TARGETED FLORA AND VEGETATION SURVEY REPORT

CBH Dowerin Receival Site

Dowerin, WA 6461

Final v.2

17/07/2024

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DOCUMENT CONTROL

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

APPENDICES

1 Introduction, Scope and Background Information

Cooperative Bulk Handling (CBH), herein referred to as "the client" commissioned Bio Diverse Solutions as Environmental Consultants to undertake a targeted flora and vegetation survey within the vicinity of the Dowerin CBH Receival Site for proposed expansion works. This survey targets three flora species; *Bossiaea atrata* (P3-Priority 3), *Acacia campylophylla* (P3-Priority 3) and *Millotia tenuifolia* var. *laevis* (P2-Priority 2). In addition, a targeted survey was conducted for the Critically Endangered (CR)/Priority 3 (P3) Eucalyptus Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands) Threatened/Priority Ecological Community (TEC/PEC). It is noted that *Thysanotus sp.* Badgingarra (previously P2) was also a targeted species for this survey; however, has more recently been delisted as a conservation significant species, thus it has been removed from the scope of the survey.

This report is accompanied by a spring reconnaissance flora, vegetation and basic fauna survey (BDS, 2023), herein referred to as the "spring survey" and preceded by an out-of-season reconnaissance flora, vegetation and basic fauna survey report completed by Bio Diverse Solutions in winter 2022 (BDS, 2022), herein referred to as the "original survey". The original survey identified *M. tenuifolia* var. *laevis* as possible to occur however required an in-season survey (December) to capture flowering and confirm. *B. atrata* and *A. campylophylla* were identified post-field during the original survey and thus a targeted survey was required to capture population extent and size. The original survey (BDS, 2022) also identified vegetation units that resembled Wheatbelt Woodlands TEC/PEC, a targeted survey is required to confirm that criteria for this TEC/PEC is met. As such, the results from the original survey (BDS, 2022) were the basis of the scope of works required for the targeted survey. The scope of works include:

- Targeted flora survey for *Bossiaea atrata* (P3), *Acacia campylophylla* (P3) and *Millotia tenuifolia* var. *laevis* (P2), including identification confirmation by the WA Herbarium of threatened flora;
- Targeted vegetation survey to determine the presence of the TEC/PEC Wheatbelt Woodlands through quadrat analysis;
- Identification of additional incidental flora species not captured in the spring survey (BDS, 2023) or the original survey (BDS, 2022), including herbarium identification if required;
- GPS and map any populations of threatened species (if applicable);
- Prepare a report on survey outcomes, consistent with EPA Guidelines; and
    - Preparation and submission of Threatened and Priority Reporting Forms for flora and Threatened Ecological Community Occurrence Forms to Department of Biodiversity, Conservation and Attractions (DBCA);
- Provide the client with the IBSA Data package (as required to be submitted by the client).

1.1 Location and Development Proposal

The survey area is defined as a 132.01 ha area situated to the southwest of the Dowerin townsite within the direct vicinity of the CBH Dowerin receival site on Irvine Road, in the Shire of Dowerin. This survey area has been earmarked by CBH for the future expansion of the existing Dowerin Receival Site. The survey area contains the existing CBH lot, surrounding agricultural land, Irvine Road reserve, Goomalling-Wyalkatchern Road reserve and the existing railway infrastructure. This targeted survey provides additional and supporting data to the already completed spring survey (BDS, 2023), to assist in the environmental approvals required for the clearing and development of these areas.

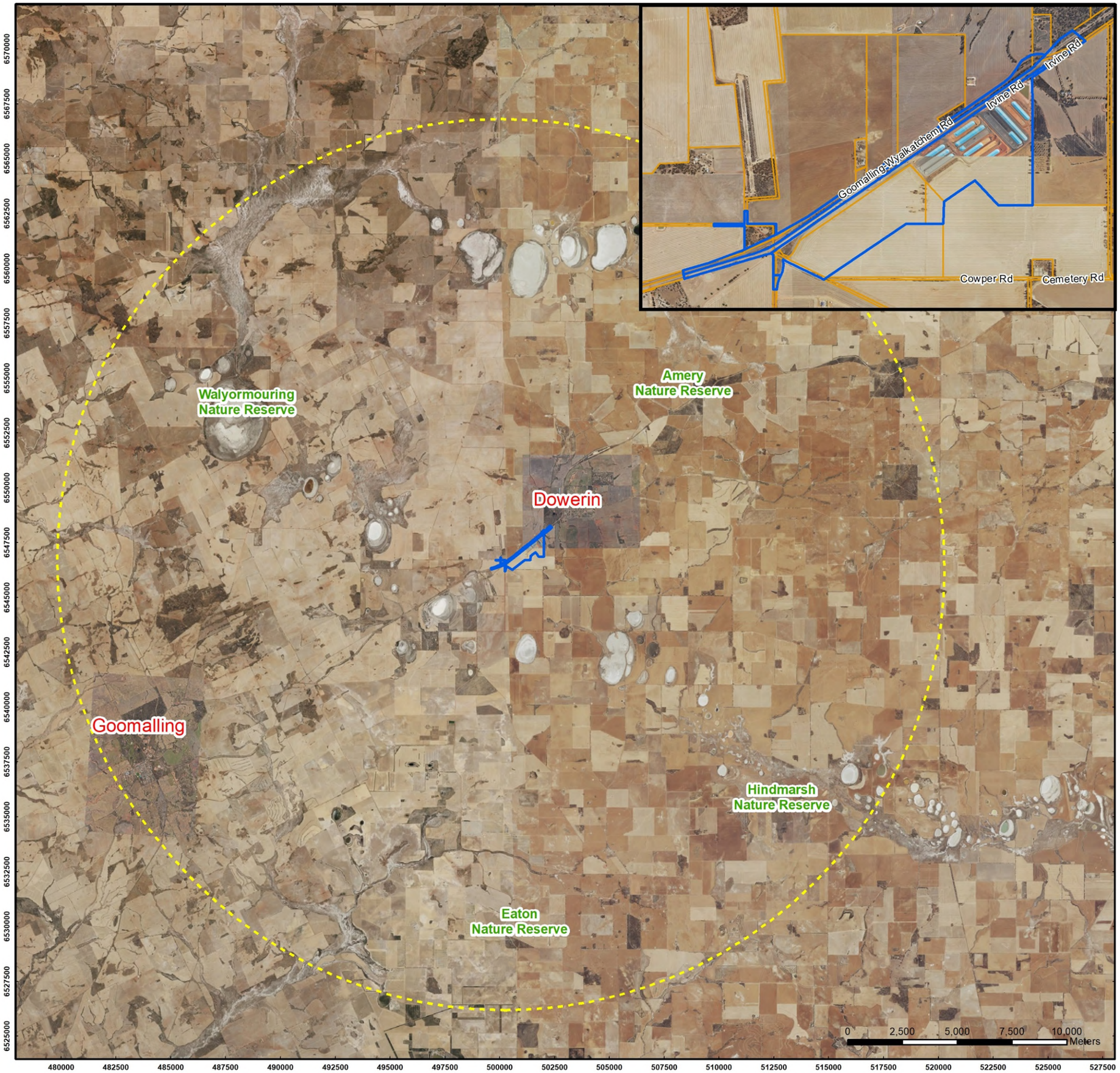
The 'study area' consists of the 20-30 km radius around the survey area, with a 20 km radius presented in Figure 1, used for desktop assessment and indications of likelihood of occurrence (LOO) of Threatened or Priority flora and ecological communities in the spring and original survey. The various search radii used to characterise the study area were determined by the sources of databases analysed. Analysis of the study area provides a broader local context and assessment in relation to the survey area.

1.2 Alignment to Legislation, Guidelines and Policies

This survey and subsequent report is aligned to the following legislation, guidelines and policies:

- *Environmental Protection and Biodiversity Conservation Act 1999* (Cth; EPBC Act). Administered by the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW);
- *Biodiversity Conservation Act 2016* (WA; BC Act). Administered by the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA);

- *Environmental Protection Act 1986* (WA; EP Act). Administered by the Western Australian Department of Water and Environmental Regulations (DWER);
- *Biosecurity and Agriculture Management Act 2007* (WA; BAM Act);
- Environment Protection Authority (EPA, 2016) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*; and
- Commonwealth of Australia (CoA, 2013) *Draft Survey guidelines for Australia's Threatened Orchids*.



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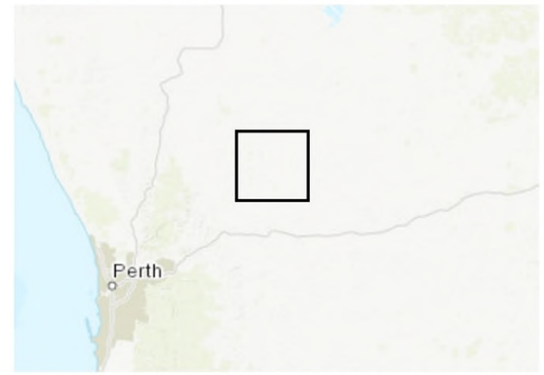


Overview Map Scale 1:5,000,000

Legend

- Survey Area
- 20 km Study Area

Scale
1:170,000 @ A3
GDA MGA 2020 Zone 50

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

CLIENT
CBH
Dowerin Receival Site
Dowerin, WA 6461

Figure 1: Survey Area Locality

	QA Check	*Drawn by*
	CvdM	**MW, WB**
STATUS	*FILE*	*DATE*
FINAL	**CBH0018-004**	**25/08/2023**

2 Methodology - Desktop Assessment

A thorough desktop assessment was completed in the original survey (BDS, 2022) and the spring survey (BDS, 2023) which included geology and soils, climate, habitat connectivity, water, environmentally sensitive areas, remnant vegetation and conservation significant fauna. As per the results of the spring survey, this targeted survey primarily covers and discusses the desktop analysis relevant to Threatened and Priority flora and ecological communities. Furthermore, this report will primarily discuss the desktop analysis completed as part of the spring survey, as the more recent analysis.

2.1 Conservation Significant Flora and Threatened and Priority Ecological Communities

A desktop assessment was previously conducted, during the spring survey (BDS, 2023), to analyse and determine a desktop inventory of potential Threatened or Priority flora species 'Likely' or 'Possible' to occur within the study area (20-30 km buffer). Desktop inventory was undertaken using the following databases:

- 20 km Protected Matters Search Tool (DCCEEW, 2023);
- 30 km Flora DBCA database records (DBCA, 2023a); and
- 20 km TEC/PEC DBCA database records (DBCA, 2023b).

The conservation significance of flora species has been assessed using data from the following sources:

- EPBC Act. Administered by DCCEEW;
- BC Act. Administered by DBCA;
- DBCA priority and threatened ecological community list (DBCA, 2023c). A non-legislative list maintained by DBCA for management purposes; and
- DBCA priority flora list. A non-legislative list maintained by DBCA for management purposes.

The full LOO analysis compiled from all available data can be found in the spring reconnaissance survey report (BDS, 2023).

Eucalyptus Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)

Wheatbelt Woodlands is listed as a Priority 3 (P3) ecological community (PEC) under the BC Act and an Endangered TEC under the EPBC Act. The survey area lies within the Merredin Avon Wheatbelt IBRA subregion, within the boundaries of the location criteria of the Wheatbelt Woodlands. The Wheatbelt Woodlands are comprised of Eucalypt woodlands that formerly were the most common type of vegetation across the wheatbelt landscape of south-western WA, inland between the Darling Range and western edge of the Goldfields. The woodlands are dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition. Woodlands dominated by mallee forms or vegetation with a very sparse eucalypt tree canopy are not part of the ecological community (DoEE, 2015).

The Wheatbelt Woodlands are recognised by the below key diagnostic features and minimum condition thresholds outlined in approved conservation advice guidelines (DoEE, 2015):

1) Occurs within the IBRA Avon Wheatbelt subregions Merredin (AVW01) and Katanning (AVW02), Western Mallee subregion (MAL02) and jarrah forest subregions Northern Jarrah Forest (JAF01) and Jarrah Forest (JAF02) when adjacent to the Avon Wheatbelt.
2) Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10% (crowns measured as if opaque).
3) Key species of the tree canopy are species of *Eucalyptus* identified in Table 2a of approved conservation guidelines (DoEE, 2015). These are species that typically have a single trunk. One or more tree species are dominant or co-dominant within the patch of the ecological community. If other species are present in the tree canopy, then these do not occur as dominants in the tree canopy.
4) Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs, as specified in Table A1 of Appendix A (DoEE, 2015).

Condition thresholds for the ecological community are described in Table 1. General notes on the condition thresholds of the ecological community are outlined in the Approved Conservation Guidelines for Wheatbelt Woodlands (DoEE, 2015). Most notably in relation to the study area, this includes "It is intended that the condition thresholds will exclude degraded patches from any requirement for protection, for instance: isolated paddock trees on farms, or small or narrow stands of trees that serve as windbreaks or shelterbelts on farms and other properties".

Table 1: Condition thresholds for Wheatbelt Woodlands TEC diagnostic criteria.
Nt. Condition is referenced to Keighery (1994) and Relative Conservation Value (RCV) is related to Roadside Conservation Committee (2014).

Category and comment	Cover of exotic plants (weeds)	Mature trees	Minimum patch size (non-roadside patches)	Minimum patch width (roadsides only)
A: patches likely to correspond to condition of Pristine / Excellent / Very Good or a High RCV	Exotic plants account for 0 to 30% of total vegetation cover in the understorey layers i.e., below the tree canopy	Mature trees may be present or absent	>2 ha	>5 m
B: Patches likely to correspond to a condition of Good or a Medium-High RCV AND retains important habitat features	Exotic plant species account for 30-50% of total vegetation cover in the understorey layers i.e., below the tree canopy	Mature trees are present, >5 trees/ha	>2 ha	>5 m
C: Patches likely to correspond to a condition of Good or a Medium-High RCV	Exotic plant species account for 30-50% of total vegetation cover in the understorey layers i.e., below the tree canopy	Mature trees either absent or <5 trees/ha	>5 ha	>5 m
D: Patches likely to correspond to a condition of Degraded to Good or medium-low RCV BUT retains important habitat features	Exotic plant species account for 50-70% of total vegetation cover in the understorey layers i.e., below the tree canopy	Mature trees present at >5 trees/0.5 ha	>5 ha	>5 m

3 Methodology – Field Survey

The targeted survey was undertaken by Dr Ellen Hickman (Senior Botanist), Charlize van der Mescht (Ecologist) and Marisa Wearing (Field Technician) on the 11th to 13th of September 2023. Due to access restrictions during the September survey 6.66 ha of the survey area could not be surveyed. Further quadrat surveys for the Wheatbelt Woodlands PEC/TEC were undertaken on the 4th December 2023. The survey area was surveyed on foot using traverses and quadrats (Figure 4).

3.1 Flora

A targeted flora survey was undertaken for *B. atrata* (P3), *A. campylophylla* (P3) and *M. tenuifolia* var. *laevis* (P2). Random meandering traverses (Figure 5) were utilised to ascertain presence/absence of the species, quantify population size and extent of the targeted flora species (if present), and ensured that all areas within 5 m of each other were covered. Flora was incidentally recorded within the survey area, to identify annual and herbaceous species not captured during the original survey (BDS, 2022). Collection of plant specimens were made where further identification was required, using Dr Ellen Hickman's Regulation 62 Flora Taking Licence FB62000526 or Charlize van der Mescht's Regulation 62 Flora Taking Licence FB62000460-2.

3.2 Threatened and Priority Ecological Communities

Ten quadrats were surveyed at sites within the survey area in vegetation units identified during the original and spring survey as resembling Wheatbelt Woodlands TEC/PEC. The quadrats surveyed were 10x10 m square understorey and 20x20 m upper storey as per Approved Conservation Guidelines for Wheatbelt Woodlands (DoEE, 2015; EPA, 2016).
Information collected within each quadrat included:

- Location: coordinates marked at the south-west corner;
- Date and site code;
- Site description: landform, slope, soil colour and type and hydrology;
- Vegetation condition;
- Percentage cover, life form, height and whether flowering and/or fruiting recorded for each species; and
- Photo taken at the northwest corner.

3.3 Survey Limitations and Constraints

An assessment of potential survey limitations was undertaken as per the EPA (2016) document *Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment* refer to Table 2 below. The primary limitation present was the access restrictions, a factor out of the control of Bio Diverse Solutions. This limitation was negated by returning to the site in December 2023 to complete the Wheatbelt Woodlands quadrat analysis. However, some areas were not able to be accessed within the flowering period of the three targeted species, presenting a major limitation.

Table 2: Assessment of potential survey limitations.

Limitation	Constraint	Comment
Experience of personnel	Nil	Dr. Ellen Hickman has over 30 years' experience surveying and documenting flora, having previously worked with the DBCA (then CALM) surveying, documenting and managing the threatened flora of WA. Charlize van der Mescht has been employed by Bio Diverse Solutions since 2019, where she has over 5 years' experience with flora and vegetation surveys in the South West, South Coast, Midwest, Esperance-Goldfields and Wheatbelt regions. She has a BSc in Environmental Science and a Masters in Environmental Management, and is now Environmental Team Leader at Bio Diverse Solutions. Marisa Wearing has been employed by Bio Diverse Solutions since 2022. In that time, she has gained valuable experience as a Field and Technical Officer, working alongside senior botanists and other experts in their field. She has a Certificate III in Conservation and Ecosystem Management.

Table 2 continued.

Limitation	Constraint	Comment
Survey timing	Major – December survey	The Shire of Dowerin is part of the Avon Wheatbelt botanical province in which the peak flowering period is September to November. The first survey of 2023 was undertaken in September during the peak flowering period for the region to capture the three targeted species, namely, *B. atrata* (P3), *A. campylophylla* (P3), and *M. tenuifolia* var. *laevis* (P2). Due to access restrictions, the remainder of the quadrat analyses were conducted in December 2023. This occurred outside of the peak flowering period and outside of the flowering period of the three targeted flora species. This presents a major limitation for some of the survey area (6.66 ha of native vegetation); see Table 8 for more details.
Access restrictions	Major	A section of the targeted survey area is within an active rail corridor and required permission from Arc Infrastructure and a Protection Officer to gain access, this did not occur in time for the September survey, and as such, 6.66 ha of the native vegetation within the survey area could not be surveyed during this time. Access to the rail corridor was later granted, and a December survey occurred.
Availability of contextual information	Minor	Publicly available desktop and background information was readily available to give a broad contextual understanding of the site. The spring survey (BDS, 2023) provides detailed contextual information required for conducting the targeted flora and vegetation survey.
Survey effort and extent	Major – 6.66 ha of restricted access Nil – Accessible survey area	Due to access restrictions during the September survey, the rail corridor could not be accessed. 6.66 ha of native vegetation was unable to be surveyed. For the areas that were accessible, a random meandering traverse ensured that all areas within 5 m of each other was conducted (Figure 5). Following the CoA (2013) *Draft Survey guidelines for Australia's Threatened Orchids,* it is recognised that due to the complex nature of Orchid phenology and physiology, more intensive survey transects and surveys over multiple time periods is required. The site has now been surveyed during June, September and December, during different seasons. The three visitations likely resulted in traverses within 2m proximity and captured a wide range of Orchid species at different flowering times. The only Orchid species identified in the desktop assessment to be possible to be present due to suitable habitat was *Pterostylis faceta* (P4), with the targeted survey conducted during its flowering timeframe.
Disturbances that may affect results	Minor	Disturbance has the potential to affect the biological representation of species and therefore ecological communities present, for example through the presence of disturbance opportunists, loss of sensitive species from direct impact, increased nutrient loading from runoff or novel ecosystems created through microclimate creation. This was observed across the subject site through disturbance from the railway track and road, areas with altered drainage and increased nutrients in ponding from the surrounding agricultural area.
Identification issues	Nil	The survey occurred during the flowering period for the three targeted species, as such, if these species were present, they would have been readily detectable. Therefore, no identification issues were encountered during this survey.

4 Results – Field Survey

4.1 Vegetation Condition

Vegetation condition throughout the survey area has been mapped using the condition rating scale (adapted from Keighery, 1994) outlined in *EPA Flora and Vegetation Survey Technical Guidance* (2016). Refer to Table 6 and Figure 3.

The vegetation ranged from Completely Degraded to Very Good condition throughout the survey area. These classification levels are related to degradation of structure and vegetation integrity by processes such as clearing, fire, weeds, grazing, Phytophthora Dieback and vehicle tracks. See Table 6 and Figure 3 for vegetation units and their condition rating. Areas rated as Degraded or Completely Degraded were associated with high occurrences of weeds and evidence of disturbance to the point that vegetation structure was altered. Where condition was Good or Very good, there were less to no occurrences of non-native species and vegetation structure was largely intact.

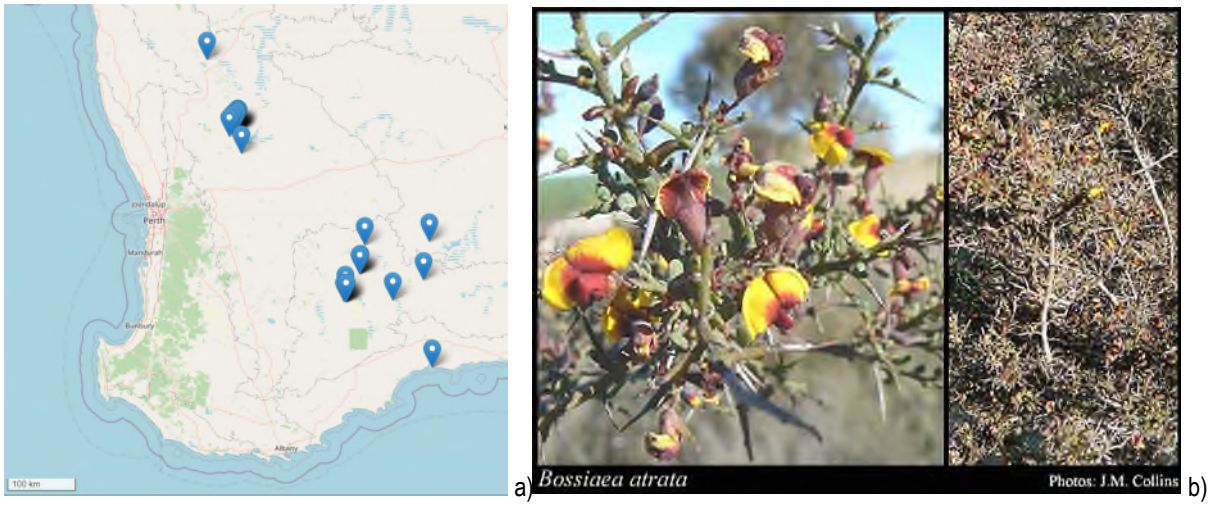
4.2 Targeted Flora

The targeted survey was undertaken to quantify the occurrence and population of *B. atrata* (P3) and *A. campylophylla* (P3) identified in the original survey (BDS, 2022), and determine if *M. tenuifolia* var. *laevis* (P2) was present, which was assessed in the original survey as "Possible" to occur in the survey area (BDS, 2022). Due to access restrictions during the targeted survey, the previously identified *A. campylophylla* individuals (BDS, 2022) were unable to be located, and no further populations were identified within the accessible survey area. *M. tenuifolia* var. *laevis* was not detected during the targeted survey. Fifteen individuals of *B. atrata* were found, although due to access restrictions this may not be representative of the entire population of *B. atrata* within the survey area. One individual occurred in the spring survey area (BDS, 2023) within the Mallee Shrubland [MSL] vegetation unit. The remainder of the individuals recorded were within the road reserve of Goomalling-Wyalkatchem Road, in an area identified as Mixed Shrubland [MSL] in the original survey (BDS, 2022; Figure 4).

***Bossiaea atrata* J.H.Ross, (P3)**

A total of 15 plants of *B. atrata* were recorded within the survey area, all within the road reserve to the south of Goomalling-Wyalkatchem Road and one in a block of remnant vegetation at the intersection of Rifle Range Road and Goomalling-Wyalkatchem Road. The plants were found in an area assessed in the original survey (BDS, 2022) to be potential habitat for the species. Due to access restrictions, 6.66 ha of native vegetation could not be surveyed during the September survey, which is on the periphery of the flowering period for *B. atrata.* 2.30 ha of the Mixed Shrubland [MSL] vegetation unit (BDS, 2022), could not be surveyed, due to these restrictions. A TPFL form that provides the comprehensive data of the *B. atrata* population was submitted to DBCA on the 11/03/2024 (Appendix F)

There are several known populations of *B. atrata*, including a population submitted by Bio Diverse Solutions to DBCA after the original survey (BDS, 2022). It has been recorded in the IBRA regions of Avon Wheatbelt, Coolgardie, Esperance Plains, and Mallee; IBRA subregions of Merredin, Recherche, Southern Cross, and Western Mallee; and Local Government Areas of Dalwallinu, Dowerin, Dundas, Kondinin, Kulin, Lake Grace, and Ravensthorpe (WAH, 1998-); see regional distribution in Figure 2a. *B. atrata* is described as a "compact, dense, intricately-branched, rigid, spinescent herb, to 1.2 m high. Fl. orange-yellow-red-brown, May to Aug", found on "white sand or sandy loam over laterite or clay, quartzite sand, clay" (WAH, 1998-), see photos in Figure 2b.



a) b)

Figure 2: a) *B. atrata* regional distribution (WAH, 1998-); b) photos of *B. atrata* (WAH, 1998-).

4.3 Threatened and Priority Ecological Communities

The targeted survey (vegetation component) focused specifically on determining the presence of 'Eucalypt Woodlands of the Western Australian Wheatbelt (Wheatbelt Woodlands)' Threatened (TEC) and Priority (PEC) Ecological Community within vegetation units identified in the spring survey (BDS, 2023) to potentially meet criteria (Section 2.1). This specifically related to Vegetation Unit 2 [EucW](BDS, 2022), Vegetation Unit 3 [EucsalW](BDS, 2022) and Vegetation Unit 4 [EucloxW] (BDS, 2023), as further described in Appendix D. Analysis, results and discussion of the quadrat sampling within each of these vegetation units are outlined below. These quadrats were used as the sample sites for analysis of quantitative and qualitative requirements to meet Wheatbelt Woodlands TEC (Tables 3-5; EPA, 2016).

Table 3: Analysis of Vegetation Unit 2: Mixed Eucalyptus Woodland [EucW] (BDS, 2022) and the threshold criteria of TEC/PEC 'Eucalyptus Woodlands of the Western Australian Wheatbelt.

Criteria	Analysis of Vegetation Unit 2: Mixed Eucalyptus Woodland [EucW]	Meet Criteria (Y/N)					
		Q2	Q4	Q7	Q8	Q9	Q10
1: Distribution and IBRA subregions.	The survey area is located within the Avon Wheatbelt 1 (AW01) – Merredin subregion.	Y	Y	Y	Y	Y	Y
2: Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10%.	Quadrat analysis shows that *Eucalyptus loxophleba* subsp. *loxophleba* (Quadrats 1, 4, 7, 8 & 9) and *Eucalyptus salmonophloia* (Quadrats 2, 3, 5 & 6) overstorey ranged from 70-100% to 30-70%, well exceeding a minimum 10% crown cover required in Criterion 2.	Y	Y	Y	Y	Y	N
3: Key species of the tree canopy are species of Eucalyptus identified in Table 2a of approved conservation guidelines (DoEE, 2015; RCC, 2014).	*Eucalyptus loxophleba* subsp. *loxophleba* and *Eucalyptus salmonophloia* are the dominant species in the NVIS L5 overstorey description, which are listed as a key species in Table 2a (DoEE, 2015).	Y	Y	Y	Y	Y	N/A
4: Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs, as specified in Table A1 of Appendix A (DoEE, 2015; RCC, 2014).	Variable understorey of grasses, herbs and shrubs is present.	Y	Y	Y	Y	Y	N/A
5: Patch Size and Condition Criteria	Table 1 identifies the specific condition and patch thresholds of Wheatbelt Woodlands TEC/PEC, with specific focus applied to the roadside minimum patch width required. The size of all the "patches" meets the condition thresholds, as they are roadside patches and a minimum width of 5 m is required. Referring to the category of condition thresholds, the vegetation present relates best to Category "D" with Degraded to Good condition present and weeds accounting for 50-70% of total cover across the quadrats sampled.	Y	Y	Y	Y	Y	N/A

Table 4: Analysis of Vegetation Unit 3: *Eucalyptus salmonophloia* Woodland [EucsalW] (BDS, 2022) and the threshold criteria of TEC/PEC 'Eucalyptus Woodlands of the Western Australian Wheatbelt.

Criteria	Analysis of Vegetation Unit 3: *Eucalyptus salmonophloia* Woodland [EucsalW]	Meet Criteria (Y/N)		
		Q3	Q5	Q6
1: Distribution and IBRA subregions.	The survey area is located within the Avon Wheatbelt 1 (AW01) - Merredin subregion.	Y	Y	Y
2: Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10%.	Quadrat analysis shows that *Eucalyptus loxophleba* subsp. *loxophleba* (Quadrats 1, 4, 7, 8 & 9) and *Eucalyptus salmonophloia* (Quadrats 2, 3, 5 & 6) overstorey ranged from 70-100% to 30-70%, well exceeding a minimum 10% crown cover required in Criterion 2.	Y	Y	Y
3: Key species of the tree canopy are species of Eucalyptus identified in Table 2a of approved conservation guidelines (DoEE, 2015; RCC, 2014).	*Eucalyptus loxophleba* subsp. *loxophleba* and *Eucalyptus salmonophloia* are the dominant species in the NVIS L5 overstorey description, which are listed as a key species in Table 2a (DoEE, 2015).	Y	Y	Y
4: Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs, as specified in Table A1 of Appendix A (DoEE, 2015; RCC, 2014).	Variable understorey of grasses, herbs and shrubs is present.	Y	Y	Y
5: Patch Size and Condition Criteria	Table 1 identifies the specific condition and patch thresholds of Wheatbelt Woodlands TEC/PEC, with specific focus applied to the roadside minimum patch width required. The size of all the "patches" meets the condition thresholds, as they are roadside patches and a minimum width of 5 m is required. Referring to the category of condition thresholds, the vegetation present relates best to Category "D" with Degraded to Good condition present and weeds accounting for 50-70% of total cover across the quadrats sampled.	Y	Y	Y

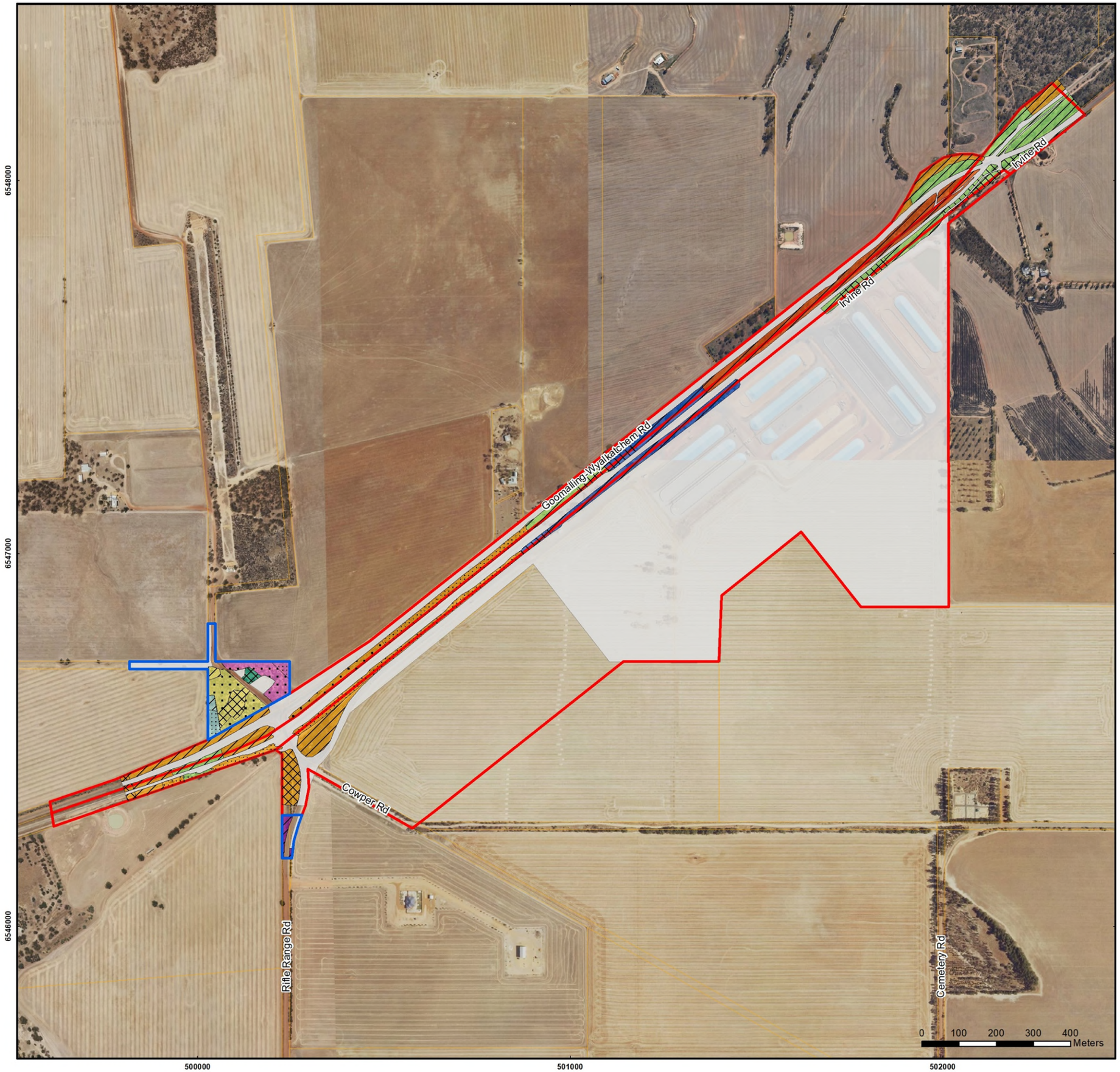
Table 5: Analysis of Vegetation Unit 4: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW] (BDS, 2023) and the threshold criteria of TEC/PEC 'Eucalyptus Woodlands of the Western Australian Wheatbelt.

Criteria	Analysis of Vegetation Unit 4: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW]	Meet Criteria (Y/N)
		Q1
1: Distribution and IBRA subregions.	The survey area is located within the Avon Wheatbelt 1 (AW01) - Merredin subregion	Y
2: Structure of the ecological community is a woodland, with minimum crown cover of tree canopy of mature woodland being 10%.	Quadrat analysis shows that *Eucalyptus loxophleba* subsp. *loxophleba* (Quadrats 1, 4, 7, 8 & 9) and *Eucalyptus salmonophloia* (Quadrats 2, 3, 5 & 6) overstorey ranged from 70-100% to 30-70%, well exceeding a minimum 10% crown cover required in Criterion 2.	Y
3: Key species of the tree canopy are species of Eucalyptus identified in Table 2a of approved conservation guidelines (DoEE, 2015; RCC, 2014).	*Eucalyptus loxophleba* subsp. *loxophleba* and *Eucalyptus salmonophloia* are the dominant species in the NVIS L5 overstorey description, which are listed as a key species in Table 2a (DoEE, 2015).	Y
4: Native understorey is present but is of variable composition, being a combination of grasses, other herbs and shrubs, as specified in Table A1 of Appendix A (DoEE, 2015; RCC, 2014).	Variable understorey of grasses, herbs and shrubs is present.	Y
5: Patch Size and Condition Criteria	Table 1 identifies the specific condition and patch thresholds of Wheatbelt Woodlands TEC/PEC, with specific focus applied to the roadside minimum patch width required. The size of all the "patches" meets the condition thresholds, as they are roadside patches and a minimum width of 5 m is required. Referring to the category of condition thresholds, the vegetation present relates best to Category "D" with Degraded to Good condition present and weeds accounting for 50-70% of total cover across the quadrats sampled.	Y

In summary, five out of the six quadrats sampled for Vegetation Unit 2 [EucW] (BDS, 2022), all of the quadrats sampled for Vegetation Unit 3 [EucsalW](BDS, 2022), and all of the quadrats sampled for Vegetation Unit 4 [EucloxW](BDS, 2023), met Wheatbelt Woodlands TEC/PEC criteria (Tables 3-5). A total of 4.28 ha of Wheatbelt Woodlands' TEC/PEC is present overall within the survey area (Table 6; Figure 4).

Table 6: Area (ha) of Wheatbelt Woodlands TEC/PEC present within vegetation units across the survey area.

Vegetation Unit	Vegetation Condition	Area (ha)
Vegetation Unit 2: EucW (BDS, 2022)	Degraded	1.99
	Very good	0.09
Vegetation Unit 3: EucsalW (BDS, 2022)	Completely Degraded	0.14
	Degraded	1.85
Vegetation Unit 4: EucloxW (BDS, 2023)	Good	0.21
	Total	**4.28**



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BIO DIVERSE SOLUTIONS

Legend Overview Map Scale 1:500 000

- Spring survey area (BDS, 2023)
- Targeted flora and TEC survey area
- Cadastre

Vegetation Units (2022 Mapping)

- 1: MSL (2022)
- 2: EucW (2022)
- 3: EucsalW (2022)
- Planted Eucalypts (updated from 2022)
- Cleared

Vegetation Units (2023 Mapping)

- 1: Unclassifiable vegetation unit
- 2: AASh (2023)
- 3: MSL (2023)
- 4: EucloxW (2023)
- 5: Eucwan (2023)
- Cleared

Vegetation Condition

- Completely Degraded
- Degraded
- Good
- Very Good

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

Scale
1:10,000 @ A3
GDA MGA 2020 Zone 50

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Figure 3: Vegetation Units and Condition Map

	QA Check	*Drawn by*
	CvdM	**MW**
STATUS	*FILE*	*DATE*
FINAL	**CBH0018-004**	**11/03/2024**

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BIO DIVERSE SOLUTIONS

Legend Overview Map Scale 1:500 000

- Spring survey area (BDS, 2023)
- Targeted flora and TEC survey area
- Cadastre
- Quadrats

Vegetation Units (2022 Mapping)

- 1: MSL (2022)
- 2: EucW (2022)
- 3: EucsalW (2022)
- Planted Eucalypts (updated from 2022)
- Cleared

Vegetation Units (2023 Mapping)

- 1: Unclassifiable vegetation unit
- 2: AASh (2023)
- 3: MSL (2023)
- 4: EucloxW (2023)
- 5: Eucwan (2023)
- Cleared

Threatened & Priority Flora

- *Bossiaea atrata*

Threatened Ecological Community

- Eucalypt Woodlands of the Western Australian Wheatbelt (CR)

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

Scale
1:10,000 @ A3
GDA MGA 2020 Zone 50

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Figure 4: Targeted flora and TEC map

	QA Check	Drawn by
	CvdM	MW
STATUS	FILE	DATE
FINAL	CBH0018-004	11/03/2024

5 Discussion

The scope for this survey was to provide the client with additional information on specific targeted flora and vegetation values for environmental approvals for the proposed expansion of the CBH Dowerin receival site. The targeted survey accompanies a spring reconnaissance survey (BDS, 2023) and is preceded by an out-of-season reconnaissance survey (BDS, 2022).

Three species of priority flora were targeted as part of this survey, namely, *Bossiaea atrata* (P3), *Acacia campylophylla* (P3) and *Millotia tenuifolia* var. *laevis* (P2). Fifteen individuals of *B. atrata* were detected. *A. campylophylla* and *M. tenuifolia* var. *laevis* were not detected.

Of the 10 quadrats sampled, nine met the criteria of Wheatbelt Woodlands TEC. A total of 4.28 ha of Wheatbelt Woodlands PEC/TEC is present within the survey area, across three vegetation units, namely, Vegetation Unit 2 [EucW[(BDS, 2022), Vegetation Unit 3 [EucsalW](BDS, 2022), and Vegetation Unit 4 [EucloxW](BDS, 2023).

A major limitation was present due to access restrictions into the rail corridor during the September survey. The entire survey area was accessible in December, and as such, the TEC component of the survey has no major limitations. However, December is outside of the flowering period for the three targeted species, and as such, a major limitation is present.

6 References

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7 Appendices

Appendix A – Survey Effort

Appendix B – Conservation Significant Values Likelihood of Occurrence Analysis

Appendix C – Conservation Status Definitions and Condition Scale

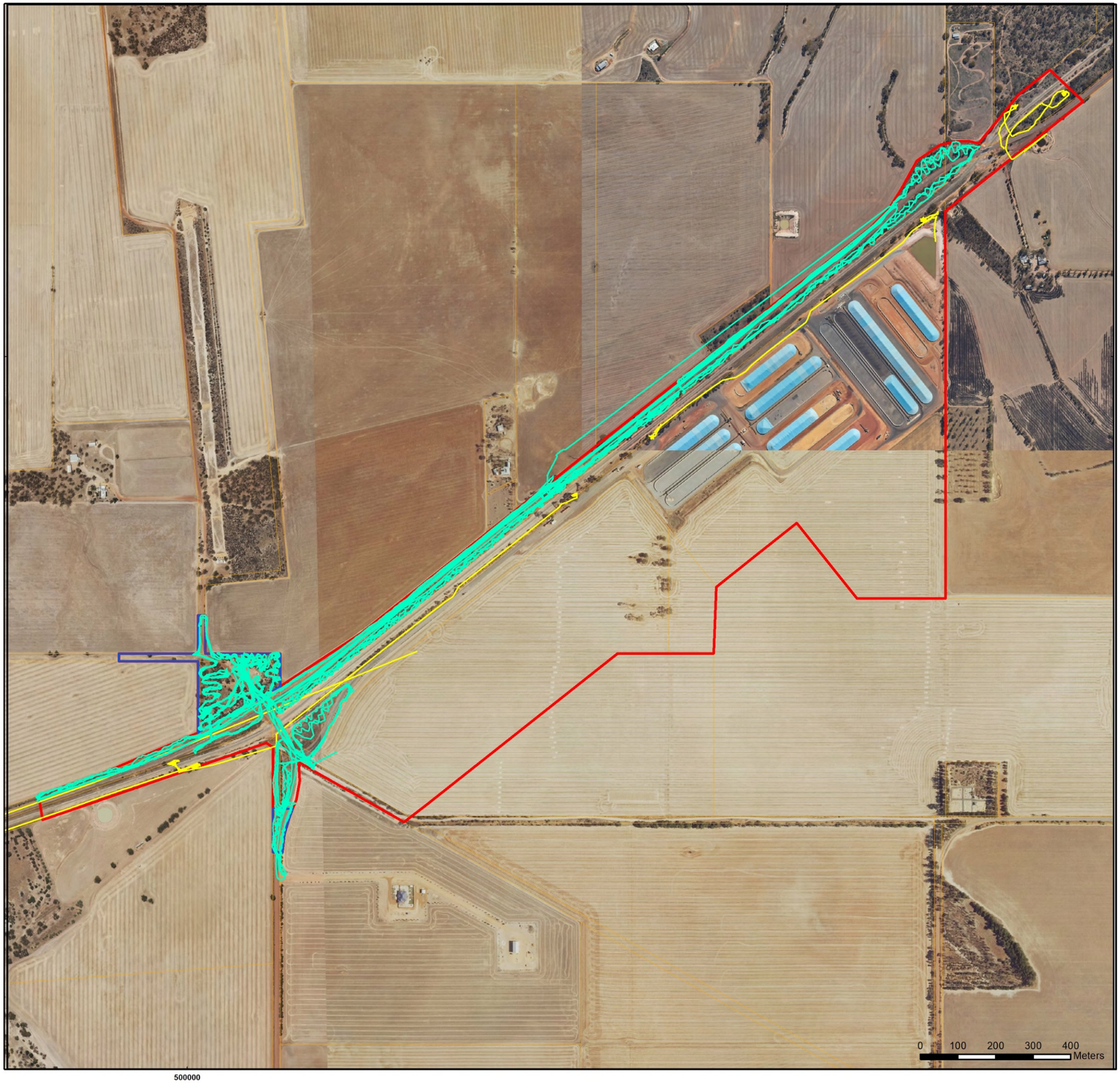
Appendix D – Vegetation Units defined in the Reconnaissance Flora and Vegetation and Basic Fauna survey (BDS, 2022)

Appendix E –Quadrat Data

Appendix F – DBCA Threatened and Priority Reporting Forms (TPFL)

Appendix A

Survey Effort



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BIO DIVERSE SOLUTIONS

Overview Map Scale 1:500 000

Legend

Cadastre

Survey Area

Spring survey area (BDS, 2023)

Targeted flora and TEC

Survey Effort

December 2023

September 2023

Data Sources
Aerial Imagery: WA Now, Landgate Subscription Imagery
Cadastre, Relief Contours and Roads: Landgate 2017
IRIS Road Network: Main Roads Western Australia 2017
Overview Map: World Topographic map service, ESRI 2012

Scale
1:10,000 @ A3
GDA MGA 2020 Zone 50

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Figure 5: Survey Effort.

	QA Check	*Drawn by*
	CvdM	**MW**
STATUS	*FILE*	*DATE*
FINAL	**CBH0018-004**	**15/12/2023**

Appendix B

Conservation Significant Values Likelihood of Occurrence Analysis

Table 7: Criteria for assessing the likelihood of occurrence of conservation significant flora within a 10km radius of the survey area.

Likelihood	Criteria
Present	Species is recorded within the survey area.
Likely	Species has been previously recorded in close proximity and suitable habitat occurs within the survey area.
Possible	Species previously recorded within 10 km and suitable habitat occurs in the survey area.
Unlikely	Suitable habitat for the species does not occur at the survey area OR Suitable habitat may occur but the species has a highly restricted distribution, is very rare and only known from a limited number of populations.
Highly Unlikely	The survey area is outside the species' natural distribution.

Table 8: Priority flora targeted as part of the targeted survey.

Family	Species	Status (WA)	Description - Species	Description - Habitat	Peak Flowering period	Likelihood of occurring – pre field survey	Likelihood of occurring – post field survey
Fabaceae	*Bossiaea atrata*	P3	Compact, dense, intricately-branched, rigid, spinescent herb, to 1.2 m high. Fl. orange-yellow-red-brown	White sand or sandy loam over laterite or clay, quartzite sand, clay.	May to Aug	Possible	**Present – detected.** Whole survey area could not be surveyed due to access restrictions.
Fabaceae	*Acacia campylophylla*	P3	Dense, rigid, spreading shrub, 0.1-0.6 m high. Fl. yellow	Lateritic gravelly soils.	Jul to Aug	Possible	Not detected. Whole survey area could not be surveyed due to access restrictions.
Asteraceae	*Millotia tenuifolia* var. *laevis*	P2	Ascending to erect annual, herb, 0.02-0.1 m high. Fl. yellow	Granite or laterite soils.	Sep to Oct	Possible	Not detected. Whole survey area could not be surveyed due to access restrictions.

Table 9: Threatened and Priority Ecological Communities targeted as part of the targeted survey.

Community Name	Status	Description	Survey Outcome
Eucalyptus Woodlands of the Western Australian Wheatbelt	Priority 3 CR (EPBC Act)	The ecological community defined and assessed as TEC/PEC 'Eucalyptus Woodland of the Western Australian Wheatbelt' is comprised of eucalypt woodlands that formerly were the most common type of vegetation across the wheatbelt landscape of south-western WA, inland between the Darling Range and western edge of the goldfields. The woodlands are dominated by a complex mosaic of eucalypt species with a tree or mallet form over an understorey that is highly variable in structure and composition. Woodlands dominated by mallee forms or vegetation with a very sparse Eucalypt tree canopy are not part of the ecological community (DoEE 2015).	**Present - detected**

Appendix C

Conservation Status Definitions and Condition Scale

Table 10: Conservation code definitions for flora listed as threatened or specially protected.
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.

Threat Category	Definition
Threatened - Critically endangered species (CR)	Facing an extremely high risk of extinction in the wild in the immediate future.
Threatened - Endangered species (EN)	Facing a very high risk of extinction in the wild in the near future.
Threatened - Vulnerable species (VU)	Facing a high risk of extinction in the wild in the medium-term future.
Threatened - Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Threatened – Extinct in the wild (EW)	Species 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.
Specially protected species - Migratory species (MI)	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; 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.
Specially protected species – Conservation Dependent (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Specially protected species – Other specially protected species (OS)	Fauna otherwise in need of special protection to ensure their conservation.

Table 11: Conservation code definitions for flora listed as Priority.
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.

Threat Category	Definition
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.
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.
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.
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.

Table 12: Conservation code definitions for ecological communities listed as threatened (TEC).

Threat Category	Definition
Presumed Totally Destroyed (PD)	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.
Critically Endangered (CR)	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.
Endangered (EN)	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.
Vulnerable (VU)	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.

Table 13: Conservation code definitions for ecological communities listed as priority (PEC).
Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community List under priorities 1, 2 and 3.

Threat Category	Definition
Priority One (P1)	Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha), and appear to be under immediate threat.
Priority Two (P2)	Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation.
Priority Three (P3)	(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 with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or; (iii)communities made up of large, and/or widespread occurrences, that may or may 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, inappropriate fire regimes, clearing, hydrological change etc.
Priority Four (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.
Priority Five (P5)	Conservation Dependent 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 D

Vegetation Units defined in the Reconnaissance Flora and Vegetation and Basic Fauna survey (BDS, 2023; 2022)

2023 Spring Survey Vegetation Units

Vegetation Unit 1: Unclassifiable vegetation unit

Vegetation Unit 1 consists of a shrubland characterised by *Acacia sp.* and an understorey dominated by invasive species. This vegetation unit is represented by R1 which is situated in an isolated patch along Rifle Range Road. This vegetation is in a Degraded state with a high number of non-native species; based on the species observed it is composed of 42% native species. Due to this state of degradation and disturbance the vegetation unit is unable to be classified. See Table 8 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): M ^^*Acacia assimilis,Acacia dielsii,Acacia multispicata*\^^shrub\3\c;G ^^ *Eragrostis curvula,Bromus diandrus,Avena barbata*\^^*tussock grass\1\c*

Vegetation Description (Muirs, 1977): *Acacia assimilis* Scrub, over *Acacia dielsii, Acacia multispicata* Heath, over *Arctotheca calendula* Open Herbs, over *Eragrostis* curvula*, Bromus diandrus, Avena barbata* Low Grass.

Area: 0.17 ha

Site description: Gently sloping site with light brown, clay loam soil, with good drainage.

Condition: Degraded.

Figure 6: Unclassifiable vegetation unit vegetation type present within the survey area.

Vegetation Unit 2: Allocasuarina/Acacia Shrubland [AASh]

Vegetation Unit 2 consists of a shrubland characterised by *Allocasuarina acutivalvis*, *Allocasuarina campestris* and *Acacia multispicata,* with an understorey composed of native and non-native species. This vegetation unit is represented by R2 which is situated in a block of remnant vegetation. A total of 51 species were found, of which 76% were native. Poaceae was the most common family recorded with eight species. See Table 9 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): U ^*Allocasuarina acutivalvis*\^shrub\6\i;M ^*Grevillea hookeriana,^Allocasuarina campestris,Acacia multispicata*\^^*shrub\3\c;G ^Dampiera lavandulacea,Bromus diandrus,Dianella revoluta*\^*forb,grass\1\d.*

Vegetation Description (Muirs, 1977): *Allocasuarina acutivalvis* Scrub, over *Grevillea hookeriana, Allocasuarina campestris* Low Scrub, over *Ecdeiocolea monostachya* Very Open Tall Sedges, over *Dampiera lavandulacea* Dense Herbs, over *Bromus diandrus, Avena barbata, Austrostipa elegantissima* Very Open Low Grass.

Area: 0.86 ha

Site description: Flat with light brown, clay loam soil, with good drainage.

Condition: Very Good and Good

Figure 7: Allocasuarina/Acacia Shrubland [AASh] vegetation type present within the survey area.

Vegetation Unit 3: Mallee Shrubland [MSL]

Vegetation Unit 3 consists of a shrubland characterised by *Eucalyptus subangusta* subsp. *subangusta*., *Allocasuarina campestris and Acacia acuminata*. R3 is situated in a block of remnant vegetation, within a section of vegetation in Very Good condition. Vegetation condition within other sections of this vegetation unit ranges from Degraded to Completely Degraded. Eighteen species were found, with no non-native species present within the sample site. Fabaceae was the most common family recorded with five species. See Table 10 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): U ^*Eucalyptus subangusta* subsp. *subangusta*\^mallee\6\i:M ^*Acacia acuminata,*^*Allocasuarina campestris*\^*shrub*\3\c;G ^*Ecdeiocolea monostachya,Austrostipa elegantissima*\^*sedge,grass*\2\c.

Vegetation Description (Muirs, 1977): *Eucalyptus subangusta subsp. subangusta* Open Tree Mallee, over *Acacia acuminata* Thicket, over *Allocasuarina campestris* Heath, over *Ecdeiocolea monostachya* Tall Sedges, over *Panaetia lessonii, Waitzia acuminata, Diuris suffusa* Very Open Herbs, over *Austrostipa elegantissima* Very Open Low Grass.

Area: 1.45 ha

Site description: Flat site with light brown, clay loam soil, with good drainage.

Condition: Very Good, Degraded, Completely Degraded

Figure 8: Mixed Shrubland [MSL] vegetation type present within the survey area.

Vegetation Unit 4: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW]

Vegetation Unit 4 consists of a woodland characterised by a *E. loxophleba* subsp. *loxophleba*. R4 is situated in a block of remnant vegetation. Seven species were found, one species is non-native. Poaceae was the most common family recorded with three species. See Table 11 for a summary of this vegetation unit.

Vegetation Description (NVIS; DoEE, 2017): U ^*Eucalyptus loxophleba* subsp. *loxophleba*\^tree\6\d;G ^^*Ehrharta longiflora,Amphipogon caricinus,Austrostipa elegantissima*\^^grass\1\d.

Vegetation Description (Muirs, 1977): *Eucalyptus loxophleba subsp. loxophleba* Dense Low Forest, over *Dodonaea bursariifolia, Rhagodia drummondii* Open Dwarf Scrub, over *Enchylaena lanata* Open Dwarf Scrub, over *Dianella revoluta* over Open Herbs, over *Ehrharta longiflora, Amphipogon caricinus, Austrostipa elegantissima* Very Open Low Grass

Area: 0.29 ha

Site description: Flat site with dark brown, clay loam soil, with good drainage.

Condition: Good, Degraded.

Figure 9: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW] vegetation type present within the survey area.

Vegetation Unit 5: *Eucalyptus wandoo* [Eucwan]

Vegetation Unit 5 consists of *Eucalyptus wandoo*. This is defined as a vegetation unit as it is distinct from the surrounding vegetation, consists of one tree species, cobers a small area and is in a Completely Degraded condition. No relevé was recorded within the vegetation unit

2022 Original Survey Vegetation Units

Vegetation Unit 1: Mixed Shrubland [MSL]

Vegetation Unit 1 consisted of a mixed native shrubland characterised by dominant shrubs of Allocasuarina acutivalvis, Grevillea hookeriana and Grevillea teretifolia over the sedge, Ecdeiocolea monostachya, and other mixed native shrubs with an understorey comprising of introduced herbs and grasses including Romulea rosea, Arctotheca calendula and Ehrharta longiflora.

Vegetation Description (NVIS): S ^^Allocasuarina acutivalvis, Grevillea hookeriana, Grevillea teretifolia\^^Shrub\1\i;V ^Ecdeiocolea monostachya\^Rush\2\bc\, H^^ Romulea rosea, Arctotheca calendula/^^herb\1\bc\.G^^ Eragrostis curvula, Ehrharta longiflora and Austrostipa elegantissima\^grass\1\w.

Vegetation Description (Muirs): Mixed Native Shrubland dominated by Allocasuarina acutivalvis, Grevillea hookeriana and Grevillea teretifolia Scrub, over Ecdeiocolea monostachya, over Romulea rosea, Arctotheca calendula, Eragrostis curvula, Ehrharta longiflora and Austrostipa elegantissima.

Area: 7.24 ha.

Site description: Gently sloping situated mid slope, with light brown clay, loamy and sandy soil which is well drained.

Condition: Very Good, Good, Degraded and Completely Degraded.

Figure 10: Mixed Shrubland [MSL] vegetation type present within the survey area.

Vegetation Unit 2: Mixed Eucalyptus Woodland [EucW]

Vegetation Unit 2 comprised of an open woodland dominated by *Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba* over *Rhagodia drummondii* and *Enchylaena tomentosa* with an understorey comprising of introduced species. Limited diversity was observed with numerous weed species present within the site and areas lacking vegetation.

Vegetation Description (NVIS): U ^^ *Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba*\^^tree\6\r;M ^^ *Rhagodia drummondii* and *Enchylaena tomentosa* \^shrub\r;W *Ehrharta longiflora* \^grass\1\bc F *Romulea rosea*, *Romulea rosea var. australis* \1\bc.

Vegetation Description (Muirs): Mixed Eucalyptus open woodland (*Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba*), over and open shrubland of *Rhagodia drummondii* and *Enchylaena tomentosa*, over introduced grasses and herbs, *Romulea rosea*, *Romulea rosea* var. *australis* and *Ehrharta longiflora*.

Area: 4.52 ha.

Site description: Gently sloping situated mid slope, with light brown clay, loamy and sandy soil which is well drained.

Condition: Good, Degraded and Completely Degraded.


Figure 11: Mixed Eucalyptus Woodland [EucW] vegetation type present within the survey area.

Vegetation Unit 3: *Eucalyptus salmonophloia* Woodland [EucsalW]

Vegetation Unit 3 consisted of an open woodland dominated by *Eucalyptus salmonophloia*, over a shrubland dominated by *Rhagodia preissii* over an understorey of *Austrostipa elegantissima* and *Ehrharta longiflora*. Limited diversity was observed with numerous weed species present within the site and areas lacking vegetation.

Vegetation Description (NVIS): U ^ *Eucalyptus salmonophloia* \^tree\8\r;M ^*Rhagodia preissii*\^shrub\2\i;G ^^ *Austrostipa elegantissima Ehrharta longiflora* \^grass\1\r.

Vegetation Description (Muirs): *Eucalyptus salmonophloia* Open Woodland over *Rhagodia preissii* open scrub over *Austrostipa elegantissima* and *Ehrharta longiflora*.

Area: 2.25 ha.

Site description: Hill crest (flat) with light brown clay, loamy and sandy soil which is well drained.

Condition: Degraded and Completely Degraded.


Figure 12: *Eucalyptus salmonophloia* Woodland [EucsalW] vegetation type present within the survey area.

Vegetation Unit 4: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW]

Vegetation Unit 4 consists of a woodland characterised by a *E. loxophleba* subsp. *loxophleba*. R4 is situated in a block of remnant vegetation. Seven species were found, one species is non-native. Poaceae was the most common family recorded with three species.

Vegetation Description (NVIS):	U ^*Eucalyptus loxophleba* subsp. *loxophleba*\^tree\6\d;G ^^*Ehrharta longiflora,Amphipogon caricinus,Austrostipa elegantissima*\^^grass\1\d.
Vegetation Description (Muirs):	*Eucalyptus loxophleba* subsp. *loxophleba* Dense Low Forest, over *Dodonaea bursariifolia*, *Rhagodia drummondii* Open Dwarf Scrub, over *Enchylaena lanata* Open Dwarf Scrub, over *Dianella revoluta* over Open Herbs, over *Ehrharta longiflora, Amphipogon caricinus, Austrostipa elegantissima* Very Open Low Grass.

Area: 0.29 ha.

Site description: Flat site with dark brown, clay loam soil, with good drainage.

Condition: Good, Degraded.

Figure 13: *Eucalyptus loxophleba* subsp. *loxophleba* Woodland [EucloxW] vegetation type present within the survey area.

Appendix E

Quadrat Data

Quadrat	Q1	**Veg Code**	Veg Type 4: EucloxW	**Date Surveyed**	12/09/2023
Location	Towards the southwest of the subject site, approximately 162.21 m from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.215073, 117.000418				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	(NVIS): U ^*Eucalyptus loxophleba* subsp. *loxophleba*\^tree\6\d;G ^^*Ehrharta longiflora,Amphipogon caricinus,Austrostipa elegantissima*\^^grass\1\d. *(*Muirs*):* *Eucalyptus loxophleba* subsp. *loxophleba* Dense Low Forest, over *Dodonaea bursariifolia, Rhagodia drummondii* Open Dwarf Scrub, over *Enchylaena lanata* Open Dwarf Scrub, over *Dianella revoluta* over Open Herbs, over *Ehrharta longiflora, Amphipogon caricinus, Austrostipa elegantissima* Very Open Low Grass.				
Condition	Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus loxophleba subsp. *loxophleba*	T-tree	8m	d > 70%	FL/FR
Maireana brevifolia	S-shrub	70-80cm	r <10%	
Rhagodia preissii	S-shrub	30cm	r <10%	
Enchylaena lanata	S-shrub	15cm	r <10%	Fruiting
Atriplex semibaccata	S-shrub	5cm	r <10%	
Dodonaea bursariifolia	S-shrub	1m	r <10%	Fruiting
Carpobrotus modestus	S-shrub	10cm	r <10%	Fl/Fr
Enchylaena tomentosa	S-shrub	15cm	r <10%	
Austrostipa elegantissima	G-grass	50cm	r <10%	Flowering
Ehrharta longiflora	G-grass	40cm	d > 70%	Flowering
Rytidosperma caespitosum	G-grass	50cm	r <10%	Flowering
Dianella revoluta	H-herb	50cm	r <10%	
Mesembryantheum crystallinum	H-herb	5cm	r <10%	Fruiting

Quadrat	Q2	**Veg Code**	Veg Type 2: EucW	**Date Surveyed**	12/09/2023
Location	Towards the centre of the subject site, approximately 980.93 m from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.209743, 117.010377				
Landform and Slope	Flat slope on plain				
Soils	Light Brown				
Hydrology	Good drainage				
Vegetation Unit description	(NVIS): U ^^ *Eucalyptus camaldulensis,Eucalyptus loxophleba* subsp. *supralaevis,Eucalyptus loxophleba* subsp. *loxophleba*\^^tree\6\r;M ^^ *Rhagodia drummondii,Enchylaena tomentosa* \^shrub\r;W *Ehrharta longiflora* \^grass\1\bc F *Romulea rosea,Romulea rosea var. australis* \1\bc. *(*Muirs*):* Mixed Eucalyptus open woodland (*Eucalyptus camaldulensis, Eucalyptus loxophleba subsp. supralaevis, Eucalyptus loxophleba subsp. loxophleba*), over an open shrubland of *Rhagodia drummondii* and *Enchylaena tomentosa,* over introduced grasses and herbs, *Romulea rosea, Romulea rosea var. australis* and *Ehrharta longiflora*.				
Condition	Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus salmonophloia	T-tree	20m	i 10-30%	Fruiting
Atriplex stipitata	S-shrub	70cm	i 10-30%	Flowering
Enchylaena tomentosa	S-shrub	10cm	r <10%	
Enchylaena lanata	S-shrub	10cm	r <10%	Fruiting
Sclerolaena diacantha	S-shrub	10cm	r <10%	Fruiting
Austrostipa elegantissima	G-grass	50cm	r <10%	Flowering
Avena barbata	G-grass	80cm	r <10%	Flowering
Ehrharta longiflora	G-grass	50cm	c 30-70%	Flowering
Lolium rigidum	G-grass	30cm	i 10-30%	Flowering
Hordeum leporinum	G-grass	15cm	r <10%	Flowering
Eremophila drummondii	S-shrub	40cm	r <10%	Flowering
Mesembryantheum crystallinum	H-herb	3cm	r <10%	Fruiting
Arctotheca calendula	H-herb	3cm	r <10%	
Crassula colorata	H-herb	2cm	r <10%	

Quadrat	Q3	**Veg Code**	Veg Type 3: EucsalW	**Date Surveyed**	12/09/2023
Location	Towards the centre of the subject site, approximately 1.28 km from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.208015, 117.012925				
Landform and Slope	Flat slope on plain				
Soils	Orange/Brown				
Hydrology	Good drainage				
Vegetation Unit description	(NVIS): U ^ *Eucalyptus salmonophloia*\^tree\8\r;M ^*Rhagodia preissii*\^shrub\2\i;G ^^ *Austrostipa elegantissima,Ehrharta longiflora* \^grass\1\r. *(*Muirs*):* *Eucalyptus salmonophloia* Open Woodland over *Rhagodia preissii* open scrub over *Austrostipa elegantissima* and *Ehrharta longiflora.*				
Condition	Very Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus salmonophloia	T-tree	20cm	i 10-30%	
Leptomeria preissiana	S-shrub	80cm	r <10%	
Eremophila drummondii	S-shrub	30cm	r <10%	
Acacia erinacea	S-shrub	40cm	r <10%	
Atriplex stipitata	S-shrub	40cm	i 10-30%	
Enchylaena lanata	S-shrub	25cm	r <10%	
Sclerolaena diacantha	S-shrub	20cm	r <10%	
Enchylaena tomentosa	S-shrub	20cm	r <10%	
Austrostipa elegantissima	G-grass	30cm	r <10%	
Rytidosperma caespitosa	G-grass	15cm	r <10%	

Quadrat	Q4	**Veg Code**	Veg Type 2: EucW	**Date Surveyed**	04/12/2023
Location	Towards the northeast of the subject site, approximately 2.17 km from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.203333, 117.020538				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	NVIS): U ^^ *Eucalyptus camaldulensis,Eucalyptus loxophleba* subsp. *supralaevis,Eucalyptus loxophleba* subsp. *loxophleba*\^^tree\6\r;M ^^ *Rhagodia drummondii,Enchylaena tomentosa* \^shrub\r;W *Ehrharta longiflora* \^grass\1\bc F *Romulea rosea,Romulea rosea* var. *australis* \1\bc. *(*Muirs*):* Mixed Eucalyptus open woodland (*Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba*), over and open shrubland of *Rhagodia drummondii* and *Enchylaena tomentosa,* over introduced grasses and herbs, *Romulea rosea, Romulea rosea* var. *australis* and *Ehrharta longiflora*.				
Condition	Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus loxophleba	T-tree	25m	i 10-30%	FL/FR
Rhagodia drummondii	S-shrub	80cm	i 10-30%	Fruiting
Atriplex stipitata (F)	S-shrub	50cm	i 10-30%	Fruiting
Enchylaena tomentosa	S-shrub	20cm	r <10%	
Amphipogon caricinus	G-grass	25cm	r <10%	
Lolium rigidum	G-grass	25cm	r <10%	
Atriplex stipitata (M)	S-shrub	30cm	i 10-30%	Flowering
Templetonia sulcata	S-shrub	10cm	bi ≈0	
Eucalyptus longicornis	T-tree	25m	r <10%	FL/FR

Quadrat	Q5	**Veg Code**	Veg Type 3: EucsalW	**Date Surveyed**	04/12/2023
Location	Towards the centre of the subject site, approximately 1.25 km from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.208530, 117.012947				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	(NVIS): U ^ *Eucalyptus salmonophloia* \^tree\8\r;M ^*Rhagodia preissii*\^shrub\2\i;G ^^ *Austrostipa elegantissima,Ehrharta longiflora* \^grass\1\r. *(*Muirs*):* *Eucalyptus salmonophloia* Open Woodland over *Rhagodia* preissii open scrub over *Austrostipa elegantissima* and *Ehrharta longiflora.*				
Condition	Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus salmonophloia	T-tree	25m	r <10%	
Acacia merrallii	S-shrub	2.5m	i 10-30%	
Eremophila drummondii	S-shrub	50cm	i 10-30%	
Leptomeria preissiana	S-shrub	1m	i 10-30%	
Atriplex stipitata (M)	S-shrub	40cm	i 10-30%	Flowering
Atriplex stipitata (F)	S-shrub	60cm	i 10-30%	Fruiting
Austrostipa elegantissima	G-grass	40cm	i 10-30%	
Sclerolaena diacantha	S-shrub	15cm	r <10%	
Daviesia nematophylla	S-shrub	80cm	r <10%	Fruiting

Quadrat	Q6	**Veg Code**	Veg Type 3: EucsalW	**Date Surveyed**	04/12/2023
Location	Towards the centre of the subject site, approximately 1.29 km from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.20829, 117.013188				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	(NVIS): U ^ *Eucalyptus salmonophloia* \^tree\8\r;M ^*Rhagodia preissii*\^shrub\2\i;G ^^ *Austrostipa elegantissima,Ehrharta longiflora* \^grass\1\r. *(*Muirs*):* *Eucalyptus salmonophloia* Open Woodland over *Rhagodia* preissii open scrub over *Austrostipa elegantissima* and *Ehrharta longiflora.*				
Condition	Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus salmonophloia	T-tree	30m	i 10-30%	
Atriplex stipitata (M)	S-shrub	80cm	r <10%	Flowering
Sclerolaena diacantha	S-shrub	30cm	i 10-30%	
Enchylaena tomentosa	S-shrub	15cm	i 10-30%	Fruiting
Salsola australis	S-shrub	15cm	r <10%	
Austrostipa elegantissima	G-grass	25cm	r <10%	
Rhagodia baccata	S-shrub	80cm	r <10%	
Amphipogon caricinus	S-shrub	30cm	r <10%	Fruiting
Enchylaena lanata	S-shrub	30cm	r <10%	
Dianella revoluta	S-shrub	30cm	r <10%	
Atriplex semibaccata	S-shrub	10cm	r <10%	

Quadrat	Q7	**Veg Code**	Veg Type 2: EucW	**Date Surveyed**	04/12/2023
Location	Towards the southwest of the subject site, approximately 251.90 m from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.216464, 117.000146				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	NVIS): U ^^ *Eucalyptus camaldulensis,Eucalyptus loxophleba* subsp. *supralaevis,Eucalyptus loxophleba* subsp. *loxophleba*\^^tree\6\r;M ^^ *Rhagodia drummondii,Enchylaena tomentosa* \^shrub\r;W *Ehrharta longiflora* \^grass\1\bc F *Romulea rosea,Romulea rosea* var. *australis* \1\bc. *(*Muirs*):* Mixed Eucalyptus open woodland (*Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba*), over and open shrubland of *Rhagodia drummondii* and *Enchylaena tomentosa,* over introduced grasses and herbs, *Romulea rosea, Romulea rosea* var. *australis* and *Ehrharta longiflora*.				
Condition	Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus loxophleba	T-tree	15m	i 10-30%	Fruiting
Maireana brevifolia	S-shrub	50cm	i 10-30%	Fruiting
Enchylaena tomentosa	S-shrub	25cm	r <10%	
Atriplex semibaccata	S-shrub	10cm	r <10%	
Rhagodia drummondii	S-shrub	50cm	i 10-30%	Fruiting
Austrostipa elegantissima	G-grass	50cm	r <10%	
Avena barbata	G-grass	30cm	r <10%	
Ehrharta calycina	G-grass	25cm	r <10%	
Amphipogon caricinus	G-grass	25cm	r <10%	Fruiting

Quadrat	Q8	**Veg Code**	Veg Type 2: EucW	**Date Surveyed**	04/12/2023
Location	Towards the southwest of the subject site, approximately 299.78 m from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.216361, 116.999555				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	NVIS): U ^^ *Eucalyptus camaldulensis,Eucalyptus loxophleba* subsp. *supralaevis,Eucalyptus loxophleba* subsp. *loxophleba*\^^tree\6\r;M ^^ *Rhagodia drummondii,Enchylaena tomentosa* \^shrub\r;W *Ehrharta longiflora* \^grass\1\bc F *Romulea rosea,Romulea rosea* var. *australis* \1\bc. *(*Muirs*):* Mixed Eucalyptus open woodland (*Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba*), over and open shrubland of *Rhagodia drummondii* and *Enchylaena tomentosa,* over introduced grasses and herbs, *Romulea rosea, Romulea rosea* var. *australis* and *Ehrharta longiflora*.				
Condition	Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus loxophleba	T-tree	15m	i 10-30%	Fruiting
Amphipogon caricinus	G-grass	25cm	r <10%	
Eragrostis curvula	G-grass	40cm	r <10%	
Avena barbata	G-grass	20cm	r <10%	
Dianella revoluta	H-herb	40cm	r <10%	
(Dead)	V-sedge			

Quadrat	Q9	**Veg Code**	Veg Type 2: EucW	**Date Surveyed**	04/12/2023
Location	Towards the northeast of the subject site, approximately 2.99 km from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.200307, 117.024453				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	NVIS): U ^^ *Eucalyptus camaldulensis,Eucalyptus loxophleba* subsp. *supralaevis,Eucalyptus loxophleba* subsp. *loxophleba*\^^tree\6\r;M ^^ *Rhagodia drummondii,Enchylaena tomentosa* \^shrub\r;W *Ehrharta longiflora* \^grass\1\bc F *Romulea rosea,Romulea rosea* var. *australis* \1\bc. *(*Muirs*):* Mixed Eucalyptus open woodland (*Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba*), over and open shrubland of *Rhagodia drummondii* and *Enchylaena tomentosa,* over introduced grasses and herbs, *Romulea rosea, Romulea rosea* var. *australis* and *Ehrharta longiflora*.				
Condition	Very Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Eucalyptus loxophleba	T-tree	18m	c 30-70%	Fruiting
Leptomeria preissiana	S-shrub	2.5m	c 30-70%	Flowering
Rhagodia drummondii	S-shrub	50cm	i 10-30%	
Enchylaena tomentosa	S-shrub	30cm	r <10%	
Senna artemisioides subsp. *filifolia*	S-shrub	2m	r <10%	
Austrostipa elegantissima	G-grass	50cm	r <10%	
Lepidosperma tenue	V-sedge	25cm	r <10%	Fruiting
Amphipogon caricinus	G-grass	20cm	r <10%	Fruiting
Avena barbata	G-grass	30cm	r <10%	

Quadrat	Q10	**Veg Code**	Veg Type 2: EucW	**Date Surveyed**	04/12/2023
Location	Towards the northeast of the subject site, approximately 2.83 km from the intersection of Goomalling-Wyalkatchem Road and Rifle Range Road.				
GPS (Lat, Long)	-31.200622, 117.023045				
Landform and Slope	Flat slope on plain				
Soils	Brown				
Hydrology	Good drainage				
Vegetation Unit description	NVIS): U ^^ *Eucalyptus camaldulensis,Eucalyptus loxophleba* subsp. *supralaevis,Eucalyptus loxophleba* subsp. *loxophleba*\^^tree\6\r;M ^^ *Rhagodia drummondii,Enchylaena tomentosa* \^shrub\r;W *Ehrharta longiflora* \^grass\1\bc F *Romulea rosea,Romulea rosea* var. *australis* \1\bc. *(*Muirs*):* Mixed Eucalyptus open woodland (*Eucalyptus camaldulensis, Eucalyptus loxophleba* subsp. *supralaevis, Eucalyptus loxophleba* subsp. *loxophleba*), over and open shrubland of *Rhagodia drummondii* and *Enchylaena tomentosa,* over introduced grasses and herbs, *Romulea rosea, Romulea rosea* var. *australis* and *Ehrharta longiflora*.				
Condition	Very Good				
Comments					

Species Name	**Form**	**Height**	**Cover (%)**	**Flowering/Fruiting**
Amphipogon caricinus	T-tree	20m	c 30-70%	Fruiting
Alyxia buxifolia	S-shrub	80cm	r <10%	
Rhagodia drummondii	S-shrub	30cm	i 10-30%	
Juncus kraussii	V-sedge	1m	r <10%	
Avena barbata	G-grass	30cm	c 30-70%	
Enchylaena tomentosa	S-shrub	15m	r <10%	
Bromus rubens	G-grass	10cm	i 10-30%	
Austrostipa elegantissima	G-grass	15cm	i 10-30%	

Appendix F

DBCA Threatened and Priority Reporting Forms (TPFL)