils, yellow sand.	Unlikely
Hysterobaeckea ochropetala subsp. *cometes*	-	-	3	Flat plain. Soil red sandy loam.	Unlikely
Lepidium fasciculatum	-	-	3	Dry lake bed. Flat. Soil red loam.	Unlikely
Notisia intonsa	-	-	3	Gently inclined crest/ plain of basalt and schist with red-brown shallow light clay/loam soils.	Unlikely
Phebalium appressum	-	-	1	Yellow sandplain.	Unlikely
Phebalium brachycalyx			3	Sand, gravelly soils. Lateritic uplands, hills.	Unlikely
Philotheca pachyphylla	-	-	1	Sand, red loam, clay loam. Sandplains, hill tops.	Unlikely
Ptilotus rigidus	-	-	1	Quartzite stones, orange sand.	Unlikely
Ptilotus sp. Kalgoorlie (J. Jackson & B. Moyle 260)	-	-	1	Small quartz outcrop which is surrounded by a salt claypan.	Unlikely

Taxon	Conservation Status			Habitat Description (WA Herbarium, 1998-)	Likelihood to occur in survey area
	EPBC	BC Act	DBCA		
Rhodanthe uniflora	-	-	1	Brown earth. Open eucalyptus woodland.	Possible
Ricinocarpos digynus	-	-	1	Rocky hillslope. Rocky surface.	Possible
Rumex crystallinus	-	-	2	Moist soil near water.	Unlikely
Thysanotus sp. Yellowdine (A.S. George 6040)	-	-	2	Ridge-based rise with yellow sand.	Unlikely
Xanthoparmelia subbarbatica	-	-	1	Growing on rocks. Ridgetop with greenstone rubble on surface.	Possible

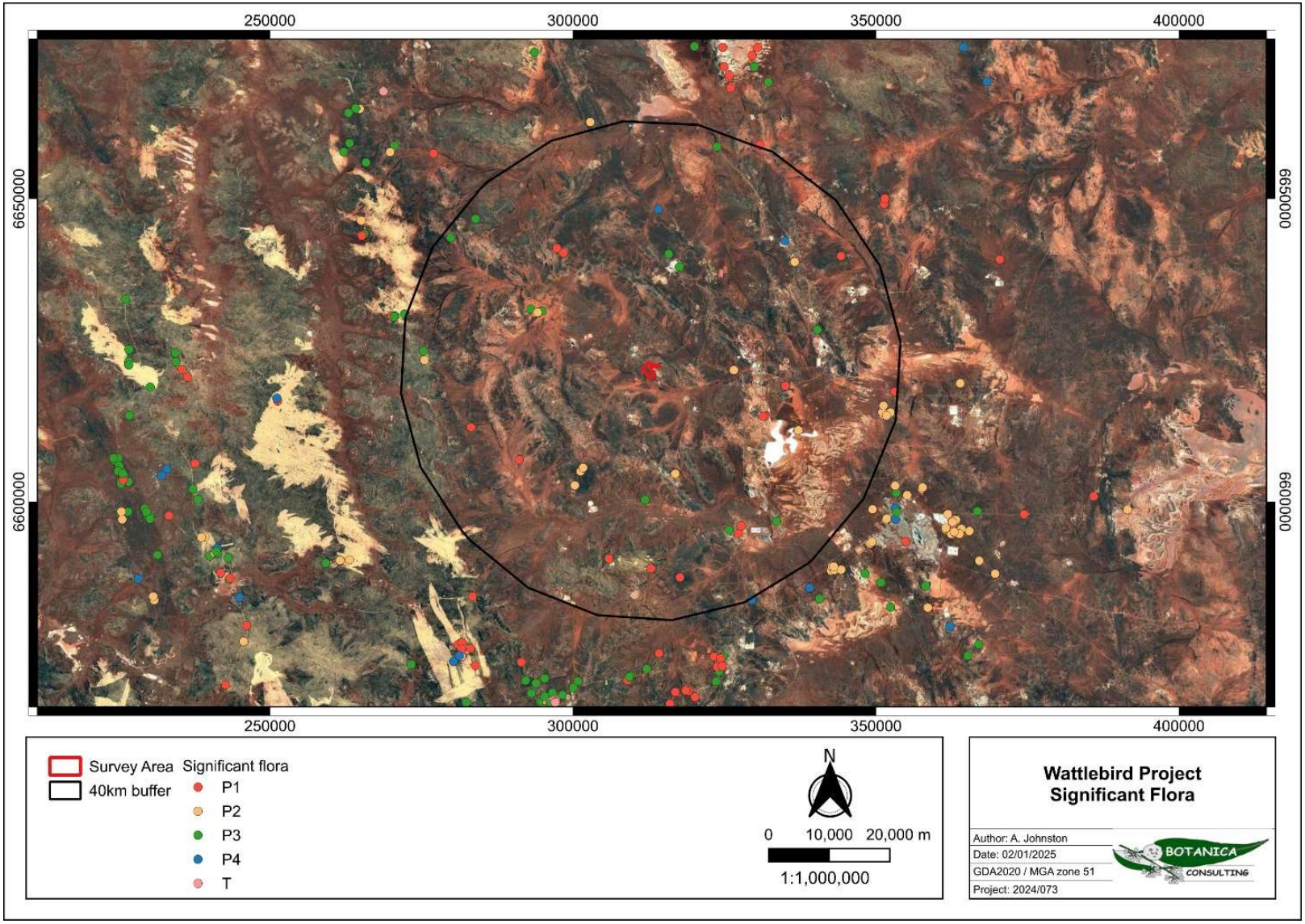


Figure 4-1: Significant flora within the desktop search area

4.1.4 Fauna

The NatureMap database search (DBCA, 2024c) identified a total 266 terrestrial vertebrate fauna taxa within 40 km of the survey area, consisting of 152 birds, 28 mammals, 81 reptiles, one fish and four amphibian taxa. Of these, four species are introduced (non-native) species:

- *Mus musculus* (House mouse)
- *Oryctolagus cuniculus* (Rabbit)
- *Vulpes* (Fox)
- *Camelus dromedarius* (Camel)

The full list of vertebrate fauna identified by the desktop search is contained in

Appendix B.

4.1.5 Conservation Significant Fauna

The desktop review (DBCA, 2024c; DCCEEW, 2024a) identified 21 terrestrial vertebrate species and three invertebrate species of conservation significance as previously being recorded within 40 km of the survey area, including 10 migratory terrestrial species.

Habitat and distribution data was used to determine the likelihood of occurrence within the survey area. The assessment identified three significant fauna species, consisting of one Vulnerable (VU) taxa, and two priority species as potentially occurring in the survey area (Table 4-3).

Table 4-3: Potentially occurring significant fauna

Species	Conservation Status			Habitat Description	Assessment and likelihood
	EPBC	BC Act	DBCA		
Aphelocephala leucopsis Southern Whiteface	VU	-	-	Found in arid regions across most of the southern half of the Australian continent, Acacia woodlands, particularly those dominated by mulga and drought-resistant chenopod shrub species, including saltbush and bluebush (ALA, 2024).	PMST records state that the species or species habitat may be in the area. Possible.
Branchinella denticulata A fairy shrimp	-	-	P3	Historical record from Lake Gidgee. Habitat would be claypans, freshwater bodies.	Would not occur in the area. No habitat in the survey area.
Calidris acuminata Sharp-tailed Sandpiper	VU	-	MI	Intertidal mudflats, also freshwater swamps and saltwater lakes (ALA, 2024).	Would not occur in the area. No habitat in the survey area.
Calidris ferruginea Curlew Sandpiper	CR and MI	CR	-	Inland, where they are rarely seen, around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (DCCEEW, 2024b).	Would not occur in the area. No habitat in the survey area.
Dasyurus geoffroii Chuditch	VU	VU	-	Deserts, woodlands, eucalypt shrubland, open forests and coastal areas. It is now found only in the southwest corner of Western Australia (ALA, 2024).	Would not occur. Considered to be regionally extinct.
Falco hypoleucos Grey Falcon	VU	VU	-	Occurs at low densities across inland Australia. The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (DCCEEW, 2024b).	Unlikely. Outside normal range (Harewood, 2012).
Falco peregrinus Peregrine falcon	-	OS	-	Open grasslands, wooded areas and tall structures in urban areas (ALA, 2024).	Possible.
Jalmenus aridus Inland hairstreak	-	-	P1	Open woodland with mature *Senna artemisioides* ssp. *filifolia* as well as mixed flowering shrubs with open areas of well drained exposed ground adjoining the hostplants (Eastwood *et al,* 2023).	Possible.
Leipoa ocellata Malleefowl	VU	VU	-	Scrublands and woodlands dominated by mallee and wattle species (DCCEEW, 2024b).	Possible.
Ogyris subterrestris petrina Arid Bronze Azure	CR	CR	-	The arid bronze azure is only known to be extant at two locations within the Wheatbelt Region and is presumed extinct at another location within the Goldfields Region (DBCA, 2020).	Possible, however nearest records are approximately 40 km to the south
Oxyura australis Blue Billed duck	-	-	P4	Endemic to wetlands of Australia's temperate regions (ALA, 2024).	Would not occur. No habitat in survey area.
Pezoporus occidentalis Night Parrot	EN	CR	-	At the landscape scale, night parrots require two distinct habitats:	Would not occur in the area. PMST records state that the species or species habitat may be in the

Species	Conservation Status			Habitat Description	Assessment and likelihood
	EPBC	BC Act	DBCA		
				1. patches of low, dense vegetation in which they roost during the day; and 2. nearby floodplains or other low-lying areas supporting diverse assemblages of native grasses and herbs in which to feed at night. (DBCA, 2024e).	area. Considered to be locally extinct. Suitable habitat not present.
Polytelis alexandrae Princess Parrot	VU	-	P4	Inhabits sand dunes and sand flats in the arid zone of western and central Australia. It occurs in open savanna woodlands and shrublands that usually consist of scattered stands of Eucalyptus (including *E. gongylocarpa, E. chippendalei* and mallee species), Casuarina or Allocasuarina trees; an understorey of shrubs such as Acacia (especially *A. aneura*), Cassia, Eremophila, Grevillea, Hakea and Senna; and a ground cover dominated by Triodia species (DCCEEW, 2024b)	Would not occur. Known to occur further east in the Great Victoria Desert.
Thinornis cucullatus Hooded Plover; Hooded Dotterel	-	-	P4	Inhabit freshwater lakes, freshwater marshes, coastal saline lagoons and sandy beaches (DCCEEW, 2024b).	Would not occur in the area. No habitat in the survey area.
Tringa nebularia Common Greenshank	EN & MI	MI	-	Sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees (DCCEEW, 2024b).	Unlikely. No habitat in survey area.
Migratory Shorebirds (inc Common sandpiper, Ruddy turnstone)	MI	IA	-	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland (DCCEEW, 2024b).	Unlikely to occur. No suitable habitat. Likely to utilise the Rowles Lagoon wetland system.

4.2 Field Assessment

4.2.1 Flora

The field survey identified 75 vascular flora taxa within the survey area. These taxa represented 36 genera across 21 families, with the most diverse families being Chenopodiaceae (17 species), Myrtaceae (9 species) and Fabaceae (9 species). Dominant genera include Eucalyptus (9 species) and Eremophila (11 species). Five annual species was observed during the survey. The full field species inventory is listed in Appendix C.

4.2.1.1 Introduced Flora

Two introduced flora (weeds) species were observed within the survey area during the survey. None of these species are listed as a Declared Pest on the Western Australian Organism List (WAOL) under the Biosecurity and Agriculture Management (BAM) Act 2007 or as a Weed of National Significance.

Table -4-4: Introduced flora species within the survey area

Family	Taxon	Common Name
Asteraceae	*Dittrichia graveolens*	Stinkwort
Lamiaceae	*Salvia verbenaca*	Wild sage

4.2.1.2 Significant Flora

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

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

No Threatened Flora taxa are previously known to occur or were identified within the survey area.

No Priority Flora taxa are previously known to occur or were identified within the survey area.

4.2.2 Vegetation Communities

A total of four broad-scale vegetation communities were identified within the survey area. These communities were identified within three landform types and comprised of one major vegetation group according to the NVIS Major Vegetation Group (MVG) definition. Vegetation community descriptions and extent are listed below in Table 4-5 and illustrated spatially Figure 4-2. Vegetation community descriptions and extents were determined from field survey results, aerial imagery interpretation and extrapolation of the communities.

The survey found RH-EW1 was the most widespread community in the survey area, occupying 187 ha (60%), while RH-EOW1 was the most restricted with 34 ha (10.7%). The diversity of species across the vegetation types was consistent. The most diverse vegetation type was OD-EW1, with 41 species (54.7%), while the least diverse was RH-EOW1 with 19 species (25%).

Table 4-5: Summary of vegetation types within the survey area

Vegetation Community	Broad Floristic Formation (NVIS VI)	Vegetation Description	Landform	Image
CLP-EW1 Area: 43ha	Eucalypt Woodlands (MVG 5)	Mid woodland of *Eucalyptus salmonophloia* over mid open shrubland of *Acacia hemiteles*/ *Eremophila scoparia* and low open shrubland of *Ptilotus obovatus* on clay-loam plain.	Clay-Loam Plain	
RH-EW1 Area: 187ha	Eucalypt Woodlands (MVG 5)	Mid woodland *Eucalyptus clelandiorum/E. oleosa* over mid open shrubland of *Eremophila caperata* and low sparse shrubland of *Cratystylis conocephala/ Eremophila pustulata* on hillslope.	Hillslope	

Vegetation Community	Broad Floristic Formation (NVIS VI)	Vegetation Description	Landform	Image
RH-EOW1 Area: 10ha	Eucalypt Open Woodlands (MVG 5)	Mid open woodland of *Eucalyptus salubris/E. clelandiorum* over mid sparse shrubland of *Eremophila* sp. Mt Jackson (G.J. Keighery 4372) and low sparse shrubland of *Cratystylis subspinescens* on hillslope.	Hillslope	
OD-EW1 Area: 39ha	Eucalypt Woodlands (MVG 5)	Mid woodland of *Eucalyptus salmonophloia* over mid open shrubland of *Acacia hemiteles/ Eremophila scoparia* and low open shrubland of *Ptilotus obovatus* in open depression	Open depression	
N/A	CV	Mining disturbance	NA	

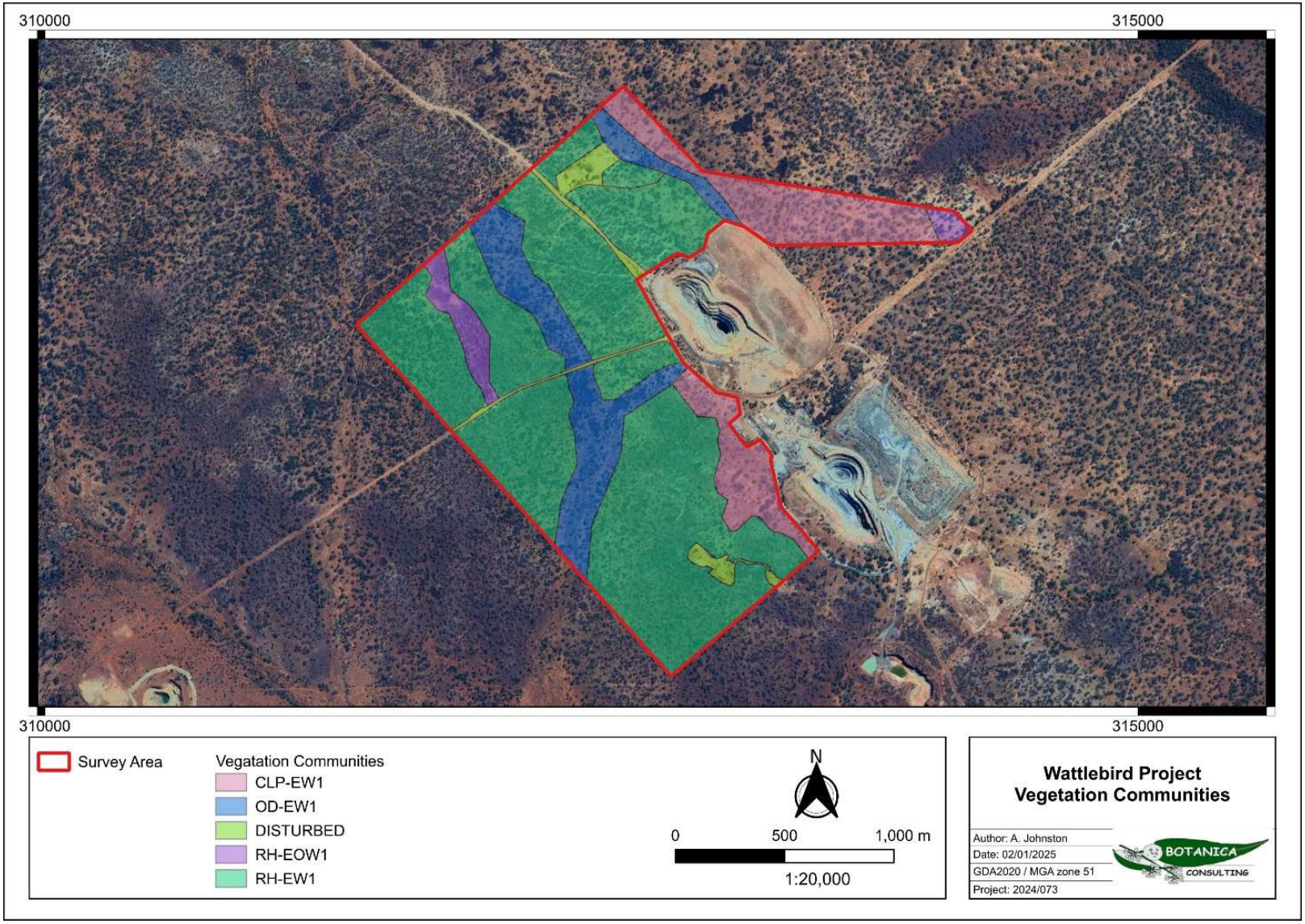


Figure 4-2: Vegetation communities within the survey area

4.2.3 Vegetation Condition

Based on the vegetation condition rating scale adapted from Keighery (1994) and Trudgen, (1988), native vegetation within the survey area was categorized as 'degraded' to 'very good'. (Figure 4-3, Table 4-6). Areas that had a vegetation rating of degraded include roads, open pit mines, dam, and other mine operations. Vegetation condition rating descriptions are listed in Appendix D.

Table 4-6: Vegetation condition rating within the survey area

Condition rating	Description	Area (ha)	Area (%)
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	10	3.3%
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.	269	93.4%
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management.	9	3.3%
Total		**288**	**100%**

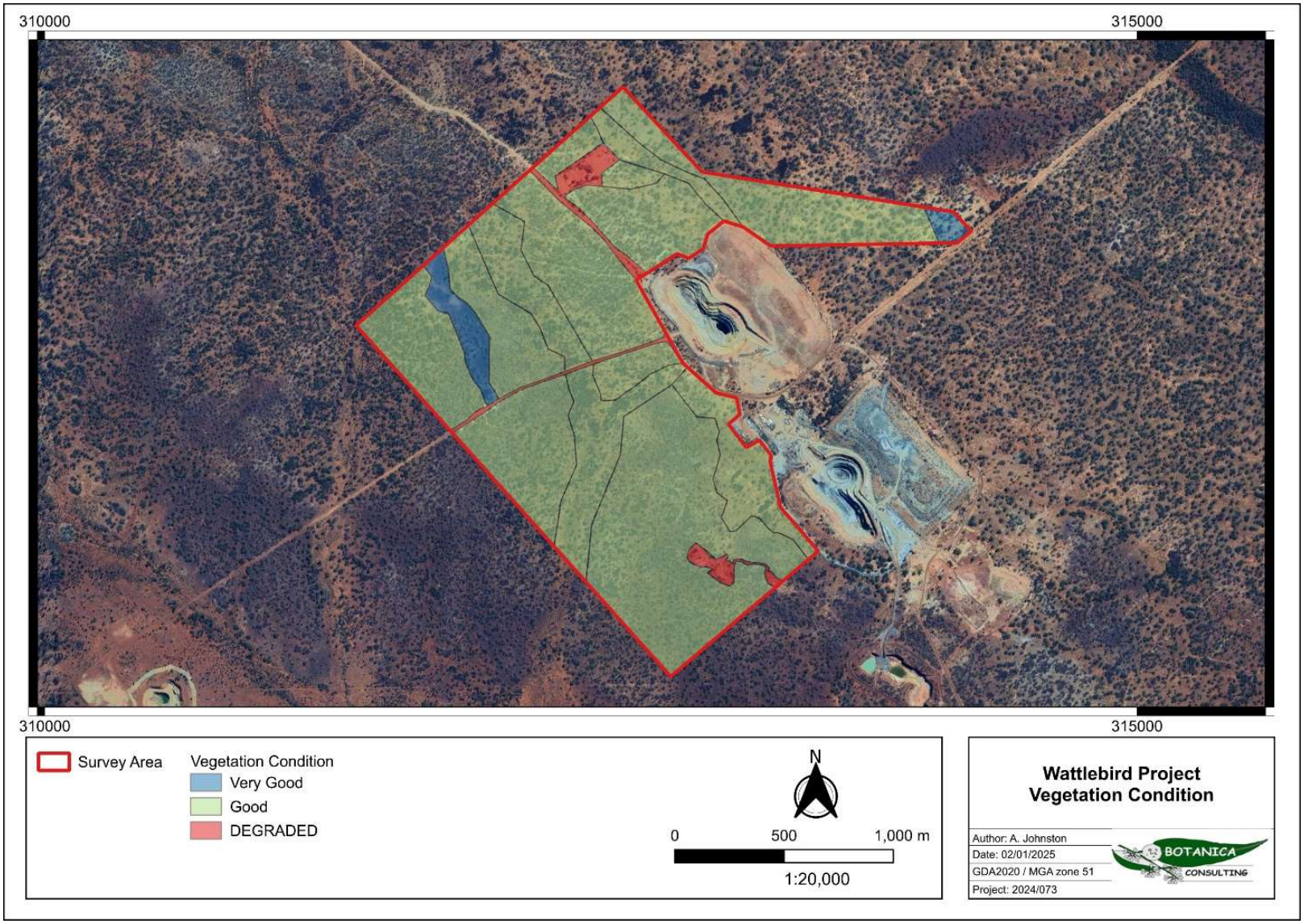


Figure 4-3: Vegetation condition within the survey area

4.2.4 Significant Vegetation

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

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

No Threatened, Priority or otherwise significant ecological communities were identified within the survey area.

4.2.5 Fauna

4.2.5.1 Fauna Habitat

Based on vegetation and associated landforms identified during the flora and vegetation assessment, seven broad scale terrestrial fauna habitats were identified as occurring within the survey area. Based on the proximity to the Goldfields highway, it is unlikely to support a high level of fauna numbers and diversity. Table 4-8 provides the area and a visual representation of fauna habitat types, and the extent of fauna habitats is shown spatially in Figure 4-4.

Table 4-7 provides a list of opportunistic observations of fauna species that was made during the field survey with a total of nine fauna species observed.

Table 4-7: Fauna species observed during the field survey

Taxon	Common Name	Comments
Avifauna		
Barnardius zonarius	Ringneck parrot	Observed
Cacatua roseicapilla	Galah	Observed
Coracina novaehollandiae	Black-faced cuckoo-shrike	Observed
Corvus coronoides	Australian raven	Observed
Grallina cyanoleuca	Magpie lark	Observed
Lichmera indistincta	Brown honey eater	Observed
Mammals		
Felis catus	Cat	Tracks observed
Oryctolagus cuniculus	Rabbit	Scats Observed
Macropus fuliginosus melanops	Western grey kangaroo	Scats Observed

Table 4-8: Main terrestrial fauna habitats within the survey area

Fauna Habitat Description	Representative Fauna Attributes	Example Image
Eucalypt woodlands on rocky slope Area= 197ha (68%)	• Ground not particularly suited to burrowing species. • Moderate diversity vegetation strata supporting a lower avifauna assemblage. • Potential refuge for small fauna under rocks, for example reptile fauna	
Eucalypt woodland on clay loam plain Area = 43ha (15%)	• Ground moderately suited to burrowing species. • Low to Moderate diversity vegetation strata supporting avifauna assemblage. • Moderate vegetation density and leaf litter, providing some refuge for reptiles.	
Eucalypt woodland in open depression Area= 39ha (13.5%)	• Ground moderately suited to burrowing species in some areas. • Moderate diversity vegetation strata supporting a good avifauna assemblage. • Moderate vegetation density and moderate leaf litter supporting small reptiles. • Source of water after rainfall events.	
Cleared areas Area= 9ha (3%)	• Ground not suited to burrowing species. • Very low diversity vegetation strata supporting minimal avifauna assemblage. • Very low vegetation density and very low leaf litter.	NA

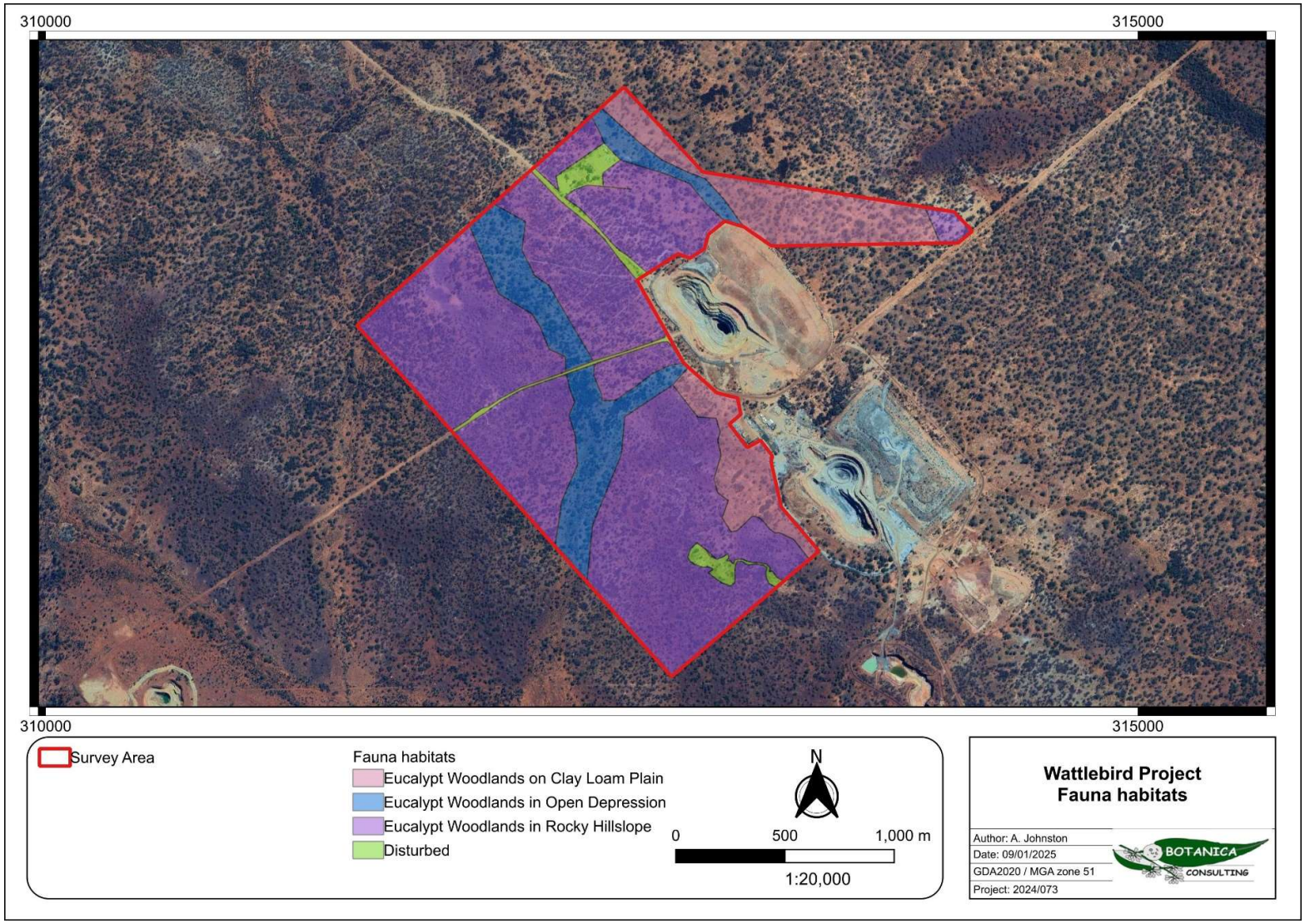


Figure 4-4: Fauna habitats within the survey area

4.2.5.2 Significant Fauna

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

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

No evidence of significant fauna species was observed during the survey, including no evidence of Malleefowl nesting mounds or other activity.

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

- **Malleefowl (*Leipoa ocellata)* - Vulnerable (EPBC Act and BC Act)**

  Previous surveys nearby have only found inactive mounds and no evidence of them breeding in the area.

- **Southern Whiteface (*Aphelocephala leucopsis)* - Vulnerable (EPBC Act)**

  This species is sparsely recorded throughout inland Australia. Suitable habitat may be present but is unlikely to represent critical habitat.

- **Arid bronze azure butterfly (*Ogyris subterrestris petrina)* – Critically Endangered (EPBC Act and BC Act)**

  Could possibly utilise the area, however surveys nearby have found no evidence of this butterfly in the area.

- **Inland hairstreak (*Jalmenus aridus*) – Priority 1 (DBCA)**

  Could possibly utilise the area, however surveys nearby have found no evidence of this butterfly in the area.

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

4.3 Matters of National Environmental Significance

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

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

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

No Matters of National Environmental Significance were identified within the survey area. Matters of State Environmental Significance

4.3.2 *Environmental Protection Act WA 1986*

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

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

the above". Exemptions under Schedule 6 of the EP Act and the EP Regulations do not apply in ESAs as declared under Section 51B of the EP Act or TEC listed under State and Commonwealth legislation.

No Matters of State Environmental Significance were identified within the survey area. No Environmentally Sensitive Areas were identified within the survey area.

4.3.3 *Biodiversity Conservation Act 2016*

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

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

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

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

4.4 Other Areas of Conservation Significance

The DBCA lists 'Priority' species and communities which are under consideration for declaration as 'Threatened' under the BC Act. These Priority species/ communities have no formal legal protection until they are endorsed by the Minister as being Threatened. No PEC's as listed by DBCA were identified within the survey area.

There are no wetlands of international importance (Ramsar Wetlands) or national importance (Australian Nature Conservation Agency Wetlands) within the survey area. There is a nationally important wetland (Rowles Lagoon) located approximately 16km North-West of the survey area.

There are no gazetted or proposed conservation reserves within the survey area. The closest gazetted reserve is the Rowles Lagoon Conservation Park (R4274) approximately 18km North-West of the survey area (Figure 2-5).

4.5 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of

the EP Act (Table 4-9). The assessment found that the proposed vegetation clearing activities are unlikely to be at variance with any clearing principle.

Table 4-9: Assessment against native vegetation clearing principles

Letter	Principle	Assessment	Outcome
Native vegetation should not be cleared if it:			
(a)	comprises a high level of biological diversity.	Vegetation within the survey area is considered to be of low biological diversity and is well represented outside the survey area.	Clearing is unlikely to be at variance with this principle
(b)	comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	The basic fauna search did not record any evidence for the presence of significant fauna or habitat within the survey area.	Clearing is unlikely to be at variance with this principle
(c)	includes, or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the BC Act and the EPBC Act were identified within the survey area.	Clearing is unlikely to be at variance with this principle
(d)	comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No Threatened Ecological Communities were identified as potentially occurring within the survey area.	Clearing is unlikely to be at variance with this principle
(e)	is significant as a remnant of native vegetation in an area that has been extensively cleared	The one vegetation association retains over 89% of its pre-European extent.	Clearing is unlikely to be at variance with this principle
(f)	is growing, in, or in association with, an environment associated with a watercourse or wetland	One minor ephemeral drainage line was identified within the survey area.	Clearing is unlikely to be at variance with this principle
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The survey area and surrounding region has not been extensively cleared. Clearing within the survey area is not considered likely to lead to land degradation issues such as salinity, water logging or acidic soils.	Clearing is unlikely to be at variance with this principle
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Clearing within the survey area is unlikely to impact any conservation reserves.	Clearing is unlikely to be at variance with this principle
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	One minor ephemeral drainage line was identified within the survey area. Clearing activities are unlikely to impact hydrological systems.	Clearing is unlikely to be at variance with this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Rainfall in the Eastern Goldfields subregion has an average rainfall of 200 – 300mm. Rainfall events are unlikely to result in localised flooding. Clearing within the survey area is not likely to increase the incidence or intensity of flooding within the survey area or surrounds.	Clearing is unlikely to be at variance with this principle

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APPENDIX A:
CONSERVATION RATINGS BC ACT AND EPBC ACT

Definitions of Conservation Significant Species

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

Code	Category
	Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, which are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
CD	**Species of special conservation interest** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as Threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
Priority species Possibly Threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of Priority for survey and evaluation of conservation status so that consideration can be given to their declaration as Threatened Fauna or Flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.	
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
Commonwealth categories of Threatened species	
EX	**Extinct** Taxa where there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild** Taxa where it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CR	**Critically Endangered** Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.

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

Definitions of conservation significant communities

Category Code	Category
State categories of Threatened Ecological Communities (TEC)	
PD	**Presumed Totally Destroyed**
	An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:
	• records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or;
	• all occurrences recorded within the last 50 years have since been destroyed.
CR	**Critically Endangered**
	An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the immediate future.
EN	**Endangered**
	An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short-term future, or is unlikely to be substantially rehabilitated in the short-term future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the short-term future.
VU	**Vulnerable**
	An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:
	The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;
	The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;
	The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.
Commonwealth categories of Threatened Ecological Communities (TEC)	
CE	**Critically Endangered** If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
EN	**Endangered** If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).

Category Code	Category
VU	**Vulnerable** If, at that time, an ecological community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).
Priority Ecological Communities	
P1	**Poorly-known ecological communities**
	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	**Poorly-known ecological communities**
	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	**Poorly known ecological communities**
	Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
	Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
	Communities made up of large, and/or widespread occurrences, which may or not be represented in the reserve system but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	**Ecological communities that are adequately known, rare but not threatened** or meet criteria for near threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	**Conservation Dependent ecological communities**
	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

APPENDIX B:
NATUREMAP SEARCH (40KM)

Animalia
AMPHI
Neobatrachus kunapalari
Neobatrachus sutor
Neobatrachus wilsmorei
Pseudophryne occidentalis
BIRD
Acanthagenys rufogularis
Acanthiza apicalis
Acanthiza chrysorrhoa
Acanthiza robustirostris
Acanthiza uropygialis
Accipiter cirrocephalus
Accipiter fasciatus
Actitis hypoleucos
Aegotheles cristatus
Anas gracilis
Anas rhynchotis
Anas superciliosa
Anhinga melanogaster subsp. novaehollandiae
Anthochaera carunculata
Aphelocephala leucopsis
Aphelocephala leucopsis subsp. castaneiventris
Aquila audax
Ardea pacifica
Ardeotis australis
Arenaria interpres
Artamus cinereus
Artamus cyanopterus
Artamus personatus
Aythya australis
Barnardius zonarius
Biziura lobata
Cacomantis flabelliformis
Cacomantis pallidus
Calamanthus cautus
Calidris acuminata
Calidris ferruginea
Calidris ruficollis
Certhionyx variegatus
Charadrius ruficapillus
Charadrius veredus
Chenonetta jubata
Cheramoeca leucosterna
Chroicocephalus novaehollandiae
Cincloramphus cruralis
Cincloramphus mathewsi
Cinclosoma castaneothorax
Cinclosoma castanotus
Circus approximans
Circus assimilis
Cladorhynchus leucocephalus
Climacteris affinis
Climacteris rufa
Colluricincla harmonica
Coracina novaehollandiae
Coracina novaehollandiae subsp. novaehollandiae
Corvus bennetti
Corvus coronoides
Corvus orru
Coturnix pectoralis
Cracticus nigrogularis
Cracticus tibicen
Cracticus torquatus
Cuculus pallidus
Cygnus atratus
Daphoenositta chrysoptera
Daphoenositta chrysoptera subsp. pileata
Dicaeum hirundinaceum
Dromaius novaehollandiae
Drymodes brunneopygia
Egretta novaehollandiae
Elanus axillaris
Elseyornis melanops
Eolophus roseicapillus
Epthianura albifrons
Epthianura tricolor
Erythrogonys cinctus
Eurostopodus argus
Falco berigora
Falco cenchroides
Falco longipennis
Falco peregrinus
Fulica atra
Fulica atra subsp. australis
Gavicalis virescens
Geopelia cuneata
Gerygone fusca
Glossopsitta porphyrocephala
Grallina cyanoleuca

Haliastur sphenurus
Hieraaetus morphnoides
Himantopus himantopus
Hirundo neoxena
Leipoa ocellata
Lichenostomus leucotis
Lichenostomus ornatus
Lichenostomus penicillatus
Lichenostomus plumulus
Lichenostomus virescens
Lichmera indistincta
Malacorhynchus membranaceus
Malurus leucopterus
Malurus pulcherrimus
Malurus splendens
Manorina flavigula
Megalurus gramineus
Melanodryas cucullata
Melithreptus brevirostris
Melopsittacus undulatus
Merops ornatus
Microcarbo melanoleucos
Microeca fascinans
Milvus migrans
Ninox novaeseelandiae
Nymphicus hollandicus
Ocyphaps lophotes
Oreoica gutturalis
Oxyura australis
Pachycephala inornata
Pachycephala pectoralis
Pachycephala rufiventris
Pardalotus punctatus
Pardalotus striatus
Pavo cristatus
Petrochelidon ariel
Petrochelidon nigricans
Petroica goodenovii
Phalacrocorax carbo
Phalacrocorax sulcirostris
Phaps chalcoptera
Platalea flavipes
Platycercus zonarius
Podargus strigoides
Poliocephalus poliocephalus
Pomatostomus superciliosus
Porzana fluminea
Ptilotula ornatus
Purnella albifrons
Pyrrholaemus brunneus
Recurvirostra novaehollandiae
Rhipidura albiscapa
Rhipidura leucophrys
Smicrornis brevirostris
Stictonetta naevosa
Strepera versicolor
Sugomel niger
Tachybaptus novaehollandiae
Tadorna tadornoides
Taeniopygia guttata
Thinornis rubricollis
Threskiornis molucca
Threskiornis spinicollis
Todiramphus pyrrhopygius
Todiramphus sanctus
Tribonyx ventralis
Tringa glareola
Tringa nebularia
Vanellus tricolor
FISH
Carassius auratus
MAMMAL
Antechinomys laniger
Camelus dromedarius
Capra hircus
Cercartetus concinnus
Chalinolobus gouldii
Chalinolobus morio
Mormopterus planiceps
Mormopterus sp.
Mus musculus
Ningaui ridei
Ningaui yvonneae
Notomys mitchellii
Nyctophilus geoffroyi
Oryctolagus cuniculus
Pseudantechinus woolleyae
Pseudomys albocinereus
Pseudomys bolami
Pseudomys hermannsburgensis
Scotorepens balstoni
Sminthopsis crassicaudata
Sminthopsis dolichura
Sminthopsis gilberti
Sminthopsis ooldea
Sminthopsis sp.
Tadarida australis
Vespadelus baverstocki
Vespadelus regulus
Vulpes vulpes
REPTILE
Brachyurophis semifasciatus
Caimanops amphiboluroides
Cryptoblepharus australis
Cryptoblepharus buchananii
Cryptoblepharus plagiocephalus
Ctenophorus cristatus
Ctenophorus fordi
Ctenophorus isolepis
Ctenophorus isolepis subsp. citrinus
Ctenophorus ornatus
Ctenophorus reticulatus

Ctenophorus salinarum
Ctenophorus scutulatus
Ctenotus atlas
Ctenotus leonhardii
Ctenotus schomburgkii
Ctenotus uber
Ctenotus uber subsp. uber
Ctenotus xenopleura
Cyclodomorphus melanops subsp. elongatus
Delma australis
Delma butleri
Demansia psammophis subsp. psammophis
Diplodactylus conspicillatus
Diplodactylus granariensis
Diplodactylus granariensis subsp. granariensis
Diplodactylus pulcher
Diporiphora amphiboluroides
Egernia depressa
Egernia formosa
Egernia richardi
Eremiascincus richardsonii
Furina ornata
Gehyra purpurascens
Gehyra variegata
Hemiergis initialis subsp. initialis
Hesperoedura reticulata
Heteronotia binoei
Lerista kingi
Lerista picturata
Lerista sp.
Lerista timida
Lialis burtonis
Liopholis inornata
Liopholis striata
Lucasium maini

Menetia greyii
Moloch horridus
Morethia adelaidensis
Morethia butleri
Nephrurus vertebralis
Parasuta gouldii
Parasuta monachus
Pogona minor
Pogona minor subsp. minor
Pseudechis australis
Pseudonaja mengdeni
Pseudonaja modesta
Pseudonaja nuchalis
Pygopus nigriceps
Ramphotyphlops australis
Ramphotyphlops bicolor
Ramphotyphlops bituberculatus
Ramphotyphlops hamatus
Ramphotyphlops waitii
Rhynchoedura ornata
Simoselaps bertholdi
Simoselaps semifasciata
Strophurus assimilis
Strophurus elderi
Strophurus wellingtonae
Suta fasciata
Tiliqua occipitalis
Tiliqua rugosa subsp. aspera
Tiliqua rugosa subsp. rugosa
Tympanocryptis cephala
Tympanocryptis cephalus
Tympanocryptis pseudopsephos subsp.
Underwoodisaurus milii
Varanus caudolineatus
Varanus gouldii

Plantae
DICOT
Abutilon cryptopetalum
Abutilon oxycarpum
Acacia acuminata
Acacia ancistrophylla var. ancistrophylla
Acacia andrewsii
Acacia aneura
Acacia burkittii
Acacia caesaneura
Acacia collegialis
Acacia consanguinea
Acacia coolgardiensis
Acacia cylindrica
Acacia duriuscula
Acacia effusifolia
Acacia epedunculata

Acacia erinacea
Acacia hemiteles
Acacia inaequiloba
Acacia inceana subsp. inceana
Acacia jennerae
Acacia kalgoorliensis
Acacia lasiocalyx
Acacia leptopetala
Acacia ligulata
Acacia longispinea
Acacia masliniana
Acacia merrallii
Acacia mulganeura
Acacia murrayana
Acacia nyssophylla
Acacia oswaldii
Acacia oswaldii (Narrow phyllode variant)

Acacia prainii
Acacia quadrimarginea
Acacia ramulosa var. linophylla
Acacia ramulosa var. ramulosa
Acacia resinimarginea
Acacia sibina
Acacia sibirica
Acacia sp.
Acacia sp.Juliflorae - terete Eremaean Region
Acacia tetragonophylla
Acacia uncinella
Acacia xerophila var. xerophila
Acacia yorkrakinensis subsp. acrita
Actinobole uliginosum
Alectryon oleifolius subsp. canescens
Allocasuarina campestris
Allocasuarina corniculata
Allocasuarina eriochlamys subsp. eriochlamys
Allocasuarina spinosissima
Aluta aspera subsp. aspera
Alyxia buxifolia
Amyema benthamii
Amyema gibberula var. gibberula
Amyema linophylla subsp. linophylla
Amyema preissii
Angianthus prostratus
Angianthus tomentosus
Arabidella chrysodema
Asteridea athrixioides
Asteridea chaetopoda
Atriplex acutibractea subsp. acutibractea
Atriplex codonocarpa
Atriplex lindleyi subsp. conduplicata
Atriplex lindleyi subsp. inflata
Atriplex nummularia
Atriplex nummularia subsp. spathulata
Atriplex pumilio
Atriplex quadrivalvata var. quadrivalvata
Atriplex semibaccata
Atriplex sp.
Atriplex vesicaria
Balaustion pulcherrimum
Banksia elderiana
Bergia trimera
Beyeria sulcata var. brevipes
Beyeria sulcata var. sulcata
Boronia coerulescens
Boronia coerulescens subsp. coerulescens
Boronia ternata
Boronia ternata var. ternata
Brachychiton gregorii
Brachyscome ciliaris
Brachyscome iberidifolia
Brachyscome lineariloba
Brachyscome perpusilla
Brachyscome sp. indet

Brachysola coerulea
Brunonia australis
Calandrinia eremaea
Calandrinia pumila
Calandrinia sp. Blackberry (D.M. Porter 171)
Calocephalus francisii
Calothamnus gilesii
Calotis hispidula
Calotis multicaulis
Calotis sp.
Calytrix birdii
Carrichtera annua
Carthamus lanatus
Cassia artemisioides subsp. filifolia
Casuarina obesa
Casuarina pauper
Centaurea melitensis
Centipeda crateriformis subsp. crateriformis
Centipeda pleiocephala
Cephalipterum drummondii
Chamelaucium ciliatum
Chenopodium album
Chenopodium curvispicatum
Chenopodium nitrariaceum
Chrysocephalum puteale
Chthonocephalus pseudevax
Comesperma integerrimum
Comesperma scoparium
Comesperma spinosum
Commersonia craurophylla
Conospermum stoechadis subsp. stoechadis
Convolvulus clementii
Convolvulus remotus
Crassula colorata var. acuminata
Crassula colorata var. colorata
Crassula tetramera
Cratystylis microphylla
Crenidium spinescens
Cryptandra aridicola
Cryptandra micrantha
Cuscuta epithymum
Cyanostegia angustifolia
Cyanostegia microphylla
Dampiera eriocephala
Dampiera latealata
Dampiera stenostachya
Dampiera tenuicaulis
Dampiera tenuicaulis var. tenuicaulis
Dasymalla terminalis
Daucus glochidiatus
Daviesia aphylla
Daviesia grahamii
Dicrastylis parvifolia
Dillwynia sp. Coolgardie (V.E. Sands 637.3.1)
Disphyma crassifolium subsp. clavellatum
Dissocarpus paradoxus

Dittrichia graveolens
Dodonaea adenophora
Dodonaea amblyophylla
Dodonaea lobulata
Dodonaea microzyga var. acrolobata
Dodonaea rigida
Dodonaea stenozyga
Dodonaea viscosa subsp. angustissima
Drosera moorei
Duboisia hopwoodii
Duma florulenta
Dysphania kalpari
Enchylaena lanata
Enchylaena tomentosa
Eremophila alternifolia
Eremophila caerulea subsp. caerulea
Eremophila caperata
Eremophila clarkei
Eremophila decipiens subsp. decipiens
Eremophila deserti
Eremophila glabra subsp. glabra
Eremophila granitica
Eremophila interstans subsp. interstans
Eremophila interstans subsp. virgata
Eremophila ionantha
Eremophila latrobei subsp. latrobei
Eremophila longifolia
Eremophila maculata subsp. brevifolia
Eremophila metallicorum
Eremophila miniata
Eremophila oldfieldii subsp. angustifolia
Eremophila oppositifolia subsp. angustifolia
Eremophila pantonii
Eremophila parvifolia subsp. auricampa
Eremophila parvifolia x scoparia
Eremophila praecox
Eremophila pustulata
Eremophila scoparia
Eremophila serrulata
Eremophila sp.
Eremophila sp. Mt Jackson (G.J. Keighery 4372)
Eremophila subfloccosa subsp. lanata
Eremophila weldii
Eriochiton sclerolaenoides
Erodium aureum
Erodium cicutarium
Erodium cygnorum
Erymophyllum ramosum subsp. ramosum
Eucalyptus calycogona subsp. calycogona
Eucalyptus campaspe
Eucalyptus celastroides
Eucalyptus celastroides subsp. celastroides
Eucalyptus ceratocorys
Eucalyptus clelandii
Eucalyptus clelandiorum

Eucalyptus comitae-vallis
Eucalyptus concinna
Eucalyptus cylindrocarpa
Eucalyptus ebbanoensis subsp. ebbanoensis
Eucalyptus ebbanoensis subsp. glauciramula
Eucalyptus educta
Eucalyptus educta x ewartiana
Eucalyptus eremicola
Eucalyptus ewartiana
Eucalyptus flavida
Eucalyptus griffithsii
Eucalyptus horistes
Eucalyptus jutsonii subsp. jutsonii
Eucalyptus leptopoda subsp. subluta
Eucalyptus lesouefii
Eucalyptus longissima
Eucalyptus loxophleba subsp. lissophloia
Eucalyptus moderata
Eucalyptus oldfieldii
Eucalyptus oleosa
Eucalyptus oleosa subsp. oleosa
Eucalyptus oleosa var. obtusa
Eucalyptus planipes
Eucalyptus ravida
Eucalyptus rigidula
Eucalyptus salicola
Eucalyptus salmonophloia
Eucalyptus salubris
Eucalyptus sp. Mulga Rock (K.D. Hill & L.A.S. Johnson KH 2668)
Eucalyptus sp. Southern smooth-bark (D. Nicolle & M. French DN 6916)
Eucalyptus torquata
Eucalyptus transcontinentalis
Eucalyptus trichopoda
Eucalyptus urna
Eucalyptus yilgarnensis
Euphorbia drummondii subsp. drummondii
Euphorbia philochalix
Euphorbia porcata
Euryomyrtus maidenii
Exocarpos aphyllus
Frankenia interioris
Frankenia pauciflora var. pauciflora
Frankenia setosa
Frankenia sp.
Frankenia tetrapetala
Gilberta tenuifolia
Glischrocaryon aureum
Glossostigma drummondii
Glycyrrhiza acanthocarpa
Gnephosis arachnoidea
Gnephosis brevifolia
Gnephosis intonsa
Gnephosis macrocephala
Gnephosis sp.
Gompholobium cinereum

Gompholobium gompholobioides
Goodenia dyeri
Goodenia havilandii
Goodenia mimuloides
Goodenia mueckeana
Goodenia occidentalis
Goodenia pinnatifida
Goodenia pusilliflora
Grevillea acacioides
Grevillea acuaria
Grevillea cagiana
Grevillea didymobotrya subsp. didymobotrya
Grevillea excelsior
Grevillea haplantha subsp. haplantha
Grevillea hookeriana
Grevillea hookeriana subsp. apiciloba
Grevillea oligomera
Grevillea sarissa subsp. bicolor
Grevillea sarissa subsp. sarissa
Grevillea teretifolia
Gunniopsis septifraga
Hakea francisiana
Hakea recurva
Hakea rigida
Hakea scoparia subsp. scoparia
Halgania cyanea var. Allambi Stn (B.W. Strong 676)
Halgania integerrima
Haloragis gossei / trigonocarpa
Haloragis trigonocarpa
Haloragis trigonocarpa/gossei
Halosarcia chartacea
Hannafordia bissillii subsp. latifolia
Heliotropium curassavicum
Helipterum craspedioides
Hemiphora elderi
Hibbertia pungens
Homalocalyx thryptomenoides
Hyalosperma glutinosum subsp. glutinosum
Hybanthus floribundus subsp. curvifolius
Hypochaeris glabra
Hysterobaeckea ochropetala subsp. cometes
Isoetopsis graminifolia
Isotoma petraea
Jacksonia nematoclada
Kippistia suaedifolia
Lachnostachys coolgardiensis
Lawrencella davenportii
Lawrencia diffusa
Lawrencia glomerata
Lawrencia helmsii
Lawrencia repens
Lawrencia squamata
Lechenaultia brevifolia
Leiocarpa websteri
Lemooria burkittii

Lepidium fasciculatum
Lepidium phlebopetalum
Leptosema aculeatum
Leucochrysum fitzgibbonii
Leucopogon hamulosus
Leucopogon sp. Boorabbin (K.R. Newbey 8374)
Leucopogon sp. Coolgardie (M. Hislop & F. Hort MH 3197)
Lycium australe
Lysiana casuarinae
Lysiana exocarpi subsp. exocarpi
Lysimachia arvensis
Lythrum wilsonii
Maireana amoena
Maireana brevifolia
Maireana carnosa
Maireana erioclada
Maireana georgei
Maireana glomerifolia
Maireana marginata
Maireana pentatropis
Maireana pyramidata
Maireana radiata
Maireana sedifolia
Maireana sp.
Maireana tomentosa subsp. tomentosa
Maireana trichoptera
Maireana triptera
Malacocera tricornis
Malleostemon roseus
Malleostemon tuberculatus
Malva parviflora
Malva weinmanniana
Marianthus bicolor
Marrubium vulgare
Marsdenia australis
Medicago minima
Melaleuca calyptroides
Melaleuca cordata
Melaleuca halmaturorum
Melaleuca hamata
Melaleuca lateriflora
Melaleuca phoidophylla
Melaleuca subalaris
Menkea australis
Menkea sphaerocarpa
Micromyrtus monotaxis
Millotia myosotidifolia
Millotia perpusilla
Minuria cunninghamii
Minuria gardneri
Minuria leptophylla
Mirbelia microphylla
Mirbelia ramulosa
Mirbelia seorsifolia
Mirbelia trichocalyx

Monotaxis grandiflora var. obtusifolia
Monotaxis luteiflora
Myosurus australis
Myriocephalus pygmaeus
Nicotiana goodspeedii
Nicotiana rotundifolia
Nicotiana simulans
Notisia intonsa
Olearia muelleri
Olearia muricata
Olearia pimeleoides
Oligocarpus calendulaceus
Oligocarpus sp.
Opuntia elata
Orianthera flaviflora
Orianthera tortuosa
Oxalis perennans
Peplidium sp.
Persicaria prostrata
Persoonia helix
Petalostylis cassioides
Petrophile seminuda
Petrophile stricta
Phebalium appressum
Phebalium canaliculatum
Phebalium filifolium
Phebalium megaphyllum
Phebalium megaphyllum x tuberculosum
Philotheca brucei subsp. brucei
Philotheca tomentella
Physopsis viscida
Pimelea aeruginosa
Pimelea angustifolia
Pimelea microcephala subsp. microcephala
Pittosporum angustifolium
Pityrodia lepidota
Plantago drummondii
Plantago sp. Mt Magnet (A.S. George 6793)
Podolepis capillaris
Podolepis rugata
Pogonolepis muelleriana
Pogonolepis stricta
Polygonum plebeium
Pomaderris forrestiana
Poranthera microphylla
Prostanthera althoferi subsp. althoferi
Prostanthera campbellii
Prostanthera grylloana
Pseudognaphalium luteoalbum
Ptilotus aervoides
Ptilotus carlsonii
Ptilotus chortophytus
Ptilotus exaltatus
Ptilotus exaltatus var. villosus
Ptilotus gaudichaudii
Ptilotus helichrysoides
Ptilotus helipteroides
Ptilotus holosericeus
Ptilotus obovatus
Ptilotus polystachyus
Radyera farragei
Ranunculus pentandrus var. platycarpus
Ranunculus sp.
Rhagodia drummondii
Rhagodia preissii
Rhodanthe charsleyae
Rhodanthe chlorocephala
Rhodanthe chlorocephala subsp. rosea
Rhodanthe chlorocephala subsp. splendida
Rhodanthe floribunda
Rhodanthe haigii
Rhodanthe laevis
Rhodanthe rubella
Rhodanthe stricta
Rhodanthe uniflora
Ricinocarpos sp. Eastern Goldfields (A. Williams 3)
Ricinocarpos stylosus
Roepera billardierei
Roepera eichleri
Roepera eremaea
Roepera ovata
Roepera tetraptera
Roycea divaricata
Rumex crystallinus
Rumex hypogaeus
Salvia reflexa
Salvia verbenaca
Santalum acuminatum
Santalum lanceolatum
Santalum spicatum
Scaevola spinescens
Schinus molle var. areira
Schoenia cassiniana
Sclerolaena cuneata
Sclerolaena diacantha
Sclerolaena drummondii
Sclerolaena fusiformis
Sclerolaena obliquicuspis
Sclerolaena patenticuspis
Senecio glossanthus
Senecio lacustrinus
Senecio pinnatifolius
Senecio pinnatifolius var. pinnatifolius
Senecio quadridentatus
Senna artemisioides
Senna artemisioides subsp. filifolia
Senna artemisioides subsp. x sturtii
Senna charlesiana
Senna pleurocarpa var. angustifolia
Senna pleurocarpa var. pleurocarpa
Seringia cacaobrunnea

Seringia velutina
Sida calyxhymenia
Sida fibulifera
Sida intricata
Sida sp. dark green fruits (S. van Leeuwen 2260)
Sida spodochroma
Sisymbrium irio
Sisymbrium orientale
Solanum cleistogamum
Solanum esuriale
Solanum hoplopetalum
Solanum lasiophyllum
Solanum nigrum
Solanum nummularium
Solanum orbiculatum
Solanum orbiculatum subsp. orbiculatum
Solanum plicatile
Solanum terraneum
Sonchus oleraceus
Stackhousia muricata
Stackhousia sp. Mt Keith (G. Cockerton & G. O'Keefe 11017)
Stenanthemum stipulosum
Stenopetalum filifolium
Streptoglossa cylindriceps
Streptoglossa liatroides
Stylidium arenicola
Stylidium dielsianum
Swainsona affinis
Swainsona beasleyana
Swainsona canescens
Swainsona halophila
Swainsona kingii
Swainsona laciniata
Swainsona paradoxa
Swainsona sp.
Synaptantha tillaeacea var. tillaeacea
Tecticornia chartacea
Tecticornia disarticulata
Tecticornia doliiformis
Tecticornia halocnemoides
Tecticornia indica subsp. bidens
Tecticornia pergranulata subsp. elongata
Tecticornia pergranulata subsp. pergranulata
Tecticornia sp. Burnerbinmah (D. Edinger et al. 101)
Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)
Tecticornia undulata
Templetonia aculeata
Tetragonia eremaea
Tetratheca efoliata
Teucrium disjunctum
Thryptomene urceolaris
Trachymene cyanopetala
Trichanthodium skirrophorum
Trigonella suavissima
Tripterococcus brunonis
Triptilodiscus pygmaeus
Trymalium myrtillus subsp. myrtillus
Velleia cycnopotamica
Velleia rosea
Verreauxia dyeri
Verticordia chrysantha
Verticordia helmsii
Verticordia picta
Vittadinia cervicularis var. cervicularis
Vittadinia dissecta var. hirta
Vittadinia eremaea
Vittadinia humerata
Vittadinia sp.
Vittadinia sulcata
Wahlenbergia gracilenta
Wahlenbergia tumidifructa
Waitzia acuminata
Waitzia acuminata var. acuminata
Waitzia fitzgibbonii
Waitzia nitida
Westringia cephalantha
Westringia rigida
Zygophyllum eichleri
Zygophyllum eremaeum
Zygophyllum fruticulosum
Zygophyllum glaucum
Zygophyllum ovatum
FERN
Cheilanthes lasiophylla
Isoetes muelleri
Marsilea hirsuta
Marsilea sp.
GYMNO
Callitris columellaris
Callitris columellaris x preissii
Callitris preissii
Callitris sp.
LIVERWORT
Asterella drummondii
Riccia bifurca
Riccia crinita
Riccia lamellosa
Riccia limbata
Riccia nigrella
Riccia sp.
MONOCOT
Agave americana
Amphipogon caricinus
Amphipogon caricinus var. caricinus
Aristida contorta
Austrostipa elegantissima
Austrostipa eremophila
Austrostipa nitida
Austrostipa platychaeta
Austrostipa scabra

Austrostipa sp. Mt Burgess (A.A. Mitchell & P.J. Waddell 10499)
Bromus rubens
Bulbine semibarbata
Caladenia footeana
Caladenia nobilis
Caladenia saxicola
Centrolepis strigosa
Chamaexeros macranthera
Chloris truncata
Chrysitrix distigmatosa
Conostylis lepidospermoides
Cyanicula amplexans
Dianella revoluta var. divaricata
Dichanthium sericeum subsp. sericeum
Eleocharis acuta
Eleocharis papillosa
Enneapogon avenaceus
Enneapogon caerulescens
Eragrostis australasica
Eragrostis dielsii
Eragrostis falcata
Eragrostis lacunaria
Eragrostis setifolia
Eriachne flaccida
Eriachne pulchella
Isolepis sp.
Juncus aridicola
Juncus subsecundus
Lachnagrostis filiformis
Lepidobolus preissianus subsp. volubilis
Lepidosperma rigidulum
Lepidosperma sanguinolentum
Monachather paradoxus
Panicum decompositum
Patersonia rudis subsp. velutina
Pentameris airoides
Prasophyllum gracile
Rostraria cristata
Rostraria pumila
Ruppia polycarpa
Rytidosperma caespitosum
Schismus barbatus
Schoenus hexandrus
Schoenus nanus
Setaria sp.
Thelymitra petrophila
Themeda triandra
Thysanotus manglesianus
Thysanotus patersonii *Thysanotus speckii*
Triglochin isingiana
Triodia rigidissima
Triodia scariosa
Triodia tomentosa

APPENDIX C:
LIST OF SPECIES IDENTIFIED WITHIN THE SURVEY AREA

Family	Taxon		CLP-EW1	RH-EW1	RH-EOW1	OD-EW1
Amaranthaceae	*Ptilotus*	*nobilis (A)*	*			
Amaranthaceae	*Ptilotus*	*obovatus*	*		*	*
Amaranthaceae	*Ptilotus*	*helichrysoides*			*	
Apiaceae	*Daucus*	*glochidiatus (A)*	*			
Apocynaceae	*Alyxia*	*buxifolia*	*			*
Asteraceae	*Dittrichia*	*graveolens (W)*	*			*
Asteraceae	*Lemooria*	*burkittii (A)*				*
Asteraceae	*Olearia*	*muelleri*	*	*	*	*
Boraginaceae	*Halgania*	*andromedifolia*	*	*		*
Casuarinaceae	*Casuarina*	*pauper*	*			*
Chenopodiaceae	*Atriplex*	*bunburyana*	*			*
Chenopodiaceae	*Atriplex*	*codonocarpa (A)*		*		*
Chenopodiaceae	*Atriplex*	*nummularia subsp. spathulata*		*		*
Chenopodiaceae	*Atriplex*	*vesicaria*		*	*	
Chenopodiaceae	*Enchylaena*	*tomentosa*	*			*
Chenopodiaceae	*Maireana*	*georgei*	*			*
Chenopodiaceae	*Maireana*	*glomerifolia*		*		*
Chenopodiaceae	*Maireana*	*oppositifolia*	*		*	
Chenopodiaceae	*Maireana*	*pyramidata*	*			*
Chenopodiaceae	*Maireana*	*sedifolia*	*			*
Chenopodiaceae	*Maireana*	*trichoptera*	*			
Chenopodiaceae	*Maireana*	*triptera*	*			*
Chenopodiaceae	*Rhagodia*	*eremaea*		*	*	
Chenopodiaceae	*Sclerolaena*	*diacantha*	*		*	*
Chenopodiaceae	*Sclerolaena*	*drummondii*		*	*	
Chenopodiaceae	*Sclerolaena*	*parviflora*	*	*		*
Chenopodiaceae	*Tecticornia*	*disarticulata*	*		*	
Disphyma	*Disphyma*	*crassifolium*				*
Fabaceae	*Acacia*	*acuminata*			*	
Fabaceae	*Acacia*	*colletioides*		*		
Fabaceae	*Acacia*	*erinacea*		*	*	
Fabaceae	*Acacia*	*hemiteles*	*			*
Fabaceae	*Acacia*	*jennerae*				*
Fabaceae	*Acacia*	*tetragonophylla*				*
Fabaceae	*Senna*	*artemisioides subsp. filifolia*	*	*		*
Fabaceae	*Swainsona*	*canescens*				*
Fabaceae	*Templetonia*	*egena*	*			
Frankeniaceae	*Frankenia*	*setosa*				*
Goodeniaceae	*Scaevola*	*spinescens*			*	
Lamiaceae	*Salvia*	*verbenaca (W)*				*
Lamiaceae	*Westringia*	*rigida*		*	*	
Malvaceae	*Alyogyne*	*hakeifolia*	*			*
Malvaceae	*Sida*	*sp. Golden calyces glabrous (H.N. Foote 32)*				*
Malvaceae	*Sida*	*spodochroma*	*			

Family	Taxon		CLP-EW1	RH-EW1	RH-EOW1	OD-EW1
Myrtaceae	*Eucalyptus*	*celastroides*	*	*	*	*
Myrtaceae	*Eucalyptus*	*clelandiorum*		*	*	*
Myrtaceae	*Eucalyptus*	*griffithsii*		*		
Myrtaceae	*Eucalyptus*	*oleosa*		*		
Myrtaceae	*Eucalyptus*	*ravida*	*			
Myrtaceae	*Eucalyptus*	*salmonophloia*	*			*
Myrtaceae	*Eucalyptus*	*salubris*	*		*	*
Myrtaceae	*Eucalyptus*	*transcontinentalis*	*			*
Myrtaceae	*Eucalyptus*	*yilgarnensis*		*		*
Pittosporaceae	*Pittosporum*	*angustifolium*		*		
Poaceae	*Austrostipa*	*elegantissima*	*			*
Poaceae	*Enneapogon*	*caerulescens*	*			
Proteaceae	*Grevillea*	*nematophylla*		*		
Santalaceae	*Exocarpos*	*aphyllus*	*	*	*	*
Santalaceae	*Santalum*	*acuminatum*	*	*		*
Santalaceae	*Santalum*	*spicatum*	*			*
Sapindaceae	Alectryon	*oleifolius*	*			*
Sapindaceae	*Dodonaea*	*lobulata*		*		
Scrophulariaceae	*Eremophila*	*caperata*	*	*		*
Scrophulariaceae	*Eremophila*	*clarkei*	*			*
Scrophulariaceae	*Eremophila*	*decipiens*		*		
Scrophulariaceae	*Eremophila*	*glabra*			*	
Scrophulariaceae	*Eremophila*	*interstans* subsp. *virgata*		*		*
Scrophulariaceae	*Eremophila*	*ionantha*	*			*
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*			*	*
Scrophulariaceae	*Eremophila*	*parvifolia*			*	
Scrophulariaceae	*Eremophila*	*pustulata*		*		
Scrophulariaceae	*Eremophila*	*scoparia*	*			*
Scrophulariaceae	*Eremophila*	sp. Mt Jackson (G.J. Keighery 4372)			*	
Solanaceae	Solanum	*hoplopetalum*				*
Solanaceae	*Solanum*	*nummularium*				*

(W) denotes introduced (weed) species
(A) denotes annual species

APPENDIX D:
VEGETATION CONDITION RATING

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

APPENDIX E:
EPBC PROTECTED MATTERS SEARCH (40KM BUFFER)

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 18-Dec-2024

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	13
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	5
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	4
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status
Historic		
Goldfields Water Supply Scheme, Western Australia	WA	Listed place

Listed Threatened Species [Resource Information]

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

Scientific Name	Threatened Category	Presence Text
BIRD		
Aphelocephala leucopsis		
Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae		
Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area
INSECT		
Ogyris subterrestris petrina		
Arid Bronze Azure [77743]	Critically Endangered	Species or species habitat may occur within area
MAMMAL		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
PLANT		
Gastrolobium graniticum		
Granite Poison [14872]	Endangered	Species or species habitat may occur within area
Ricinocarpos brevis		
[82879]	Endangered	Species or species habitat may occur within area
Thelymitra stellata		
Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
[Calidris acuminata](#)		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
[Calidris ferruginea](#)		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
[Calidris melanotos](#)		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Tringa nebularia](#)		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Defence	
Defence - KALGOORLIE RIFLE RANGE [50156]	WA
Unknown	
Commonwealth Land - [52184]	WA
Commonwealth Land - [52211]	WA
Commonwealth Land - [52183]	WA
Commonwealth Land - [52230]	WA

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
[Actitis hypoleucos](#)		
Common Sandpiper [59309]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area

Extra Information

State and Territory Reserves		[Resource Information]
Protected Area Name	Reserve Type	State
Clear And Muddy Lakes	Nature Reserve	WA
Credo	NRS Addition - Gazettal in Progress	WA
Kurrawang	Nature Reserve	WA
Rowles Lagoon	Conservation Park	WA

Nationally Important Wetlands	[Resource Information]
Wetland Name	State
Rowles Lagoon System	WA

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Goldfields Water Supply Scheme Project	2019/8547	Controlled Action	Post-Approval
Nava-1 Cable System	2001/510	Controlled Action	Completed
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Lynas Kalgoorlie Rare Earths Processing Facility	2020/8719	Not Controlled Action	Completed

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix 5 – Reconnaissance Flora and Basic Fauna Survey (Botanica Consulting, 2025b)

WATTLEBIRD PROJECT

Reconnaissance Flora and Basic Fauna Survey

Prepared for Norton Goldfields Pty Ltd
August 2025



Prepared by
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Document Information

Prepared for: Norton Goldfields Pty Ltd
Project Name: Wattlebird Project
Tenements: M16/44, M16/396
Job Reference: Reconnaissance Flora and Basic Fauna Survey
Job Number: 2025/079
Date: 26 August 2025
Version: Final

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Quality Assurance

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

Cover Photo: Vegetation in the Survey area, taken 13th June 2025.

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Appendix C: Vegetation Condition Rating

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Appendix E: PMST Search Results

EXECUTIVE SUMMARY

Botanica Consulting Pty Ltd (Botanica) was commissioned by Norton Goldfields Pty Ltd (Norton) to undertake a reconnaissance flora/ vegetation survey and basic fauna survey of their Wattlebird Project (referred to as the 'survey area'). The survey area is located approximately 48 km northwest of Kalgoorlie-Boulder in the Shire of Coolgardie and covers an area of 150 ha.

The survey area lies within the Eastern Goldfields (COO03) subregion of the Coolgardie Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA).

Botanica conducted a flora/ vegetation and basic fauna survey on the 13th of June 2025. The area was surveyed by Jim Williams (Principal Botanist) and Connor Toon (Norton employee). The area was traversed using an all-terrain vehicle.

The field survey identified 64 vascular flora taxa within the survey area. These taxa represented 29 genera across 20 families, with the most diverse families being Chenopodiaceae (16 species). Dominant genera include Eucalyptus (9 species) and Eremophila (10 species). One annual species was observed during the survey. No weed species were recorded within the survey area.

No Threatened or Priority species were identified in the survey area.

A total of four broad-scale vegetation communities were identified within the survey area. Native vegetation was categorized as 'Good,' 'Very Good' or 'Completely Degraded.' Impacts to vegetation include access tracks, historical and current mining and exploration activities.

No Threatened, Priority or otherwise significant ecological communities were identified within the survey area. No Environmentally Sensitive Areas, wetlands of international importance (Ramsar Wetlands) or national importance (Australian Nature Conservation Agency Wetlands) are found within the survey area. There are no known or potential terrestrial Groundwater Dependant Ecosystem (GDE) within the survey area. There are no gazetted or proposed conservation reserves within the survey area.

Based on vegetation and associated landforms identified during the flora and vegetation assessment, three broad scale terrestrial fauna habitats were identified as occurring within the survey area. No evidence of significant fauna species, including Malleefowl, were observed.

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of the EP Act. The assessment found that the proposed vegetation clearing activities are unlikely to be at variance with any clearing principle.

1 INTRODUCTION

Botanica Consulting Pty Ltd (Botanica) was commissioned by Norton Goldfields Pty Ltd (Norton) to undertake a reconnaissance flora/ vegetation survey and basic fauna survey of their Wattlebird Project (referred to as the 'survey area'). The survey area is located approximately 48 km northwest of Kalgoorlie-Boulder in the Shire of Coolgardie and covers an area of 150 ha (Figure 1-1).

1.1 Objectives

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

- gather background information on flora and vegetation in the target area (literature review, database and map-based searches);
- identify significant flora, vegetation and ecological communities and assess the potential sensitivity to impact;
- conduct a field survey to verify / ground truth the desktop assessment findings;
- undertake floristic community mapping to a scale appropriate for the bioregion and described according to the National Vegetation Information System (NVIS) structure and floristics;
- undertake vegetation condition mapping;
- assess the project area's plant species diversity, density, composition, structure and weed cover, using NVIS classification system for vegetation description;
- assess Matters of National Environmental Significance (MNES) and indicate whether potential impacts on MNES as protected under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) are likely to require referral of the project to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW); and
- determine the State legislative context of environmental aspects required for the assessment.

The fauna assessment was conducted in accordance with the requirements of a basic terrestrial fauna survey as defined in *Technical Guidance - Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment – June 2020* (EPA, 2020). The objectives of the assessment were to:

- Undertake a literature review, including map-based information searches of all current and relevant literature sources and databases relating to the survey area;

- Undertake a desktop investigation to identify any previously recorded occurrences of or potentially occurring Threatened and Priority listed fauna within the survey area;
- Undertake searches on available databases for details relating to any Threatened and Priority listed fauna previously identified as occurring or potentially occurring within the survey area;
- Conduct fauna habitat mapping and identify habitat types which are suitable for each significant fauna considered likely or possible to occur, or fauna recorded in the survey area;
- Compile an inventory of fauna species occurrences within the survey area;
- Undertake opportunistic, low intensity sampling of fauna; and
- Report on the conservation status of species present using the Western Australian Museum and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) databases for presence of Threatened and Priority listed fauna species within the survey area.

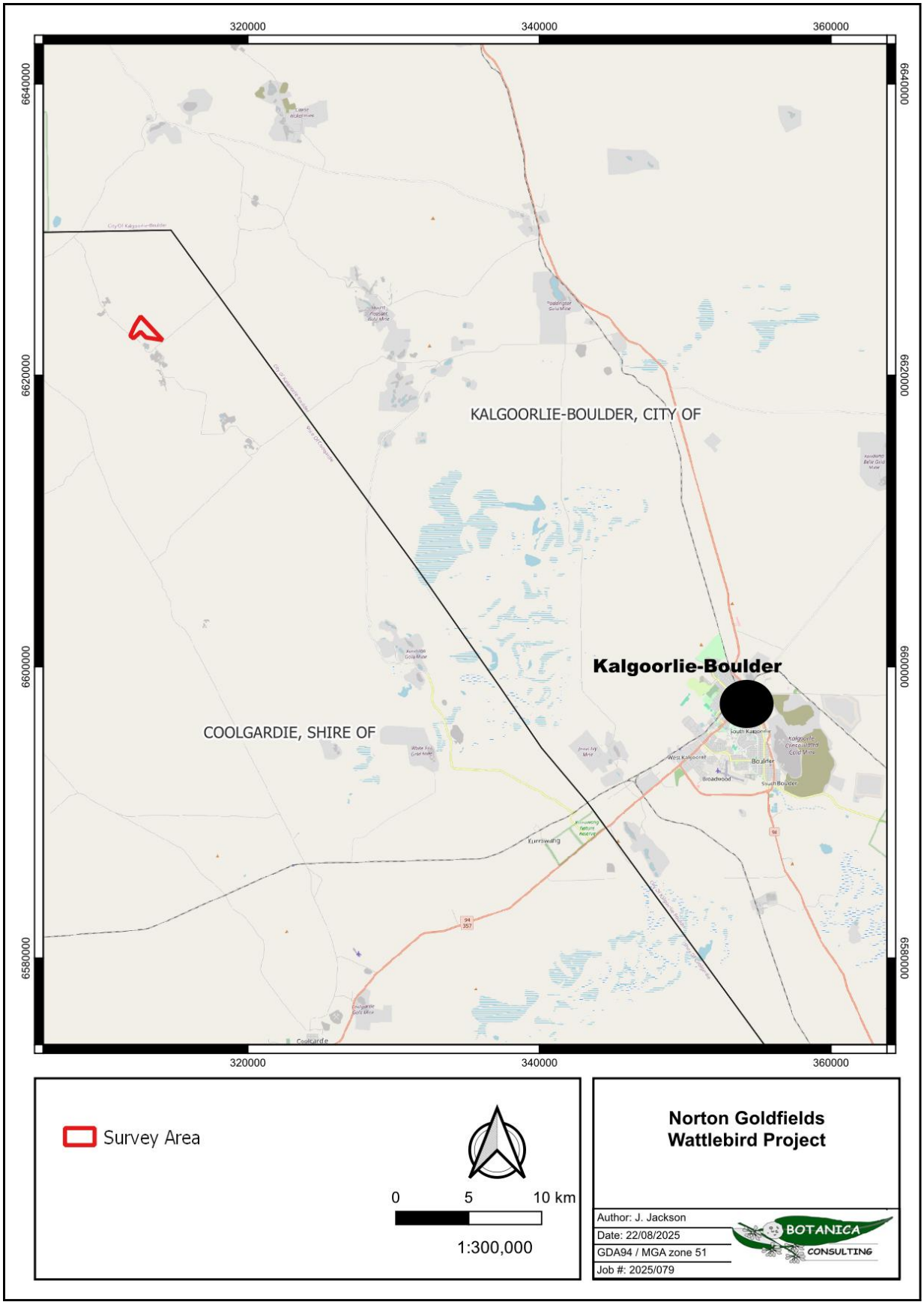


Figure 1-1: Regional map of the survey area

2 REGIONAL BIOPHYSICAL ENVIRONMENT

2.1 Regional Environment

Based on the Interim Biogeographic Regionalisation of Australia (IBRA, Version 7) (DCCEEW, 2020) the survey area is located on the western edge of within the Coolgardie Bioregion of WA. This bioregion is further divided into subregions with the survey area located in the Eastern Goldfields subregion (COO03) (Figure 2-1).

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

The Eastern Goldfields subregion (5,102,428 ha) lies on the Yilgarn Craton's Eastern Goldfields Terrain, which is described as gently undulating plains with a subdued relief, interrupted in the west with low hills and ridges of Archaean greenstones and in the east by a horst of Proterozoic basic granulite. The underlying geology is of gneisses and granites eroded into a flat plane covered with tertiary soils and with scattered exposures of bedrock. Calcareous earths are the dominant soil group and cover much of the plains and greenstone areas. A series of large playa lakes in the western half are the remnants of an ancient major drainage line (Cowan, 2001).

2.2 Land Use

The dominant land uses of the Eastern Goldfields subregion include UCL and Crown reserves, grazing native pastures (37.8%), freehold (7.15%), conservation (1.4%) and mining leases (Cowan, 2001). The survey area is located on the Mt Burges pastoral lease.

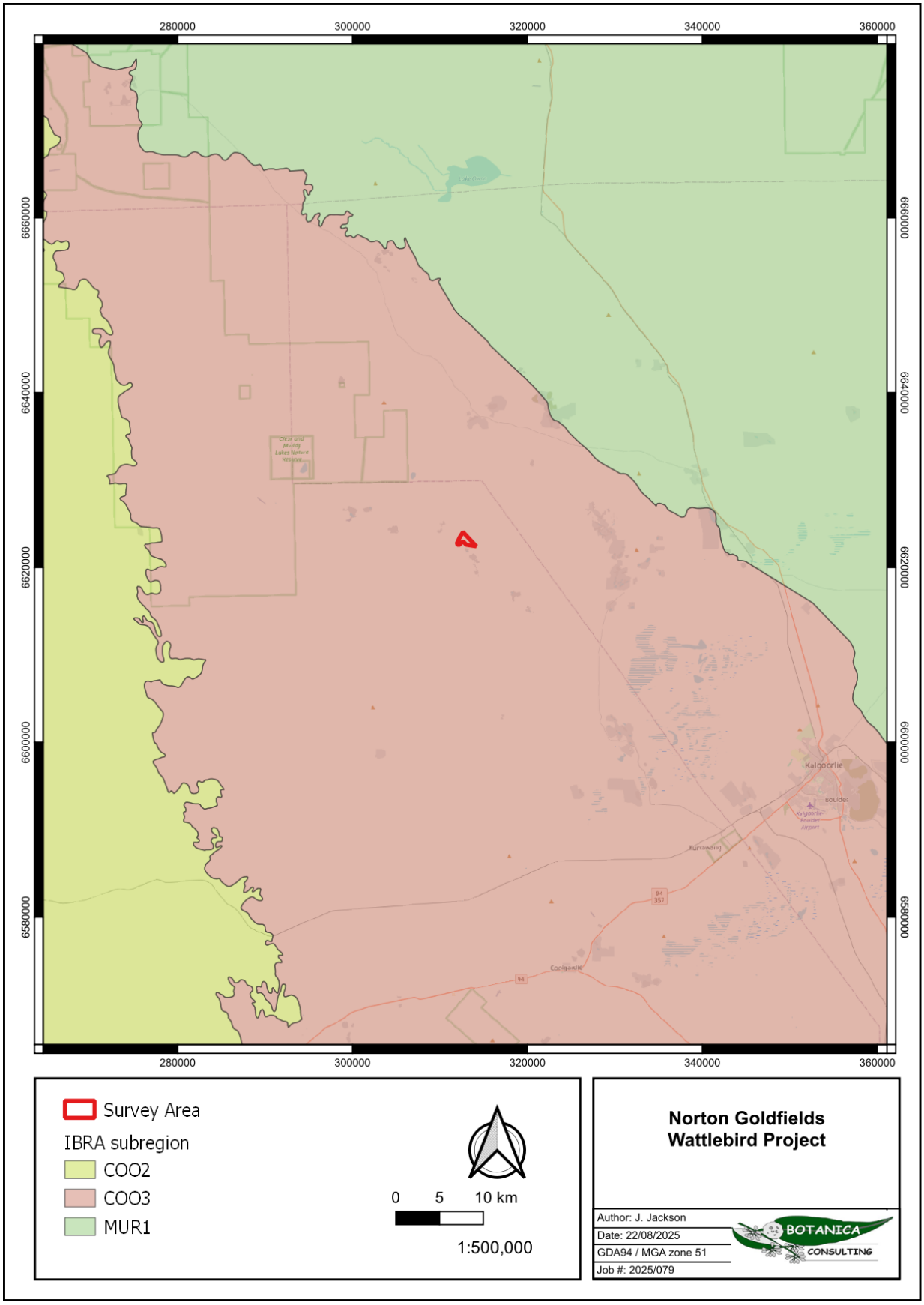


Figure 2-1: Map of IBRA subregions in relation to the survey area

2.3 Soil Landscape Systems

The survey area lies within the Kalgoorlie Province, located in the southern Goldfields between Paynes Find, Menzies, Southern Cross and Balladonia. The landscape consists of undulating plains (with some sandplains, hills and salt lakes) on the granitic rocks and greenstone of the Yilgarn Craton. Soils range from calcareous loamy earths and red loamy earths with some Salt Lake soils to red deep sands, yellow sandy earths, shallow loams and loamy duplexes. Vegetation communities are predominately Eucalypt woodlands with some acacia-casuarina thickets, mulga shrublands, halophytic shrublands and spinifex grasslands (Tille, 2006).

The Kalgoorlie Province is further divided into six soil-landscape zones, with the survey area located within the Kambalda zone (265).

The Kambalda zone (265) is in the south-eastern Goldfields between Menzies, Norseman and the Fraser Range and contains flat to undulating plains (with hills, ranges and some salt lakes and stony plains) on greenstone and granitic rocks of the Yilgarn Craton. Soils consist of calcareous loamy earths and red loamy earths with salt lakes soils and some red brown hardpan shallow loams and red sandy duplexes. Vegetation includes red mallee, blackbutt-salmon gum-gimlet woodlands with mulga and halophytic shrublands and some spinifex grasslands (Tille, 2006).

In accordance with soil landscape system mapping data (Government of Western Australia, 2019), the soil landscape zones are divided into soil landscape systems. The survey area is located within the Mx40 landscape system, as described in Table 2-1 and shown in Figure 2-2.

Table 2-1: Soil landscape systems within the survey area

Soil Landscape System	Description	Extent within Survey Area
265 Mx40	Flat to undulating valley plains and pediments; some rock outcrop	150 ha (100%)
Total		150 ha (100%)

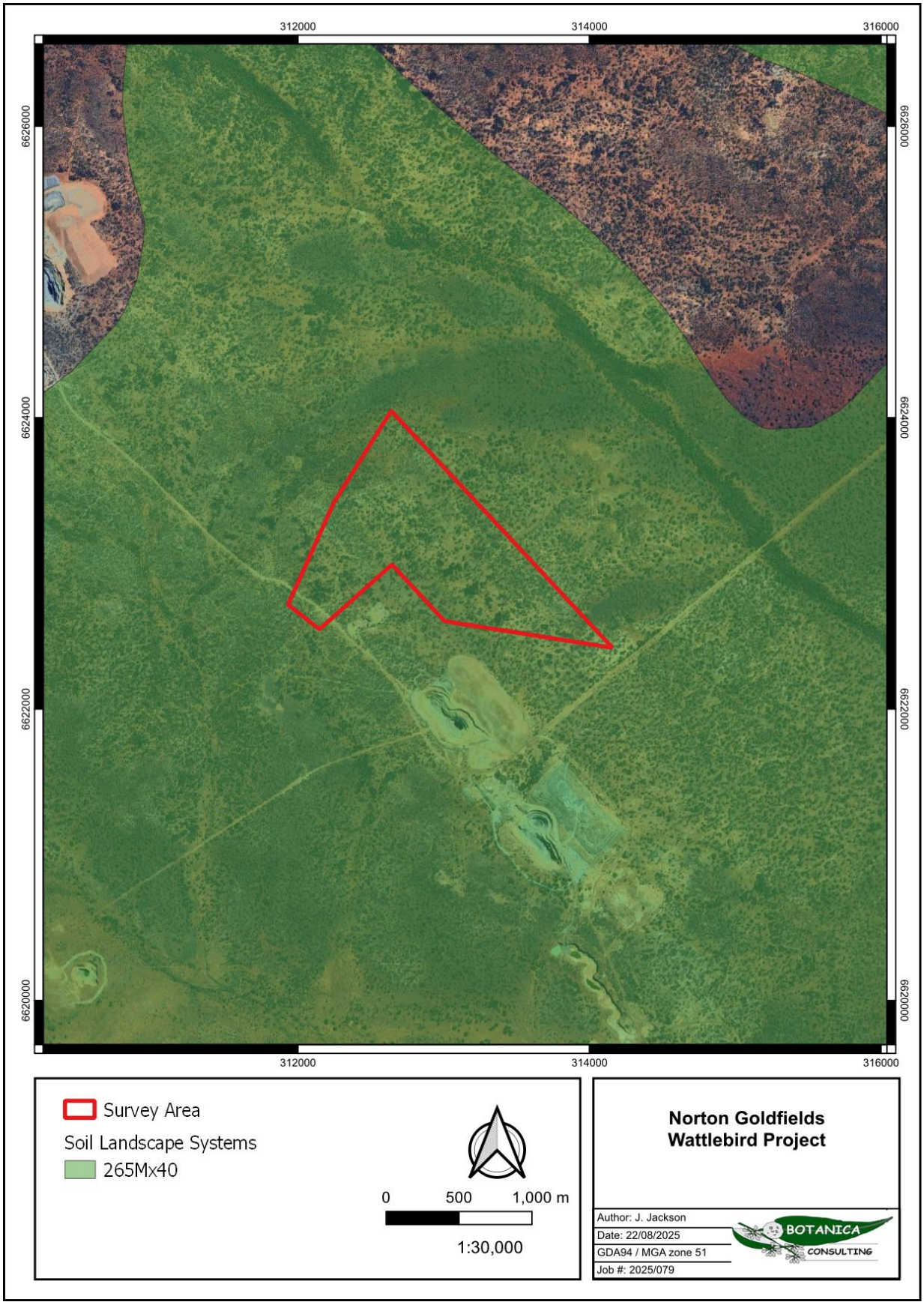


Figure 2-2: Map of soil landscape systems within the survey area

2.4 Vegetation

The vegetation of the Kalgoorlie Province is described by Tille (2006) as woodlands of redwood (*Eucalyptus transcontinentalis*), red mallee (*E. oleosa*), Dundas blackbutt (*E. dundasii*), merrit (*E. flocktoniae*) and salmon gum (*E. salmonophloia*), found on undulating plains over granite. There are also some hummock grasslands with red mallee over spinifex (*Triodia scariosa*) and thickets of Acacia, Casuarina and Melaleuca spp. Plains on greenstone have woodlands of York gum (*E. loxophleba*), salmon gum and gimlet (*E. salubris*). The valley plains have woodlands of salmon gum, red mallee, Goldfields blackbutt (*E. lesouefii*), gimlet, York gum and morrel (*E. longicornis*). These sometimes have an understorey of saltbush (*Atriplex* spp.), pearl bluebush (*Maireana sedifolia*), sago bluebush (*M. pyramidata*) and *Eremophila* spp. There are areas of spinifex grasslands with red mallee, mallees (e.g. *E. youngiana*) and marble gum (*E. gongylocarpa*). Low woodlands of mulga (*Acacia aneura*) and black sheoak (*Casuarina pauper*) over bluebush and saltbush are also present. Apart from the bare salt lake surfaces, saline valley floors have shrublands of samphire (*Tecticornia* spp.) and *Frankenia* spp. in lower areas, shrublands of saltbush and bluebush on red deep sandy duplexes, and woodlands of salmon gum, merrit, red mallee, gimlet and York gum. *Acacia neurophylla, A. beauverdiana* and *A. resinimarginea* thickets grow on gently sloping uplands on granite, with thickets of acacia, casuarina and melaleuca. There are also scrub-heaths and York gum-salmon gum-gimlet woodlands on these uplands. The hilly terrain on greenstone supports woodlands of salmon gum, Goldfields blackbutt, coral gum (*E. torquata*), York gum, gimlet, morrel, Dundas blackbutt and black sheoak. Thickets of granite wattle (*Acacia quadrimarginea*) are also present. The stony plains support scattered woodlands of Goldfields blackbutt, gimlet and salmon gum, along with shrublands of saltbush and bluebush. Sandplains in the west have acacia (*A. coolgardiensis, A. ramulosa, A. aneura, A. burkittii* and *A. tetragonophylla*) shrublands, commonly with patchy native pine (*Callitris columellaris, C. preissii*) and mallees (*E. leptopoda, E. longicornis and E. loxophleba*). Native box (*Bursaria occidentalis*), *Melaleuca uncinata* and *Hakea recurva* may also be present. Hard spinifex (*T. basedowii*) grasslands with mulga, marble gum and mallees (e.g. *E. kingsmillii*) are found on sandplains to the east. The sandy-surfaced plains support acacia, casuarina and melaleuca thickets; woodlands of York gum, cypress pine (*Callitris columellaris*), salmon gum, gimlet and mulga; and shrublands of bowgada (*A. ramulosa*) (Tille, 2006).

2.4.1 Pre-European Vegetation

The Pre-European vegetation association spatial mapping dataset (DPIRD, 2019) identified one vegetation association occurring within the survey area (Figure 2-3). The association description and their remaining extent, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019) are provided in Table 2-2. Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered “endangered” (EPA, 2000). The vegetation association in the survey area retains >97%

of their pre-European extent, and development within the survey area will not significantly reduce the current extent of these vegetation associations.

Table 2-2: Beard vegetation associations within the survey area

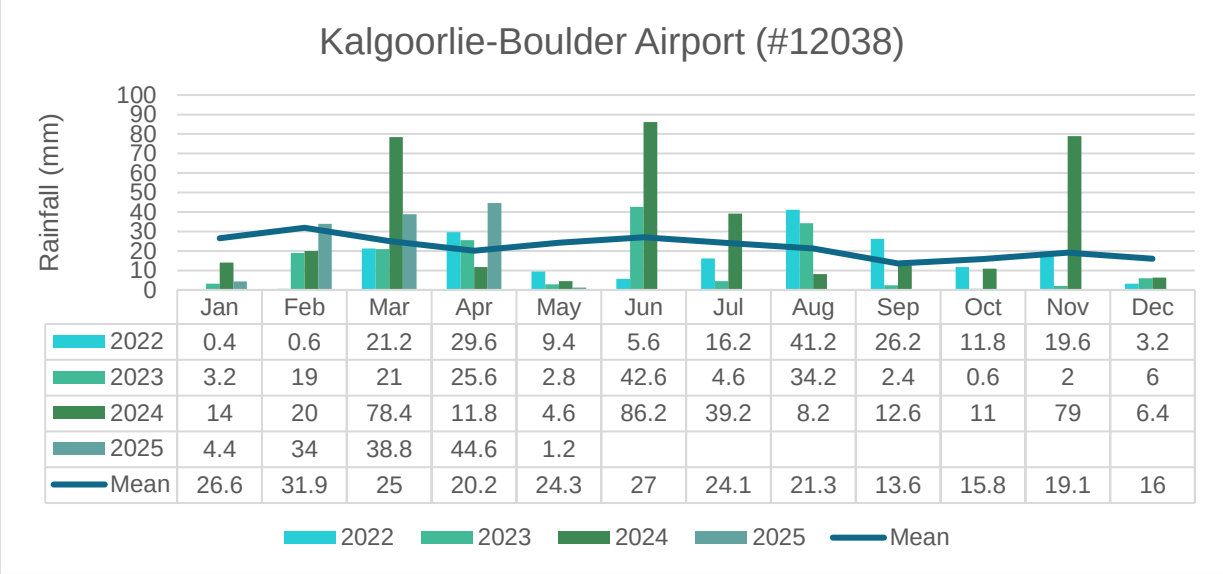
Vegetation Association	Pre-European extent remaining	% Protected for Conservation	Floristic Description	Extent within Survey Area
Kununulling 468	98.3%	0.04%	Woodland other; Goldfields; Gimlet (*Eucalyptus salubris*), Redwood (*E. oleosa*) etc.	150 ha (100%)
Total				150 ha (100%)



Figure 2-3: Pre-European vegetation associations within the survey area

2.5 Climate

The climate of the Eastern Goldfields subregion is characterised as an arid to semi-arid climate approximately 200-300mm of rainfall, sometimes in summer but usually in winter (Cowan, 2001). Rainfall data for the Kalgoorlie-Boulder Airport weather station (#12038), located approximately 48 km southeast of the survey area, is shown in **Figure 2-4** (BoM, 2025). Kalgoorlie-Boulder receives a mean annual rainfall of 264.6 mm. The data shows rainfall for the months of March and April 2025 were above average.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2022	0.4	0.6	21.2	29.6	9.4	5.6	16.2	41.2	26.2	11.8	19.6	3.2
2023	3.2	19	21	25.6	2.8	42.6	4.6	34.2	2.4	0.6	2	6
2024	14	20	78.4	11.8	4.6	86.2	39.2	8.2	12.6	11	79	6.4
2025	4.4	34	38.8	44.6	1.2							
Mean	26.6	31.9	25	20.2	24.3	27	24.1	21.3	13.6	15.8	19.1	16

Figure 2-4: Monthly rainfall for Kalgoorlie-Boulder Airport (#12038) (BoM, 2025)

2.6 Conservation Values

No Threatened Ecological Communities (TEC) listed under the Commonwealth EPBC Act, or the Western Australian BC Act are known to occur within the survey area or within 40 km of the survey area. There were no DBCA listed Priority Ecological Communities (PEC) occurring within the survey area, however two PECs are known to occur within 40 km of the survey area (Table 2-3, Figure 2-5).

Table 2-3: Priority Ecological Communities within a 40 km radius of the survey area

Priority Ecological Community	Conservation Status	Description	Location
Emu Land System	Priority 3	The Emu Land System PEC is defined as a paperbark shrubland and wetland system. It contains fresh or brackish ephemeral lakes and swamps with cane grass, lignum and paperbark shrublands.	The buffer of this PEC is 39 km northwest of the survey area.
Emu Land System	Priority 3		The buffer of this PEC is 34 km northeast of the survey area.

There are no Ramsar wetlands within the survey area or within 40 km of the survey area. There are no Environmentally Sensitive Areas (ESA) as listed under the EP Act within the survey area, however 19 km north-west of the survey area is the Rowles Lagoon Wetland system. This system is listed as

a Wetland of National Importance (ANCA Wetlands) and as an Environmentally Sensitive Area (ESA) as listed under the EP Act. (Figure 2-5). Disturbances within the survey area are unlikely to impact these areas.

There are no DBCA-managed lands, gazetted or proposed reserves within the survey area. Two Gazetted Reserves are within 40 km of the Survey area. These are the Clear and Muddy Lakes Nature Reserve (19 km North-West) and the Rowles Lagoon Conservation Park. There are also proposed extensions to these reserves, and the DBCA-managed Credo proposed Conservation Park extends across the northwestern section of the 40 km buffer. The DBCA-managed proposed extension to the Goongarrie National Nark occurs approximately 40 km north of the survey area. Disturbances within the survey area are unlikely to impact these areas. The location of Conservation Reserves, ESA's and Nationally Important Wetlands in relation to the survey area is provided in Figure 2-5.

2.6.1 Great Western Woodlands

The survey area is located just inside the northeastern edge of the Great Western Woodlands. The Great Western Woodlands is considered by The Wilderness Society of WA to be of global biological and conservation importance as one of the largest and healthiest temperate woodlands on Earth, containing many endemic taxa. The region covers almost 16 million hectares (160,000 square kilometres), from the southern edge of the Western Australian Wheatbelt to the pastoral lands of the Mulga country in the north, the inland deserts to the northeast, and the treeless Nullarbor Plain to the east.

The Great Western Woodlands provides a connection between southwest forests and inland deserts (Gondwana Link) as well as linking the north-west passage to Shark Bay. The majority of the Great Western Woodlands is unallocated crown land (61.1%) with other interests including pastoral leases (20.4%), conservation reserves (15.4%) unallocated crown land, ex pastoral (2%) managed by the Department of Biodiversity, Conservation and Attractions (DBCA) and private land (approximately 1%).

No specific management strategy or formal conservation status applies to the Great Western Woodlands. The Great Western Woodlands currently includes towns, highways, roads, railways, private property, Crown Reserves, agricultural activities and mining tenements.

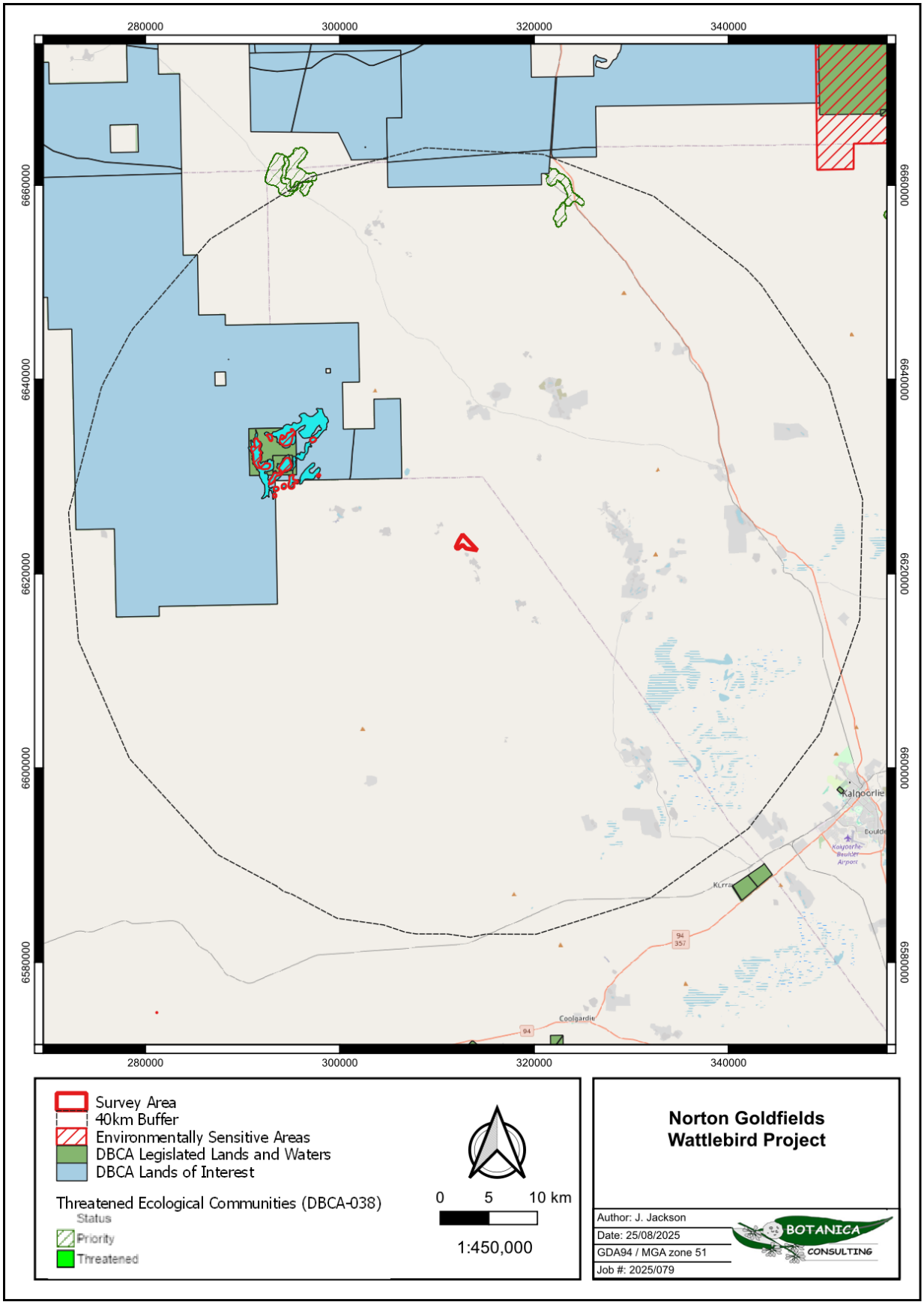


Figure 2-5: Conservation areas in relation to the survey area

2.7 Hydrology

According to the Geoscience Australia database (2015) there are no inland waters within the survey area. There is a small section of a minor ephemeral drainage line occurring in the survey area (Figure 2-6).

Groundwater Dependent Ecosystems (GDE) includes biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. In accordance with the BoM *Atlas of Groundwater Dependent Ecosystems* (BoM, 2021) database, there are no known or potential aquatic or terrestrial GDEs within the survey area, as shown Figure 2-6.



Figure 2-6: Regional hydrology of the survey area

3 SURVEY METHODOLOGY

3.1 Desktop Assessment

3.1.1 Literature Review

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

- Botanica Consulting (2020). *Ant Hill Project Reconnaissance Flora/ Vegetation Survey and Basic Fauna Survey.* Unpublished report prepared for Northern Star Resources Ltd., December 2020.
- Botanica Consulting (2024). *Solar Farm Project: Reconnaissance Flora and Fauna Report.* Prepared for Norton Goldfields Pty Ltd.
- Botanica Consulting (2025a). *Carbine and Carbine North Projects: Flora and Fauna Surveys, Spring 2024*. Prepared for Evolution Mining, March 2025.
- Botanica Consulting (2025b). *Red Dam Project: Flora and Fauna Surveys, Spring 2024*. Prepared for Evolution Mining, March 2025.
- Botanica Consulting (2025c). *Wattlebird Project: Reconnaissance Flora and Basic Fauna Assessment.* Prepared for Norton Goldfields Pty Ltd, January 2025.
- Newbey, K.R., and Hnatiuk R.J. (1985). *WA Museum, Supplement Number 23, The Biological Survey of The Eastern Goldfields of Western Australia, Part 3 Jackson – Kalgoorlie Study Area: III Vegetation and Flora*. Prepared for the WA Museum.
- Terrestrial Ecosystems (2023). *Basic and Targeted Vertebrate Fauna Survey, Carbine/Paradigm Haul Roads*. Unpublished report prepared for Evolution Mining Ltd, July 2023.
- Waddell, P. A., and Galloway, P. D. (2023). *Land systems, soils and vegetation of the southern Goldfields and Great Western Woodlands of Western Australia.* Technical bulletin 99, vol 1, Department of Primary Industries and Regional Development, Western Australian Government.

3.1.2 Database Searches

In addition to the literature review, online database search requests were also undertaken (using the survey area as centre-point and 40 km buffer) to aid in the compilation of a list of potential significant flora and fauna within the survey area:

- DBCA's Threatened and Priority Flora database (Ref: 08-0224FL) (DBCA, 2024a)
- DBCA's Threatened and Priority Ecological Communities database (Ref: 39-0124EC) (DBCA, 2024b),

- DBCA's Threatened and Priority Fauna database (Ref: 8141) (DBCA, 2024c),
- Dandjoo Search, 50 km from a central point of approximately 312903E; 6623101N (DBCA, 2025),
- EPBC Act online Matters of National Environmental Significance (MNES) database (Department of Climate Change, Energy, the Environment, and Water [DCCEEW], 2025).

It should be noted that these lists are sometimes based on observations from a broader area than the 40 km buffer (*i.e*., assessment area) and therefore may include taxa not present. The databases also often include very old records that may be incorrect or in some cases the taxa in question have become locally or regionally extinct. Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining the actual species which may be present within the specific area being investigated.

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

- EPBC Act. Administered by the Australian Government (DCCEEW);
- BC Act. Administered by the WA Government (DBCA);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List – the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and
- Priority Flora and Fauna lists. A non-legislative list maintained by DBCA for management purposes (both updated July 2025).

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

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

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

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

3.1.3 Likelihood of Occurrence

Significant flora identified during the literature review and database searches were assessed with regards to their population extent and distribution and preferred habitat to determine their likelihood of occurrence within the survey area. The assessment categorised flora species as follows

- **Unlikely:** Suitable habitat is not expected to occur and/or the survey area is outside the known range of the species.
- **Possible:** Suitable habitat may be present, and the area is within the known range of the species. This option is also used when there is insufficient information to determine the preferred habitat of a species.
- **Previously Recorded:** A record for this species is located within the survey area. Field survey will ground-truth current occurring individuals and populations.

Significant fauna species identified by the desktop review were assessed with regards to their distribution and preferred habitat to determine their likelihood of occurrence within the survey area. The assessment categorised fauna species as follows:

- **Would Not Occur:** There is no suitable habitat for the species in the survey area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).
- **Locally Extinct:** Populations no longer occur within a small part of the species natural range, in this case within 10 or 20 km of the survey area. Populations do, however, persist outside of this area.
- **Regionally Extinct:** Populations no longer occur in a large part of the species natural range, in this case within the Southern Cross region. Populations do, however, persist outside of this area.
- **Unlikely to Occur:** The survey area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the site itself would not support a population or part population of the species.

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

3.2 Field Assessment

3.2.1 Flora and Vegetation

Botanica conducted a reconnaissance flora and vegetation survey on the 13th June 2025. The survey area was traversed by two people using an all-terrain vehicle (Figure 3-1).



Figure 3-1: GPS track log of the survey effort and locations of relevés

3.2.1.1 Vegetation Mapping

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation types identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the coordinates of the boundaries between vegetation types.

At each sample point, the following information was recorded:

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

Vegetation types were classified in accordance with the NVIS Level V-Association classification.

3.2.2 Terrestrial Fauna

Botanica conducted a basic fauna survey of the survey area on the 13th June 2025. The survey area was traversed by two people using an all-terrain vehicle (Figure 3-1).

Fauna habitat types were identified across the survey area based on broad major vegetation groups and associated landform. A handheld GPS unit was used to record the coordinates of the boundaries between fauna habitats, and each habitat was photographed.

The main aim of the fauna habitat assessment was to determine the likelihood of a species of conservation significance utilising habitat within the survey area. The habitat information obtained was also used to aid in finalising the overall potential fauna list.

Available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area (determined from the desktop assessment) was researched. During the field survey, the habitats within the survey area were assessed and specific elements identified, if present, to determine the likelihood of listed Threatened and Priority species utilising habitat within the survey area.

Opportunistic observations of fauna species were made during all field survey work.

3.3 Data Analysis

Following field assessments, vegetation types and condition were mapped using the GIS program QGIS, and the hectare area/ percentage area of each vegetation type/condition and fauna habitat within the survey area was calculated. Spatial maps illustrating the location of vegetation type/condition, fauna habitat and any significant flora/ vegetation and fauna were generated using QGIS.

3.4 Personnel Involved

Table 3-1: Personnel involved with the flora, vegetation and fauna survey/ reporting

Staff Member	Position/ Qualifications	Experience	Tasks conducted during survey
Jim Williams	Environmental Consultant/Botanist/ Director (Diploma of Horticulture)	>30 years experience across WA	Project Management (Lead Botanist). Flora and vegetation survey- identifying flora species and opportunistic flora observations. Identifying and recording vegetation types. Vegetation mapping. Review of report.
Jennifer Jackson	Environmental Consultant (BSc-Honours Environmental Management)	>20 years experience across WA	Fauna survey-opportunistic fauna observations and fauna habitat assessments. Reporting and data interpretation.

3.5 Scientific Licences

Table 3-2: Scientific Licences of Botanica Staff coordinating the survey

Licensed Staff	Permit Number	Valid
Jim Williams	FB62000457-2 (Flora taking (Biological Assessment) Licence)	05/08/2025-04/08/2028

3.6 Survey Limitations and Constraints

It is important to note that field surveys will entail limitations, notwithstanding careful planning and design. Potential limitations of the survey undertaken from the 28th January 2025, as stipulated within the technical guidance for Flora And Vegetation surveys (EPA, 2016a) and the technical guidance for Terrestrial Vertebrate Fauna surveys (EPA, 2020), are listed in Table 3-3.

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

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

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

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

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted using an all-terrain vehicle. There were no access constraints.
Competency/ Experience	Not a constraint	The Botanica personnel that conducted the survey were regarded as suitably qualified and experienced. **Coordinating Staff**: Jim Williams (Botanist) **Field Staff**: Jim Williams (Botanist) and Jennifer Jackson (Botanist) **Data Interpretation**: Jim Williams and Jennifer Jackson
Timing of survey, weather & season	Minor constraint	Fieldwork was conducted in June 2025, three months prior to the EPA recommended approximate timing (Spring). Rainfall in March and April was above average. Limited flowering material and annual species were present during the survey.
Area disturbance	Not a constraint	The majority of the survey area was in good condition and comprised of native vegetation. Disturbance in the area was a result of previous mining and exploration activities.
Survey Effort/ Extent	Not a constraint	Survey intensity was appropriate for the size/significance of the area with a reconnaissance flora survey and basic fauna survey completed to identify vegetation types/ fauna habitats and significant flora, fauna and vegetation.
Availability of contextual information at a regional and local scale	Not a constraint	Conservation significant flora database searches provided by the DBCA were used to identify any potential locations of Threatened/Priority flora species. BoM, DWER, DPIRD, DBCA and DCCEEW databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region. Botanica has conducted numerous surveys within the Coolgardie Bioregion and was also able to obtain information about the area from previous research conducted within the area. Results of previous assessments in the local area were reviewed to provide context on the local environment.

Variable	Potential Impact on Survey	Details
Completeness	Minor constraint	In the opinion of Botanica, the survey area was covered sufficiently in order to identify vegetation assemblages. All observed flora individuals were able to be identified to species level. Survey work was conducted outside of optimal flowering period for majority of taxa (Spring) and EPAs recommended timing (Spring). The vegetation associations for this study were based on visual descriptions of locations in the field. The distribution of these vegetation associations outside the survey area is not known, however vegetation associations identified were categorised via comparison to vegetation distributions throughout WA given on NVIS (DotEE, 2017).

4 RESULTS

4.1 Desktop Assessment

4.1.1 Flora

The Dandjoo database search (DBCA, 2025) identified 780 vascular flora species as having previously been collected within 50 km of a central point at 312903E; 6623101N, this list was generated from WA Herbarium collections. The full list of vascular flora identified by the desktop search is provided in Appendix D.

4.1.2 Introduced Flora

The desktop review identified 65 introduced flora (weed) species as having previously been collected within 50 km of the survey area. Six of the species are listed as a Declared Pest on the Western Australian Organism List (WAOL) under the Biosecurity and Agriculture Management (BAM) Act 2007, six are listed as a Weed of National Significance (WoNS) (Table 4-1). The full list of introduced flora identified by the desktop search is contained in Appendix D.

Table 4-1: Declared and WONS species of introduced flora known to occur within 40 km of the survey area

Taxon	Common Name	Declared	WoNS
Cylindropuntia fulgida var. *mamillata*	Boxing Glove Cactus	Y	Y
Cylindropuntia imbricata	Devils Rope	Y	Y
Cylindropuntia kleiniae	Kleins Cholla	Y	Y
Echium plantagineum	Paterson's Curse	Y	N
Lycium ferocissimum	African Boxthorn	N	Y
Opuntia elata	Riverian Pear	Y	Y
Opuntia ficus-indica	Indian fig, Prickly Pear	Y	Y

4.1.3 Conservation Significant Flora

The results of the literature review, combined search of the Flora of Conservation Significance databases (DBCA, 2024a), Dandjoo search (DBCA, 2025) and Protected Matters search (DCCEEW, 2025) indicated that no Threatened Flora or Priority Flora species have previously been recorded within the survey area. The EPBC Protected Matters Search Tool identified *Thelymitra stellata* as 'species or species habitat likely to occur within the area', however this is only known to occur in the Swan Coastal Plain, Jarrah Forest and Geraldton Sandplains IBRA regions (WA Herbarium, 1998-), therefore it was not included.

As listed in Table 4-2 below, three Threatened flora and twenty-seven Priority flora were listed by the databases as potentially occurring within a 40 km radius of the survey area (map of flora locations provided in Figure 4-1).

Table 4-2: Likelihood of occurrence for Threatened and Priority flora within the survey area

Taxon	EPBC Act	BC Act	DBCA Priority Rating	Description (WAHERB, 1998-)	Likelihood of Occurrence
Acacia cylindrica			P3	Yellow/brown sand, gravelly soils. Undulating plains, flats.	Unlikely -no habitat in the survey area
Acacia epedunculata			P1	Yellow sand. Sandplains.	Unlikely
Allocasuarina eriochlamys subsp. *grossa*			P3	Stony loam, laterite clay. Granite outcrops.	Unlikely
Alyxia tetanifolia			P3	Sandy clay, loam, concretionary gravel. Drainage lines, near lakes.	Unlikely
Angianthus prostratus			P3	Red clay or loamy soils. Saline depressions.	Unlikely
Atriplex lindleyi subsp. *conduplicata*			P3	Crabhole plains.	Unlikely
Austrostipa burgesiana			P1	Flow line in a calcareous plain with *Maireana pyramidata.*	Unlikely
Calandrinia lefroyensis			P1	Hillslope with abundant quartzite rocks, orange clayey sand, adjacent to large salt lakes.	Unlikely
Eleocharis papillosa	VU		P3	Red clay over granite, open clay flats. Claypans.	Unlikely
Eremophila praecox			P2	Red/brown sandy loam. Undulating plains.	Possible
Eucalyptus educta			P2	Shallow soils. Granite rocks.	Unlikely
Eucalyptus jutsonii subsp. *jutsonii*			P4	Red to pale orange deep sands. Undulating areas and on dunes.	Unlikely
Gastrolobium graniticum	EN	EN		Sand, sandy loam, granite. Margins of rock outcrops, along drainage lines.	Unlikely
Gompholobium cinereum			P3	Well-drained open sites, slopes, plains, roadsides. Yellow sand, clayey sand, brown loam, sandy gravel, laterite.	Possible
Hakea rigida			P2	Sandy soils, yellow sand.	Unlikely
Hysterobaeckea ochropetala subsp. *cometes*			P3	Orange - red sand plain.	Unlikely
Lepidium fasciculatum			P3	Dry lake bed. Flat. Soil red loam.	Unlikely
Notisia intonsa			P3	Brown stony saline loams.	Possible
Phebalium appressum			P1	Yellow sandplain.	Unlikely
Philotheca pachyphylla			P1	Sand, red loam, clay loam. Sandplains, hill tops.	Unlikely
Ptilotus rigidus			P1	Quartz outcropping associated with large salt lakes.	Unlikely
Ptilotus sp. Kalgoorlie (J. Jackson *& B. Moyle 260)*			P1	Quartz outcropping associated with large salt lakes.	Unlikely
Rhodanthe uniflora			P1	Brown earth. Open eucalyptus woodland.	Possible
Ricinocarpos brevis	EN	EN		Rocky hillslopes, rock outcrops. BIF ranges.	Unlikely

Taxon	EPBC Act	BC Act	DBCA Priority Rating	Description (WAHERB, 1998-)	Likelihood of Occurrence
Ricinocarpos digynus			P1	Rocky hillslope. Dry red-brown sandy loam over felsic and mafic volcanics.	Possible
Rumex crystallinus			P2	Arid & semi-arid areas. Moist soil is near water.	Unlikely
Thysanotus sp. Yellowdine (A.S. George 6040)			P2	Rise with yellow sand.	Unlikely
Xanthoparmelia subbarbatica			P1	Growing on rocks. Ridgetop with greenstone rubble on surface.	Possible

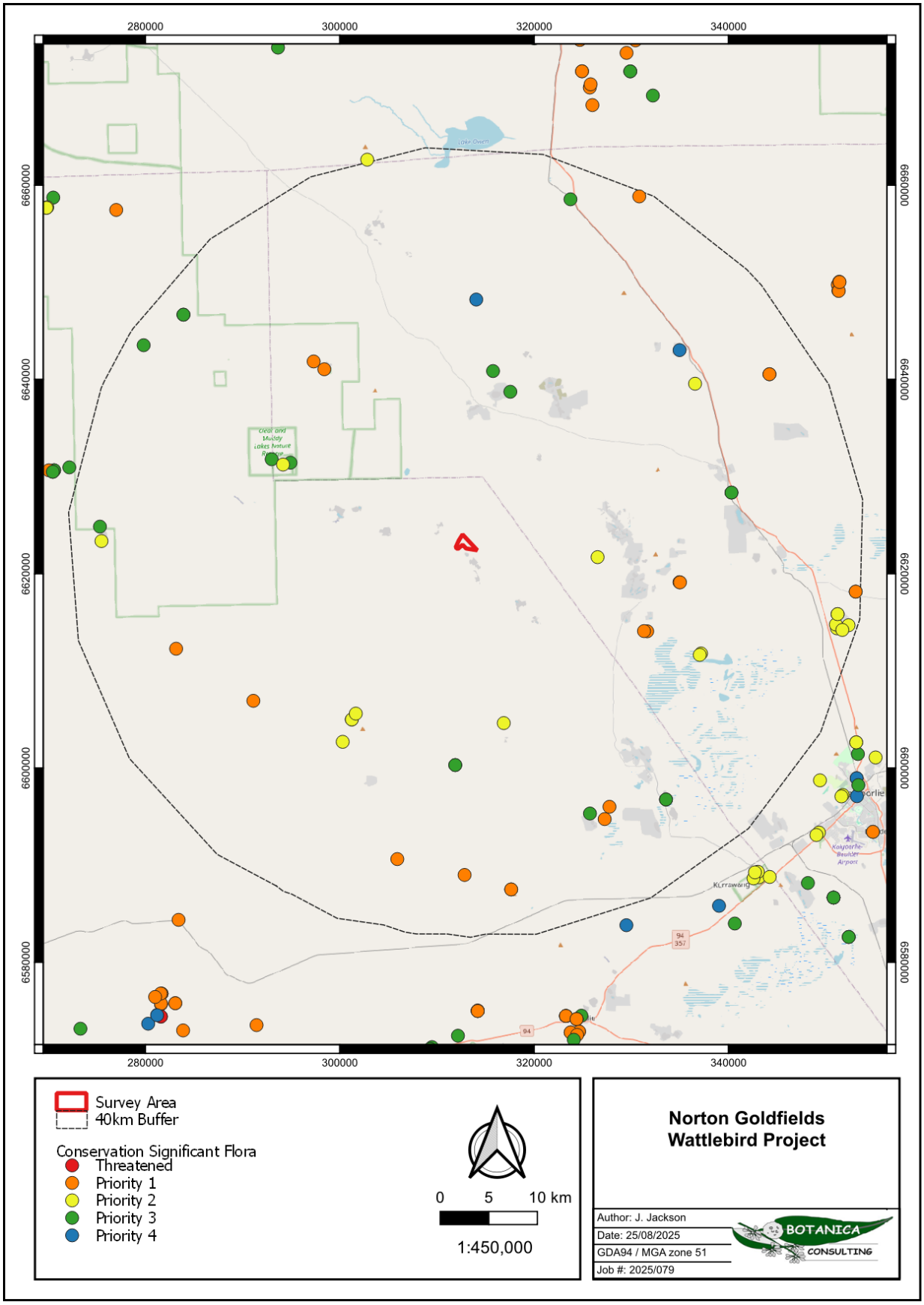


Figure 4-1: Conservation Significant flora within 40 km of the survey area

4.1.4 Fauna

According to the results of the Dandjoo search (DBCA, 2025), a total of 319 terrestrial vertebrate fauna taxa have been recorded within 50 km of the survey area, consisting of 176 bird, 42 mammal, 92 reptile and eight amphibian taxa.

4.1.5 Significant Fauna

The desktop review identified 21 terrestrial vertebrate fauna species of conservation significance that have previously been recorded in the regional area, some of which have the potential to occur in or utilise sections of the survey area at times. These species consisted of ten Threatened, two migratory, one otherwise protected and five Priority species. In addition, several migratory wading/shorebird species were assessed collectively due to their similar habitat requirements.

Habitat and distribution data was used to determine the likelihood of occurrence within the survey area (Table 4-3).

Table 4-3: Significant fauna potentially occurring within the survey area

Species	Conservation Status			Habitat Description	Assessment and likelihood
	EPBC	BC Act	DBCA		
Birds					
Aphelocephala leucopsis Southern Whiteface	VU	VU	-	Occur across most of mainland Australia south of the tropics, Southern whitefaces live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both (DCCEEW, 2025).	Unlikely. PMST records state that the species or species habitat may be in the area. There is one historic record (1905) 24 km SW of the survey area.
Calidris acuminata Sharp-tailed Sandpiper	VU		MI	Intertidal mudflats, also freshwater swamps and saltwater lakes (ALA, 2025).	Would not occur, no habitat in the survey area.
Calidris ferruginea Curlew Sandpiper	CR / MI	CR		Inland, where they are rarely seen, around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (DCCEEW, 2025).	Would not occur, no habitat in the survey area.
Falco hypoleucos Grey Falcon	VU	VU	-	Occurs at low densities across inland Australia. The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (DCCEEW, 2025).	Unlikely, there are no records of this species within 40 km of the survey area (DBCA, 2022b). PMST records state that the species or species habitat may be in the area.
Falco peregrinus Peregrine Falcon		OS		Found in most habitats, from rainforests to the arid zone, and at most altitudes, from the coast to alpine areas (Australian Museum, 2025)	Possible, 2 records within 40 km of the survey area.
Leipoa ocellata Malleefowl	VU	VU	-	Scrublands and woodlands dominated by mallee and wattle species (DCCEEW, 2025).	Possible. There are many records within 40 km of the survey area.
Oxyura australis Blue-billed duck			P4	Deep, permanent water or open lakes. (ALA, 2025)	Would not occur, no habitat in the survey area.
Pezoporus occidentalis Night Parrot	EN	CR	-	Broad habitat requirements include areas of old-growth spinifex (Triodia) for roosting and nesting, together with foraging habitats that are likely to include various native grasses and herbs, that may or may not contain shrubs or low trees. (DBCA, 2024d).	Would not occur in the area. PMST records state that the species or species habitat may be in the area. Considered to be locally extinct. Suitable habitat not present.

Species	Conservation Status			Habitat Description	Assessment and likelihood
	EPBC	BC Act	DBCA		
Polytelis alexandrae Princess Parrot	VU		P4	Inhabits sand dunes and sand flats in the arid zone of western and central Australia. It occurs in open savanna woodlands and shrublands that usually consist of scattered stands of Eucalyptus (including *E. gongylocarpa),* Casuarina or Allocasuarina trees; an understorey of shrubs such as Acacia (especially *A. aneura*), Senna, Eremophila, Grevillea, Hakea and Senna; and a ground cover dominated by Triodia species (DCCEEW, 2025)	Would not occur. Known to occur further east in the Great Victoria Desert.
Thinornis cucullatus Hooded plover			P4	Ocean sandy beaches and coastal lakes (ALA, 2025).	Would not occur, no habitat in the survey area.
Tringa nebularia Common greenshank	EN		MI	Inland wetlands and sheltered coastal areas, including mudflats, saltmarshes, river estuaries, deltas and lagoons (ALA, 2025).	Would not occur, no habitat in the survey area.
Various wading/shorebird species	MI	MI	-	Inhabit muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland (DCCEEW, 2025).	Would not occur, no habitat in the survey area.
Mammals					
Dasyurus geoffroii Chuditch	VU	VU		Deserts, woodlands, eucalypt shrubland, open forests and coastal areas. It is now found only in the southwest corner of Western Australia. (ALA, 2025).	PMST records state that the species or species habitat may be in the area. Would not occur. Considered to be regionally extinct.
Invertebrates					
Branchinella denticulata A fairy shrimp			P3	Large wetlands (ALA, 2025).	Would not occur in the area. No habitat in the survey area.
Jalmenus aridus Inland hairstreak			P1	Open woodland with mature *Senna artemisioides* ssp. *filifolia* as well as mixed flowering shrubs with open areas of well drained exposed ground adjoining the hostplants (Eastwood *et al,* 2023).	Possible.
Ogyris subterrestris petrina Arid bronze azure butterfly	CR	CR		Known to occur within Mature smooth barked Eucalypt woodlands in the Goldfields and Wheatbelt region of WA (DBCA, 2020).	Possible, records within 40 km of the survey area.

4.2 Field Assessment

4.2.1 Vegetation Types

Three vegetation types (not including cleared vegetation) were identified within the survey area. These vegetation types were located within three landform types and comprised of one NVIS major vegetation groups. Vegetation was represented by a total of 20 families, 29 genera and 64 taxa. Only one annual species was observed, no weeds were observed during the survey. The total species list is provided in Appendix B. A map showing the vegetation types present in the survey area is provided in Figure 4-2 and a summary of vegetation types is presented in Table 4-4.

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

Vegetation Community	Broad Floristic Formation (NVIS VI)	Vegetation Description	Landform	Image
CLP-EW1 Area: 75.1 ha	Eucalypt Woodlands (MVG 5)	Mid woodland of *Eucalyptus salmonophloia* over mid open shrubland of *Eremophila scoparia* over low chenopod shrubland of *Maireana sedifolia* and *Atriplex nummularia* on clay-loam plain.	Clay-Loam Plain	
CLP-EW3 Area: 9 ha	Eucalypt Woodlands (MVG 5)	Low woodland of *Eucalyptus ravida* over mid open shrubland of *Eremophila scoparia* over low chenopod shrubland of *Maireana sedifolia* and *Atriplex vesicaria* on clay-loam plain.	Clay-Loam Plain	

Vegetation Community	Broad Floristic Formation (NVIS VI)	Vegetation Description	Landform	Image
RH-EW1 Area: 56.6 ha	Eucalypt Woodlands (MVG 5)	Mid woodland *Eucalyptus clelandiorum* over mid open shrubland of *Eremophila caperata* and low sparse shrubland of *Atriplex vesicaria* on hillslope.	Hillslope	
OD-EW1 Area: 7.8 ha	Eucalypt Woodlands (MVG 5)	Mid woodland of *Eucalyptus salmonophloia* over mid open shrubland of *Acacia hemiteles/ Eremophila scoparia* low chenopod shrubland of *Maireana sedifolia* and *Atriplex nummularia* in open depression	Open depression	
Area: 0.8 ha	CV	Cleared areas	NA	



Figure 4-2: Vegetation types within the survey area

4.2.2 Significant Flora

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

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

No Threatened Flora taxa listed under Commonwealth or State legislation were identified within the survey area. No Priority Flora were identified within the survey area.

No other significant flora (as described above) were identified within the survey area.

4.2.3 Significant Vegetation

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

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

No TEC or PEC, restricted vegetation, highly disturbed vegetation, vegetation providing important refuge or significant ecological function was identified within the survey area.

4.2.4 Vegetation Condition

Based on the vegetation condition rating scale obtained from the EPA (2016a) provided in Appendix C, vegetation ranged from 'Completely degraded' to 'very good' condition with the majority of vegetation in 'Good' condition (Table 4-5). Disturbances in the area was a result of previous exploration and mining activities and pastoral land use. A map of the vegetation condition across the survey area is provided in Figure 4-3.

Table 4-5: Vegetation condition rating within the survey area

Condition rating	Description (EPA, 2016a)	Area (ha)	Area (%)
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	7	4.7
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	142	94.7
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.	<1	0.6
TOTAL		**150**	**100**

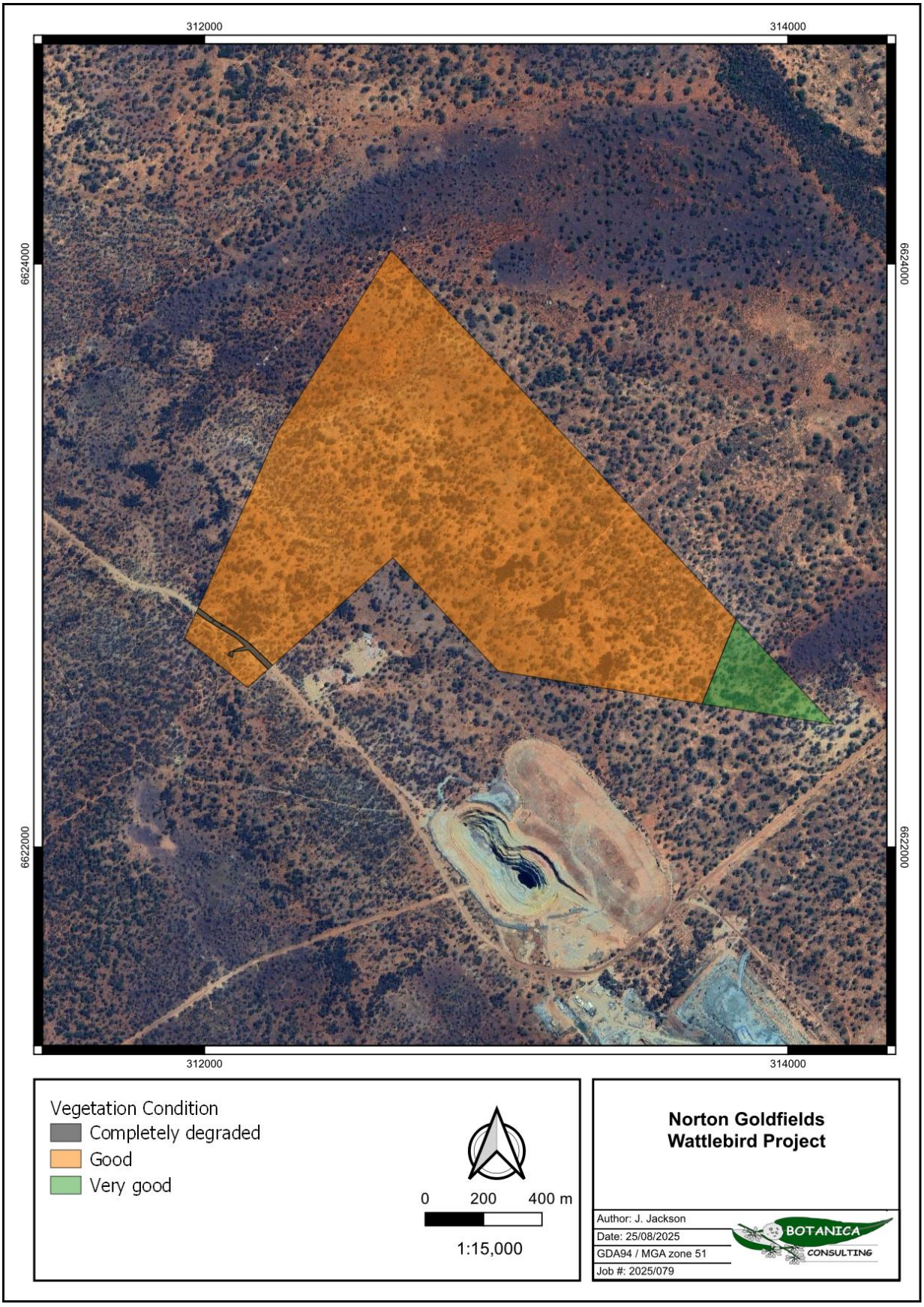


Figure 4-3: Vegetation condition rating of the survey area

4.2.5 Fauna Habitat

Three broad scale terrestrial fauna habitat (not including cleared vegetation) were identified within the survey area. The extent of the identified fauna habitat and a summary description is provided in Table 4-7below. A map of fauna habitats is provided in Figure 4-4.

Table 4-6 provides a list of opportunistic observations of fauna species that was made during the field survey with a total of six fauna species observed.

Table 4-6: Fauna species observed during the field survey

Taxon	Common Name	Comments
Avifauna		
Barnardius zonarius	Ringneck parrot	Heard
Lichmera indistincta	Brown honey eater	Observed
Malurus splendens	Splendid Fairy Wren	Observed
Pardalotus striatus	Striated pardalote	Heard
Mammals		
Oryctolagus cuniculus	Rabbit	Scats Observed
Macropus fuliginosus melanops	Western grey kangaroo	Scats Observed

Table 4-7: Main terrestrial fauna habitats within the survey area

Fauna Habitat Description	Representative Fauna Attributes	Example Image
Eucalypt woodlands on rocky slope Area= 56.6 ha (37.7%)	• Ground not particularly suited to burrowing species. • Moderate diversity vegetation strata supporting a lower avifauna assemblage. • Potential refuge for small fauna under rocks, for example reptile fauna	
Eucalypt woodland on clay loam plain Area = 84.1 ha (56%)	• Ground moderately suited to burrowing species. • Low to Moderate diversity vegetation strata supporting avifauna assemblage. • Moderate vegetation density and leaf litter, providing some refuge for reptiles.	
Eucalypt woodland in open depression Area= 7.8 ha (5.3%)	• Ground moderately suited to burrowing species in some areas. • Moderate diversity vegetation strata supporting a good avifauna assemblage. • Moderate vegetation density and moderate leaf litter supporting small reptiles. • Source of water after rainfall events.	
Cleared areas Area= <1ha (0.6%)	• Ground not suited to burrowing species. • Very small amount or no vegetation present.	N/A

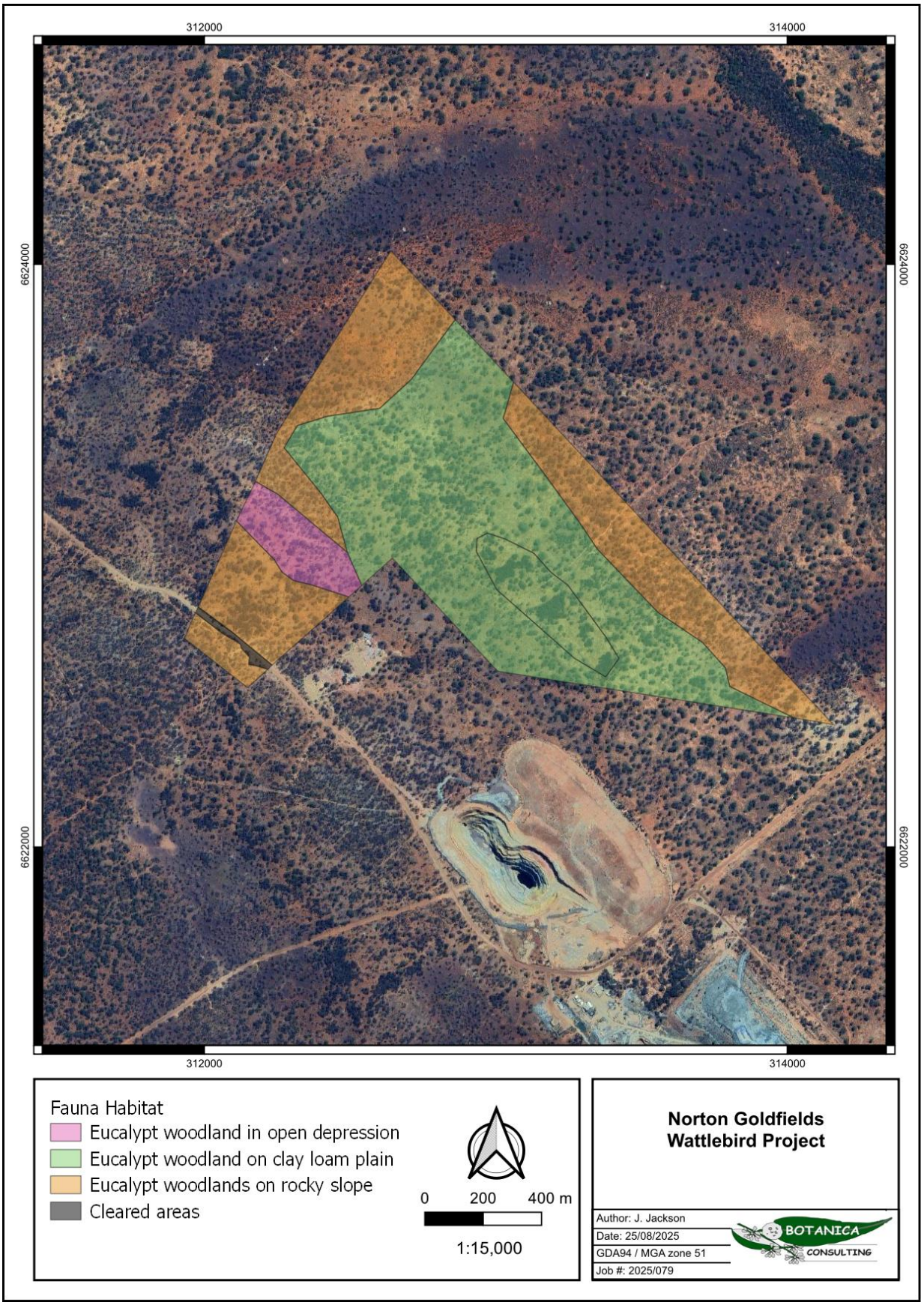


Figure 4-4: Fauna habitats within the survey area

4.2.6 Significant Fauna

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

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

No evidence of significant fauna species was observed during the survey.

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

- **Malleefowl (*Leipoa ocellata)* - Vulnerable (EPBC Act and BC Act)**

  No evidence of malleefowl was seen during this survey, including any mounds (active or inactive), tracks, feathers or scats. Previous surveys nearby (Botanica, 2020) have only found inactive mounds and no evidence of them breeding in the area.

- **Arid bronze azure butterfly (*Ogyris subterrestris petrina)* – Critically Endangered (EPBC Act and BC Act)**

  Could possibly utilise the area, however surveys nearby (Botanica, 2025b) have found no evidence of this butterfly in the area.

- **Inland hairstreak (*Jalmenus aridus*) – Priority 1 (DBCA)**

  Could possibly utilise the area, however surveys nearby (Botanica, 2025b) have found no evidence of this butterfly in the area.

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

4.3 Matters of National Environmental Significance

4.3.1 Environment Protection and Biodiversity Conservation Act 1999 (Cth)

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

The EPBC Act covers nine protected matters:

- world heritage areas
- national heritage places
- wetlands of international importance (listed under the Ramsar Convention)
- listed threatened species and ecological communities
- listed migratory species (protected under international agreements)
- Commonwealth marine areas
- Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- water resources (that relate to unconventional gas development and large coal mining development).

No MNES as defined by the EPBC Act were identified within the survey area.

4.4 Matters of State Environmental Significance

4.4.1 *Environmental Protection Act 1986* (WA)

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

Under Section 51C of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (Clearing Regulations) any clearing of native vegetation in Western Australia that is not eligible for exemption under Schedule 6 of the EP Act or under the Clearing Regulations requires a clearing permit from the DWER or the Department of Mines, Petroleum and Exploration (DMPE). Under Section 51A of the EP Act native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with

commercial intent. Section 51A of the EP Act defines clearing as “the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above”.

Environmentally sensitive areas (ESAs) are classes or areas of native vegetation as declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005* for the purposes of Part V Division 2 of the EP Act, where the exemptions for clearing vegetation under the Clearing Regulations do not apply.

The following areas are declared to be ESAs:

- a declared World Heritage property as defined in section 13 of the EPBC Act;
- an area that is included on the Register of the National Estate, because of its natural heritage value, under the Australian Heritage Council Act 2003 of the Commonwealth;
- a defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands;
- the area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located;
- the area covered by a TEC;
- a Bush Forever site listed in “Bush Forever” Volumes 1 and 2 (2000), published by the Western Australia Planning Commission, except to the extent to which the site is approved to be developed by the Western Australia Planning Commission;
- the areas covered by the following policies –
    - *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*;
    - *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*;
- the areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* applies; and
- protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

No ESAs declared under the EP Act were identified within the survey area.

Additionally, in accordance with Schedule 1, Clause 4 of the Clearing Regulations, clearing of native vegetation in a ‘Schedule One Area’ for mining purposes is not permitted without a clearing permit.

No Schedule One Areas occur within the survey area.

4.4.2 Biodiversity Conservation Act 2016 (WA)

The BC Act is administered by the DBCA to conserve and protect biodiversity and to promote the ecologically sustainable use of biodiversity components in the State of Western Australia. Under the BC Act, native species are listed as Threatened when they face a high to very high risk of extinction in the wild, and ecological communities are listed as Threatened when they face a high to very high risk of collapse. Whilst all native flora and fauna are protected throughout the State, special protection is afforded to threatened flora and ecological communities, with the authorisation of the Minister being required before such flora can be taken or communities modified.

Furthermore, The Minister may list vegetation as a 'critical habitat' if it is critical to the survival of a threatened species or ecological community. Under Section 54(1) of the BC Act, habitat is eligible for listing as critical habitat if:

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

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

4.5 Other areas of Conservation Significance

The DBCA lists 'Priority' species and communities which are under consideration for declaration as 'Threatened' under the BC Act. These Priority species/ communities have no formal legal protection until they are endorsed by the Minister as being Threatened. No PEC's as listed by DBCA were identified within the survey area.

There are no wetlands of international importance (Ramsar Wetlands) or national importance (Australian Nature Conservation Agency Wetlands) within the survey area. There is a nationally important wetland (Rowles Lagoon) located approximately 16km North-West of the survey area.

There are no gazetted or proposed conservation reserves within the survey area. The closest gazetted reserve is the Rowles Lagoon Conservation Park (R4274) approximately 18km North-West of the survey area (Figure 2-5).

4.6 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of the EP Act (Table 4-8). The assessment found that the proposed vegetation clearing activities are unlikely to be at variance with any clearing principle.

Table 4-8: Assessment against native vegetation clearing principles

Letter	Principle	Assessment	Outcome
Native vegetation should not be cleared if it:			
(a)	comprises a high level of biological diversity.	Vegetation identified within the survey area is not considered to be of high biological diversity and is well represented outside of the survey area.	Clearing is unlikely to be at variance with this principle
(b)	comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	There was no evidence of significant fauna or significant fauna habitat within the survey area.	Clearing is not at variance with this principle
(c)	includes, or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the BC Act and the EPBC Act were identified within the survey area.	Clearing is not at variance with this principle
(d)	comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No TEC listed under the EPBC Act or by the BC Act occur within the survey area.	Clearing is not at variance with this principle
(e)	is significant as a remnant of native vegetation in an area that has been extensively cleared	The vegetation association in the survey area retains >98% of its original pre-European vegetation extent.	Clearing is not at variance with this principle
(f)	is growing, in, or in association with, an environment associated with a watercourse or wetland	No minor ephemeral drainage lines occur within the survey area.	Clearing is unlikely to be at variance with this principle
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The survey area and surrounding region has not been extensively cleared. Clearing within the survey area is not considered likely to lead to land degradation issues such as salinity, water logging or acidic soils.	Clearing is unlikely to be at variance with this principle
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The survey area is not located within or adjacent to conservation areas, Environmentally Sensitive Areas or Nationally Important Wetlands.	Clearing is unlikely to be at variance with this principle
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	No minor ephemeral drainage lines occur within the survey area, and vegetation communities identified were not comprised of drainage depression habitats. Disturbances within the survey area are not expected to significantly affect water quality.	Clearing is unlikely to be at variance with this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Rainfall in the Eastern Goldfields subregion has an average rainfall of 200 – 300mm. Rainfall events are unlikely to result in localised flooding. Clearing within the survey area is not likely to increase the incidence or intensity of flooding within the survey area or surrounds.	Clearing is unlikely to be at variance with this principle

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APPENDIX A:
CONSERVATION CATEGORIES (BC ACT AND EPBC ACT)

Definitions of Conservation Significant Species

Code	Category
State categories of Threatened and Priority species	
Threatened Species (T) Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as Threatened species under section 26(2) of the BC.	
CR	**Critically Endangered** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under Schedule 2 Division 1 of the *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2025* for critically endangered fauna or Schedule 1 Division 1 of the *Biodiversity Conservation (Listing of Native Species) (Flora) Order 2025* for critically endangered flora.
EN	**Endangered** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under Schedule 2 Division 2 of the *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2025* for endangered fauna or Schedule 1 Division 2 of the *Biodiversity Conservation (Listing of Native Species) (Flora) Order 2025* for endangered flora.
VU	**Vulnerable** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under Schedule 2 Division 3 of the *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2025* for vulnerable fauna or Schedule 1 Division 3 of the *Biodiversity Conservation (Listing of Native Species) (Flora) Order 2025* for vulnerable flora.
Extinct species Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	**Extinct** Species where "*there is no reasonable doubt that the last member of the species has died*", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under Schedule 3 of the *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2025* for extinct fauna or Schedule 2 the *Biodiversity Conservation (Listing of Native Species) (Flora) Order 2025* for extinct flora.
EW	**Extinct in the Wild** Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form*", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no Threatened fauna or Threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially protected species Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as Threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.	
CD	**Species of special conservation interest** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as Threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).

Code	Category
	Published as conservation dependent fauna under Schedule 1 Division 1 of the *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2025*.
IA	**International Agreement/ Migratory** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under Schedule 1 Division 2 of the *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2025*.
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under Schedule 1 Division 3 of the *Biodiversity Conservation (Listing of Native Species) (Fauna) Order 2025*.
Priority species Possibly Threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of Priority for survey and evaluation of conservation status so that consideration can be given to their declaration as Threatened Fauna or Flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.	
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
Commonwealth categories of Threatened species	
EX	**Extinct** Taxa where there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild** Taxa where it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate

Code	Category
	seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CR	**Critically Endangered** Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered** Taxa which are not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable** Taxa which are not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Definitions of Conservation Significant Communities

Code	Category
State categories of Threatened Ecological Communities (TEC)	
PD	**Presumed Totally Destroyed**
	An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:
	• records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or;
	• all occurrences recorded within the last 50 years have since been destroyed.
CR	**Critically Endangered**
	An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the immediate future.
EN	**Endangered**
	An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short-term future, or is unlikely to be substantially rehabilitated in the short-term future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the short-term future.
VU	**Vulnerable**
	An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:
	The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;
	The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;

Code	Category
	The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.
Commonwealth categories of Threatened Ecological Communities (TEC)	
CE	**Critically Endangered** If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
EN	**Endangered** If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
VU	**Vulnerable** If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).
Priority Ecological Communities	
P1	**Poorly-known ecological communities**
	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	**Poorly-known ecological communities**
	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	**Poorly known ecological communities**
	Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
	Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
	Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	**Ecological communities that are adequately known, rare but not threatened** or meet criteria for near threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	**Conservation Dependent ecological communities**
	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

APPENDIX B:
LIST OF SPECIES IDENTIFIED WITHIN EACH VEGETATION TYPE

Blue text and (A) denotes annual flora

Family	Taxon		CLP-EW1	CLP-EW3	RH-EW1	OD-EW1
Amaranthaceae	*Ptilotus*	*obovatus*	*	*		*
Apocynaceae	*Alyxia*	*buxifolia*	*		*	*
Asteraceae	*Olearia*	*muelleri*	*	*	*	*
Boraginaceae	*Halgania*	*andromedifolia*	*	*	*	*
Casuarinaceae	*Casuarina*	*pauper*	*			*
Chenopodiaceae	*Atriplex*	*bunburyana*	*			*
Chenopodiaceae	*Atriplex*	*nummularia* subsp. *spathulata*	*		*	*
Chenopodiaceae	*Atriplex*	*vesicaria*	*	*	*	*
Chenopodiaceae	*Enchylaena*	*tomentosa*	*			*
Chenopodiaceae	*Maireana*	*georgei*	*			*
Chenopodiaceae	*Maireana*	*glomerifolia*			*	*
Chenopodiaceae	*Maireana*	*oppositifolia*	*			
Chenopodiaceae	*Maireana*	*pyramidata*	*			*
Chenopodiaceae	*Maireana*	*sedifolia*	*	*		*
Chenopodiaceae	*Maireana*	*trichoptera*	*			
Chenopodiaceae	*Maireana*	*triptera*	*	*		*
Chenopodiaceae	*Rhagodia*	*eremaea*		*	*	
Chenopodiaceae	*Sclerolaena*	*diacantha*	*	*		*
Chenopodiaceae	*Sclerolaena*	*drummondii*			*	
Chenopodiaceae	*Sclerolaena*	*parviflora*	*		*	*
Chenopodiaceae	*Tecticornia*	*disarticulata*	*			
Disphyma	*Disphyma*	*crassifolium*				*
Fabaceae	*Acacia*	*colletioides*			*	
Fabaceae	*Acacia*	*erinacea*		*	*	
Fabaceae	*Acacia*	*hemiteles*	*	*		*
Fabaceae	*Acacia*	*jennerae*				*
Fabaceae	*Acacia*	*tetragonophylla*			*	*
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*	*	*	*	*
Frankeniaceae	*Frankenia*	*setosa*				*
Goodeniaceae	*Scaevola*	*spinescens*	*		*	
Lamiaceae	*Westringia*	*rigida*		*	*	
Malvaceae	*Sida*	*calyxhymenia*		*		
Malvaceae	*Sida*	sp. Golden calyces glabrous (H.N. Foote 32)				*
Malvaceae	*Sida*	*spodochroma*	*			
Myrtaceae	*Eucalyptus*	*celastroides*	*	*	*	*
Myrtaceae	*Eucalyptus*	*clelandiorum*			*	*
Myrtaceae	*Eucalyptus*	*griffithsii*			*	
Myrtaceae	*Eucalyptus*	*oleosa*			*	
Myrtaceae	*Eucalyptus*	*ravida*	*	*		
Myrtaceae	*Eucalyptus*	*salmonophloia*	*			*
Myrtaceae	*Eucalyptus*	*salubris*	*	*		*
Myrtaceae	*Eucalyptus*	*transcontinentalis*	*			*
Myrtaceae	*Eucalyptus*	*yilgarnensis*			*	*
Pittosporaceae	*Pittosporum*	*angustifolium*	*		*	

Family	Taxon		CLP-EW1	CLP-EW3	RH-EW1	OD-EW1
Poaceae	*Austrostipa*	*elegantissima*	*	*		*
Poaceae	*Enneapogon*	*caerulescens (A)*	*		*	
Proteaceae	*Grevillea*	*nematophylla*			*	
Santalaceae	*Exocarpos*	*aphyllus*	*		*	*
Santalaceae	*Santalum*	*acuminatum*	*		*	*
Santalaceae	*Santalum*	*spicatum*	*			*
Sapindaceae	*Alectryon*	*oleifolius*	*			*
Sapindaceae	*Dodonaea*	*lobulata*			*	
Scrophulariaceae	*Eremophila*	*caperata*	*		*	*
Scrophulariaceae	*Eremophila*	*clarkei*	*			*
Scrophulariaceae	*Eremophila*	*decipiens*			*	
Scrophulariaceae	*Eremophila*	*glabra*			*	
Scrophulariaceae	*Eremophila*	*interstans* subsp. *virgata*			*	*
Scrophulariaceae	*Eremophila*	*ionantha*	*			*
Scrophulariaceae	*Eremophila*	*oldfieldii* subsp. *angustifolia*		*	*	*
Scrophulariaceae	*Eremophila*	*parvifolia*		*		
Scrophulariaceae	*Eremophila*	*pustulata*			*	
Scrophulariaceae	*Eremophila*	*scoparia*	*	*	*	*
Solanaceae	*Solanum*	*lasiophyllum*	*			*
Solanaceae	*Solanum*	*nummularium*	*			*

APPENDIX C:
VEGETATION CONDITION RATING

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

APPENDIX D:
DANDJOO SEARCH RESULTS

Dandjoo Vascular Flora Species List

Source: Dandjoo – Department of Biodiversity, Conservation and Attractions
Method: User defined circle: 50.0 km
Dandjoo Export: bio_species_list_public_2025-08-22T16_03_08.986105+08_00 flora_filtered_flora.xlsm
Filter: Kingdon = Plantae

Class	Order	Family	Taxon	Common Name	Estab.	Code
Isoetopsida	Isoetales	Isoetaceae Rchb.	Isoetes muelleri		native	
Liliopsida	Alismatales	Juncaginaceae Rich.	Triglochin isingiana		native	
Liliopsida	Asparagales	Asparagaceae Juss.	Agave americana	Century Plant	alien	
Liliopsida	Asparagales	Asparagaceae Juss.	Chamaexeros fimbriata		native	
Liliopsida	Asparagales	Asparagaceae Juss.	Thysanotus manglesianus	['Fringed Lily', "Mangles' Fringed Li	native	
Liliopsida	Asparagales	Asparagaceae Juss.	Thysanotus patersonii	Paterson's Fringed Lily	native	
Liliopsida	Asparagales	Asparagaceae Juss.	Thysanotus sp. Yellowdine (A.S. George 6040)		native	P2
Liliopsida	Asparagales	Asparagaceae Juss.	Thysanotus speckii		native	
Liliopsida	Asparagales	Asphodelaceae Juss.	Bulbine semibarbata	Leek Lily	native	
Liliopsida	Asparagales	Hemerocallidaceae R.B	Dianella revoluta var. divaricata		native	
Liliopsida	Asparagales	Iridaceae Juss.	Patersonia rudis subsp. velutina		native	
Liliopsida	Asparagales	Orchidaceae Juss.	Caladenia footeana	Crimson Spider Orchid	native	
Liliopsida	Asparagales	Orchidaceae Juss.	Caladenia saxicola	Banded Iron Stone Spider Orchid	native	
Liliopsida	Asparagales	Orchidaceae Juss.	Caladenia varians	Common Spider Orchid	native	
Liliopsida	Asparagales	Orchidaceae Juss.	Cyanicula amplexans		native	
Liliopsida	Asparagales	Orchidaceae Juss.	Diuris longifolia		native	
Liliopsida	Asparagales	Orchidaceae Juss.	Prasophyllum gracile	Little Laughing Leek Orchid	native	
Liliopsida	Asparagales	Orchidaceae Juss.	Pterostylis arida	Paynes Find Rufous Greenhood	native	P3
Liliopsida	Asparagales	Orchidaceae Juss.	Pterostylis setulosa	Hairy-stemmed Snail Orchid	native	
Liliopsida	Asparagales	Orchidaceae Juss.	Pterostylis virens	Green Spoon-lipped Rufous Green	native	P3
Liliopsida	Asparagales	Orchidaceae Juss.	Pterostylis xerampelina	Rock Loving Rufous Greenhood	native	P1
Liliopsida	Asparagales	Orchidaceae Juss.	Thelymitra petrophila		native	
Liliopsida	Poales	Centrolepidaceae Endl.	Centrolepis strigosa		native	
Liliopsida	Poales	Cyperaceae Juss.	Chrysitrix distigmatosa		native	
Liliopsida	Poales	Cyperaceae Juss.	Eleocharis acuta		native	
Liliopsida	Poales	Cyperaceae Juss.	Eleocharis papillosa		native	P3
Liliopsida	Poales	Cyperaceae Juss.	Isolepis australiensis		native	P3
Liliopsida	Poales	Cyperaceae Juss.	Lepidosperma rigidulum		native	
Liliopsida	Poales	Cyperaceae Juss.	Lepidosperma sanguinolentum		native	
Liliopsida	Poales	Cyperaceae Juss.	Schoenus hexandrus		native	
Liliopsida	Poales	Cyperaceae Juss.	Schoenus nanus	Tiny Bog Rush	native	
Liliopsida	Poales	Cyperaceae Juss.	Schoenus subaphyllus		native	
Liliopsida	Poales	Juncaceae Juss.	Juncus aridicola		native	
Liliopsida	Poales	Juncaceae Juss.	Juncus subsecundus		native	
Liliopsida	Poales	Poaceae Barnhart	Alopecurus geniculatus		alien	
Liliopsida	Poales	Poaceae Barnhart	Amphipogon caricinus	Long Greybeard Grass	native	
Liliopsida	Poales	Poaceae Barnhart	Amphipogon caricinus var. caricinus		native	
Liliopsida	Poales	Poaceae Barnhart	Aristida contorta	Bunched Kerosene Grass	native	
Liliopsida	Poales	Poaceae Barnhart	Aristida holathera var. holathera		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa blackii		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa burgesiana		native	P1
Liliopsida	Poales	Poaceae Barnhart	Austrostipa elegantissima		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa eremophila		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa nitida		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa nodosa		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa platychaeta		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa puberula		native	
Liliopsida	Poales	Poaceae Barnhart	Austrostipa scabra		native	
Liliopsida	Poales	Poaceae Barnhart	Bromus rubens		alien	
Liliopsida	Poales	Poaceae Barnhart	Cenchrus ciliaris	Buffel Grass	alien	
Liliopsida	Poales	Poaceae Barnhart	Cenchrus longisetus	Feathertop	alien	
Liliopsida	Poales	Poaceae Barnhart	Chloris truncata	Windmill Grass	native	
Liliopsida	Poales	Poaceae Barnhart	Cynodon dactylon	Couch	alien	
Liliopsida	Poales	Poaceae Barnhart	Dactyloctenium radulans		native	

Liliopsida	Poales	Poaceae Barnhart	Digitaria brownii		native	
Liliopsida	Poales	Poaceae Barnhart	Enneapogon avenaceus		native	
Liliopsida	Poales	Poaceae Barnhart	Enneapogon caerulescens		native	
Liliopsida	Poales	Poaceae Barnhart	Enneapogon cylindricus		native	
Liliopsida	Poales	Poaceae Barnhart	Enteropogon ramosus		native	
Liliopsida	Poales	Poaceae Barnhart	Eragrostis curvula	African Lovegrass	alien	
Liliopsida	Poales	Poaceae Barnhart	Eragrostis dielsii	Mallee Lovegrass	native	
Liliopsida	Poales	Poaceae Barnhart	Eragrostis falcata	Sickle Lovegrass	native	
Liliopsida	Poales	Poaceae Barnhart	Eragrostis lacunaria	Purple Lovegrass	native	
Liliopsida	Poales	Poaceae Barnhart	Eragrostis setifolia	Neverfail Grass	native	
Liliopsida	Poales	Poaceae Barnhart	Eriachne flaccida	Claypan Grass	native	
Liliopsida	Poales	Poaceae Barnhart	Eriachne pulchella		native	
Liliopsida	Poales	Poaceae Barnhart	Eriochloa australiensis		native	
Liliopsida	Poales	Poaceae Barnhart	Hordeum leporinum	Barley Grass	alien	
Liliopsida	Poales	Poaceae Barnhart	Lachnagrostis filiformis		native	
Liliopsida	Poales	Poaceae Barnhart	Monachather paradoxus		native	
Liliopsida	Poales	Poaceae Barnhart	Paspalidium constrictum		native	
Liliopsida	Poales	Poaceae Barnhart	Pentameris airoides	False Hairgrass	alien	
Liliopsida	Poales	Poaceae Barnhart	Rostraria pumila		alien	
Liliopsida	Poales	Poaceae Barnhart	Rytidosperma acerosum		native	
Liliopsida	Poales	Poaceae Barnhart	Rytidosperma caespitosum		native	
Liliopsida	Poales	Poaceae Barnhart	Rytidosperma setaceum		native	
Liliopsida	Poales	Poaceae Barnhart	Schismus arabicus	Araby Grass	alien	
Liliopsida	Poales	Poaceae Barnhart	Schismus barbatus	Kelch Grass	alien	
Liliopsida	Poales	Poaceae Barnhart	Sorghum halepense	Johnson Grass	alien	
Liliopsida	Poales	Poaceae Barnhart	Sporobolus ramigerus		native	
Liliopsida	Poales	Poaceae Barnhart	Themeda triandra		native	
Liliopsida	Poales	Poaceae Barnhart	Triodia rigidissima		native	
Liliopsida	Poales	Poaceae Barnhart	Triodia scariosa		native	
Liliopsida	Poales	Poaceae Barnhart	Triodia tomentosa		native	
Liliopsida	Poales	Restionaceae R.Br.	Lepidobolus preissianus subsp. volubilis		native	
Magnoliopsid	Apiales	Apiaceae Lindl.	Daucus glochidiatus	Australian Carrot	native	
Magnoliopsid	Apiales	Araliaceae Juss.	Trachymene cyanopetala		native	
Magnoliopsid	Apiales	Pittosporaceae R.Br.	Marianthus bicolor	Painted Marianthus	native	
Magnoliopsid	Apiales	Pittosporaceae R.Br.	Pittosporum angustifolium		mixed	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Actinobole uliginosum	Flannel Cudweed	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Angianthus prostratus		native	P3
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Angianthus tomentosus	Camel-grass	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Arctotheca calendula	Cape Weed	alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Asteridea athrixioides		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Asteridea chaetopoda		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Brachyscome ciliaris		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Brachyscome iberidifolia		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Brachyscome lineariloba		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Brachyscome perpusilla		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Calocephalus francisii		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Calotis hispidula	Bindy Eye	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Calotis multicaulis		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Carthamus lanatus	Saffron Thistle	alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Centaurea melitensis	Maltese Cockspur	alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Centipeda crateriformis subsp. crateriformis		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Centipeda pleiocephala		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Cephalipterum drummondii		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Chrysocephalum apiculatum subsp. norsemanense		native	P3
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Chrysocephalum puteale		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Chthonocephalus pseudevax	Woolly Groundheads	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Cichorium intybus	Chicory	alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Cotula australis		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Cratystylis conocephala	Greybush	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Cratystylis microphylla	Small-leaved Grey Bush	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Cratystylis subspinescens	Australian Sage	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Dittrichia graveolens		alien	

Magnoliopsid	Asterales	Asteraceae Bercht. & J	Erigeron bonariensis		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Erigeron sumatrensis		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Erymophyllum ramosum		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Erymophyllum ramosum subsp. ramosum		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Gazania linearis		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Gilberta tenuifolia		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Gnephosis arachnoidea	Cobwebby-headed Gnephosis	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Gnephosis brevifolia	Short-leaved Gnephosis	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Gnephosis macrocephala		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Helianthus annuus		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Helipterum craspedioides		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Hyalosperma glutinosum subsp. glutinosum		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Hyalosperma zacchaeus		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Hypochaeris glabra	Smooth Cats-ear	alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Isoetopsis graminifolia		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Ixiochlamys nana		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Kippistia suaedifolia		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Lactuca serriola forma serriola		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Lawrencella davenportii		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Leiocarpa websteri		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Lemooria burkittii		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Millotia myosotidifolia		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Millotia perpusilla		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Minuria cunninghamii		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Minuria gardneri		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Minuria leptophylla		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Monoculus monstrosus		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Myriocephalus pygmaeus		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Notisia intonsa		native	P3
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Olearia muelleri		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Olearia muricata		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Olearia pimeleoides		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Olearia subspicata		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Olearia trifurcata		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Oligocarpus calendulaceus		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Oncosiphon suffruticosum		alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Podolepis aristata subsp. affinis		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Podolepis rugata	Pleated Podolepis	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Pseudognaphalium luteoalbum	Jersey Cudweed	mixed	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe charsleyae		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe chlorocephala		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe chlorocephala subsp. rosea		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe chlorocephala subsp. splendida		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe floribunda		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe haigii		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe laevis		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe oppositifolia subsp. oppositifolia		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe pygmaea		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe rubella		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe stricta		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Rhodanthe uniflora		native	P1
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Schoenia cassiniana	Schoenia	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Schoenia filifolia subsp. filifolia		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Senecio glossanthus	Slender Groundsel	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Senecio lacustrinus		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Senecio magnificus	Showy Groundsel	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Senecio pinnatifolius		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Senecio pinnatifolius var. pinnatifolius		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Senecio quadridentatus		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Siemssenia capillaris	Wiry Podolepis	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Sonchus oleraceus	Common Sowthistle	alien	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Streptoglossa cylindriceps		native	

Magnoliopsid	Asterales	Asteraceae Bercht. & J	Streptoglossa liatroides		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Trichanthodium skirrophorum	Woolly Gnephosis	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Triptilodiscus pygmaeus		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Vittadinia dissecta var. hirta		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Vittadinia eremaea		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Vittadinia humerata		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Vittadinia sulcata		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Waitzia acuminata	Orange Immortelle	native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Waitzia acuminata var. acuminata		native	
Magnoliopsid	Asterales	Asteraceae Bercht. & J	Waitzia fitzgibbonii		native	
Magnoliopsid	Asterales	Campanulaceae Juss.	Lithotoma petraea		native	
Magnoliopsid	Asterales	Campanulaceae Juss.	Wahlenbergia gracilenta	Annual Bluebell	native	
Magnoliopsid	Asterales	Campanulaceae Juss.	Wahlenbergia tumidifructa		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Brunonia australis		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Coopernookia strophiolata		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera eriocephala		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera latealata		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera luteiflora		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera plumosa		native	P1
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera stenostachya	Narrow-spiked Dampiera	native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera tenuicaulis	Slender-stemmed Dampiera	native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera tenuicaulis var. tenuicaulis		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Dampiera tenuicaulis var. curvula		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia cycnopotamica		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia elderi		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia etheira		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia havilandii		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia helmsii		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia mimuloides		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia mueckeana		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia occidentalis		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia pinnatifida	Cutleaf Goodenia	native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia pusilliflora		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia rosea		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia salina		native	P2
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Goodenia sp. Midwest (K.A. Shepherd & C.F. Wilkins KS 1609)		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Lechenaultia brevifolia		native	
Magnoliopsid	Asterales	Goodeniaceae R.Br.	Scaevola spinescens	Currant Bush	native	
Magnoliopsid	Asterales	Stylidiaceae R.Br.	Levenhookia leptantha		native	
Magnoliopsid	Asterales	Stylidiaceae R.Br.	Stylidium arenicola		native	
Magnoliopsid	Asterales	Stylidiaceae R.Br.	Stylidium dielsianum	Tangle Triggerplant	native	
Magnoliopsid	Asterales	Stylidiaceae R.Br.	Stylidium limbatum	Fringed-leaved Triggerplant	native	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Arabidella chrysodema		native	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Arabidella trisecta		native	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Brassica tournefortii		alien	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Carrichtera annua	Ward's Weed	alien	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Lepidium fasciculatum	Bundled Peppercress	native	P3
Magnoliopsid	Brassicales	Brassicaceae Burnett	Lepidium phlebopetalum	Veined Peppercress	native	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Menkea australis		native	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Sisymbrium irio	London Rocket	alien	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Sisymbrium orientale	Indian Hedge Mustard	alien	
Magnoliopsid	Brassicales	Brassicaceae Burnett	Sisymbrium runcinatum		alien	
Magnoliopsid	Brassicales	Gyrostemonaceae A.Ju	Gyrostemon brownii		native	
Magnoliopsid	Brassicales	Gyrostemonaceae A.Ju	Gyrostemon racemiger		native	
Magnoliopsid	Caryophyllales	Aizoaceae Martinov	Aizoon pubescens	Coastal Galenia	alien	
Magnoliopsid	Caryophyllales	Aizoaceae Martinov	Disphyma crassifolium subsp. clavellatum		native	
Magnoliopsid	Caryophyllales	Aizoaceae Martinov	Gunniopsis propinqua		native	
Magnoliopsid	Caryophyllales	Aizoaceae Martinov	Gunniopsis quadrifida		native	
Magnoliopsid	Caryophyllales	Aizoaceae Martinov	Gunniopsis septifraga		native	
Magnoliopsid	Caryophyllales	Aizoaceae Martinov	Tetragonia eremaea		native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Alternanthera denticulata var. denticulata			
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus aervoides		native	

Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus carlsonii		native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus drummondii	Narrowleaf Mulla Mulla	native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus exaltatus	Tall Mulla Mulla	native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus gaudichaudii		native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus grandiflorus		native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus helichrysoides		native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus helipteroides	Hairy Mulla Mulla	native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus holosericeus		native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus obovatus	Cotton Bush	native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus polystachyus	Prince of Wales Feather	native	
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus procumbens		native	P1
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus rigidus		native	P1
Magnoliopsid	Caryophyllales	Amaranthaceae Juss.	Ptilotus sp. Kalgoorlie (J. Jackson & B. Moyle 260)		native	P1
Magnoliopsid	Caryophyllales	Cactaceae Juss.	Cylindropuntia fulgida var. mamillata		alien	
Magnoliopsid	Caryophyllales	Cactaceae Juss.	Cylindropuntia imbricata		alien	
Magnoliopsid	Caryophyllales	Cactaceae Juss.	Cylindropuntia kleiniae		alien	
Magnoliopsid	Caryophyllales	Cactaceae Juss.	Opuntia elata		alien	
Magnoliopsid	Caryophyllales	Cactaceae Juss.	Opuntia ficus-indica		alien	
Magnoliopsid	Caryophyllales	Caryophyllaceae Juss.	Spergularia diandra	Lesser Sand Spurry	alien	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex acutibractea subsp. acutibractea		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex codonocarpa	Flat-topped Saltbush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex eardleyae		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex lindleyi		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex lindleyi subsp. conduplicata		native	P3
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex lindleyi subsp. inflata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex nummularia	Old Man Saltbush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex nummularia subsp. spathulata	Old Man Saltbush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex pumilio	Hastate Orache	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex quadrivalvata var. quadrivalvata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex semibaccata	Berry Saltbush	mixed	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Atriplex vesicaria		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Chenopodium album	Fat Hen	alien	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Chenopodium curvispicatum		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Chenopodium nitrariaceum	Nitre Goosefoot	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Dissocarpus paradoxus		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Dysphania cristata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Dysphania kalpari		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Einadia nutans subsp. eremaea		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Enchylaena tomentosa		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Eriochiton sclerolaenoides		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana amoena		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana atkinsiana	Bronze Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana brevifolia	Small Leaf Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana carnosa	Cottony Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana erioclada		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana eriosphaera		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana georgei	Satiny Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana glomerifolia	Ball Leaf Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana marginata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana pentatropis		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana pyramidata	Sago Bush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana radiata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana sedifolia	Pearl Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana suaedifolia		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana tomentosa	Felty Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana tomentosa subsp. tomentosa		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana trichoptera	Downy Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana triptera	Threewinged Bluebush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Maireana turbinata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Malacocera tricornis	Soft Horns	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Rhagodia drummondii		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Rhagodia preissii		native	

Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Rhagodia preissii subsp. preissii		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Roycea divaricata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Sclerolaena cuneata	Yellow Bindii	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Sclerolaena diacantha	Grey Copperburr	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Sclerolaena drummondii		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Sclerolaena fusiformis		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Sclerolaena obliquicuspis	Limestone Bindii	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Sclerolaena patenticuspis	Spear-fruit Saltbush	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia chartacea		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia disarticulata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia doliiformis	Samphire	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia enodis	Smooth-seeded Samphire	native	P1
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia halocnemoides	Shrubby Samphire	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia indica subsp. bidens		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia pergranulata subsp. pergranula	Blackseed Samphire	native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia pergranulata subsp. elongata		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia sp. Burnerbinmah (D. Edinger et al. 101)		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia sp. Dennys Crossing (K.A. Shepherd & J. English KS 552)		native	
Magnoliopsid	Caryophyllales	Chenopodiaceae Vent.	Tecticornia undulata		native	
Magnoliopsid	Caryophyllales	Droseraceae Salisb.	Drosera moorei		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia cinerea		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia desertorum		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia glomerata		native	P4
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia interioris		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia interioris var. interioris		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia pauciflora		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia pauciflora var. pauciflora		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia setosa		native	
Magnoliopsid	Caryophyllales	Frankeniaceae Desv.	Frankenia tetrapetala		native	
Magnoliopsid	Caryophyllales	Montiaceae Raf.	Calandrinia eremaea	Twining Purslane	native	
Magnoliopsid	Caryophyllales	Montiaceae Raf.	Calandrinia lefroyensis		native	P1
Magnoliopsid	Caryophyllales	Montiaceae Raf.	Calandrinia pumila		native	
Magnoliopsid	Caryophyllales	Montiaceae Raf.	Calandrinia quartzitica		native	P1
Magnoliopsid	Caryophyllales	Montiaceae Raf.	Calandrinia schistorhiza		native	
Magnoliopsid	Caryophyllales	Montiaceae Raf.	Calandrinia sculpta		native	
Magnoliopsid	Caryophyllales	Montiaceae Raf.	Calandrinia translucens		native	
Magnoliopsid	Caryophyllales	Nyctaginaceae Juss.	Boerhavia coccinea	Tar Vine	mixed	
Magnoliopsid	Caryophyllales	Plumbaginaceae Juss.	Limonium sinuatum	Perennial Sea Lavender	alien	
Magnoliopsid	Caryophyllales	Polygonaceae Juss.	Duma florulenta		native	
Magnoliopsid	Caryophyllales	Polygonaceae Juss.	Persicaria prostrata		native	
Magnoliopsid	Caryophyllales	Polygonaceae Juss.	Polygonum aviculare		alien	
Magnoliopsid	Caryophyllales	Polygonaceae Juss.	Polygonum plebeium		native	
Magnoliopsid	Caryophyllales	Polygonaceae Juss.	Rumex crystallinus	Shiny Dock	native	P2
Magnoliopsid	Caryophyllales	Polygonaceae Juss.	Rumex hypogaeus	Doublegee	alien	
Magnoliopsid	Caryophyllales	Portulacaceae Juss.	Portulaca oleracea		mixed	
Magnoliopsid	Caryophyllales	Tamaricaceae Link	Tamarix chinensis			
Magnoliopsid	Celastrales	Celastraceae R.Br.	Stackhousia muricata		native	
Magnoliopsid	Celastrales	Celastraceae R.Br.	Stackhousia muricata subsp. annual (W.R. Barker 2172)		native	
Magnoliopsid	Celastrales	Celastraceae R.Br.	Stackhousia sp. Mt Keith (G. Cockerton & G. O'Keefe 11017)		native	
Magnoliopsid	Celastrales	Celastraceae R.Br.	Tripterococcus brunonis		native	
Magnoliopsid	Dilleniales	Dilleniaceae Salisb.	Hibbertia ancistrophylla		native	
Magnoliopsid	Dilleniales	Dilleniaceae Salisb.	Hibbertia exasperata		native	
Magnoliopsid	Dilleniales	Dilleniaceae Salisb.	Hibbertia pungens		native	
Magnoliopsid	Ericales	Ericaceae Juss.	Leucopogon sp. Boorabbin (K.R. Newbey 8374)		native	
Magnoliopsid	Ericales	Ericaceae Juss.	Leucopogon sp. Coolgardie (M. Hislop & F. Hort MH 3197)		native	
Magnoliopsid	Ericales	Ericaceae Juss.	Lysinema pentapetalum	Curry Flower	native	
Magnoliopsid	Ericales	Ericaceae Juss.	Melichrus sp. Coolgardie (K.R. Newbey 8698)		native	P1
Magnoliopsid	Ericales	Ericaceae Juss.	Styphelia coelophylla		native	
Magnoliopsid	Ericales	Ericaceae Juss.	Styphelia hamulosa		native	
Magnoliopsid	Ericales	Ericaceae Juss.	Styphelia serratifolia		native	
Magnoliopsid	Ericales	Primulaceae Borkh.	Lysimachia arvensis	Pimpernel	alien	
Magnoliopsid	Euasterids I	Boraginaceae Juss.	Buglossoides arvensis	Corn Gromwell	alien	

Magnoliopsid	Euasterids I	Boraginaceae Juss.	Echium plantagineum		alien	
Magnoliopsid	Euasterids I	Boraginaceae Juss.	Halgania andromedifolia		native	
Magnoliopsid	Euasterids I	Boraginaceae Juss.	Halgania cyanea var. Allambi Stn (B.W. Strong 676)		native	
Magnoliopsid	Euasterids I	Boraginaceae Juss.	Halgania cyanea var. Charleville (R.W. Purdie +111)		native	
Magnoliopsid	Euasterids I	Boraginaceae Juss.	Halgania integerrima		native	
Magnoliopsid	Euasterids I	Boraginaceae Juss.	Heliotropium curassavicum		native	
Magnoliopsid	Euasterids I	Boraginaceae Juss.	Heliotropium europaeum		alien	
Magnoliopsid	Fabales	Fabaceae	Acacia Mill.			
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia acuminata	Jam	mixed	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia ancistrophylla var. ancistrophylla		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia andrewsii		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia aneura	Mulga	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia burkittii	Sandhill Wattle	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia caesaneura		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia calcarata		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia camptoclada		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia chrysella		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia collegialis	Southern Rock Wattle	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia colletioides	Wait-a-while	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia consanguinea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia coolgardiensis	Spinifex Wattle', 'Sugar Brother	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia crenulata		native	P3
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia cylindrica		native	P3
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia desertorum var. desertorum		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia duriuscula		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia effusifolia		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia enervia subsp. explicata		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia epedunculata		native	P1
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia eremophila var. eremophila		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia erinacea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia gibbosa		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia hemiteles		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia inaequiloba		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia inceana subsp. inceana		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia jennerae		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia kalgoorliensis		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia kempeana	Witchetty Bush	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia lasiocalyx	Silver Wattle	mixed	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia leptopetala		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia ligulata	Umbrella Bush	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia longispinea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia merrallii		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia mulganeura		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia murrayana	Sandplain Wattle	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia nyssophylla		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia oswaldii	Miljee	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia papyrocarpa	Western Myall	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia prainii	Prain's Wattle	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia quadrimarginea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia ramulosa var. ramulosa		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia ramulosa var. linophylla		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia resinimarginea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia resinistipulea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia sclerophylla var. teretiuscula		native	P1
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia sibina		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia synchronicia		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia tetragonophylla	Kurara	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia uncinella		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia websteri		native	P1
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia xerophila var. xerophila		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia xerophila var. brevior		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Acacia yorkrakinensis subsp. acrita		native	

Magnoliopsid	Fabales	Fabaceae Lindl.	Bossiaea cucullata		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Daviesia aphylla		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Daviesia pachyloma		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Dillwynia acerosa		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Gastrolobium graniticum		native	EN
Magnoliopsid	Fabales	Fabaceae Lindl.	Glycyrrhiza acanthocarpa	Native Liquorice	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Gompholobium cinereum		native	P3
Magnoliopsid	Fabales	Fabaceae Lindl.	Gompholobium gompholobioides		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Hovea acanthoclada	Thorny Hovea	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Indigofera occidentalis		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Jacksonia nematoclada		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Leptosema aculeatum		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Lotus cruentus	Redflower Lotus	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Medicago laciniata	Cutleaf Medic	alien	
Magnoliopsid	Fabales	Fabaceae Lindl.	Medicago minima	Small Burr Medic	alien	
Magnoliopsid	Fabales	Fabaceae Lindl.	Medicago truncatula	Barrel Medic	alien	
Magnoliopsid	Fabales	Fabaceae Lindl.	Mirbelia microphylla		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Mirbelia ramulosa		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Mirbelia seorsifolia		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Mirbelia trichocalyx		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Petalostylis cassioides		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna artemisioides		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna artemisioides subsp. filifolia		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna artemisioides subsp. x sturtii		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna charlesiana		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna pleurocarpa		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna pleurocarpa var. pleurocarpa		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna pleurocarpa var. angustifolia		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Senna stowardii		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona beasleyana		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona canescens	Grey Swainsona	native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona gracilis		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona halophila		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona incei		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona kingii		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona leeana		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona paradoxa		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona purpurea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona rostellata		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Swainsona tenuis		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Templetonia aculeata		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Templetonia ceracea		native	
Magnoliopsid	Fabales	Fabaceae Lindl.	Trigonella suavissima		native	
Magnoliopsid	Fabales	Polygalaceae Hoffmanr	Comesperma integerrimum		native	
Magnoliopsid	Fabales	Polygalaceae Hoffmanr	Comesperma scoparium	Broom Milkwort	native	
Magnoliopsid	Fabales	Polygalaceae Hoffmanr	Comesperma spinosum		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina acutivalvis subsp. acutivalvis		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina campestris		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina corniculata		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina eriochlamys		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina eriochlamys subsp. eriochlamys		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina eriochlamys subsp. grossa		native	P3
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina helmsii		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Allocasuarina spinosissima		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Casuarina obesa		native	
Magnoliopsid	Fagales	Casuarinaceae R.Br.	Casuarina pauper		native	
Magnoliopsid	Gentianales	Apocynaceae Juss.	Alyxia buxifolia		native	
Magnoliopsid	Gentianales	Apocynaceae Juss.	Alyxia tetanifolia		native	P3
Magnoliopsid	Gentianales	Apocynaceae Juss.	Asclepias curassavica	Redhead Cottonbush	alien	
Magnoliopsid	Gentianales	Apocynaceae Juss.	Leichhardtia australis	Cogola Bush	native	
Magnoliopsid	Gentianales	Gentianaceae Juss.	Schenkia clementii		native	
Magnoliopsid	Gentianales	Loganiaceae Mart.	Orianthera flaviflora		native	

Magnoliopsid	Gentianales	Loganiaceae Mart.	Orianthera tortuosa		native	
Magnoliopsid	Gentianales	Rubiaceae Juss.	Synaptantha tillaeacea var. tillaeacea		native	
Magnoliopsid	Geraniales	Geraniaceae Juss.	Erodium aureum		alien	
Magnoliopsid	Geraniales	Geraniaceae Juss.	Erodium botrys		alien	
Magnoliopsid	Geraniales	Geraniaceae Juss.	Erodium cicutarium		alien	
Magnoliopsid	Geraniales	Geraniaceae Juss.	Erodium cygnorum		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Apatelantha viscida		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Brachysola coerulea		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Cyanostegia angustifolia	Tinsel-flower	native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Dasymalla terminalis		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Dicrastylis parvifolia		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Hemiphora elderi		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Lachnostachys coolgardiensis		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Marrubium vulgare	Horehound	alien	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Pityrodia lepidota		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Prostanthera althoferi subsp. althoferi		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Prostanthera campbellii		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Prostanthera grylloana		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Salvia reflexa	Mintweed	alien	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Salvia verbenaca	Wild Sage	alien	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Teucrium disjunctum		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Teucrium sessiliflorum	Camel Bush	native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Westringia cephalantha		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Westringia cephalantha var. cephalantha		native	
Magnoliopsid	Lamiales	Lamiaceae Martinov	Westringia rigida	Stiff Westringia	native	
Magnoliopsid	Lamiales	Phrymaceae Schauer	Glossostigma drummondii	Mudmat	native	
Magnoliopsid	Lamiales	Plantaginaceae Juss.	Plantago drummondii	Sago Weed	native	
Magnoliopsid	Lamiales	Plantaginaceae Juss.	Plantago sp. Mt Magnet (A.S. George 6793)		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila alternifolia	Poverty Bush	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila caerulea subsp. caerulea		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila caerulea subsp. merrallii	Bruce Rock Eremophila	native	P4
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila caperata		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila clarkei		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila decipiens	Slender Fuchsia	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila decipiens subsp. decipiens	Slender Fuschia Bush	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila dempsteri		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila deserti		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila gibbosa	Humped Fuschia Bush	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila glabra subsp. glabra	Common Emu Bush	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila granitica	Granite Poverty Bush	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila interstans subsp. interstans		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila interstans subsp. virgata		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila ionantha	Violet-flowered Eremophila	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila latrobei subsp. latrobei	Native Fuschia	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila longifolia	Berrigan	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila maculata subsp. brevifolia		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila metallicorum		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila microphylla		native	P3
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila miniata		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila oblonga		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila oldfieldii subsp. angustifolia		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila oppositifolia subsp. angustifolia	Western Weeooka	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila paisleyi subsp. paisleyi		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila pantonii		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila parvifolia subsp. auricampi		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila praecox		native	P2
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila pustulata		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila saligna		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila scoparia	Broom Bush (	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila serrulata	Serrate-leaved Eremophila	native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila sp. Mt Jackson (G.J. Keighery 4372)		native	
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila subfloccosa subsp. lanata		native	

Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Eremophila veronica	Veronica-like Eremophila	native	P3
Magnoliopsid	Lamiales	Scrophulariaceae Juss.	Myoporum montanum		native	
Magnoliopsid	Malpighiales	Elatinaceae Dumort.	Bergia trimera		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Bertya dimerostigma		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Beyeria sulcata var. sulcata		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Beyeria sulcata var. brevipes		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Euphorbia philochalix		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Euphorbia porcata		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Monotaxis grandiflora var. obtusifolia		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Monotaxis luteiflora		native	
Magnoliopsid	Malpighiales	Euphorbiaceae Juss.	Ricinocarpos stylosus		native	
Magnoliopsid	Malpighiales	Phyllanthaceae Martino	Poranthera microphylla	Small Poranthera	native	
Magnoliopsid	Malpighiales	Violaceae Batsch	Pigea curvifolia		native	
Magnoliopsid	Malpighiales	Violaceae Batsch	Pigea sp. Chloroxantha (E. Bennett & D. Bright EUC 1810)			P3
Magnoliopsid	Malvales	Malvaceae Juss.	Abutilon cryptopetalum		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Abutilon oxycarpum	Flannel Weed	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Androcalva aphrix		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Brachychiton gregorii	Desert Kurrajong	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Commersonia craurophylla		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Hannafordia bissillii subsp. latifolia		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Lawrencia diffusa		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Lawrencia glomerata		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Lawrencia helmsii		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Lawrencia repens		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Lawrencia squamata		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Malva parviflora	Marshmallow	alien	
Magnoliopsid	Malvales	Malvaceae Juss.	Malva weinmanniana		native	
Magnoliopsid	Malvales	Malvaceae Juss.	Radyera farragei	Knobby Hibiscus	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Seringia cacaobrunnea	Chocolate fire-bush	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Seringia velutina	Velvet firebush	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Sida calyxhymenia	Tall Sida	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Sida fibulifera	Silver Sida	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Sida intricata	Tangled Sida	native	
Magnoliopsid	Malvales	Malvaceae Juss.	Sida sp. dark green fruits (S. van Leeuwen 2260)		native	
Magnoliopsid	Malvales	Thymelaeaceae Juss.	Pimelea aeruginosa		native	
Magnoliopsid	Malvales	Thymelaeaceae Juss.	Pimelea angustifolia	Narrow-leaved Pimelea	native	
Magnoliopsid	Malvales	Thymelaeaceae Juss.	Pimelea microcephala subsp. microcephala		native	
Magnoliopsid	Myrtales	Lythraceae J.St.-Hil.	Lythrum wilsonii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Aluta appressa		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Aluta aspera subsp. aspera		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Balaustion pulcherrimum		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Calothamnus gilesii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Calytrix birdii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Calytrix creswellii		native	P3
Magnoliopsid	Myrtales	Myrtaceae Juss.	Calytrix duplistipulata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Calytrix hislopii		native	P3
Magnoliopsid	Myrtales	Myrtaceae Juss.	Calytrix ryeae			
Magnoliopsid	Myrtales	Myrtaceae Juss.	Chamelaucium ciliatum		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Chamelaucium sp. Koolyanobbing (V. Clarke 644)		native	P1
Magnoliopsid	Myrtales	Myrtaceae Juss.	Chamelaucium sp. Parker Range (B.H. Smith 1255)		native	P1
Magnoliopsid	Myrtales	Myrtaceae Juss.	Cyathostemon verrucosus		native	P3
Magnoliopsid	Myrtales	Myrtaceae Juss.	Enekbatus cryptandroides		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus campaspe		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus capillosa		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus celastroides		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus ceratocorys		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus clelandiorum		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus cometae-vallis		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus concinna		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus corrugata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus cylindrocarpa		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus ebbanoensis subsp. ebbanoensis		native	

Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus ebbanoensis subsp. glauciramula		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus ecdysiastes		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus educta		native	P2
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus eremicola		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus ewartiana	Ewart's Mallee	native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus flavida		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus griffithsii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus horistes		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus leptopoda subsp. subluta		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus lesouefii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus longissima		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus loxophleba subsp. lissophloia		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus moderata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus oldfieldii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus oleosa		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus oleosa subsp. oleosa		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus pileata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus planipes		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus platycorys		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus plumula		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus ravida		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus rigidula		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus rigidula subsp. rigidula		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus salmonophloia		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus salubris		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus torquata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus transcontinentalis		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus urna subsp. xesta		native	P3
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus x brachyphylla		native	P4
Magnoliopsid	Myrtales	Myrtaceae Juss.	Eucalyptus yilgarnensis		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Euryomyrtus maidenii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Euryomyrtus patrickiae		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Homalocalyx grandiflorus		native	P3
Magnoliopsid	Myrtales	Myrtaceae Juss.	Homalocalyx thryptomenoides		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Hysterobaeckea ochropetala subsp. cometes		native	P3
Magnoliopsid	Myrtales	Myrtaceae Juss.	Leptospermopsis fastigiata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Malleostemon roseus		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Malleostemon tuberculatus		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Melaleuca calyptroides		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Melaleuca cordata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Melaleuca halmaturorum		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Melaleuca hamata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Melaleuca lateriflora		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Melaleuca phoidophylla		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Melaleuca sheathiana	Boree	native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Micromyrtus imbricata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Micromyrtus monotaxis		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Micromyrtus obovata		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Thryptomene kochii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Thryptomene planiflora	Goldfields Laceflower	native	P1
Magnoliopsid	Myrtales	Myrtaceae Juss.	Thryptomene urceolaris		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Verticordia chrysantha		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Verticordia helmsii		native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Verticordia picta	Painted Featherflower	native	
Magnoliopsid	Myrtales	Myrtaceae Juss.	Verticordia pritzelii	Pritzel's Featherflower	native	
Magnoliopsid	Oxalidales	Elaeocarpaceae Juss.	Tetratheca efoliata		native	
Magnoliopsid	Oxalidales	Oxalidaceae R.Br.	Oxalis perennans		native	
Magnoliopsid	Oxalidales	Oxalidaceae R.Br.	Oxalis pes-caprae		alien	
Magnoliopsid	Proteales	Proteaceae Juss.	Banksia elderiana		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Conospermum stoechadis subsp. stoechadis		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea acacioides		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea acuaria		native	

Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea didymobotrya subsp. didymobotrya		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea excelsior	Flame Grevillea	native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea georgeana		native	P3
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea haplantha subsp. haplantha		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea hookeriana	Red Tooth Brushes	native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea hookeriana subsp. apiciloba		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea nematophylla subsp. nematophylla		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea oligomera		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea sarissa subsp. sarissa		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea sarissa subsp. bicolor		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Grevillea teretifolia	Round Leaf Grevillea	native	
Magnoliopsid	Proteales	Proteaceae Juss.	Hakea francisiana	Emu Tree	native	
Magnoliopsid	Proteales	Proteaceae Juss.	Hakea minyma		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Hakea multilineata	Grass Leaf Hakea	mixed	
Magnoliopsid	Proteales	Proteaceae Juss.	Hakea recurva	Djarnokmurd	mixed	
Magnoliopsid	Proteales	Proteaceae Juss.	Hakea rigida		native	P2
Magnoliopsid	Proteales	Proteaceae Juss.	Hakea scoparia subsp. scoparia		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Isopogon scabriusculus subsp. pubifloris		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Persoonia saundersiana		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Petrophile seminuda		native	
Magnoliopsid	Proteales	Proteaceae Juss.	Petrophile stricta		native	
Magnoliopsid	Ranunculales	Ranunculaceae Juss.	Myosurus australis		native	
Magnoliopsid	Ranunculales	Ranunculaceae Juss.	Ranunculus pentandrus var. platycarpus		native	
Magnoliopsid	Rosales	Rhamnaceae Juss.	Cryptandra aridicola		native	
Magnoliopsid	Rosales	Rhamnaceae Juss.	Cryptandra graniticola		native	
Magnoliopsid	Rosales	Rhamnaceae Juss.	Cryptandra micrantha		native	
Magnoliopsid	Rosales	Rhamnaceae Juss.	Pomaderris forrestiana		native	
Magnoliopsid	Rosales	Rhamnaceae Juss.	Stenanthemum stipulosum		native	
Magnoliopsid	Rosales	Rhamnaceae Juss.	Trymalium myrtillus subsp. myrtillus		native	
Magnoliopsid	Santalales	Loranthaceae Juss.	Amyema benthamii		native	
Magnoliopsid	Santalales	Loranthaceae Juss.	Amyema gibberula		native	
Magnoliopsid	Santalales	Loranthaceae Juss.	Amyema gibberula var. gibberula		native	
Magnoliopsid	Santalales	Loranthaceae Juss.	Amyema linophylla subsp. linophylla		native	
Magnoliopsid	Santalales	Loranthaceae Juss.	Amyema preissii	Wireleaf Mistletoe	native	
Magnoliopsid	Santalales	Loranthaceae Juss.	Lysiana casuarinae		native	
Magnoliopsid	Santalales	Loranthaceae Juss.	Lysiana exocarpi subsp. exocarpi	Harlequin Mistletoe	native	
Magnoliopsid	Santalales	Santalaceae R.Br.	Exocarpos aphyllus	Leafless Ballart	native	
Magnoliopsid	Santalales	Santalaceae R.Br.	Leptomeria preissiana		native	
Magnoliopsid	Santalales	Santalaceae R.Br.	Santalum acuminatum	Quandong	native	
Magnoliopsid	Santalales	Santalaceae R.Br.	Santalum lanceolatum	Northern Sandalwood	native	
Magnoliopsid	Santalales	Santalaceae R.Br.	Santalum spicatum	Sandalwood	native	
Magnoliopsid	Sapindales	Anacardiaceae R.Br.	Schinus molle var. areira		alien	
Magnoliopsid	Sapindales	Nitrariaceae Lindl.	Nitraria billardierei	Nitre Bush	native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Boronia ternata		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Boronia ternata var. ternata		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Cyanothamnus coerulescens		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Cyanothamnus coerulescens subsp. coerulescens		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Phebalium appressum		native	P1
Magnoliopsid	Sapindales	Rutaceae Juss.	Phebalium brevifolium		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Phebalium canaliculatum		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Phebalium filifolium	Slender Phebalium	native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Phebalium megaphyllum		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Philotheca brucei subsp. brucei		native	
Magnoliopsid	Sapindales	Rutaceae Juss.	Philotheca pachyphylla		native	P1
Magnoliopsid	Sapindales	Rutaceae Juss.	Philotheca tomentella		native	
Magnoliopsid	Sapindales	Sapindaceae Juss.	Alectryon oleifolius subsp. canescens		native	
Magnoliopsid	Sapindales	Sapindaceae Juss.	Dodonaea adenophora		native	
Magnoliopsid	Sapindales	Sapindaceae Juss.	Dodonaea amblyophylla		native	
Magnoliopsid	Sapindales	Sapindaceae Juss.	Dodonaea lobulata	Bead Hopbush	native	
Magnoliopsid	Sapindales	Sapindaceae Juss.	Dodonaea microzyga		native	
Magnoliopsid	Sapindales	Sapindaceae Juss.	Dodonaea rigida		native	
Magnoliopsid	Sapindales	Sapindaceae Juss.	Dodonaea stenozyga		native	

Magnoliopsid	Sapindales	Sapindaceae Juss.	Dodonaea viscosa subsp. angustissima		native	
Magnoliopsid	Saxifragales	Crassulaceae J.St.-Hil.	Crassula colorata var. colorata		native	
Magnoliopsid	Saxifragales	Crassulaceae J.St.-Hil.	Crassula colorata var. acuminata		native	
Magnoliopsid	Saxifragales	Crassulaceae J.St.-Hil.	Crassula tetramera		native	
Magnoliopsid	Saxifragales	Haloragaceae R.Br.	Glischrocaryon angustifolium		native	
Magnoliopsid	Saxifragales	Haloragaceae R.Br.	Glischrocaryon aureum	Common Popflower	native	
Magnoliopsid	Saxifragales	Haloragaceae R.Br.	Haloragis trigonocarpa		native	
Magnoliopsid	Saxifragales	Haloragaceae R.Br.	Myriophyllum petraeum		native	P4
Magnoliopsid	Solanales	Convolvulaceae Juss.	Convolvulus recurvatus subsp. nullarborensis		native	
Magnoliopsid	Solanales	Convolvulaceae Juss.	Convolvulus remotus		native	
Magnoliopsid	Solanales	Convolvulaceae Juss.	Cuscuta epithymum	Lesser Dodder	alien	
Magnoliopsid	Solanales	Solanaceae Juss.	Duboisia hopwoodii		native	
Magnoliopsid	Solanales	Solanaceae Juss.	Lycium australe	Australian Boxthorn	native	
Magnoliopsid	Solanales	Solanaceae Juss.	Lycium ferocissimum	African Boxthorn	alien	
Magnoliopsid	Solanales	Solanaceae Juss.	Nicotiana glauca	Tree Tobacco	alien	
Magnoliopsid	Solanales	Solanaceae Juss.	Nicotiana goodspeedii		native	
Magnoliopsid	Solanales	Solanaceae Juss.	Nicotiana rosulata		native	
Magnoliopsid	Solanales	Solanaceae Juss.	Nicotiana stenocarpa		native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum cleistogamum		native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum esuriale	Quena	native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum hoplopetalum	Thorny Solanum	mixed	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum lasiophyllum	Flannel Bush	mixed	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum nigrum	Black Berry Nightshade	alien	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum nummularium	Money-leaved Solanum	native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum orbiculatum	Wild Tomato	native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum orbiculatum subsp. orbiculatum	Round-leaved Solanum	native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum petrophilum	Rock Nightshade	native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum plicatile		native	
Magnoliopsid	Solanales	Solanaceae Juss.	Solanum terraneum		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera apiculata		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera aurantiaca subsp. aurantiaca		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera billardierei		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera eichleri		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera eremaea		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera fruticulosa	Shrubby Twinleaf	native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera glauca	Pale Twinleaf	native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera ovata	Dwarf Twinleaf	native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera reticulata		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Roepera tetraptera		native	
Magnoliopsid	Zygophyllales	Zygophyllaceae R.Br.	Tribulus terrestris	Caltrop	alien	
Pinopsida	Pinales	Cupressaceae Gray	Callitris columellaris		mixed	
Pinopsida	Pinales	Cupressaceae Gray	Callitris preissii		mixed	
Pteridopsida	Polypodiales	Pteridaceae E.D.M.Kirc	Cheilanthes lasiophylla	Woolly Cloak Fern	native	
Pteridopsida	Salviniales	Marsileaceae Mirb.	Marsilea hirsuta	Nardoo	native	

Summary by Class	
Class	**Taxa**
Isoetopsida	1
Liliopsida	84
Magnoliopsida	691
Pinopsida	2
Pteridopsida	2
TOTAL	**780**

Top 5 Families by Species Count	
Family	**Taxa**
Asteraceae Bercht.	99
Fabaceae Lindl.	97
Myrtaceae Juss.	79
Chenopodiaceae Ve	62
Poaceae Barnhart	50

Summary by Conservation Code	
Code	**Taxa**
P1	19
P2	6
P3	24
P4	4
EN	1

Dandjoo Terrestrial Vertebrate Fauna Species List

Source: Dandjoo – Department of Biodiversity, Conservation and Attractions
Method: User defined circle: 50.0 km
Dandjoo Export: bio_species_list_public_2025-08-22T16_02_39.976845+08_00 fauna_filtered_fauna.xlsm
Filter: Kingdon = Animalia, Phylum = Chordata

Class	Order	Family	Taxon	Common Name	Estab.	Code
Actinopterygii	Cypriniformes	Cyprinidae	Carassius auratus			
Amphibia	Anura	Limnodynastidae	Neobatrachus			
Amphibia	Anura	Limnodynastidae	Neobatrachus kunapalari	Kunapalari Frog	native	
Amphibia	Anura	Limnodynastidae	Neobatrachus pelobatoides	Humming Frog	native	
Amphibia	Anura	Limnodynastidae	Neobatrachus sutor	Shoemaker Frog	native	
Amphibia	Anura	Limnodynastidae	Neobatrachus wilsmorei		native	
Amphibia	Anura	Myobatrachidae	Geocrinia leai		native	
Amphibia	Anura	Myobatrachidae	Pseudophryne occidentalis	Western Toadlet	native	
Amphibia	Anura	Pelodryadidae GÃ¼nth	Litoria moorei		native	
Aves	Accipitriformes	Accipitridae	Aquila audax		native	
Aves	Accipitriformes	Accipitridae	Circus approximans		native	
Aves	Accipitriformes	Accipitridae	Circus assimilis		native	
Aves	Accipitriformes	Accipitridae	Elanus axillaris			
Aves	Accipitriformes	Accipitridae	Elanus caeruleus		native	
Aves	Accipitriformes	Accipitridae	Haliastur sphenurus	Whistling Kite	native	
Aves	Accipitriformes	Accipitridae	Hieraaetus morphnoides		native	
Aves	Accipitriformes	Accipitridae	Tachyspiza cirrocephala		native	
Aves	Accipitriformes	Accipitridae	Tachyspiza fasciata		native	
Aves	Anseriformes	Anatidae	Anas gracilis	Grey Teal	native	
Aves	Anseriformes	Anatidae	Anas superciliosa		native	
Aves	Anseriformes	Anatidae	Aythya australis		native	
Aves	Anseriformes	Anatidae	Biziura lobata		native	
Aves	Anseriformes	Anatidae	Cairina moschata			
Aves	Anseriformes	Anatidae	Chenonetta jubata		native	
Aves	Anseriformes	Anatidae	Cygnus atratus		native	
Aves	Anseriformes	Anatidae	Malacorhynchus membranaceus	Pink-eared Duck	native	
Aves	Anseriformes	Anatidae	Oxyura australis		native	P4
Aves	Anseriformes	Anatidae	Stictonetta naevosa	Freckled Duck	native	
Aves	Anseriformes	Anatidae	Tadorna tadornoides	Australian Shelduck	native	
Aves	Apodiformes	Aegothelidae	Aegotheles cristatus		native	
Aves	Caprimulgiformes	Caprimulgidae	Eurostopodus argus	Spotted Nightjar	native	
Aves	Caprimulgiformes	Podargidae	Podargus strigoides	Tawny Frogmouth	native	
Aves	Casuariiformes	Casuariidae	Dromaius novaehollandiae	Emu	native	
Aves	Casuariiformes	Casuariidae	Dromaius novaehollandiae novaehollandiae		native	
Aves	Charadriiformes	Charadriidae	Anarhynchus ruficapillus		native	
Aves	Charadriiformes	Charadriidae	Anarhynchus veredus			MI
Aves	Charadriiformes	Charadriidae	Charadrius cucullatus	Hooded Dotterel', 'Hooded Plover	native	P4
Aves	Charadriiformes	Charadriidae	Charadrius melanops	Black-fronted Dotterel	native	
Aves	Charadriiformes	Charadriidae	Erythrogonys cinctus		native	
Aves	Charadriiformes	Charadriidae	Vanellus tricolor		native	
Aves	Charadriiformes	Laridae	Chlidonias hybrida		native	
Aves	Charadriiformes	Laridae	Chroicocephalus novaehollandiae			
Aves	Charadriiformes	Recurvirostridae	Cladorhynchus leucocephalus		native	
Aves	Charadriiformes	Recurvirostridae	Himantopus leucocephalus			
Aves	Charadriiformes	Recurvirostridae	Recurvirostra novaehollandiae		native	
Aves	Charadriiformes	Scolopacidae	Calidris acuminata		native	MI
Aves	Columbiformes	Columbidae	Columba livia		alien	
Aves	Columbiformes	Columbidae	Ocyphaps lophotes	Crested Pigeon	native	
Aves	Columbiformes	Columbidae	Phaps chalcoptera	Common Bronzewing	native	
Aves	Columbiformes	Columbidae	Spilopelia senegalensis			
Aves	Coraciiformes	Alcedinidae	Todiramphus pyrrhopygius		native	
Aves	Coraciiformes	Alcedinidae	Todiramphus sanctus		native	
Aves	Coraciiformes	Meropidae	Merops ornatus		native	

Aves	Cuculiformes	Cuculidae	Chalcites basalis		native	
Aves	Cuculiformes	Cuculidae	Chalcites osculans		native	
Aves	Cuculiformes	Cuculidae	Heteroscenes pallidus	Pallid Cuckoo	native	
Aves	Falconiformes	Falconidae	Falco berigora		native	
Aves	Falconiformes	Falconidae	Falco berigora berigora		native	
Aves	Falconiformes	Falconidae	Falco cenchroides		native	
Aves	Falconiformes	Falconidae	Falco longipennis		native	
Aves	Falconiformes	Falconidae	Falco peregrinus		native	OS
Aves	Galliformes	Megapodiidae	Leipoa ocellata	Malleefowl	native	VU
Aves	Gruiformes	Rallidae	Fulica atra	Eurasian Coot	native	
Aves	Gruiformes	Rallidae	Fulica atra australis		native	
Aves	Gruiformes	Rallidae	Porzana fluminea		native	
Aves	Gruiformes	Rallidae	Tribonyx ventralis	Black-tailed Native-hen	native	
Aves	Otidiformes	Otididae	Ardeotis australis		native	
Aves	Passeriformes	Acanthizidae	Acanthiza apicalis		native	
Aves	Passeriformes	Acanthizidae	Acanthiza apicalis apicalis	Broad-tailed Thornbill	native	
Aves	Passeriformes	Acanthizidae	Acanthiza chrysorrhoa	Yellow-rumped Thornbill	native	
Aves	Passeriformes	Acanthizidae	Acanthiza iredalei		native	
Aves	Passeriformes	Acanthizidae	Acanthiza iredalei iredalei		native	
Aves	Passeriformes	Acanthizidae	Acanthiza robustirostris		native	
Aves	Passeriformes	Acanthizidae	Acanthiza uropygialis		native	
Aves	Passeriformes	Acanthizidae	Aphelocephala leucopsis		native	VU
Aves	Passeriformes	Acanthizidae	Aphelocephala leucopsis castaneiventris		native	
Aves	Passeriformes	Acanthizidae	Calamanthus campestris		native	
Aves	Passeriformes	Acanthizidae	Calamanthus cautus			
Aves	Passeriformes	Acanthizidae	Gerygone fusca		native	
Aves	Passeriformes	Acanthizidae	Pyrrholaemus brunneus	Redthroat	native	
Aves	Passeriformes	Acanthizidae	Smicrornis brevirostris	Weebill	native	
Aves	Passeriformes	Artamidae	Artamus cinereus	Black-faced Woodswallow	native	
Aves	Passeriformes	Artamidae	Artamus cyanopterus	Dusky Woodswallow	native	
Aves	Passeriformes	Artamidae	Artamus minor		native	
Aves	Passeriformes	Artamidae	Artamus personatus		native	
Aves	Passeriformes	Artamidae	Cracticus nigrogularis		native	
Aves	Passeriformes	Artamidae	Cracticus torquatus	Grey Butcherbird	native	
Aves	Passeriformes	Artamidae	Gymnorhina tibicen			
Aves	Passeriformes	Campephagidae	Coracina maxima		native	
Aves	Passeriformes	Campephagidae	Coracina novaehollandiae	Black-faced Cuckoo-shrike	native	
Aves	Passeriformes	Campephagidae	Coracina novaehollandiae novaehollandiae	Black-faced Cuckoo-shrike	native	
Aves	Passeriformes	Campephagidae	Lalage sueurii			
Aves	Passeriformes	Campephagidae	Lalage tricolor		native	
Aves	Passeriformes	Cinclosomatidae	Cinclosoma castaneothorax		native	
Aves	Passeriformes	Cinclosomatidae	Cinclosoma clarum		native	
Aves	Passeriformes	Cinclosomatidae	Psophodes occidentalis		native	
Aves	Passeriformes	Climacteridae	Climacteris affinis	White-browed Treecreeper	native	
Aves	Passeriformes	Climacteridae	Climacteris affinis superciliosus			
Aves	Passeriformes	Climacteridae	Climacteris rufus	Rufous Treecreeper	native	
Aves	Passeriformes	Corvidae	Corvus bennetti		native	
Aves	Passeriformes	Corvidae	Corvus coronoides	Australian Raven	native	
Aves	Passeriformes	Corvidae	Corvus orru		native	
Aves	Passeriformes	Cracticidae	Strepera versicolor	Grey Currawong	native	
Aves	Passeriformes	Dicaeidae	Dicaeum hirundinaceum	Mistletoebird	native	
Aves	Passeriformes	Estrildidae	Taeniopygia castanotis			
Aves	Passeriformes	Estrildidae	Taeniopygia guttata	Zebra Finch	native	
Aves	Passeriformes	Hirundinidae	Cheramoeca leucosterna		native	
Aves	Passeriformes	Hirundinidae	Hirundo neoxena		native	
Aves	Passeriformes	Hirundinidae	Petrochelidon ariel		native	
Aves	Passeriformes	Hirundinidae	Petrochelidon nigricans		native	
Aves	Passeriformes	Locustellidae Bonapart	Cincloramphus mathewsi		native	
Aves	Passeriformes	Locustellidae Bonapart	Poodytes gramineus			
Aves	Passeriformes	Maluridae	Malurus leucopterus	White-winged Fairy-wren	native	
Aves	Passeriformes	Maluridae	Malurus leucopterus leuconotus		native	

Aves	Passeriformes	Maluridae	Malurus leucopterus leucopterus	Dirk Hartog black and white fairy-w	native	VU
Aves	Passeriformes	Maluridae	Malurus pulcherrimus		native	
Aves	Passeriformes	Maluridae	Malurus splendens	Splendid Fairy-wren	native	
Aves	Passeriformes	Meliphagidae	Acanthagenys rufogularis		native	
Aves	Passeriformes	Meliphagidae	Anthochaera carunculata	Red Wattlebird	native	
Aves	Passeriformes	Meliphagidae	Epthianura albifrons	White-fronted Chat	native	
Aves	Passeriformes	Meliphagidae	Epthianura tricolor		native	
Aves	Passeriformes	Meliphagidae	Gavicalis virescens	Singing Honeyeater	native	
Aves	Passeriformes	Meliphagidae	Lichmera indistincta	Brown Honeyeater	native	
Aves	Passeriformes	Meliphagidae	Manorina flavigula		native	
Aves	Passeriformes	Meliphagidae	Melithreptus albogularis albogularis		native	
Aves	Passeriformes	Meliphagidae	Melithreptus brevirostris	Brown-headed Honeyeater	native	
Aves	Passeriformes	Meliphagidae	Nesoptilotis leucotis	White-eared Honeyeater		
Aves	Passeriformes	Meliphagidae	Nesoptilotis leucotis novaenorciae			
Aves	Passeriformes	Meliphagidae	Phylidonyris novaehollandiae longirostris		native	
Aves	Passeriformes	Meliphagidae	Ptilotula ornata		native	
Aves	Passeriformes	Meliphagidae	Ptilotula plumula		native	
Aves	Passeriformes	Meliphagidae	Purnella albifrons	White-fronted Honeyeater	native	
Aves	Passeriformes	Meliphagidae	Sugomel niger	Black Honeyeater	native	
Aves	Passeriformes	Monarchidae Bonaparte	Grallina cyanoleuca	Magpie-lark	native	
Aves	Passeriformes	Motacillidae	Anthus novaeseelandiae		alien	
Aves	Passeriformes	Neosittidae	Daphoenositta chrysoptera	Varied Sittella	native	
Aves	Passeriformes	Neosittidae	Daphoenositta chrysoptera pileata		native	
Aves	Passeriformes	Oreoicidae	Oreoica gutturalis		native	
Aves	Passeriformes	Oreoicidae	Oreoica gutturalis gutturalis		native	
Aves	Passeriformes	Pachycephalidae	Colluricincla harmonica	Grey Shrike-thrush	native	
Aves	Passeriformes	Pachycephalidae	Colluricincla harmonica rufiventris		native	
Aves	Passeriformes	Pachycephalidae	Pachycephala inornata	Gilbert's Whistler	native	
Aves	Passeriformes	Pachycephalidae	Pachycephala occidentalis		native	
Aves	Passeriformes	Pachycephalidae	Pachycephala rufiventris	Rufous Whistler	native	
Aves	Passeriformes	Pardalotidae	Pardalotus punctatus		native	
Aves	Passeriformes	Pardalotidae	Pardalotus striatus	Striated Pardalote	native	
Aves	Passeriformes	Pardalotidae	Pardalotus striatus ornatus		mixed	
Aves	Passeriformes	Pardalotidae	Pardalotus striatus westraliensis		native	
Aves	Passeriformes	Petroicidae Mathews, 1	Drymodes brunneopygia	Southern Scrub-robin	native	
Aves	Passeriformes	Petroicidae Mathews, 1	Eopsaltria griseogularis	Western Yellow Robin		
Aves	Passeriformes	Petroicidae Mathews, 1	Eopsaltria griseogularis griseogularis			
Aves	Passeriformes	Petroicidae Mathews, 1	Melanodryas cucullata	Hooded Robin	native	
Aves	Passeriformes	Petroicidae Mathews, 1	Microeca fascinans	Jacky Winter	native	
Aves	Passeriformes	Petroicidae Mathews, 1	Microeca fascinans assimilis		native	
Aves	Passeriformes	Petroicidae Mathews, 1	Petroica goodenovii		native	
Aves	Passeriformes	Pomatostomidae	Pomatostomus superciliosus		native	
Aves	Passeriformes	Ptilonorhynchidae	Chlamydera guttata			
Aves	Passeriformes	Rhipiduridae	Rhipidura albiscapa Gould, 1840		native	
Aves	Passeriformes	Rhipiduridae	Rhipidura leucophrys	Willie Wagtail	native	
Aves	Passeriformes	Sylviidae	Megalurus gramineus	Little Grassbird	native	
Aves	Passeriformes	Zosteropidae	Zosterops lateralis		native	
Aves	Pelecaniformes	Ardeidae	Ardea pacifica	White-necked Heron	native	
Aves	Pelecaniformes	Ardeidae	Botaurus sinensis		native	
Aves	Pelecaniformes	Threskiornithidae	Threskiornis moluccus		native	
Aves	Pelecaniformes	Threskiornithidae	Threskiornis spinicollis		native	
Aves	Podicipediformes	Podicipedidae	Poliocephalus poliocephalus	Hoary-headed Grebe	native	
Aves	Podicipediformes	Podicipedidae	Tachybaptus novaehollandiae		native	
Aves	Psittaciformes	Cacatuidae	Cacatua sanguinea		native	
Aves	Psittaciformes	Cacatuidae	Eolophus roseicapilla	Galah		
Aves	Psittaciformes	Cacatuidae	Nymphicus hollandicus		native	
Aves	Psittaciformes	Cacatuidae	Zanda latirostris	Carnaby's Cockatoo	native	EN
Aves	Psittaciformes	Psittacidae	Neophema splendida		native	
Aves	Psittaciformes	Psittacidae	Psephotellus varius			
Aves	Psittaciformes	Psittaculidae	Barnardius zonarius			
Aves	Psittaciformes	Psittaculidae	Barnardius zonarius semitorquatus			

Aves	Psittaciformes	Psittaculidae	Barnardius zonarius zonarius			
Aves	Psittaciformes	Psittaculidae	Melopsittacus undulatus		native	
Aves	Psittaciformes	Psittaculidae	Parvipsitta porphyrocephala	Purple-crowned Lorikeet	native	
Aves	Psittaciformes	Psittaculidae	Platycercus icterotis		native	
Aves	Psittaciformes	Psittaculidae	Polytelis anthopeplus	Regent Parrot	native	
Aves	Psittaciformes	Psittaculidae	Polytelis anthopeplus anthopeplus		native	
Aves	Strigiformes	Strigidae	Ninox boobook		native	
Aves	Strigiformes	Tytonidae	Tyto javanica delicatula			
Aves	Suliformes	Phalacrocoracidae	Microcarbo melanoleucos			
Aves	Suliformes	Phalacrocoracidae	Phalacrocorax carbo	Great Cormorant	native	
Mammalia	Artiodactyla	Bovidae	Bos primigenius taurus		alien	
Mammalia	Artiodactyla	Bovidae	Capra aegagrus hircus			
Mammalia	Artiodactyla	Camelidae	Camelus dromedarius	Dromedary	alien	
Mammalia	Carnivora	Canidae	Canis familiaris	Dog	alien	
Mammalia	Carnivora	Canidae	Vulpes vulpes	Red Fox	alien	
Mammalia	Chiroptera	Emballonuridae	Taphozous hilli		native	
Mammalia	Chiroptera	Molossidae	Austronomus australis	White-striped Free-tailed Bat	native	
Mammalia	Chiroptera	Molossidae	Ozimops kitcheneri	South-western Free-tailed Bat	native	
Mammalia	Chiroptera	Molossidae	Ozimops petersi	Inland Free-tailed Bat	native	
Mammalia	Chiroptera	Vespertilionidae	Chalinolobus gouldii	Gould's Wattled Bat	native	
Mammalia	Chiroptera	Vespertilionidae	Chalinolobus morio	Chocolate Wattled Bat	native	
Mammalia	Chiroptera	Vespertilionidae	Nyctophilus geoffroyi	Lesser Long-eared Bat	native	
Mammalia	Chiroptera	Vespertilionidae	Nyctophilus major tor	Central Long-eared Bat	native	P3
Mammalia	Chiroptera	Vespertilionidae	Scotorepens balstoni		native	
Mammalia	Chiroptera	Vespertilionidae	Vespadelus baverstocki		native	
Mammalia	Chiroptera	Vespertilionidae	Vespadelus regulus	Southern Forest Bat	native	
Mammalia	Chiroptera		Chiroptera			
Mammalia	Dasyuromorphia	Dasyuridae	Antechinomys laniger		native	
Mammalia	Dasyuromorphia	Dasyuridae	Dasyurus geoffroii		native	VU
Mammalia	Dasyuromorphia	Dasyuridae	Ningaui ridei	Wongai Ningaui	native	
Mammalia	Dasyuromorphia	Dasyuridae	Ningaui yvonneae	Southern Ningaui	native	
Mammalia	Dasyuromorphia	Dasyuridae	Pseudantechinus woolleyae		native	
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis		mixed	
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis crassicaudata	Fat-tailed Dunnart	native	
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis dolichura	Little long-tailed Dunnart	native	
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis fuliginosa fuliginosa		native	
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis gilberti	Gilbert's Dunnart	native	
Mammalia	Dasyuromorphia	Dasyuridae	Sminthopsis ooldea		native	
Mammalia	Diprotodontia	Burramyidae	Cercartetus concinnus	Western Pygmy-possum	native	
Mammalia	Diprotodontia	Macropodidae	Macropus fuliginosus		native	
Mammalia	Diprotodontia	Macropodidae	Osphranter rufus		native	
Mammalia	Diprotodontia	Potoroidae	Bettongia lesueur	Burrowing Bettong	native	Parent of co
Mammalia	Lagomorpha	Leporidae	Oryctolagus cuniculus	Rabbit	alien	
Mammalia	Monotremata	Tachyglossidae	Tachyglossus aculeatus		native	
Mammalia	Rodentia	Muridae	Mus musculus	House Mouse	alien	
Mammalia	Rodentia	Muridae	Notomys alexis alexis	Spinifex Hopping-mouse	native	
Mammalia	Rodentia	Muridae	Notomys mitchellii	Mitchell's Hopping-mouse	native	
Mammalia	Rodentia	Muridae	Pseudomys albocinereus		native	
Mammalia	Rodentia	Muridae	Pseudomys bolami	Bolam's Mouse	native	
Mammalia	Rodentia	Muridae	Pseudomys hermannsburgensis	Sandy Inland Mouse	native	
Mammalia	Rodentia	Muridae	Pseudomys nanus (Gould, 1858)		native	
Mammalia	Rodentia	Muridae	Pseudomys occidentalis	Western Mouse	native	P4
Reptilia	Squamata	Agamidae	Ctenophorus cristatus	Bicycle Dragon	native	
Reptilia	Squamata	Agamidae	Ctenophorus fordi	Western Mallee Dragon	native	
Reptilia	Squamata	Agamidae	Ctenophorus isolepis		native	
Reptilia	Squamata	Agamidae	Ctenophorus isolepis citrinus	Yellowy Military Dragon	native	
Reptilia	Squamata	Agamidae	Ctenophorus maculatus		native	
Reptilia	Squamata	Agamidae	Ctenophorus ornatus	Ornate Crevice-Dragon	native	
Reptilia	Squamata	Agamidae	Ctenophorus reticulatus	Western Netted Dragon	native	
Reptilia	Squamata	Agamidae	Ctenophorus salinarum	Salt Pan Dragon	native	
Reptilia	Squamata	Agamidae	Ctenophorus scutulatus	Lozenge-marked Dragon	native	

Reptilia	Squamata	Agamidae	Diporiphora amphiboluroides	Mulga Dragon	native
Reptilia	Squamata	Agamidae	Moloch horridus	Thorny Devil	native
Reptilia	Squamata	Agamidae	Pogona minor		native
Reptilia	Squamata	Agamidae	Pogona minor minor	Western Bearded Dragon	native
Reptilia	Squamata	Agamidae	Tympanocryptis		
Reptilia	Squamata	Agamidae	Tympanocryptis cephalus		native
Reptilia	Squamata	Agamidae	Tympanocryptis pseudopsephos	Goldfields Pebble-mimic Dragon	native
Reptilia	Squamata	Carphodactylidae	Nephrurus vertebralis	Midline Knob-tailed Gecko	native
Reptilia	Squamata	Diplodactylidae	Crenadactylus ocellatus		native
Reptilia	Squamata	Diplodactylidae	Diplodactylus conspicillatus	Variable Fat-tailed Gecko	native
Reptilia	Squamata	Diplodactylidae	Diplodactylus granariensis		native
Reptilia	Squamata	Diplodactylidae	Diplodactylus granariensis granariensis	Western stone gecko	native
Reptilia	Squamata	Diplodactylidae	Diplodactylus pulcher	Pretty Gecko	native
Reptilia	Squamata	Diplodactylidae	Hesperoedura reticulata	Reticulated Velvet Gecko	native
Reptilia	Squamata	Diplodactylidae	Lucasium maini	Main's ground gecko	native
Reptilia	Squamata	Diplodactylidae	Rhynchoedura ornata	Western Beaked Gecko	native
Reptilia	Squamata	Diplodactylidae	Strophurus assimilis	Goldfields Spiny-tailed Gecko	native
Reptilia	Squamata	Diplodactylidae	Strophurus elderi	Jewelled Gecko	native
Reptilia	Squamata	Diplodactylidae	Strophurus wellingtonae	Western Shield spiny-tailed gecko	native
Reptilia	Squamata	Elapidae	Brachyurophis semifasciatus	Southern Shovel-nosed Snake	native
Reptilia	Squamata	Elapidae	Demansia psammophis	Yellow-faced Whipsnake	native
Reptilia	Squamata	Elapidae	Furina ornata	Moon Snake	native
Reptilia	Squamata	Elapidae	Pseudechis australis	Mulga Snake	native
Reptilia	Squamata	Elapidae	Pseudonaja affinis affinis		native
Reptilia	Squamata	Elapidae	Pseudonaja mengdeni	Western Brown Snake	native
Reptilia	Squamata	Elapidae	Pseudonaja modesta	Ringed Brown Snake	native
Reptilia	Squamata	Elapidae	Pseudonaja nuchalis GÃ¼nther, 1858	Northern Brown Snake	native
Reptilia	Squamata	Elapidae	Simoselaps bertholdi	Jan's Banded Snake	native
Reptilia	Squamata	Elapidae	Suta fasciata	Rosen's Snake	native
Reptilia	Squamata	Elapidae	Suta gouldii	Gould's Hooded Snake	
Reptilia	Squamata	Elapidae	Suta monachus		
Reptilia	Squamata	Gekkonidae	Christinus marmoratus		native
Reptilia	Squamata	Gekkonidae	Gehyra montium	Central Rock Dtella	native
Reptilia	Squamata	Gekkonidae	Gehyra purpurascens	Purple Dtella	native
Reptilia	Squamata	Gekkonidae	Gehyra variegata	Variegated Gehyra	native
Reptilia	Squamata	Gekkonidae	Hemidactylus frenatus	Asian House Gecko	alien
Reptilia	Squamata	Gekkonidae	Heteronotia binoei	Bynoe's Gecko	native
Reptilia	Squamata	Gekkonidae	Underwoodisaurus milii	Southern Barking Gecko	native
Reptilia	Squamata	Pygopodidae	Delma australis	Marble-faced Delma	native
Reptilia	Squamata	Pygopodidae	Delma butleri	Unbanded Delma	native
Reptilia	Squamata	Pygopodidae	Lialis burtonis	Burton's Snake-lizard	native
Reptilia	Squamata	Pygopodidae	Pygopus nigriceps	Western Hooded Scaly Foot	native
Reptilia	Squamata	Pythonidae	Morelia spilota imbricata	Carpet Python', 'Western Australia	native
Reptilia	Squamata	Scincidae	Cryptoblepharus australis	Desert Wall Skink	native
Reptilia	Squamata	Scincidae	Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink \xa(	native
Reptilia	Squamata	Scincidae	Cryptoblepharus plagiocephalus	PÃ©ron's Snake-eyed Skink	native
Reptilia	Squamata	Scincidae	Ctenotus atlas	Southern Spinifex Ctenotus	native
Reptilia	Squamata	Scincidae	Ctenotus brooksi		native
Reptilia	Squamata	Scincidae	Ctenotus leonhardii	Common Desert Ctenotus	native
Reptilia	Squamata	Scincidae	Ctenotus pantherinus	Leopard Ctenotus	native
Reptilia	Squamata	Scincidae	Ctenotus schomburgkii	Sandplain Ctenotus	native
Reptilia	Squamata	Scincidae	Ctenotus uber		native
Reptilia	Squamata	Scincidae	Ctenotus uber uber	Spotted Ctenotus	native
Reptilia	Squamata	Scincidae	Ctenotus xenopleura	Wide-striped Ctenotus	native
Reptilia	Squamata	Scincidae	Cyclodomorphus melanops elongatus	Spinifex Slender Blue-tongue	native
Reptilia	Squamata	Scincidae	Egernia depressa	Southern Pygmy Spiny-tailed Skink	native
Reptilia	Squamata	Scincidae	Egernia formosa	Goldfields Crevice-skink	native
Reptilia	Squamata	Scincidae	Egernia richardi	Woodland Crevice Skink	native
Reptilia	Squamata	Scincidae	Eremiascincus richardsonii	Broad-banded Sand Swimmer	native
Reptilia	Squamata	Scincidae	Hemiergis initialis initialis	Western Earless Skink	native
Reptilia	Squamata	Scincidae	Lerista		

Reptilia	Squamata	Scincidae	Lerista kingi	King's Lerista	native
Reptilia	Squamata	Scincidae	Lerista muelleri		native
Reptilia	Squamata	Scincidae	Lerista picturata	Southern Robust Slider	native
Reptilia	Squamata	Scincidae	Lerista timida	Dwarf Three-toed Slider	native
Reptilia	Squamata	Scincidae	Liopholis inornata	Desert Skink	native
Reptilia	Squamata	Scincidae	Liopholis striata	Night Skink	native
Reptilia	Squamata	Scincidae	Menetia greyii	Common Dwarf Skink	native
Reptilia	Squamata	Scincidae	Morethia adelaidensis	Adelaide Snake-eye	native
Reptilia	Squamata	Scincidae	Morethia butleri	Butler's Snake-eye	native
Reptilia	Squamata	Scincidae	Morethia obscura		native
Reptilia	Squamata	Scincidae	Tiliqua occipitalis	Western Blue-tongue Skink	native
Reptilia	Squamata	Scincidae	Tiliqua rugosa		native
Reptilia	Squamata	Scincidae	Tiliqua rugosa aspera		native
Reptilia	Squamata	Scincidae	Tiliqua rugosa rugosa	Bobtail	native
Reptilia	Squamata	Typhlopidae Merrem, 1	Anilios australis	Southern Blind Snake	native
Reptilia	Squamata	Typhlopidae Merrem, 1	Anilios bicolor	Dark-spined Blind Snake	native
Reptilia	Squamata	Typhlopidae Merrem, 1	Anilios bituberculatus	Rough-nosed Blind Snake	native
Reptilia	Squamata	Typhlopidae Merrem, 1	Anilios hamatus	Northern Hook-snouted Blind Snak	native
Reptilia	Squamata	Typhlopidae Merrem, 1	Anilios waitii	Beaked Blind Snake \xa0	native
Reptilia	Squamata	Varanidae	Varanus caudolineatus	Stripe-tailed Goanna	native
Reptilia	Squamata	Varanidae	Varanus gouldii	Bungarra or Sand Goanna', 'Bunga	native
Reptilia	Squamata	Varanidae	Varanus tristis	Racehorse Monitor	native

Summary by Class	
Class	**Taxa**
Actinopterygii Klein	1
Amphibia	8
Aves	176
Mammalia	42
Reptilia	92
TOTAL	**319**

Top 5 Families by Species Count	
Family	**Taxa**
Scincidae	32
Agamidae	16
Meliphagidae	16
Acanthizidae	14
Elapidae	12

Summary by Conservation Code	
Code	**Taxa**
P3	1
P4	3
VU	4
EN	1
MI	2
OS	1
Parent of conservat	1

APPENDIX E:
PMST SEARCH RESULTS

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 25-Aug-2025

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	13
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	11
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status
Historic		
Goldfields Water Supply Scheme, Western Australia	WA	Listed place

Listed Threatened Species [Resource Information]

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

Scientific Name	Threatened Category	Presence Text
BIRD		
Aphelocephala leucopsis		
Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae		
Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area
INSECT		
Ogyris petrina listed as Ogyris subterrestris petrina		
Arid Bronze Azure [94250]	Critically Endangered	Species or species habitat may occur within area
MAMMAL		
Dasyurus geoffroii		
Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
PLANT		
Gastrolobium graniticum		
Granite Poison [14872]	Endangered	Species or species habitat may occur within area
Ricinocarpos brevis		
[82879]	Endangered	Species or species habitat may occur within area
Thelymitra stellata		
Star Sun-orchid [7060]	Endangered	Species or species habitat may occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata		
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Defence	
Defence - KALGOORLIE RIFLE RANGE [50156]	WA
Unknown	
Commonwealth Land - [52184]	WA
Commonwealth Land - [52211]	WA
Commonwealth Land - [52230]	WA

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Clear And Muddy Lakes	Nature Reserve	WA
Credo	NRS Addition - Gazettal in Progress	WA
Rowles Lagoon	Conservation Park	WA

Nationally Important Wetlands [Resource Information]

Wetland Name	State
Rowles Lagoon System	WA

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Goldfields Water Supply Scheme Project	2019/8547	Controlled Action	Post-Approval
Nava-1 Cable System	2001/510	Controlled Action	Completed
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed
Lynas Kalgoorlie Rare Earths Processing Facility	2020/8719	Not Controlled Action	Completed

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions when time permits.

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Appendix 6 – Level 1 Vertebrate Fauna Survey – Bullant Gold Mine (360 Environmental, 2011)

360 environmental

Bullant Gold Mine

Level 1 Vertebrate Fauna Survey

Prepared for:

Kalgoorlie Mining Company (Bullant) Pty Ltd

October 2011

people planet professional

Document Reference	Revision	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
EBS118 AB	A INTERNAL DRAFT	LF	FD	-	-
EBS118 AB	C CLIENT FINAL	LF	KMC	1 Electronic (email)	

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Executive Summary

360 Environmental was commissioned by Kalgoorlie Mining Pty Ltd (KMC) to assess vertebrate fauna values across the Bullant mining area, approximately 45 km north-west of Kalgoorlie, Western Australia.

A Level 1 vertebrate fauna survey was undertaken between 12 and 13 July 2011. The area assessed during this survey lies within the Interim Biogeographic Regionalisation for Australia (IBRA) Coolgardie bioregion and the Eastern Goldfield (COO3) subregion.

The results of the fauna survey were:

- Twenty six bird species and one native mammal species were recorded in the survey area. No frogs or reptiles were recorded. Evidence of six species of introduced mammal was observed.
- None of the bird species or mammals recorded during the field survey are currently listed as specially protected under State and/or Commonwealth legislation.
- A total of twelve bird species, ten native mammals, three reptiles and four invasive mammal species currently listed under State and/or Commonwealth legislation are predicted to potentially occur in the Project area.
- Four broad fauna habitat types were identified in the survey area of which none are identified as Threatened Ecological Communities (TECs), Priority Ecological Communities (PECs) or fauna habitats of conservation significance.

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1 Introduction

1.1 Background

Bullant Gold Mine (the Site) has previously operated as an underground and open pit gold mine, located approximately 65 kilometres (km) north east of Kalgoorlie Site. It has been recently reopened by Kalgoorlie Mining Company (Bullant) Pty Ltd (KMC) for further excavation of ore.

KMC propose to make some extensions to mining activities, as well as install a new run-of-mine (ROM), stockpile area crusher, mill and tailings storage facility (Figure 2).

1.2 Objective

The objectives of the baseline vertebrate fauna studies are as follows:

- To identify significant faunal constraints within the Project area; and
- To assist KMC with the evaluation of potential impacts on vertebrate fauna and/or habitat of conservation significance.

1.3 Scope of Work

In order to achieve the objectives outlined above, 360 Environmental undertook a baseline vertebrate fauna survey for the Project area. The scope of works included a desktop study and basic ground truthing through a reconnaissance survey. The work was carried out in accordance with Environmental Protection Authority's (EPA) Position Statement No 3 and Guidance Statement No 56 to the standard of a Level 1 survey.

The purpose of the desktop study was to gather background information relevant to the Project area by searching literature, data sources and map based information. The reconnaissance survey should verify the accuracy of the desktop study, delineate and characterise fauna and faunal assemblages present within the Project area and identify potential impacts.

1.4 Report Format

This Report has been structured in the following format:

- Section 2. Site Description;
- Section 3. Key Statutory Requirements;
- Section 4. Environmental Policy and Guidance;
- Section 5. Survey Methods;
- Section 6. Survey Limitations;
- Section 7. Results;
- Section 8. Significant Fauna Species Recorded of Predicted to Occur in the Project Area;
- Section 9. Conclusion and Recommendations;
- Section 10. Acknowledgements;
- Section 11. References; and
- Section 11. Limitations.

2 Site Description

2.1 Site Location

The Project area is located approximately 45km north-west of Kalgoorlie-Boulder within the Coolgardie biogeographic region and Eastern Goldfields subregion of the interim biogeographic regionalisation of Australia (IBRA) classification system. Land tenure includes pastoral lease, Aboriginal land and several national parks and reserves (Rangelands 2008).

The bioregion includes cattle and sheep grazing, Aboriginal land and tourism. However, the main economic activity is gold and nickel mining (Rangelands 2008). The tourist facilities include gold prospecting, museums and tourist mines (Rangelands 2008).

2.2 Climate

The closest official Bureau of Meteorology (BoM) weather station which is currently operating is the Kalgoorlie–Boulder Airport. The bioregion experiences hot summers and mild wet winters (Rangelands 2008). Recorded climatic data is summarised in Table 1.

Table 1. Kalgoorlie Long Term Averages

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Mean Max (°C)	33.7	32.0	29.5	25.1	20.6	17.5	16.7	18.5	22.3	25.7	28.9	31.9	25.2
Mean Min (°C)	18.2	17.8	16.0	12.6	8.7	6.2	5.0	5.5	8.0	11.0	14.0	16.5	11.6
Mean Rain (mm)	23.6	31.6	24.2	21.5	26.7	28.7	24.9	21.4	14.2	14.9	17.6	16.4	265.6
Median Rain (mm)	7.6	12.5	9.7	14.6	22.5	20.5	20.3	15.9	11.2	9.4	14.8	11.0	245.4
Mean Rain Days	3.8	4.3	4.2	5.4	7.0	8.0	8.3	7.0	5.5	4.3	4.0	3.7	65.3

(Source: Weather Zone 2011)

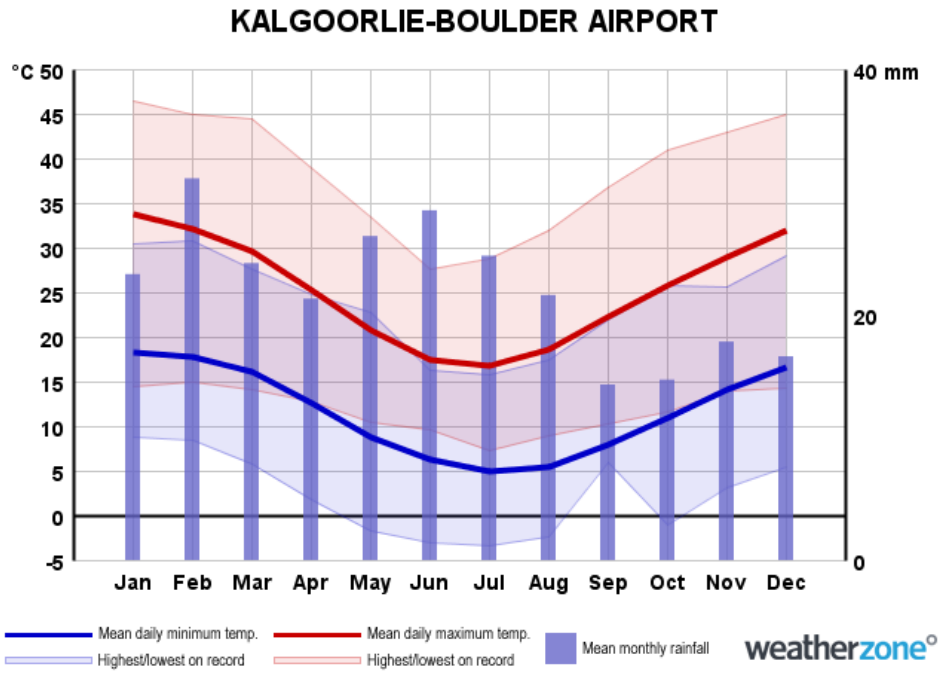


Figure 1. Kalgoorlie – Boulder Airport: Temperature and Rainfall mm (Weather Zone 2011)

2.3 Geology

The geology of the Project area is classified as metamorphosed sedimentary and acid volcanic rocks. The soil is composed of red loam soils that overlie a sequence of transported lacustrine clays (Trevor Eddie pers. comm. 2011). The Project area is a shear-hosted lode style deposit. The Bullant deposit is located within the Zuleika Shear Zone, which trends northwest on a regional scale.

It is hosted by high-magnesium basalt of the Bent Tree Group, dominated by pillow basalts, along with frequent, unmineralised quartz-carbonate veins and widespread chlorite-carbonate alteration (Trevor Eddie, pers. comm. 2011). The basalt displays varying degrees of schistosity from weak to strong within the vicinity of the of the shear zone. The distal basalt is pillowed with distinctive pillow margins (Trevor Eddie pers. comm. 2011).

2.4 Hydrology

The underground section of the mine reaches a depth of 670 m below ground level (mbgl). Groundwater recharge into the mine is low at 2 litres/second (l/s) thus the groundwater level is believed to be low.

There are several minor non-perennial water courses on the Site and in the adjacent areas. These are primarily located on the western and southern areas to the Site.

The site is not subject to regular flooding however it is possible that a 1 in 100 year rainfall event may result in flooding in select areas of the site.

2.5 IBRA Coolgardie Bioregion

The survey area lies in the IBRA Coolgardie biogeographic region, with the Murchison biogeographic region to the north, the Nullabor biogeographic region to the east, the Mallee biogeographic region to the south and the Avon Wheatbelt biogeographic region to the west (Appendix A).

The Coolgardie biogeographic region encompasses an area of 129,117 km^2 and lies within the Yilgarn Craton, a major geological province of the Eastern Goldfields (Rangelands 2008). The landforms of the Coolgardie bioregion include granite rocky outcrops, low greenstone hills, laterite uplands and broad plains (Rangelands 2008). Numerous salt lakes also occur through the bioregion (Rangelands 2008). The Coolgardie bioregion covers the interzone between mulga and spinifex country, and eucalypt environments (Rangelands 2008).

2.6 Land Forms

The survey area lies within the Kalgoorlie Province of soils and landscape zones (Tille 2006). The Kalgoorlie Province consists of an extensive plateau of low relief, flat to undulating plains with small valleys (occasionally broken by low narrow rocky hills, ridges, tors and bosses) being most commonly found on granitic terrain (Tille 2006). Silcrete duricrust, claypans, salt lakes with dunes and lunettes, gilgai areas, small remnants of sand plain, and small dune tracts may be found on the plains (Tille 2006). Low breakaways with short saline footslopes are also occasionally present (Tille 2006).

3 Key Statutory Requirements

3.1 State Legislation

Conservation of Western Australia's biodiversity is supported and protected by the following legislation:

- The *Conservation and Land Management Act 1984* (CALM Act);
- The *Environmental Protection Act 1986* (EP Act);
- The *Wildlife Conservation Act 1950* (WC Act); and
- The *Wildlife Conservation Regulations 1970* (WA).

The Wildlife Conservation (Specially Protected Fauna) Notice 2010 describes categories for fauna classified as Specially Protected in a series of Schedules (Table 2).

Table 2. WC Act Codes for Threatened Fauna (DEC 2010)

CONS. CODE	CATEGORY
Schedule 1	Fauna that is rare or likely to become extinct are declared to be fauna that is in need of special protection.
Schedule 2	Fauna that is presumed to be extinct are declared to be fauna that is in need of special protection.
Schedule 3	Birds that are identified in the agreement between the governments of Australia and Japan relating to the protection of migratory birds, and birds in danger of extinction, are declared to be fauna that is in need of special protection.
Schedule 4	Fauna that is in need of special protection, otherwise than for the reasons mentioned (in Schedule 1 – 3).

The DEC also produces a supplementary list of Priority Fauna, being species that are not considered Threatened under the WC Act but for which the Department feels there is a cause for concern. These species have no special protection, but their presence would normally be considered as potentially significant and they need further survey and evaluation of conservation status before consideration can be given to declaration as Threatened fauna. Levels of Priority are described in Table 3.

Table 3. DEC Priority Fauna Conservation Codes (DEC, 2010)

CONS.CODE	CATEGORY
P1	**Priority One** Taxa with few, poorly known populations on threatened lands.
P2	**Priority Two** Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc.
P3	**Priority Three** Taxa which are known from few specimens or sight records, some of which are on lands not under immediate threat of habitat destruction or degradation.
P4	**Priority Four** Rare taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.
P5	**Priority Five** Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

3.2 Federal Legislation

Fauna species are protected at a Federal level under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). The EPBC Act was developed to provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance (NES), to promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources, and to promote the conservation of biodiversity.

The EPBC Act includes provisions to protect native species (and in particular prevent the extinction, and promote the recovery, of threatened species) and to ensure the conservation of migratory species.

The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN). Table 4 outlines the categories of significance levels.

Table 4. Categories of Threatened Fauna Species under the EPBC Act 1999

CONS.CODE	CATEGORY
Ex	Extinct - Taxa not defiantly located in the wild during the past 50 years
ExW	Extinct in the Wild - Taxa known to survive only in captivity
CE	Critically Endangered - Taxa facing an extremely high risk of extinction in the wild in the immediate future
E	Endangered - Taxa facing a very high risk of extinction in the wild in the near future
V	Vulnerable - Taxa facing a high risk of extinction in the wild in the medium-term
NT	Near Threatened - Taxa that risk becoming Vulnerable in the wild
CD	Conservation Dependent - Taxa whose survival depends upon ongoing conservation measures. Without these measures. A conservation dependent taxon would be classified as Vulnerable or more severely threatened.
DD	Data Deficient (Insufficiently Known) - Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.

3.3 International Agreements

The EPBC Act also includes management of migratory species that are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA), Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) and the Bonn Convention (The Convention on the Conservation of Migratory Species of Wild Animals). Species included in these agreements are considered to be significant at the global level.

4 Environmental Policy and Guidance

The Environmental Protection Authority (EPA) is an independent statutory body advising the Government on environmental issues whose objectives are to protect the environment and prevent, control, and abate pollution. In most circumstances, including this assessment, the EPA applies the following objective in its assessment of proposals that may affect fauna:

> *To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement of knowledge.*

The EPA publishes position statements, environmental assessment guidelines and guidance statements to assist in the environmental impact assessment (EIA) of development proposals. The following documents address the EPA's published position on aspects of native fauna and fauna habitat protection in regards to the vertebrate fauna studies undertaken:

- *Terrestrial Biological Surveys as an element of Biodiversity Protection* Position Statement No.3 (Position Statement No.3);
- *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* Guidance Statement No. 56 (Guidance Statement 56); and
- *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (Technical Guide).

4.1 Position Statement No.3

Position Statement No. 3 discusses the principles the EPA would apply when assessing proposals that may have an effect on biodiversity values in Western Australia. The Position Statement intends to provide the following outcomes:

- Promote and encourage all proponents and their consultants to focus their attention on the significance of biodiversity and, therefore, the need to develop and implement best practice in terrestrial biological surveys; and
- Enable greater certainty for proponents in the Environmental Impact Assessment process by defining the principles the EPA will use when assessing proposals that may have an effect on biodiversity values.

4.2 Guidance Statement 56

The EPA's Guidance Statement 56 is directed at all terrestrial fauna and faunal groups and provides information and guidance on general standards and protocols for terrestrial fauna surveys for environmental consultants and proponents engaged in EIA activities.

4.3 Technical Guide

The purpose of the Technical Guide is to ensure adequate data of a high standard is obtained for EIA. The guide includes discussion of:

- The EPA and DEC's expectations for undertaking the different levels of survey (Level 1 and Level 2) as outlined in Guidance Statement 56;
- Fauna survey protocols;
- Methodology; and
- Analysis and reporting.

This guide is specific to terrestrial vertebrate fauna and provides advice on fauna sampling techniques and methodologies for different regions of the State and the analysis, interpretation and reporting requirements for EIA.

5 Survey Methods

5.1 Desktop Study

A desktop review was undertaken to collect current data relevant to the Site and its surrounds. This involved a search of available literature and survey data, web based mapping tools and map-based information.

A desktop survey of species potentially occurring within the survey area was performed using data from:

- Searches of the DEC databases;
- Search of the EPBC Act Protected Matters database;
- Search of International Union for Conservation of Nature (IUCN) Red-list;
- Review of publicly-available information on vertebrate fauna for the area surrounding Kalgoorlie; and
- Various reference books (Wilson and Swan 2003; Pizzey and Knight 2008; Van Dyke and Strahan 2008).

All conservation significant species recorded or expected to occur in the survey area were cross-checked against the Federal EPBC Threatened Matters Database and the Government Gazette Number 12 (Government of Western Australia 2010) for their status under the EPBC Act and WC Act.

5.2 Reconnaissance Survey

The field component was completed in order to determine the potential for the area to support a range of species identified during the desktop study. Particular emphasis was placed on inspecting major fauna habitats of the area in order to assess the conservation significance of each of these.

5.2.1 Survey Effort

The Project area was inspected by 360 Environmental staff members Felicity Donaldson (Senior Environmental Scientist) and Leceile Firth (Ecologist) from 12 July to 13 July 2010. A total of 24 survey hours were undertaken.

Each location (Table 5) was surveyed for approximately 20 – 40 minutes. All species seen and heard were identified and documented. Other fauna indications such as scats, tracks and diggings were identified and documented. Particular attention was paid to those habitats that could potentially support Rare, Threatened or Vulnerable species.

5.2.2 Survey Personnel

360 Environmental's Senior Environmental Scientist Felicity Donaldson and Ecologist Leceile Firth coordinated and operated the field survey and were responsible for fauna identification and documentation during the survey. Both staff members have appropriate tertiary qualifications and several years of relevant field experience enabling them to competently satisfy EPA requirements for a Level 1 Fauna Survey. Table 5 summarises their experience.

Table 5. Survey Personnel

Location	Qualifications	Experience in Similar Surveys	Survey Role
Felicity Donaldson	PhD, ongoing: *Genetic diversity in Bettongia lesueur* at national, regional and population levels, The University of Western Australia Honours I: Defining conservation units for the ringtail possum genus *Pseudocheirus*, The University of New South Wales, 2000 Bachelor of Science: Molecular Genetics and Biochemistry, The University of Sydney 1999	>10 years	Senior Environmental Scientist: Field Survey and review of report.
Leceile Firth	Bachelor of Science: Murdoch University. Double Major in Conservation & Wildlife Biology and Environmental Management	>5 years	Ecologist: Field Survey and compilation of data and report.

5.2.3 Survey Sites

The survey team examined each of the major broad habitats identified within the project area including seven specific areas of interest assigned for the following developments:

- Area A: The relocation of the Run of Mine (ROM) and stockpiles;
- Area B: The proposed Tailings Storage Pit (TSP);
- Area C: The waste dump - south of the proposed TSP;
- Area D: The waste dump - south east of the proposed ROM and stockpile area;
- Area E: The waste dump - north east of the Bullant pit and underground;
- Area F: The waste dump - north east of the turkeys nest; and

- Area G: An initial proposed crusher area behind the administration and workshop buildings. The proposed area for the crusher has now been adjusted by KMC to north of the main waste dump (Appendix B, Figure 2).

All species seen and heard were recorded for each broad habitat and area of interest. Table 6 provides a reference of locations surveyed over the two days.

Appendix B (Figure 3) provides an aerial map illustrating the Areas and Locations surveyed. Appendix C provides plate images for each of the Locations surveyed.

Table 6. Reference Locations

Location	Survey Effort (Mins)	GPS location (GDA 1994 Map 51)		Plate No.	Area
		Eastings	Northings		
Location A	20	313841	6620457	1	B
Location B	20	313729	6620444	2	B
Location C	20	313657	6620356	3	B
Location D	20	313583	6620277	4	B
Location E	20	313800	6620223	5	B
Location F	20	313871	6620240	6	B
Location G	20	314033	6619888	7	B
Location H	20	313864	6619733	8	C
Location I	20	313874	6619583	9	C
Location J	20	313992	6619416	10	C
Location K	20	314039	6619338	11	C
Location L	20	314206	6619302	12	C
Location M	20	314364	6619335	13	C
Location N	20	314439	6619397	14	C
Location O	20	314485	6619520	15	C
Location P	20	314463	6619725	16	B
Location Q	20	314300	6619906	17	B
Location R	20	314151	6620246	18	B
Location S	20	313887	6620621	19	D
Location T	30	313616	6620775	20	A
Location U	30	313115	6621267	21	G
Location V	40	314328	6621162	22	E
Location W	30	312916	6621919	23	F

5.2.4 Survey Weather

Conditions for the survey were cool, with a minimum and maximum temperature of 8ºC and 12ºC for the 12 July 2011 and 9.1ºC and 15.5ºC for the 13 July 2011 (BoM 2011). The area received 5.6 mm of rain for the 12 July 2011 however conditions cleared in the late afternoon and remained cleared for the duration of the field survey.

6 Survey Limitations

Table 7 addresses potential limitations and constraints associated with the Level 1 Fauna Survey. The following limitations have been addressed with reference to Guidance Statement 56.

Table 7. Survey Limitations

POTENTIAL LIMITATIONS	CONSTRAINT*	COMMENT
Competency and experience of the consultant (s) carrying out the survey	No	The two staff members who completed the field work and prepared this report have appropriate training and experience in conducting Level 1 Fauna Surveys (Table 5). Less experienced persons involved in the preparation of this report were supported by competent and senior personnel.
Scope	No	The purpose of Level 1 survey was to assist in the identification of significant faunal constraints within the proposed Project area; and assist the evaluation of potential impacts on fauna and habitat of conservation significance based on the findings from desktop studies and passive detection methods. This level of survey is adequate for developments within the Coolgardie biogeographic region with a clearing impact of less than 50 ha. The expansion of operations at the Bullant Gold mine as proposed at the time of conducting the survey was less than 50 ha. For developments greater than 50 ha, the EPA would require a minimum of two Level 2 (trapping) Surveys over different seasons to demonstrate spatial and temporal variations in faunal assemblages (according to Guidance Statement 56).
Proportion of fauna identified, recorded and/ or collected	Yes Significant	Amphibians, reptiles and mammals are mainly recorded through intensive trapping (Level 2 Survey) and are infrequently recorded opportunistically. It is unlikely that the species identified during the Level 1 Fauna Survey represent the entire fauna assemblage of the area. In addition it is likely that the cool conditions and rainfall experienced during the survey would influence the detection of certain fauna groups i.e. reptiles. However, the proportion of fauna identified and recorded is considered acceptable for a Level 1 Fauna Survey.
Sources of	No	Vertebrate fauna information was accessed by searching

Information		available literature and survey data; web based mapping tools and map-based information.
Proportion of the task achieved	No	The field component fulfils EPA requirements for a Level 1 Fauna Survey.
Timing/ weather/season / cycle	Yes Moderate	The Goldfields normally experiences cool wet condition during Winter. The rain received is likely to influence the detection of certain fauna groups, in particular reptiles which would otherwise be potentially observed during fine warm conditions. One of the main aims of a Level 1 Fauna Survey is to assess habitat and this was not impacted by the weather conditions at the time of the survey. In addition, the bird survey was considered adequate with high bird activity during the site visit. The fauna groups not observed (reptiles and mammals) are unlikely to contain any conservation significant fauna due to the lack of suitable habitat. The proportion of fauna recorded is considered acceptable for a Level 1 Fauna Survey.
Disturbances which affected results of the survey	No	The project area has undergone significant clearing as a part of the construction and development of the Bullant Gold Mine. Thus the species identified during this survey may be reduced through previous mining and exploration activities on site. This is expected in a survey of this type at an active mine in the Goldfields.
Intensity of survey effort	No	The intensity of the survey effort was sufficient for the area surveyed and as part of a level 1 Fauna Survey according to Guidance Statement 56 and the Technical Guide.
Completeness	No	Opportunistic searches were conducted for each of broad habitats identified within the project area including specific areas of interest i.e. area surrounding the relocation of ROM and stockpiles.
Resources	No	Adequate resources were available.
Remoteness and/ or access problems	No	Access to and around the site was not limited.
Availability of contextual information on the region	No	360 Environmental had adequate access to fauna databases to determine which species were likely to be identified within the Project area.

*Constraint (yes/ no); Significant – greater than 60%; Moderate – 20-60%; Negligible – less than 20%

7 Results

The results section has been structured in the following format:

- Section 7.1 provides a summary of the data results from Desktop Survey.
- Section 7.2 provides a summary of results from the Reconnaissance Survey. This includes assessment of fauna habitat and fauna recorded during the survey.

Additional data, including figures (maps) and tables have been attached as the following appendices:

- Appendix A: provides a map of the IBRA biogeographic regions;
- Appendix B: provides two aerial overview of the study area with points marking the location of Areas surveyed;
- Appendix C: provides a series of plates (photo images) of Locations A – W and Habitat types identified as part of the reconnaissance survey; and
- Appendix D: provides a tabulated summary of the desktop survey;
- Appendix E: provides a table of raw data for the reconnaissance survey;
- Appendix F: provides results of the bird survey in reference to areas surveyed; and
- Appendix G: provides a series of plates for fauna and or evidence (scats and burrows) of fauna identified during the survey.

7.1 Desktop Survey

A search of the DEC's Threatened and Priority Fauna Database, NatureBase, and the EPBC Protected Matters Database was undertaken to identify conservation significant fauna species that potentially occur within the survey area. The species listed in the desktop study (Appendix D) have special status under State and/ or Commonwealth legislation. Each species has either been recorded or is listed as having the potential to occur in the vicinity of the Project area.

The search area ranges from a 10 km radius from the Project area (DEC fauna search and the EPBC protected Matters Database search) to a wider search within the Goldfields region (NatureBase and EPBC).

According to the DEC fauna search, two fauna species of conservation significance have been previously recorded within 10 km of the Project area. These include:

- Australian Bustard, (*Ardeotis australis*)-Priority 4 DEC; and
- Malleefowl, (*Leipoa ocellata*) - Vulnerable EPBC Act.

A total of thirteen Threatened fauna, four Migratory bird species and four invasive species identified under the EPBC Act have potential to occur within the Project area. In addition, ten Scheduled species listed under the WC Act and four Priority species listed on the DEC's Priority fauna list are predicted to potentially occur within the Project area.

Section 8 provides an assessment of the likelihood of each of the species listed in Appendix D being found in the Project area.

7.2 Reconnaissance Survey

The following section briefly summarises the findings for each of the major fauna groups and species of Conservation Significance recorded within the Project area. The detailed results of the reconnaissance survey are displayed in raw data table in Appendix E.

7.2.1 Fauna Habitat

In general, Australian mammal species correlate more with substrate than vegetation community, with the exception of arboreal species and avifauna. For the purpose of the fauna survey a simpler classification of the habitats in the survey area was undertaken compared to that of the vegetation survey (Williams and Seeds 2011). The following broad fauna habitats were identified in the survey area:

- Habitat 1: Open *Eucalyptus* woodland (e.g. *Eucalyptus salmonophloia*) over mixed tall and medium shrubs (e.g *Eremophila scoparia and Olearia muelleri*) (Plate 15);
- Habitat 2: Open *Eucalyptus* woodland (e.g. *Eucalyptus salmonophloia)* over mixed low shrubs (e.g. *Maireana sedifolia* and *Tecticornia sp*.) (Plate 21);
- Habitat 3: Closed *Eucalyptus* woodland (e.g. *Eucalyptus salmonophloia)* – little or no understorey (Plate 6); and
- Habitat 4: Open sandy plains with mixed low scrubland (Plate7).

Appendix C provides plate images for each of the broad habitats identified.

The following Area locations consisted of the following Habitat types:

- Habitat 1: Area B and Area C;
- Habitat 2: Area A, Area B, Area C, Area D, Area E, and Area F
- Habitat 3: Area B, and Area F; and
- Habitat 4: Area B and Area C.

7.2.2 Birds

A total of 26 bird species were recorded during the survey (Appendix F). The highest number of species was recorded from Habitat 2 (22 species), followed by Habitat 1 (15 species), Habitat 4 (3 species) and lastly Habitat 3 (2 species). Five species were recorded as flying overhead. It is important to note that survey effort was not distributed evenly between Habitats therefore species diversity should not be assessed spatially between different habitat types.

Of the 26 bird species observed in the Project area none are of conservation significance based on the protected lists under State and Commonwealth legislation and the DEC's Priority list at the time of reporting. The potential impact to birds of conservation

significant that may occur (but were not observed) within the Project area (based on results of the desktop study) is discussed in section 8.

7.2.3 Mammals

One native mammal species was observed during the survey – the Western Grey Kangaroo (*Macropus fuliginosus).* Typically in surveys such as this, only the larger native mammals are recorded. The Western Grey Kangaroo does not have specific protection as a conservation significant species. The potential impact to mammals of conservation significance that may occur (but were not observed) within the Project area (based on results of the desktop study) is discussed in Section 8.

7.2.4 Amphibians and Reptiles

No amphibians or reptiles were identified during the survey. It is likely that further amphibians and/or reptile species do occur in the survey area however it is difficult to detect amphibians and reptiles without using intensive survey techniques which was outside the scope of this survey. The potential impact to amphibians and reptiles of conservation significance that may occur (but were not observed) within the Project area (based on results of the desktop study) is discussed in Section 8.

7.2.5 Conservation Significant Fauna

No species of conservation significance were recorded during the field survey. Conservation significant fauna that have potential to occur in the survey area are discussed in section 8.

7.2.6 Introduced Species

Evidence (i.e. scats and burrows) of the following introduced species were observed during the survey:

- Goat (*Capra hircus*) (Appendix G - Plate 23);
- Rabbit, European Rabbit (*Oryctolagus cuniculus*) (Appendix G - Plate 24);
- Cow, (*Bos taurus*) (Appendix G - Plate 25);
- House mouse, (*Mus musculus*) - reported by onsite Company personnel 13/06/2011; and
- Cat, House Cat, Domestic Cat (*Felis catus*) - reported by onsite Company personnel 13/06/2011.

8 Significant Fauna Species Recorded or Predicted to Occur in the Project Area

A total of twelve bird species, ten native mammals, three reptiles and four invasive mammal species listed under State and/or Australian Government legislation are predicted to occur in the Goldfields region (Coolgardie bioregion). No amphibians of conservation significance are predicted to occur within the Goldfields region and or Project area.

Table 8 provides an assessment and summary of the potential impact of the proposed Bullant Project on Conservation Significant Fauna which are predicted to potentially occur within the Project area. Further detail is provided in section 8.1.

Table 8: Impact of Bullant Project on Conservation Significant Fauna

Species	State Scheduled / Priority	Federal EPBC Act	Potential Impact
Birds – Aves			
Australian Bustard, (*Ardeotis australis*)	Priority 4		May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Australian Painted Snipe (*Rostratula australis*)		Vulnerable.	Unlikely to be seen in project area, so the potential for impact on this species is low
Cattle Egret (*Ardea ibis*)		Migratory Marine. Migratory Wetland.	May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Fork-tailed Swift (*Apus pacificus*)		Migratory Marine.	May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Great Egret, White Egret (*Ardea alba*)		Migratory Marine. Migratory Wetland.	May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Major Mitchell's Cockatoo (*Cacatua leadbeateri*)	Scheduled 4		May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Malleefowl (*Leipoa ocellata*)	Scheduled 1	Vulnerable	May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Naretha, Blue Bonnet (*Northiella haematogaster narethae*)	Scheduled 4		Unlikely to be seen in project area, so the potential for impact on this species is low.
Peregrine Falcon (*Falco peregrinus*)	Scheduled 4		Unlikely to be seen in project area, so the potential for impact on this species is low.
Rainbow Bee-eater (*Merops ornatus*)		Migratory Wetland.	May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Slender-billed Thornbill (*Acanthiza iredalei iredalei*)		Vulnerable	May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.

Western Rosella (Inland spp) (*Platycerus icterotis xanthogenys*)		Vulnerable	Unlikely to be seen in project area, so the potential for impact on this species is low.
Mammals			
Central Long-eared Bat (*Nyctophilus timoriensis*)	Priority 4		May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Crest-tailed Mulgara (*Dasycercus cristicauda*)	Scheduled 1	Vulnerable	Unlikely to be in the project area, so the potential for impact on this species is low.
Chuditch, Western Quoll (*Dasyurus geoffroii*)		Vulnerable	Unlikely to be in the project area, so the potential for impact on this species is low.
Greater Bilby (*Macrotis lagotis*)		Vulnerable	Unlikely to be in the project area, so the potential for impact on this species is low
Karkarratul, Northern Marsupial Mole (*Notoryctes caurinus*)		Endangered	Unlikely to be in the project area, so the potential for impact on this species is low
Long-tailed Dunnart (*Sminthopsis longicaudata*)	Priority 4		Unlikely to be in the project area, so the potential for impact on this species is low
Plains Rat (*Psuedomys australis*)		Vulnerable	Unlikely to be in the project area, so the potential for impact on this species is low
Sandhill Dunnart (*Sminthopsis psammophila*)	Scheduled 1	Endangered	Unlikely to be in the project area, so the potential for impact on this species is low
Southern Marsupial Mole, Yitjarritjarri, Itjaritjari (*Notoryctes typhlops*)	Scheduled 1	Endangered	Unlikely to be in the project area, so the potential for impact on this species is low
Warru, Black-footed Rock-wallaby (MacDonnell Ranges race) *(Petrogale lateralis* MacDonnell Ranges race)		Vulnerable	Unlikely to be in the project area, so the potential for impact on this species is low
Reptiles			
Carpet Python *(Morelia spilota imbricate)*	Scheduled 4 Priority 4		May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Great Desert Skink, Tjakura, Warrarna, Mulyamiji (*Liopholis kintorei*)	Scheduled 1	Vulnerable	Unlikely to be in the project area, so the potential for impact on this species is low
Woma (*Aspidites ramsayi*)	Scheduled 4		May infrequently be seen in the area, however, clearing vegetation is unlikely to impact on this species.
Invasive Species			
Cat (*Felis catus*)		Invasive	Located within Project area. Clearing vegetation likely to compound impact on native species. A feral management plan is recommended to reduce impact.
Goat (*Capra hircus*)		Invasive	Located within Project area. Clearing vegetation likely to compound impact on native species. A feral management plan is recommended to reduce impact.
Rabbit (*Oryctolagus cuniculus*)		Invasive	Located within Project area. Clearing vegetation likely to compound impact on native species. A feral management plan is recommended to reduce impact.
Red Fox (*Vulpes vulpes*)		Invasive	Likely to be found within Project area. Clearing vegetation likely to compound impact on native species. A feral management plan is recommended to reduce impact.

8.1 Conservation Significant Fauna

The following provides background and habitat preference for each of the conservation significant fauna species listed in Table 8 and an assessment of the potential impact of the proposed Bullant Project on Conservation Significant Fauna based on habitat preferences.

8.1.1 Birds - Aves

Australian Bustard, (*Ardeotis australis*)

Priority 4 species with DEC.

The Australian Bustard is well distributed through much of the state, excluding heavily wooded areas of the south. It inhabits open tussock grasslands, *Triodia* hummock grasslands, grassy woodlands, low shrub lands and farming country (Pizzey and Knight 1997).

Results from the desktop study confirm sightings of the Australian Bustard within 10 km of the Project area. Based on previous sightings and the availability of suitable habitat, it is considered likely that the species may be located within the Project area. Based on the Bustards widespread distribution, clearing associated with the Bullant Project is considered unlikely to have a significant impact on the species.

Australian Painted Snipe (*Rostratula australis*)

Vulnerbale species under the EPBC Act 1999.

The Painted Snipe is a moderately small marsh bird, sparsely distributed throughout areas of WA where there is sufficient water, including the Kimberly, Pilbara, South-west and formerly at Lake Carnegie, as well as Tasmania and Eastern Australia (Johnstone & Storr 1998). It is a migratory species also protected by the China Australia Migratory Bird Agreement (CAMBA) (DEH 2004).

The Painted Snipe inhabits shallow freshwater or brackish wetlands that are either permanent or temporarily filled (DEH 2004). It nests in a scrape or saucer made of twigs, reeds and grasses, upon hummocks above the waterline (Pizzey & Knight 1997).

Based on the lack of suitable habitat, 360 Environmental considers it unlikely that the Australian Painted Snipe be found within the Project area. The Bullant Project is not considered likely to have an impact on the species.

Cattle Egret (*Ardea ibis*)

Migratory species under the EPBC Act 1999.

The Cattle Egret is found within the southern and northern parts of Western Australia. The species has been recorded in paddocks, pastures, croplands, wetlands, tidal mudflats and drain areas (Pizzey and Knight 1997).

Based on the current collection of water in the proposed tailings storage pit (Area B) and the relatively low relief of the land (during the wetter months) it is possible that the Cattle Egret could be found within the Project area periodically. 360 Environmental considers, based on the lack of permanent suitable habitat, that clearing associated with the Bullant Project unlikely to significantly impact the species.

Fork-tailed Swift (*Apus pacificus*)

Migratory species under the EPBC Act 1999.

The Fork-tailed Swift is found over open country, from semi desert to coasts, islands, occasionally over forests and cities (Pizzey and Knight 1997).

Based on the species widespread distribution and aerial behaviour over a wide variety of habitats, there is potential for the species to be recorded within the Project area. Conversely, as a result of its wide distribution and indifference to a wide variety of habitats it is considered that clearing associated with the Bullant Project will be unlikely to significantly impact the species.

Great Egret, White Egret (*Ardea alba*)

Migratory species under the EPBC Act 1999.

The Great Egret has been recorded in a wide range of wetland habitats. These include swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (Pizzey and Knight 1997).

Based on the current collection of water in the proposed tailings storage pit (Area B) and the relatively low relief of the land (during the wetter months) it is possible that the Great Egret be found within the Project area periodically. 360 Environmental considers, based on the species widespread distribution and the lack of suitable permanent habitat that clearing associated with the Bullant Project unlikely to significantly impact the species.

Major Mitchell's Cockatoo (*Cacatua leadbeateri*)

Schedule 4 species under the WA WC Act.

The Major Mitchell's has a disjunct distribution throughout the semi-arid and arid zones of Western Australia, including the Kimberley, Murchison River area and the Great Victoria Desert (Johnstone & Storr 1998). It usually inhabits sparsely wooded country near water and tall Eucalypts, including farmlands as well as coastal areas (Johnstone & Storr 1998). Nesting occurs in eucalypt holes or hollows; especially Salmon Gum and River Gum (Johnstone & Storr 1998).

Based on the presence of relatively suitable habitat, it is considered likely that the Major Mitchell's Cockatoo be found within the Project area. However, based on its relatively widespread distribution and availability of suitable habitat outside the Project area, clearing associated with the Bullant Project is considered unlikely to have significant impact.

Malleefowl (*Leipoa ocellata*)

Schedule 1 species under the WA WC Act; Vulnerable under the EPBC Act 1999.

Malleefowl require large home ranges that provide sufficient food sources of seeds and insect larvae to sustain a breeding pair, and conditions dry and hot enough to allow for proper egg incubation from the construction of the mound (Johnstone & Storr 1998; Garnett & Crowley 2000). Subsequently, this species has a dependence on drier, inland bio-regions that contain open woodland and scrub, which has resulted in a distribution spanning across semi-arid sections of southern Australia, with populations observed though inland sections of south-east Western Australia (Priddel & Wheeler 1995).

Malleefowl have been recorded in mallee, acacia, paperbark, sheoak and other scrubs; eucalypt woodlands, coastal heaths mostly on sandy or gravel soils (Pizzey and Knight 1997).

Results from the desktop study and works previously conducted by 360 Environmental have confirmed sightings of the Malleefowl within 10 km of the Project area. Based on previous sightings and the availability of suitable habitat, it is considered likely that the species may be recorded within the Project area on occasion. Based on the Malleefowl's large home range, and small clearing impacts associated with the Bullant Project, it is considered unlikely to have a significant impact.

Naretha, Blue Bonnet (*Northiella haematogaster narethae*)

Schedule 4 species under the WC Act.

Blue Bonnets are only found on the western side of the Nullarbor Plain, usually within sight of *Casuarina* and *Acacia* woodland, and chenopod shrub land (DSEWPC 2000). They are mostly seen in pairs or small parties of up to ten birds, and feed on seeds, especially those of the *Acacia* species (Johnstone & Storr 1998). They may be seen

Photo: www.birdforum.net

living far from water (DSEWPC 2000). Blue Bonnets nest in tree hollows in dead or live trees.

Based on the lack of suitable habitat, 360 Environmental considers it unlikely that the Blue Bonnet be found within the Project area. The Bullant Project is not considered to be at risk of having a significant impact on the species, however 360 Environmental recommends avoiding the removal of hollow bearing trees as a general measure for habitat conservation.

Peregrine Falcon (*Falco peregrinus*)

Schedule 4 species under the WA WC Act.

The Peregrine Falcon occurs in all parts of Australia except desert regions (DSEWPC 2011). It mainly inhabits coastal cliffs, rivers, ranges or wooded watercourses or lakes, and feeds almost exclusively on other birds (Johnstone & Storr 1998). Nesting takes place on cliffs, ledges, granite outcrops, tree hollows and even disused eagle nests (Johnstone & Storr 1998).

Based on the lack of suitable habitat, 360 Environmental considers it unlikely that the Peregrine Falcon would be a resident within the Project area. The Bullant Project is not considered likely to have an impact on the species.

Rainbow Bee-eater (*Merops ornatus*)

Migratory species under the EPBC Act 1999.

The Rainbow Bee-eater has been recorded in open woodlands with sandy loamy soil; sand ridges, sandpits, riverbanks, road cuttings, beaches dunes, cliffs mangroves, rainforests, woodlands and golf courses (Pizzey and Knight 1997).

Based on the availability of relatively suitable habitat it is considered possible that the Rainbow Bee-eater could be found within the Project area. Nonetheless, 360 Environmental considers, based on the Rainbow Bee-eater's relatively widespread distribution, that clearing associated with the Bullant Project unlikely to have a significant impact on this globally distributed species.

Slender-billed Thornbill (*Acanthiza iredalei iredalei)*

Vulnerable species under the EPBC Act 1999.

The Slender-billed Thornbill is sedentary and known from a small number of sub-populations in arid, or semi-arid, south-western Australia (TSSC 2008). The known populations form a discontinuous band from Carnarvon in Western Australia to Port Augusta in South Australia, and are predominantly under threat from habitat degradation, due to grazing of livestock and other introduced herbivores, as well as changed fire regimes (TSSC 2008). The Slender-billed Thornbill inhabits Chenopod shrub and samphire in treeless or sparsely wooded flatlands (giving rise to its other common

name of Samphire Thornbill), but may also be seen in near-coastal scrubs amongst low Melaleuca or dwarf mangroves (Johnstone & Storr 1998).

Although areas of Chenopod shrubs and Samphire where not recorded as part of the fauna habitat assessment – its occurrence within the wider area could potentially find Slender –billed Thornbills migrating through the Project area. Nonetheless, 360 Environmental considers based on the lack of suitable habitat that clearing associated with the Bullant Project is unlikely to have a significant impact on the species.

Western Rosella (Inland spp) (*Platycerus xanthogenys*)

Vulnerable species under the EPBC Act 1999.

The Western Rosella inland subspecies inhabits eucalypt and Sheoak woodlands and scrubs, especially those containing Wandoo, Salmon gum, Flooded gum, tall Mallee and Rock Sheoak (DEC 2009). It has undergone a significant change in distribution, suffering decline or extinction in 25% of its former range (DEC 2009).

Based on the availability of suitable habitat it is possible that a Western Rosella be found within the Project area. However the Project area is outside its current known distribution, therefore 360 Environmental considers its occurrence unlikely and that clearing associated with the Bullant Project will be unlikely to significantly impact the species.

8.1.2 Mammals

Central Long-eared Bat *(Nyctophilus timoriensis)*

Priority 4 species with the DEC.

The Central Long-eared Bat is found across semi-arid South Australia. It inhabits wet sclerophyll forests and a range of dry woodland and shrub land communities in arid and semi-arid regions (Menkorst and Knight 2004). The woodland trees include species such as Salmon Gum, Gimlet, *Eucalyptus floctoniae, E. oleosa, E. transcontinentalis and E. gracilis*. In these habitats it roosts in tree crevices, foliage or under loose bark.

Based on the availability of suitable habitat, it is possible that the Central Long-eared Bat may be found within the Project area. However, based on its relatively widespread distribution and availability of suitable habitat outside the Project area, the small amount of clearing associated with the Bullant Project is considered unlikely to have significant impact.

Chuditch, Western Quoll (*Dasyurus geoffroii*)

Vulnerable species under the EPBC Act 1999.

Habitat requirements for the Chuditch are not as specific as other native marsupials, with the species able to exist in a variety of environments from denser eucalypt forests and open woodlands to sparser, semi-arid and low-lying scrub (Van Dyck & Strahan 2008). While the historical bio-regions for the Chuditch would have included much of the wheat-belt and southern sections of the Pilbara, the only remaining habitat suitable for supporting Chuditch is through the cooler south-west corner of the state, in areas with significant concentrations of prey and sufficient logs and hollows for nests (Van Dyck & Strahan 2008).

The availability of suitable habitat based on the diverse habitat preferences of the Western Quoll implies the potential for the Western Quoll to occur within the Project area. However, the Project area is outside the Western Quolls current known distribution, therefore 360 Environmental considers its occurrence unlikely and that clearing associated with the Bullant Project is unlikely to impact the species.

Crest-tailed Mulgara (*Dasycercus cristicauda*)

Vulnerable under the EPBC Act and Schedule 1 under the *WA Wildlife Conservation Act*

With a widespread but patchy distribution throughout sandy arid areas of central Australia, the Crest-tailed Mulgara makes its home in sand dunes at the base of Cane Grass clumps or in Nitre Bush hummocks around salt lakes (Van Dyck & Strahan 2008).

Based on the lack of suitable habitat and the Project area being outside the Crest-tailed Mulgara's current known distribution, 360 Environmental considers its occurrence within the Project area unlikely and that clearing associated with the Bullant Project is unlikely to impact the species.

Greater Bilby *(Macrotis lagotis)*

Vulnerable species under the EPBC Act 1999.

The Greater Bilby, also known as the Rabbit-eared Bandicoot, once occupied much of arid and semi-arid Australia, but is now mostly restricted to scattered colonies in the northern parts of Western Australia (inland as far south as Warburton) and the Northern Territory (Menkhorst & Knight 2004).

A variety of different habitat types are occupied by *Macrotis lagotis,* including Acacia shrublands over red earth, desert sandplains and dunes, and Mitchell Grass areas of stony downs (Van Dyck & Strahan 2008). Major factors affecting the decline of *M. lagotis* are introduced predators, competition from rabbits and livestock, and drought (Van Dyck & Strahan 2008).

Based on the lack of suitable habitat and the Project area being outside the Greater Bilbys's current known distribution, 360 Environmental considers its occurrence within the Project area unlikely and that clearing associated with the Bullant Project is unlikely to impact the species.

Karkarratul, Northern Marsupial Mole (*Notoryctes caurinus*)

Endangered species under the EPBC Act 1999.

The Northern Marsupial Mole occurs in sand dune systems of north-western Australia, particularly the Great Sandy Desert and Little Sandy Desert (Van Dyck & Strahan 2008). It burrows through sand using the forelimbs, and very rarely comes to the surface (Jones et al. 2003). These journeys to the surface are apparently more likely after rain events (Van Dyck & Strahan 2008).

The Project area is outside the northern Marsupial Moles current known distribution. The Project area also contains no sand dunes. Therefore 360 Environmental considers its occurrence within the Project area unlikely and that clearing associated with the Bullant Project unlikely to impact the species.

Long-tailed Dunnart (*Sminthopsis longicaudata*)

Priority 4 species with DEC.

The Long – tailed Dunnart is known only from a few widespread locations in the Pilbara, Goldfields and Gibson Desert, the Long-tailed Dunnart inhabits arid, rocky screes with shrubs and hummock grasses (Menkhorst & Knight 2004).

Based on the lack of suitable habitat and the Project area being outside the Long-tailed Dunnarts's current known distribution, 360 Environmental considers its occurrence within the Project area unlikely and that clearing associated with the Bullant Project unlikely to impact the species.

Plains Rat *(Psuedomys australis)*

Endangered under the EPBC Act and Schedule 1 under the WA WC Act.

The Plains Rat was formerly widespread across arid southern Australia. The only currently known population exist is 600 km north-south band west of Lake Eyre. The Plains Rat inhabits open country primarily on clay based soils and gibber plains, spreading to adjacent dunes during population outbreaks (Menkorst and Knight 2004).

Based on the lack of suitable habitat (i.e. cracking clay depressions and gibber plains) and the Project area being outside the Plains Rat's current known distribution, the occurrence of the Plains Rat within the Project area is considered unlikely. As a result, clearing associated with the Bullant Project is considered unlikely to have an impact on the species.

Sandhill Dunnart (*Sminthopsis psammophila*)

Endangered under the EPBC Act and Schedule 1 under the WA WC Act.

Known from widely-separated locations in the Great Victoria Desert of WA and SA, the Sandhill Dunnart inhabits sandy areas, usually with sand dunes, understorey of *Triodia* spp. hummock grass and a variety of overstorey such as *Eucalyptus*, *Callitris*, mallee or Desert Oak (Van Dyck & Strahan 2008). They shelter in hummock grasses (Menkhorst & Knight 2004), sometimes digging burrows, and are also known to undergo torpor in cooler conditions (Withers & Cooper 2009). Home ranges may be up to 7.5 hectares, with considerable overlap between males and females, and individuals may travel up to 350 metres over a night's foraging (Van Dyck & Strahan 2008).

There are small pockets of *Triodia* found within the Project area, however its occurrence and the surrounding substrate are considered unsuitable as habitat for the Sandhill Dunnart. It is unlikely that Sandhill Dunnarts would be found within the Project area. Clearing associated with the Bullant Project unlikely to impact the species. However, as a general conservation measure 360 Environmental recommends that the clearing of *Triodia* hummocks is minimised as they provide important habitat for many small mammal and reptile species.

Southern Marsupial Mole, Yitjarritjarri, Itjaritjari (*Notoryctes typhlops*)

Endangered under the EPBC Act and Schedule 1 under the WA WC Act.

The Southern Marsupial Mole is found in sand-dune deserts of Central Australia, where it tunnels 20-60 cm below the sand surface of dune-crests and slopes, or sometimes swales and sand plains (Van Dyck & Strahan 2008). Rather than 'swim' through the loose sand, the Itjaritjari burrows tunnels through lightly cemented sand, back-filling as they go, and there is no evidence of tunnel re-use, with up to 100 km of backfilled tunnels found per hectare of land in some areas (Van Dyck & Strahan 2008).

Based on the enigmatic nature of the Southern Marsupial Mole it cannot be ruled out that the species may be found within the Project area. However, based on the lack of suitable habitat (i.e. sandy soils) its occurrence is considered highly unlikely. Clearing associated with the Bullant Project is considered unlikely to have a significant impact on the species.

Warru, Black-footed Rock-wallaby (MacDonnell Ranges race) (*Petrogale lateralis* MacDonnell Ranges race)

Vulnerable species under the EPBC Act 1999.

Also called the Black-flanked Rock Wallaby, this species is widely scattered across central and Western Australia. There is great variation in habitat, with populations found in areas of temperate rocky islands, to spinifex-clad hills, sandstone gorges, or granite outcrops surrounded by mallee scrub (Van Dyck & Strahan 2008).

This shy wallaby shelters in rock crevices and caves and is mostly nocturnal, although frequently known to bask in the sun on cooler mornings and evenings (Menkhorst & Knight 2004).

The relatively low relief of the Project area and lack of suitable habitat (i.e. sandstone gorges, rocky islands and spinifex clad hills) deems the occurrence of the Black Footed Rock Wallaby within the Project area as unlikely. As a result, clearing associated with the Bullant Project is considered unlikely to have an impact on the species.

8.1.3 Reptiles

Carpet Python (*Morelia spilota imbricata*)

Schedule 4 under the WA WC Act and Priority 4 with the DEC.

The Carpet Python is widespread and occupies the most diverse habitats of any Australian Python. They shelter in hollow trunks and limbs, disused burrows, caves, rock crevices and beneath boulders and can persist in some urban environments.

Based on the species adaptability to a wide variety of habitats and the Project area being inside its current known distribution it is possible that the Carpet Python could be found within the Project area. Conversely, based on its wide distribution and its adaptability to a wide variety of habitats the clearing associated with the Bullant Project is considered unlikely to have a significant impact on the species.

Great Desert Skink, Tjakura, Warrarna, Mulyamiji (*Egernia kintorei; Liopholis kintorei*)

Vulnerable under the EPBC Act and Schedule 1 under the WA *Wildlife Conservation Act 1950*.

The Great Desert Skink occupies arid sand-flats and clay-based or loamy soils vegetated with spinifex, and digs large and complex multi-entranced burrow systems with shared defecation sites (Wilson & Swan 2003).

Based on the lack of suitable habitat and the Project area being outside the Great Desert Skink's current known distribution, 360 Environmental considers its occurrence within the Project area unlikely and that clearing associated with the Bullant Project is unlikely to impact the species.

Woma (*Aspidites ramsayi*)

Scheduled 4 species under the WA WC Act.

The Woma is found in the subhumid to arid interior parts of Australia. It inhabits woodland, heaths and shrub lands, often with spinifex (Wilson and Swan 2003). The Woma shelters in abandoned monitor and mammal burrows and soil cracks (Wilson and Swan 2003).

Based on the availability of suitable habitat, and the Project area being inside Woma's current known distribution it is possible that the Woma Python could be found within the Project area. However, based on its relatively widespread distribution and availability of suitable habitat outside the Project area, clearing associated with the Bullant Project is considered unlikely to have significant impact.

8.1.4 Invasive Species

Cat (*Felis catus*)

Invasive species under the EPBC Act

The Cat is well distributed throughout Australia and well adapted to wide variety of habitats, from rainforests to desert and cities (Menkhorst and Knight 2004).

The presence of cats was noted around the Bullant Project facilities by on-site Company personnel. It is considered that regular predation by introduced cats on native mammal, reptile, frog and bird species has contributed significantly to mortality rates and the population decline for certain species (DSEWPC 2010). It is thought that the occurrence of the house mouse (*Mus musculus*) (also noted by onsite Company personnel) is attracting the cat/s to the facilities. 360 Environmental recommends consideration of the implementation of a feral management plan to minimise the impact of invasive species occurring within the Project area.

Goat *(Capra hircus)*

Invasive species under the EPBC Act

The Goat is widely spread throughout most of Australia however patchy outside the monsoonal tropics. The Goat tends to be absent from the wettest and driest regions however it is well established in sheep grazing country, in particular semi-arid shrub land and woodland with rocky outcrops (Menkhorst and Knight 2004).

Goats have a major impact on native vegetation through overgrazing of native herbs, grasses, shrubs or trees; soil degradation; the introduction of weed species and the fouling of waterholes (DSEWPC 2010). The impact caused by goats has contributed significantly to the degradation and availability of suitable habitat, food and water leaving native species at greater risk of predation (DSEWPC 2010). Goat scat was noted during the fauna survey. To reduce the impact of feral goats on native species, 360 Environmental recommends the implementation of a feral management plan to minimise the impact of goats occurring within the Project area.

Rabbit (*Oryctolagus cuniculus*)

Invasive species under the EPBC Act

The Rabbit is widely distributed throughout Australia except for monsoonal areas. The Rabbit will establish populations around reliable water sources in deserts, in temperate and subtropical regions absent only from extensive undisturbed wet forest or heath (Menkhorst and Knight 2004).

Rabbits have a major impact on native vegetation through overgrazing of native herbs, grasses; ringbarking trees and shrubs; soil degradation; and preventing the regeneration of seeds and seedlings (SEWPaC 2010). Impacts caused by Rabbits have contributed significantly to the degradation, competition and availability of suitable habitat and food, leaving native species at greater risk of predation. Rabbit scat was noted during the fauna survey. To reduce the impact of the Rabbit on native species, 360 Environmental recommends consideration of a feral management plan minimise the impacts of Rabbits occurring within the Project area.

Red Fox (*Vulpes vulpes*)

Invasive species under the EPBC Act

The Fox is widespread south of Tropic of Capricorn and found in most habitats from wet forest to deserts and suburbs (Menkhorst and Knight 2004).

Feral predation from foxes and cats has historically been the primary source of population decline of ground – nesting birds, small to medium sized mammals and reptiles (SEWPaC 2010). Although evidence of foxes were not found in the immediate Project area, evidence of foxes in surrounding areas has been noted. To reduce the predation of Fox on native fauna species, 360 Environmental recommends consideration of the implementation of a feral management plan to minimise the impact of foxes potentially occurring within the Project area.

9 Conclusions and Recommendations

9.1 Fauna Summary

Twenty six (26) bird species and one native mammal species were recorded in the survey area. No frogs or reptiles were recorded. Evidence of six species of introduced mammal was noted.

Of the bird species observed, none are listed under State and/or Australian Government legislation. No native mammal species recorded during the survey is listed under State and/or Australian Government legislation however an extensive trapping survey would be required to determine presence of species which may be of conservation significance. Vertebrate fauna in the survey area would be expected to be typical of the area and the habitat types present.

The fauna habitat types identified in the survey are well represented in the survey area. The most common habitat within the survey area is Habitat type 2: Open Mallee woodland (e.g. *Eucalyptus salmonophloia*) over low shrubs (e.g. *Maireana sedifolia* and *Tecticornia* sp.) (Plate 21).

Habitat 2 (Area A; Area B; Area C; Area D; Area E; and Area F) recorded the highest number of bird species in the survey suggesting high local fauna habitat values. This habitat types is dominant across all parts of the survey area suggesting that the habitat is widespread.

Habitat 3 closed Mallee woodland – no understorey and Habitat 4 open sandy plain with low scrub recorded the lowest number of bird species. These Habitat types especially Habitat 3 may be expected to support a higher number of reptiles and smaller native mammals rather than birds.

Parts of the Project area displayed evidence of grazing from cattle, goats and rabbits. Grazing in conjunction with soil degradation and competition for suitable burrowing sites is thought to influence the ability for small native burrowing fauna to habitat these areas. Areas with lower grazing impacts are likely to have higher values to fauna.

A total of twelve bird species (Appendix D), ten native mammals, three reptiles and four invasive mammal species listed under State and/or Australian Government legislation are predicted to occur in the Goldfields region. No amphibians of conservation significance are predicted to occur within the proximity of the Project area. Of the species observed no conservation significant species is likely to be significantly impacted by proposed developments for the Bullant Gold Mine expansion.

Habitats such as Mallee and Acacia woodlands and spinifex grasslands are known to support a wide range of species that are dependent on it for shelter. Due to the

presence of suitable habitat the following conservation significant vertebrate fauna (and their preferred habitat) may be found:

- Birds:
  - Australian Bustard – grassy woodlands;
  - Cattle Egret – open low relief areas;
  - Great Egret – open low relief areas;
  - Major Mitchells Cockatoo – *Eucalyptus* woodland;
  - Malleefowl – open *Eucalyptus* woodland;
  - Rainbow Bee-eater – open woodland areas near water courses;
  - Slender Thornbill – chenopod scrubs and Samphire or woody flatlands; and
  - Western Rosella – salmon Gum/ Mallee woodland.
- Mammals:
  - Central Long –eared Bat – salmon/ Gimlet woodlands; and
  - Southern Marsupial Mole – dune crest slopes – loose sandy soils.
- Reptiles:
  - Carpet Python – diverse habitat types; and
  - Woma - woodland, heath and scrublands.

In addition to the broad habitat types mentioned above, large mature 'habitat' trees may provide tree hollows potentially supportive of conservation interest birds.

The proposed area for the crusher has now been adjusted by KMC to north of the main waste dump (Appendix B, Figure 2). This was not proposed at the time of the Level 1 fauna survey, however vegetation is consistent with other vegetation units surveyed throughout the Project area (Botanica 2011). 360 Environmental staff did complete a brief survey of the area however did not complete a specific habitat and fauna assessment. Based on surveying completed by Botanica and the Level 1 fauna assessment, 360 Environmental does not consider that clearing associated with the new crusher area as likely to have a significant impact on fauna species.

9.2 Fauna Recommendations

In summary, the recommendations include:

- Minimising the clearing of remnant native vegetation wherever possible. For example, if it is possible to put infrastructure in already cleared or disturbed areas then this should be considered rather than clearing new areas of remnant, undisturbed vegetation;

- The removal of large mature 'habitat' trees (with hollows) should be avoided where reasonably practicable;
- Conisderation of the development and implementation of a feral management plan to minimise the impact of invasive species which may be attracted to the Bullant Project;
- In the event that the Project progresses beyond the currently anticipated new crusher, mill and tailings storage facility and more extensive clearing is required, KMC may be required to undertake a Level 2 Fauna survey of the project area, targeting conservation significant species; and
- As above, if more extensive clearing is required a Short Range Endemic Survey is recommended.

10 Acknowledgements

Thanks to Shorty from KMC for assisting the field staff in locating the survey area and for providing onsite support and advice.

Plant identifications were completed with reference to the Bullant Flora Report completed by Goldfields botanical specialists Andrea and Jim Williams.

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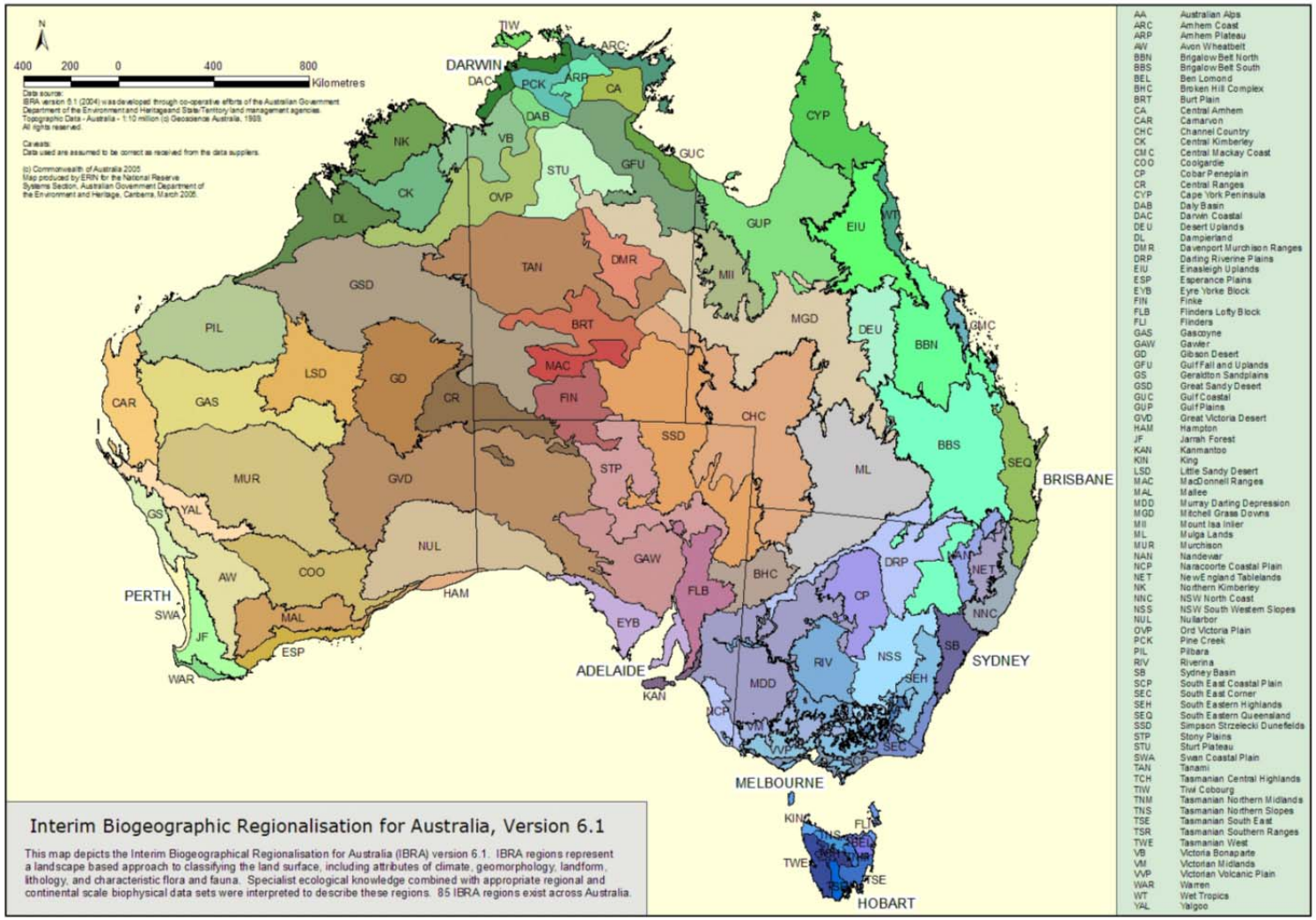
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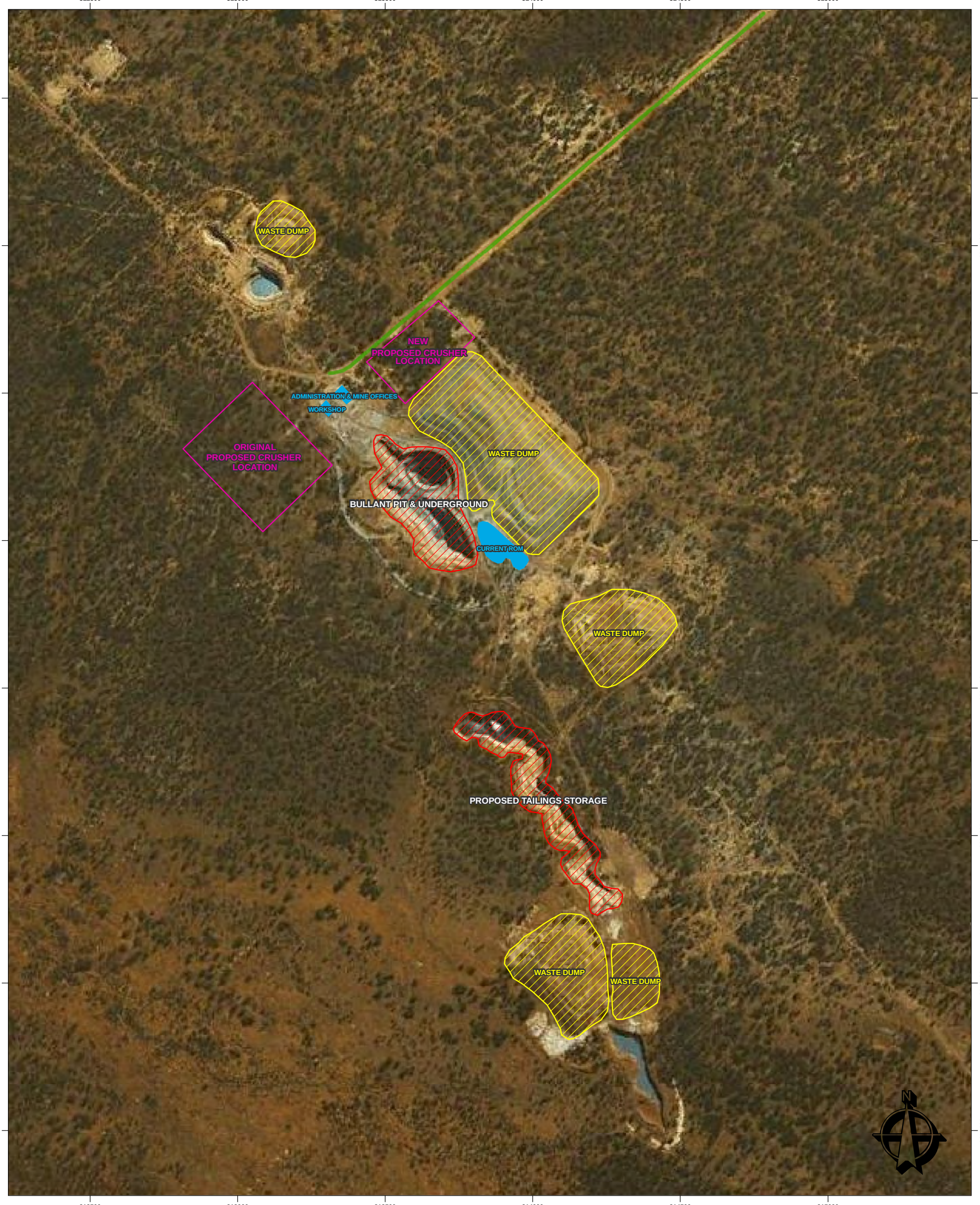
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APPENDIX A: IBRA BIOREGIONS


Interim Biogeographic Regionalisation for Australia, Version 6.1
This map depicts the Interim Biogeographical Regionalisation for Australia (IBRA) version 6.1. IBRA regions represent a landscape based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna. Specialist ecological knowledge combined with appropriate regional and continental scale biophysical data sets were interpreted to describe these regions. 85 IBRA regions exist across Australia.
DARWIN
ADELAIDE
PERTH
BRISBANE
SYDNEY
MELBOURNE
HOBART
AA Australian Alps
ARC Arnhem Coast
ARP Arnhem Plateau
AW Avon Wheatbelt
BBN Brigalow Belt North
BBS Brigalow Belt South
BEL Ben Lomond
BHC Broken Hill Complex
BRT Burt Plain
CA Central Arnhem
CAR Carnarvon
CHC Channel Country
CK Central Kimberley
CMC Central Mackay Coast
COO Coolgardie
CP Cobar Peneplain
CR Central Ranges
CYP Cape York Peninsula
DAB Daly Basin
DAC Darwin Coastal
DEU Desert Uplands
DL Dampierland
DMR Davenport Murchison Ranges
DRP Darling Riverine Plains
EIU Einasleigh Uplands
ESP Esperance Plains
EYB Eyre Yorke Block
FIN Finke
FLB Flinders Lofty Block
FLI Flinders
GAS Gascoyne
GAW Gawler
GD Gibson Desert
GFU Gulf Fall and Uplands
GS Geraldton Sandplains
GSD Great Sandy Desert
GUC Gulf Coastal
GUP Gulf Plains
GVD Great Victoria Desert
HAM Hampton
JF Jarrah Forest
KAN Kanmantoo
KIN King
LSD Little Sandy Desert
MAC MacDonnell Ranges
MAL Mallee
MDD Murray Darling Depression
MGD Mitchell Grass Downs
MII Mount Isa Inlier
ML Mulga Lands
MUR Murchison
NAN Nandewar
NCP Naracoorte Coastal Plain
NET New England Tablelands
NK Northern Kimberley
NNC NSW North Coast
NSS NSW South Western Slopes
NUL Nullarbor
OVP Ord Victoria Plain
PCK Pine Creek
PIL Pilbara
RIV Riverina
SB Sydney Basin
SCP South East Coastal Plain
SEC South East Corner
SEH South Eastern Highlands
SEQ South Eastern Queensland
SSD Simpson Strzelecki Dunefields
STP Stony Plains
STU Sturt Plateau
SWA Swan Coastal Plain
TAN Tanami
TCH Tasmanian Central Highlands
TIW Tiwi Cobourg
TNM Tasmanian Northern Midlands
TNS Tasmanian Northern Slopes
TSE Tasmanian South East
TSR Tasmanian Southern Ranges
TWE Tasmanian West
VB Victoria Bonaparte
VM Victorian Midlands
VVP Victorian Volcanic Plain
WAR Warren
WT Wet Tropics
YAL Yalgoo

(DSEWPC 2010)

APPENDIX B: AERIAL MAPS



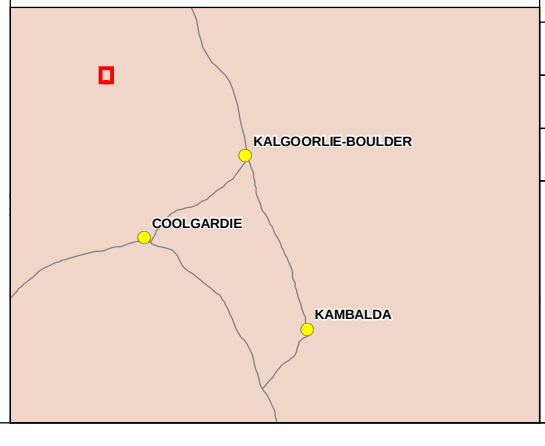
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Legend

- Mine Facility
- Site Infrastructure
- Proposed Crusher Location
- Waste Disposal Site
- Access Road

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM GOOGLE EARTH 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

LOCALITY MAP



1:12,000 @ A3

0 50 100 200 300 400 Metres

DRAWING ID	DATE
EBS118.02	28/09/2011

HORIZONTAL DATUM AND PROJECTION

GDA 1994 MGA Zone 51

CREATED	CHECKED	APPROVED	REVISION
TJ	LF	FD	0

Kalgoorlie Mining Company Pty. Ltd.

Bullant Gold Project
Baseline Vertebrate Fauna Studies
Bullant Project Area
Figure 2

360 environmental

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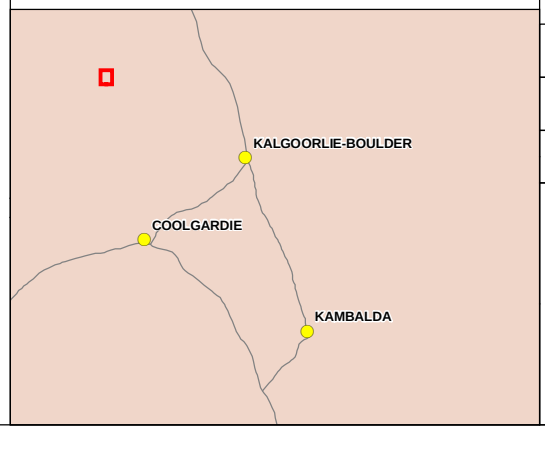
Area F
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Legend

- Survey Areas
- Survey Points
- Site Features

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM GOOGLE EARTH 2010
- LOCALITY MAP SOURCED FROM LANDGATE 2006

LOCALITY MAP



1:12,000 @ A3

0 50 100 200 300 400 Metres

DRAWING ID	DATE
EBS118.03	28/09/2011

HORIZONTAL DATUM AND PROJECTION

GDA 1994 MGA Zone 51

CREATED	CHECKED	APPROVED	REVISION
TJ	LF	FD	0

Kalgoorlie Mining Company Pty. Ltd.

Bullant Gold Project
Baseline Vertebrate Fauna Studies
Bullant Level 1 Fauna Survey: Locations and Areas Surveyed
Figure 3

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APPENDIX C: PLATES FOR LOCATIONS SURVEYED AND BROAD HABITAT TYPES



Plate 1: Location A – Open Mallee Woodland over tall shrubs



Plate 2: Location B – Open Mallee Woodland over medium shrubs



Plate 3: Location C – Open Mallee Woodland over low shrubs



Plate 4: Location D - Open low scrub plains



Plate 5: Location E – Open Mallee woodland (unburnt) adjacent low shrub plains



Plate 6: Location F –Mallee woodland (burnt), limited understorey present



Plate 7: Location G – Open low shrub plains



Plate 8: Location H – Open Mallee over medium shrub



Plate 9: Location I - Low shrub plains at base of waste dump land bank



Plate 10: Location J – Low Open Mallee woodland over medium shrubs (disturbed area)



Plate 11: Location K- Regrowth over disturbed area



Plate 12: Location L - Disturbed area surrounding pit



Plate 13: Location M – View facing south over old pit



Plate 14: Location N – Disturbed area adjacent to a waste dump



Plate 15: Location O – Open Mallee over tall shrubs



Plate 16: Location P – Open Mallee over small shrubs



Plate 17: Location Q –View looking north, east of proposed tailings pit. Low open shrub plains



Plate 18: Location R – View looking south, east of proposed tailings pit. Open Mallee woodland no understory



Plate 19: Location S – Opposite Waste dump. Open Mallee woodland over medium shrubs



Plate 20: Location T – Open Mallee woodland over small to medium shrubs adjacent underground pit. View looking west, to the west of underground operation



Plate 21: Location U - Open Mallee woodland over small to medium shrubs.



Plate 22: Location V - Open Mallee woodland over small to medium shrubs. Area behind major waste dump



Plate 23: Location W - Open Mallee woodland over small to medium shrubs

APPENDIX D: DESKTOP STUDY RESULTS

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
Birds						
Goldfields region – Has been previously recorded within 10km of Project site (DEC fauna search 2011).	Australian Bustard	*Ardeotis australis*			P4	Found in tussock grassland, *Triodia* hummock grassland, grassy woodland, low shrublands (Pizzey and Knight 1997).
Goldfields region	Australian Painted Snipe	*Rostratula australis*	Vulnerable			Sparsely distributed throughout areas of WA where there is sufficient water, including the Kimberly, Pilbara, South-west and formerly at Lake Carnegie, as well as Tasmania and Eastern Australia (Johnstone & Storr 1998). Inhabits shallow freshwater or brackish wetlands that are either permanent or temporarily filled (DEH 2004).
Goldfields region	Cattle Egret	*Ardea ibis*	Migratory Marine. Migratory Wetland.			This species has been recorded in paddocks, pastures, croplands, wetlands, tidal mudflats and drain areas (Pizzey and Knight 1997).

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
Goldfields region	Fork-tailed Swift	*Apus pacificus*	Migratory Marine.			Found over open country, from semi desert to coasts, islands, occasionally over forests and cities (Pizzey and Knight 1997).
Goldfields region	Great Egret, White Egret	*Ardea alba*	Migratory Marine. Migratory Wetland.			The species has been recorded in a wide range of wetland habitats. These include swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (Pizzey and Knight 1997).
Goldfields region	Major Mitchell's Cockatoo	*Cacatua leadbeateri*		Scheduled Priority Fauna		A disjunct distribution throughout the semi-arid and arid zones of Western Australia, including the Kimberley, Murchison River area and the Great Victoria Desert (Johnstone & Storr, 1998). Usually inhabits sparsely wooded country near water and tall Eucalypts, including farmlands as well as coastal areas (johnstone & Storr 1998).
Goldfields region – Has been previously	Malleefowl	*Leipoa ocellata*	Vulnerable	Scheduled 1 Priority Fauna		Mallefowl have been recorded in mallee, acacia, paperbark, sheoak and other scrubs; eucalypt woodlands, coastal heaths mostly on sandy or

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
recorded within 10km of Project site (DEC fauna search 2011)						gravel soils (Pizzey and Knight 1997).
Goldfields region	Naretha, Blue Bonnet	*Northiella haematogaster narethae*		Scheduled 4 Priority Fauna		Found on the western side of the Nullarbor plain, usually within sight of *Casuarina* and *Acacia* woodland, and chenopod shrubland (DSEWPC, 2000). They are mostly seen in pairs or small parties of up to ten birds, and feed on seeds, especially those of the *Acacia* species (Johnstone & Storr 1998). They may be seen living far from water (DSEWPC 2000).
Goldfields region	Peregrine Falcon	*Falco peregrinus*		Scheduled 4 Priority Fauna		Occurs in all parts of Australia except desert regions (DSEWPC 2011). It mainly inhabits coastal cliffs, rivers, ranges or wooded watercourses or lakes, and feeds almost exclusively on other birds (Johnstone & Storr 1998).
Goldfields region	Rainbow Bee-eater	*Merops ornatus*	Migratory Wetland.			Recorded in open woodlands with sandy loamy soil; sand ridges, sandpits, riverbanks, road

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
						cuttings, beaches dunes, cliffs mangroves, rainforests, woodlands and golf courses (Pizzey and Knight 1997).
Goldfields region	Slender-billed Thornbill	*Acanthiza iredalei iredalei*	Vulnerable			Recorded in low, dense saltbush, bluebush, cotton bush (*mairena sp.*); samphire on salt lakes, salt marshes, low banksia, tea tree, casuarina scrubs, sand plain heaths; mulga, other acacias; and mangroves (Pizzey and Knight 1997).
Goldfields region	Western Rosella (Inland spp)	*Platycerus icterotis xanthogenys*	Vulnerable			The inland subspecies inhabits eucalypt and Sheoak woodlands and scrubs, especially those containing Wandoo, Salmon gum, Flooded gum, tall Mallee and Rock Sheoak (DEC 2009).
Mammals						
Goldfields region	Central Long-eared Bat	*Nyctophilus timoriensis*			Priority 4	Found across semi-arid South Australia. Inhabits wet sclerophyll forests and a range of dry woodland and shrub land communities in arid and semi-arid regions (Menkorst and Knight 2004).
Goldfields region	Crest-tailed Mulgara	*Dasycercus cristicauda*	Vulnerable	Scheduled 1		Widespread but patchy distribution throughout sandy arid areas of central Australia, the Crest-tailed Mulgara makes its home in sand dunes at the base of Cane Grass clumps or in Nitre Bush

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
						hummocks around salt lakes (Van Dyck & Strahan 2008).
Goldfields region	Chuditch, Western Quoll	*Dasyurus geoffroii*	Vulnerable			Able to exist in a variety of environments from denser eucalypt forests and open woodlands to sparser, semi-arid and low-lying scrub (Van Dyck & Strahan 2008). While the historical bio-regions for D.geoffrii would have included much of the wheat-belt and southern sections of the Pilbara, the only remaining habitat suitable for supporting chuditch numbers is through the cooler south-west corner of the state, in areas with significant concentrations of prey and sufficient logs and hollows for nests (Van Dyck & Strahan 2008).
Goldfields region	Greater Bilby	*Macrotis lagotis*	Vulnerable			This species once occupied much of arid and semi-arid Australia, but is now mostly restricted to scattered colonies in the northern parts of Western Australia (inland as far south as Warburton) and the Northern Territory (Menkhorst & Knight 2004).
Goldfields region	Long-tailed Dunnart	*Sminthopsis longicaudata*			Priority 4	Known only from a few widespread locations in the Pilbara, Goldfields and Gibson Desert, the Long-tailed Dunnart inhabits arid, rocky screes

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
						with shrubs and hummock grasses (Menkhorst & Knight 2004).
Goldfields region	Karkarratul, Northern Marsupial Mole	*Notoryctes caurinus*	Endangered			Occurs in sand dune systems of north-western Australia, particularly the Great Sandy Desert and Little Sandy Desert (Van Dyck & Strahan 2008).
Goldfields region	Plains Rat	*Psuedomys australis*	Vulnerable			Formerly widespread across arid southern Australia. Only known population to exist is a 600km north-south band west of Lake Eyre. Inhabits open country primarily on clay based soils and gibber plains, spreading to adjacent dunes during population outbreaks (Menkorst and Knight 2004).
Goldfields region	Sandhill Dunnart	*Sminthopsis psammophila*	Endangered	Scheduled 1 Priority Fauna		The Sandhill Dunnart inhabits sandy areas, usually with sand dunes, understorey of Triodia spp. hummock grass and a variety of overstorey such as Eucalyptus, Callitris, mallee or Desert Oak (Van Dyck & Strahan 2008).
Goldfields region	Southern Marsupial Mole,	*Notoryctes typhlops*	Endangered	Scheduled 1 Priority Fauna		Found in sand-dune deserts of Central Australia, where it tunnels 20-60 cm below the sand surface of dune-crests and slopes, or sometimes swales

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
	Yitjarritjarri, Itjaritjari					and sandplains (Van Dyck & Strahan 2008).
Goldfields region	Warru, Black-footed Rock-wallaby (MacDonnell Ranges race)	*Petrogale lateralis MacDonnell Ranges race*	Vulnerable			Widely scattered across central and western Australia. Populations found in areas of temperate rocky islands, to spinifex-clad hills, sandstone gorges, or granite outcrops surrounded by mallee scrub (Van Dyck & Strahan 2008).
Reptiles						
Goldfields region	Carpet Python	*Morelia spilota imbricata*		Scheduled Priority Fauna	Priority 4	Occupy most habitats within its broad distribution (Wilson and Swan 2003).
Goldfields region	Great Desert Skink, Tjakura, Warrarna, Mulyamiji	*Liopholis kintorei*	Vulnerable	Scheduled 1 Priority Fauna		It occupies arid sand-flats and clay-based or loamy soils vegetated with spinifex, and digs large and complex multi-entranced burrow systems with shared defecation sites (Wilson & Swan 2003).
Goldfields region	Woma	*Aspidites ramsayi*		Scheduled 4 Priority Fauna		Found in subhumid to arid interior. Inhabits woodland, heaths and shrub lands, often with spinifex (Wilson and Swan 2003).

Search Area	Common Name	Scientific Name	Conservation Status			Preferred Habitat
			EPBC Act	WC Act	DEC Priority	
Amphibians						
No frogs are listed as having conservation significance within10 km of the Project Area						
Invasive Species						
Goldfields region	Cat	*Felis catus*	Invasive			Found in all habitats from rainforests to desert and cities (Menkhorst and Knight 2004).
Goldfields region	Goat	*Capra hircus*	Invasive			Widely spread throughout most of Australia however patchy outside monsoonal tropics. Absent from the wettest and driest regions, well established in sheep grazing country in particular semi-arid shrub land and woodland with rocky outcrops (Menkhorst and Knight 2004).
Goldfields region	Rabbit	*Oryctolagus cuniculus*	Invasive			Widely distributed throughout Australia except for monsoonal areas. Will establish populations around reliable water sources in deserts, in temperate and subtropical regions absent only from extensive undisturbed wet forest or heath (Menkhorst and Knight 2004).
Goldfields region	Red Fox	*Vulpes vulpes*	Invasive			Widespread south of Tropic of Capricorn. Found in most habitats from wet forest to deserts and suburbs (Menkhorst and Knight 2004).

APPENDIX E: RAW FAUNA DATA

Scientific Name	Species common name	Date	Fauna Group	Native/ Introduced	Habitat				Overhead	Reliability *	Method *	Comments
					1	2	3	4				
Anthus australis	Australasian Pipit	12/07/2011	Bird	N	✓	✓				1	4	
Artamus cinereus	Black Faced Wood Swallow	12/07/2011	Bird	N		✓				1	4	
Phaps chalcoptera	Bronzewing Pigeon	12/07/2011	Bird	N	✓					1	4	
Falco berigora	Brown Falcon	13/07/2011	Bird	N		✓				1	4	
Cincloramphus cruralis	Brown Songlark	12/07/2011	Bird	N	✓	✓				1	4	
Felis catus	Cat	12/07/2011	Mammal	I						1	15	Noted as around the office facilities according to Company on site personnel - Clint baker
Bos primigenius	Cow	12/07/2011	Mammal	I						1	9	
Bos primigenius	Cow	12/07/2011	Mammal	I						1	9	
Cacatua roseicapilla	Gallah	12/07/2011	Bird	N					✓	1	4	
Capra hircus	Goat	12/07/2011	Mammal	I						1	9	
Capra hircus	Goat	12/07/2011	Mammal	I						1	9	
Strepera versicolor	Grey Currawong	12/07/2011	Bird	N		✓	✓			1	4	
Strepera versicolor	Grey Currawong	12/07/2011	Bird	N				✓	✓	2	4	
Lichenostomus plumulus	Grey-fronted Honey Eater	12/07/2011	Bird	N		✓	✓			1	4	

Lichenostomus plumulus	Grey-fronted Honey Eater	12/07/2011	Bird	N			✓			1	4	
Chrysococcyx basalis	Horsefield's Bronze Cuckoo	12/07/2011	Bird	N	✓	✓				1	4	
Acanthiza apicalis	Inland Thornbill	12/07/2011	Bird	N	✓	✓				1	4	
Microeca fascinans	Jacky Winter	12/07/2011	Bird	N		✓						
Corvus bennetti	Little Crow	12/07/2011	Bird	N	✓	✓				1	4	
Corvus bennetti	Little Crow	12/07/2011	Bird	N	✓		✓		✓	1	6	
Corvus bennetti	Little Crow	13/07/2011	Bird	N				✓		1	4	
Cracticus tibicen	Magpie	13/07/2011	Bird	N		✓				1	4	
Artamus personatus	Masked Woodswallow	12/07/2011	Bird	N		✓			✓	1	4	
Mus musculus	Mice	12/07/2011	Mammal	I						1	15	Noted as around the office facilities according to Company on site personnel - Clint baker
Psephotus varius	Mulga Parrot	13/07/2011	Bird	N		✓				1	4	
Psephotus varius	Mulga Parrot	12/07/2011	Bird	N		✓				1	4	
Cacomantis pallidus	Pallid Cuckoo	13/07/2011	Bird	N		✓				1	4	
Cracticus nigrogularis	Pied Butcherbird	12/07/2011	Bird	N		✓				1	4	
Certhionyx variegatus	Pied Honey Eater	13/07/2011	Bird	N	✓	✓				1	4	
Oryctolagus cuniculus	Rabbit	12/07/2011	Mammal	I	✓	✓	✓			1	9	
Oryctolagus cuniculus	Rabbit	12/07/2011	Mammal	I	✓	✓		✓		1	9	Rabbit - burrows and scats found all over site
Anthochaera carunculata	Red Wattlebird	13/07/2011	Bird	N		✓				1	4	
Anthochaera carunculata	Red Wattlebird	13/07/2011	Bird	N				✓		1	4	
Anthochaera carunculata	Red Wattlebird	12/07/2011	Bird	N					✓	1	4	
Cincloramphus mathewsi	Rufous Songlark	12/07/2011	Bird	N	✓	✓				1	4	

Lichenostomus virescens	Singing Honey Eater	12/07/2011	Bird	N	✓					1	4	
Lichenostomus virescens	Singing Honey Eater	12/07/2011	Bird	N	✓	✓				1	4	
Pardalotus striatus	Striated Pardalote	12/07/2011	Bird	N	✓					1	4	
Pardalotus striatus	Striated Pardalote	12/07/2011	Bird	N		✓				1	4	
Pardalotus striatus	Striated Pardalote	13/07/2011	Bird	N		✓				1	4	
Smicrornis brevirostris	Weebill	13/07/2011	Bird	N	✓	✓				1	4	
Smicrornis brevirostris	Weebill	12/07/2011	Bird	N		✓				1	4	
Macropus fuliginosus	Western Grey Kangaroo	12/07/2011	Mammal	N						1	9	
Macropus fuliginosus	Western Grey Kangaroo	12/07/2011	Mammal	I						1	4	Western Grey Kangaroo - scats identified as well
Barnardius zonarius	Western Ringneck	12/07/2011	Bird	N	✓					1	4	
Barnardius zonarius	Western Ringneck	13/07/2011	Bird	N	✓	✓				1	4	
Barnardius zonarius	Western Ringneck	12/07/2011	Bird	N					✓	1	4	
Rhipidura leucophrys)	Willy wagtail	12/07/2011	Bird	N	✓	✓				1	4	
Taeniopygia guttata	Zebra finches	12/07/2011	Bird	N	✓					1	4	

*Legend

Reliability	Method		
0-50 m	1- Pit	6- Heard	11- Tracks
50-100 m	2- Elliot	7- Nest/ eggs	12- Road kill
100-250 m	3- Funnel	8- Skeleton/ feathers	13- Anabat
250-500 m	4- Observed	9- Scats	14- Sub Fossil
500-1000m	5- Captured foraging	10 - Diggings	15- Other

APPENDIX F: RESULTS OF THE BIRD SURVEY

Species	Common Name	Status - State	Status - Federal	Habitat				
				1	2	3	4	Overhead
Phaps chalcoptera	Common Bronzewing Pigeon			✓				
Leichenstomus virescens	Singing Honeyeater			✓	✓			
Certhionyx variegatus	Pied Honeyeater			✓	✓			
Lichenostomus plumulus	Grey-fronted Honeyeater			✓	✓			
Smicrornis brevirostris	Weebill			✓	✓			
Psephotus varius	Mulga Parrot				✓			
Cincloramphus cruralis	Brown Songlark			✓	✓			
Cincloramphus mathewsi	Rufous Songlark			✓	✓			
Falco berigora	Brown Falcon				✓			
Artamus cinereus	Black-faced Woodswallow				✓			
Anthus novaeseelandiae	Australasian Pipit			✓	✓			
Cacatua roseicapilla	Galah							✓
Chrysococcyx basalis	Horsefield's Bronze Cuckoo			✓	✓			
Cacomantis pallidus	Pallid Cuckoo				✓			
Microeca fasciFnans	Jacky-winter				✓			
Acanthiza apicalis	Inland Thornbill			✓	✓			

Species	Common Name	Status - State	Status - Federal	Habitat				
				1	2	3	4	Overhead
Artamus personatus	Masked Woodswallow				✓			✓
Barnardius zonarius	Western Ringneck			✓	✓			✓
Corvus bennetti	Little Crow			✓	✓	✓	✓	✓
Rhipidura leucophrys	Willy wagtail			✓	✓			
Taeniopygia guttata,	Zebra finches			✓				
Strepera versicolor	Grey Currawong				✓	✓	✓	
Pardalotus striatus	Striated Pardalote			✓	✓			
Anthochaera carunculata	Red Wattlebird				✓		✓	✓
Cracticus tibicen	Australian Magpie				✓			
Cracticus nigrogularis	Pied Butcherbird				✓			
Total Number of Species				16	24	2	3	5

APPENDIX G: FAUNA PLATES



Plate 23: Goat Scat



Plate 24: Rabbit Scat



Plate 25: Cow scat

Appendix 7 – Wattlebird Project Malleefowl Survey 2014 (Botanica Consulting, 2014)

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PO Box 2027 Boulder WA 6432
ABN 47141175297

Tari Pawlyk
Environmental Officer
Norton Goldfields Limited
Paddington Operations
PO Box 1653
Kalgoorlie WA 6430

15th August 2014

RE: Wattle Bird Project Malleefowl Survey 2014

Dear Tari,

Botanica Consulting (BC) was commissioned by Norton Goldfields Limited (NGF) to undertake a targeted Malleefowl mound search within the Wattle Bird survey area at the Bullant Mining Facility (Appendix 1).

The Malleefowl survey was undertaken in August 2014 during the 2014/2015 Malleefowl breeding season. This survey was conducted to fulfill the requirements of NGF's Malleefowl Management Plan, which aims to ensure minimum impacts on Malleefowl around the Wattle Bird survey area at the Bullant Mining Facility. Malleefowl are protected under both State and Commonwealth legislation as a threatened fauna species and impacts on this species and its potential habitat must be avoided or minimized during the course of mining and exploration activities to ensure the long term survival of this species within the local area is not compromised.

Scope

The scope of works for the 2014/2015 breeding season reporting was to conduct a baseline survey for any evidence of malleefowl (active and inactive malleefowl mounds, tracks, feathers etc.) within the Wattle Bird survey area at the Bullant mining facility (see Appendix 1).

Methodology

The field survey was conducted by four people including personnel from BC and NGF. The survey was carried out over two days on the 7th and 14th of August 2014. The Wattle Bird survey area was traversed using three quad bikes, an all-terrain vehicle and on foot where required. Survey participants positioned themselves 30 to 50m apart (actual distance depending on anticipated vegetation density) along a line perpendicular to the proposed transect direction. To assist members to follow near parallel transect lines the first member of the chain would

commence their transect while following a set bearing using a handheld GPS. The second person in the line used the first person as a navigation guide and only commenced their transect once the first person has advanced approximately 5m from the starting position, with other team members following the same protocol progressively along the line. Each staff member had a hand-held GPS and camera in order to record and photograph any evidence of Malleefowl (i.e. Malleefowl mounds, suspected Malleefowl mounds, Malleefowl tracks, Malleefowl individuals).

A map of the area traversed during the survey is provided in Appendix 2. As shown in the aerial image, some sections of the survey area could not be traversed due to presence of open pits/abandonment and Waste Rock Landforms.

Survey Limitations

The results and conclusions presented here are based upon field data and monitoring carried out over a limited period of time and must therefore be considered merely indicative of the environmental condition of the site at the time of the field assessment. It should also be noted that while every effort was made to detect potential mounds within the area, due to an extensive history of exploration, prospecting, mining and pastoral disturbance over a period of approximately 100 years within the survey area some small, subdued or highly eroded mounds may have the potential to have been missed in the survey area.

Results

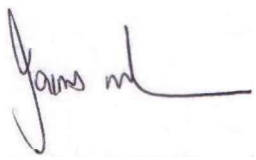
The Malleefowl survey was completed at the Wattle Bird survey area by four individuals over a two day period, no Malleefowl sightings were made, and there was no evidence of Malleefowl recorded including no inactive or active Malleefowl mounds identified.

Conclusion and Recommendations

The Wattle Bird Malleefowl survey has been conducted to satisfy the conditions of the proposed clearing permit associated with the cut back operation of the Wattle bird pit and the continued exploration within the broader Bullant Mining Facility. There were no signs of the presence of Malleefowl within the Wattle Bird survey area and the vegetation structure within the survey area is relatively open and unlikely to support Malleefowl.

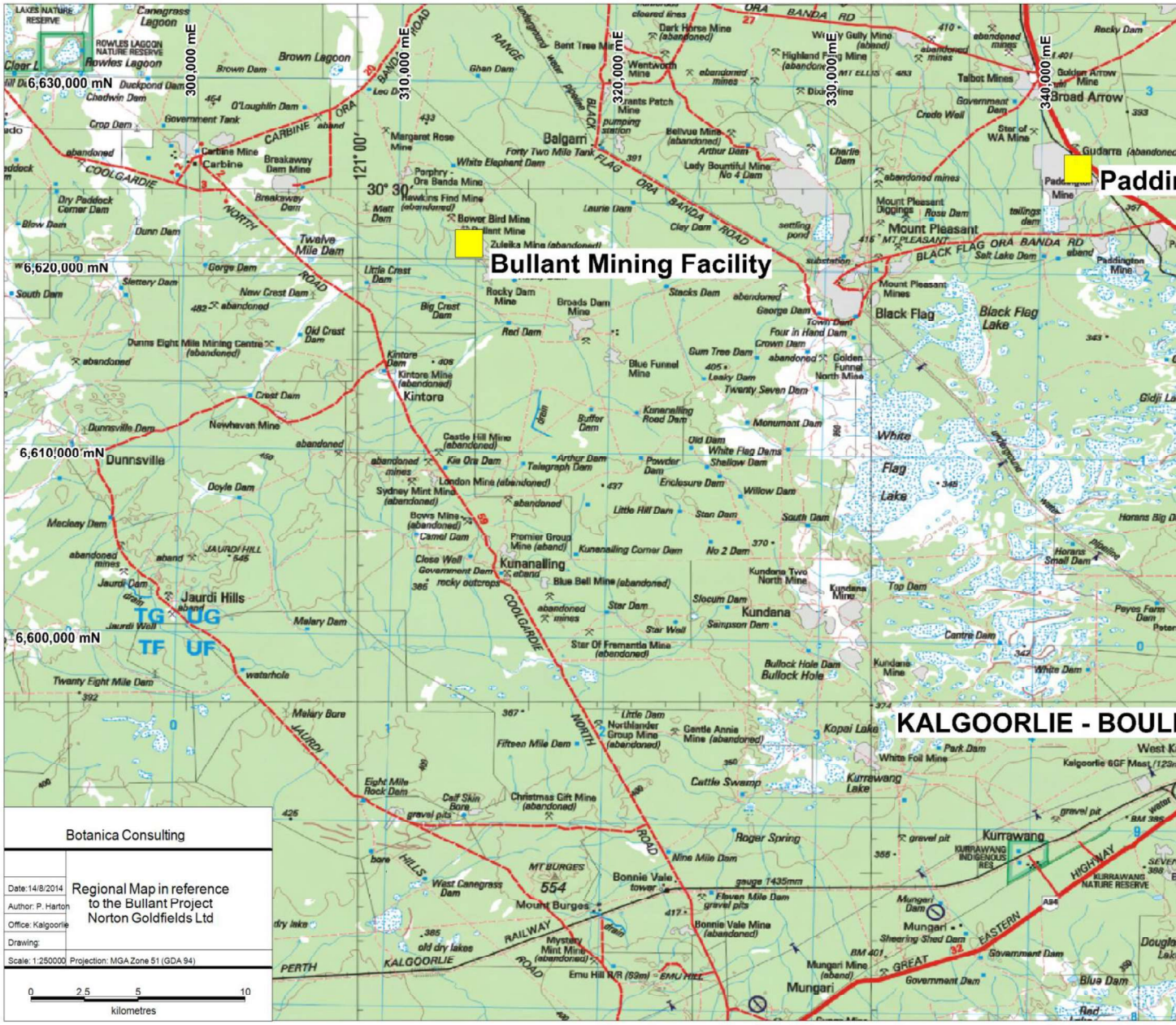
Should you have any questions, please do not hesitate to contact me.

Regards,

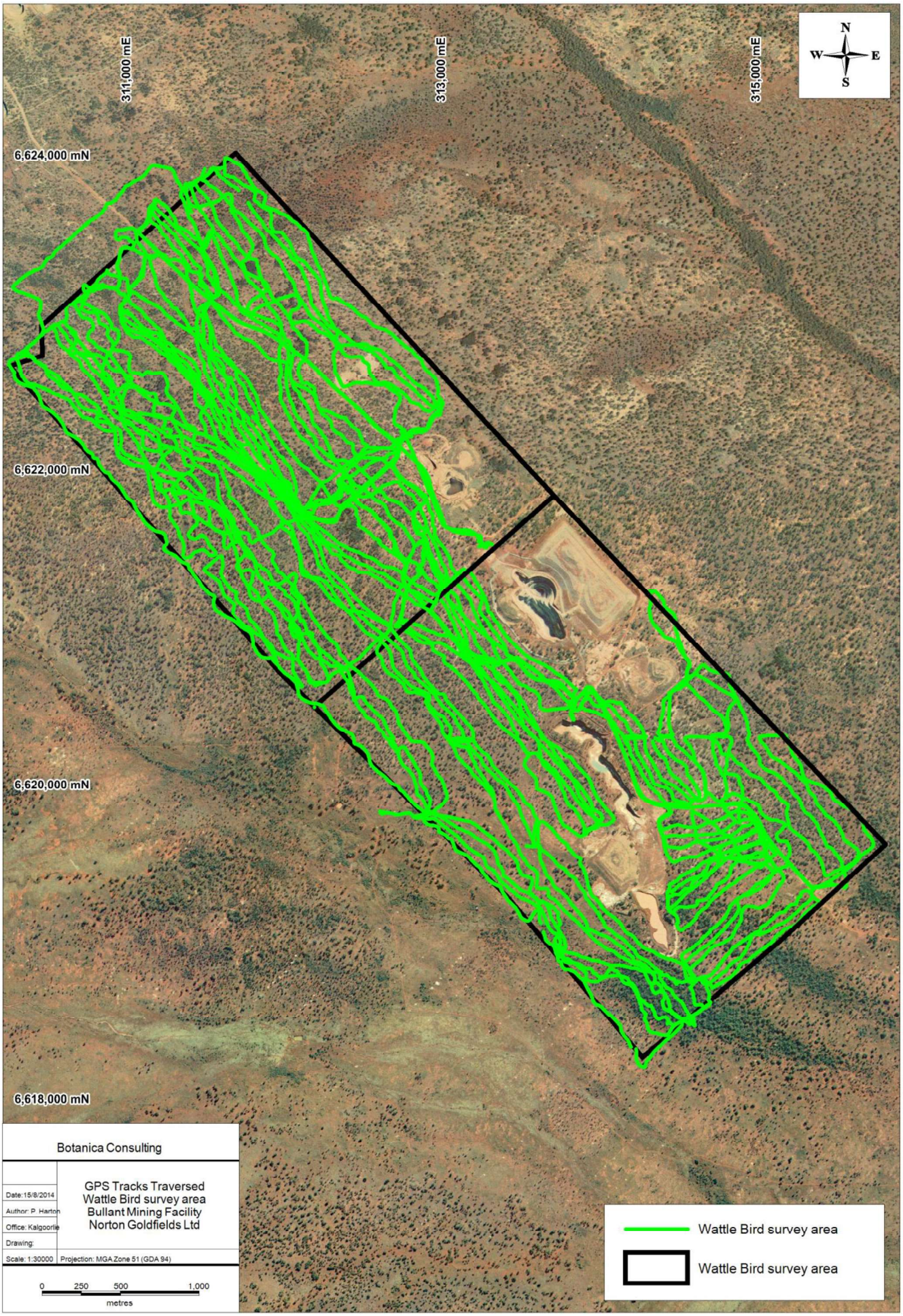


Jim Williams
Director

Appendix 1: Regional Map of the Wattle Bird survey Area August 2014 Malleefowl Survey



Appendix 2: Map of Wattle Bird survey areas including GPS tracks traversed during August 2014



Appendix 8 – Malleefowl survey for the Wattlebird project area (Terrestrial Ecosystems, 2025)

Ref: 2024-0167-003-sp

16 January 2025

Connor Toon
Environmental Advisor
Norton Gold Fields
PO Box 1653,
Kalgoorlie
WA 6430

Re: Malleefowl survey for the Wattlebird project area

Dear Connor

Terrestrial Ecosystems is pleased to provide the outcomes of a targeted Malleefowl survey for the Wattlebird project area (i.e. project area; Figure 1).

Malleefowl

Malleefowl (*Leipoa ocellata*) have been found in mallee regions of southern Australia from approximately the 26th parallel of latitude southwards. Malleefowl are mostly found in semi-arid and arid shrubland, and low woodlands dominated by mallee in the more temperate areas (Frith 1962, Parsons et al. 2008). Malleefowl are now only found throughout these regions in fragmented patches of mostly dense vegetation due to clearing of habitat for agriculture, increased fire frequency, competition with exotic herbivores (sheep, rabbits, cattle, goats) and kangaroos, predation by wild dogs, foxes and cats, inbreeding because of fragmentation, and possibly hunting for food.

Malleefowl is a member of the family of birds (Megapodiidae) that builds a nest mound in which it incubates its eggs. This relatively large, mostly terrestrial bird nests in the same general area year after year and will often use the same nest mound (Frith 1962, Priddel and Wheeler 2003). Outside the breeding period, birds will range over several square kilometres (Booth 1987, Benshemesh 2007). Chicks are independent after hatching and disperse widely, moving up to 2km per day (Benshemesh 2007) and do not appear to respond to habitat boundaries.

Malleefowl build large mounds of sand, gravel, and vegetation that can be 3-5m wide and over 1m high. This is mostly done between autumn and spring as a combined effort of the pair intending to use the mound. Once completed, the male spends most of his time tending the mound, whereas the female spends most time foraging.

The Malleefowl's wariness, cryptic habits, and colouration make it difficult to census their numbers reliably and accurately. Brickhill (1985), Benshemesh and Emison (1996) and Priddel and Wheeler (2003) have all used the number of active mounds as a proxy of Malleefowl numbers. This is a relevant proxy, as it directly relates to the number of reproductively active birds, which is a good indicator of the survival of the local population.

Parsons et al. (2008) reported the loss of Malleefowl was associated with areas that had the greatest loss of vegetation for agriculture, those cleared more than 70 years ago and areas with higher densities of sheep. Benshemesh (2007) and Birdlife International (2016) reported the following threats to Malleefowl:

- Vegetation clearing, loss of habitat from grazing by introduced herbivores, and raised salinity levels leading to habitat loss and fragmentation;
- Predation by foxes and feral cats, as they both predate on chicks, and foxes are known to dig up mounds containing eggs;
- Fires resulting in medium-term loss of foraging and breeding habitat;
- Climate change resulting in reduced rainfall and a loss or reduction in the opportunity to successfully incubate eggs in decomposing vegetation in mounds; and
- Vehicle impact, particularly on roadside verges where birds feed on spilled grain.

Malleefowl and their eggs are vulnerable to predation by foxes, and newly hatched chicks are vulnerable to foxes, cats, and raptors (Priddel and Wheeler 1990, Benshemesh and Burton 1997, Priddel and Wheeler 1997, Benshemesh and Burton 1999, Benshemesh 2007, Lewis and Hines 2014). Foxes and cats in the region likely predate on Malleefowl and their eggs.

Fires kill Malleefowl and removes the vegetation from Malleefowl habitat, displacing birds into other areas that are often unsuitable (Woinarski 1999, Benshemesh 2007). Fires occur predominantly during the breeding season, and even if the birds are not killed by fire, they will generally not return to an active mound in a burnt area that is exposed to predators, and where there is little protection from adjacent vegetation, with the consequence that the eggs are not successfully incubated.

Malleefowl mound profiles

The following six Malleefowl mound profiles are used by the National Malleefowl Monitoring Program (National Malleefowl Recovery Team 2016):

Profile 1 (crater rim apparent) – this is the typical mound shape but is inactive and without any accumulated vegetation in the crater (Plate 1).

Profile 2 (mound dug out) – this is a recently dug-out mound with steep sides to the crater, with the base forming a box-like structure with the sides normally 20-30cm deep. Sometimes litter has been raked into windrows in readiness to be placed in the mound (Plate 2).

Profile 3 (mound filled if litter) – this mound contains litter in the crater and is the next construction stage after profile 2. It should be apparent where litter has been raked into the mound. There may or may not be some sand mixed with the litter at this stage (Plate 3).

Profile 4 (active mound with no crater) – this active mound is closed, and dome-shaped. Note that some mounds have a dome and no crater but are not active (Plate 4).

Profile 5 (mound with crater and often a peak at the centre) – this is an active mound that is being opened or closed (Plate 5).

Profile 6 (disused or extinct mound) – this mound has not been used for some time and weathering and erosion have 'flattened' the original mound (Plate 6).

Profile 7 (extinct or mega mound) – very broad and flat and will generally measure in excess of 10m in diameter. These mounds are thought to have been made by a species of megafauna, a bird like Malleefowl but much larger. The mega mound may have a more recent mound on top of it.



Plate 1. Typical mound with raised rim

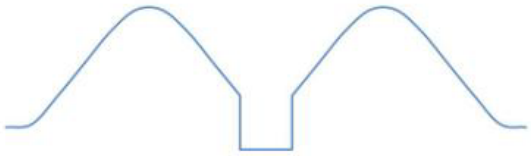


Plate 2. Mound fully dug out



Plate 3. Mound with litter

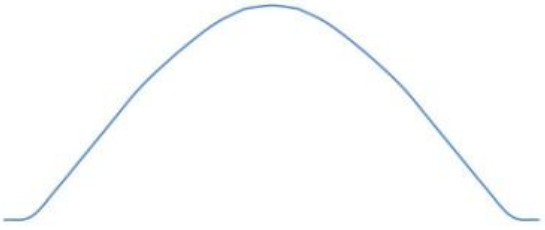


Plate 4. Mound mounded up (no crater)



Plate 5. Mound has a sand crater with peak in centre

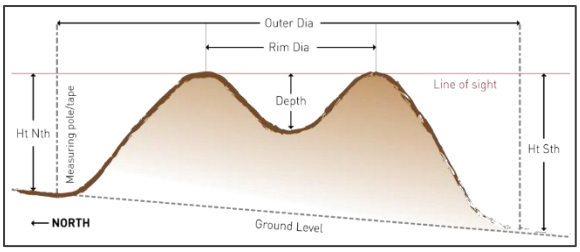


Plate 6. Mound low and flay without peak or crater

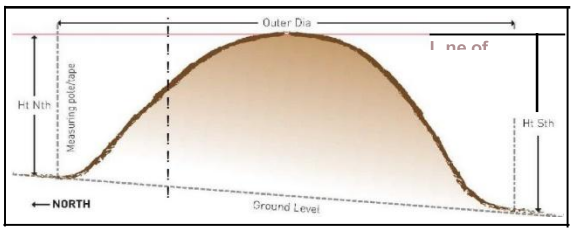
Methods

The field survey was conducted by walking or use of slow-moving all-terrain vehicles (ATVs). The distance between transects depends on the density of vegetation and the zoologists' visibility.

If mounds are located, they are mapped and rated according to the National Malleefowl mound monitoring guidelines (National Malleefowl Recovery Team 2016)The monitoring included measuring the mound's width and height, the depth of the crater, and the rim diameter. Each mound was also photographed to compare with future monitoring programs.



Mound profile 1



Mound profile 4

Height (cm)—The height of the mound above the ground is measured. An average of the high and low sides is provided if the mound is on sloping ground.

Depth (cm) - The depth is the vertical distance from the crater's base to a horizontal line drawn across the top of the rim.

Outer diameter (cm) - The outer diameter is the outermost limit of the mound. Sometimes a mound will have two outer diameters, where a mound is built upon an older and larger mound. In this case, a larger distance has been provided.

Rim diameter (cm)—The rim diameter is the distance across the mound. If the rim is oblique, an average of the distances is provided.

Results

Tom Raymond and Simon Pitt undertook a site survey on 22 November 2024. The zoologists used ATV's and foot transects to survey the site. Eighty-four kilometres of survey transects were traversed (Figure 1).

No Malleefowl mounds were in the Wattlebird project area. Plates 7 to 12 show some of the habitats encountered across the site.



Plate 7. Habitat in the project area



Plate 8. Habitat in the project area



Plate 9. Habitat in the project area



Plate 10. Habitat in the project area



Plate 11. Habitat in the project area



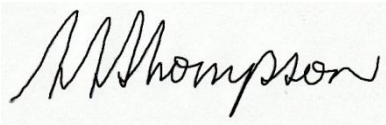
Plate 12. Habitat in the project area

Conclusion

There was no evidence to indicate that Malleefowl are utilising the Wattlebird project area for breeding.

Please do not hesitate to contact the undersigned (0407 385 239), if you require any further information.

Yours sincerely



Dr Scott Thompson
Partner and Principal Zoologist

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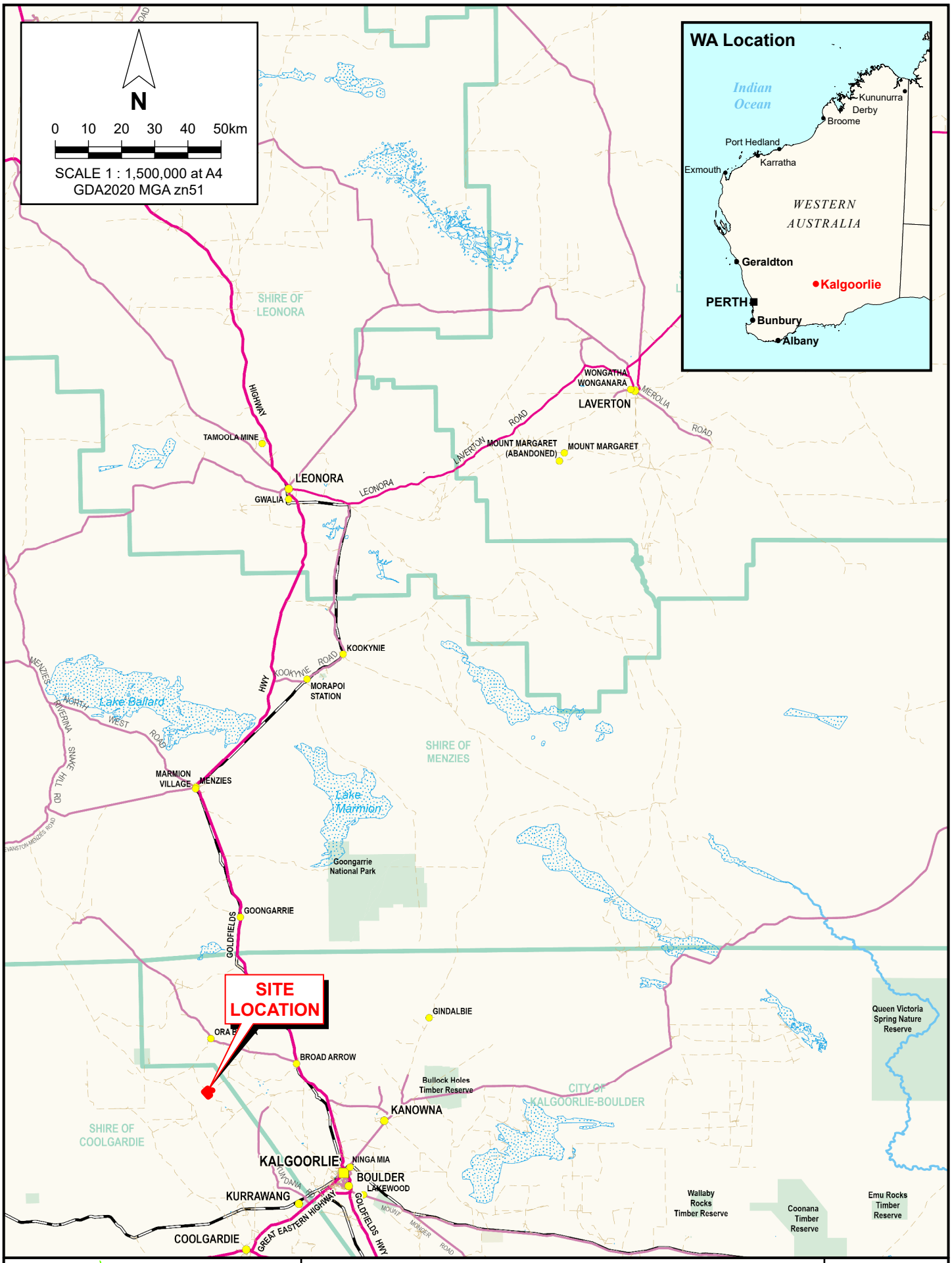
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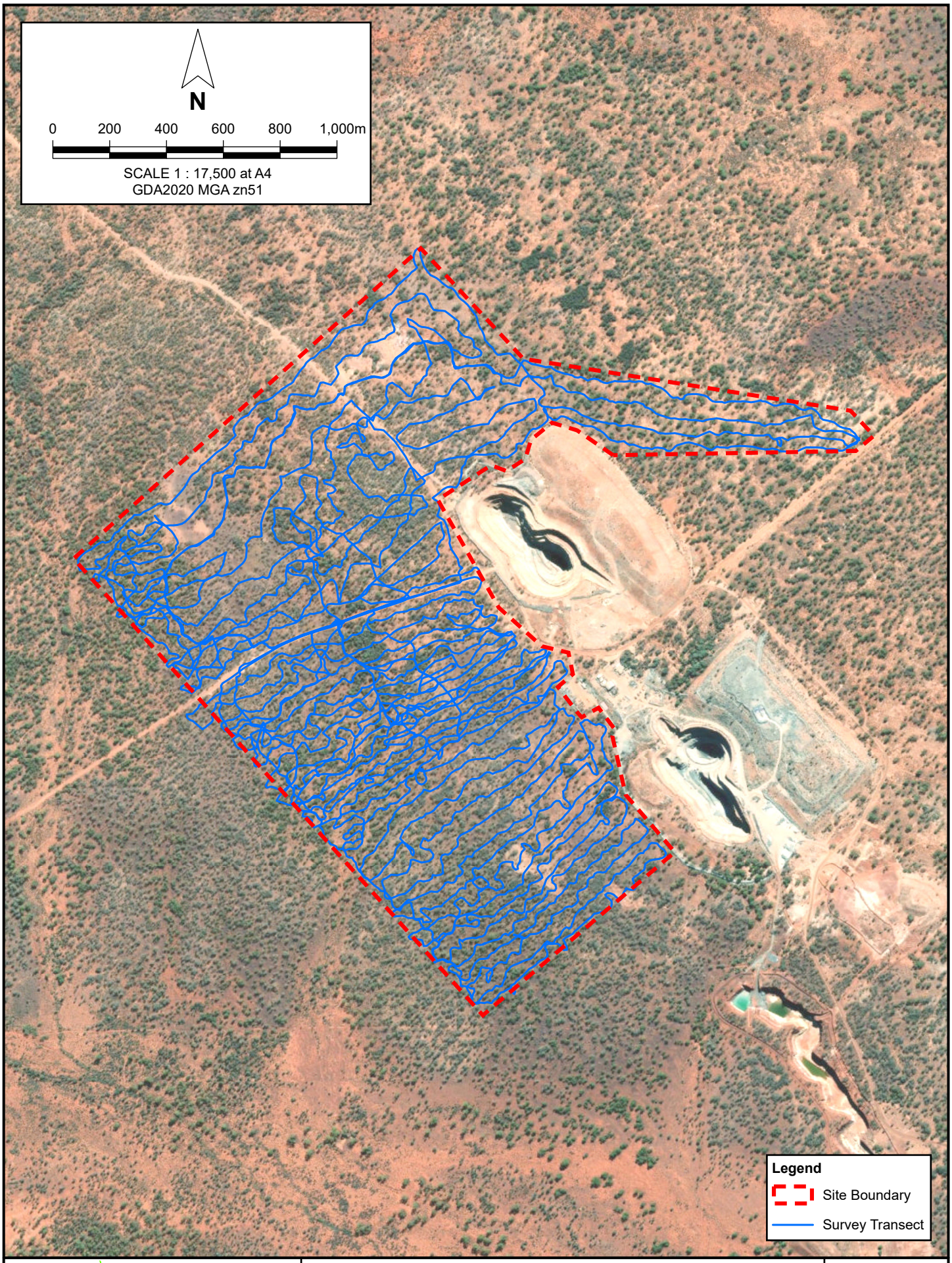
TERRESTRIAL ECOSYSTEMS

Paddington Gold Pty Ltd
MALLEEFOWL SURVEY
WATTLEBIRD PROJECT AREA

REGIONAL LOCATION

Figure 1

Drawn: S. Thompson | Date: 21 Jan 2025 | Job: 2024-0167



TERRESTRIAL ECOSYSTEMS

Paddington Gold Pty Ltd
MALLEEFOWL SURVEY
WATTLEBIRD PROJECT AREA

PROJECT AREA WITH SURVEY TRANSECTS

Figure 2

Drawn: S. Thompson

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