Talison 132kV Powerline Connection Project

Detailed Flora and Vegetation Survey

Prepared for Talison Lithium
12 April 2022

Document Status						
Rev No.	Authors	Reviewer/s	Date	Approved for Issue		
				Name	Distributed To	Date
1	D.Brearley	J.Bull	23/03/22	D.Brearley	T.Semler	25/03/22
F	D.Brearley	T.Semler	06/04/22	D.Brearley	T.Semler	12/04/22

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EXECUTIVE SUMMARY

Talison Lithium Pty Ltd (Talison) currently operates a lithium mine at Greenbushes, situated approximately 250 km south of Perth in south-west Western Australia. As part of the current expansion of mining operations at the site, Talison is constructing a new 132kV powerline. Onshore Environmental Consultants Pty Ltd (Onshore Environmental) was commissioned by Talison to undertake a single season detailed flora and vegetation survey of ten localised native vegetation remnants occurring within the proposed powerline corridor, herein referred to as the study area. It is noted that a wildfire in early February 2022 impacted 1,700 hectares (ha) including the majority of the study area.

The field survey was completed by a Principal Botanist from Onshore Environmental working over a two day period from the 20th to the 21st of March 2022. A total number of 54 plant taxa (including varieties and subspecies) from 26 families and 45 genera were recorded from the study area. Species representation was greatest among the Poaceae, Fabaceae, Myrtaceae, Asparagaceae and Cyperaceae, with the most speciose genus being *Eucalyptus* (five taxa), followed by *Corymbia, Bossiaea, Kennedia, Lepidosperma* and *Lomandra* (two taxa each).

None of the plant taxa recorded from the study area were gazetted as Threatened Flora (T) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or the Western Australian *Biodiversity Conservation Act (2016)* (BC Act). As well, none of the plant species recorded from the study area are currently listed as Priority flora by the Department of Biodiversity Conservation and Attractions (DBCA), and none represent a range extension from their current known distribution.

A total of 26 introduced species were recorded from the study area, of which two taxa were listed as Declared Plants under the *Biosecurity and Agriculture Management Act (2007)* (BAM Act) and are also considered Weeds of National Significance (WONS):

- **Asparagus asparagoides* (Bridal Creeper) - s22(2); and
- **Rubus anglocandicans* (Blackberry) - s22(2) (C3 Exempt).

A total of three vegetation types from two broad landforms were described and mapped from the study area. Field assessment confirmed that vegetation was not aligned with any known Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) represented within the South West Region. Vegetation within the study area was determined to generally be well represented at the state, bioregional and local government authority levels.

Vegetation condition had been reduced across the entire study area, rated as good (54%), degraded (23%) or completely degraded (23%). There were no areas rated within the highest three condition categories of pristine, excellent or very good. Multiple historical disturbances were compounded by the small and isolated nature of the remnants amongst predominantly cleared agricultural land. Many of the remnants comprised exotic eucalypts and all supported highly disturbed understorey strata, with many described as parkland cleared. Disturbances including grazing by domestic stock, elevated numbers of kangaroos seeking refuge, surface soil disturbance, colonisation of weeds from adjacent pasture, and altered surface drainage.

Vegetation was determined to be of low conservation value owing to the high level of disturbance and reduced vegetation condition, combined with the small area and inability to consolidate the native vegetation remnants into larger blocks.

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1.0 INTRODUCTION

1.1 Preamble

Talison is a Western Australian mining company with operations based at Greenbushes in the south-west of Western Australia. The Greenbushes Mine is located approximately 250 km south of Perth and 80 km south-east of the port of Bunbury (Figure 1).

The site comprises a number of open cut mining operations for tantalum, tin and spodumene (lithium). An underground tantalum operation has also been developed but is currently under care and maintenance. The Greenbushes pegmatitie is the world's largest hard rock tantalum resource and the largest and highest-grade lithium minerals resource in the world. Minerals produced at Talison's Greenbushes Mine can be found in many different applications including mobile phones, computers, surgical implants, electronic devices, glassware, ceramics and batteries.

Talison is currently undertaking an expansion of mining activities to increase output from the Greenbushes Mine. This includes constructing a new 132kV powerline extending approximately 10 km southeast towards Hester from the southern boundary of the Mine Development Envelope (MDE). Associated approvals require a flora and vegetation survey to be completed across ten native vegetation remnants occurring within the powerline corridor.

1.2 Previous Surveys

There have been nine previous flora and vegetation surveys undertaken within the Greenbushes Mine area, with one of these surveys intersecting the study area. The previous surveys are listed below and described in more detail in Section 3.1.1:

- Trudgen and Morgan (1991) *A Flora and Vegetation Survey of part of the Greenbushes Leases*;
- Onshore Environmental Consultants (2006) *Flora and Vegetation Survey Greenbushes Mine Site: Vegetation surrounding south east corner of the TSF*;
- AECOM Australia Pty Ltd (2010) *Bridgetown RWSS Pipelines Millstream Dam to Greenbushes Link Biological Survey*;
- Onshore Environmental (2012) *Flora and Vegetation Survey Greenbushes Mining Leases*;
- Onshore Environmental (2018) *Greenbushes Mining Operations Detailed Flora and Vegetation Survey;*
- Onshore Environmental Consultants (2019a) *Greenbushes Infrastructure Corridors Detailed Flora and Vegetation Survey;*
- Onshore Environmental Consultants (2019b) *Targeted Flora Survey Greenbushes Lithium Mine;*
- Onshore Environmental Consultants (2020) *Targeted Survey for Eucalyptus relicta Greenbushes Lithium Operations;* and
- Onshore Environmental (2022) *Detailed Flora and Vegetation Survey, Greenbushes Mine Expansion Area 2 and Area 4.*

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1

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HESTER BROOK

GEEGELUP BROOK

Dalgarup Brook

Hester Brook

Bridgetown Golf Club

Hester Dam

TALISON
Location Map

Location of 132kV Powerline Connection Project

Figure 1

Legend

- Study Area
- Talison Tenements

N

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Meters
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Datum: GDA94
Projection: MGA Zone 50

Date:	25/03/2022
Status:	Draft
Figure:	1
Sheet Size:	A3
Internal Reference:	TAL_132kv_Loc_2022
Drawn by:	GSM
Requested by:	DB

1.3 Climate

The study area occurs on a boundary between the dry Mediterranean region to the north which experiences six dry months per year, and the moderate Mediterranean region to the south which experiences four dry months per year (Beard 1981). The Greenbushes region has cool wet winters and hot dry summers. Average annual rainfall for the town of Greenbushes is 923.0 mm (Bureau of Meteorology [BOM] 2022), with the majority of falls occurring during the winter months of June and July associated with cold fronts moving across the south-west of Western Australia.

The annual rainfall for the three-month period prior to the March 2022 field survey was 9.6 mm, compared to 50.8 mm for the long term average (Figure 2). The timing of the field survey was outside of the recommended spring (September to November) period, and preceding summer and autumn rainfall was relatively low. This resulted in poor seasonal conditions at the time of the field survey.

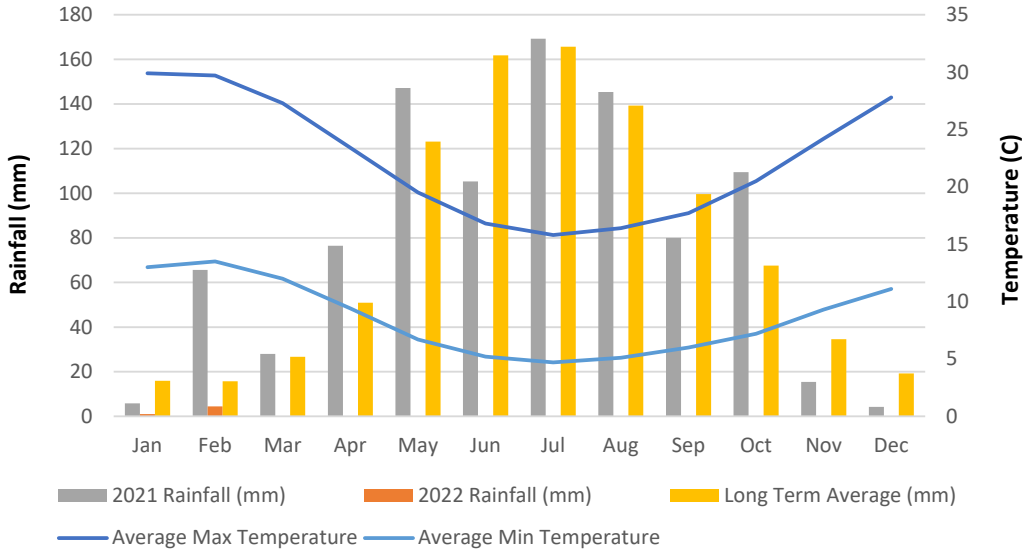

Figure 2 Climatic data for Greenbushes with monthly rainfall figures for 2021 and January to February 2022 (Bureau of Meteorology 2022).

1.4 Biogeographic Regions

The latest version of the Interim Biogeographic Regionalisation for Australia (IBRA7) divides Australia into 89 bioregions based on climate, geology, landform, native vegetation and species information, and includes 419 sub-regions (Department of Environment 2013). The bioregions and sub-regions are the reporting unit for assessing the status of native ecosystems and their level of protection in the National Reserve System.

The study area is located within the Southern Jarrah Forest (JF2) sub-region within the Jarrah Forest bioregion. The Southern Jarrah Forest sub-region is described as, “Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Marri-Wandoo woodlands on clayey soils. Eluvial and alluvial deposits support Agonis shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands. The

climate is Warm Mediterranean" (Hearn *et al*. 2002).

The vegetation of the sub-region is described as "Jarrah - Marri forest in the west grading to Marri and Wandoo woodlands in the east. There are extensive areas of swamp vegetation in the south-east, dominated by Paperbarks and Swamp Yate. The understory component of the forest and woodland reflects the more mesic nature of this area. The majority of the diversity in the communities occurs on the lower slopes or near granite soils where there are rapid changes in site conditions" (Hearn *et al*. 2002).

1.5 Land Use

The project area is situated entirely within the Shire of Bridgetown-Greenbushes, and intersects 13 separate land tenures which are tabulated below (Table 1, Figure 1). The proposed corridor extends predominantly through cleared farmland and plantation, with a smaller proportion intersecting localised native vegetation remnants where condition has been reduced by surrounding land uses.

Table 1 Details for landholder forming the 132 kV powerline corridor easement.

	Property Details	Address	Area (ha)
1	Talison Australia Pty Ltd	Lot 5 (previously Lot 1263) Forest Park Road	50.6
2	Main Roads WA	South West Highway (Road Reserve)	NR
3	Talison Australia Pty Ltd	Lot 11240 South West Highway	12.2
4	Recruit Tree Farm Australia PL	Lot 70 South West Highway	161.7
5	Talison Australia Pty Ltd	Lot 72 South West Highway	60.4
6	Talison Australia Pty Ltd	Lot 7974 South West Highway	66.5
7	Shire Bridgetown Greenbushes	Dalgarup Brook Road (Road Reserve)	NR
8	Water Corporation	Lot 10438 Bill Baldock Drive	75.1
9	Sanders	Lot 616 Wagebadenup Ridge	40.4
10	Bridgetown Golf Club	Lot 6799 Bill Baldock Drive	NR
11	Shire Bridgetown Greenbushes	Hester Road (Road Reserve)	NR
12	Talison Australia Pty Ltd	Lot 1961 Hester Road	48.8
13	Western Power	Lot 3 Hester Road	3.4

1.6 Landforms, Soils

Tille (1996) has mapped soils of the Wellington-Blackwood District, which includes the town sites of Greenbushes and Bridgetown on its southern boundary. The study area occurs within the Hester Sub-system of the Darling Plateau System, and consists of undulating ridges and hill crests formed on laterite and gneiss which typically slope downwards off the main plateau into the surrounding Lowden Valleys System. The soils are mostly loamy gravels, sandy gravels and loamy earths.

The geology of the Greenbushes area is described as Archean granite of the Yilgarn Block (Wilde and Walker 1982) and the major soil types are listed below (Tille 1961):

Darling Plateau and Manjimup Plateau

- Dwellingup Subsystem (DW): Ridge Crests and Divides - broad undulating lateritic divides formed over granite and gneiss. Loamy gravels and sandy gravels are the most common soils with pockets of deep sands; and
- Yarragil Upstream Valleys Phase (YGu): Minor Valleys - 5-20 m deep with gradients of 3-10% on the slopes. The valley floor is broader than downstream. Being shallowly incised these valleys have a higher proportion of gravels and sands derived from laterite.

Lowden Valleys (granitic rocks)

- Grimwade Subsystem (GR): Low Slopes - moderately deep valleys (30-70 m) incised into granitic terrain. Lateritic colluvium often covers the slopes which have mostly low gradients (5-20%). Loamy earths and loamy gravels are the dominant soils.

1.7 Flora and Vegetation

The study area occurs in the Menzies Sub-district of the Darling Botanical District, in the South-West Botanical Province (Beard 1981). The Menzies Sub-district (southern jarrah forest) covers a total area of 26,572 km^2, of which 18,715 km^2 (70%) originally supported jarrah and jarrah-marri forest (Beard 1990). It is estimated that approximately 61% of the total area has been cleared since European settlement, mainly in the valleys which are free of laterite, leaving the forest intact on laterised higher plateau levels.

The Menzies Sub-district is characterised by Jarrah stands on laterite within some Marri and Wandoo woodlands. Valley soils are often richer and Blackbutt (*Eucalyptus patens)* is more dominant in these areas. Flooded Gum (*Eucalyptus rudis)* is common along stream banks and Bullich (*Eucalyptus megacarpa)* is also present in some areas. Within the study area vegetation is dominated by Jarrah *(Eucalyptus marginata)* and Marri *(Corymbia calophylla)* forest over the tall shrubs bull banksia *(Banksia grandis)* and snotty gobble *(Persoonia longifolia).* The lower understorey strata contains a range of plant genera including *Hakea, Acacia, Xanthorrhoea, Adenanthos, Hovea, Leucopogon, Macrozamia, Leucopogon, Bossiaea, Daviesia, Grevillea, Patersonia, Styphelia* and *Kennedia.*

A variety of published studies that relate to flora and vegetation of the southern jarrah forest are listed below:

- Distribution and prehistory of karri, jarrah & marri - Churchill (1968);
- Structure and composition of the karri forest around Pemberton - McArthur and Clifton (1975);
- Vegetation mapping of the Manjimup-Pemberton area - (Smith 1972);
- Vegetation mapping of the Swan area - Beard (1981);
- Vegetation mapping of the Darling System - Heddle *et al.* (1980); and
- Vegetation mapping as part of the Regional Forest Agreement - Mattiske and Havel (1998).

Vegetation complexes of the southern jarrah forest have most recently been defined by Heddle *et al.* (1980) and updated by Mattiske and Havel (1998). Mattiske and Havel (1998) describe vegetation of the survey area as ‘mixture of open forest of *Eucalyptus marginata - Corymbia calophylla* with some *Eucalyptus patens* on slopes’.

2.0 METHODOLOGY

2.1 Legislation and Guidance Statements

The detailed flora and vegetation survey followed as closely as practicable the EPA requirements for the environmental surveying and reporting of flora and vegetation in Western Australia:

- Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016a);
- Environmental Factor Guideline: Flora and Vegetation (EPA 2016b); and
- Statement of Environmental Principles, Factors and Objectives (EPA 2020).

2.2 Desktop Assessment

2.2.1 Literature Review

Regional scale reports relevant to the study area locality were reviewed, including:

- a summary of bioregional data (Hearn *et al*. 2002); and
- vegetation description and mapping by Beard (1981), and more recently by Heddle, Loneragan and Havel (1980) and by Mattiske and Havel (1998).

In addition, there was a review of all publicly available literature and internal reports commissioned and held by Talison Lithium. There were nine flora and vegetation surveys previously completed between 1991 and 2022 within close proximity to the study area. As part of the desktop review total flora lists for the nine flora assessments were reviewed to ensure nomenclature was accurate, consistent and current. The previous survey work is summarised in more detail in Section 3.1.1.

2.2.2 Database Searches

Desktop searches included information relating to significant flora, TECs and PECs previously collected or described within, or in close proximity to, the study area. For this report the search was extended beyond the study area to place flora values into a local and regional context. The following databases were searched:

- NatureMap: This database represents the most comprehensive source of information on the distribution of Western Australia's flora, comprising records from the DBCA database and the Western Australian (WA) Herbarium Specimen Database (40 km radial search) (DBCA 2018a);
- DBCA's Threatened and Priority flora database was searched to confirm the NatureMap results (40 km radial search) (DBCA 2018b);
- DBCA's TEC, PEC and Environmentally Sensitive Areas (ESAs) database was searched to identify significant communities (100 km radial search) (DBCA 2018c);
- EPBC Act Protected Matters Database (10 km radial search) (DAWE 2021); and
- International Union for Conservation of Nature (IUCN) database) (IUCN 2021).

2.2.3 Assessment of Likelihood of Occurrence in the study area

A list of conservation significant species occurring within a 40 km radius of the study area was compiled during the literature review and database searches. The likelihood of each taxon occurring within the study area was assessed using a set of rankings and criteria (Table 2) based on presence of suitable landform (inferred from aerial imagery with contours overlayed and from knowledge of the adjacent areas) and distance to known records.

Table 2 Ranking system used to assign the likelihood that a species would occur in the study area.

Rank	Criteria
Recorded	The species has been recorded in the study area.
Likely to occur	The species has previously been recorded from a landform which is present within the study area, and there are previous records within a 20 km radius of the study area.
Possible to occur	The species has previously been recorded from a landform which is present within the study area, and there are previous records within a 40 km radius of the study area.
Unlikely to occur	The landform from which the species has previously been recorded is absent within the study area, and/or there are no previous records within a 40 km radius of the study area.

2.3 Field Survey Methodology

2.3.1 Timing and Personnel

The detailed flora and vegetation survey was completed by Principal Botanist Dr Jerome Bull working over a two day period from the 20th to the 21st of March 2022.

2.3.2 Sampling of Study Sites

The field survey involved systematic sampling using quadrats (referred to as study sites). The study sites were 10 m by 10 m in dimension which is standard for the Jarrah Forest bioregion. The number of study sites sampled was determined by the size and heterogeneity of the study area, and confirmed by a species accumulation curve. To comply with the EPA guidance statement (2016) a minimum of three study sites were formally assessed within each vegetation type mapped within the study area. A total of ten quadrats were formally assessed, with additional relevé sites used to confirm vegetation mapping boundaries and provide site descriptions for points of interest. The locations of all quadrats sampled are provided in Figure 3.

TALISON LITHIUM

Location of study sites within the study area

FIGURE 3

Legend

- Study Sites
- Talison Tenements

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Meters
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Datum: GDA94
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Date:	25/03/2022
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The study sites were assessed to provide a list of the total flora occurring within the study area and a description of the vegetation structure. Data collected covered a range of environmental parameters including:

- Landform and habitat;
- Aspect;
- Soil colour and soil type;
- Rock type;
- Slope (angle);
- Vegetation condition;
- Disturbance (caused by fire, clearing, grazing etc);
- Age since fire;
- Broad floristic formation;
- Vegetation type description; and
- Height and percentage ground cover provided by individual plant taxa.

Vegetation condition for each of the study sites was determined using a recognised rating scale (based on Keighery 1994, see Appendix 1).

2.3.3 Targeted Surveys for Conservation Significant Species

Targeted searches for species of conservation significance were completed throughout the study area. Ground truthing provided an opportunity to record opportunistic locations for Threatened and Priority listed flora, and undertake closer examination of specific landforms where conservation significant flora may be expected to occur.

2.3.4 Weed Survey and Mapping

Introduced species were recorded from the study sites formally assessed within the study area. Opportunistic collections were also made while moving throughout native vegetation remnants within the study area, with targeted weed searches were completed in any high moisture habitats encountered.

2.3.5 Floristic Analysis

A multivariate statistical analysis of the floristic quadrat data (ten quadrats) was completed to assist in understanding the vegetation-habitat relationships within the study area. A two-way classification (Agglomerative Hierarchical Fusion) of the presence/absence quadrat data was carried out on the 54 taxon x 10 quadrat dataset using the program PATN (Belbin, 2003). The flexible UPGMA classification strategy was used (β = -0.1), together with the Bray-Curtis site similarity measure. The number of groups to be determined was set at ten. The primary output of the classification was in the form of a dendrogram and a two-way table of taxa and quadrats (Appendix 2).

2.3.6 Vegetation Type and Condition Mapping

The classification of vegetation types within the study area follow the height, life form and density classes of Muir (1977) (see Appendix 3). This is largely a structural classification suitable for broader scale mapping, but taking all ecologically significant strata into account. Vegetation types recorded within the study area were grouped according to broad floristic formation. A broad floristic formation describes the

dominant growth form, cover and height as well as the dominant genus for the dominant stratum (Department of Environment and Heritage (DEH) 2003).

Vegetation type mapping utilised high-resolution aerial photography of the entire study area at a scale of 1:4,000, with definition of vegetation polygons based on contrasting shading patterns. Ground-truthing of the study area was completed during the field survey with vegetation descriptions made within selected vegetation polygons to confirm dominant structural layers and associated plant taxa. The sampling intensity (ten quadrats) ensured at least one quadrat was assessed within each of the ten native vegetation remnants. High resolution aerial photography and associated flora and vegetation data was used to provide vegetation type descriptions for each remnant, and determine any variation within individual remnants.

2.3.7 Vouchering

Voucher specimens were taken for all taxa where the identification could not be confirmed in the field. Taxonomy was completed by Dr Jerome Bull, and use was made of the Western Australian Herbarium.

2.3.8 Field Survey Constraints

The EPA Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2016a) list seven potential limitations that field surveys may encounter. These limitations are addressed in Table 3.

Table 3 Relevance of limitations to the flora and vegetation survey, as identified by EPA (2016a).

Constraint	Relevance
Availability of contextual information at a regional and local scale	There have been nine previous flora and vegetation surveys within close vicinity of the study area, including a previous assessment of the proposed powerline route in spring 2018 (Onshore Environmental 2019a) providing a comprehensive local database.
Proportion of flora recorded and/or collected, any identification issues	There was a high sampling intensity that included assessment of all ten native vegetation remnants occurring within the study area at March 2022. The proportion of flora recorded in March 2022 was likely to represent an underestimate owing to the timing of the field survey (autumn) and recent wildfire which impacted a large proportion of the study area (eight of the ten quadrats sampled).
Survey timing, rainfall, season of survey	The survey was completed over two days in autumn 2022 and following the period of lowest annual rainfall. Seasonal conditions were rated as poor, with annual and ephemeral flora taxa not anticipated to be present.
Disturbance that may have affected the results of survey such as fire, flood or clearing	A recent wildfire had impacted a large proportion of the study area that included eight of the ten native vegetation remnants. The fire had removed much of the understorey vegetation. Results from previous survey of the same powerline corridor undertaken by Onshore Environmental in spring 2018 (Onshore Environmental 2019a) was used to confirm presence of conservation significant flora taxa.

Constraint	Relevance
Was the appropriate area fully surveyed (effort and extent)	A Principal Botanist spent two field days covering the ten native vegetation remnants forming the study area. A total of ten quadrats (one quadrat per remnant) were assessed within the study area. This represents an appropriate effort to survey remnant native vegetation within the study area.
Access restrictions within the survey area	The study area was accessed by vehicle and on foot, noting that vegetation mapping was facilitated by high-resolution aerial photography (1:4,000). There were no access restrictions encountered.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed	The Principal Botanist, Dr Jerome Bull, has 20 years' experience working within the southern jarrah forest, and has worked extensively in state forest surrounding the Greenbushes Mine in recent years.

2.3.9 Assessment of Conservation Significance

The conservation significance of flora and ecological communities are classified at a Commonwealth, State and Local level on the basis of various Acts and Agreements, including:

International Level:

- IUCN: The IUCN 'Red List' lists species at risk under nine categories (status codes) (Appendix 4).

Commonwealth Level:

- EPBC Act: The Department of Agriculture, Water and the Environment (DAWE) lists Threatened flora and ecological communities, which are determined by the Threatened Species Scientific Committee according to criteria set out in the Act. The Act lists flora that are considered to be of conservation significance under one of six categories (Appendix 4).

State Level:

- BC Act: At a State level, native flora species are protected under the BC Act - Wildlife Conservation Notice. A number of species are assigned an additional level of conservation significance based on a limited number of known populations and the perceived threats to these locations (Appendix 4); and
- DBCA Priority list: DBCA produces a list of Priority species and ecological communities that have not been assigned statutory protection under the BC Act. Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added under Priorities 1, 2 or 3. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been removed from the threatened species list for other taxonomic reasons, are placed in Priority 4. These species require regular monitoring (see Appendix 4). The list of PECs identifies those that need further investigation before nomination for TEC status at a State level.

Local Level:

- Species may be considered of local conservation significance because of their patterns of distribution and abundance. Although not formally protected by legislation, such species are acknowledged to be in decline as a result of threatening processes, primarily habitat loss through land clearing.

3.0 RESULTS

3.1 Desktop Review

3.1.1 Previous Flora Surveys

The results from previous flora and vegetation surveys completed within close proximity to the study area are presented in Table 4 and summarised below. The nine surveys have recorded one Threatened Flora taxon and four Priority flora taxa within a 20 km radius of the study area:

- *Caladenia harringtoniae* (Threatened, Vulnerable);
- *Eucalyptus relicta* (Priority 2);
- *Melaleuca viminalis* (Priority 2);
- *Tetratheca parvifolia* (Priority 3); and
- *Acacia semitrullata* (Priority 4).

Two species have been identified as occurring outside of their known distribution (i.e. range extensions):

- **Cyperus involucratus* (80 km southeast); and
- *Hybanthus epacroides* (180 km west).

Vegetation types recorded during the previous surveys are not aligned with any Commonwealth or State listed TECs or DBCA listed PECs, and are regarded as well represented and adequately reserved.

The previous surveys have typically recorded a high representation of introduced species within the total flora, reflecting heavy logging and related disturbance of the State Forest precinct around Greenbushes.

Table 4 Results from flora and vegetation surveys previously completed within, or in close proximity to, the study area.

Survey	Consultant	Year	Field Survey Date	Flora Statistics	Significant Flora	Introduced (Weed) Taxa
A Flora and Vegetation Survey of Part of the Greenbushes Leases	Trudgen and Morgan	1991	13-14 April 1991	91 plant taxa 35 families 65 genera	None	9 introduced taxa including one Declared Plant listed under the BAM Act; **Rubus anglocandicans* (Blackberry)
Flora and Vegetation Survey Greenbushes Mine Site: Vegetation surrounding south east corner of the TSF	Onshore Environmental Consultants	2006	13th April 2006	135 plant taxa 37 families 97 genera	None	27 introduced taxa including one Declared Plant listed under the BAM Act; **Rubus anglocandicans* (Blackberry)
Bridgetown RWSS Pipelines Millstream Dam to Greenbushes Link Biological Survey	AECOM Australia Pty Ltd	2010	Spring 2009	86 plant taxa 37 families 70 genera	None	29 introduced taxa including three Declared Plant listed under the BAM Act; **Rubus ulmifolius* (Blackberry), **Asparagus asparadoidies* (Bridal Creeper), **Echium plantagineum* (Paterson's Curse)
Flora and Vegetation Survey Greenbushes Mining Leases	Onshore Environmental Consultants	2012	13-21 October 2011	368 plant taxa 73 families 208 genera	*Caladenia harringtoniae* (T); *Tetratheca parvifolia* (P3)	86 introduced taxa including three Declared Plants listed under the BAM Act; **Asparagus asparagoides* (Bridal Creeper), **Galium aparine* (Goosegrass), **Rubus ulmifolius* (Blackberry)
Greenbushes Mining Operations Detailed Flora and Vegetation Survey	Onshore Environmental Consultants	2018	27 February - 2 March and 26 September, 4, 16-18 October 2018	365 plant taxa 63 families 200 genera	*Acacia semitrullata* (P4), **Cyperus involucratus* (range extension)	66 introduced taxa, including three Declared Plants listed under the BAM Act; **Asparagus asparagoides* (Bridal Creeper), **Rubus anglocandicans* (Blackberry) and **Rumex acetosella* (Sorrell)

Survey	Consultant	Year	Field Survey Date	Flora Statistics	Significant Flora	Introduced (Weed) Taxa
Greenbushes Infrastructure Corridors Detailed Flora and Vegetation Survey	Onshore Environmental Consultants	2019a	30 July - 6 August and 26-27, 29-30 September, 3-4 and 18 October 2018	280 plant taxa 60 families 157 genera	*Acacia semitrullata* (P4), *Melaleuca viminalis* (P2), *Hybanthus epacroides* (range extension)	45 introduced taxa, including two Declared Plants listed under the BAM Act; **Asparagus asparagoides* (Bridal Creeper) and **Rubus anglocandicans* (Blackberry)
Targeted Flora Survey Greenbushes Lithium Mine	Onshore Environmental Consultants	2019b	19-20 September and 10 October 2019	Not assessed	*Acacia semitrullata* (P4)	Not assessed
Targeted Survey for Eucalyptus relicta Greenbushes Lithium Operations	Onshore Environmental Consultants	2020	20-24 July and 5-15 August 2020	Not assessed	*Eucalyptus relicta* (P2)	Not assessed
Detailed Flora and Vegetation Survey, Greenbushes Mine Expansion Area 2 and Area 4	Onshore Environmental Consultants	2021	26-31 October 2021	272 plant taxa 60 families 162 genera	None	49 introduced taxa, including one Declared Plant listed under the BAM Act; **Rubus ulmifolius* (Blackberry)

3.1.2 Threatened Flora listed under the EPBC Act

A search of the EPBC Act Protected Matters database was undertaken for a 10 km radius around the study area (DAWE 2021). The search identified three records of Threatened flora potentially occurring within the buffer outside of the study area; *Caladenia hoffmanii* (Endangered), *Caladenia harringtoniae* and *Diuris micrantha* (Vulnerable).

There were no TECs listed from the Commonwealth database occurring within or surrounding the study area.

3.1.3 Threatened Flora listed under the IUCN Red List

A search of the IUCN database (IUCN 2021) determined that no Threatened Flora taxon was likely to occur within the study area.

3.1.4 Threatened Flora listed under the WA Wildlife Conservation (Rare Flora) Notice

Three Threatened Flora taxa were identified within a 40 km radius of the study area from the DBCA's rare flora and NatureMap database searches (DBCA 2018a, 2018b); *Caladenia harringtoniae, Caladenia christineae* and *Diuris drummondii*. *Caladenia harringtoniae* is the closest population, previously recorded within state forest approximately 5 km west northwest from the western boundary of the study area (Onshore Environmental 2012).

3.1.5 Priority Flora Recognised by the DBCA

The DBCA rare flora database and NatureMap searches (DBCA 2018a, 2018b) identified 22 Priority flora taxa as potentially occurring within a 40 km radius of the study area (Table 5). None of these taxa were considered *likely* to occur within the study area, however it was considered *possible* that six taxa may *possibly* occur within the study area (as per criteria set out in Table 1) (Table 5).

Table 5 Priority flora taxa previously recorded within a 50 km radius of the study area (DBCA 2018a), and the likelihood of these taxa occurring within the study area.

Taxon	Cons Code	Habitat Preference	Likelihood in the study area
Acacia parkerae	3	Loam soils.	Unlikely
Acacia tayloriana	4	Grey or yellow/orange sandy soils, lateritic gravel, clay loam.	Possible
Andersonia barbata	2	White sand. Swampy areas.	Possible
Aponogeton hexatepalus	4	Freshwater: ponds, rivers, claypans.	Unlikely
Caladenia uliginosa subsp. *patulens*	1	Clay loam and gravel. Well drained soils amongst dense shrubs.	Possible
Carex tereticaulis	3	Black peaty sand.	Unlikely
Chorizema carinatum	3	Sand, sandy clay.	Possible
Dampiera heteroptera	3	Sandy soils. Swampy areas.	Unlikely
Dillwynia sp. Capel (P.A. Jurjevich 1771)	1	Littered grey loamy sand, rocky soils. Valleys, rangelands.	Unlikely
Eucalyptus relicta	2	Grey clay-loam. Undulating upper slopes, along creeklines.	Unlikely
Gastrolobium formosum	3	Clay loam. Along river banks or in swamps.	Unlikely
Grevillea bronwenae	3	Grey sand over laterite, lateritic loam. Hillslopes.	Unlikely
Grevilla ripicola	4	Sandy clay, clay or gravelly loam. Swampy flats, granite outcrops, along watercourses.	Unlikely
Melaleuca viminalis	2	Drainage lines and flats.	Unlikely
Pultenaea skinneri	4	Sandy or clayey soils. Winter-wet depressions.	Unlikely
Scaevola ballajupensis	1	Brown sandy gravel, laterite, granite. Outcrops.	Unlikely
Synaphea otiostigma	3	Clayey laterite, gravelly loam, sand.	Possible
Tetraria sp. Blackwood River (A.R. Annels 3043)	3	Loam soil.	Unlikely
Tetraria sp. Nannup (P.A. Jurjevich 1133)	1	Laterite.	Unlikely
Tetratheca parvifolia	3	Loam soils.	Possible
Thysanotus formosus	1	Clayey sand, sandy loam. In situations often inundated in winter.	Unlikely
Thysanotus gageoides	3	Sand, clay, granite, sandstone, laterite.	Unlikely

3.1.6 TECs listed under State and Federal legislation

A search of the EPBC Protected Matters database confirmed there were no Commonwealth listed TECs previously recorded within or adjacent to, the study area. A search of the DBCA ecological community database confirmed there were no State listed TEC records for a 90 km radius around the study area.

3.1.7 PECs recognised by DBCA

In addition to TECs, DBCA has generated a list of PECs occurring in the South-West Region of Western Australia. The list identifies communities that require further investigation prior to nomination for TEC status. A search of DBCA's ecological community database confirmed there were no PECs known to occur within a 90 km radius of the study area.

3.1.8 Environmentally Sensitive Areas

There is one Environmentally Sensitive Area (ESA) identified approximately 5 km west north-west of the study area, and 560 m northwest from the intersection of Huitson Road and Maranup Ford Road. The ESA incorporates the winter-wet dampland supporting the Threatened *Caladenia harringtoniae* population. This landform / habitat type was not represented within the study area.

3.2 Flora Species

A total number of 54 plant taxa (including varieties and subspecies) from 26 families and 45 genera was recorded from the study area (Table 6, Appendix 5). Species representation was greatest among the Poaceae, Fabaceae, Myrtaceae, Asparagaceae and Cyperaceae, with the most speciose genus being *Eucalyptus* (5 taxa), followed by *Corymbia, Bossiaea, Kennedia, Lepidosperma* and *Lomandra* (2 taxa each).

A species by site matrix and raw data for the ten study sites is presented in Appendices 6 and 7 respectively. The species accumulation curve demonstrates that the study area was adequately sampled, with the curve reaching an asymptote (Figure 4).

Table 6 Statistics for total flora recorded from the study area.

Parameter	No. Taxa
No. Families	26
No. Genera	45
No. Species (incl. subspecies & varieties)	54
No. Native Species (incl. subsp. & var.)	28
No. Threatened Flora	0
No. Priority Flora	0
No. Range Extensions	0
No. Introduced Species	26
Speciose Families	
Poaceae	9
Fabaceae	7
Myrtaceae	7
Asparagaceae	4
Cyperaceae	3
Proteaceae	2
Asteraceae	2
Iridaceae	2
Speciose Genera	
Eucalyptus	5
Bossiaea	2
Corymbia	2
Kennedia	2
Lepidosperma	2
Lomandra	2

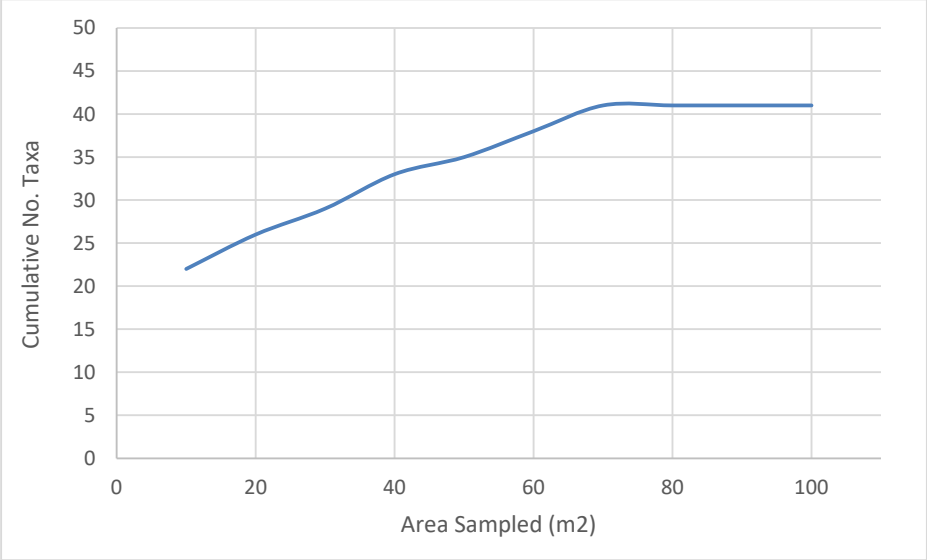


Figure 4 Species accumulation curve for the ten study sites formally assessed within the study area.

3.3 Conservation Significant Flora Species

3.3.1 Threatened Flora listed under the EPBC Act and BC Act

None of the plant taxa recorded from the study area were gazetted as Threatened Flora (T) under the EPBC Act or the BC Act.

3.3.2 Priority Flora

None of the plant taxa recorded from the study area were listed by the DBCA as Priority Flora.

3.3.3 Range Extensions

None of the plant taxa recorded from the study area were identified as occurring outside of their known distribution or range (i.e. range extensions).

3.4 Introduced Flora

A total of 26 introduced species were recorded from within the study area (Table 7), of which two taxa were listed as Declared Plants under the BAM Act and are also considered WONS:

- **Asparagus asparagoides* (Bridal Creeper) - s22(2); and
- **Rubus anglocandicans* (Blackberry) - s22(2) (C3 Exempt).

The diversity of weeds within the study area was relatively high and reflected the small size and isolated nature of the native vegetation remnants, combined with close proximity of surrounding agricultural land. Many of the weed species would have volunteered from adjacent annual pasture on cleared farmland.

Table 7 Introduced species recorded from the study area.

Species	Common Name	Category
**Asparagus asparagoides*	Bridal Creeper	s22(2) (Exempt)
**Avena barbata*	Bearded Oat	Permitted - s11
**Brassica tournefortii*	Mediterranean Turnip	Permitted - s11
**Briza maxima*	Blowfly Grass	Permitted - s11
**Bromus diandrus*	Great Brome	Permitted - s11
**Cortaderia selloana*	Pampas Grass	Permitted - s11
**Corymbia citriodora*	Lemon-scented Gum	Permitted - s11
**Cynodon dactylon*	Couch Grass	Permitted - s11
**Disa bracteata*	South African Weed Orchid	Permitted - s11
**Ehrharta calycina*	Perennial Veld Grass	Permitted - s11
**Eucalyptus camaldulensis*	River Gum	Permitted - s11
**Eucalyptus saligna*	Sydney Blue Gum	Permitted - s11
**Eucalyptus* sp. indet		Permitted - s11
**Hypochaeris glabra*	Smooth Catsear	Permitted - s11
**Lupinus luteus*	Yelloe Lupin	Permitted - s11
**Orobanche minor*	Lesser Broomrape	Permitted - s11
**Petrorhagia dubia*	Hairy Pink	Permitted - s11
**Phalaris aquatica*	Bulbous Canary-grass	Permitted - s11
**Pinus radiata*	Monterey Pine	Permitted - s11

Species	Common Name	Category
**Plantago lanceolata*	Ribwort Plantain	Permitted - s11
**Romulea rosea*	Guildford Grass	Permitted - s11
**Rubus anglocandicans*	Blackberry	s22(2) (C3 Exempt)
**Rumex conglomeratus*	Clustered Dock	Permitted - s11
**Sonchus oleraceus*	Common Sowthistle	Permitted - s11
**Stenotaphrum secundatum*	Buffalo Grass	Permitted - s11
**Watsonia meriana*	Bulbil Watsonia	Permitted - s11

3.5 Vegetation

A total of three vegetation types from two landforms were described and mapped from the study area, with two of these vegetation types occurring within the proposed clearing footprint (Figure 5). The three vegetation types were classified into two broad floristic formations according to dominant vegetation strata (Table 8). Raw data for each of the ten formal quadrats assessed is provided in Appendix 7.

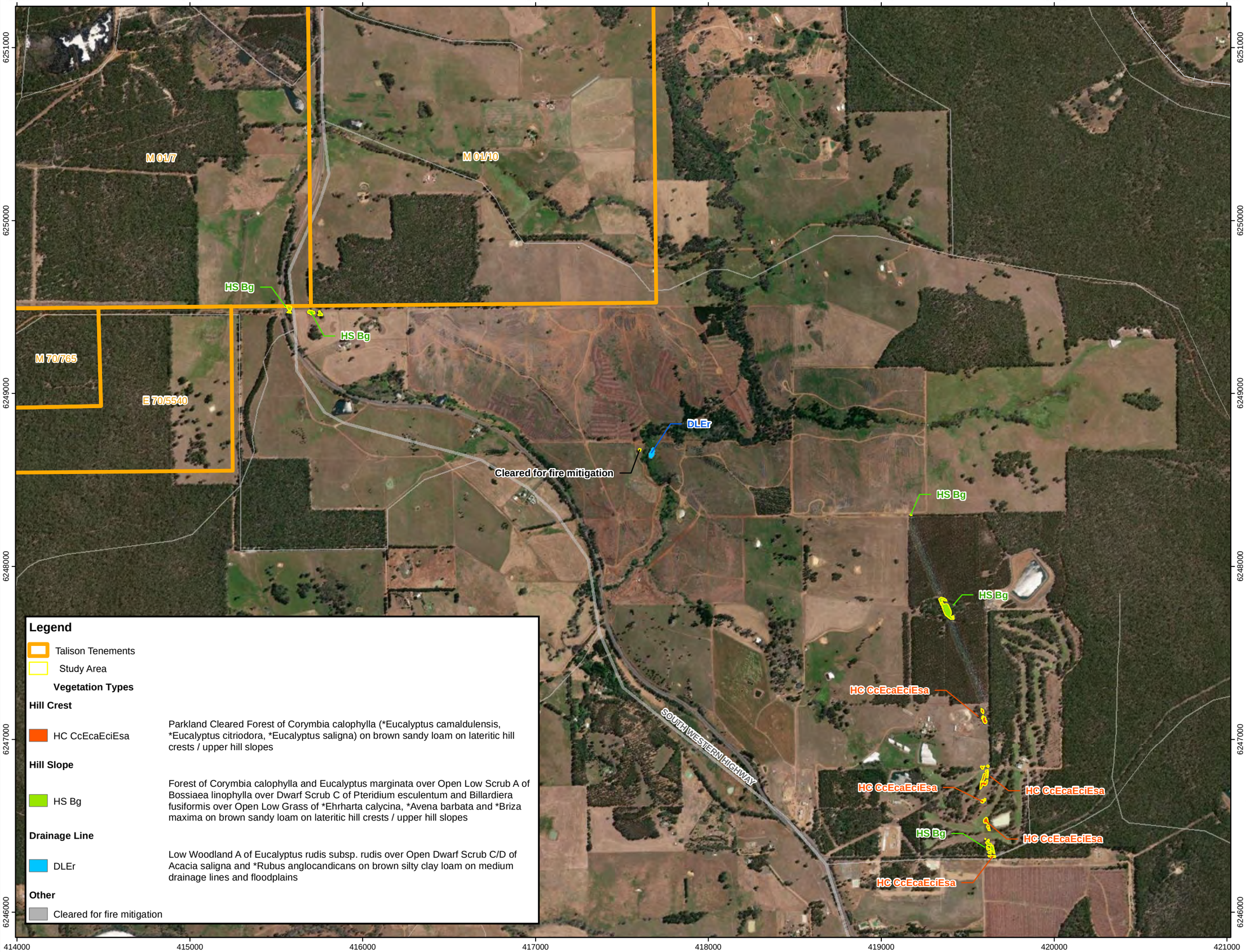
Vegetation within the proposed clearing footprint was characterised by Jarrah-Marri forest or parkland cleared Marri forest planted with exotic eucalypts on gravelly sandy loam soils on lateritic hill crests and slopes. A drainage line supporting Flooded Gum *(Eucalyptus rudis* subsp. *rudis)* occurred at one location along the powerline corridor, but there will be no requirement for clearing within this degraded vegetation type.

None of the vegetation types recorded from the study area were aligned with Commonwealth or State listed TECs or DBCA listed PECs from the South West Region.

Table 8 Vegetation types described and mapped within the study area (shaded), with quadrat descriptions also provided (unshaded).

Area	Broad Floristic Formation	Vegetation Map Code	Vegetation Type Description	Condition	Quadrats
	Corymbia Forest	HS Bg	Forest of Corymbia calophylla and Eucalyptus marginata over Open Low Scrub A of Bossiaea linophylla over Dwarf Scrub C of Pteridium esculentum and Billardiera fusiformis over Open Low Grass of *Ehrharta calycina, *Avena barbata and *Briza maxima on brown sandy loam on lateritic hill crests / upper hill slopes		
Area 1			Forest of Corymbia calophylla and Eucalyptus marginata over Dwarf Scrub C of Pteridium esculentum and Billardiera fusiformis over Open Low Grass of *Ehrharta calycina, *Avena barbata and *Briza maxima with Open Low Scrub A of Bossiaea linophylla over Very Open Herbs of *Plantago lanceolata and *Asparagus asparagoides on grey clayey sand on hill crests/ upper hill slopes	Good	PD01
Area 2			Dense Forest of Corymbia calophylla over Low Grass of *Avena barbata and *Briza maxima on brown sandy loam on hill crests/ upper hill slopes (parkland cleared over pasture)	Completely Degraded	PD02
Area 4			Forest of Corymbia calophylla and Eucalyptus marginata on hill crests/ upper hill slopes (intensely burnt)	Good	PD09
Area 9			Forest of Corymbia calophylla and Eucalyptus marginata over Open Low Woodland A of Corymbia calophylla and Eucalyptus marginata over Open Scrub of Bossiaea linophylla on brown sandy loam on hill crests/ upper hill slopes (intensely burnt)	Good	PD06
	Eucalyptus Low Woodland A	DL Er	Low Woodland A of Eucalyptus rudis subsp. rudis over Open Dwarf Scrub C/D of Acacia saligna and *Rubus anglocandicans on brown silty clay loam on medium drainage lines and floodplains		
Area 3			Low Woodland A of Eucalyptus rudis subsp. rudis over Open Dwarf Scrub D of Acacia saligna and *Rubus anglocandicans on brown silty clay loam on medium drainage line	Degraded	PD03
Area 3			Dwarf Scrub C of *Rubus anglocandicans and Acacia saligna over Open Tall Sedges of Typha orientalis with Open Low Woodland A of Eucalyptus rudis subsp. rudis on brown light clay on floodplain	Degraded	PD04
Area 3			Open Tall Grass of *Phalaris auqatica, *Cortaderia selleoana and *Stenotaphrum secundatum with Open Dwarf Scrub D of Acacia saligna over Very Open Herbs of Atriplex prostrata and Alternanthera nodiflora over Very Open Low Sedges of Juncus pallidus on brown silty clay loam on floodplain	Degraded	PD05
	Corymbia Forest	HC CcEcaEciEsa	Parkland Cleared Forest of Corymbia calophylla (*Eucalyptus camaldulensis, *Eucalyptus citriodora, *Eucalyptus saligna) on brown sandy loam on lateritic hill crests / upper hill slopes		
Area 5			Forest of *Eucalyptus camaldulensis, *Eucalyptus citriodora and *Eucalyptus sp. indet on brown sandy loam on hill crests/ upper hill slopes (parkland cleared over pasture) (intensely burnt)	Degraded	PD10

Area	Broad Floristic Formation	Vegetation Map Code	Vegetation Type Description	Condition	Quadrats
Area 6			Dense Forest of Corymbia calophylla and *Eucalyptus saligna on brown sandy loam on hill crests/ upper hill slopes (parkland cleared adjacent to golf course) (intensely burnt)	Good	PD08
Area 7			Forest of *Eucalyptus saligna and Corymbia calophylla over Low Woodland A of *Eucalyptus saligna on brown silty loam on hill crests/ upper hill slopes (parkland cleared adjacent to golf course) (intensely burnt)	Degraded	
Area 8			Forest of *Eucalyptus saligna and Corymbia calophylla over Low Woodland A of *Eucalyptus saligna on brown silty loam on hill crests/ upper hill slopes (parkland cleared adjacent to golf course) (intensely burnt)	Degraded	PD07
Area 10			Forest of *Eucalyptus camaldulensis, *Eucalyptus citriodora and *Eucalyptus sp. indet on hill crests/ upper hill slopes (intensely burnt)	Completely Degraded	



TALISON LITHIUM

Vegetation Type Map
132kV Powerline Connection Project

FIGURE 5

N

0 200 400 600
Meters
1:20,000
Datum: GDA94
Projection: MGA Zone 50

Date:	11/04/2022
Status:	Draft
Figure:	5
Sheet Size:	A3
Internal Reference:	TAL_132kVVeg_Types2022
Drawn by:	GSM
Requested by:	DB

Broad Floristic Formation	*Corymbia* Forest
Vegetation Association	HS Bg - Forest of *Corymbia calophylla* and *Eucalyptus marginata* subsp. *marginata* over Open Low Scrub A of *Bossiaea linophylla* over Dwarf Scrub C of *Pteridium esculentum* and *Billardiera fusiformis* over Open Low Grass of **Ehrharta calycina, *Avena barbata* and **Briza maxima* on brown sandy loam on lateritic hill crests / upper hill slopes

Area Mapped	0.420 ha or 47% of the study area
Quadrats Sampled	PD01, PD02, PD06, PD09
Soils	Brown sandy loam
Land Form	Lateritic hill crests and upper hillslope
Priority Ecological Community	No
Conservation Significant Flora	None
Introduced Species	**Asparagus asparagoides, *Avena barbata, *Briza maxima, *Bromus diandrus, *Disa bracteata, *Ehrharta calycina, *Hypochaeris glabra, *Orobanche minor, *Petrorhagia dubia, *Pinus radiata, *Plantago lanceolata, *Romulea rosea, *Sonchus oleraceus, *Watsonia meriana*
Vegetation Condition	Good to Completely Degraded
Disturbances	Rubbish, weeds, soil disturbance (historic)
Average Fire Age	Old (6+ years) and Recent (0 to 2 years)

Broad Floristic Formation	*Corymbia* Forest
Vegetation Association	HC CcEcaEciEsa - Parkland Cleared Forest of *Corymbia calophylla (*Eucalyptus camaldulensis, *Eucalyptus citriodora, *Eucalyptus saligna)* on brown sandy loam on lateritic hill crests / upper hill slopes

Area Mapped	0.457 ha or 51% of the study area
Quadrats Sampled	PD07, PD08, PD10
Soils	Brown sandy loam
Land Form	Lateritic hill crests and upper hill slopes
Priority Ecological Community	No
Conservation Significant Flora	None
Introduced Species	**Corymbia citriodora, *Cynodon dactylon, *Eucalyptus camaldulensis, *Eucalyptus saligna, *Pinus radiata, *Plantago lanceolata*
Vegetation Condition	Degraded to Completely Degraded
Disturbances	Weeds, adjacent golf course, altered drainage line
Average Fire Age	Recent (0-2 years)

Broad Floristic Formation	*Eucalyptus* Low Woodland A
Vegetation Association	DL Er - Low Woodland A of *Eucalyptus rudis* subsp. *rudis* over Open Dwarf Scrub C/D of *Acacia saligna* and **Rubus anglocandicans* on brown silty clay loam on medium drainage lines and floodplains

Area Mapped	0.017 ha or 2% of the study area
Quadrats Sampled	PD03, PD04, PD05
Soils	Brown silty clay loam
Land Form	Drainage lines and floodplains
Priority Ecological Community	No
Conservation Significant Flora	None
Introduced Species	**Brassica tournefortii, *Cortaderia selloana, *Hypochaeris glabra, *Lupinus luteus, *Phalaris aquatica, *Rubus anglocandicans, *Rumex conglomeratus, *Stenotaphrum secundatum*
Vegetation Condition	Degraded
Disturbances	Mining exploration, road/access track, weeds, kangaroo grazing
Average Fire Age	Recent (0-2 years)

3.6 Vegetation Condition

Vegetation condition within the ten remnants forming the study area was rated as good (54%), degraded (23%) and completely degraded (23%) (Table 9). There was no vegetation rated within the highest three condition categories of pristine, excellent or very good, reflecting the small and isolated nature of the remnants amongst predominantly cleared agricultural land (Figure 6). Many of the remnants comprised exotic eucalypts and all supported highly disturbed understorey strata, with many described as parkland cleared. Disturbances including recent wildfire, grazing by domestic stock, elevated numbers of kangaroos seeking refuge, surface soil disturbance, colonisation of weeds from adjacent pasture and golf course (in the southeast), and altered surface drainage.

Table 9 Area of vegetation condition classes within the study area.

Vegetation Association	Area (ha)	% of Study Area
Good	0.48	53.7
Degraded	0.20	22.9
Completely Degraded	0.21	23.4
Total	0.89	100.0

TALISON LITHIUM

Vegetation Condition Map
132kV Powerline Connection Project

FIGURE 6

Legend

- Talison Tenements
- Study Area

Vegetation Condition

- Completely Degraded
- Degraded
- Good

N

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Meters
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Datum: GDA94
Projection: MGA Zone 50

Date:	11/04/2022
Status:	Draft
Figure:	6
Sheet Size:	A3
Internal Reference:	TAL_132kVVeg_Con2022
Drawn by:	GSM
Requested by:	DB

3.7 Vegetation Significance

3.7.1 Beard (1981) Vegetation Associations

Regional vegetation mapping completed by Beard (1981) was utilised to assess representation of vegetation within the study area. A single Beard vegetation association was represented within the study area; 3 Medium forest; jarrah-marri (Table 10, Figure 7). In terms of representation, the Western Australian Government is committed to the National Objectives Targets for Biodiversity Conservation which includes a target that prevents clearance of ecological communities with an extent below 30% of that present at pre-European settlement (Department of Natural Resources and Environment 2002, EPA 2000). When considering representation at the State level, Beard vegetation association 3 currently has 67.76% of the pre-European extent remaining (Table 10, Government of Western Australia 2018). The study area is located within the Jarrah Forest Bioregion, specifically within the Southern Jarrah Forest Subregion (as discussed in Section 1.3). When considering the representation of vegetation association 3 at the IBRA regional and sub-regional levels, 67.10% and 59.40% of the pre-European extent remains respectively (Table 10). The study area falls entirely within the Shire of Bridgetown-Greenbushes. At this local level 56.35% of the pre-European extent remains for vegetation association 3 (Table 10). Vegetation within the study area is therefore determined to be well represented at all levels (state-wide, bioregional [IBRA region and IBRA sub-region] and local government authority).

In terms of reservation, there is a benchmark for a minimum of 15% of each Beard (1981) vegetation association to be protected in Class I-IV reserves (Commonwealth of Australia 1997). The proportion of the current extent of vegetation association 3 occurring within Class I-IV reserves at a state-wide, bioregional and local government authority level ranges between 23.44% and 31.13%, noting that larger proportions (ranging from 78.50% to 86.77%) occur within DBCA managed lands (Table 10). Hence the reservation status is determined to be above the minimum benchmark confirming adequate reservation for vegetation association 3.

3.7.2 Mattiske and Havel (1998) Vegetation Complexes

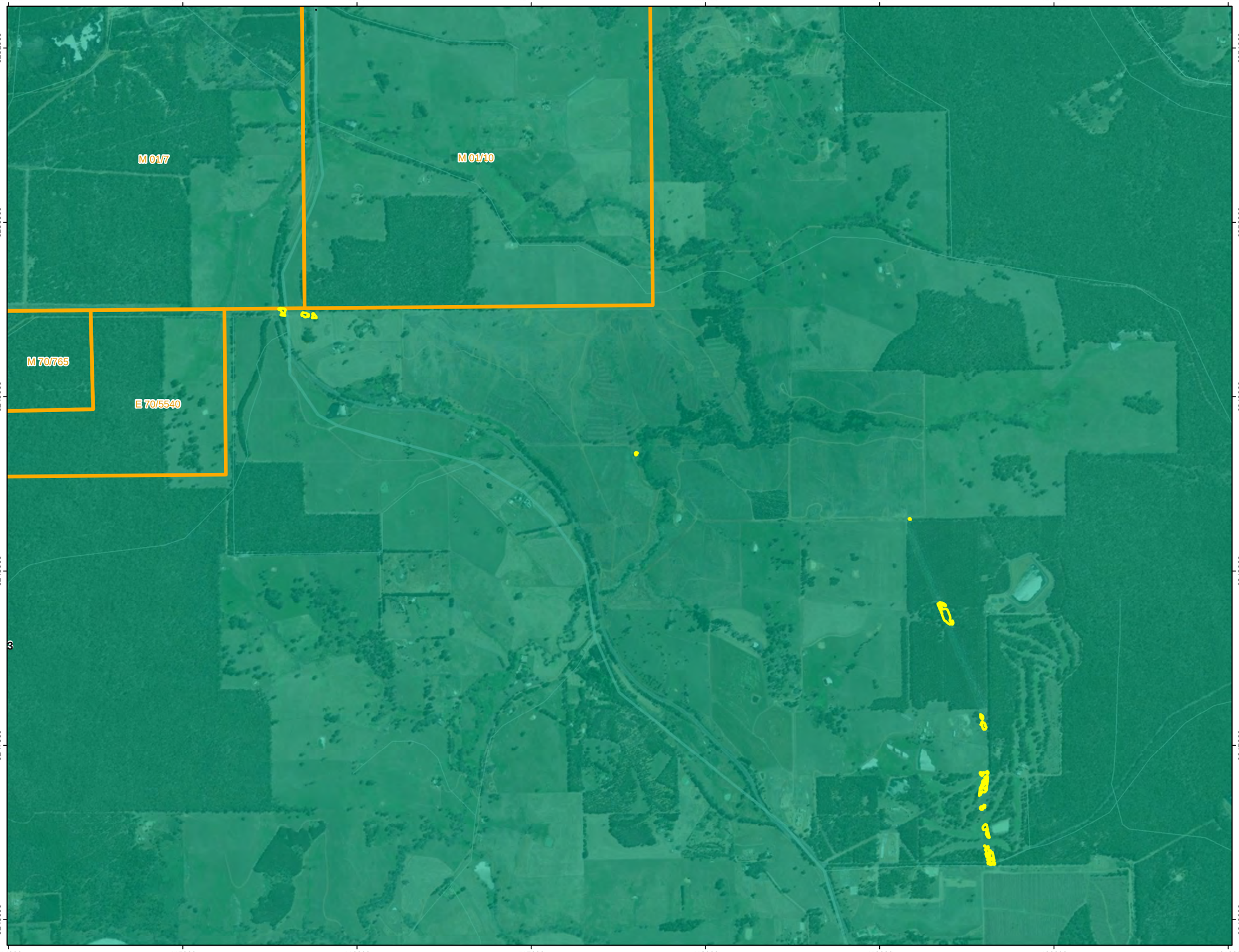
The pre-1750 distribution of vegetation complexes of the South West Forest Region of Western Australia has been mapped at 1:50,000 scale by Mattiske and Havel (1998) as part of the biodiversity assessment for the comprehensive regional assessment for the South West Forest Region. Interrogation of this database confirmed there were three vegetation complexes intersecting the study area:

- BL (Balingup) - Open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* on slopes and woodland of *Eucalyptus rudis* on the valley floor in the humid zone;
- CC1 (Catterick) - Open forest of *Eucalyptus marginata-Corymbia calophylla* mixed with *Eucalyptus patens* on slopes, *Eucalyptus rudis* and *Banksia littoralis* on valley floors in the humid zone; and
- HR (Hester) - Tall open forest to open forest of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla* on lateritic uplands in perhumid and humid zones.

The three vegetation complexes currently have between 29.38% and 73.68% of the pre-European extent remaining within the South West Forest Region, between 1.49% and 14.96% of the current extent within Class I-IV conservation reserves, and between 15.34% and 67.12% of the current extent within DBCA ,managed lands (Table 10).

Table 10 Pre-European and current extent of vegetation represented within the study area (Government of Western Australia 2018).

Vegetation System / Association	Pre-European Extent (ha)	Current Extent (ha)	% Pre-European Extent Remaining	Current Extent in Class I-IV Reserves (ha)	% Current Extent in Class I-IV Reserves	Current Extent DBCA Managed Lands (ha)	% Current Extent DBCA Managed Lands
State-wide							
3 Medium forest; jarrah-marri	2,661,404.62	1,803,437.48	67.76	485,223.00	26.91	1,469,765.60	81.50
IBRA Region							
JAF - Jarrah Forest	2,390,591.54	1,604,101.56	67.10	385,183.08	24.01	1,299,263.74	81.00
IBRA Sub-Region							
JAF02 - Southern Jarrah Forest	1,482,491.85	880,655.65	59.40	274,167.05	31.13	691,319.44	78.50
Local Government Authority							
Shire of Bridgetown-Greenbushes	121,152.70	68,275.41	56.35	16,006.81	23.44	59,243.12	86.77
Mattiske & Havel Complexes							
Balingup Complex BL	59,446.57	17,466.47	29.38	883.65	1.49	9,120.37	15.34
Catterick Complex CC1	27,385.55	16,733.59	61.10	1,875.21	6.85	15,210.18	55.54
Hester Complex HR	32,249.57	23,762.74	73.68	4,825.98	14.96	21,647.46	67.12



TALISON LITHIUM

Beard (1981) vegetation associations represented within the study area

FIGURE 7

Legend

Talison Tenements

Pre-European Vegetation (Beard 1975)

System / Vegetation Assoc.

Bridgetown, 3

N

0 200 400 600

Meters
1:20,000
Datum: GDA94
Projection: MGA Zone 50

Date:	25/03/2022
Status:	Draft
Figure:	7
Sheet Size:	A3
Internal Reference:	TAL_132kvBeard2022
Drawn by:	GSM
Requested by:	DB

3.8 Vegetation Significance

3.8.1 Commonwealth Level

None of the three vegetation types recorded from the study area supported Threatened Flora listed under the EPBC Act, or were aligned with any Commonwealth listed TECs. Therefore, vegetation within the study area was not considered to be of national significance.

3.8.2 State Level

None of the three vegetation types recorded from the study area supported Threatened Flora listed under the BC Act, or were aligned with any state listed TECs or PECs. Furthermore, there were no Priority flora taxa listed by DBCA recorded from the study area. Hence, vegetation within the study area was not considered to be of state significance.

3.8.3 Local Level

None of the plant taxa recorded from within the study area were determined to occur outside their known distribution, i.e. range extensions, and potentially represent new plant taxa. Therefore, vegetation was not determined to be of local conservation significance.

4.0 SUMMARY

Onshore Environmental completed a detailed flora and vegetation survey of ten localised native vegetation remnants occurring within a proposed 132kV powerline corridor extending southeast from the Greenbushes MDE to Hester. The field survey was completed by a Principal Botanist working over two days in mid March 2022.

A total number of 54 plant taxa (including varieties and subspecies) from 26 families and 45 genera were recorded from the study area. Species representation was greatest among the Poaceae, Fabaceae, Myrtaceae, Asparagaceae and Cyperaceae, with the most speciose genus being *Eucalyptus* (five taxa), followed by *Corymbia, Bossiaea, Kennedia, Lepidosperma* and *Lomandra* (two taxa each).

None of the plant taxa recorded from the study area were gazetted as Threatened Flora (T) under the Commonwealth EPBC Act or the Western Australian BC Act. As well, none of the plant species were currently listed as Priority flora by the DBCA, and none represented a range extension from their current known distribution.

A total of 26 introduced species were recorded from the study area, of which two taxa were listed as Declared Plants under the BAM Act and are also considered WONS:

- **Asparagus asparagoides* (Bridal Creeper) - s22(2); and
- **Rubus anglocandicans* (Blackberry) - s22(2) (C3 Exempt).

A total of three vegetation types from two broad landforms were described and mapped from the study area. Field assessment confirmed that vegetation was not aligned with any known TECs or PECs represented within the South West Region. Vegetation was determined to generally be well represented at the state, bioregional and local government authority levels.

Vegetation condition had been reduced across the entire study area, rated as good (54%), degraded (23%) or completely degraded (23%). There were no areas rated within the highest three condition categories of pristine, excellent or very good. Multiple historical disturbances were compounded by the small and isolated nature of the remnants amongst predominantly cleared agricultural land. Many of the remnants comprised exotic eucalypts and all supported highly disturbed understorey strata, with many described as parkland cleared. Disturbances including grazing by domestic stock, elevated numbers of kangaroos seeking refuge, surface soil disturbance, colonisation of weeds from adjacent pasture, and altered surface drainage.

Vegetation was determined to be of low conservation value owing to the high level of disturbance and reduced vegetation condition, combined with the small area and inability to consolidate the native vegetation remnants into larger blocks.

5.0 STUDY TEAM

The detailed flora and vegetation survey was planned, co-ordinated and executed by the following personnel:

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Licences

The field survey was conducted under the authorisation of the following licences issued by DBCA:

- Jerome Bull, Onshore Environmental Consultants 'Flora Taking (Biological Assessment)' Licence No. FB62000102.

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APPENDIX 1

Vegetation condition scale
(as developed by Keighery 1994)

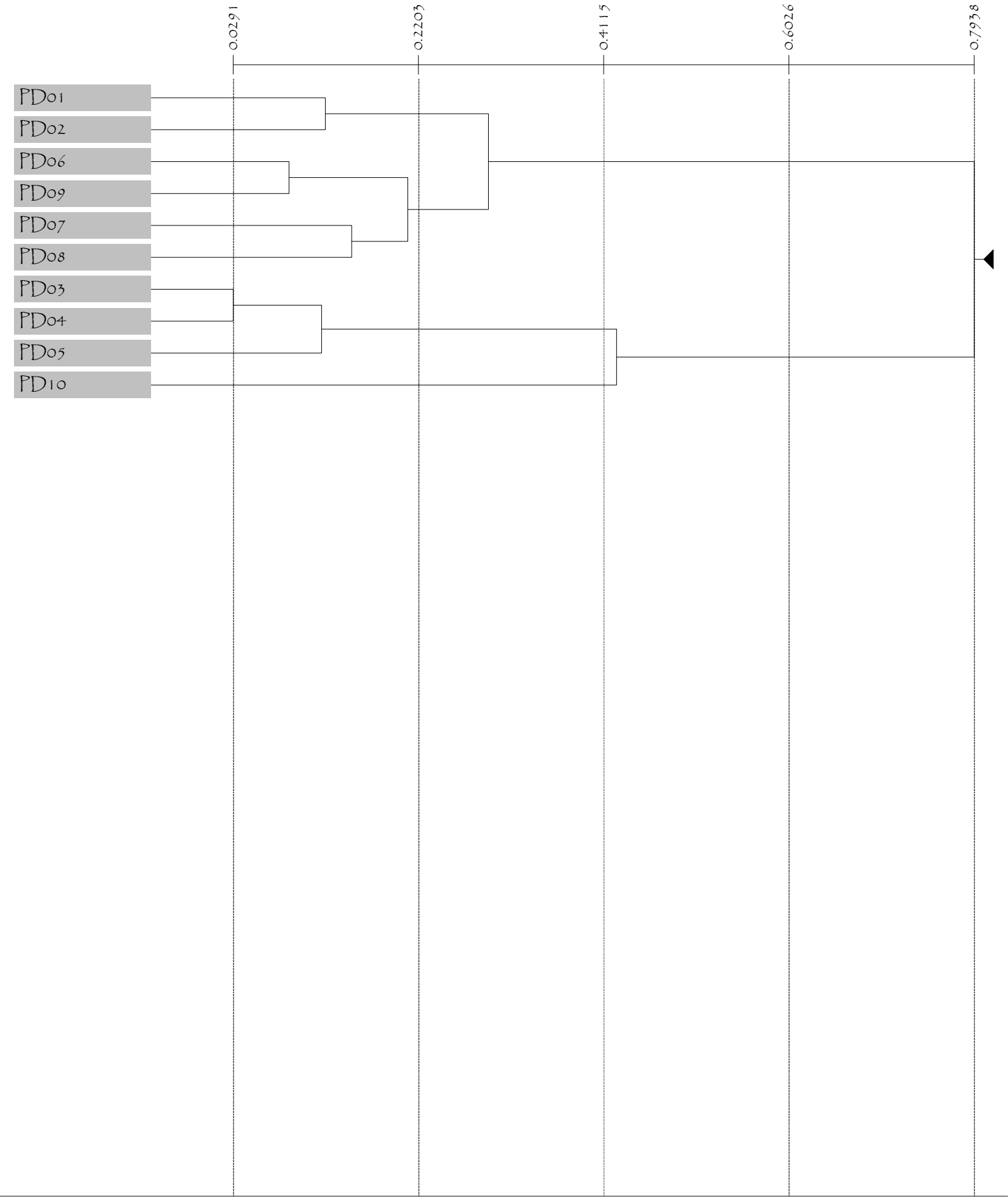
Condition	Scale	Description
Pristine	1	Pristine or nearly so, no obvious signs of disturbance.
Excellent	2	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	3	Vegetation structure altered; obvious signs of disturbance.
Good	4	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it.
Degraded	5	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching Very Good condition without intensive management.
Completely Degraded	6	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

APPENDIX 2

Dendrogram of floristic quadrat groups produced by the flexible UPGMA classification

Fusion Type: Flexible UPGMA Beta = -0.10
On Association: Two-Step (Columns) Created on: 12:57:29, March 25, 2022

Column Fusion Dendrogram



APPENDIX 3

Vegetation Classifications following Muir (1997)

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

APPENDIX 4

Conservation Codes

Definition of Threatened Flora Categories under the EPBC Act

Category	Description
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild	A species is categorised as extinct in the wild if it is only known to survive in cultivations, in captivity, or as a naturalised population well outside its past range; or if it has not been recorded in its known/expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	The species is facing an extremely high risk of extinction in the wild and in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival, or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Conservation Dependent	The species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Threatened, Extinct and Specially Protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

The *Wildlife Conservation (Specially Protected Fauna) Notice 2018* and the *Wildlife Conservation (Rare Flora) Notice 2018* have been transitioned under regulations 170, 171 and 172 of the *Biodiversity Conservation Regulations 2018* to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016.*

Definition of Categories of Threatened, Extinct and Specially Protected fauna and flora under the BC Act

T Threatened species
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). **Threatened fauna** is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for Threatened Fauna. **Threatened flora** is that subset of 'Rare Flora' listed under schedules 1 to 3 of the *Wildlife Conservation (Rare Flora) Notice 2018* for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.
CR Critically endangered species
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".*
EN Endangered species
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".*
VU Vulnerable species
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".*

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
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).
EW Extinct in the wild species
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.
MI Migratory species
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.
CD Species of special conservation interest (conservation dependent fauna)
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).
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).

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.
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.
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.
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.
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.

APPENDIX 5

Total flora list from the study area

Family	Genus	Species	Rank	Name
Amaranthaceae	*Alternanthera*	*nodiflora*		
Asparagaceae	**Asparagus*	*asparagoides*		
Asparagaceae	*Lomandra*	*drummondii*		
Asparagaceae	*Lomandra*	*pauciflora*		
Asparagaceae	*Thysanotus*	*patersonii*		
Asteraceae	**Hypochaeris*	*glabra*		
Asteraceae	**Sonchus*	*oleraceus*		
Brassicaceae	**Brassica*	*tournefortii*		
Caryophyllaceae	**Petrorhagia*	*dubia*		
Chenopodiaceae	*Atriplex*	*prostratus*		
Cyperaceae	*Lepidosperma*	*leptostachyum*		
Cyperaceae	*Lepidosperma*		sp.	indet
Cyperaceae	*Netrostylis*		sp.	Jarrah Forest (R. Davis 7391)
Dennstaedtiaceae	*Pteridium*	*esculentum*		
Dilleniaceae	*Hibbertia*	*commutata*		
Ericaceae	*Leucopogon*	*verticillatus*		
Fabaceae	**Lupinus*	*luteus*		
Fabaceae	*Acacia*	*saligna*		
Fabaceae	*Bossiaea*	*linophylla*		
Fabaceae	*Bossiaea*	*ornata*		
Fabaceae	*Hardenbergia*	*comptoniana*		
Fabaceae	*Kennedia*	*carinata*		
Fabaceae	*Kennedia*	*prostrata*		
Iridaceae	**Romulea*	*rosea*		
Iridaceae	**Watsonia*	*meriana*		
Juncaceae	*Juncus*	*pallidus*		
Myrtaceae	**Corymbia*	*citriodora*		
Myrtaceae	**Eucalyptus*	*camaldulensis*		
Myrtaceae	**Eucalyptus*	*saligna*		
Myrtaceae	**Eucalyptus*		sp.	indet
Myrtaceae	*Corymbia*	*calophylla*		
Myrtaceae	*Eucalyptus*	*marginata*	subsp.	*marginata*
Myrtaceae	*Eucalyptus*	*rudis*	subsp.	*rudis*
Orchidaceae	**Disa*	*bracteata*		
Orobanchaceae	**Orobanche*	*minor*		
Pinaceae	**Pinus*	*radiata*		
Pittosporaceae	*Billardiera*	*fusiformis*		
Plantaginaceae	**Plantago*	*lanceolata*		
Poaceae	**Avena*	*barbata*		
Poaceae	**Briza*	*maxima*		
Poaceae	**Bromus*	*diandrus*		
Poaceae	**Cortaderia*	*selloana*		
Poaceae	**Cynodon*	*dactylon*		
Poaceae	**Ehrharta*	*calycina*		
Poaceae	**Phalaris*	*aquatica*		
Poaceae	**Stenotaphrum*	*secundatum*		
Poaceae	*Austrostipa*		sp.	indet
Polygonaceae	**Rumex*	*conglomeratus*		
Proteaceae	*Banksia*	*grandis*		
Proteaceae	*Persoonia*	*longifolia*		
Rosaceae	**Rubus*	*anglocandicans*		
Typhaceae	*Typha*	*orientalis*		
Xanthorrhoeaceae	*Xanthorrhoea*	*gracilis*		
Zamiaceae	*Macrozamia*	*riedlei*		

APPENDIX 6

Species by site matrix for the ten quadrats formally assessed within the study area

Genus	Species	Rank	Name	PD01	PD02	PD03	PD04	PD05	PD06	PD07	PD08	PD09	PD10
*Asparagus	asparagoides			X									
*Avena	barbata			X	X								
*Brassica	tournefortii												
*Briza	maxima			X	X								
*Bromus	diandrus			X	X								
*Cortaderia	selloana							X					
*Corymbia	citriodora												X
*Cynodon	dactylon												
*Disa	bracteata				X								
*Ehrharta	calycina			X									
*Eucalyptus	camaldulensis												X
*Eucalyptus	saligna									X	X		
*Eucalyptus		sp.	indet										X
*Hypochaeris	glabra				X			X					
*Lupinus	luteus												
*Orobanche	minor				X								
*Petrorhagia	dubia												
*Phalaris	aquatica						X	X					
*Pinus	radiata									X			
*Plantago	lanceolata			X							X		
*Romulea	rosea				X								
*Rubus	anglocandicans					X	X	X					
*Rumex	conglomeratus					X	X	X					
*Sonchus	oleraceus												
*Stenotaphrum	secundatum							X					
*Watsonia	meriana			X									
Acacia	saligna					X	X	X					
Alternanthera	nodiflora							X					
Atriplex	prostratus							X					

Genus	Species	Rank	Name	PD01	PD02	PD03	PD04	PD05	PD06	PD07	PD08	PD09	PD10
Austrostipa		sp.	indet	X						X			
Banksia	grandis												
Billardiera	fusiformis			X									
Bossiaea	linophylla			X					X				
Bossiaea	ornata			X									
Corymbia	calophylla			X	X				X	X	X	X	
Eucalyptus	marginata	subsp.	marginata	X					X			X	
Eucalyptus	rudis	subsp.	rudis			X	X	X					
Hardenbergia	comptoniana			X									
Hibbertia	commutata												
Juncus	pallidus			X				X					
Kennedia	carinata												
Kennedia	prostrata			X									
Lepidosperma	leptostachyum												
Lepidosperma		sp.	indet							X			
Leucopogon	verticillatus			X									
Lomandra	drummondii			X									
Lomandra	pauciflora												
Macrozamia	riedlei			X					X		X		
Netrostylis		sp.	Jarrah Forest (R. Davis 7391)	X	X								
Persoonia	longifolia												
Pteridium	esculentum			X									
Thysanotus	patersonii			X									
Typha	orientalis						X						
Xanthorrhoea	gracilis												

APPENDIX 7

Raw data for ten quadrats formally assessed within the study area

Study Sites

Site	Landform	Vegetation Type	Condition	Slope	Soil Type	Last Fire	Outcrop	Easting	Northing
PD-01	Hillcrest/ Upper Hillslope	Forest of Corymbia calophylla and Eucalyptus marginata over Dwarf Scrub C of Pteridium esculentum and Billardiera fusiformis over Open Low Grass of *Ehrharta calycina, *Avena barbata and *Briza maxima with Open Low Scrub A of Bossiaea linophylla over Very Open Herbs of *Plantago lanceolata and *Asparagus asparagoides	Degraded	Low	Grey Clayey Sand	Old (6+ yr)	Limited Outcropping	415571	6249475
PD-02	Hillcrest/ Upper Hillslope	Dense Forest of Corymbia calophylla over Low Grass of *Avena barbata and *Briza maxima	Completely Degraded	Low	Brown Sandy Loam	Old (6+ yr)	Moderate Outcropping	415703	6249473
PD-03	Drainage Area/ Floodplain	Low Woodland A of Eucalyptus rudis subsp. rudis over Open Dwarf Scrub D of Acacia saligna and *Rubus anglocandicans	Degraded	Low	Brown Silty Clay Loam	Recent (0 to 2 yr)	Negligible	417665	6248646
PD-04	Medium Drainage Line	Dwarf Scrub C of *Rubus anglocandicans and Acacia saligna over Open Tall Sedges of Typha orientalis with Open Low Woodland A of Eucalyptus rudis subsp. rudis	Degraded	Low	Brown Light Clay	Recent (0 to 2 yr)	Negligible	417681	6248662

Site	Landform	Vegetation Type	Condition	Slope	Soil Type	Last Fire	Outcrop	Easting	Northing
PD-05	Drainage Area/ Floodplain	Open Tall Grass of *Phalaris auqatica, *Cortaderia selleoana and *Stenotaphrum secundatum with Open Dwarf Scrub D of Acacia saligna over Very Open Herbs of Atriplex prostrata and Alternanthera nodiflora over Very Open Low Sedges of Juncus pallidus	Degraded	Low	Brown Silty Clay Loam	Recent (0 to 2 yr)	Negligible	417646	6248668
PD-06	Hillcrest/ Upper Hillslope	Forest of Corymbia calophylla and Eucalyptus marginata over Open Low Woodland A of Corymbia calophylla and Eucalyptus marginata over Open Scrub of Bossiaea linophylla (Dead)	Good	Low	Brown Sandy Loam	Recent (0 to 2 yr)	Limited Outcropping	419638	6246371
PD-07	Hillslope	Forest of *Eucalyptus saligna and Corymbia calophylla over Low Woodland A of *Eucalyptus saligna	Degraded	Low	Brown Silty Loam	Recent (0 to 2 yr)	Limited Outcropping	419609	6246527
PD-08	Hillcrest/ Upper Hillslope	Dense Forest of Corymbia calophylla and *Eucalyptus saligna	Degraded	Low	Brown Sandy Loam	Recent (0 to 2 yr)	Limited Outcropping	416591	6246745
PD-09	Hillcrest/ Upper Hillslope	Forest of Corymbia calophylla and Eucalyptus marginata	Good	Low	Brown Loamy Sand	Recent (0 to 2 yr)	Moderate Outcropping	419375	6247756
PD-10	Hillcrest/ Upper Hillslope	Forest of *Eucalyptus camaldulensis, *Eucalyptus citriodora and *Eucalyptus sp. indet	Completely Degraded	Low	Brown Loamy Sand	Recent (0 to 2 yr)	Moderate Outcropping	419594	6247120

Flora

Site	Sampled	Genus	Species	Rank	Name	% Cover	Height (m)
PD-01	Quadrat	*Asparagus	asparagoides			2	Cl
PD-01	Quadrat	*Avena	barbata			2	0.7
PD-01	Quadrat	*Briza	maxima			2	0.3
PD-01	Quadrat	*Bromus	diandrus			2	0.35
PD-01	Quadrat	*Ehrharta	calycina			4	0.4
PD-01	Opportunistic	*Orobanche	minor			-	-
PD-01	Opportunistic	*Pinus	radiata			-	-
PD-01	Quadrat	*Plantago	lanceolata			6	0.3-0.7
PD-01	Quadrat	*Watsonia	meriana			1	0.5-1.8
PD-01	Quadrat	Austrostipa		sp.	indet	<1	1.2
PD-01	Quadrat	Billardiera	fusiformis			3	0.6-1
PD-01	Quadrat	Bossiaea	linophylla			2	1.5-2
PD-01	Quadrat	Bossiaea	ornata			1	0.4
PD-01	Quadrat	Corymbia	calophylla			50	15-30
PD-01	Quadrat	Eucalyptus	marginata	subsp.	marginata	5	6-15
PD-01	Quadrat	Hardenbergia	comptoniana			0.5	Cl
PD-01	Opportunistic	Hibbertia	commutata			-	-
PD-01	Quadrat	Juncus	pallidus			<1	0.7
PD-01	Quadrat	Kennedia	prostrata			1.5	Cr
PD-01	Opportunistic	Lepidosperma	leptostachyum			-	-
PD-01	Quadrat	Leucopogon	verticillatus			<1	0.6
PD-01	Quadrat	Lomandra	drummondii			1	0.4
PD-01	Opportunistic	Lomandra	pauciflora			-	-
PD-01	Quadrat	Macrozamia	riedlei			<1	0.6
PD-01	Quadrat	Netrostylis		sp.	Jarrah Forest (R. Davis 7391)	1	0.6
PD-01	Quadrat	Pteridium	esculentum			9	0.5-1
PD-01	Quadrat	Thysanotus	patersonii			<1	Cl
PD-02	Quadrat	*Avena	barbata			35	0.6
PD-02	Quadrat	*Briza	maxima			4	0.3
PD-02	Quadrat	*Bromus	diandrus			2	0.3

Site	Sampled	Genus	Species	Rank	Name	% Cover	Height (m)
PD-02	Quadrat	*Disa	bracteata			<1	0.3
PD-02	Quadrat	*Hypochaeris	glabra			<1	0.2
PD-02	Quadrat	*Orobanche	minor			<1	0.3
PD-02	Opportunistic	*Petrorhagia	dubia			-	-
PD-02	Quadrat	*Romulea	rosea			<1	0.1
PD-02	Opportunistic	*Sonchus	oleraceus			-	-
PD-02	Quadrat	Corymbia	calophylla			80	15-30
PD-02	Quadrat	Netrostylis		sp.	Jarrah Forest (R. Davis 7391)	<1	0.4
PD-03	Opportunistic	*Phalaris	aquatica			-	-
PD-03	Quadrat	*Rubus	anglocandicans			2	0.5
PD-03	Quadrat	*Rumex	conglomeratus			<1	0.2
PD-03	Quadrat	Acacia	saligna			4	0.4
PD-03	Quadrat	Eucalyptus	rudis	subsp.	rudis	25	10-20
PD-04	Opportunistic	*Brassica	tournefortii			-	-
PD-04	Opportunistic	*Cortaderia	selloana			-	-
PD-04	Opportunistic	*Lupinus	luteus			-	-
PD-04	Quadrat	*Phalaris	aquatica			1	1
PD-04	Quadrat	*Rubus	anglocandicans			10	0.5-1
PD-04	Quadrat	*Rumex	conglomeratus			0.5	0.2
PD-04	Quadrat	Acacia	saligna			3	0.4
PD-04	Opportunistic	Atriplex	prostratus			-	-
PD-04	Quadrat	Eucalyptus	rudis	subsp.	rudis	1	15
PD-04	Quadrat	Typha	orientalis			20	2-3
PD-05	Quadrat	*Cortaderia	selloana			3	1-2
PD-05	Quadrat	*Hypochaeris	glabra			<1	0.1
PD-05	Quadrat	*Phalaris	aquatica			7	0.5-1
PD-05	Quadrat	*Rubus	anglocandicans			1	0.5
PD-05	Quadrat	*Rumex	conglomeratus			1	0.2
PD-05	Quadrat	*Stenotaphrum	secundatum			2	0.1
PD-05	Quadrat	Acacia	saligna			7	0.3
PD-05	Quadrat	Alternanthera	nodiflora			2	0.2

Site	Sampled	Genus	Species	Rank	Name	% Cover	Height (m)
PD-05	Quadrat	Atriplex	prostrata			2	0.4
PD-05	Quadrat	Eucalyptus	rudis	subsp.	rudis	2	1-2
PD-05	Quadrat	Juncus	pallidus			2.5	1.3
PD-06	Quadrat	Bossiaea	linophylla			<1	-
PD-06	Quadrat	Corymbia	calophylla			45	3-30
PD-06	Quadrat	Eucalyptus	marginata	subsp.	marginata	15	5-20
PD-06	Quadrat	Macrozamia	riedlei			1	0.5
PD-06	Opportunistic	Persoonia	longifolia			-	-
PD-06	Opportunistic	Pteridium	esculentum			-	-
PD-07	Quadrat	*Eucalyptus	saligna			10	5-20
PD-07	Quadrat	*Eucalyptus	saligna			20	20-30
PD-07	Quadrat	*Pinus	radiata			0.5	2.5
PD-07	Quadrat	Austrostipa		sp.	indet	<1	0.8
PD-07	Opportunistic	Banksia	grandis			-	-
PD-07	Quadrat	Corymbia	calophylla			15	25
PD-07	Quadrat	Lepidosperma		sp.	indet	0.5	0.2
PD-08	Opportunistic	*Cynodon	dactylon			-	-
PD-08	Opportunistic	*Eucalyptus	camaldulensis			-	-
PD-08	Quadrat	*Eucalyptus	saligna			20	20-30
PD-08	Quadrat	*Plantago	lanceolata			<1	0.5
PD-08	Quadrat	Corymbia	calophylla			60	20-30
PD-08	Quadrat	Macrozamia	riedlei			<1	0.4
PD-08	Opportunistic	Persoonia	longifolia			-	-
PD-09	Quadrat	Corymbia	calophylla			45	15-30
PD-09	Quadrat	Eucalyptus	marginata	subsp.	marginata	20	15-30
PD-10	Quadrat	*Corymbia	citriodora			15	15-30
PD-10	Quadrat	*Eucalyptus	camaldulensis			15	15-30
PD-10	Quadrat	*Eucalyptus		sp.	indet	15	15-30

PD01

PD02

PD03

PD04

PD05

PD06

PD07

PD08

PD09

PD10