WESTERN AREAS LTD

Forrestania Nickel Operation

CPS 6654/2 AMENDMENT APPLICATION – SUPPORTING DOCUMENT

Version 1
Document Date: 10/11/2021

DOCUMENT DETAILS

Title	CPS 6654/2 Amendment Application – Supporting Document
Status	Final
Version	1
Document Type	Native Vegetation Clearing Permit Amendment Application
Reference Number	CPS 6654/2
Document Date	10 November 2021
Applicable Tenure and Holder(s)	Western Areas Ltd - M77/545
Purpose	The purpose of this document is to support an application to amend CPS 6654/2 to increase the authorised area of clearing from 12 ha to 30.4 ha. Western Areas Ltd (WSA) intend to construct and operate additional borrow pits on M77/545 to support paste fill plant operations for underground stoping (Flying Fox and Spotted Quoll) and other mining infrastructure projects. Therefore, additional clearing of native vegetation is required.
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Approver	Bryan Williams

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1. INTRODUCTION

1.1 Background

Western Areas Ltd (WSA) operates the Forrestania Nickel Operations (FNO), targeting Nickel-Copper deposits located within the Shire of Kondinin, approximately 400 km east of Perth in the Forrestania Greenstone Belt (Figure 1).

WSA previously obtained approval for a native vegetation clearing permit (NVCP) in 2015 for CPS 6654/1 (now superseded) to clear 12 ha of native vegetation within a 120.86 ha permit area (within mining tenement M77/545). The purpose of the NVCP was to allow installation of mining infrastructure including mining of borrow material to supply paste plant operations. Since 2015, WSA have cleared approximately 10.68 ha of native vegetation under the NVCP and have reported annually to the Department of Mines, Industry Regulation and Safety (DMIRS). Between 2016 and 2019 WSA operated the Lounge Lizard West sand pit before rehabilitating the pit in June of 2020. In October 2020 WSA obtained approval to extend the duration of the NVCP for an additional five years to 31 October 2025 (currently CPS 6654/2, Appendix A).

1.2 Proposed amendments

WSA are proposing to increase the allowable clearing area on CPS 6654/2 for the purpose of developing additional borrow pits to supply the paste fill plant. The sand is used to blend with reclaimed tails to maintain paste fill that supports continuing underground mining activities. WSA is seeking an additional clearing allowance of 20 ha which would result in the total allowable clearing under CPS 6654/2 to become 32 ha.

WSA have delineated a "sand resource target area" where additional borrow pits would supply a maximum of 100,000 m^3 of sand (Figure 2). The "sand resource target area" represents an indicative area where future sand pits will be located based on resource definition sampling. As development progresses, spatial and depth variation in the sand resource is likely which will dictate the final disturbance footprint.

WSA will undertake the following management measures both prior to and during ground disturbing activities including:

- Implementation of WSA's Ground Disturbance Procedure;
- Avoidance of all conservation significant flora and fauna species;
- Implementation of WSA's Vehicle Hygiene Management Procedure;
- Clearing areas progressively as needed rather than in one campaign to avoid unnecessary removal of vegetation; and
- As per tenement conditions for M77/545, WSA will progressively rehabilitate borrow pits within a year of sand extraction being completed so that the disturbance area for borrow pits does not exceed 6.5 ha at any point in time.

Given the age of survey information used to inform the decision of CPS 6654/1 (Astron 2014), WSA engaged Botanica (2021) to undertake further survey to inform the assessment of conservation significant flora and fauna species. Survey was conducted over the entire permit area (120.86 ha) however a more targeted effort was undertaken within the "sand resource target area" (20 ha). Reconnaissance flora survey was undertaken as defined in *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016a). Level 1 fauna survey was also undertaken in accordance with the requirements of a reconnaissance terrestrial fauna survey as defined in *Technical Guidance – Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA 2016a). Outcomes from both Astron (2014) and Botanica (2021) are presented within this document and attached in Appendix B and **Error! Reference source not found.** respectively.

1.3 Purpose of this document

The purpose of this document is to support an application to amend CPS 6654/2 to increase the authorised area of clearing from 12 ha to 32 ha. WSA intend to develop additional borrow pits on M77/545 to support paste fill plant operations for underground stoping (Flying Fox and Spotted Quoll) and other mining infrastructure projects. Therefore, additional clearing of native vegetation is required.

Figure 1: FNO location

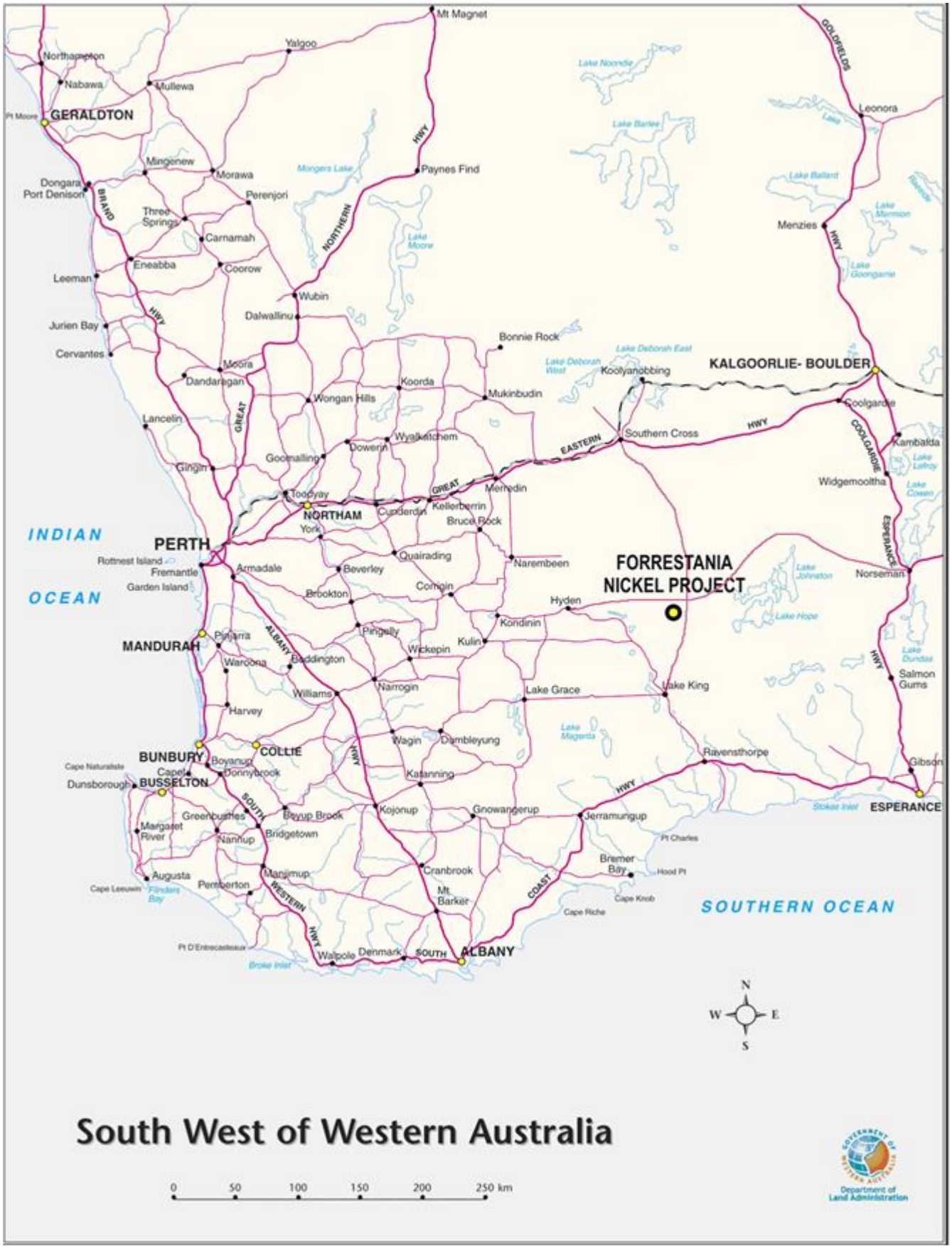
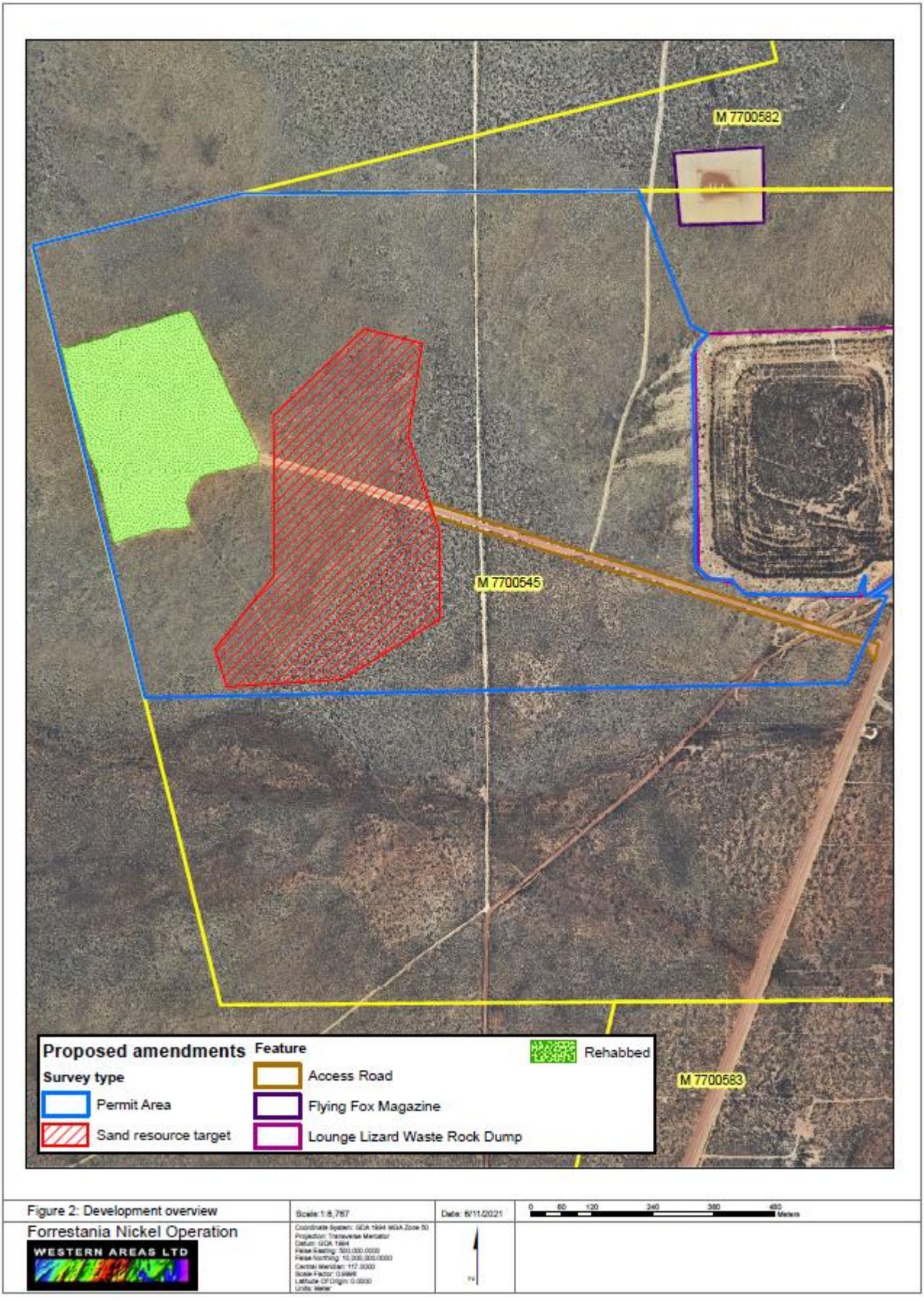


Figure 2: CPS 6654/2 Permit Area and sand resource target area.



2. PHYSICAL ENVIRONMENT

2.1 Biogeographic and regional setting

The permit area lies within the Western Mallee subregion of the Mallee Region, as classified by IBRA (Interim Biogeographic Regionalisation for Australia). This subregion encompasses an area of 3,981,720 ha (DoE 2021).

The Mallee Bioregion also forms part of the South-West and Interzone Province of Western Australia in a region known as the Roe Botanical District. The Mallee Bioregion is located in the south-eastern part of Yilgarn Craton which is gently undulating, with partially occluded drainage. The Western Mallee subregion has more relief than its eastern counterpart. Its main surface-types comprise clays and silts underlain by kankar, exposed granite, sandplains, isolated uplands of laterite pavements and Salt Lake systems on a granite basement (Botanica 2021).

Vegetation within the subregion is comprised of mallee communities that occur on a variety of surfaces, Eucalyptus woodlands that occur mainly on fine-textured soils with scrub-heath on sand and laterite. The subregion is described as having greater relief than its eastern counterpart, with main surface-types comprising of clays and silts underlain by Kankar, exposed granite, sandplains and laterite pavements (Beecham and Danks 2001).

2.2 Geology, landform and soils

The Mallee region is described as Archaean and Proterozoic granites overlain in the east by early Tertiary sediments (Beard 1990).

The permit area is mapped as soil landscape zone 250 – South Eastern Zone of Ancient Drainage of the Avon Province (Tille et al 2004). The geology is described as gently undulating terrain, dominated by salt lake chains and areas of prominent granite outcrops, on deeply weathered mantle and alluvium over granite rocks of the Yilgarn Craton. Soil is comprised of sandy duplexes that are often alkaline with ironstone gravelly soils and loamy earths that are often calcareous and some loamy duplexes, sandy earths, deep sands, and saline wet soils (Tille et al 2004).

2.3 Hydrology

2.3.1 Surface water

The permit area is located within the Swan Avon-Lockhart catchment of the Avon River Basin. The broader natural drainage of the region is characterised by chains of salt lakes coinciding with relics of old river systems (paleodrainages). The salt lakes act as surface water sinks except after heavy rainfall events when floodwaters move along those paleodrainage systems.

According to the Geoscience Australia database (2015), there are no perennial or ephemeral inland waters or drainage lines within the survey area (Botanica 2021). There are no permanent natural surface water features within the permit area or wider FNO although short term flows may occur in association with a high rainfall event. The closest water bodies of significance to the permit area are Lake Cronin (approximately 9.8 km ENE) and Lake Ned (approximately 8.1 km SE).

The Mallee region in which the survey area is found, is described as having a dry warm Mediterranean climate, with winter precipitation and an annual rainfall between 300 to 500 mm (Beard 1990).

2.3.2 Groundwater

Groundwater at the FNO is hypersaline in nature, occurs within weathered and fractured rock bedrock aquifers and generally moves from higher in the landscape from greenstone belts to salt lakes, generally overlying palaeochannel systems. Groundwater levels in the Flying Fox area were originally in the range 345 to 377 m AHD (about 50 to 70 m bgl), and are now in the range 264 to 374 m AHD due to dewatering operations (Rockwater, 2020).

Groundwater Dependent Ecosystems (GDE) include biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. According to the BoM

Atlas of Groundwater Dependent Ecosystems (BoM, 2020) database, there are no known or potential aquatic GDEs located within the survey area (Botanica 2021). Although this database suggests the permit area has a moderate potential to contain a terrestrial GDE, given the proposed development within the permit area relates to sand pit activities and will not impact the groundwater table, impacts to potential GDE vegetation are unlikely to occur. For this reason, GDE communities are not discussed further in this assessment.

3. BIOLOGICAL ENVIRONMENT

3.1 Flora and Vegetation

A flora and vegetation survey was previously undertaken across the permit area by Astron (2014) in order to support the original application for CPS 6654/1. Astron (2014) undertook a Level 2 flora and vegetation survey in accordance with *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia - Guidance Statement No. 51* (EPA 2004a). Guidance statement No. 51 has since been superseded by EPA (2016a).

Given the age of the Astron (2014) survey, WSA engaged Botanica (2021) to undertake further survey in accordance with EPA (2016a) to better inform the assessment on the presence or absence of conservation significant flora and vegetation.

3.1.1 Flora

Astron (2014) identified a total of 128 taxa from 32 families and 72 genera within the permit area. The dominant family was Myrtaceae with 29 taxa recorded and Melaleuca was the most frequently recorded genus. A species list for the survey is presented in Appendix H of Astron (2014) [Appendix B of this supporting document].

Botanica (2021) identified a total of 179 taxa from 30 families and 75 genera within the permit area. Differences between Botanica (2021) and Astron (2014) species lists is attributable to the larger Botanica (2021) survey area compared with Astron (2014). For the purposes of this application the species list has not been sub-categorised for the permit area. A species list for the survey is presented in Appendix 4 of Botanica (2021) [**Error! Reference source not found.** of this supporting document].

3.1.1.1 Threatened and Priority Flora

Neither Astron (2014) nor Botanica (2021) identified any Threatened flora species listed under section 178 of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) or pursuant to Part 2 of the *Biodiversity Conservation Act 2018* (BC Act) and as listed by DBCA.

One Priority flora taxa was recorded by Botanica (2021) in the survey area corresponding to this permit which was previously recorded by Astron (2014), *Eutaxia hirsuta* (P2). Locations of Priority flora recorded within the Permit area are shown in Figure 3. A map showing regional Threatened and Priority Flora records in relation to the permit area is also provided in Botanica (2021); **Error! Reference source not found.**.

3.1.1.2 Introduced Species

No introduced (weed) species were recorded within the permit by either Astron (2014) or Botanica (2021).

3.1.2 Vegetation

3.1.2.1 Vegetation assessment

The Department of Primary Industries and Regional Development (DPIRD) Vegetation Association GIS file (2018) indicates that the permit area is located within the Beard's and Hopkins' Vegetation Association (BHVA), Forrestania 2048 of the Western Mallee subregion. The extent of this BHVA, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019) is provided in Table 1.

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). As per the proposed additional clearing of 20 ha will not significantly reduce the extent of pre-European vegetation.

Table 1: Pre-European Vegetation Association within the permit area

Region	Pre-European extent (ha)	Current pre-European extent (%)	Proposed additional clearing (ha) (% of current extent)
Forrestania 2048: Shrublands; scrub-heath in the Mallee Region			
Western Mallee Subregion	5,735.92	97.56	20 (0.3%)
Western Australian	7,829.67	97.92	20 (0.25%)

Vegetation types were described and mapped for the permit area by Astron (2014) and Botanica (2021). Given slight differences in classification, and for the purposes of considering the most recent information available, the assessment will consider the Botanica (2021) vegetation assessment. Vegetation types recorded, and the extent of each within the permit area are summarised in Table 2 and shown in Figure 3.

Table 2: Vegetation associations within permit area (Botanica 2021)

Major Vegetation Group	Vegetation association code and description	Vegetation code	Approximate extent within permit area – ha (%)
Heathland (MVG 18)	Low heathland of *Banksia sessilis, Hakea platysperma,* and *Verticordia chrysantha*, *Verticordia roei* and *Grevillea incrassata* on sandplain.	SP-H2	69.2 ha (57%)
Mallee Woodland and Shrubland (MVG 14)	Open mallee shrubland of *Eucalyptus tenera/ E. pileata* over low heathland of *Melaleuca adnata, M. calyptroides, M. lateriflora* and low open shrubland of *Acacia deficiens/ A. intricata* on sand-loam plain.	SLP-MWS1	37.61 ha (31%)
	Cleared	NA	14.05 (12%)
		Total	**120.86 (100%)**

3.1.2.2 Vegetation condition

Vegetation within the permit area was predominantly classed as being in 'Very Good' condition throughout based on the vegetation condition rating scale adapted from Keighery, 1994 and Trudgen, 1988 (Botanica 2021; Appendix 4). 'Very Good' condition depicts vegetation structure altered by obvious signs of disturbance, for example by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing. Disturbance within the survey area was a result of existing mining infrastructure and exploration gridlines.

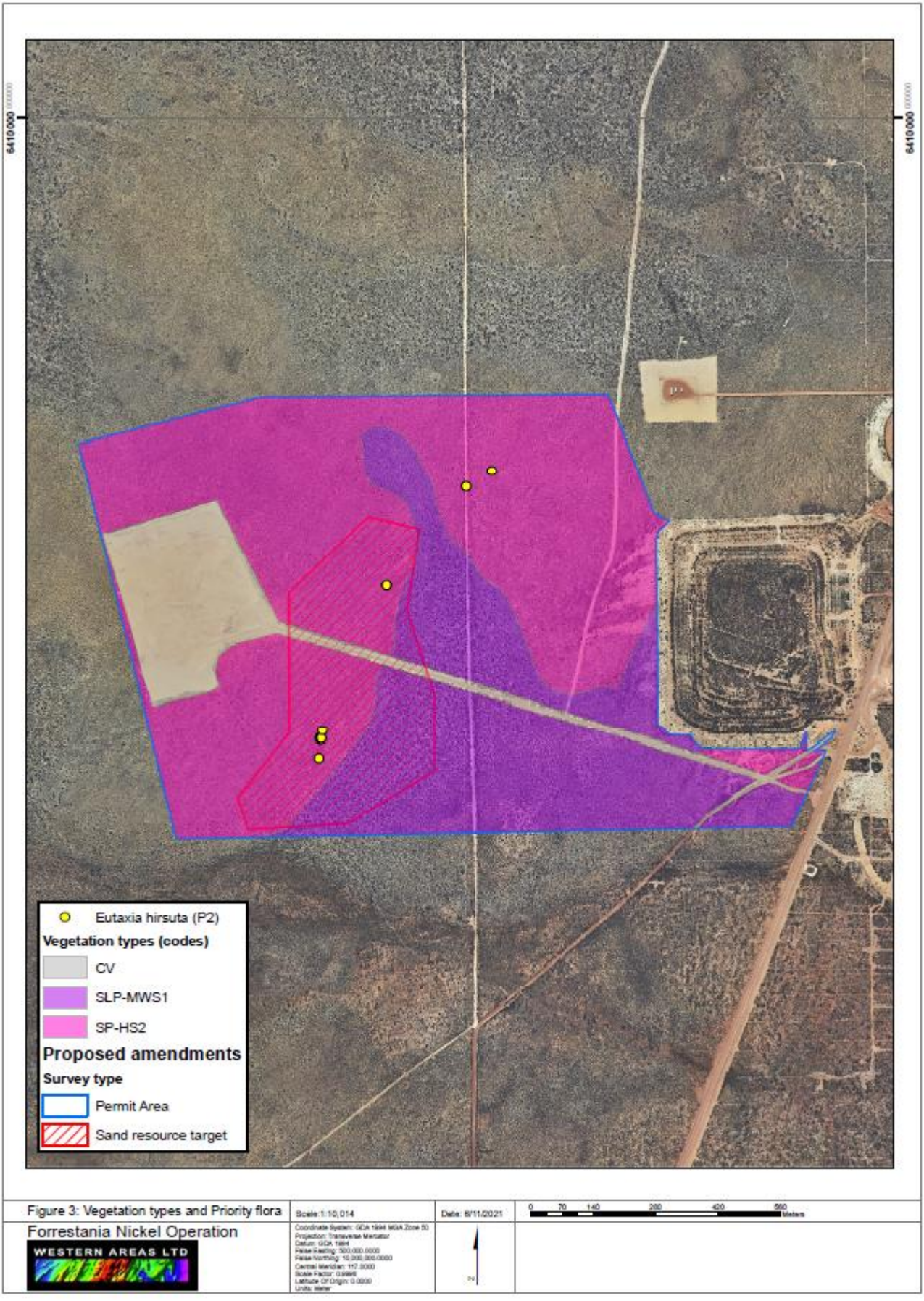
3.1.2.3 Threatened and Priority Ecological Community

None of the vegetation associations were considered analogous with any Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) listed under the EPBC Act or BC Act (Botanica 2021). Approximately 86.37 ha (71%) of the permit area lies within the buffer of the Lake Cronin Environmentally Sensitive Area (ESA).

The permit area is located adjacent to the spatially mapped 500 m buffer of the Ironcap Hills Vegetation Complexes (North Ironcap) obtained from the DBCA communities database. This Priority Ecological Community is managed by the DBCA as a Priority 3 Ecological Community. No banded ironstone was identified within the permit area and the vegetation complex described above was not represented within the permit area (Botanica 2021).

According to the DPIRD (2018) Vegetation Association GIS file, the BIF complex within the Greater North Ironcap area is classified by pre-European vegetation association Forrestania 1413; Shrublands; Acacia, Casuarina & Melaleuca thicket which is represented in both the Southern Cross and Western Mallee subregion. This vegetation association does not occur within the permit area (Botanica 2021).

Figure 3: Vegetation types and Priority flora



3.2 Terrestrial Fauna

A fauna survey was previously undertaken across the permit area by Astron (2014) in order to support the original permit for CPS 6654/1. Astron (2014) undertook a reconnaissance fauna survey in accordance with *Guidance Statement 56 -Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2014b). Guidance Statement No. 56 has since been superseded by EPA (2016b).

Given the age of the Astron (2014) survey, WSA engaged Botanica (2021) to undertake further fauna survey across the permit area including a targeted survey across the "sand resource target area" to better inform the assessment on the presence or absence of conservation significant fauna.

3.2.1 Terrestrial fauna species

Astron (2014) recorded 27 fauna species through either direct observation or indirect evidence, comprising of 26 bird species and 1 mammal species (See Table 10 of Appendix B). Astron (2014) concluded that all the vertebrate fauna species recorded in the survey were known and typical for the Mallee bioregion. No species were outside their expected distribution and all were common for the local vicinity.

Botanica (2021) undertook a likelihood assessment of fauna species present based on habitat assessment and database searches and determined that a total of 230 fauna species were likely to be present across the survey area (Table 4-6 of **Error! Reference source not found.**). This survey area also included an area to the east referred to as Lounge Lizard East which is subject to a separate application. For the purposes of this application the number of species has not been sub-categorised for the permit area.

3.2.1.1 Threatened and priority fauna

No conservation significant fauna or evidence of their presence was recorded within the permit area by either Astron (2014) or Botanica (2021).

Based on likelihood assessments conducted by both Astron (2014) and Botanica (2021), the following species of conservation significance were regarded as possibly utilising the permit area for some purposes at times. These include:

- Lake Cronin Snake - *Paroplocephalus atriceps* (DBCA – Priority 3);
- Carnaby's Black Cockatoo - *Calyptorhynchus latirostris* (BC Act and EPBC Act – Endangered);
- Western Rosella (inland ssp) - *Platycercus icterotis xanthogenys* (DBCA - Priority 4);
- Malleefowl – *Leipoa ocellata* (BC Act and EPBC Act Vulnerable);
- Peregrine Falcon – *Falco peregrinus* (BC Act – Other Specially Protected);
- Western Brush Wallaby – *Notamacropus Irma* (DBCA – Priority 4);
- Chuditch - *Dasyurus geoffroii* (BC Act and EPBC Act - Vulnerable);
- Central Long-eared Bat - *Nyctophilus major tor* (DBCA - Priority 4); and
- Rainbow bee-eater, Merops ornatus (EPBC Act - Marine)

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.

3.2.2 Terrestrial fauna habitat

Habitat types were described and mapped for the permit area by Astron (2014) and Botanica (2021). Given slight differences in classification, and for the purposes of considering the most recent information available, the assessment will consider the Botanica (2021) habitat assessment.

Botanica (2021) recorded one habitat type referred to as 'Sand-Loam Plain – Heathland/Mallee Shrubland'. This habitat type comprises of dense Acacia/ Allocasuarina/ Banksia/ Melaleuca heathland and mallee shrubland over mixed low shrubs and is considered very well suited to a variety of burrowing small mammals and reptiles. The habitat was also described by Botanica (2021) as having a less diverse vegetation strata supporting a less diverse avifauna assemblage. This habitat type is considered well represented across the Mallee region and not unique to the permit area.

4. ASSESSMENT AGAINST THE TEN CLEARING PRINCIPALS

An assessment of the proposed vegetation clearing against the ten native vegetation Clearing Principles contained in Schedule 5 of the Environmental Protection Act 1976 (EP Act) is provided in Sections 4.1 to 4.10. Table 2 contains a summary of the assessment.

The proposed clearing is not considered to be at variance with any of the Principles.

Table 3: Summary of assessment against ten clearing principals

Clearing Principal	Is not at variance	May be at variance
a) Native vegetation should not be cleared if it comprises a high level of biological 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 Western Australia	☒	☐
c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of Rare flora	☒	☐
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 (TEC)	☒	☐
e) Native vegetation should not be cleared if it is significant as remnant vegetation in an area that has been extensively cleared	☒	☐
f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	☒	☐
g) Native vegetation should not be cleared if the clearing of vegetation is likely to cause appreciable land degradation	☒	☐
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	☒	☐
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	☒	☐
j) Native vegetation should not be cleared if the clearing of vegetation is likely to cause, or exacerbate, the incidence of flooding	☒	☐

4.1 Comprises high level of biological diversity

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

With the exception of granite outcrops, vegetation of the Western Mallee subregion is not considered to comprise of a high level of biodiversity, however, it does contain a high number of endemic species (Beecham & Danks, 2001). Vegetation identified within the permit area is not considered to be of high biological diversity, and is well represented outside of the permit area (Botanica 2021).

The permit area has been well surveyed by both Astron (2014) and Botanica (2021) with total flora species identified in both Appendix B and **Error! Reference source not found.**. No state or federally listed TECs or PECs have been recorded within the application area.

As the proposed clearing does not comprise a high level of biological diversity, the proposed clearing is not considered to be at variance with this Principle.

4.2 Potential impact to any significant habitat for fauna indigenous to Western Australia

Principle (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 Western Australia.

No conservation significant fauna or evidence of their presence was recorded within the permit area by either Astron (2014) or Botanica (2021). In addition, the survey area comprises of broad fauna habitats that are typical of those in the wider region. Given the small size of the survey area and the presence of large expanses of similar habitat in surrounding areas, potential impacts anticipated to be non-existent/negligible. No unique fauna habitats (hollow bearing trees, malleefowl mounds, caves, rocky outcrops/ pools etc.) occur within the permit area. No water bodies (perennial or intermittent) occur within the permit area.

Specifically, to Carnaby's Black-Cockatoo *Calyptorhynchus latirostris,* it is listed as a potential species as it has infrequently been recorded in the general area. They are expected to only occur very occasionally in small transient groups. The survey area contains no potential breeding habitat for this species. No impact on this species conservation status is anticipated.

As the native vegetation in the application area is not considered significant habitat for fauna indigenous to Western Australia, the proposed clearing is not considered to be at variance with this Principle.

4.3 Potential impact to any rare flora

Principle (c): Native vegetation should not be cleared if it 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 (Astron 2014, Botanica 2021).

One Priority flora taxa was recorded by Botanica (2021) which was previously recorded by Astron (2014), *Eutaxia hirsuta* (P2). Locations of Priority flora recorded within the Permit area are shown in Figure 3. A map showing regional Threatened and Priority Flora records in relation to the permit area is also provided in Botanica (2021); **Error! Reference source not found.**. In line with the Botanica (2021) recommendation, WSA will avoid impacts to all priority flora, including maintaining at least a 10 m exclusion zone.

The proposed clearing is not considered to be at variance with this Principle.

4.4 Potential of any threatened ecological communities

Principle (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 (TEC).

No state or federally listed TECs or PEC's have been recorded within the permit area from either Astron (2014) or Botanica (2021). A map showing the total extent of PEC's in relation to the survey area is provided within the Botanica (2021) assessment.

The proposed clearing is not considered to be at variance with this Principle.

4.5 Significance as a remnant of native vegetation in the area that has been extensively cleared

Principle (e): Native vegetation should not be cleared if it is significant as remnant vegetation in an area that has been extensively cleared.

The permit area is located within BHVA Forrestania 2048 of the Western Mallee subregion. The current extent of this vegetation association, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019) is 97.56% of the pre-European extent of 5,735.92 ha. As such, a significant representation of this vegetation association remains. The proposed clearing in the permit area is 20 ha, therefore, the clearing is only 0.3% of the current extent of this vegetation association. This is still well above the target of 30% or more pre-clearing extent, outlined in national objectives.

Additionally, the vegetation types in the permit area were described by Botanica (2021). The majority of the vegetation occurring in the proposed clearing area is vegetation type SP-H2 (low heathland of *Bansia sessilis*/ *Hakea platysperma* and *Verticordia chrysantha*, *Verticordia roei* and *Grevillea incrassata* on sandplain). While there are 69 ha of this vegetation type in the permit area only 13 ha are in theproposed clearing area. The remaining vegetation consists of vegetation type SLP-MWS1 (open mallee shrubland or *Eucalyptus tenera*/*E. pileata* over low heathland of *Melaleuca adnata*, *M. calyptroides*, *M. lateriflora* and low open shrubland of *Acacia deficiens*/*A. intricata* on sand-loam plain). There are 37.6 ha of this vegetation type in the permit area, yet only 6.3 ha are part of the proposed clearing area. These vegetation types have not been extensively cleared; they aren't fragmented and they form large intact areas contiguous with other vegetation types. The small amount of clearing proposed will have limited impact on any ecosystem services provided by these vegetation types.

Furthermore, vegetation condition is considered "Very Good" due to the obvious signs of disturbance from mining infrastructure and exploration gridlines, however, would likely regenerate naturally.

The proposed clearing is considered unlikely to be at variance with this Principle.

4.6 Impact on any watercourses and/or wetlands

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

There have been no perennial or ephemeral watercourses or wetlands mapped by Geoscience Australia (2015) in the permit area. A drainage line has been identified, however, is over 50 m to the south of the proposed clearing area. The vegetation surveyed within the permit area is not consistent with the typical plant assemblages that occur near watercourses or wetlands.

The proposed clearing is considered unlikely to be at variance with this Principle.

4.7 Potential to cause appreciable land degradation

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

The permit area occurs within Soil Landscape System Ms8 (gently undulating plains with broad shallow drainage depressions) and the climate is characterised as arid to semi-arid Mediterranean with an annual rainfall of 200 – 300 mm (Botanica 2021). Based on the landscape type and climate, erosion is unlikely. During sand extraction from previous borrow pits, erosion (water or wind) has not been evident (neither has salinity or acidification) and this is likely due to the gently sloping nature of this landscape, the improbability of high intensity rainfall events and the careful planning and construction of the borrow pits. Furthermore, within the proposed clearing area only small areas are excavated at a time and these are subsequently rehabilitated (topsoil and vegetation replaced) as excavations progress.

The proposed clearing is considered unlikely to be at variance with this Principle.

4.8 Potential to impact on the environmental values of adjacent or nearby conservation areas

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.

According to Botanica's 2021 survey, the permit area is not located within a gazetted conservation area. Furthermore, according to the EPA (2009) Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region, the permit area occurs within a 56,750 ha area within the mineralised greenstone belt in the Lake Cronin Region which is proposed to be managed under Section 33(2) of the *Conservation and Land Management Act 1984* (CALM Act) but not formally reserved. Given the small size of the proposed clearing area (19 ha) in relation to this proposed management area, significant impact to this land is unlikely.

The proposed clearing is considered unlikely to be at variance with this Principle.

4.9 Potential deterioration in the quality of surface or underground water

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

There are no inland waters (lakes/playas) or any perennial/ephemeral drainage lines within the permit area. Most rainfall is lost to evaporation. Only a small portion infiltrates the soil and recharges the groundwater.

The proposed clearing is considered unlikely to be at variance with this Principle.

4.10 Potential of clearing to cause, or exacerbate, the incidence of flooding

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

Rainfall is highly variable with an average annual rainfall between 200 – 300 mm and an evaporation rate of 2000 mm (Botanica 2021). The region is not prone to flooding and according to Botanica (2021) the permit area does not contain riparian vegetation.

The proposed clearing is considered unlikely to be at variance with this Principle.

5. REPORTING AND AUDITING

Disturbance as a result of the proposed vegetation clearing will be reported yearly under the FNO Annual Environmental Report (AER), Clearing Permit Report and Mine Rehabilitation Fund (MRF) reporting.

Upon approval of this Clearing Permit, subsequent environmental approvals will be sought to excavate and utilise the sand borrow pit. These approvals will include additional conditions and commitments relating to progressive clearing dependant on demand and depth of sand resource, rehabilitation design specifications and reporting.

6. CONCLUSION

The vegetation and habitats present within the proposed Clearing Permit Area are well represented on a regional scale. It is considered unlikely that there will be any impact on the conservation status of relevant flora and fauna species and there are likely to be only minor local impacts from loss and fragmentation of vegetation.

The proposed clearing will not impact significantly upon the ten clearing principles and a range of environmental management procedures are in place to ensure that clearing will be managed to minimise any potential adverse impacts. Rehabilitation will minimise exposed areas and the long-term loss of vegetation cover.

7. REFERENCES

Astron Environmental Services (Astron), 2014. *Forrestania Nickel Operation - Lounge Lizard Vegetation, Flora and Fauna Biological Assessment*. Prepared for Western Areas Limited. October 2014. Report Reference 17603-14-BISR-1Rev0_141203.

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APPENDIX A - CPS 6654/2

GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	6654/2
Duration of Permit:	From 12 September 2015 to 31 October 2025
Permit Holder:	Western Areas Limited

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I - CLEARING AUTHORISED

1. **Land on which clearing is to be done**
   Mining Lease 77/545

2. **Purpose for which clearing may be done**
   Clearing for the purposes of mineral production and associated activities.

3. **Area of Clearing**
   The Permit Holder must not clear more than 12 hectares of native vegetation. All clearing must be within the area cross-hatched yellow on attached Plan 6654/2.

4. **Type of Clearing Authorised – staged clearing**
   The Permit Holder shall not clear native vegetation unless the purpose for which the clearing is authorised is enacted within six months of the authorised clearing being undertaken.

5. **Application**
   This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

PART II - MANAGEMENT CONDITIONS

6. **Avoid, minimise and reduce the impacts and extent of clearing**
   In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

   (a) avoid the clearing of native vegetation;
   (b) minimise the amount of native vegetation to be cleared; and
   (c) reduce the impact of clearing on any environmental value.

7. Dieback and Weed control

When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:

(i) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
(ii) ensure that no *dieback* or *weed*-affected soil, *mulch, fill* or other material is brought into the area to be cleared;
(iii) restrict the movement of machines and other vehicles to the limits of the areas to be cleared; and
(iv) only move soils in *dry conditions*.

8. Flora management

(a) Prior to undertaking any clearing authorised under this Permit, the Permit Holder shall engage a *botanist*, to inspect the Permit Area for the presence of *priority flora*;

(b) Where *priority flora* are identified under Condition 8(a) of this Permit, the Permit Holder shall engage a *botanist* to map the *critical habitat* of the identified *priority flora* within the Permit Area; and

(c) The Permit Holder shall ensure that no clearing occurs within 10 metres of identified *priority flora*, unless first approved by the *CEO*.

PART III - RECORD KEEPING AND REPORTING

9. Records to be kept

The Permit Holder must maintain the following records for activities done pursuant to this Permit:

(a) In relation to the clearing of native vegetation authorised under this Permit:

(i) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
(ii) the date that the area was cleared;
(iii) the size of the area cleared (in hectares); and
(iv) purpose for which clearing was undertaken.

(b) actions taken to avoid, minimise and reduce the impacts and the extent of clearing in accordance with Condition 6 of this Permit; and

(c) actions taken to minimise the introduction and spread of *weeds* and *dieback* in accordance with Condition 7 of this Permit.

(d) flora management actions taken in accordance with Condition 8 of this Permit.

10. Reporting

(a) The Permit Holder shall provide a report to the *CEO* by 31 July each year for the life of this Permit, demonstrating adherence to all conditions of this Permit, and setting out the records required under Condition 9 of this Permit in relation to clearing carried out between 1 July and 30 June of the previous financial year.

(b) If no clearing authorised under this Permit was undertaken between 1 July and 30 June of the previous financial year, a written report confirming that no clearing under this permit has been carried out, must be provided to the *CEO* by 31 July of each year.

(c) Prior to 31 October 2025, the Permit Holder must provide to the *CEO* a written report of records required under Condition 9 of this Permit where these records have not already been provided under Condition 10(a) of this Permit.

DEFINITIONS
The following meanings are given to terms used in this Permit:

botanist means a person who holds a tertiary qualification in environmental science or equivalent, and has a minimum of 2 years work experience in identification and surveys of flora native to the bioregion being inspected or surveyed, or who is approved by the *CEO* as a suitable *botanist* for the bioregion;

CEO means the Chief Executive Officer of the Department responsible for administering the clearing provisions contained within the *Environmental Protection Act 1986* or an Officer with delegated authority under Section 20 of the *Environmental Protection Act 1986;*

critical habitat means any part of the Permit Area comprising of the habitat of flora or fauna species and its population, that is critical for the health and long term survival of the flora or fauna species and its population;

dieback means the effect of *Phytophthora* species on native vegetation;

dry conditions means when soils (not dust) do not freely adhere to rubber tyres, tracks, vehicle chassis or wheel arches;

fill means material used to increase the ground level, or fill a hollow;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

priority flora means those plant taxa described as priority flora classes 1, 2, 3, or 4 in the Department of Biodiversity, Conservation and Attractions' *Threatened and Priority Flora List for Western Australia* (as amended);

weed/s means any plant -
(a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
(b) published in a Department of Biodiversity, Conservation and Attractions Regional Weed Rankings Summary, regardless of ranking; or
(c) not indigenous to the area concerned.

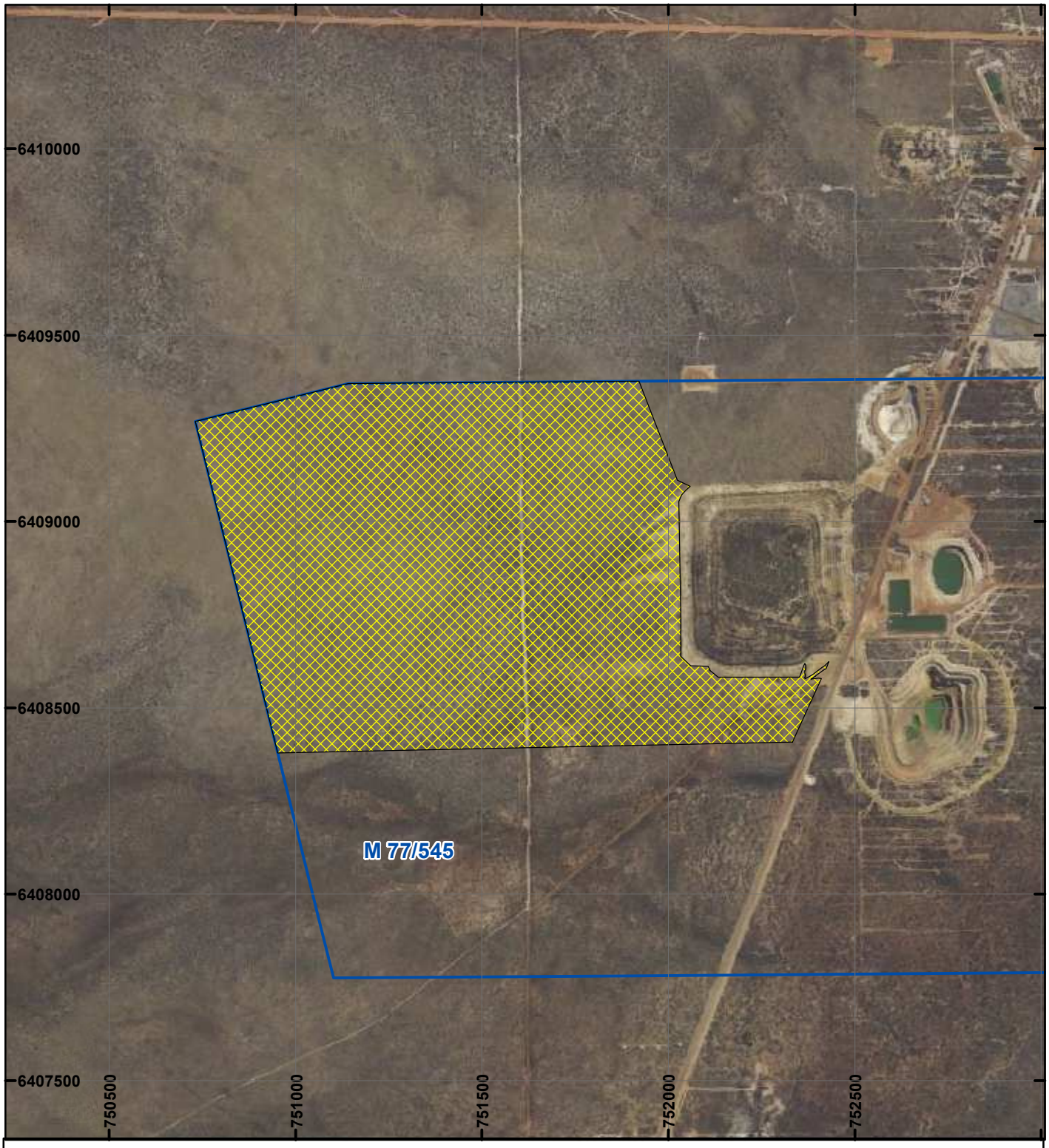
Danielle Risbey

_____

Danielle Risbey
Acting General Manager Environmental Compliance
Resource and Environmental Compliance Division
29 October 2020

Officer with delegated authority under Section 20
of the *Environmental Protection Act 1986*

PLAN 6654/2



LEGEND

- Mining Tenements

Clearing Instruments

- Areas Approved to Clear

Orthophotography sourced from Landgate

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Scale 1:15,000

(Appoximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.

DANIELLE RISBEY Date 29/10/2020

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Information derived from this map should be confirmed with the data custodian acknowleged by the agency acronym in the legend.

APPENDIX B – VEGETATION, FLORA AND FAUNA ASSESSMENT (ASTRON 2014)

Forrestania Nickel Operations
Lounge Lizard
Vegetation, Flora and Fauna Biological Assessment

October 2014

Prepared for
Western Areas Limited

Astron Environmental Services
129 Royal Street
East Perth WA 6004
Phone: (08) 9421 9600
Fax: (08) 9421 9699
Email: perth@astron.com.au

Report Reference: 17603-14-BISR-1Rev0_141203

Forrestania Nickel Operations
Lounge Lizard – Vegetation, Flora and Fauna Biological Assessment

Prepared for
Western Areas Limited

Job Number: 17603-14

Reference: 17603-14-BISR-1Rev0_141203

Revision Status

Rev	Date	Description	Author(s)	Reviewer
A	13/11/2014	Draft Issued for Client Review	N. Cadd S. Stapleton	V. Clarke
B	25/11/2014	Revised Draft Issued for Client Review	N. Cadd S. Stapleton	V. Clarke
0	3/12/2014	Issued for Information	N. Cadd S. Stapleton	V. Clarke

Approval

Rev	Date	Issued to	Authorised by	
			Name	**Signature**
A	13/11/2014	Phillip Knapton	S. Pearse	
B	25/11/2014	Phillip Knapton	S. Pearse	
0	3/12/2014	Phillip Knapton	S. Pearse	

astron environmental services

Abbreviations and Definitions

Abbreviation	Definition
Astron	Astron Environmental Services
Biota	Biota Environmental Sciences
BOM	Bureau of Meteorology
Botanica	Botanica Consulting
CALM	Conservation and Land Management
DAFWA	Department of Agriculture and Food
DEC	Department of Environment and Conservation
DoE	Department of the Environment
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Areas
GIS	Geographical Information System
Ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
Km	Kilometres
m	Metres
mm	Millimetres
NVCP	Native Vegetation Clearing Permit
P	Priority
Parks and Wildlife	Department of Parks and Wildlife
PEC	Priority Ecological Community
RNE	Register of National Estate
'Survey area'	The proposed Lounge Lizard sand pit, which is 145 hectares and lies immediately west of the existing Flying Fox operations.
T	Threatened
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora Database
TP list	Threatened and Priority Flora Species List
WAHerb	Western Australian Herbarium
WAM	Western Australian Museum
WC Act	*Wildlife Conservation Act 1950*
WSA	Western Areas Limited

Executive Summary

Western Areas Limited commissioned Astron Environmental Services to conduct a Level 2 flora and vegetation survey and Level 1 fauna assessment within the Lounge Lizard mining area. The survey area comprises approximately 145 hectares.

Three vegetation associations were defined within the survey area: sandplain heath, and two mallee woodlands; none of which represent a threatened or priority ecological community. Remnant vegetation was rated as 'excellent' condition, with very little disturbance noted.

One hundred and twenty-eight taxa from 32 families and 72 genera were recorded within the survey area. The most represented families were Myrtaceae, Proteaceae and Fabaceae. No threatened flora was recorded during the survey. One priority flora species was recorded; *Eutaxia hirsuta* P2.

No introduced flora species were recorded within the survey area.

Two broad fauna habitats based on landform and vegetation type, namely a *Banksia* low heath and *Eucalyptus* mallee woodland with *Melaleuca* low scrub were recorded in the survey area. Both of these fauna habitat types have been previously recorded within the local vicinity and can be broadly found within the Western Mallee subregion. The Banksia low heath is 87.8 ha of the survey area and is considered foraging habitat for the State and Federally-listed Carnaby's cockatoo (*Calyptorhynchus latirostris*).

Twenty-seven fauna species, comprised of 26 bird species and one mammal species, were recorded during the field survey. This included one fauna species of conservation significance; the crested bellbird (southern subspecies) (*Oreoica gutturalis gutturalis*). This species was recorded within the *Eucalyptus* mallee woodland with *Melaleuca* low scrub fauna habitat type.

Nine fauna species identified by desktop review were considered to have a high likelihood of occurring in the survey area. The majority of these species are birds and therefore highly mobile and can move to similar habitats within the local vicinity and therefore not solely reliant upon fauna habitats of the survey area. However, the clearing of more than 1 ha of quality foraging habitat (*Banksia* dominated heath) is considered under Federal guidelines to comprise a significant impact to the Carnaby's cockatoo and therefore requires referral under guidelines stipulated by the Federal Department of Environment.

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1 Introduction

1.1 Project Background

Astron Environmental Services (Astron) was engaged by Western Areas Limited (WSA) to complete a vegetation, flora and fauna assessment to support a Native Vegetation Clearing Permit (NVCP) application, for the proposed Lounge Lizard sand pit (herein referred to as the 'survey area'). The survey area is approximately 145 hectares (ha) and lies immediately west of the existing Flying Fox operations, approximately 75 kilometres (km) east of Hyden, Western Australia (Figure 1).

1.2 Scope and Objectives

The objective of the survey was to provide a Level 2 flora and vegetation survey and Level 1 fauna assessment through a desktop assessment and field survey, to contribute data to a report of sufficient standard to support an NVCP application.

Astron conducted the survey in accordance with the Environmental Protection Authority (EPA) *Position Statement No. 3* (EPA 2002), *Guidance Statement No. 51* (EPA 2004a), *Guidance Statement No. 56* (EPA 2004b), and the *Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA and Department of Environment and Conservation (DEC) 2010). The scope of works was to undertake:

- A desktop assessment, including database searches and literature review of available resources.
- A vegetation and flora assessment, to include:
  - the presence of threatened (T) (formerly known as declared rare flora) and priority (P) flora, and weeds
  - mapping of dominant vegetation associations (with supporting photos of each type and location data) including dominant species, structure and condition
  - discussion of the significance of any vegetation recorded
  - a list of the vascular plant species recorded with the survey area
  - discussion of the levels of disturbance and erosion within the survey area, including vegetation condition mapping.
- A fauna and fauna habitat assessment, to include:
  - habitat assessments for each fauna habitat observed including landform, vegetation structure and condition, and photographs
  - the likely presence of fauna and their conservation significance
  - opportunistic fauna sightings, and their conservation significance
  - mapping of significant fauna habitats (with supporting photos of each type and location data), and discussion of their representation in a regional context
  - an assessment of the significance of any fauna habitat recorded.
- Preparation of a final report which addresses the tasks outlined above, relevant contextual information, methodology, timing and limitations.

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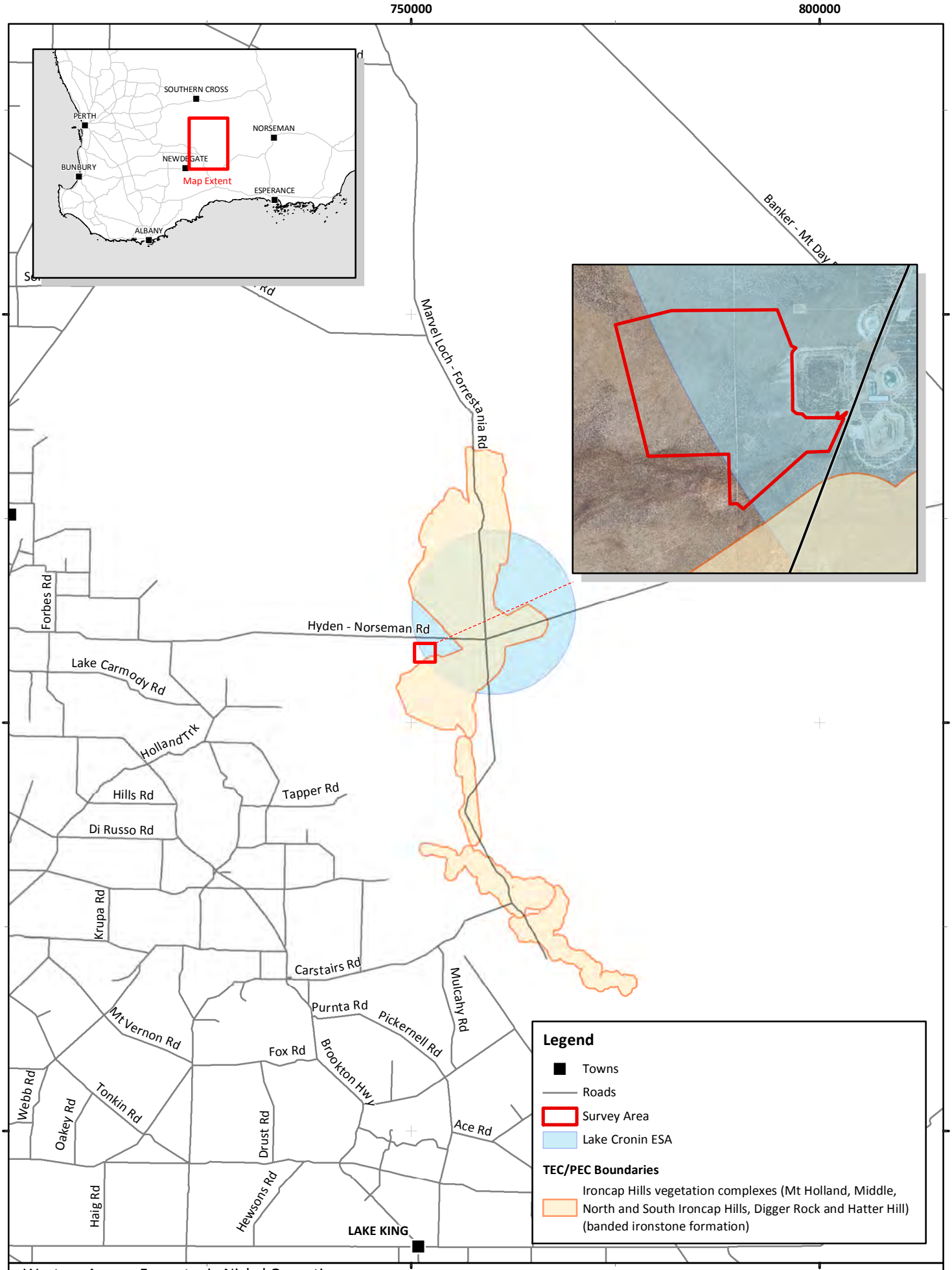

Western Areas - Forrestania Nickel Operations

Lounge Lizard Vegetation, Flora and Fauna Biological Assessment

Figure 1: Survey Area Location

astron environmental services

Author: N. Cadd	Date: 07-11-2014
Drawn: C. Dyde	Figure Ref: 17603-14-BIDR-1RevA_141107_Fig01

Datum: GDA 1994 - Projection: MGA Zone 50

0 5 10 15 20 Km

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1.3 Environmental Context

1.3.1 Climate

The Mallee region in which the survey area is found, is described as having a dry warm Mediterranean climate, with winter precipitation and an annual rainfall between 300 to 500 millimetres mm (Beard 1990).

Based on long-term climatic data from the nearest weather station at Hyden (Station 10568), (approximately 75 km west of the survey area), the mean annual rainfall since 1928 is 342.3 mm (Bureau of Meteorology (BOM) 2014). The mean maximum daily temperatures range between 16.4 degrees Celsius (°C) and 33.7°C (BOM 2014) (Figure 2).

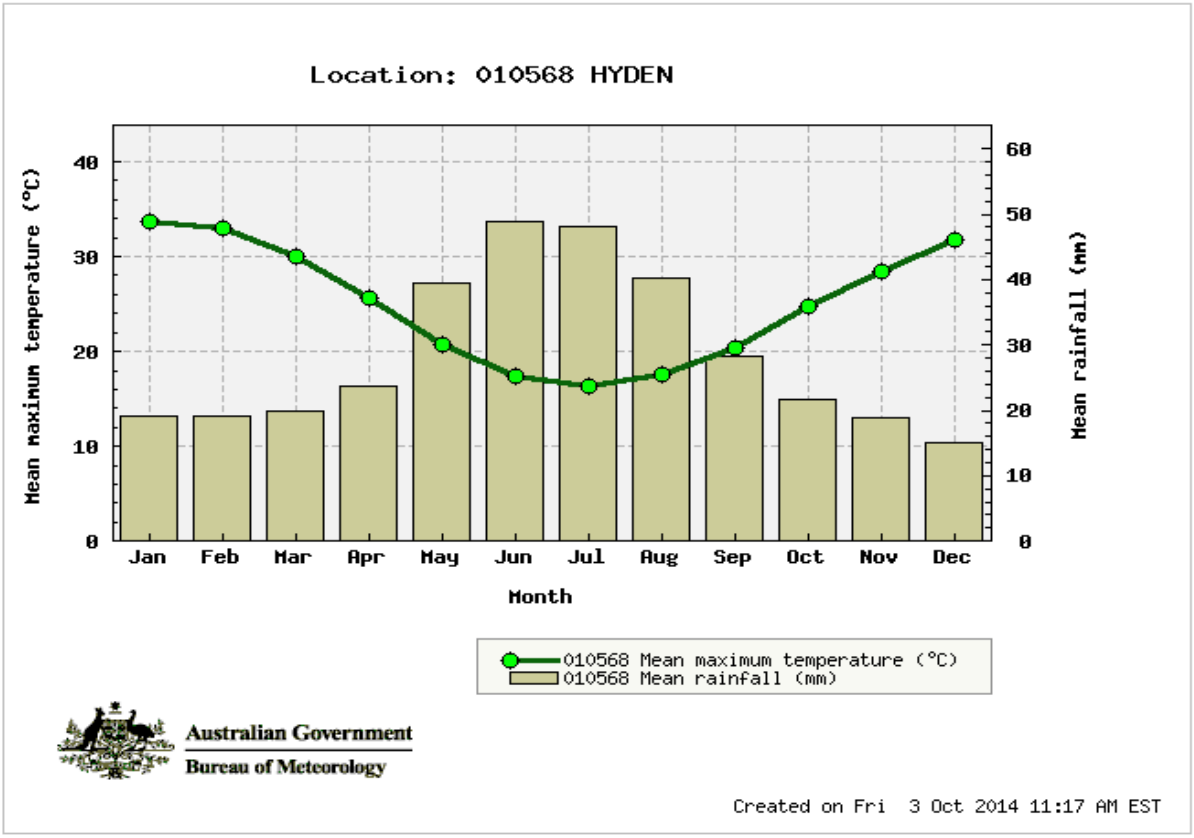

Figure 2: Climate data for Hyden (Station 10568). Mean annual rainfall data has been calculated from 1928-2014 and mean maximum temperature has been calculated from 1970-2014 (BOM 2014).

1.3.2 Geology and Soils

The Mallee region is described as Archaean and Proterozoic granites overlain in the east by early Tertiary sediments (Beard 1990).

The survey area is mapped as soil landscape zone 250 – *South Eastern Zone of Ancient Drainage of the Avon Province* (Tille et al 2004). The geology is described as gently undulating terrain, dominated by salt lake chains and areas of prominent granite outcrops, on deeply weathered mantle and alluvium over granite rocks of the Yilgarn Craton. Soil is comprised of sandy duplexes that are often alkaline with ironstone gravelly soils and loamy earths that are often calcareous and some loamy duplexes, sandy earths, deep sands, and saline wet soils (Tille et al 2004).

1.3.3 Surface Water and Hydrology

The survey area is located within the Swan Avon-Lockhart catchment of the Avon River Basin. Several tributaries from the surrounding Lake Cronin and Lake Carmody systems are located within the vicinity of the survey area. A minor drainage flat intersects the southern end of the survey area running from east to west.

1.3.4 Vegetation and Flora

1.3.4.1 Pre-European Vegetation

The survey area is located within the Roe Botanical District of the Southwest Province as described by Beard (1990). The Roe Botanical District is dominated by mallee, with *Eucalyptus eremophila* the most consistent species. Patches of eucalypt woodland occur on lower ground, and scrub heath and *Casuarina* thickets on residual plateau soils (Beard 1990).

One vegetation association, Forrestania 2048 (Shepherd et al. 2002), is associated with the survey area. This vegetation unit is described in Table 1, including the current and pre-European extent of the vegetation unit within the survey area and the Mallee region.

Table 1: Extent of pre-European vegetation in the survey area (Government of Western Australia 2013a).

Vegetation association	Extent in survey area (ha)	Current extent in Mallee bioregion (ha)	Pre-European extent (ha)	Proportion of Pre-European extent remaining (%)	Vegetation Description
Forrestania 2048	145	154,944.50	313,728.20	43.39	Shrublands, scrub-heath

1.3.5 Interim Biogeographic Regionalisation of Australia

The Interim Biogeographic Regionalisation for Australia (IBRA version 7) divides the Australian continent into 89 bioregions and 419 subregions (Department of the Environment (DoE) 2014a). The IBRA regions represent a landscape-based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna. The survey area occurs in the Mallee bioregion, of which approximately 15-30% is represented in the national reserve system (DoE 2014b).

The biodiversity of the 53 subregions recognised in Western Australia in 2002 was documented as part of a national audit to provide priorities for conservation action (Department of Conservation and Land Management 2002). The survey area occurs within Western Mallee subregion of the Mallee region. The subregion was described in the audit as follows:

> Western Mallee MAL2 – has more relief than its eastern counterpart, with main surface-types comprising of clays and silts underlain by Kankar, exposed granite, sandplains and laterite pavements. Vegetation is comprised of mallee communities that occur on a variety of surfaces, *Eucalyptus* woodlands that occur mainly on fine-textured soils with scrub-heath on sand and laterite (Beecham and Danks 2001).

1.3.6 Land Use and Tenure

The survey area is located within the Shire of Kondinin on unallocated Crown land subject to mineral exploration. The local area is primarily used for mineral exploration and mining activity.

2 Methodology

2.1 Desktop Assessment

2.1.1 Database Searches

A search for Environmentally Sensitive Areas (ESA) in the vicinity of the survey area was conducted using the WA Atlas (Landgate 2014) and Register of the National Estate (RNE) spatial database (Australian Government 2008).

Database searches were conducted to identify listed conservation significant ecological communities and flora and fauna species within or in close proximity to the survey area that are listed under the *Wildlife Conservation Act 1950* (WC Act), the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or are endorsed by the Western Australian Minister for Environment; Heritage. Conservation categories for flora, fauna and ecological communities are presented in Appendix A. Search details are summarised in Table 2. Introduced flora species were compared to the DAFWA list to determine if any have been listed as declared pests (DAFWA 2014) and the Weeds of National Significance (WONS) list (Australian Weeds Committee 2012). Introduced flora and fauna categories are presented in Appendix A.

Table 2: Database searches requested.

Database name	Date search results received	Search focus	Search area
Protected Matters Search Tool (DoE 2014c)	3/10/2014	Flora and fauna of national environmental significance	20 km radius surrounding point defined by the coordinates: -32°29'36", 119°42'00" (GDA94).
Threatened and Priority Ecological Communities Database (Parks and Wildlife 2014a)	9/10/2014	Listed threatened and priority ecological communities.	30 km radius surrounding point defined by the coordinates: -32°29'37.3", 119°41'58.1"
Threatened and Priority Flora Database (TPFL) (Parks and Wildlife 2014b)	13/10/2014	Conservation listed flora species.	
Western Australian Herbarium flora (WAHerb) (Parks and Wildlife 2014c)			
Threatened and Priority Flora Species List (TP list) (Parks and Wildlife 2014d)			
NatureMap (Parks and Wildlife 2014e)	1/10/2014	Terrestrial flora and fauna of conservation significance	20 km radius surrounding point defined by the coordinates: -32°29'36", 119°42'00" (GDA94).
Threatened Fauna Database (Parks and Wildlife 2014f)	9/10/2014	Threatened and priority fauna species	30 km radius surrounding point defined by the coordinates: -32°29'37.3", 119°41'58.1"
BirdLife Australia (Birdlife Australia 2014)	6/10/2014	Bird Species	One degree, coordinates: 32.03636, 120.16847

2.1.1.1 Vegetation and Flora

The 21 Priority Ecological Communities (PECs) listed for the Wheatbelt region (Department of Parks and Wildlife 2014f) were reviewed to determine if any were analogous with ecological communities recorded during the survey area.

Prior to conducting the field survey, aerial imagery was interpreted to identify potential habitat to support conservation significant flora. The conservation significant flora species returned from the database searches were then categorised according to the criteria listed in Table 3 for potential occurrence within the survey area.

Table 3: Criteria used pre-survey to assess the likely presence of conservation significant flora in the survey area.

Likelihood of occurrence	Pre-survey
Likely	Species previously recorded within 10 km of the survey area and suitable habitat appears to be present in the survey area.
Potential	Species previously recorded within 10 - 20 km of the survey area and/or suitable habitat appears to be present in the survey area.
Unlikely	No preferable habitat appears to be present in the survey area.

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

2.1.1.2 Fauna and Fauna Habitat

Conservation significant fauna species returned from the above database searches (Table 2) were categorised pre-survey according to the criteria in Table 4 for occurrence within the survey area.

Table 4: Criteria used pre and post-survey to assess the likely presence of conservation significant fauna in the survey area.

Likelihood of occurrence	Pre-survey
High	Species has been recorded within the survey area or within 20 km of the survey area and preferred habitat appears to be present.
Moderate	Species has not been recorded from within the survey area, however species has been recorded within 20 km of the survey area and suitable habitat appears to be present.
Low	Species recorded within 20 km of the survey area but suitable habitat does not appear to be present.

2.1.2 Literature Review

A number of biological surveys have previously been commissioned by WSA within the vicinity of the survey area and supplied to Astron for the purpose of the desktop assessment. This includes two flora and vegetation assessments, and five fauna assessments. The reports reviewed as part of this assessment are:

- Biota Environmental Sciences Pty Ltd (Biota) 2006a, 'Forrestania Fauna Survey', unpublished report to Western Areas NL.
- Biota 2006b, 'Forrestania Water Disposal Pipeline Fauna Survey', unpublished report to Western Areas NL.
- Biota 2007, 'Forrestania Fauna Monitoring Survey – Flying Fox Phases III and IV', unpublished report to Western Areas NL.
- Biota 2009, 'Forrestania Targeted Malleefowl Survey', unpublished report to Western Areas NL.
- Biota 2010, 'Spotted Quoll Haul Road – Single Phase Fauna Survey', unpublished report to Western Areas NL.
- Botanica Consulting (Botanica) 2013a, 'Flora and Vegetation Survey of the Greater Flying Fox Area', unpublished report to Western Areas NL.
- Botanica 2013b, 'Flora and Vegetation Survey of the Greater New Morning/Spotted Quoll Area', unpublished report to Western Areas NL.
- Craig and Bamford 2004, 'Site Survey of the Proposed Flying Fox, New Morning, Cosmic Boy and Digger Rocks Nickel Mines near Middle Ironcap', unpublished report to Western Areas NL.

2.2 Field Survey

The field survey was conducted from 14 to 16 October 2014 by Astron Senior Environmental Scientist, Natalie Cadd and Scientist, Samantha Stapleton. The daily weather observations recorded at Hyden (station 10568), approximately 75 km west from the survey area, were used to identify local rainfall preceding the survey (Figure 3). A total of 278 mm was recorded at Hyden in the 12 months preceding the survey. This is 62.1 mm below the long term average of 340.1 mm at this site (BOM 2014). In the three months preceding the field survey, approximately 110 mm of rainfall was recorded for Hyden, which is largely consistent with the average rainfall received for the same period (Figure 3).

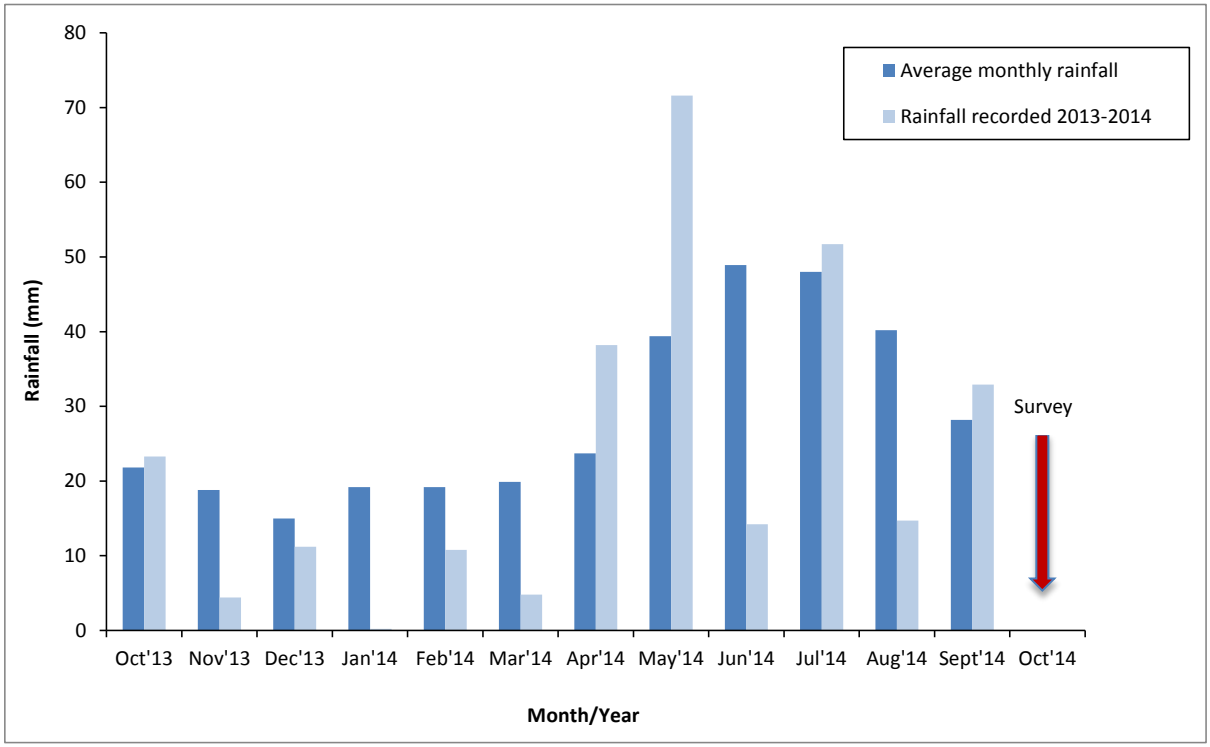

Figure 3: Mean (1928-2014) rainfall (mm) and total recorded rainfall (mm) received at Hyden station in the 12 months preceding the survey (BOM 2014).

2.2.1 Vegetation and Flora

The vegetation and flora field survey was undertaken in accordance with the requirements outlined in the EPA guidance documents (EPA 2002, 2004a).

Information acquired during the desktop study assisted in the execution and site familiarisation for the field survey.

Seven 20 metre (m) x 20 m quadrats and two relevés (unbounded sample areas of approximately 20 x 20 m) were surveyed in representative vegetation associations within the survey area.

The following information was collected at each quadrat:

- **Location** – coordinates measured using a handheld GPS (MGA50, GDA94). One set of coordinates taken from a central location of each quadrat and relevé.
- **Recorder and date**–personnel involved in sampling that location and the survey date.
- **Species and foliar cover** – all vascular plant species present including conservation significant and introduced species. Species that could not be identified in the field were collected for later identification at the Astron herbarium or the WA Herbarium. Percentage cover for each plant species was estimated to the nearest per cent.
- **Weeds** – the coordinates, density, photographs, and associated habitat/landscape element of any introduced (weed) flora.
- **Vegetation description** – vegetation was described according to Muir's (1977) vegetation classification system and the National Vegetation Information System, level 5 (DoE 2014d)(Appendix B). At this level, vegetation is described to 'association' where up to three

dominant genera for each of the upper, mid and ground strata are categorised based on dominant growth form, cover and height.

- **Vegetation condition** – assessed according to the M.E. Trudgen (Keighery 1994) vegetation condition classification (Appendix B).
- **Habitat** – a broad description of the surrounding landscape based on landform, topography and soil.
- **Disturbances** – records of any obvious disturbances such as fire, tracks or grazing.
- **Photographs** – a photograph was taken of each quadrat and relevé.

Location, population size and photographs for conservation significant flora species identified in the field were also recorded.

The survey area was accessed by 4WD vehicle then traversed on foot. An ArcPad geographic information system (GIS) with the survey area uploaded, plus hard copies of colour aerial photography on A3 maps at a scale of 1: 7,000 were used to assist in navigation, as well as delineating vegetation boundaries.

2.2.2 Fauna Assessment

The fauna survey was undertaken in accordance with relevant EPA guidance (EPA 2004b, EPA and DEC 2010). This guidance advises field observers to describe fauna habitats within the survey area in order to provide a comprehensive indication of fauna that can reasonably be expected to occur. A comprehensive fauna list can only be provided after a detailed Level 2 fauna survey, i.e. a survey that includes the installation and monitoring of traps over several days during at least two seasons.

Therefore, the aim of this fauna survey was to record opportunistic fauna observations, assess the potential for the survey area to support conservation significant fauna species or habitat and, assess and describe the fauna habitat types observed within the survey area.

The survey area was traversed on foot by Natalie Cadd and Samantha Stapleton, concurrent with the botanical assessment. Fauna habitat assessments for each fauna habitat type present within the survey area were completed, with habitat descriptions based on landform and vegetation type. Habitat condition was assessed based on the presence of anthropogenic (human-induced) disturbances, and using the descriptors suggested by Thompson and Thompson (2010) (Appendix B). All vertebrate fauna species observed opportunistically by each field team member were recorded and compiled into one comprehensive list.

2.3 Taxonomy and Nomenclature

2.3.1 Flora

Plant specimens that were not identified in the field were identified in Perth by Astron Principal Scientist, Vanessa Clarke and Senior Botanist, Natalie Cadd. Specimens which were cryptic or difficult to determine were taken to the WA Herbarium for full determination. The assigned nomenclature is consistent with the current listing of scientific names recognised by the WA Herbarium and was used for the species list and associated species information collected. Data from each mapping note were entered into a customised Access database.

2.3.2 Fauna

Nomenclature and sequence for amphibians, reptiles and mammals within this report is as per Western Australian Museum (WAM) *Checklist of the Vertebrates of Western Australia* (WAM 2014). Birds are delineated according to Christidis and Boles (2008).

For species identified in the desktop assessment where there is doubt to their true taxonomy (through subsequent name changes or taxonomic reviews) every effort was made to determine the current scientific name for each taxon. In addition, some taxon names may be followed by 'sp.', meaning that the species name was not given in the data source or the identification is in doubt.

2.4 Limitations

No major limitations were encountered while conducting the vegetation, flora and fauna survey. The region is well documented and seven surveys previously conducted within close proximity to the survey area provided contextual information. There were no access limitations, with the entire survey area able to be traversed on foot. The survey was conducted following average monthly rainfall for the three months prior to the survey. Despite this, many flora species were no longer in flower; the majority however still retained sufficient diagnostic characteristics for positive identification. All fauna data collected from the field were reviewed and validated by Astron Senior Ecologist Matthew Love, who is familiar with the fauna and habitats of the Western Mallee region. The habitats recorded are considered widespread and the species observed are regionally common so competency and experience are not considered to be limiting factors.

3 Results

3.1 Desktop Study

3.1.1 Environmentally Sensitive Areas

Approximately 104 ha of the survey area lies within the buffer of the Lake Cronin ESA. The Lake Cronin area is listed on the RNE (DoE 2014b).

3.1.2 Vegetation and Flora

No State or Commonwealth listed Threatened Ecological Communities (TECs) or PECs were identified within the survey area (Parks and Wildlife 2014a; DoE 2014c). The buffer of the State listed terrestrial PEC *"Ironcap Hills vegetation complexes (Mt Holland, Middle, North and South Ironcap Hill, Digger Rock and Hatter Hill) (banded ironstone formation)"* is however located approximately 250 m south-east of the survey area.

The Parks and Wildlife TPFL (Parks and Wildlife 2014b), WAHerb (Parks and Wildlife 2014c) and TP list (Parks and Wildlife 2014d) database searches indicated that six species listed as threatened (T) have been recorded within 10 km of the search area:

- *Banksia sphaerocarpa* var. *dolichostyla*
- *Boronia revoluta*
- *Eucalyptus steedmanii*
- *Grevillea involucrata*
- *Grevillea scapigera*
- *Paragoodia crenulata* (Appendix C).

Eighty-eight priority flora species have been previously recorded within 30 km of the search area (Appendix D) (Parks and Wildlife 2014b, 2014c, 2014d, 2014e). Of these, 22 have a priority (P) one (P1) status, 13 have a P2 status, 40 have a P3 status and the remaining 13 have a P4 status. These species were assessed, as part of the desktop study, to determine their likelihood of occurrence within the survey area. Assessment was based on habitat preferences, combined with previous location data and associated vegetation information. The pre-survey desktop assessment indicated that 19 of the listed threatened and priority flora species were considered 'likely to occur' in the survey area. A further 34 species were considered to have the 'potential to occur' in the survey area (Appendix C).

Results of the literature review identified one threatened, two P2, five P3 and two P4 flora species as having been previously recorded within close proximity of the survey area (Table 5) (Botanica Consulting 2013a,b). The nearest record of a currently listed priority flora species is *Microcorys* sp. Forrestania (V. English 2004) P4. No TECs were recorded, however the North and Middle Ironcap Hills of the "*Ironcap Hills Vegetation complexes"* PEC have been recorded in previous surveys in the vicinity.

Table 5: Literature review results from surveys conducted within the vicinity of the survey area.

Author (year)	Survey area	Survey focus	Significant conservation values recorded within survey area boundary
Botanica (2013a)	Greater Flying Fox area (267 ha)	Vegetation and flora	*Baeckea* sp. North Ironcap (R.J. Cranfield 10580) (P2) *Boronia westringioides* (P2) *Baeckea* sp. Parker Range (M. Hislop & F. Hort MH 2968) (P3) *Daviesia elongata* subsp. *implexa* (P3) *Dillwynia acerosa* (P3)^ *Eutaxia acanthoclada* (P3) *Verticordia mitodes* (P3) *Microcorys* sp. Forrestania (V. English 2004) (P4) North Ironcap region of the *Ironcap Hills Vegetation Complexes* (PEC)
Botanica (2013b)	Greater New Morning/Spotted Quoll area (178.5 ha)	Vegetation and flora	*Eucalyptus steedmanii* (T) *Stylidium sejunctum* (P2)* (now P3) *Eremophila racemosa* (P4) *Microcorys* sp. Forrestania (V. English 2004) (P4) North Ironcap and Middle Ironcap region of the *Ironcap Hills Vegetation Complexes (*PEC)

*Priority listing revised since completion of report
^Species no longer listed on the priority flora list.

3.1.3 Fauna

The fauna database searches and literature review identified 234 terrestrial vertebrate fauna species recorded within the vicinity of the survey area. This included eight amphibian species, 59 reptile species, 140 bird species and 27 mammal species (including seven introduced), of which 21 species are deemed to have conservation significance. Results are presented in Appendix D. Table 6 presents the conservation significant fauna species identified from prior surveys in the vicinity of the survey areas.

Appendix D lists those species of conservation significance identified by the EPBC Protected Matters (DoE 2014c), *Naturemap* (Parks and Wildlife 2014e), Parks and Wildlife Threatened fauna database (2014f) and *Birdata* (Birdlife Australia 2014) database searches. Aquatic and marine species have been excluded from the report as no marine or aquatic habitats occur within the survey area.

Table 6: Literature review results from surveys conducted within the vicinity of the survey area.

Author (year)	Survey area	Survey focus	Significant conservation values recorded within survey area boundary
Biota (2006a)	Flying Fox area	Fauna	*Calyptorhynchus latirostris* (Carnaby's black cockatoo) (En, S1) *Dasyurus geoffroii* (Western quoll/chuditch) (Vu, S1) *Platycercus icterotis xanthogenys* (Western rosella) (S1) *Macropus irma* (Western brush wallaby) (P4) *Pomatostomus superciliosus ashbyi* (White-browed babbler) (P4) *Morelia spilota imbricata* (Carpet python) (S4) *Oreoica gutturalis gutturalis* (Crested bellbird) (P4) *Hylacola cauta whitlocki* (Shy groundwren (western)) (P4) *Merops ornatus* (Rainbow bee-eater) (Mi, S3)
Biota (2006b)	Flying Fox mine to Diggers Rock	Fauna	*Leipoa ocellata* (Malleefowl) (S1, Vu) *Platycercus icterotis xanthogenys* (Western rosella) (S1) *Falco peregrinus* (Peregrine falcon) (S4) *Hylacola cauta whitlocki* (Shy groundwren (western)) (P4) *Calamanthus campestris montanellus* (Rufous fieldwren) (P4) *Oreoica gutturalis gutturalis* (Crested bellbird) (P4)
Biota (2007)	Flying Fox area	Fauna	*Calyptorhynchus latirostris* (Carnaby's black cockatoo) (En, S1) *Dasyurus geoffroii* (Western quoll/chuditch) (Vu, S1) *Platycercus icterotis xanthogenys* (Western rosella) (S1) *Falco peregrinus* (Peregrine falcon) (S4) *Hylacola cauta whitlocki* (Shy groundwren (western)) (P4) *Calamanthus campestris montanellus* (Rufous fieldwren) (P4) *Oreoica gutturalis gutturalis* (Crested bellbird) (P4) *Pomatostomus superciliosus ashbyi* (White-browed babbler) (P4) *Macropus irma* (Western brush wallaby) (P4)
Biota (2009)	Forrestania area	Targeted Fauna Search	*Leipoa ocellata* (Malleefowl) (S1, Vu) (inactive mounds were recorded, active mound and sightings in the vicinity of the survey area)
Biota (2010)	Spotted Quoll haul road	Fauna	*Calyptorhynchus latirostris* (Carnaby's black cockatoo) (En, S1) *Leipoa ocellata* (Malleefowl) (S1, Vu) (inactive mounds were recorded in the vicinity of a site) *Hylacola cauta whitlocki* (Shy groundwren (western)) (P4) *Pomatostomus superciliosus ashbyi* (White-browed babbler) (P4) *Oreoica gutturalis gutturalis* (Crested bellbird) (P4) *Dasyurus geoffroii* (Western quoll/chuditch) (Vu, S1)
Craig and Bamford (2004)	Flying Fox, New Morning, Cosmic Boy and Digger Rocks mine areas	Fauna	*Morelia spilota imbricata* (Carpet python) (S4) *Leipoa ocellata* (Malleefowl) (S1, Vu) *Falco peregrinus* (Peregrine falcon) (S4) *Calyptorhynchus latirostris* (Carnaby's black cockatoo) (En, S1) *Platycercus icterotis xanthogenys* (Western rosella) (S1) *Merops ornatus* (Rainbow bee-eater) (Mi, S3) *Hylacola cauta whitlocki* (Shy groundwren (western)) (P4)

3.2 Vegetation and Flora

3.2.1 Vegetation

Three vegetation associations were described and mapped for the survey area. Vegetation associations recorded, and the extent of each within the survey area, are summarised in Table 7. Vegetation association mapping is presented in Appendix E and survey site data is presented in Appendix F.

Table 7: Vegetation associations described for the survey area.

Vegetation association code and description	Habitat	Area within survey area (proportion of survey area)	Site(s)	Vegetation condition	Representative photograph
SpH1 *Banksia cirsioides* open low scrub over mixed dwarf scrub. **Associated species:** *Petrophile ericifolia* subsp. *ericifolia, Beaufortia interstans, Hakea corymbosa, Grevillea cagiana, Allocasuarina microstachya, Verticordia chrysanthella, Verticordia inclusa, Melaleuca seriata, Mesomelaena preissii.*	Sandplain heath	87.8 ha (61%)	FOR01, FOR02, FORr01	Excellent	 **Plate 1: Vegetation representing sandplain heath – facing south-east from GPS coordinate 751662mE and 6409206mS (MGA Zone 50 H).**

Vegetation association code and description	Habitat	Area within survey area (proportion of survey area)	Site(s)	Vegetation condition	Representative photograph
EMW1 *Eucalyptus eremophila* open tree mallee over mixed *Melaleuca* species open dwarf scrub to heath. **Associated species:** *Eucalyptus platycorys, Melaleuca hamata, Melaleuca eleuterostachya, Melaleuca adnata, Melaleuca glaberrima, Dodonaea bursarifolia, Phebalium tuberculosum, Lepidosperma viscidum.*	Mallee Woodland	10.7 ha (7%)	FOR03, FOR06	Excellent	 **Plate 2: Vegetation representing Eucalyptus mallee woodlands – facing east from GPS coordinate 751727mE and 6408117mS (MGA Zone 50 H).**
EMW2 *Eucalyptus platycorys* open tree mallee to tree mallee over *Melaleuca hamata* open low scrub to low scrub over mixed open dwarf scrub. **Associated species:** *Eucalyptus rigidula, Melaleuca seriata, Melaleuca glaberrima, Leptospermum erubescens, Gastrolobium spinosum, Hibbertia gracilipes, Lepidosperma viscidum.*	Mallee Woodland	44.0 ha (30%)	FOR04, FOR05, FOR07, FORr02	Excellent	 **Plate 3: Vegetation representing Eucalyptus mallee woodlands – facing south-east from GPS coordinate 751849mE and 6408430mS (MGA Zone 50 H).**

3.2.2 Conservation Significance of Vegetation

The vegetation recorded in the survey area is considered representative of the vegetation expected on comparable landforms in the broader region (Beecham and Danks 2001). The vegetation associations recorded in the survey area have been previously described for the broader Lounge Lizard and Flying Fox project areas (Botanica 2006, 2007, 2009, 2013a,b; EPA 2009a).

None of the vegetation associations were considered analogous with a listed TEC or PEC.

One-hundred and four hectares of the survey area lies within the buffer of the Lake Cronin ESA.

3.2.3 Vegetation Condition

Remnant vegetation within the survey area was considered to be in 'excellent' (Keighery 1994) condition (Appendix G). No weed species; recent indication of fire; or evidence of erosion was recorded.

Approximately 2 ha (1%) of the survey area, located immediately south of the adjoining Flying Fox operations, was recorded as being in 'good' condition (Keighery 1994) due to previous partial clearing.

3.2.4 Flora

One hundred and twenty-eight taxa from 32 families and 72 genera were recorded within the survey area. The dominant family was Myrtaceae with 29 taxa recorded and Melaleuca was the most frequently recorded genus (Table 8). A species list for the survey area is presented in Appendix H.

Table 8: Taxa most frequently recorded in the survey area.

Family	Number of taxa
Myrtaceae	29
Proteaceae	23
Fabaceae	15
Family	**Number of taxa**
Melaleuca	9
Grevillea	6
Acacia	6

3.2.5 Conservation Significance of Flora

Targeted searches in potential habitat identified one state-listed priority flora species within the survey area; *Eutaxia hirsuta* P2 (Table 9) (**Plate 4**). This species was recorded only once, and was associated with the sandplain heath vegetation of vegetation association SpH1 (**Plate 5**).

Table 9: Conservation significant flora recorded during the survey.

Species	Conservation Status	Abundance	Habitat	Location (GPS coordinates)
Eutaxia hirsuta	P2	1	Gently undulating sandplain	751662mE/6409206mS

Plate 4: ***Eutaxia hirsuta*** **P2.**

Plate 5: Sandplain habitat in which *Eutaxia hirsuta* P2 was recorded.

3.2.6 Post-survey Likelihood of Occurrence of Conservation Significant Flora

Prior to the field reconnaissance and surveys, threatened and priority flora species recorded from within the proximity of the survey area were reviewed and rated according to their perceived potential to occur with the survey area. Following the field survey, and with greater understanding of the soils, landforms and habitats within the survey area, this list was reviewed (Appendix C). More informed and qualified ratings were then assigned, which reduced the number of species with potential to occur within the survey area from 53 down to 23.

3.2.7 Introduced Flora (Weeds)

No introduced flora species were recorded within the survey area.

3.3 Fauna

3.3.1 Fauna Habitats and Condition

Based on the site inspection and the identified vegetation associations, two broad fauna habitat types were identified within the survey area (Plate 6 and Plate 7). The fauna habitats types recorded were:

- *Banksia* low heath
- *Eucalyptus* mallee woodland with *Melaleuca* low scrub

Fauna habitats were considered to be 'high quality' habitat (Thompson and Thompson 2010), as they appeared to be generally unaffected by grazing herbivores or fire. These fauna habitats types are generally recorded across the Mallee region and are not unique for the survey area.

Plate 6: *Banksia* low heath.

Plate 7: *Eucalyptus* mallee woodland with *Melaleuca* low

3.3.2 Fauna Observations

Twenty-seven fauna species, comprised of 26 bird species and one mammal species, were recorded during the field survey either through direct observation or indirect evidence (Table 10). One fauna of conservation significance was recorded during the field survey, crested bellbird (southern subsp.) (*Oreoica gutturalis gutturalis*). This species was recorded at MGA Zone 50 H 751648mE 6408356mN within the *Eucalyptus* mallee woodland with *Melaleuca* low scrub fauna habitat type. All the vertebrate fauna species recorded in the survey area are known and typical for the Mallee bioregion. No species were outside their expected distribution and all are common for the local vicinity.

Table 10: Fauna species recorded during the survey.

Species name	Common name	Observation type
Birds		
Aquila audax	Wedge-tailed eagle	Individual(s)
Falco berigora	Brown falcon	Individual(s)
Eolophus roseicapillus	Galah	Individual(s), calls
Barnardius zonarius	Australian ringneck	Individual(s), calls
Phaps chalcoptera	Common bronzewing	Individual(s)
Lichenostomus virescens	Singing honeyeater	Individual(s), calls
Lichmera indistincta indistincta	Brown honeyeater	Individual(s), calls
Glyciphila melanops	Tawny-crowned honeyeater	Individual(s), calls
Manorina flavigula	Yellow-throated miner	Individual(s), calls
Acanthagenys rufogularis	Spiny-cheeked honeyeater	Individual(s), calls
Gerygone fusca	Western gerygone	Individual(s)
Anthochaera carunculata	Red wattlebird	Individual(s)
Coracina novaehollandiae	Black-faced cuckoo shrike	Individual(s)
Myiagra inquieta	Restless flycatcher	Calls
Oreoica gutturalis	Crested bellbird	Individual(s), calls
Malurus pulcherrimus	Blue-breasted fairy-wren	Calls
Smicrornis brevirostris	Weebill	Individual(s), calls
Pardalotus striatus	Striated pardalote	Individual(s), calls
Acanthiza uropygialis	Chestnut-rumped thornbill	Individual(s), calls
Acannthiza apicalis	Inland thornbill	Individual(s), calls
Cracticus tibicen	Australian magpie	Individual(s)
Rhipidura leucophrys	Willie wagtail	Individual(s)
Corvus coronoides	Australian raven	Individual(s)
Grallina cyanoleuca	Magpie-lark	Individual(s)
Petrochelidon nigricans	Tree martin	Individual(s), calls
Anthus cervinus	Red-throated pipit	Individual(s), calls
Mammals		
Macropus fuliginosus	Western grey kangaroo	Scats, tracks

3.3.3 Likelihood of Occurrence for Conservation Significant Fauna

A description of habitat preferences for each of the State and Federally-listed terrestrial vertebrate fauna of conservation significance identified during the desktop study, and an assessment of the likelihood of the species occurring within the survey area prior to and following the field survey, is provided in Appendix D.

Of the conservation significant fauna identified during the desktop study, six species were deemed to have a moderate likelihood of occurring in the survey area and seven species were considered to have a low likelihood of being present in the survey area due to limited presence of preferred

habitat. Nine species were considered to have a high likelihood of occurring in the survey area, including the crested bellbird (southern spp.) which was recorded during the current assessment. These include the carpet python, Lake Cronin snake, rainbow bee-eater, Carnaby's cockatoo, western rosella, white-browed babbler, shy heathwren and chuditch, which have a historical presence in the survey area along with suitable habitat being present. These species are discussed in further detail below.

Carpet python, *Morelia spilota imbricata* (WC Act Schedule 4)

The Carpet Python is found in south-west Western Australia in most habitats. The species shelters in hollow trunks and limbs, disused burrows, caves, crevices and beneath boulders (Wilson and Swan 2010). The carpet python was previously recorded within the vicinity of the survey area at Flying Fox (Biota 2006a) and Cosmic Bay and Digger Rocks Mine (Craig and Bamford 2004). This species would be expected to occur within the survey area despite not being recorded given the preferred habitats present and preferred habitat present. The lack of record during the current assessment probably reflects the low densities at which it occurs, combined with its cryptic behaviour. The species would be expected to occur in most or all habitats within the study area at a low density.

Lake Cronin snake, *Paroplocephalus atriceps* (WC Act Priority 3)

The Lake Cronin snake is a poorly understood elapid that is endemic to the Lake Cronin area with less than five specimens having been found. Very little is known of their ecological requirements with some anecdotal evidence suggesting this species of snake is generally active at night and is possibly arboreal. The Lake Cronin snake has not been recorded in any of the previous fauna assessments detailed in Table 6, however the little know records are within 9 km of Lake Cronin near to the current survey area.

Rainbow bee-eater, *Merops ornatus* (WC Act Schedule 3, EPBC Act Migratory)

The rainbow bee-eater is seasonally common and widespread in Western Australia. It is a resident, breeding visitor, passage migrant and winter visitor, wintering from the Gascoyne north to Indonesia. It migrates south mainly late September and early October and north from February to April. It is scarce to very common across its range. This species prefers lightly wooded, preferably sandy, country near water (Johnstone and Storr 2004). This species usually nest in excavated burrows in the banks of rivers, creeks or dams, in roadside cuttings, in the walls of gravel pits or quarries, in mounds of gravel, or in cliff-faces (Boland 2004, Forshaw and Cooper 1987, Fry 1984, Higgins 1999, Lill 1993). Nests can be reused (Lill 1993), however mating pairs usually construct new nests at the beginning of each breeding season (Boland 2004, Lill 1993, Morris 1977). The rainbow bee-eater was previously recorded within the vicinity of the survey area at Flying Fox (Biota 2006a) and Cosmic Bay and Digger Rocks Mine (Craig and Bamford 2004). No nests were recorded within the survey area, however, this species is likely to be present during its annual seasonal migration.

Carnaby's black-cockatoo, *Calyptorhynchus latirostris* (WC Act Schedule 1, EPBC Act Endangered)

Carnaby's black-cockatoo is found only in the south-west of Western Australia, and since 1970 its range has reduced by at least 50% (Cale 2003). Carnaby's black-cockatoo feeds in eucalypt woodlands and kwongan heaths, mainly eating the seeds of *Banksia, Hakea, Grevillea* and *Eucalyptus* species (Cale 2003). Nesting mainly occurs in hollows of salmon gum (*Eucalyptus salmonophloia*) and wandoo (*E. wandoo*) in the Wheatbelt region (Cale 2003). There have been numerous records of the Carnaby's cockatoo within the vicinity of the survey area, specifically at Flying Fox (Biota 2006a, 2007), Spotted Quoll (Biota 2010) and Cosmic Bay and Digger Rocks Mine

(Craig and Bamford 2004). The *Banksia* heath fauna habitat of the survey area represents a potential foraging habitat resource for this species.

Western Rosella (inland subspecies), *Platycercus icterotis xanthogenys* (WC Act Priority 4)

The inland subspecies of the western rosella prefers open eucalypt forest and timbered areas, with a heath understorey, but can also be found in cultivated land and orchards. The survey area represents a cross over in distribution with the other south west subspecies *Platycercus icterotis icterotis*. There have been numerous records of the western rosella within the vicinity of the survey area, specifically at Flying Fox (Biota 2006a, b, 2007) and Cosmic Bay and Digger Rocks Mine (Craig and Bamford 2004). The subspecies is probably widespread in the area, particularly in drier woodland areas and the survey area probably represents a small part of a much larger home range for this species.

White-browed babbler (western Wheatbelt), *Pomatostomus superciliosus ashbyi* (WC Act Priority 4)

The white-browed babbler is mainly found in arid and semiarid zones in habitat dominated by dry sclerophyll woodlands with a shrubby understorey. The subspecies has been recorded in a range of habitat types but typically woodlands with a dense understorey (Johnstone and Storr 2004). This species has a historical presence within the vicinity of the survey area with records of the white-browed babbler at Flying Fox (Biota 2006a, 2007) and at Spotted Quoll (Biota 2010). The white-browed babbler could potentially occur in all fauna habitat types of the survey area.

Crested bellbird (southern subspecies), *Oreoica gutturalis gutturalis* (WC Act Priority 4)

The southern subspecies of the crested bellbird inhabits woodland, mallee and Acacia shrublands (Higgins and Peter 2002) and has previously been recorded within the local vicinity of the survey area at Flying Fox (Biota 2006a, b, 2007) and at Spotted Quoll (Biota 2010). This species was recorded within the current survey area at 50 H 751648mE 6408356mN within the *Eucalyptus* mallee woodland with *Melaleuca* low scrub fauna habitat type. It is likely to be widespread throughout the area in low densities.

Shy heathwren, *Hylacola cauta whitlocki* (WC Act Priority 4)

The shy heathwren inhabits eucalypt mallee woodlands that have relatively dense shrub and heath understorey (Johnstone and Storr 2004). There have been numerous records of the shy heathwren within the vicinity of the survey area, specifically at Flying Fox (Biota 2006a, b, 2007), Spotted Quoll (Biota 2010) and Cosmic Bay and Digger Rocks Mine (Craig and Bamford 2004). It is likely to be widespread throughout the area in low densities.

Chuditch, *Dasyurus geoffroii* (WC Act Schedule 1, EPBC Act Vulnerable)

The chuditch can occupy a wide variety of habitats including woodland, dry sclerophyll forests in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forests (Orell and Morris 1994). The former range of the chuditch has contracted markedly since European colonisation due a range of pressures but primarily due to land clearing (Orell and Morris 1994). The chuditch has been recorded close to survey area at Flying Fox (Biota 2006a, 2007), and at Spotted Quoll (Biota 2010). This species is likely to use fauna habitats primarily in a foraging capacity as part of much large home range. No large logs and significant trees were recorded in the survey area as potential den sites.

4 Discussion

The survey area occurs on gently undulating sandplains within the Mallee region. This landform is dominated by mixed low heath and open mallee woodlands.

The vegetation recorded within the survey area is considered typical of what might be expected on these landforms in the Western Mallee subregion and all vegetation associations described within the survey area have been documented for the broader Lounge Lizard and Flying fox mining areas (Botanica 2006, 2007, 2009, 2013; EPA 2009a).

No Commonwealth or State listed TECs or PECs were recorded within the survey area (DoE 2014c; Parks and Wildlife 2014a). The buffer of the State listed PEC *"Ironcap Hills vegetation complexes (Mt Holland, Middle, North and South Ironcap Hill, Digger Rock and Hatter Hill) (Banded ironstone formation)"* is located approximately 250 m south-east of the survey area. The survey area does not contain banded ironstone formation or vegetation complexes associated with this PEC. Aside from a small area of previously disturbed vegetation adjacent to the existing Flying Fox operations, vegetation within the survey area was in 'excellent' condition.

A large proportion of the survey area lies within the buffer of the Lake Cronin ESA. This ESA is centered on the Lake Cronin wetland. The buffer zone associated with the Lake Cronin ESA has been described as supporting extensive contiguous shrubland, sandplain and woodland environments, including excellent representation of a range of vegetation types that are now extensively cleared in the Wheatbelt (EPA 2009b). As such, vegetation within the buffer area may be considered locally and regionally significant.

The suite of flora recorded was considered representative of what may be expected in the local area (Botanica 2009, 2013a, b). The survey followed three months of rainfall consistent with the average, however a number of flora species were no longer in flower during the field survey. Despite this, a reasonable inventory of flora was captured and the majority of species still retained sufficient diagnostic characteristics for positive identification.

No threatened flora was identified in the survey area and, based on comprehensive searches of the survey area, none are considered likely to occur. One priority flora species, *Eutaxia hirsuta* P2, was recorded. One individual of this species was identified in association with sandplain heath vegetation. There are currently five vouchered records of this species at the Western Australian Herbarium (2014), with two records listed as occurring within conservation reserves; Lake Barker Reserve and Wogarl Reserve. The closest record occurs some 80 km north-east of the survey area, near Lake Barker (Western Australian Herbarium 2014). Given the current known spatial distribution of this species, the occurrence of specimens within conservation reserves and the extent of suitable habitat outside of the survey area, it is not considered likely that the proposed clearing will have a significant impact on the regional conservation status of this taxa. A permit to take is not required prior to clearing, as this taxon is not specially protected under any State or Commonwealth legislation.

Despite undertaking a comprehensive targeted search for conservation significant flora species, there remains potential for 23 conservation significant species to occur within the survey area. Although the survey area was traversed comprehensively, vegetation at times was dense and some species are cryptic. Should any of these species be present within the survey area, the proposed clearing is not considered likely to significantly impact the conservation status of any of the species, based on the number of locations outside of the survey area that they are currently known from.

No weed species were recorded within the survey area.

The survey area contains two broad fauna habitats based on landform and vegetation type, namely a *Banksia* low heath and *Eucalyptus* mallee woodland with *Melaleuca* low scrub. Both of these fauna habitat types have been previously recorded within the local vicinity (Biota 2006a, b, 2007, 2010), are typical of the Western Mallee subregion, and are therefore not unique to the survey area. However, these fauna habitats potentially provide foraging and shelter for nine conservation significant species considered to have a high likelihood of occurrence; carpet python, Lake Cronin snake, rainbow bee-eater, Carnaby's cockatoo, western rosella, white-browed babbler, crested bellbird, shy heathwren and chuditch. The majority of these conservation significant species would generally exist in low densities within the fauna habitat types of the survey area and are not likely to be solely reliant on the survey area. No breeding activities were recorded within the survey area. In addition the majority of these species are birds and therefore highly mobile, being able to easily move to similar habitats within the vicinity of the survey area. The carpet python and the Lake Cronin snake may suffer localised mortalities due to clearing activities however it is not expected that this would reduce the population of either species in a regional sense. Overall, the direct impact to fauna within the survey area, from the proposed clearing, is expected to be minimal.

Twenty-seven fauna species, comprised of 26 bird species and one mammal species, were recorded during the field survey either through direct observation or indirect evidence including one fauna species of conservation significance the crested bellbird (southern subspecies) (*Oreoica gutturalis gutturalis*).

The *Banksia* low heath habitat (87.8 ha) and potentially the *Eucalyptus* mallee woodland habitats (54.7 ha) within the survey area are considered potential foraging habitat for Carnaby's black cockatoo. This species could be expected to occur on an infrequent basis, foraging within the survey area during their annual migration activities. However similar foraging habitat exists outside of the survey area within the local area and no breeding hollows or potential breeding trees were recorded within the survey area. The potential impacts to Carnaby's black cockatoo from clearing of foraging habitat within the survey area should be assessed against the EPBC Act referral guidelines (DSEWPaC 2012). These guidelines state that clearing of greater than 1 ha of quality foraging habitat constitutes a high risk of significant impact and therefore referral to the Federal environment minister is recommended.

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

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Table A.1: Categories of threatened ecological communities (DEC 2010).

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

En: Endangered
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting **any one or more** of the following criteria (A, B, or C): A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement **and either or both** of the following apply (i or ii): i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
VU: Vulnerable
An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B or C): A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

Table A.2: Definitions and criteria for priority ecological communities (DEC 2010).

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

P1: Priority One – 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. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2: Priority Two – Poorly-Known ecological communities
Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3: Priority Three – Poorly-Known ecological communities
(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4: Priority Four
Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5: Priority Five – Conservation dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Table A.3: Definitions and criteria for threatened ecological communities (DoE 2014).

Three categories exist for listing threatened ecological communities under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). An ecological community may be categorised:

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

Table A.4: Conservation codes for Western Australian flora and fauna (DPaW 2013).

Code	Conservation category	Definition
X	Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice and Wildlife Conservation (Rare Flora) Notice under the Wildlife Conservation Act 1950. Presumed Extinct Fauna Presumed Extinct Flora (Declared Rare Flora – Extinct)	Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
T	Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice and Wildlife Conservation (Rare Flora) Notice under the Wildlife Conservation Act 1950. Threatened Fauna (Fauna that is rare or is likely to become extinct) Threatened Flora (Declared Rare Flora - Extant)	Taxa that 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.
IA	Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice under the Wildlife Conservation Act 1950. Birds protected under an international agreement	Birds that are subject to an agreement between governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction.
S	Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice under the Wildlife Conservation Act 1950. Other specially protected fauna	Fauna that is in need of special protection, otherwise than for the reasons mentioned in the above schedules.
	Threatened fauna and flora (Schedule 1) are further ranked by the Department according to their level of threat using IUCN Red List criteria: CR: Critically Endangered - considered to be facing an extremely high risk of extinction in the wild. EN: Endangered - considered to be facing a very high risk of extinction in the wild. VU: Vulnerable - considered to be facing a high risk of extinction in the wild.	

Table A.5: Priority species under Western Australian Wildlife Conservation Act 1950

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

P1: Priority One – Poorly known taxa
Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2: Priority Two – Poorly known taxa
Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3: Priority Three – Poorly known taxa
Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4: Priority Four: Rare, near threatened and other taxa in need of monitoring
(a) Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5: Priority Five: Conservation dependent taxa
Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxa becoming threatened within five years.

Table A.6: Categories and definitions for EPBC Act listed flora and fauna species (DoE 2014).

Conservation category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the wild	Taxa known to survive only in captivity.
Critically endangered (CR)	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (E)	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable (V)	Taxa facing a high risk of extinction in the wild in the medium term.
Near threatened (NT)	Taxa that risk becoming Vulnerable in the wild.
Conservation dependent (CD)	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data deficient (insufficiently known) (DD)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least concern (LC)	Taxa that are not considered threatened.

Table A.7: Declared pests categories as gazetted under the *Biosecurity and Agriculture Management Act 2007* (Department of Agriculture and Food 2013).

The management of introduced flora species in Western Australia is now regulated through the Biosecurity and Agriculture Management Act 2007 (BAM Act). A list of declared pests, including 'pest' plants is provided under the BAM Act, which has been updated to incorporate a number of other Acts that are administered by DAFWA (2013). Declared pests can fall into two categories: one that relates to the prevention of introducing the species or eradicating it; and the other relates to managing the species and whether it can be kept (i.e. for scientific purposes, education or other purpose).

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

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

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

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Appendix B: Vegetation Classification and Condition Scales, and Fauna Habitat Condition Scale

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Table B.1: 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 Tall Grass Low Grass 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

Table B.2: Vegetation condition scale Keighery (1994).

Condition	Description
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered obvious signs of disturbance. Disturbance to vegetation structure covers repeated fire, aggressive weeds, dieback, logging, grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure covers frequent fires, aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure includes frequent fires, presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas often described as “parkland cleared” with the flora comprising weed or crop species with isolated native trees or shrubs.

Modified from Trudgen, 1991, by Keighery for the Swan Coastal Plain Survey. Found in *Bushland Plant Survey: a Guide to Plant Community Survey for the Community.*

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

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

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Appendix C: Threatened and Priority Flora, and Fauna Species Likelihood of Occurrence within the Survey Area.

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Table C.1: Likelihood of occurrence of threatened and priority flora recorded within 20 km of the survey area (TPFL (Parks and Wildlife 2014b); WAHerb (Parks and Wildlife 2014c); TP List (Parks and Wildlife 2014d); *NatureMap* (Parks and Wildlife 2014e)). Note: The TP List database is searched using place names. As a result, many of the records obtained from this database may occur beyond 50 km of the survey area (Parks and Wildlife 2014d).

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Threatened						
Banksia sphaerocarpa var. *dolichostyla*	Lignotuberous shrub, 1-3 m high.	Perennial	Yellow-orange flowers from March - May.	Lateritic gravel, grey sand.	Potential	Unlikely
Boronia revoluta	Shrub, 0.4-0.8 m high.	Perennial	Pink flowers from July - August.	Stony sandy loam or sand. Plains, hillsides & summits.	Potential	Potential
Eucalyptus steedmanii	Tree, 2-8(-12) m high, bark smooth.	Perennial	White flowers from January - March.	Gravelly loam over ironstone, sand. Low hills, undulating plains.	Likely	Unlikely
Grevillea involucrata	Prostrate to low-domed open shrub, 0.15-0.3 m high, up to 2 m wide.	Perennial	Pink/pink-red flowers in June - October.	Amongst medium trees, or low trees, or low (sclerophyll) shrubland; in rocky or stony soil, or sand, or loam; occupying lateritic ridge.	Unlikely	Unlikely
Grevillea scapigera	Suckering, prostrate to weakly ascending shrub, 0.15-0.4 m high, up to 1.8 m wide.	Perennial	White/yellow-green flowers in February, or October - November.	Amongst medium trees, or low trees; in gravelly soil, or sand; occupying heathlands, sand plains; growing in gravel pits.	Unlikely	Unlikely
Paragoodia crenulata	Prostrate shrub	Annual	Yellow and brown flowers.	Hill slopes, gullies. Stony red loams, clays.	Potential	Unlikely
Priority 1						
Aotus lanea	Prostrate shrub, to 0.2 m high.	Perennial	Red/orange/brown, flowers in April or October.	Grey clayey sand, yellow clay, deep siliceous sand. Edges of salt lakes, valleys.	Unlikely	Unlikely

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Baeckea sp. Blue Haze Mine (P. Armstrong 06/910)	Shrub, approximately 0.7m high.	Perennial	Pink flowers. September - October	Undulating plains, granite hills. Loams and sandy clay-loams.	Potential	Unlikely
Baeckea sp. Crossroads (B.L. Rye & M.E. Trudgen 241186)	Open straggly shrub to 1.0 m high.	Perennial	Pink flowers in November	Gentle slopes and small hills. Yellow-brown silty sands.	Potential	Unlikely
Baeckea sp. Forrestania (K.R. Newbey 1105)	Shrub, to 0.6 m high.	Perennial	No information available.	Sand. Plains.	Potential	Unlikely
Baeckea sp. Lake Cronin (K.R. Newbey 9191)	Upright, spreading, moderately open shrub.	Perennial	White/pink flowers in October.	Well-drained gravelly sands. Moderately exposed, gently undulating plain.	Likely	Unlikely
Brachyloma nguba	Erect, compact to spreading, mid-dense shrub, to 0.8 m high.	Perennial	Red flowers from April - May.	White to brown sandy clay, shallow sandy loam. Open mallee woodland, mallee scrub, flat plains.	Potential	Potential
Brachyloma sp. Forrestania White (M. Hislop & F. Hort MH 2591)	Erect shrub to approximately 1.5 m high.	Perennial	White flowers. May.	Plains, yellow sandy loams.	Potential	Unlikely
Dampiera scaevolina	Erect to ascending herb or shrub, 0.2-0.5 m high.	Perennial	Blue/white flowers from September - November.	Sandy and gravelly soils.	Unlikely	Unlikely
Dicrastylis capitellata	Low spreading shrub, 0.2-0.25 m high.	Perennial	Blue-purple flowers in May.	Loamy sand, sandy loam.	Unlikely	Unlikely
Dillwynia sp. Capel (P.A. Jurjevich 1771)	Erect, open, spreading shrub, to 2 m high.	Perennial	Yellow-orange-red - pink flowers from September - October.	Littered grey loamy sand, rocky soils. Valleys, rangelands.	Likely	Unlikely
Drosera grievei	Fibrous-rooted herb, to 0.03 m high.	Perennial	White flowers in September.	Clayey sand.	Unlikely	Unlikely
Eremophila adenotricha	Erect, bushy, viscid shrub, 0.6-1.2 m high.	Perennial	Blue flowers in September.	Red/brown earth, clay.	Unlikely	Unlikely

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Eremophila lucida	Shrub, to 1.8 m high.	Perennial	Cream-yellow flowers in October.	Clay loam, sandy loam. Adjacent to samphire flats and granite outcrops.	Unlikely	Unlikely
Eucalyptus myriadena subsp. *parviflora*	Mallee or tree, 3-10 m high, bark rough, coarse and flaky on trunk, smooth above.	Perennial	White flowers, April	Grey-whitish loams, brown sandy clays. Edges of swamps, slopes, plains.	Likely	Potential
Eucalyptus phenax subsp. *compressa*	Robust, erect (mallee), to 9 m high, bark rough, ribbony, tan to grey bark to 2m, smooth light grey over tan above.	Perennial	White flowers from September - December or January.	Gravelly clays to loams. Hilly sites.	Unlikely	Unlikely
Hemigenia sp. Newdegate (E. Bishop 75)	Spindly, erect to spreading shrub, 0.2-0.45 m high, to 0.5 m wide.	Perennial	Blue/purple flowers from September - October.	Upper slopes, Clay loam. Disturbed sites.	Potential	Unlikely
Lepidosperma amantiferrum	Tufted rhizomatous, herb (sedge), culms and leaves distichous.	Perennial	No information available.	Yellow sandy loam with banded ironstone gravel and rocks. Gentle lower slopes, broad flats	Potential	Unlikely
Lepidosperma ferriculmen	Tufted rhizomatous, herb (sedge), culms and leaves distichous.	Perennial	July	Well-drained orange-red sandy loam with banded ironstone gravel and rocks. Stony slopes.	Potential	Unlikely
Leucopogon sp. Yellowdine (M. Hislop & F. Hort MH 3194)	Shrub.	Perennial	White flowers.	Mixed heath, undulating sand plains, yellow sands.	Unlikely	Unlikely
Stenanthemum liberum	Dwarf shrub, ca 0.5 m high.	Perennial	No information available.	Slopes, Banded ironstone formation, yellow sandy loam over laterite.	Potential	Unlikely

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Stylidium validum	Caespitose herb, 0.06-0.3 m high,	Perennial	White/pink flowers from September - October.	Clayey sand or loam, ironstone, greenstone gravel. Hill slopes and hilltops. Eucalypt woodland, mallee shrubland.	Potential	Unlikely
Xanthoparmelia sargentii	Prostrate Lichen	Lichen	No information available.	Granite outcrops	Unlikely	Unlikely
Priority 2						
Acacia asepala	Diffuse, much-branched shrub, 0.5-1.5 m high.	Perennial	Yellow flowers in August.	Red-brown sandy loam. Slopes, undulating plains, along drainage lines.	Likely	Unlikely
Acacia gemina	Erect, open shrub, 0.4-1.2 m high.	Perennial	Yellow flowers.	Lateritic gravelly soils, sandstone. Creek lines and gullies, scree slopes.	Potential	Unlikely
Acacia kerryana	Low, spreading, domed shrub, 0.3-1 m high.	Perennial	Yellow flowers from October - December or January - February.	Granitic loamy sand, stony clayey loam or clayey sand. Low stony ridges, undulating plains.	Potential	Unlikely
Acacia tuberculata	Diffuse, slender shrub, 0.3-1.8 m high.	Perennial	Yellow flowers in September.	Granite Outcrops.	Unlikely	Unlikely
Baeckea sp. North Ironcap (R.J. Cranfield 10580)	Erect, open shrub, to 0.4 m high.	Perennial	White/pink flowers in October.	Red clay. Slopes, Gently undulating sand plains.	Likely	Potential
Boronia westringioides	Erect shrub, 0.2-0.75 m high.	Perennial	Pink flowers from July - September.	Loamy sand. Plains.	Likely	Potential
Conospermum sigmoideum	Erect shrub, 0.2-0.5 m high.	Perennial	Blue flowers from August - September.	Yellow, white sands. Hillsides, plains, sand dunes.	Potential	Unlikely
Eutaxia lasiocalyx	Low, spreading, multi-stemmed shrub, to 0.15 m high.		Yellow flowers.	Red sandy loam, laterite and quartz gravel. Gentle lower slopes.	Potential	Unlikely
Kulinia eludens	Rhizomatous, tufted herb (sedge-like).	Perennial	Brown flowers in November.	Deep yellow sand. Openings in open shrubland.	Unlikely	Unlikely

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Olearia laciniifolia	Erect, few-stemmed shrub, 0.6-1.2 m high.	Perennial	Blue/purple and white/yellow flowers from May - Sep.	White sand. Around playa lakes.	Unlikely	Unlikely
Stypandra jamesii	Effuse, spreading rhizomatous herb, to 0.3 m high.	Perennial	Cream-white flowers from October to November.	Shallow soils. Crevices and fissures in granite rocks, around edges of outcrops.	Unlikely	Unlikely
Synaphea cervifolia	Shrub, to 0.3 m high.	Perennial	Yellow flowers from June - October.	Sandy clay and gravel.	Unlikely	Unlikely
Priority 3						
Acacia lanei	Spreading shrub, 1.5-2.3 m high.	Perennial	Yellow flowers from July to September.	Clay, clay loam, gravelly loam. Along drainage lines and creeks.	Unlikely	Unlikely
Acacia obesa	Low spreading shrub, 0.3-0.6(-1) m high.	Perennial	Yellow flowers from July to September.	Yellow sand, gravelly loam.	Unlikely	Unlikely
Acacia undosa	Dense, spreading shrub, 0.3-1.5 m high.	Perennial	Yellow flowers from July to September.	Sandy clay loam, clayey sand. Undulating plains, low-lying areas.	Potential	Unlikely
Baeckea sp. Hyden (J.M. Brown 141)	Shrub, 0.25-0.75 m high.	Perennial	Pink-white flowers in May or August - October.	Sandy gravel, sandy clay, gravelly loam.	Unlikely	Unlikely
Baeckea sp. Parker Range (M. Hislop & F. Hort MH 2968)	Straggly, erect shrub, to 1.5 m high.	Perennial	Pink flowers in June.	Yellow to orange sandy loam with laterite gravel. Hill slopes, gently undulating sand plains, low ridges, road verges.	Likely	Potential
Banksia rufa subsp. *flavescens*	Prostrate, lignotuberous shrub, to 0.45 m high.	Perennial	Cream-yellow flowers from July to August.	Sandy loam or sand with gravel.	Potential	Potential
Banksia viscida	Densely branched, non-lignotuberous shrub, 0.4-1 m high.	Perennial	Yellow-orange flowers from July - October.	Gravelly soils. Lateritic rises.	Potential	Potential

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Bossiaea flexuosa	Compact shrub, to 0.6 m high.	Perennial	Yellow-orange-red-brown flowers from September - November.	Deep sandy soil.	Potential	Unlikely
Comesperma calcicola	Soft herb, to 0.3 m high.	Perennial	Pink flowers from October - December or January.	Calcareous or semi-saline clay loams, limestone. Areas around saline water.	Unlikely	Unlikely
Cryptandra dielsii	Intricately branched, spreading shrub, 0.2-0.6 m high.	Perennial	White flowers from July - September.	Sand, often over laterite. Sand plains.	Unlikely	Unlikely
Cryptandra polyclada subsp. *polyclada*	Mat-forming or upright shrub, 0.1-0.7 m high.	Perennial	White/cream flowers from January - May or August - October.	Gravel, Sand. Sand plains.	Likely	Potential
Daviesia elongata subsp. *implexa*	Spreading or sprawling shrub, 0.4-1 m high.	Perennial	Yellow/orange & red flowers in September.	Sand and laterite.	Likely	Potential
Elatine macrocalyx	Prostrate, glabrous, mat-forming herb.	Annual	White flowers from May - October (probably opportunistic).	Shallow sands over clay. Margins of playa lakes and clay pans.	Unlikely	Unlikely
Eucalyptus exigua	Mallee, 2-5 m high, bark smooth.	Perennial	White-cream flowers in March.	Sandy loam, white sand. Sand plains.	Potential	Unlikely
Eucalyptus ornata	Tree, 6-10 m high, bark smooth, grey.	Perennial	White flowers.	Laterite. Ridges.	Unlikely	Unlikely
Eutaxia acanthoclada	Compact, mat-forming, prostrate shrub, to 0.3 m high.	Perennial	Yellow/orange/red, flowers from October - November.	Light brown sandy clay, shallow sandy loam, red clay over banded ironstone, gravel. Gently undulating plains.	Likely	Potential

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Eutaxia nanophylla	Straggly, rounded shrub, to 0.35 m high.	Perennial	Yellow - orange - red flowers from October - November.	Clayey sand, red clay, stoney clayey loam. Low-lying areas, damp flats, slopes, undulating plains, low stony ridges.	Likely	Potential
Eutaxia rubricarina	Straggling shrub, to 0.5 m high.	Perennial	Orange and yellow and brown flowers in August or October.	Gravelly sand, grey to pinkish-white sandy clay, red loam. Flats, slopes, valley floors, road verges.	Likely	Potential
Frankenia drummondii	Prostrate shrub.	Perennial	White flowers.	Sand. Lake edges.	Unlikely	Unlikely
Grevillea insignis subsp. *elliotii*	Erect, bushy, non-lignotuberous shrub, 1-2 m high.	Perennial	Red/pink - cream - white flowers in October.	Gravelly sand or loam over ironstone. Hilltops or rises.	Potential	Unlikely
Grevillea pilosa subsp. *redacta*	Spreading to prostrate, non-lignotuberous shrub, 0.4-1.2 m high.	Perennial	Red flowers in February or October or December.	Amongst medium trees, or low trees, or low (sclerophyll) shrubland; in gravelly soil, or sand, or loam; occupying gravel rises.	Potential	Unlikely
Hakea pendens	Shrub, 2-3 m high, 2.5-3.1 m wide.	Perennial	Pink-white in September.	Stony loam. Ironstone ridges.	Unlikely	Unlikely
Hibbertia pachyphylla	Shrub, to 0.5 m high.	Perennial	Yellow flowers from September - November.	White to yellow sand, brown sandy gravel, gravelly loam, laterite, granite, quartz. Undulating plains, low rises, valley floors.	Potential	Potential
Isolepis australiensis	Grass-like or herb (sedge), 0.03-0.055 m high.	Annual	Flowers in June or September.	Silty sand, sandy clay. Lake margins, pools.	Unlikely	Unlikely
Keraudrenia adenogyna	Erect shrub, ca 0.4 m high.	Perennial	Purple-blue flowers in September.	Heavy loamy clay, loamy gravelly soils. Low-lying area.	Potential	Unlikely
Melaleuca ochroma	Shrub.	Perennial	Pale pink/mauve	Sandy loams and clays	Unlikely	Unlikely

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
			flowers in October/November.			
Microseris scapigera	Erect tuberous herb, 0.15-0.8 m high, summer-dormant.	Perennial	Yellow flowers from September - October.	Sandy soils. Margins of salt lakes, granite rock areas, samphire flats.	Unlikely	Unlikely
Mirbelia densiflora	Erect or straggling shrub, 0.2-1 m high.	Perennial	Yellow-orange flowers in October or January.	Stony loam, loamy sand. Small ridges, breakaways, undulating plains.	Unlikely	Unlikely
Oxymyrrhine plicata	Shrub.	Perennial			Unlikely	Unlikely
Persoonia cymbifolia	Erect, spreading shrub, 0.2-0.6(-1) m high.		Yellow flowers in December or January.	Sandy soils. On flats or in rock crevices.	Potential	Unlikely
Phebalium brachycalyx	Shrub, 0.4-1.5 m high.		Yellow-cream-white flowers from August - September.	Sand, gravelly soils. Lateritic uplands, hills.	Unlikely	Unlikely
Phebalium drummondii	Upright shrub, 0.6-1.5 m high.		Yellow flowers from July to September.	Gravelly sandy or clayey soils. Flats, roadsides.	Unlikely	Unlikely
Pityrodia scabra subsp. *dendrotricha*	Shrub.	Perennial	White flowers.	Low plains near water.	Potential	Unlikely
Prostanthera nanophylla	Shrub, 0.1-1 m high.		Blue-purple-white flowers from August to November.	Yellow sand over laterite, rocky loam. Sand plains.	Unlikely	Unlikely
Pultenaea daena	Dense, prostrate, domed shrub, to 0.07 m high.		Yellow flowers in March.	White to yellow sand or sandy loam, sandy or loamy clay, gravel, limestone, dolomite, laterite. Gently undulating plains, adjacent to salt lakes, in disturbed areas.	Likely	Potential

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Sphaerolobium validum	Erect shrub, to 0.9 m high.	Perennial	Yellow and red flowers in September.	White-grey sand, red-brown clayey sand, laterite gravel and quartz pebbles. Gently undulating areas, flats, roadsides.	Potential	Potential
Stylidium rhipidium	Slender herb, ca 0.05 m high.	Annual	White flowers from October - November.	Sandy soils. Wet creek flats, swamps, granite outcrops.	Potential	Unlikely
Stylidium sejunctum	Caespitose herb, 0.25-0.45 m high.	Perennial	White/pink-purple flowers from September - November.	Clayey sand or loam, laterite. Outcrops, upper slopes, breakaways. Mallee and Allocasuarina shrubland.	Likely	Potential
Thelymitra variegata	Tuberous herb, 0.1-0.35 m high.	Perennial	Orange - red - purple - pink flowers from June - September	Sandy clay, sand, laterite.	Unlikely	Unlikely
Thysanotus cymosus	Caespitose herb (with fibrous roots with ellipsoidal tubers), to 0.3 m high.	Perennial	Purple flowers from September - October	Clay, granitic or lateritic sand.	Unlikely	Unlikely
Verticordia gracilis	Low, slender shrub, 0.15-0.6 m high.		Pink flowers from October - November.	Yellow sand, gravelly sand, sandy loam.	Likely	Potential
Verticordia mitodes	Spreading shrub, 0.15-0.7 m high.		Pink-purple flowers from October - December or January.	Yellow sand. Undulating plains.	Likely	Potential

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Priority 4						
Banksia shanklandiorum	Upright, non-lignotuberous shrub, 0.4-2.5 m high, to 3 m wide.	Perennial	June - August.	White/yellow sand with lateritic gravel.	Unlikely	Unlikely
Calamphoreus inflatus	Erect, spreading shrub, 0.4-1.6 m high, to 2 m wide.		Blue-purple/green flowers from October - December or February - March.	Clay loam with ironstone gravel. Flats, slopes, disturbed sites.	Potential	Unlikely
Daviesia oxylobium	Glaucous shrub, 0.5-1 m high.	Perennial	Yellow - red - pink flowers from July - August.	Sandy lateritic soils. Undulating plains.	Unlikely	Unlikely
Drosera graniticola	Erect tuberous herb, 0.1-0.2 m high.	Perennial	White flowers from August - September.	Granite outcrops.	Unlikely	Unlikely
Eremophila biserrata	Prostrate shrub, to 3 m wide.	Perennial	Green/yellow-green flowers from September - November or March.	Sandy or sandy clay soils. Alluvial flats, salt flats and lakes.	Unlikely	Unlikely
Eremophila racemosa	Erect shrub, 0.5-1.7 m high.	Perennial	Purple-pink-red/white flowers in March or August - December.	Sandy or stony loam, clay loam. Hills, undulating plains, roadsides.	Potential	Unlikely
Eremophila serpens	Prostrate, creeping, forming large patches shrub, 0.03-0.4 m high, forming large patches to 2 m wide.	Perennial	Green/yellow-green flowers from September - December or March to May.	White/grey sand, alluvium, loam. Winter-wet depressions, sub-saline flats, drainage lines, salt lakes.	Unlikely	Unlikely

Species	Habit	Life Form	Flowering time	Habitat	Likelihood of Occurrence	
					Pre-survey	Post-survey
Eucalyptus georgei subsp. *fulgida*	Tree, 4-20 m high, bark smooth, often hanging in ribbons.	Perennial	Cream-white flowers.	Sandy loam, clayey sand. Slight depressions.	Potential	Unlikely
Grevillea prostrata	Loose, prostrate shrub, 0.04-0.1 m high, 0.8-1.2 m wide.	Perennial	Cream-white/pink-red flowers from August - December or January.	White, grey or yellow sand, gravel. Sand plains.	Likely	Potential
Gyrostemon ditrigynus	Shrub, 0.4-1.5 m high.		Creamy green flowers, May	Sand, sandy clay, loam. Plains, low ironstone ridges.	Potential	Potential
Haegiela tatei	Ascending to erect herb, 0.02-0.08(-0.2) m high.	Annual	White-yellow flowers from August to November.	Clay, sandy loam, gypsum. Saline habitats.	Unlikely	Unlikely
Microcorys sp. Forrestania (V. English 2004)	Prostrate or erect shrub, 0.35-0.4 m high.	Perennial	White/purple flowers in January or April.	Yellow sandy clay or red-brown clay. Open woodland or cleared areas.	Likely	Potential
Sowerbaea multicaulis	Tufted herb, 0.075-0.25 m high.	Perennial	Purple-violet flowers from October - December or January.	Yellow-brown sand.	Potential	Potential
Likely	Species previously recorded within 10 km of the survey area and suitable habitat appears to be present in the survey area.					
Potential	Species previously recorded within 10 - 20 km of the survey area and/or suitable habitat appears to be present in the survey area.					
Unlikely	No preferable habitat appears to be present in the survey area.					

Table C.2: Likelihood of occurrence of conservation significant fauna species listed as potentially occurring in the vicinity of the survey area (*NatureMap* (DPaW 2014e), DPaW Threatened Fauna Database (DPaW 2014f), PMST (DoE, 2014c).

Scientific name (common name)	Conservation codes			Preferred habitat	Likelihood of Occurrence
	EPBC	WC	DPaW		
Reptiles					
Morelia spilota subsp. *imbricata* (carpet python)		S4		Semi-arid coastal and inland habitats, banksia woodland, eucalypt woodlands, and grasslands and commonly utilises hollow logs for shelter.	High
Paroplocephalus atriceps (Lake Cronin snake)			P3	Semiarid southern interior of Western Australia (Lake Cronin, Peak Eleanor and Maggi Hayes Hills).	High
Birds					
Apus pacificus (fork-tailed swift)	Mi	S3		Largely aerial species independent of the terrestrial environment.	Low
Ardea modesta (eastern great egret)	Mi			Shallow freshwaters and salt waters; rarely dry pastures.	Low
Ardea ibis (cattle egret)	Mi	S3		Largely wetland species however can exploit drier open habitats more than other heron species.	Low
Charadrius rubricollis (hooded plover)			P4	Inhabits sandy, ocean beaches, with highest densities on beaches with large amounts of washed up seaweed and open dunes. Also inhabits coastal and inland saltlakes.	Low
Calidris acuminata (sharp-tailed sandpiper)	Mi	S3		Muddy edges of shallow fresh/brackish wetlands with emergent sedges, saltmarsh, grass and low vegetation	Low
Falco peregrinus (peregrine falcon)		S4		Found throughout most of Australia across most habitat types, but especially areas with cliffs and rocky outcrops.	Moderate

Scientific name (common name)	Conservation codes			Preferred habitat	Likelihood of Occurrence
	EPBC	WC	DPaW		
Ardeotis australis (Australian bustard)			P4	Grassland, open woodland and open agricultural country across northern Australia.	Moderate
Leipoa ocellata (malleefowl)	Vu	S1		Largely confined to arid and semi-arid woodland that is dominated by mallee eucalypts on sandy soils with less than 430 mm of rainfall annually.	Moderate
Merops ornatus (rainbow bee-eater)	Mi	S3		Lightly wooded, preferably sandy country near water.	High
Calyptorhynchus baudinii (Baudin's cockatoo)	Vu	S1		Eucalypt forest, where it feeds on mainly marri seeds, flowers, nectar and buds. Also feed on seeds of *Eucalyptus, Hakea, Banksia* and pine species.	Moderate
Calyptorhynchus latirostris (Carnaby's cockatoo)	En	S1		Woodland or forest that contains live or dead trees of Salmon Gum, Wandoo, Tuart, Jarrah, Flooded Gum, Karri or Marri. Feeds on seeds, flowers and nectar of native proteaceous plant species (e.g. *Banksia* spp., *Dryandra* spp., *Grevillea* spp.), eucalypts and *Pinus* spp.	High
Platycercus icterotis subsp. *xanthogenys* (western rosella (inland))			P4	Open eucalypt forest and timbered areas, including cultivated land and orchards. Also found in drier woodland, with a heath understorey.	High
Pomatostomus superciliosus subsp. *ashbyi* (white-browed babbler (western Wheatbelt))			P4	Dry sclerophyll woodlands with shrubby understorey, mulga, acacias, mallee, Cyprus pine scrubs, timber, scrub along watercourses and saltbush.	High
Oreoica gutturalis subsp. *gutturalis* (crested bellbird (southern))			P4	Most types of scrubs and thickets including open *Banksia* scrubs and heathland with emergent *Eucalyptus todtiana.*	High-recorded

Scientific name (common name)	Conservation codes			Preferred habitat	Likelihood of Occurrence
	EPBC	WC	DPaW		
Falcunculus frontatus subsp. *leucogaster* (crested shrike-tit (south-western))			P4	Open eucalypt forest and woodland.	Moderate
Hylacola cauta subsp. *whitlocki* (shy heathwren (western))			P4	Found in shrublands, including understorey of eucalypt woodlands and scrubs, post fire regeneration and uncleared road verges and remnants in farmlands. It favours scrubs with stony soils.	High
Mammals					
Dasyurus geoffroii (chuditch, western quoll)	Vu	S1		Wandoo and Salmon Gum woodland, mallee, Jarrah forest and mixed Marri/Jarrah forest.	High
Macropus irma (western brush wallaby)			P4	Open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets.	Moderate
Phascogale calura (red-tailed phascogale)	En	S1		Wandoo and Sheoak woodland associations, with populations most dense in the latter vegetation type.	Low
Recorded	N/A				
High	Species has been recorded within the survey area or within 20 km of the survey area and preferred habitat appears to be present.				
Moderate	Species has not been recorded from within the survey area, however species has been recorded within 20 km of the survey area and suitable habitat appears to be present.				
Low	Species recorded within 20 km of the survey area but suitable habitat does not appear to be present.				

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Appendix D: Fauna Database Search and Literature Review Results

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Table D.1: List of amphibian fauna identified by the literature review and database searches as recorded within the vicinity of the survey area.

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D
			EPBC Act	WC Act	DPaW				
Limnodynastidae									
Heleioporus albopunctatus	Western spotted frog					x			
Limnodynastes dorsalis	Western banjo frog					x			
Neobatrachus albipes	White-footed trilling frog					x			
Neobatrachus kunapalari	Kunapalari frog					x			
Neobatrachus pelobatoides	Humming frog					x			
Neobatrachus sutor	Shoemaker frog					x			
Myobatrachidae									
Crinia pseudinsignifera	Bleating froglet					x		x	
Pseudophryne occidentalis	Western toadlet					x		x	
Key: A = Listed in NatureMap or DPaW Threatened Fauna Search; B = Listed in the EPBC Protected Search Matters Tool; C = Recorded in previous surveys within the survey area; D = Recorded in current assessment.									

Table D.2: List of reptilian fauna identified by the literature review and database searches as recorded within the vicinity of the survey area.

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D
			EPBC Act	WC Act	DPaW				
Agamidae									
Ctenophorus adelaidensis	Western heath dragon							x	
Ctenophorus chapmani	Eastern heath dragon					x			
Ctenophorus cristatus	Bicycle dragon					x		x	
Ctenophorus maculatus	Spotted military dragon					x		x	
Ctenophorus maculatus badius									
Ctenophorus maculatus dualis									
Ctenophorus maculatus griseus						x		x	
Ctenophorus ornatus	Ornate crevice dragon					x			
Ctenophorus salinarum	Salt pan dragon					x			
Moloch horridus	Thorny devil					x		x	
Pogona minor								x	
Pogona minor minor						x		x	
Diplodactylidae									
Crenadactylus ocellatus	Clawless gecko					x		x	
Crenadactylus ocellatus ocellatus						x		x	
Diplodactylus calcicolus	South coast gecko					x			
Diplodactylus granariensis						x		x	
Diplodactylus granariensis granariensis						x		x	
Diplodactylus pulcher						x		x	
Hesperoedura reticulata						x		x	
Lucasium maini						x		x	
Strophurus spinigerus								x	
Strophurus spinigerus inornatus						x			
Carphodactylidae									
Underwoodisaurus milii	Southern barking gecko					x		x	
Gekkonidae									

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D
			EPBC Act	WC Act	DPaW				
Gehyra variegata						x		x	
Pygopodidae									
Delma australis						x		x	
Delma fraseri						x		x	
Lialis burtonis						x		x	
Pygopus lepidopodus	Common scaly foot							x	
Scincidae									
Cryptoblepharus buchananii						x		x	
Cryptoblepharus plagiocephalus								x	
Ctenotus atlas						x			
Ctenotus impar						x		x	
Ctenotus schomburgkii						x		x	
Cyclodomorphus melanops elongatus						x			
Egernia richardi						x		x	
Hemiergis initialis						x		x	
Hemiergis initialis brookeri								x	
Hemiergis initialis initialis						x			
Lerista distinguenda						x		x	
Lerista dorsalis								x	
Lerista picturata						x		x	
Liopholis multiscutata						x		x	
Menetia greyii						x			
Morethia butleri						x			
Morethia obscura						x		x	
Tiliqua occipitalis	Western bluetongue					x		x	
Tiliqua rugosa						x		x	
Varanidae									
Varanus gouldii	Bungarra or sand monitor					x		x	
Varanus rosenbergi	Heath monitor							x	

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D
			EPBC Act	WC Act	DPaW				
Typhlopidae									
Ramphotyphlops australis						x		x	
Ramphotyphlops bituberculatus						x			
Boidae									
Morelia spilota imbricata	Carpet python			S4		x		x	
Elapidae									
Neelaps bimaculatus	Black-naped snake					x			
Parasuta gouldii						x		x	
Parasuta nigriceps						x		x	
Paroplocephalus atriceps	Lake Cronin snake				P3	x			
Pseudonaja affinis	Dugite					x		x	
Pseudonaja affinis affinis						x			
Simoselaps bertholdi	Jan's banded snake					x		x	
Key: A = Listed in NatureMap or DPaW Threatened Fauna Search; B = Listed in the EPBC Protected Search Matters Tool; C = Recorded in previous surveys within the survey area; D = Recorded in current assessment.									

Table D.3: List of avian fauna identified by the literature review and database searches as recorded within the vicinity of the survey area.

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D	E
			EPBC Act	WC Act	DPaW					
Casuariidae										
Dromaius novaehollandiae	Emu					x		x	x	
Megapodiidae										
Leipoa ocellata	Malleefowl		VU	S1		x	x	x	x	
Anatidae										
Biziura lobata	Musk duck					x				
Stictonetta naevosa	Freckled duck					x				
Cygnus atratus	Black swan					x				
Tadorna tadornoides	Australian shelduck					x		x		
Chenonetta jubata	Australian wood duck					x				
Malacorhynchus membranaceus	Pink-eared duck					x				
Anas rhynchotis	Australasian shoveler					x				
Anas gracilis	Grey teal					x		x		
Anas castanea	Chestnut teal					x				
Anas superciliosa	Pacific black duck					x				
Aythya australis	Hardhead					x				
Podicipedidae										
Tachybaptus novaehollandiae	Australasian grebe					x				
Poliocephalus poliocephalus	Hoary-headed grebe					x				
Podiceps cristatus	Great crested grebe					x				
Columbidae										
Phaps chalcoptera	Common bronzewing					x		x	x	x
Phaps elegans	Brush bronzewing					x		x	x	
Ocyphaps lophotes	Crested pigeon					x		x		
Podargidae										
Podargus strigoides	Tawny frogmouth					x		x	x	
Eurostopodidae										
Eurostopodus argus	Spotted nightjar							x	x	

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D	E
			EPBC Act	WC Act	DPaW					
Aegothelidae										
Aegotheles cristatus	Australian owlet-nightjar							x	x	
Apodidae										
Apus pacificus	Fork-tailed swift			S3			x	x		
Ardeidae										
Ardea modesta	Eastern great egret			S3			x			
Ardea ibis	Cattle egret			S3			x			
Egretta novaehollandiae	White-faced Heron							x		
Threskiornithidae										
Threskiornis molucca	Australian white ibis					x				
Threskiornis spinicollis	Straw-necked Ibis					x				
Accipitridae										
Lophoictinia isura	Square-tailed kite							x	x	
Haliastur sphenurus	Whistling kite							x		
Accipiter fasciatus	Brown goshawk							x		
Accipiter cirrocephalus	Collared sparrowhawk					x		x	x	
Aquila audax	Wedge-tailed eagle					x		x	x	x
Hieraaetus morphnoides	Little eagle							x		
Falconidae										
Falco cenchroides	Nankeen kestrel					x		x	x	
Falco berigora	Brown falcon					x		x	x	x
Falco longipennis	Australian hobby					x		x		
Falco peregrinus	Peregrine falcon			S4		x		x	x	
Rallidae										
Fulica atra	Eurasian coot					x				
Recurvirostridae										
Cladorhynchus leucocephalus	Banded stilt							x		
Charadriidae										
Charadrius ruficapillus	Red-capped plover							x		

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D	E
			EPBC Act	WC Act	DPaW					
Thinornis (Charadrius) rubricollis	Hooded plover				P4		x			
Scolopacidae										
Calidris acuminata	Sharp-tailed sandpiper			S3		x				
Turnicidae										
Turnix velox	Little button-quail					x			x	
Cacatuidae										
Calyptorhynchus baudinii	Baudin's black-cockatoo		VU	S1		x				
Calyptorhynchus latirostris	Carnaby's black-cockatoo		EN	S1		x	x	x	x	
Eolophus roseicapillus	Galah							x	x	x
Nymphicus hollandicus	Cockatiel					x				
Psittacidae										
Glossopsitta porphyrocephala	Purple-crowned lorikeet					x		x	x	
Polytelis anthopeplus	Regent parrot					x		x	x	
Platycercus icterotis	Western rosella					x		x	x	
Platycercus icterotis xanthogenys	Western rosella (Inland ssp)				P4	x				
Barnardius zonarius	Australian ringneck					x		x	x	x
Psephotus varius	Mulga parrot					x				
Melopsittacus undulatus	Budgerigar					x		x		
Neophema elegans	Elegant parrot					x		x	x	
Cuculidae										
Chalcites basalis	Horsfield's bronze-cuckoo							x		
Chalcites osculans	Black-eared cuckoo							x		
Chalcites lucidus	Shining bronze-cuckoo							x	x	
Cacomantis pallidus	Pallid cuckoo					x		x		
Cacomantis flabelliformis	Fan-tailed cuckoo					x		x	x	
Strigidae										
Ninox novaeseelandiae	Southern boobook					x		x	x	
Halcyonidae										
Todiramphus pyrrhopygius	Red-backed kingfisher					x		x		

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D	E
			EPBC Act	WC Act	DPaW					
Todiramphus sanctus	Sacred kingfisher					x		x		
Meropidae										
Merops ornatus	Rainbow bee-eater					x	x	x	x	
Climacteridae										
Climacteris rufa	Rufous treecreeper					x		x	x	
Maluridae										
Malurus splendens	Splendid fairy-wren					x				
Malurus leucopterus	White-winged fairy-wren					x		x		
Malurus pulcherrimus	Blue-breasted fairy-wren					x		x	x	x
Stipiturus malachurus	Southern emu-wren								x	
Acanthizidae										
Sericornis frontalis	White-browed scrubwren					x		x		
Hylacola cauta	Shy heathwren					x		x	x	
Hylacola cauta whitlocki	Shy heathwren (Western ssp)				P4	x			x	
Calamanthus campestris	Rufous fieldwren					x		x	x	
Pyrrholaemus brunneus	Redthroat					x		x	x	
Smicrornis brevirostris	Weebill					x		x	x	x
Gerygone fusca	Western gerygone					x		x	x	x
Acanthiza chrysorrhoa	Yellow-rumped thornbill					x		x	x	
Acanthiza uropygialis	Chestnut-rumped thornbill					x		x	x	x
Acanthiza apicalis	Inland thornbill					x		x	x	x
Pardalotidae										
Pardalotus punctatus	Spotted pardalote					x			x	
Pardalotus striatus	Striated pardalote					x		x	x	x
Meliphagidae										
Certhionyx variegatus	Pied honeyeater							x	x	
Lichenostomus virescens	Singing honeyeater							x	x	x
Lichenostomus leucotis	White-eared honeyeater					x		x	x	
Lichenostomus cratitius	Purple-gaped honeyeater					x		x	x	

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D	E
			EPBC Act	WC Act	DPaW					
Lichenostomus ornatus	Yellow-plumed honeyeater							x	x	
Lichenostomus plumulus	Grey-fronted honeyeater								x	
Purnella albifrons	White-fronted honeyeater							x	x	
Manorina flavigula	Yellow-throated miner					x		x	x	x
Acanthagenys rufogularis	Spiny-cheeked honeyeater					x		x	x	x
Anthochaera lunulata	Western wattlebird					x				
Anthochaera carunculata	Red wattlebird					x		x	x	x
Epthianura albifrons	White-fronted chat					x				
Sugomel niger	Black honeyeater							x		
Glyciphila melanops	Tawny-crowned honeyeater							x	x	x
Lichmera indistincta	Brown honeyeater					x		x	x	x
Phylidonyris novaehollandiae	New Holland honeyeater					x				
Phylidonyris niger	White-cheeked honeyeater							x	x	
Melithreptus brevirostris	Brown-headed honeyeater					x		x	x	
Pomatostomidae										
Pomatostomus superciliosus	White-browed babbler					x		x	x	
Pomatostomus superciliosus subsp. *ashbyi*	White-browed babbler (Western wheatbelt)				P4	x				
Eupetidae										
Cinclosoma castanotum	Chestnut quail-thrush							x	x	
Neosittidae										
Daphoenositta chrysoptera	Varied sittella					x		x	x	
Campephagidae										
Coracina novaehollandiae	Black-faced cuckoo-shrike					x		x	x	x
Lalage sueurii	White-winged triller							x	x	
Pachycephalidae										
Falcunculus frontatus leucogaster	Crested shrike-tit (southwestern ssp.)				P4			x		
Pachycephala inornata	Gilbert's whistler					x		x	x	

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D	E
			EPBC Act	WC Act	DPaW					
Pachycephala pectoralis	Golden whistler					x		x	x	
Pachycephala rufiventris	Rufous whistler					x		x		
Colluricincla harmonica	Grey shrike-thrush					x		x	x	
Oreoica gutturalis	Crested bellbird					x		x	x	
Oreoica gutturalis subsp. *gutturalis*	Crested bellbird (southern ssp.)				P4	x				x
Artamidae										
Artamus personatus	Masked woodswallow					x		x		
Artamus cinereus	Black-faced woodswallow					x		x	x	
Artamus cyanopterus	Dusky woodswallow					x		x	x	
Cracticus torquatus	Grey butcherbird					x		x	x	
Cracticus nigrogularis	Pied butcherbird					x		x	x	
Cracticus tibicen	Australian magpie					x		x	x	x
Strepera versicolor	Grey currawong					x		x	x	
Rhipiduridae										
Rhipidura albiscapa	Grey fantail					x		x	x	
Rhipidura leucophrys	Willie wagtail					x		x	x	x
Corvidae										
Corvus coronoides	Australian raven					x		x	x	x
Corvus bennetti	Little crow							x	x	
Corvus orru	Torresian crow							x		
Monarchidae										
Myiagra inquieta	Restless flycatcher					x				x
Grallina cyanoleuca	Magpie-lark					x				x
Petroicidae										
Microeca fascinans	Jacky winter					x		x	x	
Petroica goodenovii	Red-capped robin					x		x		
Melanodryas cucullata	Hooded robin							x	x	
Eopsaltria griseogularis	Western yellow robin					x		x	x	

Scientific Name	Common Name	Introduced	Conservation Codes			A	B	C	D	E
			EPBC Act	WC Act	DPaW					
Drymodes brunneopygia	Southern scrub-robin					x		x	x	
Megaluridae										
Cincloramphus mathewsi	Rufous songlark					x		x		
Timaliidae										
Zosterops lateralis	Silvereye					x		x	x	
Hirundinidae										
Hirundo neoxena	Welcome swallow					x		x		
Petrochelidon nigricans	Tree martin							x	x	x
Nectariniidae										
Dicaeum hirundinaceum	Mistletoebird							x		
Estrildidae										
Taeniopygia guttata	Zebra finch					x				
Motacillidae										
Anthus novaeseelandiae	Australasian pipit							x	x	x
Anthus cervinus	Red-throated pipit					x				
Key: A = Listed in NatureMap or DPaW Threatened Fauna Search; B = Listed in the EPBC Protected Search Matters Tool; C = Listed by Birdlife Birdata; D = Recorded in previous surveys within the survey area; E = Recorded in current assessment.										

Table D.4: List of mammalian fauna identified by the literature review and database searches as recorded within the vicinity of the survey area.

Scientific Name	Common name	Introduced	Conservation Codes			A	B	C	D
			EPBC Act	WC Act	DPaW				
Tachyglossidae									
Tachyglossus aculeatus	Short-beaked echidna							x	
Dasyuridae									
Dasyurus geoffroii	Western quoll, chuditch		VU	S1		x	x	x	
Ningaui yvonneae	Southern ningaui					x			
Phascogale calura	Red-tailed phascogale		EN	S1			x		
Sminthopsis crassicaudata	Fat-tailed dunnart					x		x	
Sminthopsis gilberti	Gilbert's dunnart					x		x	
Sminthopsis granulipes	White-tailed dunnart					x		x	
Sminthopsis griseoventer	Grey-bellied dunnart							x	
Macropodidae									
Macropus fuliginosus	Western grey kangaroo					x		x	x
Macropus irma	Western brush wallaby				P4	x		x	
Burramyidae									
Cercartetus concinnus	Western pygmy-possum, mundarda					x		x	
Tarsipedidae									
Tarsipes rostratus	Honey possum, noolbenger							x	
Vespertilionidae									
Chalinolobus gouldii	Gould's wattled bat					x		x	
Chalinolobus morio	Chocolate wattled bat					x		x	
Nyctophilus geoffroyi	Lesser long-eared bat					x		x	
Vespadelus regulus	Southern forest bat					x		x	
Molossidae									
Mormopterus planiceps	Southern freetail-bat					x		x	
Tadarida australis	White-striped freetail-bat							x	
Muridae									
Mus musculus	House mouse	*				x	x	x	
Notomys mitchellii	Mitchell's hopping-mouse					x		x	

Scientific Name	Common name	Introduced	Conservation Codes			A	B	C	D
			EPBC Act	WC Act	DPaW				
Pseudomys albocinereus	Ash-grey mouse					x		x	
Leporidae									
Oryctolagus cuniculus	European rabbit	*				x	x	x	
Canidae									
Canis lupus familiaris	Dog	*						x	
Vulpes vulpes	Red fox	*				x	x	x	
Felidae									
Felis catus	Cat	*				x	x	x	
Suidae									
Sus scrofa	Pig	*					x		
Camelidae									
Camelus dromedarius	Dromedary, camel	*					x		
Key: A = Listed in NatureMap or DPaW Threatened Fauna Search; B = Listed in the EPBC Protected Search Matters Tool; C = Recorded in previous surveys within the survey area; D = Recorded in current assessment.									

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Appendix E: Vegetation Association Mapping and Priority Flora Location

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751000 751500 752000 752500

6409500 6409000 6408500 6408000

Vegetation Mapping

Sandplain Heath

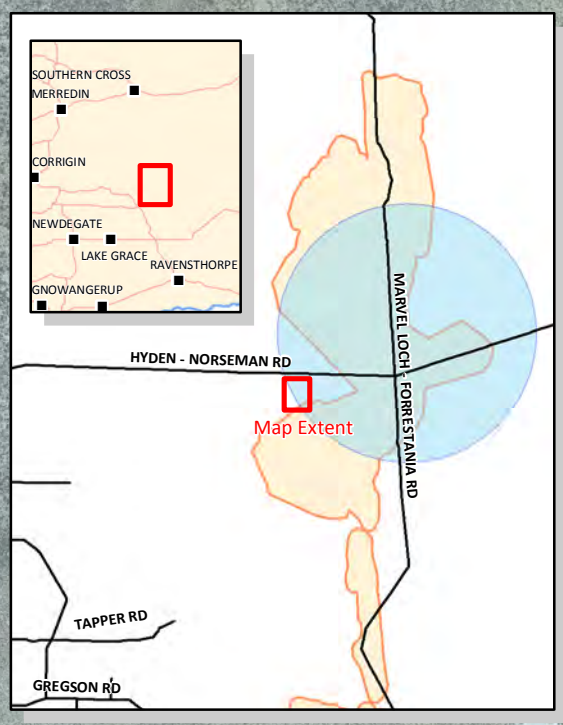
SpH1 — *Banksia cirsioides* open low scrub over mixed dwarf scrub.
Associated species: *Petrohile ericifolia* subsp. *ericifolia, Beaufortia interstans, Hakea corymbosa, Grevillea cagiana, Allocasuarina microstachya, Verticordia chrysanthella, Verticordia inclusa, Melaleuca seriata, Mesomelaena preissii.*

Eucalyptus Mallee Woodlands

EMW1 — *Eucalyptus eremophila* open tree mallee over mixed *Melaleuca* species open dwarf scrub to heath.
Associated species: *Eucalyptus platycorys, Melaleuca hamata, Melaleuca eleuterostachya, Melaleuca adnata, Melaleuca glaberrima, Dodonaea bursarifolia, Phebalium tuberculosum, Lepidosperma viscidum.*

EMW2 — *Eucalyptus platycorys* open tree mallee to tree mallee over *Melaleuca hamata* open low scrub to low scrub over mixed open dwarf scrub.
Associated species: *Eucalyptus rigidula, Melaleuca seriata, Melaleuca glaberrima, Leptospermum erubescens, Gastrolobium spinosum, Hibbertia gracilipes, Lepidosperma viscidum.*

Cleared



Eutaxia hirsuta (P2)

SpH1

SpH1

EMW2

EMW2

EMW2

EMW1

EMW1

Legend

- Haul Road
- Survey Area
- Lake Cronin ESA

Priority Flora

- *Eutaxia hirsuta* (P2)

TEC/PEC Boundaries

- Ironcap Hills vegetation complexes (Mt Holland, Middle, North and South Ironcap Hills, Digger Rock and Hatter Hill) (banded ironstone formation)

Western Areas - Forrestania Nickel Operations
Lounge Lizard Vegetation, Flora and Fauna Biological Assessment

Appendix E: Vegetation Association Mapping and Priority Flora Location

astron environmental services

Author: N. Cadd	Date: 10-11-2014
Drawn: C. Dyde	Figure Ref: 17603-14-BIDR-1RevA_141110_AppE

Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:7,000 (A3)

0 100 200 300 400 500 Metres

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WSA Forrestania

Site **FOR01**

Location: Lounge lizard sand pit area. **Type:** Quadrat 20 x 20m

Date: 14/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751662 mE **Northing:** 6409206 mN

Habitat: Gently undulating sandplain.
Soil: Yellow beige sands.
Rock Type: N/A.
Vegetation: *Banksia cirsioides* open low scrub over mixed dwarf scrub.
Veg Condition: Excellent.
Fire Age: >10 years.

Species List

Name	Cover (%)	Height (m)
?Stylidium clavatum	+	0.20
Acacia acoma	+	0.20
Adenanthos argyreus	+	0.30
Allocasuarina humilis	+	1.00
Allocasuarina microstachya	2	0.30
Allocasuarina spinosissima	+	0.60
Aotus sp. Tortile (G.J. Keighery 3767)	+	0.40
Banksia cirsioides	1	1.00
Banksia laevigata subsp. *fuscolutea*	+	0.60
Banksia violacea	+	0.80
Beaufortia interstans	4	0.40
Boronia coerulescens subsp. *spicata*	+	0.20
Cassytha glabella	+	climber
Caustis dioica	+	0.15
Comesperma scoparium	+	0.40
Conospermum brownii	+	0.50

Eutaxia hirsuta	+	0.15
Grevillea cagiana	1	0.80
Grevillea shuttleworthiana subsp. *obovata*	+	0.90
Hakea corymbosa	1	0.50
Hemigenia westringioides	+	0.30
Isopogon scabriusculus	+	0.45
Lepidobolus preissianus	+	0.15
Lepidosperma sp.	+	0.30
Leptospermum fastigiatum	+	1.20
Leptospermum spinescens	+	0.60
Lysinema ciliatum	+	0.50
Melaleuca cordata	+	0.60
Melaleuca seriata	1	0.50
Mesomelaena preissii	1	0.30
Neurachne alopecuroidea	+	0.05
Petrophile ericifolia subsp. *ericifolia*	4	0.40
Petrophile stricta	+	1.00
Schoenus sp.	+	0.08
Stylidium sp.	+	0.04
Synaphea interioris	+	0.15
Tetratheca efoliata	+	0.15
Verticordia chrysanthella	2	0.50
Verticordia inclusa	+	0.40
Verticordia picta	+	0.30

WSA Forrestania Site FOR02

Location: Lounge lizard sand pit area. **Type:** Quadrat 20 x 20m

Date: 14/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751281 mE **Northing:** 6409186 mN

Habitat: Open sandplain.
Soil: Beige sands with scattered pea gravel.
Rock Type: Scattered surface pea gravel.
Vegetation: *Banksia cirsioides* open low scrub over mixed dwarf scrub.
Veg Condition: Excellent.
Fire Age: >10 years.
Notes: Bare ground: 10-20%.

Occasional patches of *Eucalyptus ?subangusta* subsp. *angusta, Melaleuca hamata* and *Melaleuca glaberrima* occurred in this vegetation association.

Species List

Name	Cover (%)	Height (m)
?Stylidium clavatum	+	0.10
Acacia acoma	+	0.20
Allocasuarina microstachya	2	0.25
Allocasuarina spinosissima	+	0.40
Aotus sp. Tortile (G.J. Keighery 3767)	+	0.30
Banksia cirsioides	1	1.00
Beaufortia interstans	5	0.40
Callitris columellaris	+	0.40
Conospermum brownii	+	0.10
Grevillea shuttleworthiana subsp. *obovata*	+	0.90
Hakea corymbosa	4	0.60
Hakea platysperma	1	0.60

Halgania lavandulacea	+	0.10
Hemigenia westringioides	+	0.10
Isopogon scabriusculus	+	0.60
Leptospermum fastigiatum	+	1.00
Leucopogon dielsianus	+	0.30
Melaleuca cordata	+	0.30
Melaleuca seriata	1	0.40
Mesomelaena preissii	1	0.20
Neurachne alopecuroidea	+	0.05
Petrophile ?divaricata	+	0.30
Petrophile ericifolia subsp. *ericifolia*	1	0.45
Petrophile stricta	1	0.50
Scaevola restiacea	+	0.30
Schoenus sp.	+	0.05
Stylidium sp.	+	0.05
Synaphea interioris	+	0.10
Tetratheca efoliata	+	0.15
Thysanotus sp.	+	climber
Verticordia chrysanthella	+	0.40
Verticordia inclusa	1	0.40
Verticordia picta	+	0.60

WSA Forrestania Site FOR03

Location: Lounge lizard sand pit area. **Type:** Quadrat 20 x 20m

Date: 15/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751142 mE **Northing:** 6408372 mN

Habitat: Very gently undulating/sloping plain.
Soil: Grey-beige sand.
Rock Type: N/A.
Vegetation: *Eucalyptus eremophila* and *Eucalyptus platycorys* open tree mallee over *Melaleuca hamata* and *Melaleuca eleuterostachya* low scrub over *Melaleuca glaberrima* open dwarf scrub with *Lepidosperma viscidum* very open tall sedges.
Veg Condition: Excellent.
Fire Age: >10 years.
Notes: Bare ground: 20-50%.

Species List

Name	Cover (%)	Height (m)
Allocasuarina spinosissima	+	0.40
Baeckea sp.	+	0.40
Beyeria sulcata ? var.	+	0.45
Callitris columellaris	+	1.00
Cassytha glabella	+	climber
Darwinia sp. Lake Cobham (K. Newbey 3262)	+	0.20
Daviesia lancifolia	+	0.40
Dodonaea viscosa subsp. *spatulata*	+	0.60
Eucalyptus eremophila	10	2.20
Eucalyptus platycorys	5	1.70
Eucalyptus rigidula	+	1.80
Gahnia ancistrophylla	+	0.15
Gastrolobium spinosum	+	0.40

Grevillea huegelii	+	0.70
Guichenotia micrantha	+	0.35
Hakea commutata	+	0.60
Lepidosperma viscidum	1	0.65
Melaleuca eleuterostachya	2	1.40
Melaleuca glaberrima	5	0.40
Melaleuca hamata	20	1.10
Melaleuca laxiflora	+	0.60
Melaleuca sp.	+	0.40
Phebalium tuberculosum	1	0.30
Santalum acuminatum	+	1.50
Verticordia plumosa var. *incrassata*	+	0.40

WSA Forrestania Site FOR04

Location: Lounge lizard sand pit area. **Type:** Quadrat 20 x 20m

Date: 15/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751421 mE **Northing:** 6408407 mN

Habitat: Gently sloping plain.
Soil: Greyish orange (pale) sands.
Rock Type: Pea gravel pebbles - very scattered.
Vegetation: *Eucalyptus platycorys* tree mallee over *Melaleuca hamata* low scrub over *Melaleuca seriata* and *Melaleuca glaberrima* open dwarf scrub with *Lepidosperma viscidum* very open tall sedges.
Veg Condition: Excellent.
Fire Age: >10 years.
Notes: Bare ground: 20-50%.

Species List

Name	Cover (%)	Height (m)
Banksia cirsioides	+	0.50
Callitris columellaris	+	0.70
Calytrix sp.	+	0.40
Cassytha glabella	+	climber
Darwinia sp. Lake Cobham (K. Newbey 3262)	+	0.20
Daviesia lancifolia	+	0.30
Desmocladus flexuosus	+	0.10
Eucalyptus platycorys	26	2.20
Eucalyptus rigidula	+	2.00
Gahnia ancistrophylla	+	0.40
Gastrolobium spinosum	+	0.50
Grevillea oncogyne	+	1.10
Guichenotia micrantha	+	0.30

Hibbertia gracilipes	+	0.30
Lepidosperma viscidum	1	0.50
Leptomeria preissiana	+	1.20
Lomandra mucronata	+	0.10
Lysinema ciliatum	+	0.60
Melaleuca glaberrima	1	0.40
Melaleuca hamata	10	1.0
Melaleuca seriata	6	0.40
Neurachne alopecuroidea	+	0.03
Olax benthamiana	+	0.40
Petrophile ?divaricata	+	0.40
Petrophile ericifolia subsp. *ericifolia*	+	0.30
Phebalium tuberculosum	+	0.40
Verticordia chrysanthella	+	0.40
Verticordia inclusa	+	0.40
Verticordia plumosa var. *incrassata*	+	0.45

WSA Forrestania Site FOR05

Location: Lounge lizard sand pit area. **Type:** Quadrat 20 x 20m

Date: 15/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751849 mE **Northing:** 6408430 mN

Habitat: Gently sloping sandplain.
Soil: Beige - fawn fine loamy sand.
Rock Type: Fine scattered pea gravel pebbles.
Vegetation: *Eucalyptus platycorys* open tree mallee over *Melaleuca hamata* and *Leptospermum erubescens* low scrub over *Melaleuca glaberrima, Gastrolobium spinosum* and *Hibbertia gracilipes* dwarf scrub with *Lepidosperma viscidum* very open low sedges.
Veg Condition: Excellent.
Fire Age: >10 years.
Notes: Bare ground: 50-90%.

Species List

Name	Cover (%)	Height (m)
Allocasuarina spinosissima	+	1.10
Banksia cirsioides	+	0.80
Calytrix sp.	+	0.40
Darwinia sp. Lake Cobham (K. Newbey 3262)	+	0.20
Daviesia benthamii	+	1.00
Daviesia lancifolia	+	0.30
Eucalyptus eremophila	+	2.20
Eucalyptus platycorys	15	1.50
Gastrolobium spinosum	1	0.40
Grevillea cagiana	+	1.00
Guichenotia micrantha	+	0.30
Hakea multilineata	+	1.40
Hibbertia gracilipes	1	0.30

Hibbertia pungens	+	0.15
Isopogon scabriusculus	+	0.50
Lepidosperma viscidum	1	0.40
Leptomeria preissiana	+	1.00
Leptospermum erubescens	1	1.00
Leucopogon sp.	+	0.20
Lysinema ciliatum	+	0.60
Melaleuca glaberrima	4	0.35
Melaleuca hamata	15	1.0
Micromyrtus erichsenii	+	0.40
Petrophile ericifolia subsp. *ericifolia*	+	0.45
Phebalium tuberculosum	+	0.20
Stylidium sp.	+	0.03
Verticordia chrysanthella	+	0.40

WSA Forrestania Site FOR06

Location: Lounge lizard sand pit area. **Type:** Quadrat 20 x 20m

Date: 15/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751727 mE **Northing:** 6408117 mN

Habitat: Undulating sandplain.
Soil: Orange-brown loamy sand.
Rock Type: N/A.
Vegetation: *Eucalyptus eremophila* open tree mallee over *Melaleuca hamata* and *Melaleuca adnata* heath.
Veg Condition: Excellent.
Fire Age: >10 years.
Notes: Bare ground: 20-50%.

Species List

Name	Cover (%)	Height (m)
Astartea aspera	+	0.60
Daviesia benthamii	+	1.00
Dodonaea bursariifolia	1	0.50
Eucalyptus eremophila	12	3.00
Hakea commutata	+	1.10
Lepidosperma viscidum	+	0.40
Melaleuca adnata	5	1.10
Melaleuca eleuterostachya	+	1.00
Melaleuca hamata	40	1.50
Melaleuca lateriflora	+	1.00
Melaleuca laxiflora	+	0.90
Phebalium tuberculosum	+	0.50
Santalum acuminatum	+	1.10

WSA Forrestania Site FOR07

Location: Lounge lizard sand pit area. **Type:** Quadrat 20 x 20m

Date: 21/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 752265 mE **Northing:** 6408463 mN

Habitat: Gently sloping sandplain.
Soil: Pale orange/yellow/grey sands.
Rock Type: N/A.
Vegetation: *Eucalyptus platycorys* open tree mallee over *Melaleuca hamata* low scrub.
Veg Condition: Excellent.
Fire Age: >10 years.
Notes: Bare ground: 50-90%.

Species List

Name	Cover (%)	Height (m)
Banksia cirsioides	+	0.80
Beaufortia interstans	+	0.40
Darwinia sp.	+	0.20
Daviesia lancifolia	+	0.40
Eucalyptus platycorys	10	2.10
Eucalyptus rigidula	1	1.10
Gahnia ancistrophylla	+	0.40
Gastrolobium spinosum	+	0.40
Gompholobium viscidulum	+	0.10
Grevillea cagiana	+	
Grevillea shuttleworthiana subsp. *obovata*	+	0.70
Guichenotia micrantha	+	0.40
Hakea corymbosa	+	0.50
Lepidosperma viscidum	+	0.60

Leptomeria preissiana	+	1.00
Leptospermum fastigiatum	+	0.60
Lysinema ciliatum	+	0.70
Melaleuca hamata	30	1.10
Melaleuca seriata	+	0.50
Phebalium tuberculosum	+	0.20
Verticordia chrysanthella	+	0.50

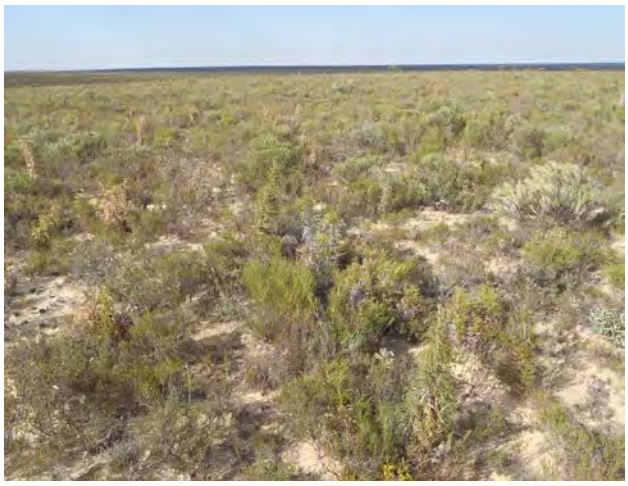
WSA Forrestania Site FORR01

Location: Lounge lizard sand pit area. **Type:** Relevé

Date: 16/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751245 mE **Northing:** 6408833 mN

Habitat: Crest of very low sandplain rise.
Soil: Yellow-grey sands.
Rock Type: N/A.
Vegetation: *Banksia cirsioides* open low scrub over mixed open dwarf scrub.
Veg Condition: Excellent.
Fire Age: >10 years.
Notes: Bare ground: 50-90%.



Species List

Name	Cover (%)	Height (m)
Adenanthos argyreus	+	0.20
Allocasuarina microstachya	2	0.20
Allocasuarina thuyoides	+	0.80
Banksia cirsioides	2	1.00
Banksia erythrocephala	+	0.80
Banksia laevigata subsp. *fuscolutea*	+	0.80
Beaufortia interstans	1	0.40
Grevillea cagiana	+	0.50
Grevillea shuttleworthiana subsp. *obovata*	+	0.80
Hakea corymbosa	1	0.50
Isopogon scabriusculus	+	0.50
Lepidobolus preissianus	+	0.15
Leptospermum spinescens	+	0.50
Lysinema ciliatum	+	0.90

Melaleuca cordata	+	0.50
Melaleuca seriata	1	0.40
Mesomelaena preissii	1	0.20
Neurachne alopecuroidea	+	0.05
Petrophile ericifolia subsp. *ericifolia*	2	0.30
Schoenus sp.	+	0.05
Synaphea interioris	+	0.20
Verticordia chrysanthella	+	0.50
Verticordia inclusa	+	0.40

WSA Forrestania Site FORR02

Location: Lounge lizard sand pit area. **Type:** Relevé

Date: 16/10/2014 **Described by:** NC/SS **Seasonal Conditions:** Excellent

MGA Zone: 50 **Easting:** 751498 mE **Northing:** 6408689 mN

Habitat: Sandplain.
Soil: Pale grey-yellow/orange sands.
Rock Type: N/A.
Vegetation: *Eucalyptus platycorys* tree mallee over *Melaleuca hamata* open low scrub.
Veg Condition: Excellent.
Fire Age: >10 years.

Species List

Name	Cover (%)	Height (m)
Acacia sphacelata subsp. *sphacelata*	+	0.50
Banksia cirsioides	+	0.80
Calytrix sp.	+	0.50
Desmocladus flexuosus	+	0.15
Eucalyptus platycorys	25	2.20
Gahnia ancistrophylla	+	0.20
Gompholobium viscidulum	+	0.15
Grevillea cagiana	+	0.90
Hibbertia gracilipes	1	0.35
Lepidosperma viscidum	+	0.70
Leptospermum fastigiatum	+	1.10
Lomandra mucronata	+	0.10
Lysinema ciliatum	+	0.70
Melaleuca hamata	8	1.10
Petrophile ericifolia subsp. *ericifolia*	+	0.30

Verticordia inclusa	+	0.50

WSA Forrestania **Site OPP**

Location: Lounge lizard sand pit area. **Type:** Opportunistic Collections

Date: 20/10/2014

Species List

Name

Acacia assimilis subsp. *assimilis*
Acacia burkittii
Acacia erinacea
Acacia poliochroa
Acacia sphacelata subsp. *sphacelata*
Allocasuarina acutivalvis subsp. *acutivalvis*
Allocasuarina thuyoides
Amphipogon turbinatus
Aotus sp. Tortile (G.J. Keighery 3767)
Astroloma serratifolium
Austrostipa hemipogon
Banksia elderiana
Banksia erythrocephala
Beaufortia micrantha var. *micrantha*
Callitris columellaris
Conospermum stoechadis subsp. *sclerophyllum*
Conostylis petrophiloides
Dampiera juncea
Daviesia benthamii
Daviesia benthamii subsp. *acanthoclona*
Desmocladus flexuosus
Dianella revoluta var. divaricata
Eremophila scoparia
Eucalyptus ?subangusta subsp. *subangusta*
Eucalyptus platycorys
Eutaxia neurocalyx subsp. *papillosa*
Exocarpos aphyllus
Exocarpos sparteus
Glischrocaryon roei
Grevillea excelsior
Grevillea incurva
Grevillea oncogyne
Hakea corymbosa
Hakea platysperma
Halgania lavandulacea
Lachnostachys bracteosa
Laxmannia paleacea
Leptomeria preissiana
Leucopogon sp. Coujinup (M.A. Burgman 1085)
Logania tortuosa
Lomandra effusa
Lomandra mucronata
Melaleuca glaberrima
Melaleuca hamata
Melaleuca lateriflora
Microcorys exserta
Neurachne alopecuroidea
Olearia ramosissima
Patersonia rudis subsp. *velutina*
Petrophile ?divaricata
Petrophile stricta
Pimelea suaveolens
Pimelea subvillifera
Santalum murrayanum
Templetonia rossii
Verticordia picta
Verticordia plumosa var. *incrassata*
Verticordia roei subsp. *roei*
Westringia cephalantha

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Appendix G: Vegetation Condition Mapping

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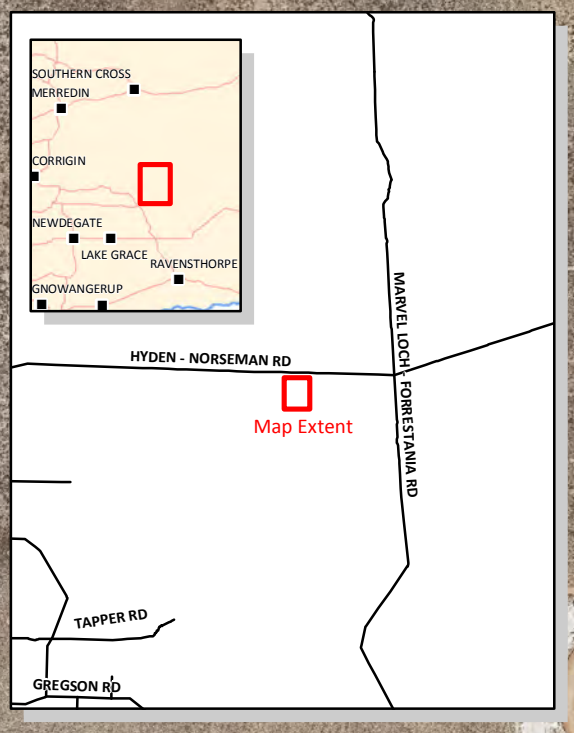

Legend

- Haul Road
- Survey Area

Vegetation Condition

- Excellent
- Good
- Cleared tracks

Western Areas - Forrestania Nickel Operations

Lounge Lizard Vegetation, Flora and Fauna Biological Assessment

Appendix G: Vegetation Association Mapping

Author: N. Cadd	Date: 07-11-2014
Drawn: C. Dyde	Figure Ref: 17603-14-BIDR-1RevA_141110_AppG

Datum: GDA 1994 - Projection: MGA Zone 50 - Scale: 1:7,000 (A3)

0 100 200 300 400 500 Metres

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Appendix H: Vascular Flora Species List

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

Family	Species Name	Conservation Status
Asparagaceae	*Laxmannia paleacea*	
	Lomandra effusa	
	Lomandra mucronata	
	Thysanotus sp. indet.	
Asteraceae	*Olearia ramosissima*	
Boraginaceae	*Halgania lavandulacea*	
Casuarinaceae	*Allocasuarina acutivalvis* subsp. *acutivalvis*	
	Allocasuarina humilis	
	Allocasuarina microstachya	
	Allocasuarina spinosissima	
	Allocasuarina thuyoides	
Cupressaceae	*Callitris columellaris*	
Cyperaceae	*Caustis dioica*	
	Gahnia ancistrophylla	
	Lepidosperma sp. indet.	
	Lepidosperma viscidum	
	Mesomelaena preissii	
	Schoenus sp. indet.	
Dilleniaceae	*Hibbertia gracilipes*	
	Hibbertia pungens	
Elaeocarpaceae	*Tetratheca efoliata*	
Ericaceae	*Astroloma serratifolium*	
	Leucopogon dielsianus	
	Leucopogon sp. indet.	
	Leucopogon sp. Coujinup (M.A. Burgman 1085)	
	Lysinema ciliatum	
Euphorbiaceae	*Beyeria sulcata*	
Fabaceae	*Acacia acoma*	
	Acacia assimilis subsp. *assimilis*	
	Acacia burkittii	
	Acacia erinacea	
	Acacia poliochroa	
	Acacia sphacelata subsp. *sphacelata*	
	Aotus sp. Tortile (G.J. Keighery 3767)	
	Daviesia benthamii	
	Daviesia benthamii subsp. *acanthoclona*	
	Daviesia lancifolia	
	Eutaxia hirsuta	P2
	Eutaxia neurocalyx subsp. *papillosa*	
	Gastrolobium spinosum	
	Gompholobium viscidulum	
	Templetonia rossii	
Goodeniaceae	*Dampiera juncea*	
	Scaevola restiacea	
Haemodoraceae	*Conostylis petrophiloides*	
Haloragaceae	*Glischrocaryon roei*	
Hemerocallidaceae	*Dianella revoluta* var. *divaricata*	

Family	Species Name	Conservation Status
Iridaceae	*Patersonia rudis* subsp. *velutina*	
Lamiaceae	*Hemigenia westringioides*	
	Lachnostachys bracteosa	
	Microcorys exserta	
	Westringia cephalantha	
Lauraceae	*Cassytha glabella*	
Loganiaceae	*Logania tortuosa*	
Malvaceae	*Guichenotia micrantha*	
Myrtaceae	*Astartea aspera*	
	Baeckea sp. indet.	
	Beaufortia interstans	
	Beaufortia micrantha var. *micrantha*	
	Calytrix sp. indet.	
	Darwinia sp. indet.	
	Darwinia sp. Lake Cobham (K. Newbey 3262)	
	Eucalyptus ?subangusta subsp. *subangusta*	
	Eucalyptus eremophila	
	Eucalyptus platycorys	
	Eucalyptus rigidula	
	Leptospermum erubescens	
	Leptospermum fastigiatum	
	Leptospermum spinescens	
	Melaleuca adnata	
	Melaleuca cordata	
	Melaleuca eleuterostachya	
	Melaleuca glaberrima	
	Melaleuca hamata	
	Melaleuca lateriflora	
	Melaleuca laxiflora	
	Melaleuca seriata	
	Melaleuca sp. indet.	
	Micromyrtus erichsenii	
	Verticordia chrysanthella	
	Verticordia inclusa	
	Verticordia picta	
	Verticordia plumosa var. *incrassata*	
	Verticordia roei subsp. *roei*	
Olacaceae	*Olax benthamiana*	
Poaceae	*Amphipogon turbinatus*	
	Austrostipa hemipogon	
	Neurachne alopecuroidea	
Polygalaceae	*Comesperma scoparium*	
Proteaceae	*Adenanthos argyreus*	
	Banksia cirsioides	
	Banksia elderiana	
	Banksia erythrocephala	
	Banksia laevigata subsp. *fuscolutea*	
	Banksia violacea	
	Conospermum brownii	

Family	Species Name	Conservation Status
Proteaceae	*Conospermum stoechadis* subsp. *sclerophyllum*	
	Grevillea cagiana	
	Grevillea excelsior	
	Grevillea huegelii	
	Grevillea incurva	
	Grevillea oncogyne	
	Grevillea shuttleworthiana subsp. *obovata*	
	Hakea commutata	
	Hakea corymbosa	
	Hakea multilineata	
	Hakea platysperma	
	Isopogon scabriusculus	
	Petrophile divaricata	
	Petrophile ericifolia subsp. *ericifolia*	
	Petrophile stricta	
	Synaphea interioris	
Restionaceae	*Desmocladus flexuosus*	
	Lepidobolus preissianus	
Rutaceae	*Boronia coerulescens* subsp. *spicata*	
	Phebalium tuberculosum	
Santalaceae	*Exocarpos aphyllus*	
	Exocarpos sparteus	
	Leptomeria preissiana	
	Santalum acuminatum	
	Santalum murrayanum	
Sapindaceae	*Dodonaea bursariifolia*	
	Dodonaea viscosa subsp. *spatulata*	
Scrophulariaceae	*Eremophila scoparia*	
Stylidiaceae	*?Stylidium clavatum*	
	Stylidium sp. indet.	
Thymelaeaceae	*Pimelea suaveolens*	
	Pimelea subvillifera	

APPENDIX C – FLORA, VEGETATION AND FAUNA ASSESSMENT (BOTANICA 2021)

Flora/ Vegetation and Fauna Assessment
Lounge Lizard Sand Pits
Prepared For
Western Areas Limited

October 2021
Version 1

Prepared by:
Botanica Consulting Pty Ltd
33 Brewer Street
Perth WA 6000

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Glossary

Acronym	Description
ANCA	Australian Nature Conservation Agency.
BA	Birdlife Australia.
BAM Act	*Biosecurity and Agriculture Management Act 2007*, WA Government.
BC Act	*Biodiversity Conservation Act 2016*, WA Government.
Botanica	Botanica Consulting Pty Ltd.
BoM	Bureau of Meteorology.
CAMBA	China Australia Migratory Bird Agreement 1998.
DAFWA	Department of Agriculture and Food (now DPIRD), WA Government.
DAWE	Department of Agriculture, Water and the Environment (formerly DotEE), Australian Government.
DBCA	Department of Biodiversity, Conservation and Attractions (formerly DPaW), WA Government.
DMIRS	Department of Mines, Industry Regulation and Safety (formerly DMP), WA Government
DotEE	Department of the Environment and Energy (now DAWE), Australian Government.
DPIRD	Department of Primary Industries and Regional Development, WA Government
DWER	Department of Water and Environmental Regulation (formerly EPA, DER and DoW), WA Government
EP Act	Environmental Protection Act 1986, WA Government.
EP Regulations	Environmental Protection (Clearing of Native Vegetation) Regulations 2004, WA Government.
EPA	Environmental Protection Authority, WA Government.
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*, Australian Government.
ESA	Environmentally Sensitive Area.
Ha	Hectare (10,000 square meters).
IBRA	Interim Biogeographic Regionalisation for Australia.
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union.
JAMBA	*Japan Australia Migratory Bird Agreement 1981.*
Km	Kilometer (1,000 meters).
MVG	Major Vegetation Groups.
NVIS	National Vegetation Information System.
PEC	Priority Ecological Community.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement 2007.
SRE	Short Range Endemic.
SSC	Species Survival Commission, International.
TEC	Threatened Ecological Community.
WA	Western Australia.
WAHERB	Western Australian Herbarium.
WAM	Western Australian Museum, WA Government.

Executive Summary

Botanica Consulting Pty Ltd (Botanica) was commissioned by Western Areas Limited to undertake a reconnaissance flora/ vegetation survey, basic fauna survey and targeted flora/ fauna survey of proposed new borrow pit developments within tenements M77/545 and M77/911 (referred to as the 'survey area'). The survey area is located at Lounge Lizard, an area adjacent and to the south of the Flying Fox mine site, owned and operated by Western Areas Limited, located approximately 78km east of Hyden, Western Australia. The survey was conducted on the 21st and 22nd September 2021. The total survey area encompassed an approximate area of 383 ha. The target survey area encompassed an approximate area of 25.7 ha

Four vegetation types were identified within the survey area. These vegetation types were located within three landform types and comprised of three major vegetation groups, which were represented by a total of 30 Families, 75 Genera and 179 Taxa. No introduced flora were identified within the survey area. Based on the vegetation condition rating scale adapted from Keighery, 1994 and Trudgen, 1988 vegetation was rated as 'very good'.

The broad scale terrestrial fauna habitats within the survey area have been identified as comprising a mosaic of clay-loam plain and sand-loam plain. Results of the literature review identified 32 mammals (including 9 bat species), 121 birds, 65 reptiles and 22 frog species that have previously been recorded in the general area, some of which have the potential to occur, subject to the identified habitats being suitable.

No Threatened flora or Threatened Ecological Communities (TEC) as listed under the Western Australian *Biodiversity Conservation (BC) Act 2016* or Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* were identified within the survey area. The survey area is located adjacent to the spatially mapped 500m buffer of the *Ironcap Hills Vegetation Complexes* (North Ironcap) obtained from the Department of Biodiversity, Conservation and Attractions (DBCA) communities database search. This Priority Ecological Community is listed by the DBCA as a Priority 3 Ecological Community. No banded ironstone was identified within the survey area and no vegetation representative of this Priority Ecological Community was identified within the survey area. Three Priority flora taxa were identified within the survey area; *Eutaxia hirsuta* (P2), *Microcorys* sp. Forrestania (V. English 2004) (P4) and *Rinzia triplex* (P3).

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

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

The survey area is located within an Environmentally Sensitive Area (ESA) as listed under the *Environmental Protection (EP) Act 1986.* This ESA is associated with Lake Cronin which is located approximately 4.5km north-east of the survey area.

The survey area is not located within a vested Conservation Reserve, however according to the EPA (2009) Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region, the survey area occurs within a 56,750ha area within the mineralised greenstone belt in the Lake Cronin Region which is proposed to be managed under Section 33(2) of the *Conservation and Land Management Act 1984* (CALM Act) but not formally reserved.

Botanica have undertaken an assessment against the ten native vegetation Clearing Principles contained in Schedule 5 of the EP Act. Based on the information provided in this report, this assessment considered that the proposed sand pit works in the survey area is unlikely to be at variance with these ten Clearing Principles.

1 Introduction

1.1 Project Description

Botanica Consulting Pty Ltd (Botanica) was commissioned by Western Areas Limited to undertake a reconnaissance flora/ vegetation survey, basic fauna survey and targeted flora/ fauna survey of proposed new borrow pit developments within tenements M77/545 and M77/911 (referred to as the 'survey area') . The survey area is located within the Flying Fox mine site, owned and operated by Western Areas Limited, located approximately 78km east of Hyden, Western Australia (Figure 1-2). The survey was conducted on the 21st and 22nd September 2021. The total survey area encompassed and approximate area of 383 ha. The target survey area encompassed an approximate area of 25.7 ha (Figure 1-1).

1.2 Objectives

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

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

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

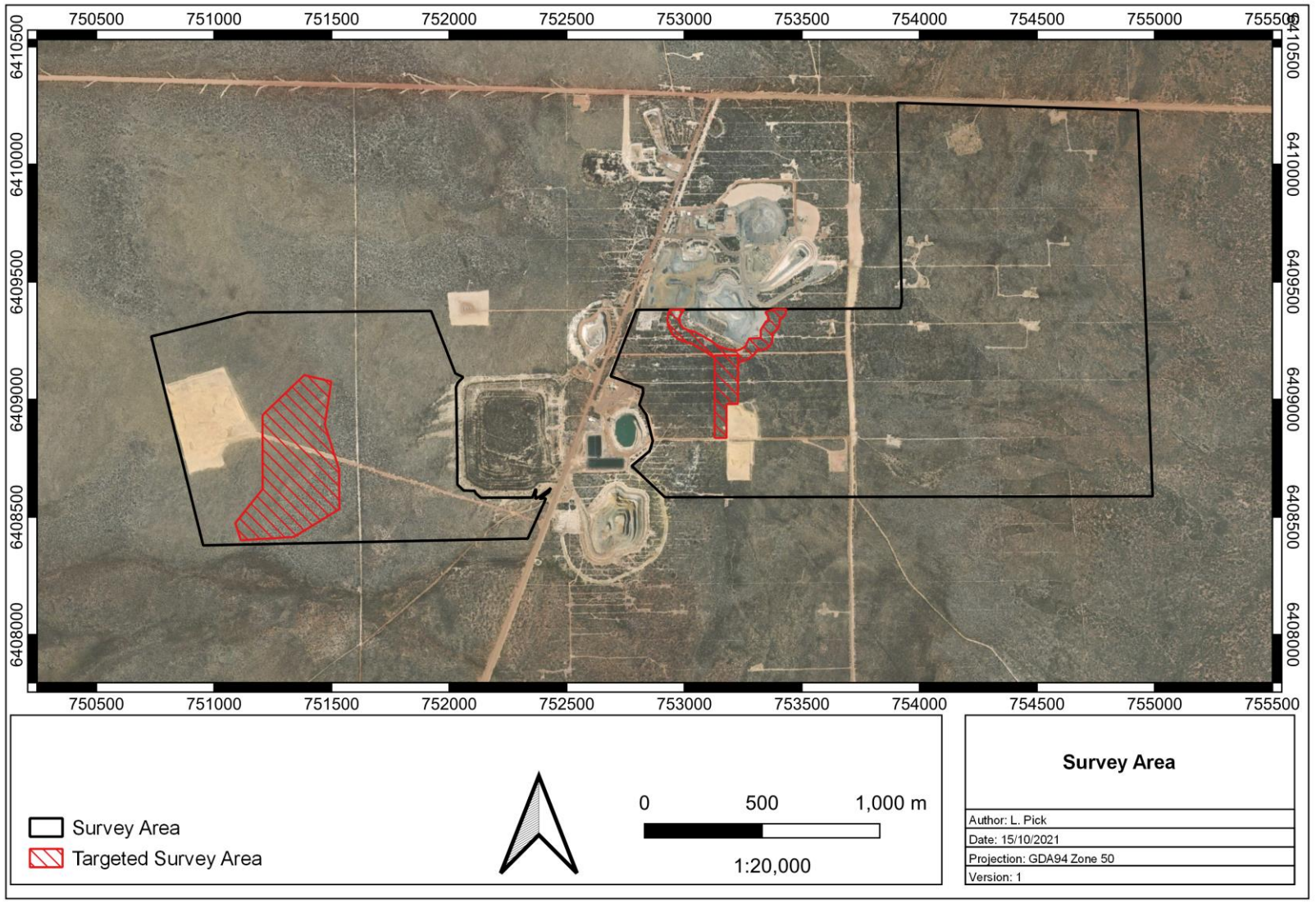


Figure 1-1: Flying Fox sand pit survey area

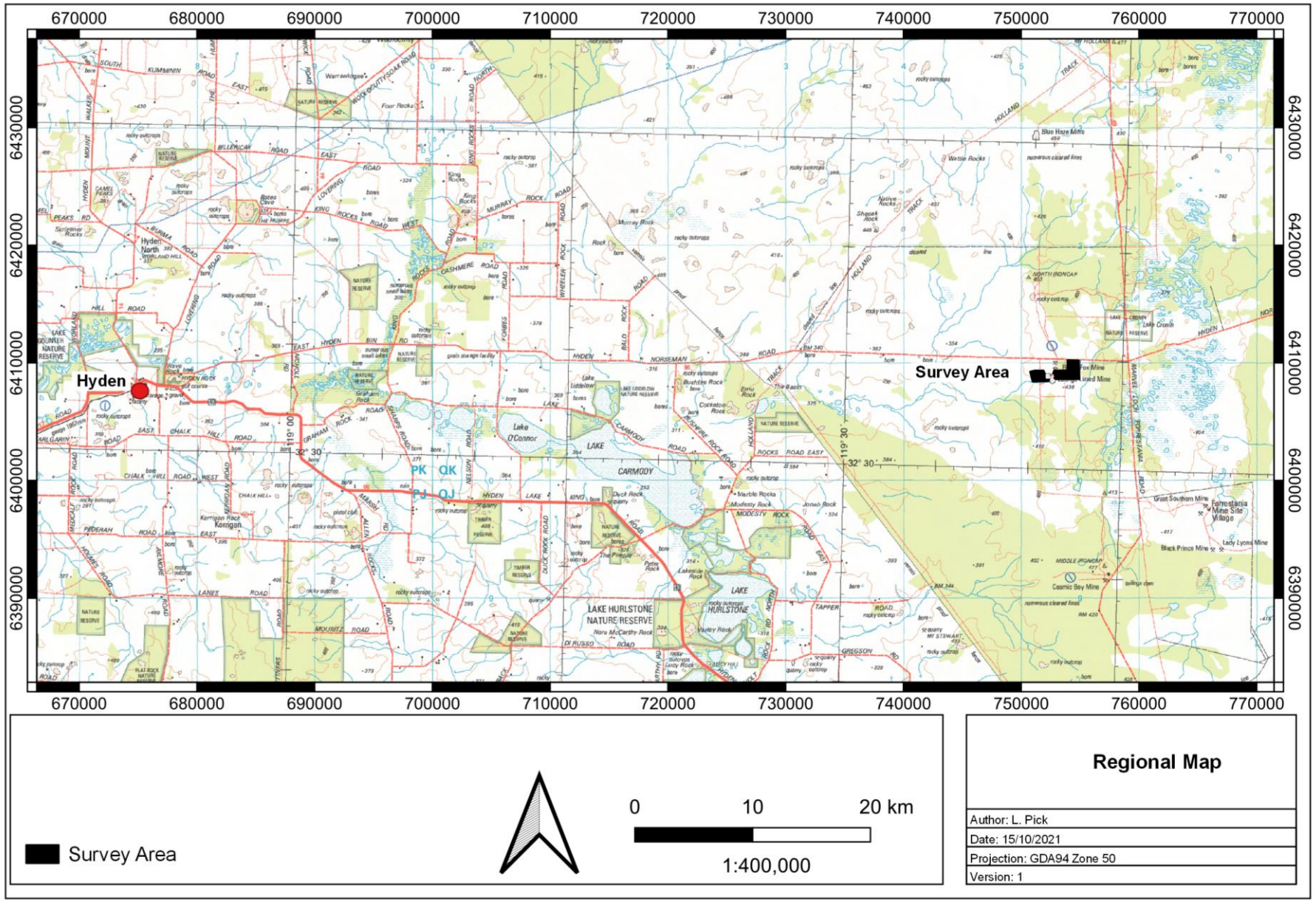


Figure 1-2: Regional map of the survey area

2 Regional Biophysical Environment

2.1 Regional Environment

The survey area lies within the South-West and Interzone Province of Western Australia. Based on the Interim Biogeographic Regionalisation of Australia (IBRA), Version 7 (DotEE, 2012), the survey area is located on the border of the Coolgardie and Mallee Bioregions. The Coolgardie and Mallee Bioregions are further divided into subregions with the survey area located within the Western Mallee subregion (MAL2) of the Mallee Bioregion and the Southern Cross subregion (COO2) of the Coolgardie Bioregion (Figure 2-1).

The Coolgardie Bioregion forms part South-West and Interzone of Western Australia in a region known as the Coolgardie Botanical District (Beard, 1990). The Coolgardie Bioregion is located within the Yilgarn Craton and is characterised by a granite basement which includes Archaean Greenstone intrusions in parallel belts. Drainage is occluded. The Southern Cross subregion comprises gently undulating uplands on granite strata and broad valleys with bands of low greenstone hills (McKenzie, J.E. May and S. McKenna, 2002).

The Mallee Bioregion also forms part of the South-West and Interzone Province of Western Australia in a region known as the Roe Botanical District. The Mallee Bioregion is located in the south-eastern part of Yilgarn Craton which is gently undulating, with partially occluded drainage. The Western Mallee subregion has more relief than its eastern counterpart. Its main surface-types comprise clays and silts underlain by kankar, exposed granite, sandplains, isolated uplands of laterite pavements and Salt Lake systems on a granite basement (McKenzie, J.E. May and S. McKenna, 2002).

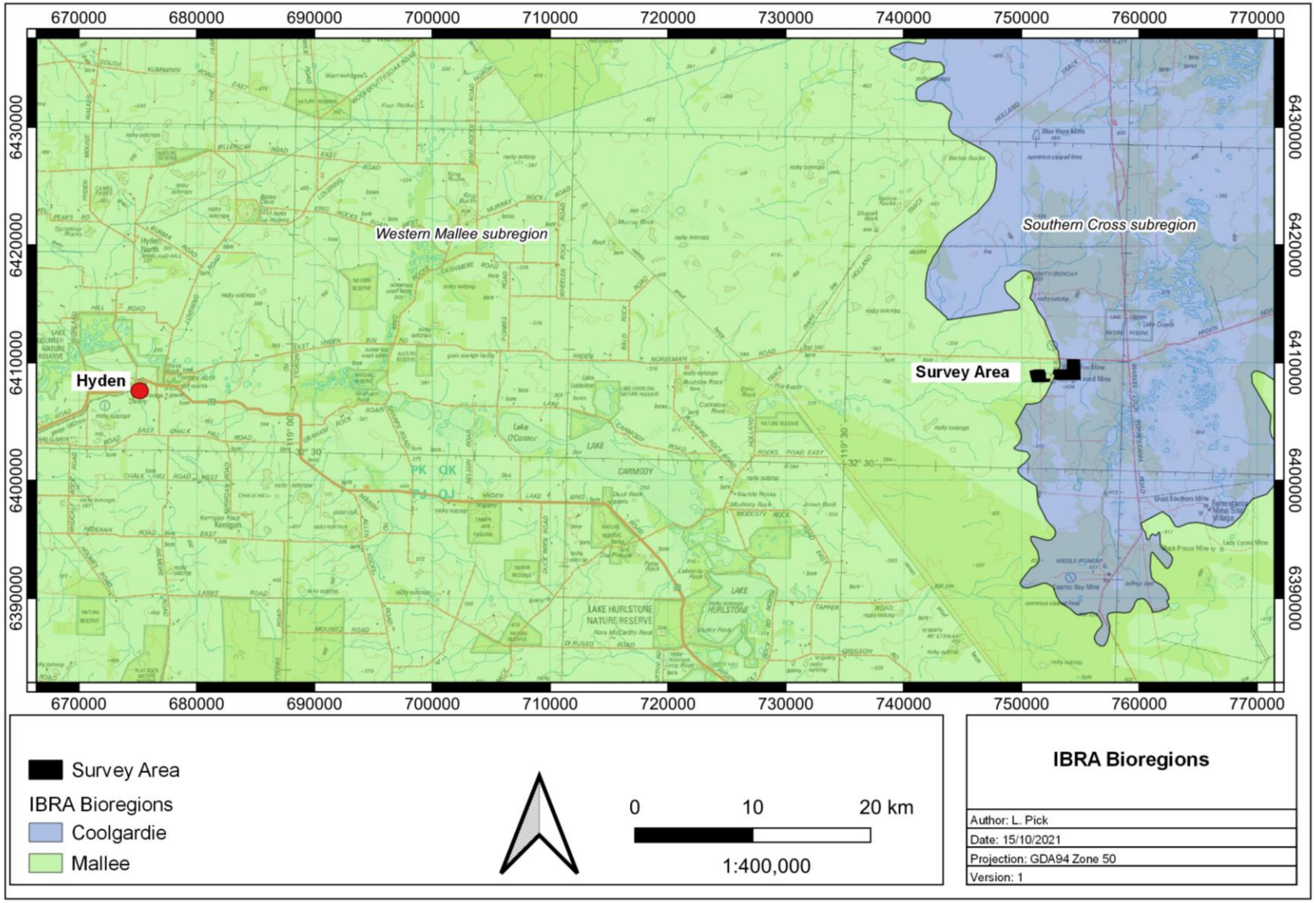


Figure 2-1: Map of IBRA Bioregions in relation to the survey area

2.2 Soils and Landscape Systems

Based on geographic information provided by the Department of Agriculture and Food Western Australia (DAFWA, 2014), the survey area is located within the South-eastern Zone of Ancient Drainage (250) of the Avon Province (25).

The Avon Province is characterised as a laterised plateau (dissected at fringes and with saline drainage lines inland) on deeply weathered mantle and alluvium over granitic rocks of the Yilgarn Craton (and Albany-Fraser Orogen). Soil are comprised of sandy duplexes soils and ironstone gravelly soils with loamy earths, loamy duplexes, sandy earths, deep sands and wet soils. Vegetation is dominated by York gum-wandoo-salmon gum-morrel gimlet woodland and jarrah-marri-karri-wandoo woodlands/forests (with some mallee scrub, tammar-wodjil thickets and scrub-heath). This Province is located in the south-west, between Nannup, Denmark, Jerramungup, Southern Cross, Lake Moore, Carnamah and the Perth Hills (Tille, 2006).

The South-western Zone of Ancient Drainage (250) is characterised by gently undulating terrain (with some salt lake chains and areas of prominent granitic outcrops) on deeply weathered mantle and alluvium over granitic rocks of the Yilgarn Craton. Soils include sandy duplexes (often alkaline) with ironstone gravelly soils and loamy earths (often calcareous) and some loamy duplexes, sandy earths, deep sands and saline wet soils. Mallee scrub and salmon gum-gimlet-morrel woodlands (and some scrub-heath). This zone is located in the southern Wheatbelt between Kondinin, Lake Grace, Gnowangerup, Frank Hann National Park and Mt Holland (Tille, 2006).

These South-western Zone of Ancient Drainage is further divided into soil landscape systems, with the survey area located within the soil landscape system described in Table 2-1 and Figure 2-2 below.

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

Soil Landscape System	Description
Ms8	Gently undulating plains with broad shallow drainage depressions

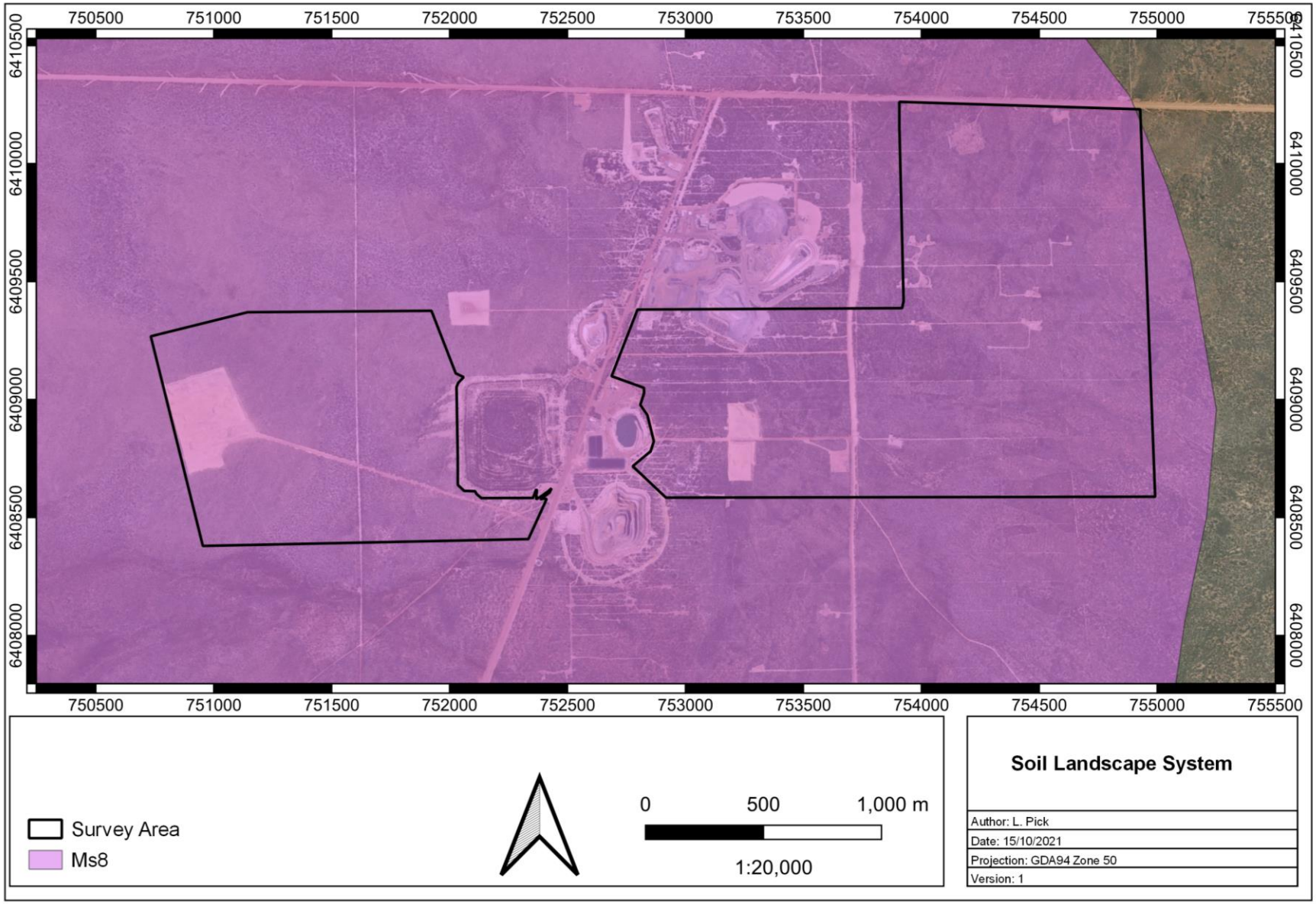


Figure 2-2: Map of Soil Landscape Systems within the survey area

2.3 Remnant Vegetation

The Department of Primary Industries and Regional Development (DPIRD) Vegetation Association GIS file (2018) indicates that the survey area is located within Pre-European Beard vegetation association Forrestania 511 of the Southern Cross subregion and Forrestania 2048 of the Western Mallee subregion. The extent of these vegetation associations, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019) are provided in Table 2-2 and Figure 2-3.

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

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

Region	Pre-European Extent (ha)	Pre-European extent remaining (%)	% of Current extent within DBCA managed lands	Extent within the survey area (ha)
Forrestania 511: Medium woodland; salmon gum & morrel				
Southern Cross Subregion	153,641.65	99.58	9.68	50
Western Australia	163,919.47	99.59	9.07	
Forrestania 2048: Shrublands; scrub-heath in the Mallee Region				
Western Mallee Subregion	5,735.92	97.56	0	4
Western Australia	7,829.67	97.92	0.64	

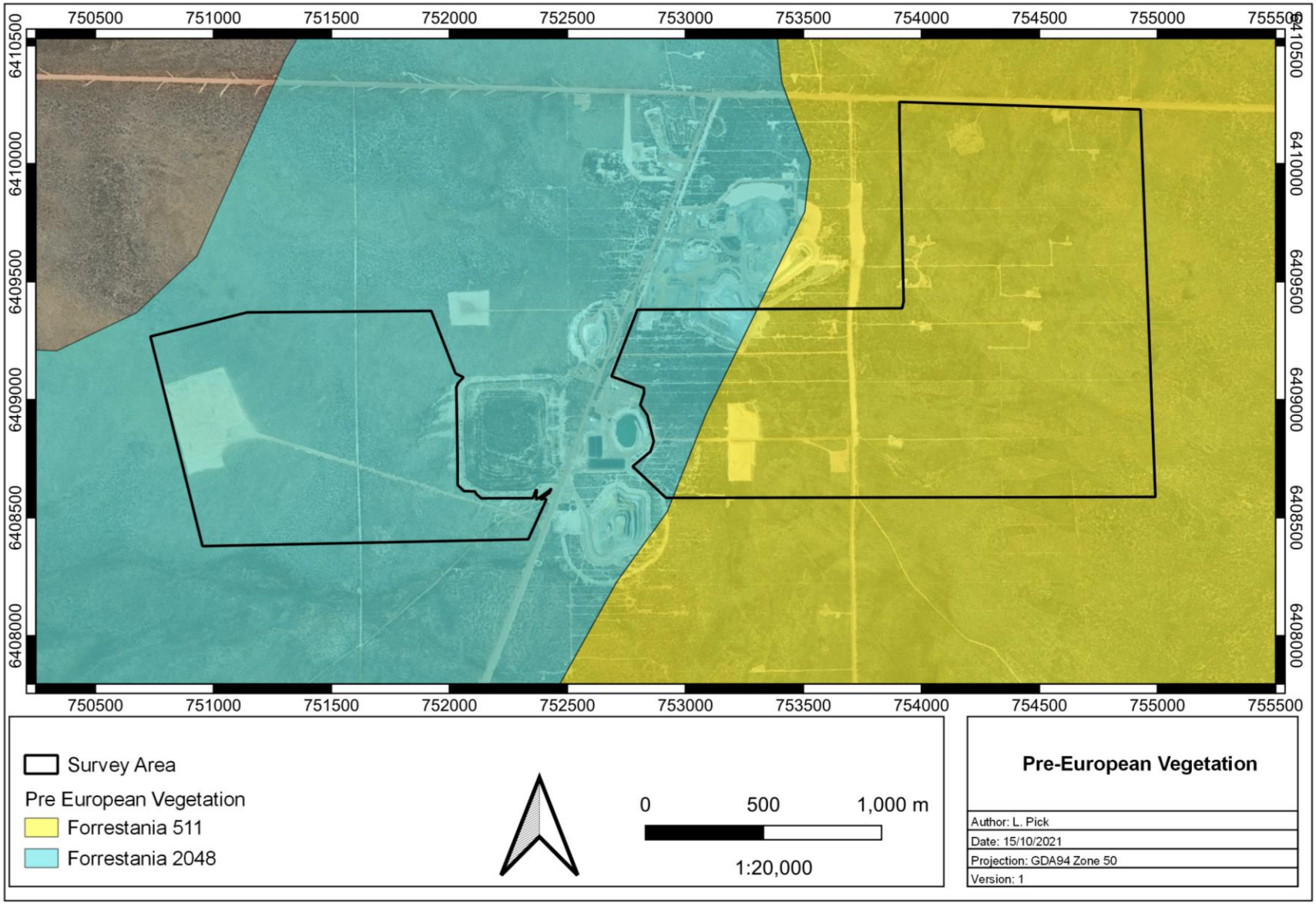
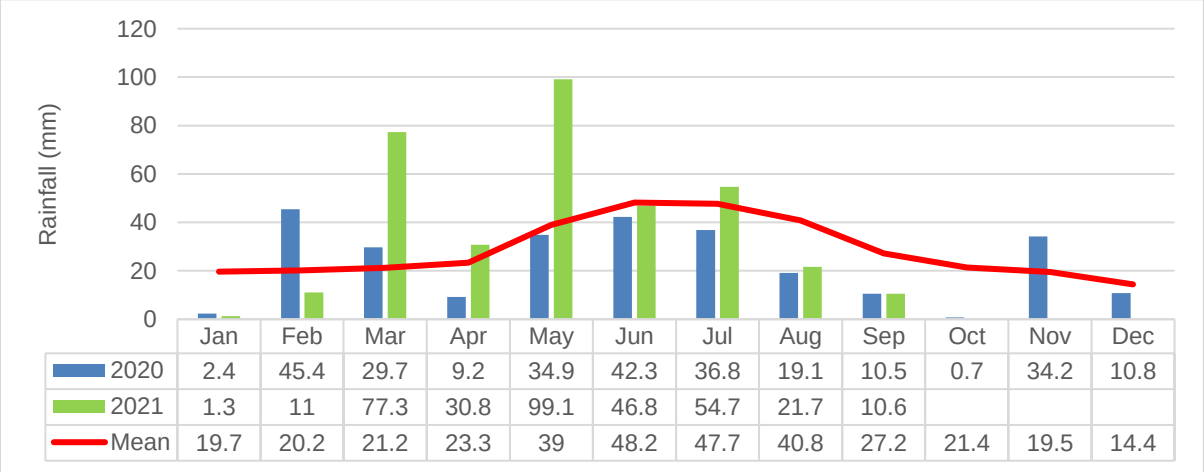


Figure 2-3: Pre-European Vegetation Associations within the survey area

2.4 Climate

The climate of the Southern Cross subregion is characterised as arid to semi-arid Mediterranean with an annual rainfall of 200-300mm (Beard, 1990; Cowan, 2001). The climate of the Western Mallee subregion is characterised as dry warm Mediterranean with an annual rainfall of 300-500mm (Beard, 1990; Beecham & Danks, 2001). Rainfall data for the Hyden weather station (#10568) located approximately 78km west of the survey area is shown in Figure 2-4 (BoM, 2021). Mean monthly rainfall ranges from 48.2 mm in June to 14.4 mm in December, whilst the mean annual rainfall is 339.6 mm. Annual rainfall received in 2020 was below average. Survey work was undertaken in September 2021 within the EPA recommended timing for primary surveys of the South-West and Interzone Province (i.e. Spring) (EPA, 2016).



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	2.4	45.4	29.7	9.2	34.9	42.3	36.8	19.1	10.5	0.7	34.2	10.8
2021	1.3	11	77.3	30.8	99.1	46.8	54.7	21.7	10.6			
Mean	19.7	20.2	21.2	23.3	39	48.2	47.7	40.8	27.2	21.4	19.5	14.4

Figure 2-4: Monthly rainfall and mean monthly rainfall (January 2020 to September 2021) for the Hyden weather station #10568 (BoM, 2021)

2.5 Hydrology

According to the Geoscience Australia database (2015), there are no perennial or ephemeral inland waters or drainage lines within the survey area (Figure 2-5).

Groundwater Dependent Ecosystems (GDE) includes biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. According to the BoM *Atlas of Groundwater Dependent Ecosystems* (BoM, 2019) database, there are no known or potential aquatic GDEs located within the survey area (Figure 2-5). The survey area has moderate potential to contain the following terrestrial GDE listed in Table 2-3 and shown spatially in Figure 2-5 (BoM, 2020). As the proposed developments within the survey relate to sand pit activities and will not impact the groundwater table, impacts to potential GDE vegetation are unlikely to occur.

Table 2-3: Potential Terrestrial Groundwater Dependent Ecosystems (BoM, 2020)

GDE Description	Potential GDE according to BoM (2019b)
Undulating plains with some sandplains, ferruginous breakaways; ridges of metamorphic rocks and granitic hills and rises; calcretes, large salt lakes and dunes along valleys.	Moderate potential GDE

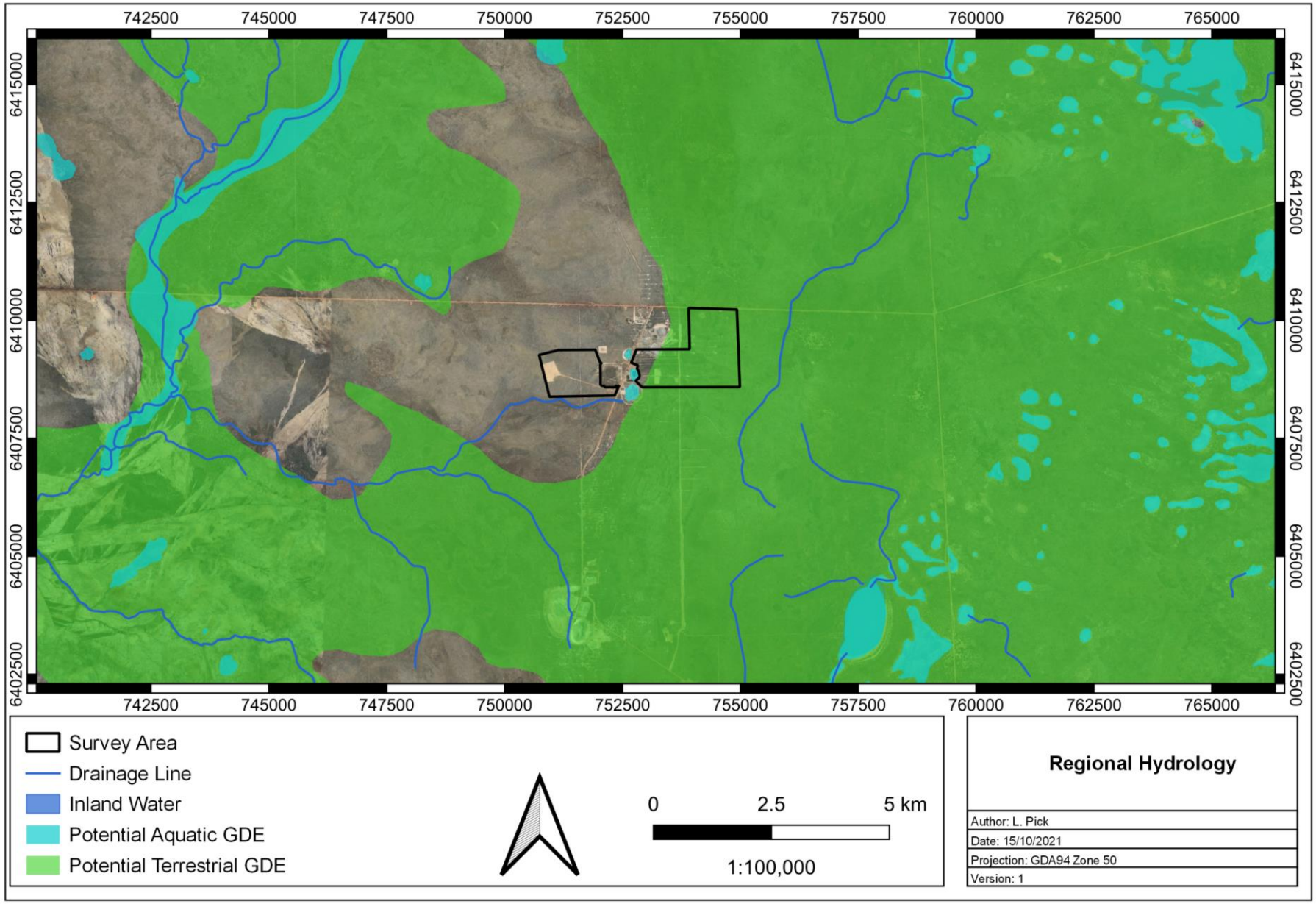


Figure 2-5: Surface Hydrology of the survey area

2.6 Land Use

The dominant land uses of the Southern Cross subregion includes native pastures (17%), Conservation Reserves (11.53%), UCL & Crown Reserves (66.74%) and Cultivation – Dry Land agriculture (2.27%) (Cowan, 2001). The dominant land uses of the Western Mallee subregion includes Dry Land agriculture, UCL & Crown Reserves, roads and other easements.

The survey area also lies within 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 species. The region covers almost 16 million hectares, 160,000 square kilometers, 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 (Figure 2-6).

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.

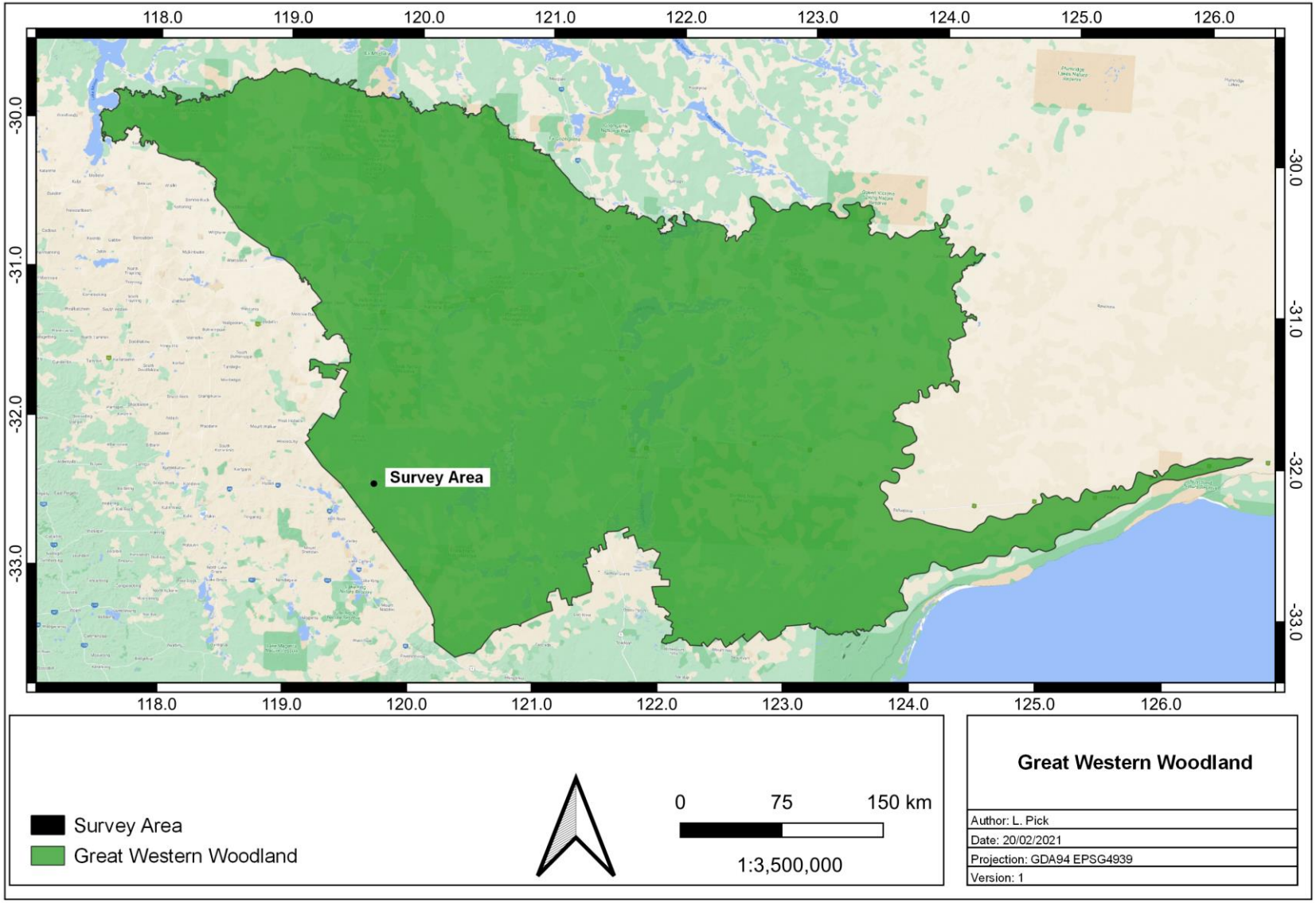


Figure 2-6: Location of survey area within the Great Western Woodlands

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:

- How, R. A Newbey, K.R Dell, J. Muir, B.G & Hnatiuk, R.J, (1988), *The Biological survey of the Eastern Goldfields of Western Australia: Lake Johnston-Hyden.* Western Australian Muesum Supplement No. 30.
- Gibson (2004) Flora and vegetation of the Eastern Goldfields Ranges: Part 7. Middle and South Ironcap, Digger Rock and Hatter Hill. Science Division, Department of Conservation and Land Management.
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- Biota (2018), New Morning Level 1 and Targeted Terrestrial fauna Survey, prepared for Western Areas Limited, Biota Environmental Sciences.
- Botanica (2021a), Detailed Flora and Vegetation Survey and Targeted Flora survey of the New Morning Project, prepared for Western Areas Limited, Botanica Consulting.
- Botanica (2021b), Reconnaissance Flora/ Vegetation Survey & Basic Fauna Survey Lounge Lizard East Sand Pit Extension, prepared for Western Areas Limited, Botanica Consulting.

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

- DBCA Priority/ Threatened Flora Database Search (DBCA, 2018a)
- DBCA Priority/ Threatened Ecological Communities Database Search (DBCA, 2018b)
- DBCA NatureMap Database (DBCA, 2021);
- DAWE Protected Matters search tool (DAWE, 2021).

The DBCA Priority/ Threatened Flora Database Search and Priority/ Threatened Ecological Communities Database Search were conducted within a 50km radius of the survey area (DBCA, 2018a; DBCA, 2018b).

The NatureMap and Protected Matters Search were conducted for an area encompassing a 40km radius of the centre coordinates -32.4322S 119.6932E. It should be noted that these lists are based on observations from a broader area than the assessment area (40km radius) and therefore may include taxa not present. The databases also often include very old records that may be incorrect or in some cases the taxa in question have become locally or regionally extinct. Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining what actual species may be present within the specific area being investigated. The conservation significance of flora and fauna taxa was assessed using data from the following sources:

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

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

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

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

3.2 Field Assessment

Botanica conducted a reconnaissance flora/ vegetation survey, basic fauna survey and targeted flora/ fauna survey on the 21st and 22nd September 2021. The total survey area encompassed an approximate area of 383 ha. The target survey area encompassed an approximate area of 25.7 ha. The survey area was traversed on foot and 4WD by two personnel; Jim Williams and Michelle Luinstra. GPS tracks of the area traversed within the survey area is shown spatially in Figure 3-1.

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

3.2.1 Reconnaissance Flora Survey

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

At each sample point (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 WAHERB. Vegetation was classified in accordance with NVIS classifications.

3.2.2 Targeted Flora Survey

A targeted search for Threatened and Priority flora was conducted within the target survey area, encompassing an approximate area of 25.7 ha. The survey area was systematically searched on foot by two Botanica staff members to identify and record the locations of Threatened and Priority flora. Any locations of Threatened and Priority flora were recorded using a hand-held GPS. For any Threatened and Priority Flora identified, a simple plant count (not differentiated between juvenile/mature plants, flowering or non-flowering plants) was conducted for each record.

3.2.3 Basic Fauna Survey

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

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

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

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

3.2.4 Targeted Fauna Survey

A targeted search for Malleefowl was conducted within the target survey area. The footprint was systematically searched on foot by two personnel to identify and record the locations of any Malleefowl activity (i.e. mounds, footprints and feathers). Any locations/ observations of Malleefowl activity were recorded using a hand-held GPS.

3.2.5 Personnel involved

Jim Williams - Environmental Consultant/ Director (Diploma of Horticulture)
Michelle Luinstra - Environmental Consultant (Bachelor of Science-Biology)
Greg Harewood - Zoologist (Bachelor of Science-Zoology)
Lauren Pick - Environmental Consultant (Bachelor of Science-Zoology/Conservation Biology)

3.2.6 Scientific licences

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

Licensed staff	Permit Number	Valid Until
Jim Williams	FB62000108 (Licence to take flora for scientific purposes)	27/05/2019-27/05/2022

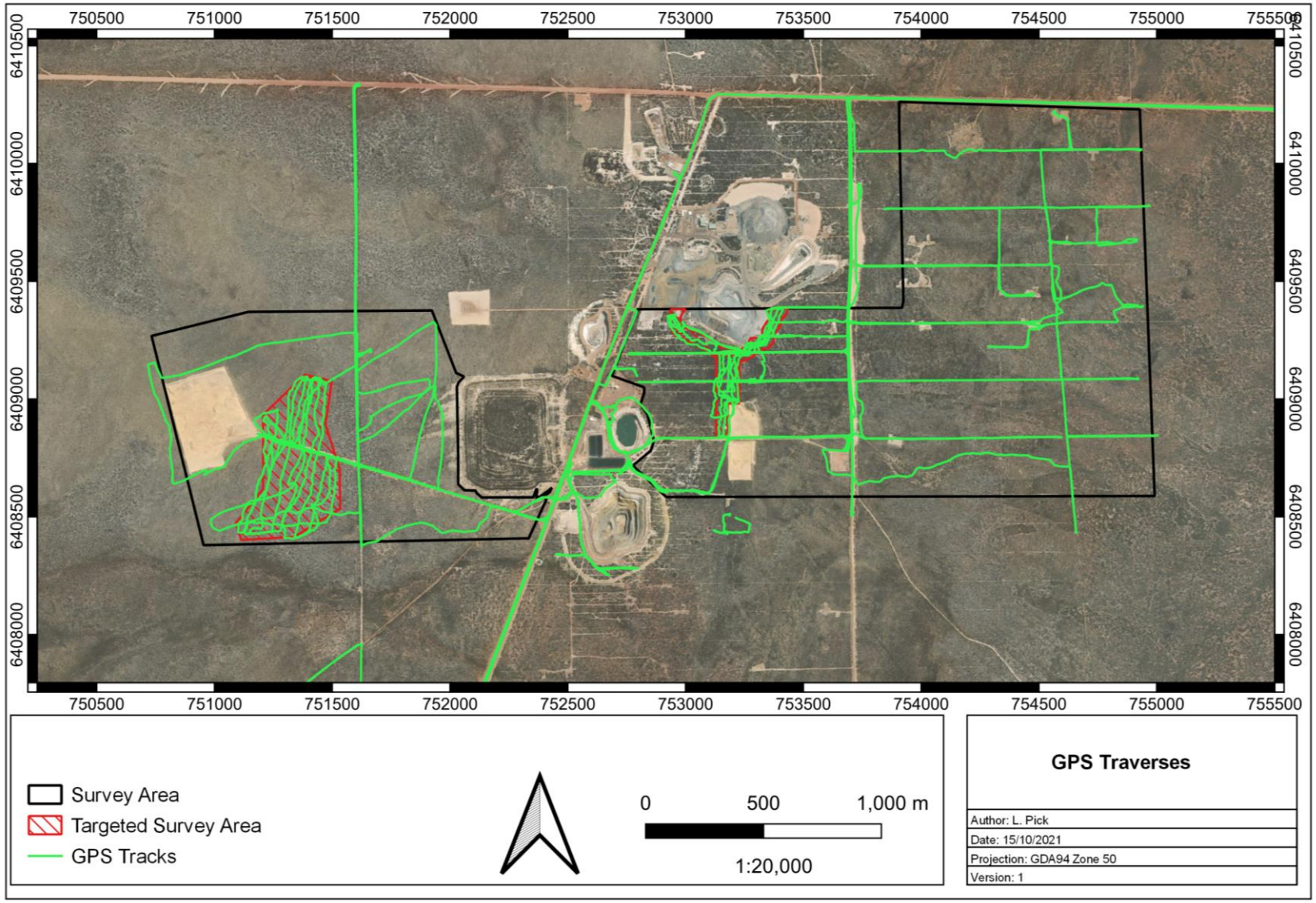


Figure 3-1: GPS Tracks recorded within the survey area

3.3 Survey limitations and constraints

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

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

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

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

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

Variable	Potential Impact on Survey	Details
Access problems	Not a constraint	The survey was conducted via 4WD and on foot. Numerous tracks were located within the survey area, providing ease of access.
Competency/ Experience	Not a constraint	The BC personnel that conducted the survey were regarded as suitably qualified and experienced. **Coordinating Botanist/ Zoologist:** Jim Williams **Field Survey:** Jim Williams and Michelle Luinstra **Data Interpretation:** Jim Williams, Greg Harewood and Lauren Pick
Timing of survey, weather & season	Minor constraint	Fieldwork was completed within the EPA's recommended primary survey time period (i.e. Spring) for the South-West and Interzone Province. The survey area has been previously surveyed by Botanica and other consultants over multiple years (2005, 2006-2008, 2012, 2014 and 2021) and multiple seasons.
Area disturbance	Not a constraint	The area has been disturbed from exploration and mining; 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 flora survey and basic fauna completed to identify vegetation types/fauna habitats and

Variable	Potential Impact on Survey	Details
		conservation significant species/communities over the survey area. Targeted flora and fauna surveys were also conducted.
Availability of contextual information at a regional and local scale	Not a constraint	Threatened flora database searches provided by the DBCA were used to identify any potential locations of Threatened/Priority taxa. BoM, DWER, DPIRD, DBCA and DAWE databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region. Previous Flora/ Fauna surveys within the local area have been assessed for pertinent information and environmental context of the regional area.
Completeness	Minor constraint	In the opinion of Botanica, the survey area was covered sufficiently in order to identify vegetation assemblages. Few annual species were present during the current survey, however Botanica have previously conducted flora surveys within the survey area over multiple years (2006-2008, 2012 and 2021) and multiple seasons. All observed flora individuals were able to be identified to species level. The vegetation types for this study were based on visual descriptions of locations in the field. The distribution of these vegetation communities/ fauna habitats outside the study area is not known, however vegetation types identified were categorised via comparison to vegetation distributions throughout WA specified in the NVIS Major Vegetation Groups (DotEE, 2017b).

4 Results

4.1 Desktop Assessment

4.1.1 Flora/Vegetation

According to the results of the NatureMap search (DBCA, 2021), a total of 1,300 flora taxa have been recorded within a 40 km radius of the survey area. Dominant genera include *Acacia, Eucalyptus* and *Melaleuca.* Combined results of database searches (DBCA, 2021 and DAWE, 2021) identified 49 introduced taxa as potentially occurring within 40km of the survey area (Table 4-1). According to the Department of Primary Industries and Regional Development Western Australian Organism List (DPIRD, 2020), two taxa are listed as a Declared Pest under the *Biosecurity and Agriculture Management* (BAM) *Act 2007.* Three taxa are listed as a Weed of National Significance (WoNS).

Table 4-1: Introduced flora within 40km of the survey area

Taxon	Common Name	Declared Pest	WoNS
Aira caryophyllea	Silvery Hairgrass		
Alyssum linifolium	Flax-leaf Alyssum		
Arctotheca calendula	Cape Weed, African Marigold		
Asparagus asparagoides	Bridal Creeper	Y	Y
Avellinia michelii			
Brassica tournefortii	Mediterranean Turnip		
Brassica x napus			
Bromus catharticus	Prairie Grass		
Bromus rubens	Red Brome		
Bupleurum semicompositum			
Carrichtera annua	Wards Weed		
Centaurea melitensis	Maltese Cockspur, Malta Thistle		
Centaurium erythraea	Common Centaury		
Centaurium tenuiflorum			
Cotula bipinnata	Ferny Cotula		
Crassula natans			
Crassula natans var. *minus*			
Ehrharta longiflora	Annual Veldt Grass		
Erodium cicutarium	Common Storksbill		
Hordeum leporinum	Barley Grass		
Hornungia procumbens			
Hypochaeris glabra	Smooth Catsear		
Juncus bufonius	Toad Rush		
Lepidium africanum	Rubble Peppercress		
Lolium rigidum	Wimmera Ryegrass		
Lycium ferocissimum	African Boxthorn		Y
Lysimachia arvensis	Pimpernel		
Medicago sativa	Alfalfa		
Mesembryanthemum crystallinum	Iceplant		
Mesembryanthemum nodiflorum	Slender Iceplant		

Taxon	Common Name	Declared Pest	WoNS
Parapholis incurva	Coast Barbgrass		
Parentucellia latifolia	Common Bartsia		
Pentameris airoides subsp. *airoides*			
Plantago coronopus	Buckshorn Plantain		
Rostraria cristata			
Rostraria pumila			
Schismus barbatus	Kelch Grass		
Sonchus oleraceus	Common Sowthistle		
Spergularia diandra	Lesser Sand Spurry		
Spergularia rubra	Sand Spurry		
Stellaria pallida			
Tamarix aphylla	Athel Pine	Y	Y
Trifolium arvense var. *arvense*			
Trifolium campestre	Hop Clover		
Trifolium tomentosum var. *tomentosum*			
Ursinia anthemoides	Ursinia		
Vulpia bromoides	Squirrel Tail Fescue		
Vulpia myuros forma megalura			
Vulpia myuros forma myuros			

The results of the literature review, combined search of the DBCA's Flora of Conservation Significance databases (DBCA, 2018a), NatureMap (DBCA, 2021) and DAWE protected matters search (DAWE, 2021) recorded no Threatened Flora or Priority Flora within the survey area. Thirteen Threatened Flora and 97 Priority Flora taxa were listed on the databases as occurring within a 40km radius of the survey area (Appendix 5). A map of flora locations is provided in Appendix 2. These taxa were assessed and ranked for their likelihood of occurrence[2] within the survey area. The rankings and criteria used were:

- Unlikely: Area is outside of the currently documented distribution for the species/no suitable habitat (type, quality and extent) was identified as being present during the field/desktop assessment.

- Possible: Area is within the known distribution of the species in question and habitat of at least marginal quality was identified as being present during the field/desktop assessment, supported in some cases by recent records being documented from within or near the area.

- Known to Occur: The species in question was positively identified as being present during current or previous field surveys.

[2] Based on habitat descriptions provided by the WA Herbarium (Florabase), habitat descriptions provided in previous records listed on the DBCA Threatened Flora Database (DBCA, 2018a) and DAWE Species Profile and Threats Database (DAWE, 2020b)

Of the 110 species listed as potentially occurring within 40km of the survey area (Appendix 5), 57 were considered 'possible' to occur within the survey area[3] (Table 4-2). Five taxa were 'known to occur' within the survey area based on previous records by Botanica (2013), Astron (2014) and DBCA (2018a).

Table 4-2: Flora of Conservation Significance identified as possible or known to occur within the survey area

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Acacia sp. Mt Holland (B. Ellery BE 1147)			P1	No description available	Possible
Anticoryne melanosperma			P3	No description available	Possible
Austrostipa sp. Carlingup Road (S. Kern & R. Jasper LCH 18459)			P1	No description available	Possible
Austrostipa sp. Mt Holland (W.A. Thompson & J. Allen 948)			P1	No description available	Possible
Baeckea sp. Blue Haze Mine (P. Armstrong 06/910)			P1	No description available	Possible
Baeckea sp. Crossroads (B.L. Rye & M.E. Trudgen 241186)			P1	No description available	Possible
Baeckea sp. Forrestania (K.R. Newbey 1105)			P1	No description available	Possible
Baeckea sp. Hatter Hill (K.R. Newbey 3284)			P3	Narrow, open, upright shrub, to 1.3 m high. Fl. pink, Jun to Oct. Yellow-orange coarse sandy loam with laterite gravel, red-brown sandy loam with quartz pebbles. Undulating plains.	Possible
Baeckea sp. Koonadgin (B.L. Rye & M.E. Trudgen BLR 241137)			P3	No description available	Possible
Baeckea sp. Lake Cronin (K.R. Newbey 9191)			P1	Upright, spreading, moderately open shrub. Fl. white/pink, Oct. Well-drained gravelly sands. Moderately exposed, gently undulating plain.	Possible
Baeckea sp. North Ironcap (R.J. Cranfield 10580)			P1	Erect, open shrub, to 0.4 m high. Fl. white/pink, Oct. Red clay. Gently undulating sandplains.	Possible
Banksia rufa subsp. *flavescens*			P3	Prostrate, ?lignotuberous shrub, to 0.45 m high. Fl. cream-yellow, Jul to Aug. Sandy loam or sand with gravel.	Possible
Banksia viscida			P3	Densely branched, non-lignotuberous shrub, 0.4-1 m high. Fl. yellow-orange, Jul to Oct. Gravelly soils. Lateritic rises.	Possible
Boronia westringioides			P2	Erect shrub, 0.2-0.75 m high. Fl. pink, Jul to Sep. Loamy sand. Plains.	Possible

[3] Includes 27 taxa where habitat description are not available. In the absence of habitat description have been tentatively considered as 'possible' to occur

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Brachyloma nguba			P1	Erect, compact to spreading, mid-dense shrub, to 0.8 m high, leaves discolorous, usually 2-3 mm long; style 0.2-0.25 mm long; disc truncate. Fl. red, Apr to May. White to brown sandy clay, shallow sandy loam. Open mallee woodland, mallee scrub, flat plains.	Possible
Brachyloma stenolobum			P1	No description available	Possible
Calamphoreus inflatus			P4	Erect, spreading shrub, 0.4-1.6 m high, to 2 m wide. Fl. blue-purple/green, Oct to Dec or Feb to Mar. Clay loam with ironstone gravel. Flats, disturbed sites.	Possible
Calytrix nematoclada			P3	Shrub, 0.15-0.5(-1) m high. Fl. purple-pink, Sep or Nov to Dec or Jan. Yellow or grey sand. Sandplains.	Possible
Chorizema circinale			P3	Prostrate, scrambling, wiry shrub, to 0.4 m high. Fl. yellow & orange & red, Sep to Dec. Yellow sand, sandy clay with gravel. Flats, margin of gravel pit.	Possible
Cryptandra polyclada subsp. *polyclada*			P3	Mat-forming or upright shrub, 0.1-0.7 m high. Fl. white/cream, Jan to May or Aug or Oct. Sand. Sandplains.	Possible
Dampiera orchardii			P2	Erect perennial, herb, 0.2-0.4 m high. Sand.	Possible
Dampiera scaevolina			P1	Erect to ascending perennial, herb or shrub, 0.2-0.5 m high. Fl. blue/white, Sep to Nov. Sandy & gravelly soils.	Possible
Daviesia elongata subsp. *implexa*			P3	Spreading or sprawling shrub, 0.4-1 m high. Fl. yellow/orange & red, Sep. Sand & laterite.	Possible
Daviesia implexa			P3	No description available	Possible
Dicrastylis capitellata			P1	Low spreading shrub, 0.2-0.25 m high. Fl. blue-purple, May. Loamy sand, sandy loam.	Possible
Eremophila racemosa			P4	Erect shrub, 0.5-1.7 m high. Fl. purple-pink-red/white, Mar or Aug to Dec. Sandy or stony loam, clay loam. Undulating plains, roadsides.	Possible
Eucalyptus cerasiformis			P4	Mallee, 2-3.5 m high, bark smooth, grey to brown. Fl. yellow, Dec or Jan to Mar. Red loamy soils.	Possible
Eucalyptus deflexa			P4	(Mallee), 1-3 m high, bark smooth. Fl. pink/cream-white, Mar or May to Oct. Clay loam, sandy loam, white or yellow sand, often with gravel. Flat areas & slight rises.	Possible
Eucalyptus exigua			P3	Mallee, 2-5 m high, bark smooth. Fl. white-cream, Mar. Sandy loam, white sand. Sandplains.	Possible
Eucalyptus retusa			P1	No description available	Possible
Eutaxia hirsuta			P2	Erect, shrub, spindly shrub (broom-like). *Stems* terete, glabrous; pustules or glands absent.	Known to occur[3]
Eutaxia sp. North Ironcap (P. Armstrong PA 06/898)			P1	No description available	Possible

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Grevillea aneura			P4	Dense, prickly shrub, 0.5-2.8 m high. Fl. red, Jun or Aug to Dec or Jan. Sand, sandy clay, gravel.	Possible
Grevillea neodissecta			P4	No description available	Possible
Grevillea prostrata			P4	Loose, prostrate shrub, 0.04-0.1 m high, 0.8-1.2 m wide. Fl. cream-white/pink-red, Aug to Dec or Jan. White, grey or yellow sand, gravel. Sandplains.	Possible
Guichenotia anota			P1	Shrubs, 1 m high; branchlets hairy, not glaucous. Leaves alternate, 10-25 mm long	Possible
Guichenotia asteriskos			P2	Erect, compact shrub, ca 0.35 m high. Fl. white, Sep to Oct. Sandy clay or loam with gravel.	Possible
Hemigenia sp. Newdegate (E. Bishop 75)			P1	Spindly, erect to spreading shrub, 0.2-0.45 m high, to 0.5 m wide. Fl. blue/purple, Sep to Oct. Clay loam. Disturbed sites.	Possible
Hibbertia carinata			P1	Shrub, to 0.4 m high. Fl. yellow, Aug to Sep. Well-drained gravelly sand, yellow sand with gravel.	Possible
Hibbertia pachyphylla			P3	Shrub, to 0.5 m high. Fl. yellow, Sep to Nov. White to yellow sand, brown sandy gravel, gravelly loam, laterite, granite, quartz. Undulating plains, low rises, valley floors.	Possible
Hydrocotyle eichleri			P3	No description available	Possible
Hysterobaeckea pterocera			P1	No description available	Possible
Labichea rossii			P1	No description available	Possible
Melaleuca ochroma			P3	No description available	Possible
Microcorys sp. Forrestania (V. English 2004)			P4	Prostrate or erect shrub, 0.35-0.4 m high. Fl. white/purple, Jan or Apr. Yellow sandy clay or red-brown clay. Open woodland or cleared areas.	Known to occur[2]
Microcorys sp. Mt Holland (D. Angus DA 2397)			P1	No description available	Possible
Microseris walteri			P3	No description available	Possible
Mirbelia taxifolia			P1	Shrub, 0.6-0.9 m high. Fl. orange-yellow, Sep. Red or yellow sand.	Possible
Notisia intonsa			P3	No description available	Possible
Orianthera exilis			P2	No description available	Possible
Oxymyrrhine plicata			P3	No description available	Possible
Pityrodia scabra subsp. *dendrotricha*			P3	No description available	Possible
Pityrodia sp. Yilgarn (A.P. Brown 2679)			P3	No description available	Possible
Pterostylis echinulata			P3	No description available	Possible
Rinzia torquata			P3	No description available	Known to occur[1]
Rinzia triplex			P3	No description available	Known to occur[1,2]
Seringia adenogyna			P3	No description available	Possible

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Stylidium thylax			P2	Creeping perennial, herb, 0.04-0.08 m high, Leaves adpressed to stem, ovate to lanceolate, 0.1-0.4 cm long, 0.6-1.5 mm wide, apex mucronate, margin hyaline, glabrous. Inflorescence uni-flowered, pedicels glandular. Fl. white, Oct. Sand. Gentle slopes and plains. Heath, mallee shrubland.	Possible
Thysanotus lavanduliflorus			P1	Caespitose perennial, herb (with tuberous roots), to 0.25 m high. Fl. purple, Nov to Dec. Sand, sandy loam.	Possible
Thysanotus sp. Yellowdine (A.S. George 6040)			P2	No description available	Possible
Verticordia gracilis			P3	Low, slender shrub, 0.15-0.6 m high. Fl. pink, Oct to Nov. Yellow sand, gravelly sand, sandy loam.	Known to occur[1]
Verticordia stenopetala			P3	Shrub, 0.2-0.6(-1.3) m high. Fl. pink/pink-purple-red, Oct to Dec or Jan. Yellow sand, sometimes with gravel. Undulating plains.	Possible

[1] DBCA record (2018a); [2] Botanica record (2013); [3] Astron record (2014)

4.1.2 Fauna

According to the results of the NatureMap search (DBCA, 2021), a total of 243 vertebrate fauna taxa have been recorded within a 40 km radius of the survey area, including 10 amphibians, 145 bird, 25 mammals and 63 reptiles. Combined results of database searches (DBCA, 2021 and DAWE, 2021) identified eight introduced taxa as potentially occurring within the survey area, these being:

1. *Camelus dromedarius* (Camel)
2. *Canis lupus familiaris* (Dog)
3. *Capra hircus* (Goat)
4. *Felis catus* (Cat)
5. *Mus musculus* (House Mouse)
6. *Oryctolagus cuniculus* (Rabbit)
7. *Sus scrofa* (Pig)
8. *Vulpes vulpes* (Red Fox)

Vertebrate fauna of conservation significance identified during the literature review as previously being recorded in the general area were assessed and ranked for their likelihood of occurrence within the survey area itself (Table 4-3). The rankings and criteria used were:

- Would Not Occur: There is no suitable habitat for the species in the survey area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).
    - Locally Extinct: Populations no longer occur within a small part of the species natural range, in this case within 10 or 20km of the survey area. Populations do however persist outside of this area.

  - Regionally Extinct: Populations no longer occur in a large part of the species natural range, in this case within the Southern Cross/ Western Mallee Bioregions. Populations do however persist outside of this area.

- Unlikely to Occur: The survey area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the site itself would not support a population or part population of the species.

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

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

Table 4-3: Likelihood of Occurrence – Fauna Species of Conservation Significance

Species	Conservation Status			Habitat Description	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA Priority		
Carnaby's Black Cockatoo *Calyptorhynchus latirostris*	EN	EN	-	Carnaby's cockatoo is endemic to the south-west of WA, ranging from the Kalbarri in the north to Esperance in the south-east, and inland to Coorow, Kellerberrin and Lake Cronin. They are most common in semi-arid parts of the south-west. Carnaby's cockatoo occur in uncleared and remnant areas of woodland, shrubland and kwongan heath dominated by Proteaceous species. They breed in the semiarid and subhumid interior eucalypt woodlands, principally dominated by Salmon Gum Eucalyptus salmonophloia or Wandoo Eucalyptus wandoo. The Avon Wheatbelt bioregion is an important breeding area for the species. After breeding, flocks tend to migrate coastward in search of food, with the Swan Coastal Plain recognised as an important foraging area.	Unlikely to occur. This species is only recorded very infrequently this far north east of its main documented range. The survey area contains no hollow bearing trees suitable for this species to use for breeding purposes. Potential impacts anticipated to be non-existent/negligible
Grey Falcon *Falco hypoleucos*	VU	VU	-	Occurs in arid and semi-arid Australia. The species is mainly found where annual rainfall is less than 500 mm, except when wet years are followed by drought, when the species might become marginally more widespread, although it is essentially confined to the arid and semi-arid zones at all times. The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses.	Unlikely to occur. This species is only recorded very infrequently in this general area. The survey area contains no suitable breeding habitat. No impact on this species conservation status will occur.
Malleefowl *Leipoa ocellata*	VU	VU	-	Occurs in unburned mallee and woodland with abundant litter and low scrub.	Possibly occurs however habitat appears very marginal/or unsuitable for breeding supported by lack of observations during survey. Occasional transients only. Potential impacts anticipated to be non-existent/negligible
Night Parrot *Pezoporus occidentalis*	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, and may or may not contain shrubs or low trees. (DPaW, 2017).	Would not occur. Preferred habitat absent. No records in southern goldfields/ mallee region. No impact on this species conservation status will occur.
Fork-tailed Swift *Apus pacificus*	MI	MI	-	Low to very high airspace over varied habitat from rainforest to semi desert.	Possibly Occurs aerially over survey area on very rare occasions. No impact on this species conservation status will occur.
Peregrine Falcon *Falco peregrinus*	-	OS	-	Diverse from rainforest to arid shrublands, from coastal heath to alpine Mainly about cliffs along coasts, rivers and ranges and about wooded watercourses and lakes. The species utilises the ledges, cliff faces and large hollows/broken spouts of trees for nesting. It will also occasionally use the abandoned nests of other birds of prey.	Possibly Occurs aerially over survey area on very rare occasions. No suitable breeding habitat. Potential impacts anticipated to be non-existent/negligible

Species	Conservation Status			Habitat Description	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA Priority		
Western Rosella (inland) *Platycercus icterotis* subsp. *xanthogenys*	-	-	P4	Western Rosellas are found in open eucalypt forest and timbered areas, including cultivated land and orchards. The inland species occurs in drier woodland, with a heath understorey.	Possibly Occurs however habitat appears marginal/or unsuitable for breeding. No impact on this species conservation status will occur.
Migratory shorebirds (various species)	MI	MI	P4	Migratory shorebirds generally prefer 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.	Would not occur. No suitable habitat. No impact on this species conservation status will occur.
Chuditch *Dasyurus geoffroii*	VU	VU	-	Previously occurred throughout arid and semi-arid Australia, but is now restricted to south-west Western Australia. It now currently inhabits a wide range of wooded habitats, including wet and dry sclerophyll, eucalyptus forest (especially Jarrah, Eucalyptus marginata) dry woodlands and mallee remnants.	Possibly occurs as occasional transient individuals only. Large expanses of similar habitat in surrounding areas. Potential impacts anticipated to be non-existent/negligible.
Western Brush Wallaby *Notamacropus irma*	-	-	P4	Dry sclerophyll forest and woodland, including mallee areas with grassy understorey and thickets of shrubs.	Possibly occurs as occasional transient individuals only. Large expanses of similar habitat in surrounding areas. Potential impacts anticipated to be non-existent/negligible.
Heath Mouse *Pseudomys shortridgei*	EN	VU	-	Heath mouse frequently inhabits species-rich dry heathland, and open woodland and forest habitats with a heath understorey. In both the western and eastern subpopulations there appears to be a preference for a structurally complex heath. In Western Australia, the heath mouse has been trapped mostly in species-rich heath but also in mixed scrub and mallee. The species has not been located in vegetation less than 10 years post-fire and it has been known to attain high densities in heath 30 years post-fire.	Unlikely to occur. This species has not been recorded in the general area during several detailed fauna surveys over many years. Large expanses of similar habitat in surrounding areas No impact on this species conservation status will occur
Western Mouse *Pseudomys occidentalis*			P4	The western mouse shows a preference for long unburnt habitat (between 30 and 50 yrs) on sandy clay loam or sandy loam. Vegetation in suitable habitats is variable and includes sparse low shrubland, tall dense shrubland, sparse to dense shrub mallee and mid-dense woodland. All sites where the western mouse has been collected have had patches of extremely dense vegetation. On some sites, populations occur in dense vegetation surrounded by granite rocks, which may afford them protection from fire. Quandong (Santalum acuminatum) and sedge species are thought to be important habitat requirements in the northern part of the western mouse's range. Populations are fragmented and restricted to this type of (fragmented) habitat.	Unlikely to occur. This species has not been recorded in the general area during several detailed fauna surveys over many years. Large expanses of similar habitat in surrounding areas No impact on this species conservation status will occur

Species	Conservation Status			Habitat Description	Likelihood of Occurrence
	EPBC Act	BC Act	DBCA Priority		
Red-tailed Phascogale *Phascogale calura*	VU	CD	-	The red-tailed phascogale occurs in remnant vegetation in the southern wheatbelt of Western Australia, where annual mean rainfall is 400−500 mm. Most of the records are concentrated in an area about 150 km long in a north-south direction from Brookton to Katanning. The red-tailed phascogale is largely confined to woodlands with old-growth hollow-producing eucalypts, particularly Wandoo (*Eucalyptus wandoo*) and York gum (*E. loxophleba*), often with associated rock sheoak (*Allocasuarina huegeliana*), but has also been recorded in shrublands and various mosaics of woodland, shrubland and scrub-heath. It avoids relatively open areas and rocky ridges which are devoid of vegetation. The species prefers long unburnt (more than 50 years) patches.	Unlikely to occur. Habitat appears to be unsuitable. In addition this species has not been recorded in the general area during several detailed fauna surveys over many years. Large expanses of similar habitat in surrounding areas No impact on this species conservation status will occur.
Lake Cronin Snake *Paroplocephalus atriceps*	-	-	P3	Eucalyptus woodlands and granite outcrops.	Possibly occurs, however as the area of impact is small and there are large expanses of similar habitat in surrounding areas potential impacts are anticipated to be non-existent/negligible
Central Long-eared Bat *Nyctophilus major tor*	-	-	P4	Appears to prefer heavy eucalypt woodlands and tall woodlands with a tall shrub understorey. Less common in open woodlands.	Possibly occurs while foraging though no nearby records. No suitable refuge habitat. Large expanses of similar habitat in surrounding areas No impact on this species conservation status will occur.

4.2 Field Assessment

4.2.1 Vegetation Types

Four vegetation types were identified within the survey area. These vegetation types were identified within three landform types and comprised of three major vegetation groups according to the NVIS, Major Vegetation Group (MVG) definition (Table 4-4). These vegetation types were represented by a total of 30 Families, 75 Genera and 179 Taxa as listed in Appendix 3. A map showing the vegetation types present in the survey area is provided in Figure 4-1.

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

Major Vegetation Group	Vegetation Type	Vegetation Code	Extent within survey area	Image
Eucalypt Woodland (MVG 5)	Low woodland of *Eucalyptus salmonophloia* over low open heathland of *Melaleuca adnata, M. calyptroides, M. eleuterostachya* on clay-loam plain	CLP-EW1	8 ha (2.0%)	
Mallee Woodland and Shrubland (MVG 14)	Open mallee shrubland of *Eucalyptus tenera/ E. pileata* over low heathland of *Melaleuca adnata, M. calyptroides, M. lateriflora* and low open shrubland of *Acacia deficiens/ A. intricata* on sand-loam plain	SLP-MWS1	136 ha (35.5%)	

Major Vegetation Group	Vegetation Type	Vegetation Code	Extent within survey area	Image
Heathland (MVG 18)	Mid heathland of *Allocasuarina campestris/ Allocasuarina corniculata, Acacia eremophila/ Acacia fragilis* and *Melaleuca cordata/ Melaleuca hamata* on sandplain	SP-H1	135 ha (35.3%)	
Heathland (MVG 18)	Low heathland of *Banksia sessilis/ Hakea platysperma* and *Verticordia chrysantha, Verticordia roei* and *Grevillea incrassata* on sandplain	SP-H2	69 ha (18.1%)	
N/A	Cleared Vegetation (excluding exploration)	CV	35 ha (9.1%)	No image available
Total			**383 ha**	

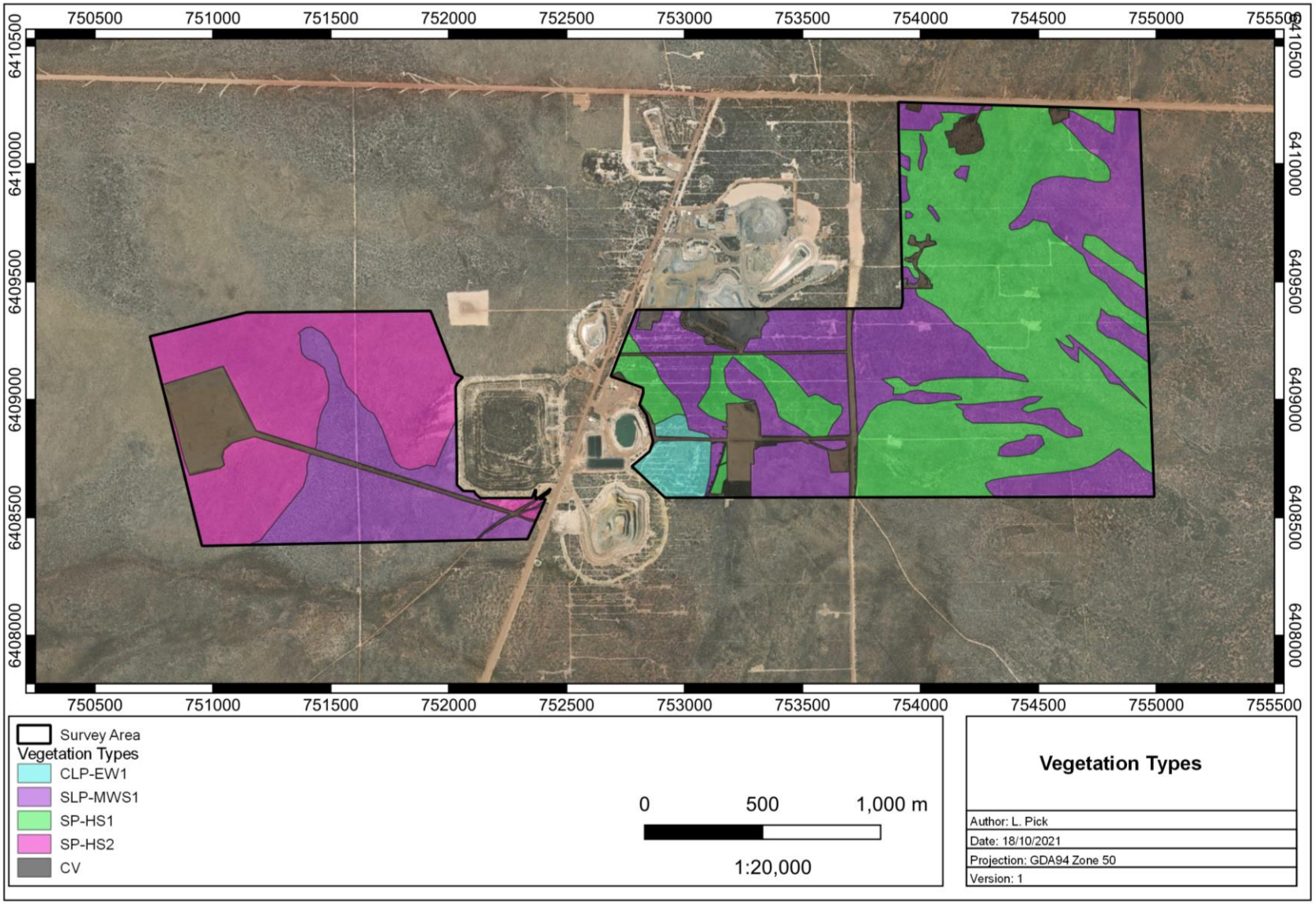


Figure 4-1: Vegetation types within the survey area

4.2.2 Vegetation Condition

Based on the vegetation condition rating scale adapted from Keighery, 1994 and Trudgen, 1988 (Appendix 4), vegetation was rated as 'Very Good' (Figure 4-2). 'Very Good' condition depicts vegetation structure altered by obvious signs of disturbance, for example by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing. Disturbance within the survey area was a result of existing mining infrastructure and exploration gridlines.

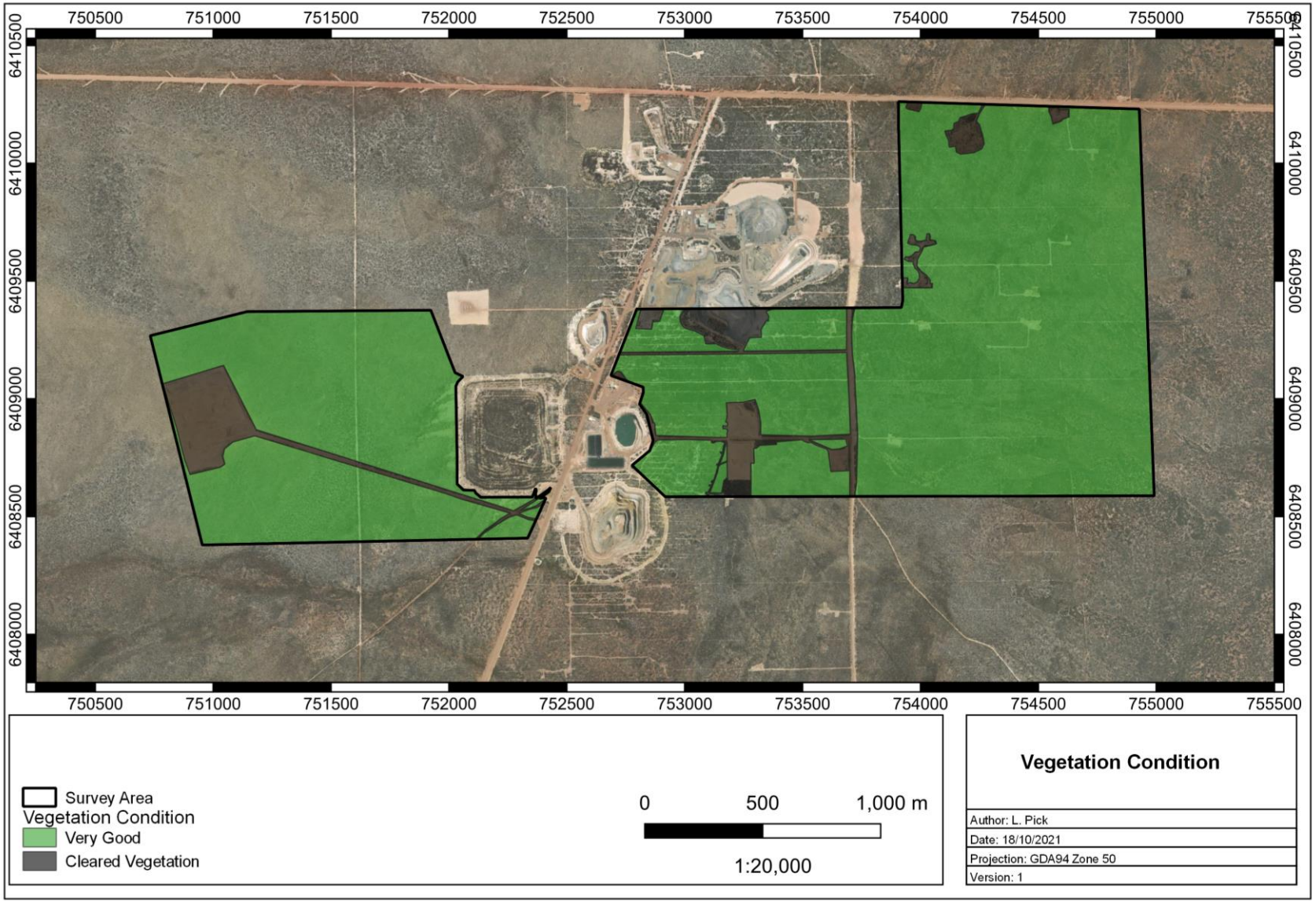
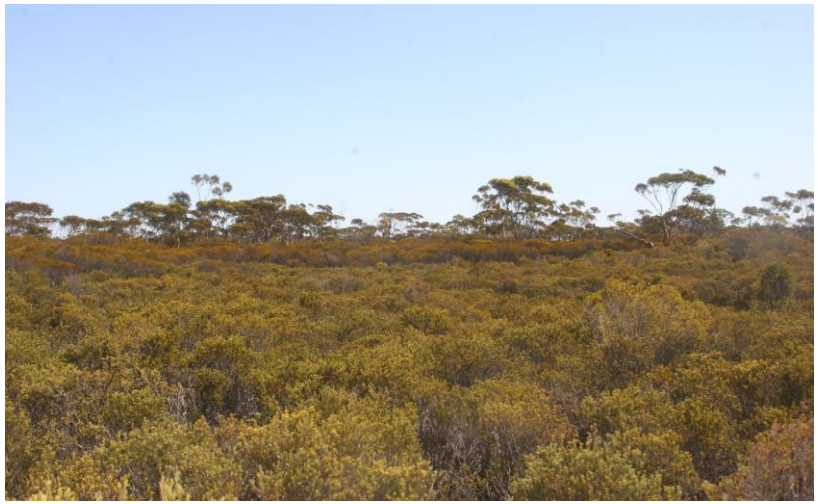


Figure 4-2: Vegetation condition within the survey area

4.2.3 Fauna Habitat

The broad scale terrestrial fauna habitats within the survey area presented below are based on vegetation and associated landforms identified during the flora and vegetation assessment. The extent of the identified fauna habitats and a summary description of each are provided in Table 4-5 below.

Table 4-5: Main Terrestrial Fauna Habitats within the survey area

Fauna Habitat	Description	Representative Fauna Attributes	Example Image
<u>Clay-Loam Plain</u> Eucalypt Woodland approximate area = 8 ha; 2.0%	Clay-loam plain comprising Salmon Gum woodland over *Melaleuca* spp. and mixed low shrubs.	• Range of vegetation strata suitable to a variety of passerine and nonpasserine birds. • Moderate to high leaf litter due to the presence of mature Eucalypt trees. • Relatively dense shrubs providing cover for small fauna. • Ground not especially suited to burrowing species	
<u>Sand-Loam Plain</u> Heathland/ Mallee Shrubland approximate area = 341 ha; 88.8%	Sand-loam plain comprising of dense Acacia/ Allocasuarina/ Banksia/ Melaleuca heathland and mallee shrubland over mixed low shrubs.	• Substrate very well suited to a variety of burrowing small mammals and reptiles. • Less diverse vegetation strata supporting a less diverse avifauna assemblage.	

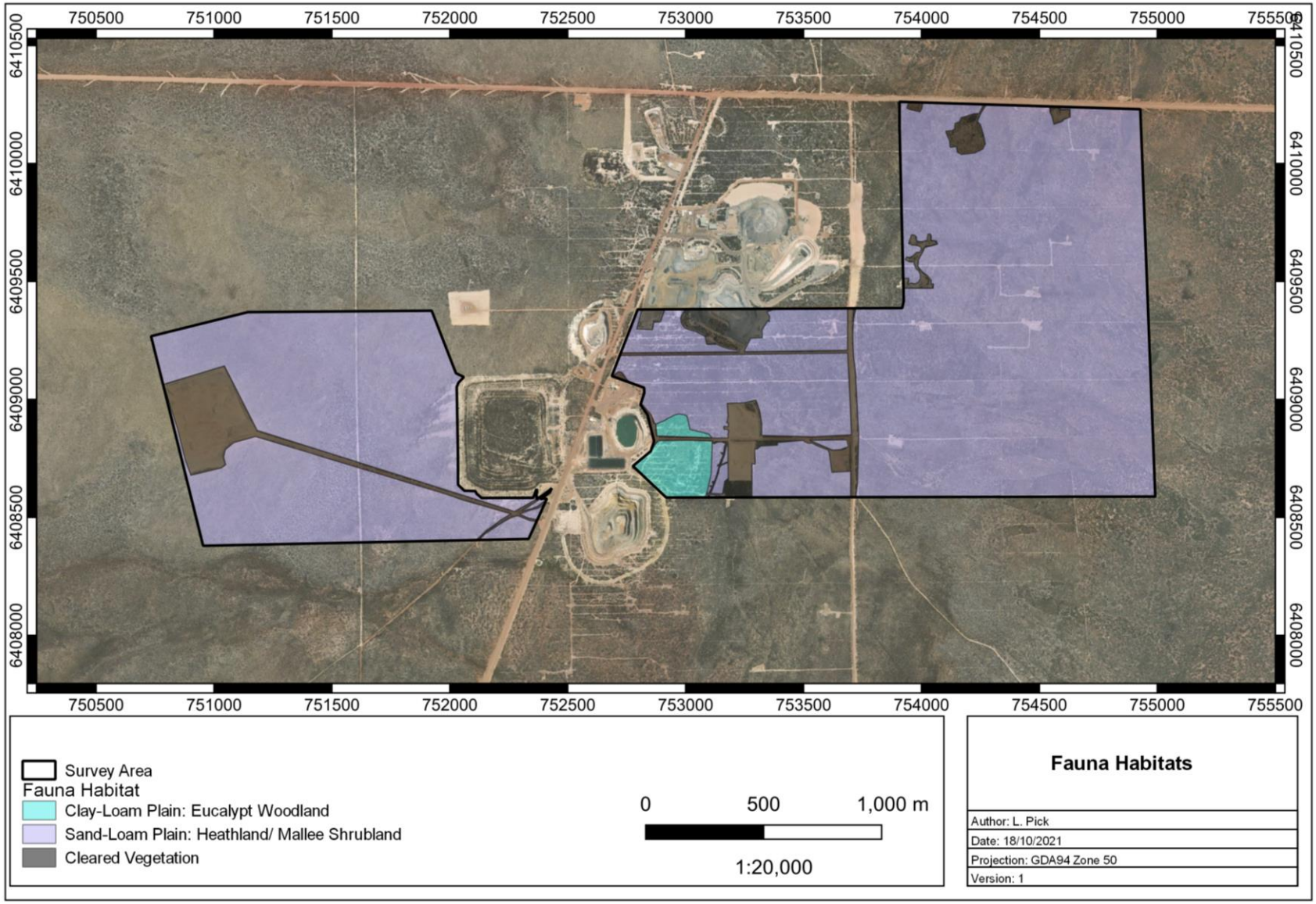


Figure 4-3: Main Terrestrial Fauna Habitats within the survey area

Based on the habitats present within the survey area, a list of expected vertebrate fauna species likely to occur in the survey area was compiled from information obtained during the literature review and is presented in Appendix 6. The results of some previous fauna surveys carried out in the general area are also summarised in this species listing as are the DBCA NatureMap database search results.

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

Table 4-6 summarises the numbers of potential species based on vertebrate class considered likely to be present in the general vicinity of the survey area based on the complete list held Appendix 6. This list has been developed based on the complete list provided in Appendix 6 and using a precautionary approach adopted for the assessment. At any one time, only a subset of the listed potential species is likely to be present within the bounds of the survey area.

Table 4-6: Summary of Potential Vertebrate Fauna Species

Group	Total number of potential species	Potential number of specially protected species	Potential number of migratory species	Potential number of priority species
Amphibians	12	0	0	0
Reptiles	65	0	0	1
Birds	121	3	0	1
Non-Volant Mammals	23[6]	1	0	1
Volant Mammals (Bats)	9	0	0	1
Total	**230[6]**	**4**	**0**	**4**

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

4.2.4 Introduced Species

No introduced flora or fauna species were recorded during the survey.

4.2.5 Significant Flora

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

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

No Threatened flora were identified within the survey area. Three Priority flora taxa were identified within the survey area, each of which have been previously recorded by Botanica (2013) and Astron (2014); *Eutaxia hirsuta* (P2), *Microcorys* sp. Forrestania (V. English 2004) (P4) and *Rinzia triplex* (P3). Two additional Priority Flora are listed on the DBCA database as occurring within the survey area; *Rinzia torquata* (P3) and *Verticordia gracilis* (P3) however to date neither record has been able to be confirmed. These records were obtained during previous flora surveys conducted by Frost O'Connor and Associates in 2004/ 2005 and have not been identified despite numerous searches. GPS coordinates of taxa recorded within the survey area is provided in Table 4-7 and shown in Figure 4-4.

No other significant flora (as described above) was identified within the survey area. A map showing regional Threatened and Priority Flora records in relation to the survey area is provided in Appendix 2.

Table 4-7: Significant Flora recorded within the survey area

Taxon	Coordinates	Image
Eutaxia hirsuta (P2)	50H 751662 6409206[3] 50H 751274 6408561 50H 751276 6408603 50H 751276 6408606 50H 751277 6408606 50H 751277 6408605 50H 751279 6408604 50H 751281 6408623 50H 751425 6408949	
Microcorys sp. Forrestania (V. English 2004) (P4)	50H 754547 6410246[2] 50H 754796 6409814[2]	

Taxon	Coordinates	Image
Rinzia triplex (P3)	50H 753722 6409262[1,2]	

[1] DBCA record (2018a); [2] Botanica record (2013); [3] Astron record (2014)

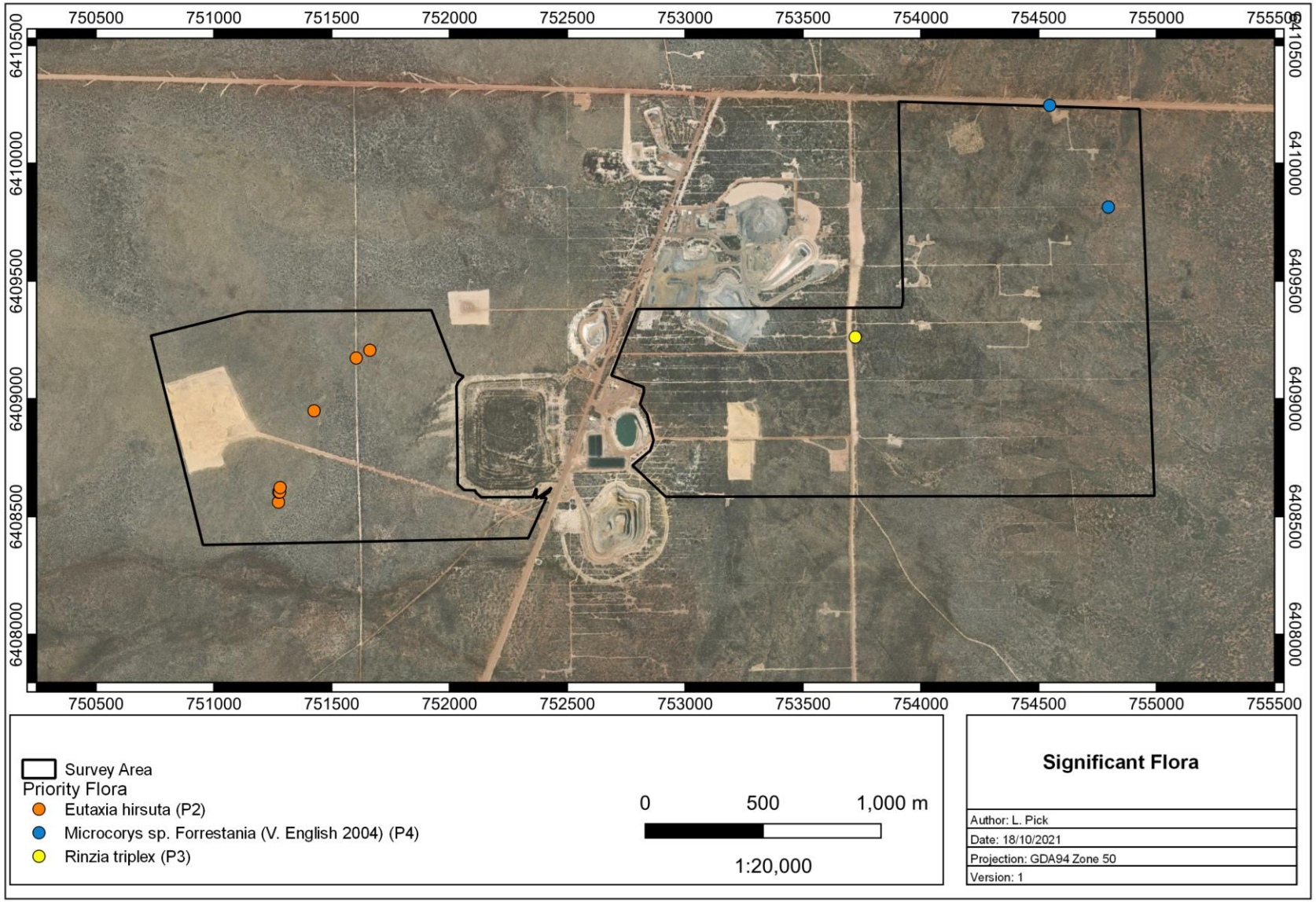


Figure 4-4: Significant flora recorded within the survey area

4.2.6 Significant Vegetation

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

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

The survey area is located adjacent to the spatially mapped 500m buffer of the *Ironcap Hills Vegetation Complexes* (North Ironcap) obtained from the DBCA communities database. This Priority Ecological Community is managed by the DBCA as a Priority 3 Ecological Community. This vegetation community was first described by Newbey and Hnatiuk (1988) during the biological survey of the Lake Johnston-Hyden area as a BIF complex and was considered one of seven unique vegetation communities to the Lake Johnston-Hyden area. The description of the North Ironcap BIF complex is provided below:

The complex vegetation on banded ironstone formation had a number of species dominant at different sites. Low trees (Acacia lasiocalyx and Eucalyptus flocktoniae [Merrit]) were rare. Mallees of Eucalyptus. aff. wandoo (E. livida, E. capillosa subsp. polyclada) were usually present in small areas partially lateritized, while E. eremophila occurred rarely. Tall shrubs that were occasionally present included Allocasuarina campestris ssp. campestris (also low shrub), A. corniculata, Banksia sphaerocarpa var. dolichostyla (Ironcaps), Calothamnus quadrifidus (also low shrub), Dryandra aff. cersioides, Grevillea pterosperma, Hakea subsulcata, H. scoparia, Leptospermum erubescens, Melaleuca fulgens, M. uncinata, Santalum acuminatum and Trymalium aff. ledifolium; low shrubs were Acacia sulcata var. platyphylla, Acacia sp. (KRN 5226), Chamelaucium ciliatum (south), Cryptandra miliaris, Dodonaea adenophora, D. amblyophylla (west), Dryandra sp. (KRN 5229), Melaleuca cordata, Phebalium filifolium, P. microphyllum, P. tuberculosum ssp. tuberculosum, P. aff. tuberculosum and Platysace maxwellii (west); perennial grasses of Spartochloa scirpoidea; and sedges of Lepidosperma drummondii, L. viscidum var. viscidum, Lepidosperma sp. (KRN 5232), Lepidosperma sp. (KRN 5233) and Lepidosperma sp. (KRN 6488).

No banded ironstone was identified within the survey area and the vegetation complex described above was not represented within the survey area.

According to the DPIRD (2018) Vegetation Association GIS file, the BIF complex within the Greater North Ironcap area is classified by pre-European vegetation association Forrestania 1413; Shrublands; *Acacia, Casuarina & Melaleuca* thicket which is represented in both the Southern Cross and Western Mallee subregion. This vegetation association does not occur within the survey area (see **Section 2.3**).

No other significant vegetation (as described above) was identified within the survey area. A map showing the total extent of Priority Ecological Communities in relation to the survey area is provided in Appendix 2.

4.2.7 Significant Fauna

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

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

No significant fauna were observed during the survey. The current status of some species on site and/or in the general area is difficult to determine, however, based on the habitats present and, in some cases, direct observations or recent nearby records, the following species of conservation significance can be regarded as possibly utilising the survey area for some purpose at times, these being:

- **Lake Cronin Snake *Paroplocephalus atriceps* - P4 (DBCA Priority Species)**
  Status of this species in the survey area is difficult to determine but it has been listed as potentially present as the survey area falls within/near the species documented range. The species does however appear to be very uncommon given the paucity of documented records in the immediate vicinity. Given the small size of the survey area and the presence of large expanses of similar habitat in surrounding areas, potential impacts are anticipated to be non-existent/negligible.

- **Carnaby's Black-Cockatoo *Calyptorhynchus latirostris* - Endangered (EPBC Act and BC Act)**
  Listed as a potential species as it has infrequently been recorded in the general area. Expected to only occur very occasionally in small transient groups. The survey area contains no potential breeding habitat for this species. No impact on this species conservation status is anticipated.

- **Western Rosella (inland ssp) *Platycercus icterotis* subsp*. xanthogenys* - P4 (DBCA Priority Species)**
  Listed as a potential species as it has infrequently been recorded in the general area. Expected to only occur very occasionally in small transient groups. The survey area contains no potential breeding habitat for this species. No impact on this species conservation status is anticipated.

- **Malleefowl *Leipoa ocellata* – Vulnerable (EPBC Act and BC Act)**
  Listed as a potential species as it has previously been recorded in the general area. No evidence of recent malleefowl activity (active mounds, tracks, feathers or bird observations etc.) was however observed within the survey area and therefore it is expected only to occur occasionally as transient individuals. No impact on this species conservation status is anticipated.

- **Peregrine Falcon *Falco peregrinus* – Other Specially Protected (BC Act)**
  This species potentially utilises some sections of the survey area as part of a much larger home range, though records in this area are uncommon. It would not breed within the survey area. No impact on this species conservation status will occur.

- **Western Brush Wallaby *Notamacropus irma* - P4 (DBCA Priority Species**
  Listed as a potential species as it has infrequently been recorded in the general area. Expected to only occur very occasionally as individuals/pairs if at all. Given the small size of the survey area and the presence of large expanses of similar habitat in surrounding areas, potential impacts anticipated to be non-existent/negligible.

- **Chuditch *Dasyurus geoffroii* - Vulnerable (EPBC Act and BC Act)**
  Listed as a potential species as it has previously been recorded in the general area. Possibly occurs as occasional transient individuals only. Given the small size of the survey area and the presence of large expanses of similar habitat in surrounding areas, potential impacts anticipated to be non-existent/negligible.

- **Central Long-eared Bat *Nyctophilus major tor* – P4 (DBCA Priority Species)**
  Listed as a potential species as the survey area falls within the species documented range. The species does however appear to be uncommon in the general area given the lack of documented records in the immediate vicinity. The survey area represents potential foraging habitat but lacks refuge habitat (hollow bearing trees). No impact on this species conservation status is anticipated.

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.

A number of other species of conservation significance, while possibly present in the general area and/or the local region are not listed as potential species due to the survey area being outside of their currently recognised range, a lack of suitable habitat or known/very likely local or regional extinction (and no subsequent recruitment from adjoining areas).

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

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

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

4.4 Relevant State Legislation

4.4.1 Environmental Protection Act WA 1986

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

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

No evidence of the survey area containing any TEC or Threatened Flora or Fauna was identified during the survey. Approximately 375 ha of the survey area is located within an ESA

which encompasses an approximate 10km radius of Lake Cronin as listed under the *Environmental Protection Act 1986* (EP Act).

4.4.2 Biodiversity Conservation Act 2016

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

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

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

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

4.4.3 Conservation Reserves

The survey area is not located within a vested Conservation Reserve. The closest vested Conservation Reserve is the Lake Cronin Nature Reserve, located approximately 4.5km north-east of the survey area which is managed by DBCA as a Class A Reserve.

According to the EPA (2009) *Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region*, the survey area occurs within a 56,750ha area within the mineralised greenstone belt in the Lake Cronin Region which is proposed to be managed under Section 33(2) of the *Conservation and Land Management Act 1984* (CALM Act) but not formally reserved. A map showing conservation areas in relation to the survey area is provided in Appendix 2.

4.5 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, as presented in this report, Botanica provides the following comments regarding the native vegetation clearing principles listed under Schedule 5 of the EP Act (Table 4-8).

Table 4-8: Assessment of development within the survey area against native vegetation clearing principles

Letter	Principle	Assessment	Outcome
Native vegetation should not be cleared if it:			
(a)	comprises a high level of biological diversity.	Woodlands of the Southern Cross subregion have a very high diversity of Eucalypts with as many as 170 species occurring within the subregion. The subregion also has a high diversity of Acacia species however most species (excluding Threatened and Priority Flora species) are wide ranging and usually occur in at least one, and often several, adjoining subregions (Cowan, 2001). With the exception of granite outcrops vegetation of the Western Mallee subregion is not considered to comprise of a high level of biodiversity however it does contain a high number of endemic species (Beecham & Danks, 2001). 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 to this principle
(b)	comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	No significant fauna were observed within the survey area. No evidence of Malleefowl activity was identified during the targeted survey. The survey area comprises of broad fauna habitats that are typical of those in the wider region. No unique fauna habitats (caves, rocky outcrops/ pools etc.) occur within the survey area. No water bodies (both perennial/ non-perennial) occur within the survey area.	Clearing is unlikely to be at variance to this principle
(c)	includes, or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the BC Act and the EPBC Act were identified within the survey area.	Clearing is not at variance to this principle
(d)	comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No TEC listed under the EPBC Act or by the BC Act occur within the survey area.	Clearing is not at variance to this principle
(e)	is significant as a remnant of native vegetation in an area that has been extensively cleared	The survey area occurs within the pre-European Beard vegetation association Forrestania 511 of the Southern Cross subregion and Forrestania 2048 Western Mallee subregion which retain >97% of their original pre-European vegetation extent.	Clearing is unlikely to be at variance to this principle
(f)	is growing, in, or in association with, an environment associated with a watercourse or wetland	There are no inland waters (lakes/ playas) or any perennial/ ephemeral drainage lines within the survey area.	Clearing is unlikely to be at variance to 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 occurs within the pre-European Beard vegetation association Forrestania 511 of the Southern Cross subregion and Forrestania 2048 Western Mallee subregion which retain >97% of their original pre-European vegetation extent. Clearing within these vegetation associations	Clearing is unlikely to be at variance to this principle

Letter	Principle Native vegetation should not be cleared if it:	Assessment	Outcome
		is not likely to lead to land degradation issues such as salinity, water logging or acidic soils.	
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The survey area is not located within a gazetted conservation area. According to the EPA (2009) Advice on Conservation Values and Review of Nature Reserve Proposals in the Lake Cronin Region, the survey area occurs within a 56,750ha area within the mineralised greenstone belt in the Lake Cronin Region which is proposed to be managed under Section 33(2) of the CALM Act 1984 but not formally reserved. Given the small size of the survey area (54 ha) in relation to this proposed management area (56,750ha) significant impact to this land is unlikely.	Clearing is unlikely to be at variance to this principle
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	There are no inland waters (lakes/ playas) or any perennial/ ephemeral drainage lines within the survey area. Most rainfall is lost by evaporation or surface runoff. Only a small portion infiltrates the soil and recharges the groundwater.	Clearing is unlikely to be at variance to this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Rainfall is highly variable with an average annual rainfall of 339.6 mm and an evaporation rate of 2000 mm. The region is not prone to flooding and does not contain riparian vegetation.	Clearing is unlikely to be at variance to this principle

5 Recommendations

- Clearing Permit approval under the EP Act is required prior to any clearing within the survey area as the survey area is located within an ESA listed under the EP Act.
- Disturbance to Priority Flora taxa should be avoided where possible, including maintaining a 10m exclusion zone surrounding Priority Flora. Should avoidance not be possible, consultation with the DBCA Species and Communities Program is recommended prior to clearing of Priority Flora.

6 Bibliography

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Appendix 1: Conservation Ratings BC Act and EPBC Act

Definitions of Conservation Significant Species

Code	Category
State categories of threatened and priority species	
Threatened Species (T) Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act).	
CR	**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 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 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.

Code	Category
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.
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.

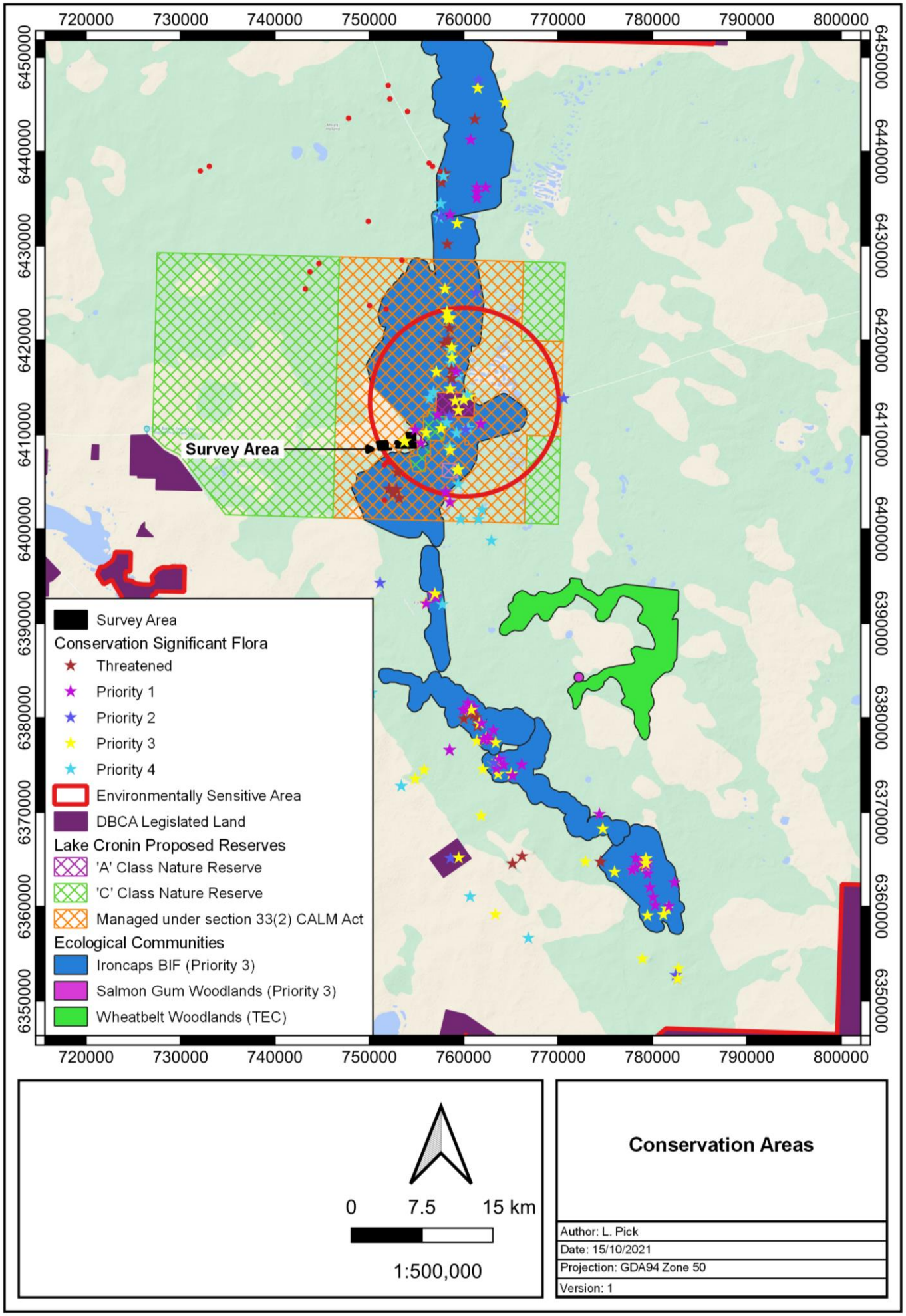
Code	Category
VU	**Vulnerable** Taxa which are not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which are the focus of a specific conservation 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.

Category Code	Category
Commonwealth categories of Threatened Ecological Communities (TEC)	
CE	**Critically Endangered** If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
EN	**Endangered** If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
VU	**Vulnerable** If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).
Priority Ecological Communities (PEC)	
P1	**Poorly-known ecological communities** Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.
P2	**Poorly-known ecological communities** Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	**Poorly known ecological communities** Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	**Ecological communities that are adequately known, rare but not threatened** or meet criteria for near threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	**Conservation Dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

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



Appendix 3: List of species identified within each vegetation type

Red text-Priority species (WAHERB, 2021)

Family	Genus	Taxon	CLP-EW1	SLP-MWS1	SP-H1	SP-H2
Apiaceae	*Platysace*	*deflexa*			*	
Apiaceae	*Platysace*	*maxwellii*		*		
Asparagaceae	*Lomandra*	*effusa*			*	
Asparagaceae	*Lomandra*	*mucronata*	*		*	
Asteraceae	*Olearia*	*dampieri* subsp. *eremicola*			*	
Asteraceae	*Olearia*	*lanuginosa*		*		
Asteraceae	*Olearia*	*muelleri*			*	
Boraginaceae	*Halgania*	*andromedifolia*			*	
Boraginaceae	*Halgania*	*lavandulacea*	*			
Boryaceae	*Borya*	*constricta*			*	
Casuarinaceae	*Allocasuarina*	*acutivalvis*	*	*	*	
Casuarinaceae	*Allocasuarina*	*campestris*			*	
Casuarinaceae	*Allocasuarina*	*corniculata*			*	*
Casuarinaceae	*Allocasuarina*	*decussata*	*	*	*	
Casuarinaceae	*Allocasuarina*	*humilis*			*	
Casuarinaceae	*Allocasuarina*	*microstachya*				*
Celastraceae	*Psammomoya*	*choretroides*			*	
Chenopodiaceae	*Atriplex*	*vesicaria*	*			
Chenopodiaceae	*Chenopodium*	*curvispicatum*	*			
Chenopodiaceae	*Maireana*	*pyramidata*			*	
Chenopodiaceae	*Rhagodia*	*preissii* subsp. *preissii*			*	
Chenopodiaceae	*Sclerolaena*	*diacantha*	*			
Chenopodiaceae	*Sclerolaena*	*uniflora*	*			
Convolvulaceae	*Wilsonia*	*humilis*		*		
Cupressaceae	*Callitris*	*canescens*		*		
Cupressaceae	*Callitris*	*preissii*	*	*	*	*
Cyperaceae	*Gahnia*	*ancistrophylla*		*	*	
Cyperaceae	*Lepidosperma*	*drummondii*	*	*	*	
Cyperaceae	*Lepidosperma*	sanguinolentum				
Cyperaceae	*Schoenus*	*brevisetis*				
Dasypogonaceae	*Calectasia*	*valida*	*			
Dilleniaceae	*Hibbertia*	*ancistrophylla*			*	
Dilleniaceae	*Hibbertia*	*gracilipes*			*	*
Ericaceae	*Leucopogon*	sp. Coujinup (Burgman 1085)			*	
Ericaceae	*Leucopogon*	sp. Wheatbelt (S. Murray 257)	*			
Ericaceae	*Lysinema*	*ciliatum*	*		*	*
Ericaceae	*Styphelia*	*epacridis*			*	
Ericaceae	*Styphelia*	*serratifolia*	*		*	
Ericaceae	*Styphelia*	*conostephioides*	*			
Ericaceae	*Styphelia*	*dielsianus*			*	
Ericaceae	*Styphelia*	*lissanthoides*			*	
Euphorbiaceae	*Bertya*	*dimerostigma*			*	
Fabaceae	*Acacia*	*assimilis* subsp. *atroviridis*	*			
Fabaceae	*Acacia*	*binata*		*		
Fabaceae	*Acacia*	*brachyclada*			*	
Fabaceae	*Acacia*	*deficiens*		*	*	
Fabaceae	*Acacia*	*densiflora*			*	
Fabaceae	*Acacia*	*eremophila* var. *eremophila*			*	

Family	Genus	Taxon	CLP-EW1	SLP-MWS1	SP-H1	SP-H2
Fabaceae	*Acacia*	*erinacea*	*	*	*	
Fabaceae	*Acacia*	*fragilis*		*	*	
Fabaceae	*Acacia*	*hemiteles*		*	*	
Fabaceae	*Acacia*	*heteroneura* var. *jutsonii*			*	
Fabaceae	*Acacia*	*intricata*		*		
Fabaceae	*Acacia*	*leptopetala*		*	*	
Fabaceae	*Acacia*	*neurophylla* subsp. *erugata*			*	
Fabaceae	*Acacia*	*sulcata* var. *platyphylla*		*		
Fabaceae	*Aotus*	sp. Tortile (G.J. Keighery 3767)		*		
Fabaceae	*Aotus*	*tietkensii*		*		
Fabaceae	*Chorizema*	*aciculare* subsp. *aciculare*				*
Fabaceae	*Daviesia*	*benthamii*	*	*	*	
Fabaceae	*Daviesia*	*brachyphylla*	*			
Fabaceae	*Daviesia*	*lancifolia*	*		*	
Fabaceae	*Daviesia*	*nematophylla*			*	
Fabaceae	*Daviesia*	*pachyloma*			*	
Fabaceae	*Dillwynia*	*divaricata*		*		
Fabaceae	*Dillwynia*	*uncinata*			*	
Fabaceae	*Eutaxia*	*hirsuta* (P2)				*
Fabaceae	*Gastrolobium*	*melanocarpum*			*	
Fabaceae	*Gastrolobium*	*spinosum*	*		*	
Fabaceae	*Gastrolobium*	*trilobum*			*	*
Fabaceae	*Gompholobium*	*gompholobioides*	*			
Fabaceae	*Jacksonia*	*nematoclada*		*		
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*			*	
Fabaceae	*Templetonia*	*egena*			*	
Fabaceae	*Templetonia*	*sulcata*	*			
Goodeniaceae	*Coopernookia*	*strophiolata*		*	*	
Goodeniaceae	*Dampiera*	*angulata*			*	
Goodeniaceae	*Dampiera*	*eriocephala*			*	
Goodeniaceae	*Goodenia*	*pinifolia*	*		*	
Goodeniaceae	*Scaevola*	*spinescens*	*			
Haloragaceae	*Glischrocaryon*	*roei*	*			
Hemerocallidaceae	*Dianella*	*revoluta*			*	
Lamiaceae	*Dasymalla*	*terminalis*		*		
Lamiaceae	*Hemiphora*	*lanata*		*		
Lamiaceae	*Microcorys*	sp. Forrestania (V. English 2004) (P4)		*	*	
Lamiaceae	*Westringia*	*cephalantha*		*	*	
Lamiaceae	*Westringia*	*rigida*		*		
Lauraceae	*Cassytha*	*glabella*			*	
Lauraceae	*Cassytha*	*melantha*		*	*	
Myrtaceae	*Balaustion*	*pulcherrimum*	*		*	
Myrtaceae	*Beaufortia*	*interstans*	*		*	
Myrtaceae	*Beaufortia*	*schaueri*	*		*	
Myrtaceae	*Calytrix*	*breviseta* subsp. *stipulosa*			*	
Myrtaceae	*Calytrix*	*duplistipulata*			*	
Myrtaceae	*Calytrix*	*violacea*			*	
Myrtaceae	*Cyathostemon*	*ambiguus*		*	*	
Myrtaceae	*Cyathostemon*	*tenuifolius*			*	
Myrtaceae	*Darwinia*	*inconspicua*	*	*	*	*
Myrtaceae	*Eucalyptus*	*calycogona*		*		

Family	Genus	Taxon	CLP-EW1	SLP-MWS1	SP-H1	SP-H2
Myrtaceae	*Eucalyptus*	*celastroides* subsp. *celastroides*	*			
Myrtaceae	*Eucalyptus*	*cylindriflora*		*		
Myrtaceae	*Eucalyptus*	*cylindrocarpa*			*	
Myrtaceae	*Eucalyptus*	*horistes*	*			*
Myrtaceae	*Eucalyptus*	*pileata*		*	*	
Myrtaceae	*Eucalyptus*	*platycorys*	*		*	
Myrtaceae	*Eucalyptus*	*polita*			*	
Myrtaceae	*Eucalyptus*	*rigidula*			*	*
Myrtaceae	*Eucalyptus*	*salmonophloia*		*		
Myrtaceae	*Eucalyptus*	*tenera*		*	*	*
Myrtaceae	*Eucalyptus*	*transcontinentalis*		*		
Myrtaceae	*Leptospermum*	*erubescens*	*	*	*	
Myrtaceae	*Leptospermum*	*roei*			*	*
Myrtaceae	*Leptospermum*	*spinescens*			*	
Myrtaceae	*Melaleuca*	*acuminata*		*		
Myrtaceae	*Melaleuca*	*adnata*		*	*	
Myrtaceae	*Melaleuca*	*calyptroides*	*	*	*	
Myrtaceae	*Melaleuca*	*cordata*	*	*	*	
Myrtaceae	*Melaleuca*	*cucullata*		*	*	
Myrtaceae	*Melaleuca*	*eleuterostachya*		*		
Myrtaceae	*Melaleuca*	*elliptica*		*	*	
Myrtaceae	*Melaleuca*	*hamata*	*	*	*	
Myrtaceae	*Melaleuca*	*lateriflora*		*		
Myrtaceae	*Melaleuca*	*laxiflora*			*	
Myrtaceae	*Melaleuca*	*pauperiflora* subsp. *fastigiata*	*			
Myrtaceae	*Melaleuca*	*pauperiflora* subsp. *pauperiflora*		*		
Myrtaceae	*Melaleuca*	*radula*		*		
Myrtaceae	*Melaleuca*	*teuthidoides*		*		
Myrtaceae	*Melaleuca*	*thyoides*		*		
Myrtaceae	*Melaleuca*	*uncinata*		*	*	
Myrtaceae	*Micromyrtus*	*obovata*			*	
Myrtaceae	*Rinzia*	*triplex* (P3)		*		
Myrtaceae	*Thryptomene*	*kochii*		*	*	
Myrtaceae	*Verticordia*	*chrysantha*		*	*	*
Myrtaceae	*Verticordia*	*roei*			*	*
Olacaceae	*Olax*	*benthamiana*			*	
Pittosporaceae	*Marianthus*	*bicolor*		*		
Proteaceae	*Banksia*	*cirsioides*	*		*	*
Proteaceae	*Banksia*	*elderiana*		*		*
Proteaceae	*Banksia*	*erythrocephala*		*	*	*
Proteaceae	*Banksia*	*laevigata* subsp. *laevigata*			*	*
Proteaceae	*Banksia*	*sessilis*			*	*
Proteaceae	*Grevillea*	*acuaria*	*			
Proteaceae	*Grevillea*	*cagiana*	*		*	*
Proteaceae	*Grevillea*	*eriostachya*		*	*	
Proteaceae	*Grevillea*	*eryngioides*		*		*
Proteaceae	*Grevillea*	*huegelii*		*		
Proteaceae	*Grevillea*	*incrassata*				*
Proteaceae	*Grevillea*	*obliquistigma*		*		
Proteaceae	*Grevillea*	*oncogyne*	*			
Proteaceae	*Grevillea*	*pterosperma*		*		

Family	Genus	Taxon	CLP-EW1	SLP-MWS1	SP-H1	SP-H2
Proteaceae	*Grevillea*	*shuttleworthiana* subsp. *obovata*	*			*
Proteaceae	*Hakea*	*corymbosa*	*			*
Proteaceae	*Hakea*	*cygna* subsp. *cygna*			*	
Proteaceae	*Hakea*	*incrassata*	*			
Proteaceae	*Hakea*	*multilineata*		*	*	
Proteaceae	*Hakea*	*newbeyana*			*	
Proteaceae	*Hakea*	*platysperma*				*
Proteaceae	*Hakea*	*scoparia*	*	*	*	*
Proteaceae	*Isopogon*	*scabriusculus*				*
Proteaceae	*Persoonia*	*coriacea*		*	*	
Proteaceae	*Persoonia*	*helix*	*	*	*	
Proteaceae	*Petrophile*	*circinata*				*
Proteaceae	*Petrophile*	*stricta*			*	
Proteaceae	*Petrophile*	*teretifolia*			*	
Rutaceae	*Boronia*	*inornata*		*		
Rutaceae	*Drummondita*	*hassellii*			*	
Rutaceae	*Microcybe*	*albiflora*			*	
Rutaceae	*Microcybe*	*ambigua*			*	
Rutaceae	*Microcybe*	*multiflora*	*			
Rutaceae	*Phebalium*	*filifolium*	*			
Santalaceae	*Exocarpos*	*aphyllus*	*			
Santalaceae	*Exocarpos*	*sparteus*		*	*	*
Santalaceae	*Leptomeria*	*preissiana*			*	
Santalaceae	*Santalum*	*acuminatum*	*	*	*	*
Sapindaceae	*Dodonaea*	*bursariifolia*		*		
Scrophulariaceae	*Eremophila*	*densiflora*	*			
Scrophulariaceae	*Eremophila*	*dichroantha*		*		
Scrophulariaceae	*Eremophila*	*drummondii*		*	*	
Thymelaeaceae	*Pimelea*	*aeruginosa*			*	

Appendix 4: Vegetation Condition Rating

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

Appendix 5: Conservation Significant Flora within 40km of the survey area

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Acacia asepala			P2	Diffuse, much-branched shrub, 0.5-1.5 m high. Fl. yellow, Aug. Red-brown sandy loam. Undulating plains, along drainage lines.	Unlikely
Acacia kerryana			P2	Low, spreading, domed shrub, 0.3-1 m high. Fl. yellow, Oct to Dec or Jan to Feb. Granitic loamy sand, stony clayey loam or clayey sand. Low stony ridges, undulating plains.	Unlikely
Acacia lanuginophylla	EN	VU		Dense shrub, 0.5-1.2 m high. Fl. yellow, Jul to Oct. White/grey sand, clayey sand, gravelly soils. Flats, along drainage lines.	Unlikely
Acacia repanda			P3	Rounded to obconic, single-stemmed or much-branched shrub, 0.5-2 m high, bark 'minni-ritchi'. Fl. yellow, Jun to Aug. Loam, sandy or gravelly loam. Near granite outcrops.	Unlikely
Acacia sp. Mt Holland (B. Ellery BE 1147)			P1	No description available	Possible
Anticoryne melanosperma			P3	No description available	Possible
Austrostipa sp. Carlingup Road (S. Kern & R. Jasper LCH 18459)			P1	No description available	Possible
Austrostipa sp. Mt Holland (W.A. Thompson & J. Allen 948)			P1	No description available	Possible
Baeckea sp. Blue Haze Mine (P. Armstrong 06/910)			P1	No description available	Possible
Baeckea sp. Crossroads (B.L. Rye & M.E. Trudgen 241186)			P1	No description available	Possible
Baeckea sp. Forrestania (K.R. Newbey 1105)			P1	No description available	Possible
Baeckea sp. Hatter Hill (K.R. Newbey 3284)			P3	Narrow, open, upright shrub, to 1.3 m high. Fl. pink, Jun to Oct. Yellow-orange coarse sandy loam with laterite gravel, red-brown sandy loam with quartz pebbles. Undulating plains.	Possible
Baeckea sp. Koonadgin (B.L. Rye & M.E. Trudgen BLR 241137)			P3	No description available	Possible
Baeckea sp. Lake Cronin (K.R. Newbey 9191)			P1	Upright, spreading, moderately open shrub. Fl. white/pink, Oct. Well-drained gravelly sands. Moderately exposed, gently undulating plain.	Possible
Baeckea sp. North Ironcap (R.J. Cranfield 10580)			P1	Erect, open shrub, to 0.4 m high. Fl. white/pink, Oct. Red clay. Gently undulating sandplains.	Possible
Baeckea sp. Sheoaks Rocks (M.E. Trudgen MET5452)			P1	Open shrub, to 0.3 m high. Fl. white/pink, Nov. Yellow-brown silty sand. Mid-upper gentle slopes.	Unlikely
Banksia rufa subsp. *flavescens*			P3	Prostrate, ?lignotuberous shrub, to 0.45 m high. Fl. cream-yellow, Jul to Aug. Sandy loam or sand with gravel.	Possible
Banksia sphaerocarpa var. *dolichostyla*	VU	VU		Lignotuberous shrub, 1-3 m high. Fl. yellow-orange, Mar to May. Lateritic gravel, grey sand.	Unlikely
Banksia viscida			P3	Densely branched, non-lignotuberous shrub, 0.4-1 m high. Fl. yellow-orange, Jul to Oct. Gravelly soils. Lateritic rises.	Possible

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Boronia revoluta	EN	VU		Shrub, 0.4-0.8 m high. Fl. pink, Jul to Aug. Stony sandy loam or sand. Plains, hillsides & summits.	Unlikely
Boronia westringioides			P2	Erect shrub, 0.2-0.75 m high. Fl. pink, Jul to Sep. Loamy sand. Plains.	Possible
Brachyloma nguba			P1	Erect, compact to spreading, mid-dense shrub, to 0.8 m high, leaves discolorous, usually 2-3 mm long; style 0.2-0.25 mm long; disc truncate. Fl. red, Apr to May. White to brown sandy clay, shallow sandy loam. Open mallee woodland, mallee scrub, flat plains.	Possible
Brachyloma stenolobum			P1	No description available	Possible
Caladenia graniticola		EN		Tuberous, perennial, herb, to 0.21 m high, plant usually single flowered. Fl. green-yellow, Oct. Gritty sandy clay, granite. Near low exposed rock outcrops.	Unlikely
Caladenia hoffmanii	EN	EN		Tuberous, perennial, herb, 0.13-0.3 m high. Fl. green & yellow & red, Aug to Oct. Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Unlikely
Calamphoreus inflatus			P4	Erect, spreading shrub, 0.4-1.6 m high, to 2 m wide. Fl. blue-purple/green, Oct to Dec or Feb to Mar. Clay loam with ironstone gravel. Flats, disturbed sites.	Possible
Calectasia pignattiana	VU	VU		Rhizomatous, prickly herb, to 0.5 m high. Fl. blue-purple, Aug to Oct. Sand to sandy clay over granite or laterite, gravel. Plains and gentle slopes.	Unlikely
Calytrix nematoclada			P3	Shrub, 0.15-0.5(-1) m high. Fl. purple-pink, Sep or Nov to Dec or Jan. Yellow or grey sand. Sandplains.	Possible
Chorizema circinale			P3	Prostrate, scrambling, wiry shrub, to 0.4 m high. Fl. yellow & orange & red, Sep to Dec. Yellow sand, sandy clay with gravel. Flats, margin of gravel pit.	Possible
Comesperma calcicola			P3	Soft perennial, herb, to 0.3 m high. Fl. pink, Oct to Dec or Jan. Calcareous or semi-saline clay loams, limestone. Areas around saline water.	Unlikely
Conospermum sigmoideum			P2	Erect shrub, 0.2-0.5 m high. Fl. blue, Aug to Sep. Yellow sand.	Unlikely
Cryptandra polyclada subsp. *polyclada*			P3	Mat-forming or upright shrub, 0.1-0.7 m high. Fl. white/cream, Jan to May or Aug or Oct. Sand. Sandplains.	Possible
Dampiera orchardii			P2	Erect perennial, herb, 0.2-0.4 m high. Sand.	Possible
Dampiera scaevolina			P1	Erect to ascending perennial, herb or shrub, 0.2-0.5 m high. Fl. blue/white, Sep to Nov. Sandy & gravelly soils.	Possible
Daviesia elongata subsp. *implexa*			P3	Spreading or sprawling shrub, 0.4-1 m high. Fl. yellow/orange & red, Sep. Sand & laterite.	Possible
Daviesia implexa			P3	No description available	Possible
Dicrastylis capitellata			P1	Low spreading shrub, 0.2-0.25 m high. Fl. blue-purple, May. Loamy sand, sandy loam.	Possible

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Elatine macrocalyx			P3	Prostrate, glabrous, mat-forming annual, herb, sepals 2-3mm long, fruit indehiscent. Fl. white, May to Oct (probably opportunistic). Shallow sands over clay. Margins of playa lakes and clay pans.	Unlikely
Eremophila biserrata			P4	Prostrate shrub, to 3 m wide. Fl. green/yellow-green, Sep to Nov or Mar. Sandy or sandy clay soils. Alluvial flats, salt flats & lakes.	Unlikely
Eremophila racemosa			P4	Erect shrub, 0.5-1.7 m high. Fl. purple-pink-red/white, Mar or Aug to Dec. Sandy or stony loam, clay loam. Undulating plains, roadsides.	Possible
Eremophila verticillata	EN	CR		Low spreading shrub, up to 0.8 m high, to 1 m wide. Fl. purple-violet, Nov to Dec. Clay loam, loam over limestone.	Unlikely
Eucalyptus cerasiformis			P4	Mallee, 2-3.5 m high, bark smooth, grey to brown. Fl. yellow, Dec or Jan to Mar. Red loamy soils.	Possible
Eucalyptus deflexa			P4	(Mallee), 1-3 m high, bark smooth. Fl. pink/cream-white, Mar or May to Oct. Clay loam, sandy loam, white or yellow sand, often with gravel. Flat areas & slight rises.	Possible
Eucalyptus exigua			P3	Mallee, 2-5 m high, bark smooth. Fl. white-cream, Mar. Sandy loam, white sand. Sandplains.	Possible
Eucalyptus georgei subsp. *fulgida*			P4	Tree, 4-20 m high, bark smooth, often hanging in ribbons. Fl. cream-white. Sandy loam, clayey sand. Slight depressions.	Unlikely
Eucalyptus myriadena subsp. *parviflora*			P1	Mallee or tree, 3-10 m high, bark rough, coarse & flaky on trunk, smooth above. Loam. Swamps, plains.	Unlikely
Eucalyptus recta	EN	VU		Tree, to 15 m high, bark smooth. Sandy laterite.	Unlikely
Eucalyptus retusa			P1	No description available	Possible
Eucalyptus steedmanii	VU	VU		Tree, 2-8(-12) m high, bark smooth. Fl. white, Jan to Mar. Gravelly loam over ironstone, sand. Low hills, undulating plains.	Unlikely
Eutaxia acanthoclada			P3	Compact, mat-forming, prostrate shrub, to 0.3 m high. Fl. yellow/orange/red, Oct to Nov. Light brown sandy clay, shallow sandy loam, red clay over banded ironstone, gravel. Gently undulating plains.	Unlikely
Eutaxia hirsuta			P2	Erect, shrub, spindly shrub (broom-like). *Stems* terete, glabrous; pustules or glands absent.	Known to occur[3]
Eutaxia lasiocalyx			P2	Low, spreading, multi-stemmed shrub, to 0.15 m high. Fl. yellow, Nov. Red sandy loam, laterite and quartz gravel. Gentle lower slopes.	Unlikely
Eutaxia nanophylla			P3	Straggly, rounded shrub, to 0.35 m high. Fl. Yellow & orange & red, Oct to Nov. Clayey sand, red clay, stoney clayey loam. Low-lying areas, damp flats, slopes, undulating plains, low stony ridges.	Unlikely

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Eutaxia rubricarina			P3	Straggling shrub, to 0.5 m high. Fl. Orange & yellow & brown, Aug or Oct. Gravelly sand, grey to pinkish-white sandy clay, red loam. Flats, slopes, valley floors, road verges.	Unlikely
Eutaxia sp. North Ironcap (P. Armstrong PA 06/898)			P1	No description available	Possible
Frankenia drummondii			P3	Prostrate shrub. Fl. white. Sand. Lake edges.	Unlikely
Gastrolobium tenue			P1	Low, bushy shrub, to 0.6 m high. Fl. Orange & red & purple, Sep to Oct. Yellow sand or sandy clay. Undulating dunes, stony outcrops.	Unlikely
Grevillea aneura			P4	Dense, prickly shrub, 0.5-2.8 m high. Fl. red, Jun or Aug to Dec or Jan. Sand, sandy clay, gravel.	Possible
Grevillea neodissecta			P4	No description available	Possible
Grevillea insignis subsp. *elliotii*			P3	Erect, bushy, non-lignotuberous shrub, 1-2 m high. Fl. red/pink & cream & white, Oct. Gravelly sand or loam over ironstone. Hilltops or rises.	Unlikely
Grevillea pilosa subsp. *redacta*			P3	Spreading to prostrate, non-lignotuberous shrub, 0.4-1.2 m high. Fl. red, Feb or Oct or Dec. Sand, laterite.	Unlikely
Grevillea prostrata			P4	Loose, prostrate shrub, 0.04-0.1 m high, 0.8-1.2 m wide. Fl. cream-white/pink-red, Aug to Dec or Jan. White, grey or yellow sand, gravel. Sandplains.	Possible
Guichenotia anota			P1	Shrubs, 1 m high; branchlets hairy, not glaucous. Leaves alternate, 10-25 mm long	Possible
Guichenotia asteriskos			P2	Erect, compact shrub, ca 0.35 m high. Fl. white, Sep to Oct. Sandy clay or loam with gravel.	Possible
Gyrostemon ditrigynus			P4	Shrub, 0.4-1.5 m high. Sand, sandy clay, loam. Plains, low ironstone ridges.	Unlikely
Haegiela tatei			P4	Ascending to erect annual, herb, 0.02-0.08(-0.2) m high. Fl. white-yellow, Aug to Nov. Clay, sandy loam, gypsum. Saline habitats.	Unlikely
Hemigenia sp. Newdegate (E. Bishop 75)			P1	Spindly, erect to spreading shrub, 0.2-0.45 m high, to 0.5 m wide. Fl. blue/purple, Sep to Oct. Clay loam. Disturbed sites.	Possible
Hibbertia axillibarba			P1	Shrub, to 0.7 m high. Fl. yellow, Sep to Oct. Lateritic soil. Ranges.	Unlikely
Hibbertia carinata			P1	Shrub, to 0.4 m high. Fl. yellow, Aug to Sep. Well-drained gravelly sand, yellow sand with gravel.	Possible
Hibbertia pachyphylla			P3	Shrub, to 0.5 m high. Fl. yellow, Sep to Nov. White to yellow sand, brown sandy gravel, gravelly loam, laterite, granite, quartz. Undulating plains, low rises, valley floors.	Possible
Hydrocotyle eichleri			P3	No description available	Possible
Hysterobaeckea pterocera			P1	No description available	Possible
Isolepis australiensis			P3	Annual, grass-like or herb (sedge), 0.03-0.055 m high, glumes 0.8-1.2 mm long; stamens 1(-2); style branches 3; nut with abaxial angle acute. Fl. Jun or Sep. Silty sand, sandy clay. Lake margins, pools.	Unlikely
Labichea rossii			P1	No description available	Possible

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Lepidosperma amantiferrum			P1	Tufted rhizomatous, herb (sedge), leaves 0.15-0.42 m high, culms and leaves distichous. Yellow sandy loam with banded ironstone gravel and rocks. Gentle lower slopes.	Unlikely
Lepidosperma ferriculmen			P1	Tufted rhizomatous, perennial, herb (sedge), leaves 0.16-0.38 m high, culms and leaves distichous. Well-drained orange-red sandy loam with banded ironstone gravel and rocks. Stony slopes.	Unlikely
Lepidosperma lyonsii			P4	Tufted rhizomatous, perennial, herb (sedge), leaves 0.31-0.53 m high, culms and leaves distichous. Pale orange skeletal sandy loam with banded ironstone gravel & rock, well-drained shallow stony loamy with quartz. Gentle hill slopes, upper slopes of large hill.	Unlikely
Melaleuca macronychia subsp. *trygonoides*			P3	Multi-stemmed, spreading shrub, 1-4 m high, leaves broadly elliptic. Fl. red, Feb or Jul to Aug or Oct. Sandy soils. Granite outcrops.	Unlikely
Melaleuca ochroma			P3	No description available	Possible
Microcorys sp. Forrestania (V. English 2004)			P4	Prostrate or erect shrub, 0.35-0.4 m high. Fl. white/purple, Jan or Apr. Yellow sandy clay or red-brown clay. Open woodland or cleared areas.	Known to occur[2]
Microcorys sp. Mt Holland (D. Angus DA 2397)			P1	No description available	Possible
Microseris walteri			P3	No description available	Possible
Mirbelia densiflora			P3	Erect or straggling shrub, 0.2-1 m high. Fl. yellow-orange, Oct or Jan. Stony loam, loamy sand. Small ridges, breakaways, undulating plains.	Unlikely
Mirbelia taxifolia			P1	Shrub, 0.6-0.9 m high. Fl. orange-yellow, Sep. Red or yellow sand.	Possible
Notisia intonsa			P3	No description available	Possible
Olearia laciniifolia			P2	Erect, few-stemmed shrub, 0.6-1.2 m high. Fl. blue/purple & white/yellow, May to Sep. White sand. Around playa lakes.	Unlikely
Orianthera exilis			P2	No description available	Possible
Oxymyrrhine plicata			P3	No description available	Possible
Paragoodia crenulata	CE	VU		The flower spike has 1–3 flowers that are brown and yellow in colour. The flowering period is from July to August. This species is thought to require disturbance (DEC, 2010)	Unlikely
Pityrodia scabra subsp. *dendrotricha*			P3	No description available	Possible
Pityrodia sp. Yilgarn (A.P. Brown 2679)			P3	No description available	Possible
Pterostylis echinulata			P3	No description available	Possible
Pultenaea daena			P3	Dense, prostrate, domed shrub, to 0.07 m high. Fl. yellow, Mar. White to yellow sand or sandy loam, sandy or loamy clay, gravel, limestone, dolomite, laterite. Gently undulating plains, adjacent to salt lakes, in disturbed areas.	Unlikely
Rinzia torquata			P3	No description available	Known to occur[1]
Rinzia triplex			P3	No description available	Known to occur[1,2]

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Roycea pycnophylloides	EN	VU		Perennial, herb, forming densely branched, silvery mats to 1 m wide. Fl. Sep. Sandy soils, clay. Saline flats.	Unlikely
Scaevola tortuosa			P1	Ascending perennial, herb, 0.1-0.2 m high. Fl. blue-purple/pink, Oct. Sandy clay. Margins of salt lakes.	Unlikely
Seringia adenogyna			P3	No description available	Possible
Stenanthemum liberum			P1	Dwarf shrub, ca 0.5 m high. Yellow sandy loam over laterite.	Unlikely
Stylidium sejunctum			P3	Caespitose perennial, herb, 0.25-0.45 m high, Leaves tufted, linear to narrowly oblanceolate, 10-30 cm long, 0.8-4 mm wide, apex acute to mucronate, margin involute, glabrous to scabrous. Membraneous scale leaves present at base of mature leaves. Scape glandular throughout. Inflorescence paniculate. Fl. white/pink-purple, Sep to Nov. Clayey sand or loam, laterite. Outcrops, upper slopes, breakaways. Mallee and Allocasuarina shrubland.	Unlikely
Stylidium thylax			P2	Creeping perennial, herb, 0.04-0.08 m high, Leaves adpressed to stem, ovate to lanceolate, 0.1-0.4 cm long, 0.6-1.5 mm wide, apex mucronate, margin hyaline, glabrous. Inflorescence uni-flowered, pedicels glandular. Fl. white, Oct. Sand. Gentle slopes and plains. Heath, mallee shrubland.	Possible
Stylidium validum			P1	Caespitose perennial, herb, 0.06-0.3 m high, Leaves tufted, oblanceolate, 1.5-10 cm long, 2.2-6 mm wide, apex acute to acuminate, margin entire, glabrous, glaucous. Scape glabrous. Inflorescence paniculate. Fl. white/pink, Sep to Oct. Clayey sand or loam, ironstone, greenstone gravel. Hillslopes and hilltops. Eucalypt woodland, mallee shrubland.	Unlikely
Teucrium diabolicum			P3	Compact, dwarf shrub, 0.1 m high, to 0.1 m wide. Fl. white, Apr. Hills, road verges.	Unlikely
Tetratheca aphylla subsp. *megacarpa*	VU	VU		Shrub, to 0.35 m high. Yellow sand, brown sandy loam, yellow-brown clay loam, gravel, laterite. Rises and ridges.	Unlikely
Thysanotus lavanduliflorus			P1	Caespitose perennial, herb (with tuberous roots), to 0.25 m high. Fl. purple, Nov to Dec. Sand, sandy loam.	Possible
Thysanotus sp. Yellowdine (A.S. George 6040)			P2	No description available	Possible
Tribonanthes purpurea	VU	VU		Tuberous, perennial, herb, 0.03-0.04 m high. Fl. pink-purple, Aug. Seasonally wet soils in moss swards & herbfields among granite rocks.	Unlikely
Verticordia gracilis			P3	Low, slender shrub, 0.15-0.6 m high. Fl. pink, Oct to Nov. Yellow sand, gravelly sand, sandy loam.	Known to occur[1]
Verticordia multiflora subsp. *solox*			P2	Erect to spreading shrub, 0.2-0.6 m high. Fl. yellow, Oct to Dec or Jan. Yellow sand over gravel, sand over granite.	Unlikely

Taxon	Conservation Code			Description (WAHERB, 2021)	Likelihood of Occurrence
	EPBC Act	BC Act	Priority Listing		
Verticordia staminosa var. *cylindracea*	EN	VU		Spreading shrub, 0.3-0.8 m high. Fl. green-yellow/yellow-brown, Jul to Oct. Soil pockets. Granite outcrops.	Unlikely
Verticordia stenopetala			P3	Shrub, 0.2-0.6(-1.3) m high. Fl. pink/pink-purple-red, Oct to Dec or Jan. Yellow sand, sometimes with gravel. Undulating plains.	Possible

Appendix 6: Potential Fauna Species List

Listing of Fauna Potentially Present in/near Survey Area

Lounge Lizard Sand Pits

Approximate centroid 119° 41' 36" E, 32° 25' 46" S

Compiled by Greg Harewood - February 2021

Recorded (Captured/Sighted/Heard/Signs) = X

A = How, R.A. et al. (1988). The biological survey of the eastern goldfields of Western Australia. Part 4. Lake Johnston-Hyden Study Area. Records of the WAM, supplement No. 30. (Lake Cronin)

B = Biota (2006a/2007a). Forrestania Monitoring Survey, Flying Fox Phases I, II, III and IV. Unpublished report for Western Areas NL.
Biota (2006b). Forrestania Water Disposal Pipeline Survey – Fauna and Faunal Assemblages Report. Unpublished report for Western Areas NL.
Biota (2007b). Diggers South Fauna Survey – Phase I. Unpublished report for Western Areas NL.
Biota (2010). Spotted Quoll Haul Road Single Phase Fauna Survey. Unpublished report for Western Areas N.L. May 2010.
Biota (2018). New Morning Level 1 and Targeted Terrestrial Fauna Survey Unpublished report for Western Areas N.L. Nov 2018.

C = KLA (2010). Cazaly Resources Ltd. Parker Range Iron Ore Project. Fauna Assessment. Unpublished report for Cazaly Resources Limited. August 2011.

D = DBCA (2021). NatureMap Database search. “By Circle”119° 41' 36" E, 32° 25' 56" S – Survey Area (plus 40 km buffer). 20 February 2021.

Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Amphibia						
Myobatrachidae Ground or Burrowing Frogs						
Crinia pseudinsignifera	Bleating Froglet	LC		X		X
Heleioporus albopunctatus	Western Spotted Frog	LC	X	X		X
Limnodynastes dorsalis	Western Banjo Frog	LC	X			X
Myobatrachus gouldii	Turtle Frog	LC				
Neobatrachus albipes	White-footed Trilling Frog	LC				X
Neobatrachus centralis	Trilling Frog	LC	X			

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

Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Neobatrachus kunapalari	Kunapalari Frog	LC				X
Neobatrachus pelobatoides	Humming Frog	LC	X			X
Neobatrachus sp.	Unidentified Burrowing Frog	LC				
Neobatrachus sutor	Shoemaker Frog	LC	X			X
Pseudophryne guentheri	Crawling Toadlet	LC				X
Pseudophryne occidentalis	Western Toadlet	LC	X	X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Reptilia						
Diplodactylidae Geckoes						
Crenadactylus ocellatus	Clawless Gecko	LC	X	X		X
Diplodactylus granariensis granariensis	Wheatbelt Stone Gecko	LC	X	X	X	
Diplodactylus pulcher	Western Saddled Ground Gecko	LC		X	X	X
Lucasium maini	Main's Ground Gecko	LC	X	X	X	X
Oedura reticulata	Reticulated Velvet Gecko	LC	X	X	X	
Strophurus intermedius	Southern Spiny-tailed Gecko	LC				
Strophurus spinigerus inornatus	Orange-eyed Southwestern Spiny-tailed Gecko	LC	X	X		
Gekkonidae Geckoes						
Christinus marmoratus	Marbled Gecko	LC			X	
Gehyra variegata	Variegated Dtella	LC	X	X		X
Heteronotia binoei	Bynoe's Gecko	LC	X			
Underwoodisaurus milii	Barking Gecko	LC	X	X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Pygopodidae Legless Lizards						
Delma australis	Marble-faced Delma	LC		X		X
Delma butleri	Unbanded Delma	LC				
Delma fraseri	Fraser's Legless Lizard	LC	X	X		X
Lialis burtonis	Burton's Legless Lizard	LC	X	X		X
Pygopus lepidopodus	Common Scaly Foot	LC		X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Agamidae Dragon Lizards						
Ctenophorus cristatus	Crested Bicycle Dragon	LC	X	X	X	X
Ctenophorus isolepis	Goldfields Military Sand Dragon	LC				
Ctenophorus maculatus	Spotted Military Dragon	LC	X	X		X
Ctenophorus ornatus	Ornate Crevice Dragon	LC				X
Ctenophorus salinarum	Salt Pan Dragon	LC	X			X
Moloch horridus	Thorny Devil	LC	X	X		X
Pogona minor minor	Western Bearded Dragon	LC	X	X	X	
Rankinia adelaidensis chapmani	Eastern Heath Dragon	LC	X	X		
Varanidae Monitor's or Goanna's						
Varanus gouldii	Gould's Sand Monitor	LC	X	X		X
Varanus rosenbergi	Heath Monitor	LC		X		X
Varanus tristis	Black-headed Monitor	LC				

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Scincidae Skinks						
Cryptoblepharus buchananii	Buchanan's Snake-eyed Skink	LC	X	X	X	X
Ctenotus atlas	Southern Malle Ctenotus	LC	X			X
Ctenotus impar	Odd-striped Ctenotus	LC	X	X		X
Ctenotus schomburgkii	Barred Wedge-snout Ctenotus	LC	X	X		X
Ctenotus xenopleura	Wide-striped Sandplain Ctenotus	LC				
Cyclodomorphus melanops elongatus	Eastern Slender Blue-tongue	LC	X			
Egernia formosa	Goldfields Crevise Skink	LC				X
Egernia inornata	Desert Skink	LC			X	
Egernia richardi	Woodland Crevice Skink	LC	X	X	X	X
Eremiascincus richardsonii	Broad-banded Sand Swimmer	LC				
Hemiergis initialis initialis	Sth Five-toed Mulch Skink	LC		X		
Hemiergis peronii peronii	Four-toed Earless Skink	LC				

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Lerista distinguenda	SW Four-toed Lerista	LC	X	X		X
Lerista dorsalis	Southern Four-toed Lerista	LC		X		
Lerista kingi	King's Three-toed Slider	LC				
Lerista picturata	Goldfields Robust Lerista	LC		X		X
Lerista timida	Dwarf Three-toed Slider	LC				
Liopholis multiscutata	Bull Skink	LC	X	X	X	X
Menetia greyii	Dwarf Skink	LC	X	X	X	X
Morethia butleri	Woodland Dark-flecked Morethia	LC	X		X	X
Morethia obscura	Shrubland Pale-flecked Morethia	LC	X	X		X
Tiliqua occipitalis	Western Bluetongue	LC	X	X		X
Tiliqua rugosa	Bobtail	LC		X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Typhlopidae Blind Snakes						
Ramphotyphlops australis	Southern Blind Snake	LC	X	X	X	
Ramphotyphlops bicolor	Dark-spined Blind Snake	LC				
Ramphotyphlops bituberculatus	Prong-snouted Blind Snake	LC				
Ramphotyphlops hamatus	Northern Hook-snouted Blind Snake	LC				
Boidae Pythons, Boas						
Morelia imbricata	Southern Carpet Python	LC				

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Elapidae Elapid Snakes						
Brachyurophis semifasciata	Southern Shovel-nosed Snake	LC				
Echiopsis curta	Bardick	LC		X		X
Neelaps bimaculatus	Black-naped Snake	LC	X			X
Parasuta gouldii	Gould's Hooded Snake	LC	X	X		X
Parasuta nigriceps	Black-backed Snake	LC		X		X
Paroplocephalus atriceps	Lake Cronin Snake	P3	X	X		X
Pseudechis australis	Mulga Snake	LC	X			X
Pseudonaja affinis	Dugite	LC	X	X		X
Pseudonaja modesta	Ringed Brown Snake	LC			X	
Simoselaps bertholdi	Jan's Banded Snake	LC		X		X

Aves

Casuariidae Emus, Cassowarries						
Dromaius novaehollandiae	Emu	LC	X	X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Megapodiidae Moundbuilders						
Leipoa ocellata	Malleefowl	S3 VU VU	X	X	X	X
Phasianidae Quails, Pheasants						
Coturnix pectoralis	Stubble Quail	LC				
Accipitridae Kites, Goshawks, Eagles, Harriers						
Accipiter cirrocephalus	Collared Sparrowhawk	LC	X	X		X
Accipiter fasciatus	Brown Goshawk	LC				X
Aquila audax	Wedge-tailed Eagle	LC		X	X	X
Aquila morphnoides	Little Eagle	LC	X	X		
Circus assimilis	Spotted Harrier	LC				X
Elanus caeruleus	Black-shouldered Kite	LC				
Haliastur sphenurus	Whistling Kite	LC				X
Hamirostra isura	Square-tailed Kite	LC	X	X		

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Falconidae Falcons						
Falco berigora	Brown Falcon	LC	X	X	X	X
Falco cenchroides	Australian Kestrel	LC	X	X		X
Falco longipennis	Australian Hobby	LC	X			X
Falco peregrinus	Peregrine Falcon	S7 LC		X		X
Otididae Bustards						
Ardeotis australis	Australian Bustard	LC	X			X
Turnicidae Button-quails						
Turnix velox	Little Button-quail	LC		X		X
Charadriidae Lapwings, Plovers, Dotterels						
Vanellus tricolor	Banded Lapwing	LC				

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Columbidae Pigeons, Doves						
Ocyphaps lophotes	Crested Pigeon	LC				X
Phaps chalcoptera	Common Bronzewing	LC	X	X	X	X
Phaps elegans	Brush Bronzewing	LC		X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Psittacidae Parrots						
Cacatua roseicapilla	Galah	LC	X	X	X	X
Calyptorhynchus latirostris	Carnaby's Black-Cockatoo	S2 EN EN	X	X		X
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	LC	X	X	X	
Melopsittacus undulatus	Budgerigar	LC				X
Neophema elegans	Elegant Parrot	LC	X	X	X	X
Nymphicus hollandicus	Cockatiel	LC				X
Platycercus icterotis xanthogenys	Western Rosella (inland ssp)	P4	X	X	X	
Platycercus varius	Mulga Parrot	LC		X		X
Platycercus zonarius	Australian Ringneck	LC	X	X	X	X
Polytelis anthopeplus	Regent Parrot	LC	X	X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Cuculidae Parasitic Cuckoos						
Cacomantis flabelliformis	Fan-tailed Cuckoo	LC	X	X		X
Chrysococcyx basalis	Horsfield's Bronze Cuckoo	LC	X		X	X
Chrysococcyx lucidus	Shining Bronze Cuckoo	LC		X		
Chrysococcyx osculans	Black-eared Cuckoo	LC				
Cuculus pallidus	Pallid Cuckoo	LC	X	X		
Strigidae Hawk Owls						
Ninox novaeseelandiae	Boobook Owl	LC	X		X	
Tytonidae Barn Owls						
Tyto alba	Barn Owl	LC				
Podargidae Frogmouths						
Podargus strigoides	Tawny Frogmouth	LC	X	X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Caprimulgidae Nightjars						
Eurostopodus argus	Spotted Nightjar	LC	X	X	X	X
Aegothelidae Owlet-nightjars						
Aegotheles cristatus	Australian Owlet-nightjar	LC	X	X		X
Halcyonidae Tree Kingfishers						
Todiramphus pyrrhopygia	Red-backed Kingfisher	LC				
Todiramphus sanctus	Sacred Kingfisher	LC				X
Meropidae Bee-eaters						
Merops ornatus	Rainbow Bee-eater	JA LC	X	X	X	X
Climacteridae Treecreepers						
Climacteris rufa	Rufous Treecreeper	LC	X	X		

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Maluridae Fairy Wrens, GrassWrens						
Malurus lamberti	Variegated Fairy-wren	LC				
Malurus leucopterus	White-winged Fairy-wren	LC				X
Malurus pulcherrimus	Blue-breasted Fairy-wren	LC	X	X	X	X
Malurus splendens	Splendid Fairy-wren	LC				X
Stipiturus malachurus	Southern Emu-wren	LC		X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Acanthizidae Thornbills, Geryones, Fieldwrens & Whitefaces						
Acanthiza apicalis	Broad-tailed Thornbill	LC	X	X	X	X
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	LC	X	X		X
Acanthiza uropygialis	Chestnut-rumped Thornbill	LC	X	X		X
Aphelocephala leucopsis	Southern Whiteface	LC				
Calamanthus campestris	Rufous Fieldwren	LC	X	X		X
Gerygone fusca	Western Gerygone	LC	X	X		X
Hylacola cauta whitlocki	Shy Heath-wren (western)	LC	X	X		
Pyrrholaemus brunneus	Redthroat	LC	X	X	X	X
Sericornis frontalis	White-browed Scrubwren	LC	X			X
Smicrornis brevirostris	Weebill	LC	X	X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Pardalotidae Pardalotes						
Pardalotus punctatus	Spotted Pardalote	LC	X	X	X	X
Pardalotus striatus	Striated Pardalote	LC	X	X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Meliphagidae Honeyeaters, Chats						
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	LC		X		X
Anthochaera carunculata	Red Wattlebird	LC	X	X	X	X
Certhionyx niger	Black Honeyeater	LC			X	
Certhionyx variegatus	Pied Honeyeater	LC				X
Epthianura albifrons	White-fronted Chat	LC	X			X
Epthianura tricolor	Crimson Chat	LC				
Lichenostomus cratitius	Purple-gaped Honeyeater	LC	X	X		X
Lichenostomus leucotis	White-eared Honeyeater	LC	X	X	X	X
Lichenostomus ornatus	Yellow-plumed Honeyeater	LC	X	X	X	
Lichenostomus plumulus	Grey-fronted Honeyeater	LC		X		
Lichenostomus virescens	Singing Honeyeater	LC		X	X	
Lichmera indistincta	Brown Honeyeater	LC	X	X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Manorina flavigula	Yellow-throated Miner	LC	X	X	X	X
Melithreptus brevirostris	Brown-headed Honeyeater	LC	X	X	X	X
Phylidonyris albifrons	White-fronted Honeyeater	LC	X	X	X	
Phylidonyris melanops	Tawny-crowned Honeyeater	LC	X	X		
Phylidonyris nigra	White-cheeked Honeyeater	LC		X		
Phylidonyris novaehollandiae	New Holland Honeyeater	LC		X		X
Petroicidae Australian Robins						
Drymodes brunneopygia	Southern Scrub-robin	LC	X	X	X	X
Eopsaltria griseogularis	Western Yellow Robin	LC	X	X	X	
Microeca fascinans	Jacky Winter	LC	X	X		X
Petroica cucullata	Hooded Robin	LC	X	X		
Petroica goodenovii	Red-capped Robin	LC	X	X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Pomatostomidae Babblers						
Pomatostomus superciliosus	White-browed Babbler	LC	X	X		X
Cinclosomatidae Whipbirds, Wedgebills, Quail Thrushes						
Cinclosoma castanotus	Chestnut Quail-thrush	LC	X	X		
Neosittidae Sitellas						
Daphoenositta chrysoptera	Varied Sittella	LC	X	X	X	X
Pachycephalidae Crested Shrike-tit, Crested Bellbird, Shrike Thrushes, Whistlers						
Colluricincla harmonica	Grey Shrike-thrush	LC	X	X	X	X
Falcunculus frontatus	Crested Shrike-tit	LC				X
Oreoica gutturalis	Crested Bellbird	LC	X	X	X	X
Pachycephala inornata	Gilbert's Whistler	LC				X
Pachycephala pectoralis	Golden Whistler	LC	X	X	X	
Pachycephala rufiventris	Rufous Whistler	LC		X	X	X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Dicruridae Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo						
Grallina cyanoleuca	Magpie-lark	LC		X		X
Myiagra inquieta	Restless Flycatcher	LC				X
Rhipidura fuliginosa	Grey Fantail	LC	X	X	X	
Rhipidura leucophrys	Willie Wagtail	LC	X	X		X
Campephagidae Cuckoo-shrikes, Trillers						
Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC	X	X	X	X
Lalage tricolor	White-winged Triller	LC	X	X		X
Artamidae Woodswallows, Butcherbirds, Currawongs						
Artamus cinereus	Black-faced Woodswallow	LC	X	X		X
Artamus cyanopterus	Dusky Woodswallow	LC	X	X		X
Artamus personatus	Masked Woodswallow	LC				X
Artamus superciliosus	White-browed Woodswallow	LC				

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Cracticidae Currawongs, Magpies & Butcherbirds						
Cracticus nigrogularis	Pied Butcherbird	LC		X	X	X
Cracticus tibicen	Australian Magpie	LC		X		X
Cracticus torquatus	Grey Butcherbird	LC	X	X		X
Strepera versicolor	Grey Currawong	LC		X	X	X
Corvidae Ravens, Crows						
Corvus bennetti	Little Crow	LC				X
Corvus coronoides	Australian Raven	LC		X	X	X
Corvus sp.	Unidentified corvid	LC				
Motacillidae Old World Pipits, Wagtails						
Anthus australis	Australian Pipit	LC	X	X		X
Estrilidae Grass Finches & Mannikins						
Taeniopygia guttata	Zebra Finch	LC				X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Dicaeidae Flowerpeckers						
Dicaeum hirundinaceum	Mistletoebird	LC	X			X
Hirundinidae Swallows, Martins						
Cheramoeca leucosternus	White-backed Swallow	LC				
Hirundo ariel	Fairy Martin	LC				
Hirundo neoxena	Welcome Swallow	LC				X
Hirundo nigricans	Tree Martin	LC	X	X		
Sylviidae Old World Warblers						
Cincloramphus cruralis	Brown Songlark	LC				
Cincloramphus mathewsi	Rufous Songlark	LC				
Zosteropidae White-eyes						
Zosterops lateralis	Silvereye	LC	X	X		X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Mammalia						
Tachyglossidae Echidnas						
Tachyglossus aculeatus	Echidna	LC	X	X		X
Dasyuridae Carnivorous Marsupials						
Antechinomys laniger	Kultarr	LC				
Dasyurus geoffroii	Chuditch	S3 VU VU		X		X
Ningaui yvonneae	Southern Ningaui	LC	X			X
Sminthopsis crassicaudata	Fat-tailed Dunnart	LC		X		X
Sminthopsis dolichura	Little long-tailed Dunnart	LC			X	X
Sminthopsis gilberti	Gilbert's Dunnart	LC	X	X		X
Sminthopsis granulipes	White-tailed Dunnart	LC	X	X		X
Sminthopsis griseoventer	Grey-bellied Dunnart	LC		X		
Sminthopsis ooldea	Ooldea Dunnart	LC				X

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Burramyidae Pygmy Possums						
Cercartetus concinnus	Western Pygmy-possum	LC	X	X	X	X
Tarsipedidae Honey Possum						
Tarsipes rostratus	Honey Possum	LC		X		
Macropodidae Kangaroos, Wallabies						
Macropus fuliginosus	Western Grey Kangaroo	LC	X	X		X
Macropus irma	Western Brush Wallaby	P4 LC		X		
Macropus robustus	Euro	LC	X			
Molossidae Freetail Bats						
Ozimops kitcheneri	Western Freetail-bat	LC	X	X	X	
Tadarida australis	White-striped Freetail-bat	LC	X	X	X	

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Vespertilionidae Ordinary Bats						
Chalinolobus gouldii	Gould's Wattled Bat	LC	X	X	X	X
Chalinolobus morio	Chocolate Wattled Bat	LC		X	X	X
Nyctophilus geoffroyi	Lesser Long-eared Bat	LC	X	X	X	X
Nyctophilus major tor	Central Long-eared Bat	P4				
Scotorepens balstoni	Inland Broad-nosed Bat	LC			X	X
Vespadelus baverstocki	Inland Forest Bat	LC				X
Vespadelus regulus	Southern Forest Bat	LC	X	X	X	X
Muridae Rats, Mice						
Mus musculus	House Mouse	Introduced	X	X	X	X
Notomys mitchellii	Mitchell's Hopping-mouse	LC	X	X	X	X
Pseudomys albocinereus	Ash-grey Mouse	LC	X	X		X
Pseudomys bolami	Bolam's Mouse	LC	X			

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Class **Family** *Species*	Common Name	Conservation Status	A	B	C	D
Canidae Dogs, Foxes						
Canis lupus	Dingo/Dog	LC/Introduced	X	X		
Vulpes vulpes	Red Fox	Introduced	X	X		X
Felidae Cats						
Felis catus	Cat	Introduced		X	X	X
Camelidae Camels						
Camelus dromedarius	Camel	Introduced				
Leporidae Rabbits, Hares						
Oryctolagus cuniculus	Rabbit	Introduced	X	X		X

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