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ANKETELL ROAD PROJECT

Assessment of FCT 26a Threatened Ecological Community

FINAL

February 2025

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Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Main Roads Western Australia

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
V1	G. Woodman	9/01/2025	Mitt Ramgobin	15/01/2025
V2	A. Saligari	13/02/2025	G. Woodman	13/02/2025

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1.0 Introduction

1.1 Project Overview

Main Roads Western Australia (Main Roads) is undertaking upgrade works for Anketell Road, located approximately 30 km south of Perth (the Project). Biota Environmental Sciences (Biota) have undertaken detailed and targeted flora and vegetation assessments for the Project, with the results of the surveys consolidated in the Anketell Road Upgrade Consolidated Biological Report (Biota, 2024).

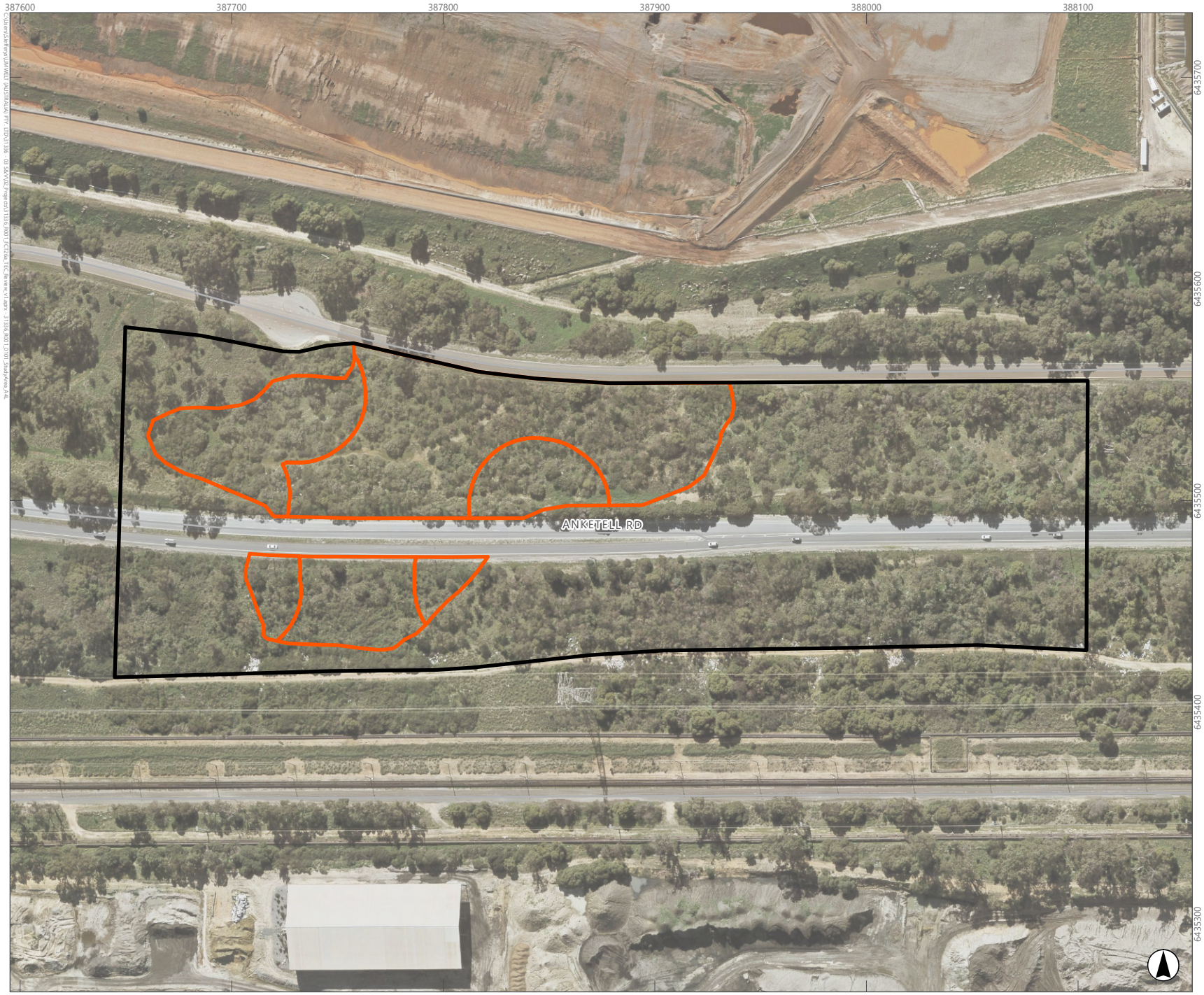
Biota (2024) mapped an occurrence of the *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges Threatened Ecological Community (TEC), listed as Critically Endangered under the *WA Biodiversity Conservation Act 2016* (BC Act), and is equivalent to federally listed Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Critically endangered) TEC (as listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

Identification of this significant community within the Main Roads development footprint has the potential to result in a significant residual impact from the proposed development. At the time of writing, this site comprised a registered Department of Biodiversity, Conservation and Attractions (DBCA) TEC (Occurrence 75), as described in Luu, R., & English, V. (2005). Main Roads sought clarification of mapped values given inconsistencies between DBCA and Biota TEC occurrence mapping. Umwelt was commissioned by Main Roads to undertake a review of the listing of the TEC, this occurrence in particular, and a field survey to verify the occurrence, condition and boundary of the TEC. This report documents methods and results of the desktop review and field survey.

1.2 Study Area

A Study Area has been defined for the survey. This is a polygon including the location of FCT 26b as mapped by Biota (2024), as well as the surrounding vegetation (**Figure 1.1**). The Study Area covers an area of approximately 6.3 ha. The Biota (2024) mapped occurrence covers an area of 1.96 ha.

FIGURE 1.1
Study Area Location



Legend

- Study Area
- Biota (2024) Mapped Occurrence of *Melaleuca huegelii - Melaleuca systena* shrublands of limestone ridges
- Road

0 50 100

Metres

Scale 1:2,500 at A4
GDA2020 MGA Zone 50

Image Source: Landgate (2024) | **Data Source:** Landgate (2024), Biota (2024), MRWA (2024)

1.3 Aims and Objectives

The specific objectives of this assessment were to:

- Conduct a desktop review of the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion Commonwealth listed TEC, and the *Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges (floristic community type 26a as originally described in Gibson et al. 1994) State listed TEC at the Anketell Road Project Site to identify its history and reported extent and condition.
- Undertake a field survey (review) of the Anketell Road Project Site (as supplied by Main Roads) and confirm the extent and condition of the Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion Commonwealth listed TEC, and the FCT26a *Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges State listed TEC.
- Map the extent of these communities at the site as far as practicable.
- Map the condition of the vegetation of the TEC occurrence in accordance with the scale presented in the Environmental Protection Authority (EPA) *Technical Guidance for Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA, 2016).

2.0 Methods

2.1 Desktop Assessment

Prior to commencement of the field survey, a desktop assessment was undertaken. The desktop assessment involved the following:

- Review of the Biota Consolidated Biological Report (Biota, 2024), particularly Section 4.6.1.3 and Section 4.6.2.1 that describe the *Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges (Gibson et al. 1994 type 26a) Commonwealth TEC and *Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges (Gibson et al. 1994 type 26a) State listed TEC, respectively.
- Review government listing advice for the TEC, including:
    - *Melaleuca huegelii – Melaleuca systena* shrublands on limestone ridges (Swan Coastal Plain type 26a - Gibson et al. 1994) Interim Recovery Plan 2004–2009 (Luu & English, 2005)
    - Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (DCCEEW, 2023a).
- Review historical aerial photography of the site (photography provided by Main Roads) to understand the site history in terms of threatening processes.

2.2 Field Survey

2.2.1 Personnel and Licensing

Table 2.1 lists the personnel involved in both fieldwork and plant identifications for the flora and vegetation assessment. The field team leader has had significant previous experience (>25 years) in conducting flora and vegetation surveys in WA, including similar flora surveys in the SCP region. The field personnel has previous experience (>10 years) in undertaking flora and vegetation surveys in WA (including the SCP). Field personnel hold current Flora Taking (Biological Assessment) Licences (under Regulation 62 of the Biodiversity Conservation Regulations 2018 (BC Regs)) and Authorisation to Take or Disturb Threatened Species (pursuant to Section 40 of the BC Act) as outlined in **Table 2.1**.

Table 2.1 Personnel and Licensing Information

Personnel	Flora Collecting Permit	Role
Greg Woodman **BSc (Biology) (Hons)**	FB62000053-2 TFL 132-2122	Project Director / Field Team Leader
Alison Saligari **BSc (Environmental Biology) (Hons)**	FB62000048-2 TFL 129-2122	Field Team Member

2.2.2 Field Survey Methods

The field survey of the Study Area was undertaken on 21 November 2024. The timing of the site visit was selected to coincide with what is considered to be the most appropriate time to survey in the South West province; as per EPA Technical Guidance (EPA, 2016), this is spring (September to November), as most of the taxa in this region flower at this time.

The Study Area was accessed via foot transects. Appropriate landholder/manager permissions were obtained prior to undertaking field survey. A total of 17 mapping note locations were undertaken in the Study Area to describe the vegetation, soil and landform to identify the possible extent of the TEC within the Study Area. Mapping note locations were recorded using handheld Global Positioning System (GPS) units (Geocentric Datum of Australia (GDA) 2020, Zone 50). The following information was recorded at the mapping note locations:

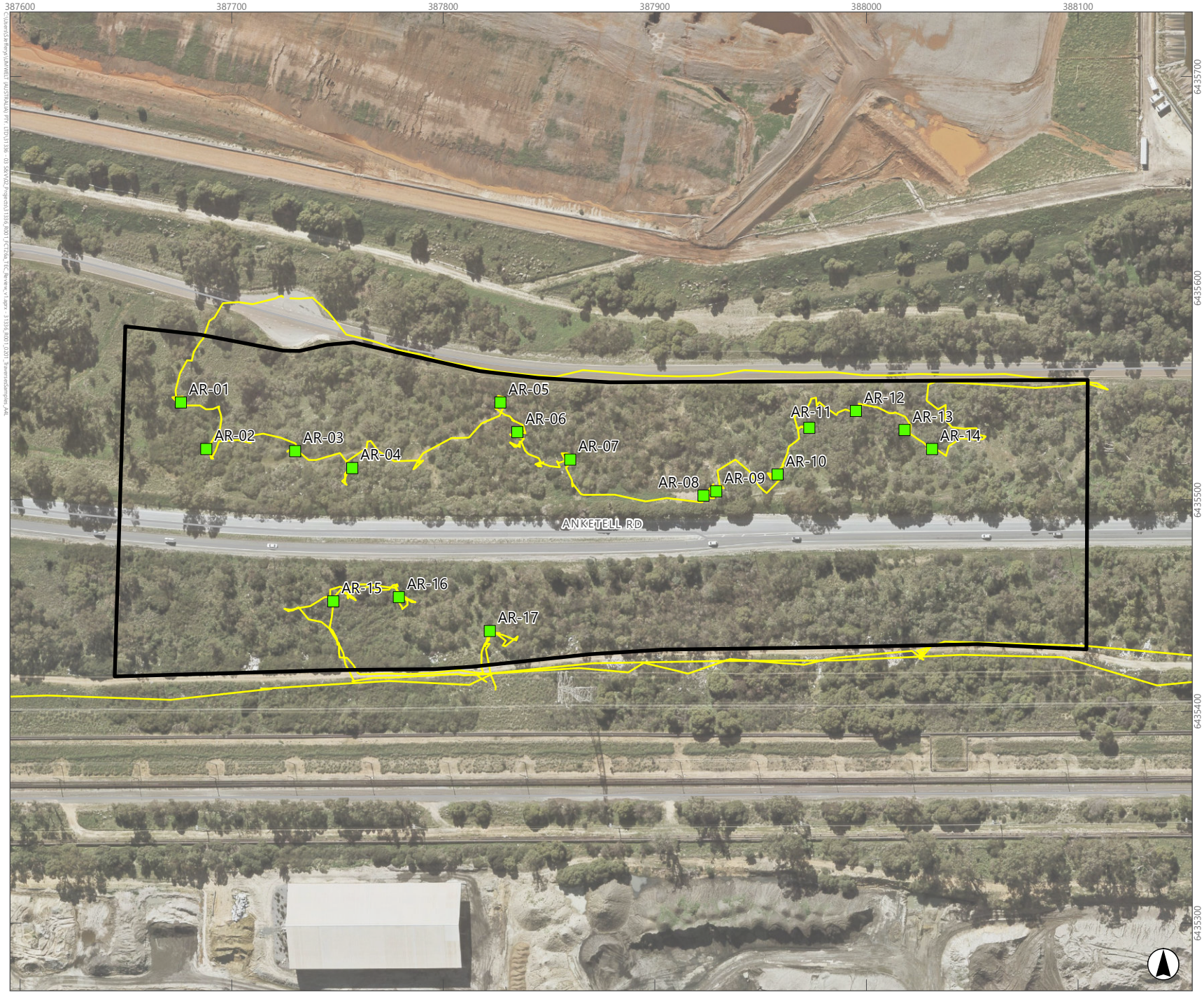
- Site photograph
- Topography
- Soil colour and type (including the presence of any rock outcropping and surface stones)
- Vegetation condition (EPA, 2016); scale presented in **Appendix A**)
- Structural description of vegetation including dominant taxa.

Quadrats were not established and assessed within the Survey Area as this was not within the scope of the assessment. However, irrespective to this, it is considered that the condition of the vegetation was not adequate to support quadrat assessment and subsequent floristic analysis against the SCP datasets.

All traverses made during the field survey are mapped as track logs on **Figure 2.1**, along with sample site locations.

FIGURE 2.1

Study Area Traverses and Sample Site Locations



Legend

- Study Area
- Road
- Mapping Note
- Track Log

0 50 100

Metres

Scale 1:2,500 at A4
GDA2020 MGA Zone 50

Image Source: Landgate (2024) | **Data Source:** Landgate (2024), Biota (2024), MRWA (2024), Umwelt (2025)

2.3 Mapping and Assessment of the TEC

The data from the field survey was utilised in conjunction with the diagnostics described in the Approved Conservation Advice for the Commonwealth Honeymyrtle shrubland on limestone ridges of the SCP TEC (DCCEEW, 2023a), and the description provided in the State-listed *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges (Swan Coastal Plain Community type 26a - Gibson et al. 1994) Interim Recovery Plan (Luu & English, 2005) to assess for the presence, and map the extent of, the State and Commonwealth listed TEC.

The current procedure recommended by DBCA for determining FCTs on the southern SCP is to establish and survey quadrats in the appropriate season and carry out analyses with the Gibson et. al. (1994) and Keighery et.al. (2012) datasets as per the 'Methods for survey and identification of Western Australian threatened ecological communities' procedure (DBCA, 2023). The methods for statistical analysis in this procedure were not undertaken as part of the current survey, as quadrat assessment was not undertaken (as discussed in **Section 2.2.2**).

Therefore, the TEC occurrence was mapped over the Study Area based on ratings categories as a result of field observations as described in **Section 3.2**. Due to the high level of previous disturbance over the Study Area, mapping of the TEC in definitive terms was not possible.

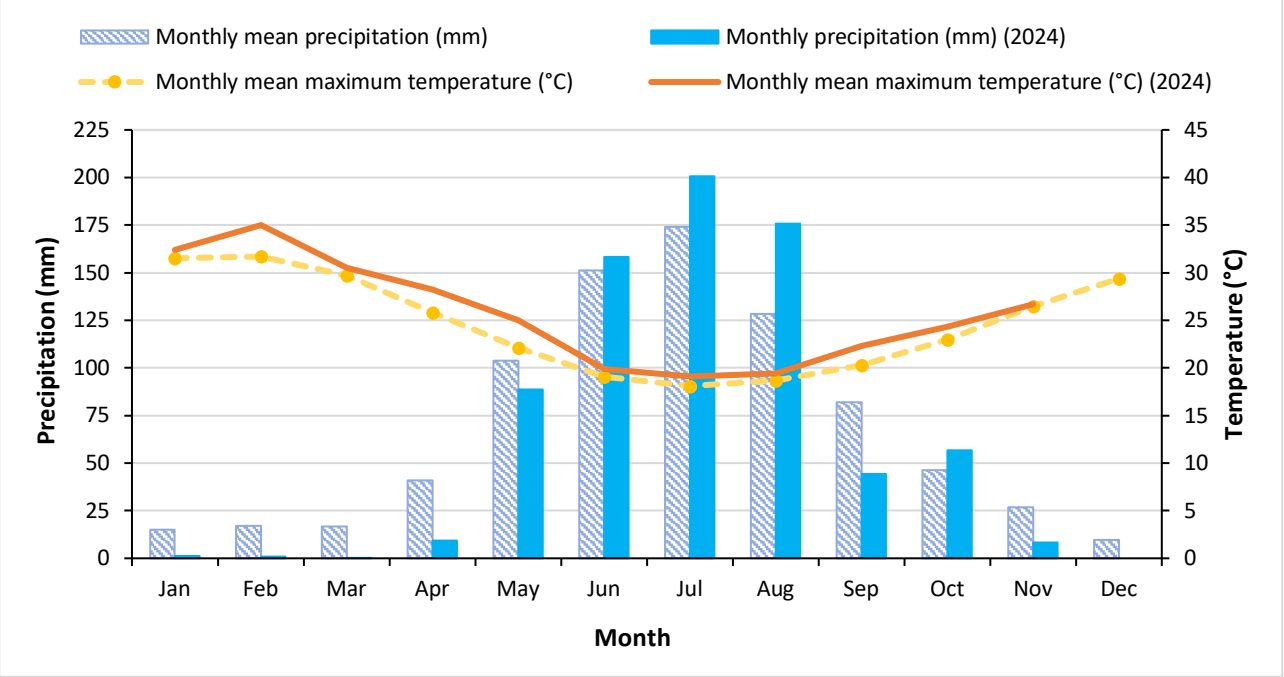
3.0 Results

3.1 Desktop Review Results

3.1.1 Site Context

The Study Area is located in the Swan Coastal Plain IBRA bioregion and Perth IBRA subregion (DCCEEW, 2023b). The climate of the SCP region is classified as warm Mediterranean, with predominantly winter precipitation (600–1,000 millimetres (mm)) and five to six dry months per year (Beard, 2015).

Graph 3.1 presents monthly precipitation totals and monthly maximum temperature statistics prior to the 2024 survey, as well as long-term average monthly precipitation and maximum temperature data recorded at Bureau of Meteorology (BoM) Jandakot Aero station (station number: 9172; data from 1972–2024) (BoM, 2024). The rainfall received in the wetter months prior to the field survey (May to August 2024) was above the long-term average (623.4 mm compared to 557.4 mm respectively); however, the rainfall received in spring 2024, was below the long term average (109.2 mm received from September to November 2024, compared to the long-term average of 155.5 mm). Prior to the field survey the mean monthly maximum temperatures recorded in 2024 (January–November) were consistently above the long-term average.



Graph 3.1 Temperature and Precipitation for Jandakot Aero (BoM, 2024)

Soil landscape mapping has been compiled across South-West WA by the Department of Primary Industries and Regional Development (DPIRD) (2022), with the mapping based on compilation of a variety of soil and soil-landscape surveys. The Study Area occurs overs one soil landscape system; the Spearwood System, which in the Study Area consists of two soil landscape units as described below:

- Spearwood S2a Phase: Lower slopes (1–5%) of dune ridge with moderately deep to deep siliceous yellow-brown sands or pale sands with yellow-brown subsoils and minor limestone outcrop.
- Spearwood S3 Phase: Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow-brown sands.

The vegetation of WA as it was presumed to have existed prior to European settlement has been mapped at a scale of 1:250,000 as vegetation system associations (VSAs), with the Pre-European Vegetation spatial database created (Beard et al., 2013; DPIRD, 2019). The Study Area occurs across a single VSA, being Spearwood_998, described as medium woodland; tuart. This VSA has 36.6% of its pre-European extent remaining and 13.7% of the current extent in conservation reserves (DBCA, 2019).

3.1.2 Honeymyrtle Shrubland on Limestone Ridges of the Swan Coastal Plain Bioregion - Commonwealth Listed TEC

The federally listed Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Critically endangered) TEC is described in the Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (DCCEEW, 2023a). The conservation advice (DCCEEW, 2023a) provides the following broad description of the TEC:

> The Honeymyrtle shrubland, described in this Conservation Advice, is the assemblage of plants, animals and other organisms associated with a type of warm temperate shrubland or heath, dominated by *Melaleuca huegelii* (chenille honeymyrtle), *M. systena* (coastal honeymyrtle), and/or *Banksia sessilis* (parrot bush).
>
> It occurs only in southwest Western Australia (WA). It is known from a small number of locations in the Swan Coastal Plain IBRA1 Bioregion (SWA). It is a shrub-dominated ecological community, with sclerophyll shrubs forming thickets or heaths, above a typically diverse ground layer of herbs, including sedges, Restionaceae and occasional grasses. Honeymyrtle shrubland only occurs on the slopes and tops of limestone ridges on the Swan Coastal Plain. Its plants provide food for a variety of nectar-, seed- and fruit-eating birds, and browsing for mammals. The associated rocky and sandy substrates provide ample reptile basking sites, and the shrub layer gives them cover.

Further information on the specific shrub species and herbaceous ground layer species provided in sections 1.2.2.2.1 and 1.2.2.2.2 of the conservation advice.

The conservation advice also outlines the key diagnostic characteristics for the TEC, in section 2.1 of the document. The specific diagnostics are listed and addressed with respect to the Survey Area in **Section 3.2**.

Section 2.2 of DCCEEW (2023a) outlines patch requirements for the TEC. The main points outlined are:

- The minimum patch size for the TEC is 0.01 ha.
- Allowances are made for ‘breaks’ of up to 30 m between areas that meet the key diagnostic characteristics.
- Variation, in cover, condition or composition of vegetation across a patch is not evidence of multiple patches, as long as the patch as a whole meets the key diagnostic characteristics.

- A buffer zone is intended to help protect and manage areas of the TEC. The recommended minimum buffer zone for the TEC is at least 200 m from the outer edge of a patch if the zone is native vegetation, or 100 m for other adjacent areas. However, the appropriate size depends on the nature of the buffer and local context.
- Restored (including reconstructed) areas and regrowth, are part of this nationally defined ecological community, as long as they meet the key diagnostic characteristics.

3.1.3 *Melaleuca huegelii – M. systena* Shrublands of Limestone Ridges (Floristic Community Type 26a as Originally Described in Gibson et al. 1994) - State Listed TEC

As previously stated, the federally listed Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Critically endangered) TEC is equivalent to the state (BC Act) listed *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges (Critically endangered) TEC.

The DCCEEW Approved Conservation Advice for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion states:

> "…this ecological community corresponds to the Critically Endangered WA Threatened Ecological Community '*Melaleuca huegelii – M. systena* shrublands of limestone ridges (floristic community type 26a as originally described in Gibson et al. 1994)' that is on the WA environmentally sensitive area list."

The *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges (Swan Coastal Plain Community type 26a - Gibson et al. 1994) Interim Recovery Plan for the State TEC (Luu & English, 2005) provides the following description for the TEC:

> Species rich thickets, heaths or scrubs dominated by *Melaleuca huegelii*, *M. systena* (previously *M. acerosa*), *Dryandra sessilis* over *Grevillea preissii*, *Acacia lasiocarpa* and *Spyridium globulosum*, occurring on skeletal soil on ridge slopes and ridge tops (community 26a as described by Gibson et al. 1994).

The interim recovery plan also describes the habitat requirements for FCT 26a as occurring on skeletal soil on ridge slopes and ridge tops, known from massive limestone ridges around Yanchep and near Lake Clifton, while FCT 26b (not a TEC) is found on the lower slopes or in pockets with deeper soil.

The occurrence of the TEC within the Study Area is referenced in the interim recovery plan, listed as Occurrence 75, and described as degraded and appearing to have been heavily grazed historically, with the land managers intending to rehabilitate the area by using methods that include replanting and weed control (S. Sandover1 personal communication) (Luu & English, 2005).

A total of 11 Gibson et al. (1994) quadrats were identified as FCT 26a, with these quadrats averaging 50.2 species, eight of which are weeds species (note that the Gibson et. al. (1994) report doesn't clearly state if the mean species richness includes weeds, but in the absence of further information, it is assumed that is the case).

3.1.4 Biota Survey Review

The Biota (2024) survey covered an area of 220.99 ha; however the assessment included data from other recent Biota surveys over a larger area.

The vegetation of the Study Area was mapped as vegetation units B5 and E1, with part of B5 considered to represent the state-listed *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges TEC and the federally listed Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion TEC.

Vegetation unit B5 was described from three Biota quadrats (ANK15, WTP05 and WTP41) as per the description below:

> *Banksia sessilis* var. *cygnorum* (*Melaleuca huegelii* subsp. *huegelii*) tall open shrubland over *Melaleuca systena* scattered shrubs over **Ehrharta longiflora*, **E. calycina*, **Bromus diandrus*, **Avena barbata* bunched grassland over **Trifolium campestre* var. *campestre*, **Euphorbia terracina*, **E. peplus*, **Sonchus oleraceus* open herbland.

The TEC was described as Degraded on the north side of Anketell Road and Good condition on the south side of Anketell Road in Section 4.1.10 of Biota (2024). Statistical analysis of quadrats within the mapped area of the TEC, grouped quadrats WTP05 and WTP41 with FCT 24 and quadrat ANK15 with FCT 30b. The Biota quadrats assessed in the areas mapped as vegetation unit B5 (the TEC) in Good condition, had significantly less native taxa and a much larger number of weed taxa than the averages presented in Appendix 1 of Gibson et al. (1994) for FCT 26a. Therefore, while statistical analysis may provide some insight into the FCT which the quadrats may represent, the final determination of an FCT which was not identified from the analyses (i.e. FCT 26b), is relatively probable given the condition of the vegetation.

Regardless of the FCT analyses results, Biota (2024) provide detailed justification for the vegetation being mapped as both the Commonwealth-listed state-listed Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion TEC and the State-listed *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges TEC, mapping two patches of the TEC, covering a total area of 1.96 ha. This included addressing the diagnostic characteristics patch requirements presented in DCCEEW (2023a), and also addressing text from the interim recovery plan for the TEC (Luu & English, 2005) as presented in Table 4.13 of the Biota (2024) report.

Section 4.6.1.3 of Biota (2024) provided an assessment of the three quadrats and associated mapping against the key diagnostics for the TEC outlined in in DCCEEW (2023a), indicating that the two mapped patches meet the diagnostic criteria. However, review of the data recorded for the three quadrats indicates that all three quadrats are heavily dominated by introduced taxa, with the majority of native taxa consisting of perennial shrub taxa, as listed below:

- WTP05 – 22 taxa recorded, including 3 native taxa (*Banksia sessilis* var. *cygnorum*, *Caladenia latifolia*, *Caladenia reptans* subsp. *reptans*) 19 introduced taxa
- WTP41 – 22 taxa recorded, including 3 native taxa (*Dianella revolu*ta var. *revoluta*, *Melaleuca huegelii* subsp. *huegelii*, *Melaleuca systena*) and 19 introduced taxa
- ANK15 – 40 taxa recorded, including 11 native taxa (*Acacia rostellifera*, Asteraceae sp., *Banksia sessilis*, *Clematis linearifolia*, *Dianella revoluta* var. *revoluta*, *Grevillea vestita* subsp. *vestita*, *Hardenbergia comptoniana*, *Hibbertia hypericoides*, *Lepidosperma calcicola*, *Melaleuca huegelii* subsp. *huegelii*, *Thysanotus manglesianus*) and 29 introduced taxa:

Therefore, the quadrat data indicates that the vegetation does not meet diagnostic 1.2.2.2.2 as outlined in DCCEEW (2023a) and listed below:

> The ground layer typically has numerous herbs, including orchids and lilies, and may develop a mossy ground cover (Gibson et al. 1994; Keighery et al. 2003; WA DBCA 2022). Typical species include: *Crassula colorata* (dense stonecrop), *Daucus glochidiatus* (Australian carrot), *Desmocladus flexuosus*, *Eriochilus dilatatus* (white bunny orchid), *Millotia tenuifolia* (soft millotia), *Phyllangium paradoxum* (wiry mitrewort), *Thysanotus manglesianus* (fringed lily), T*. patersonii* (fringed lily) and *Trachymene pilosa* (native parsnip). Other, common ground layer species include: *Hydrocotyle hispidula* (fire pennywort), *Opercularia vaginata* (dog weed), *Parietaria debilis* (pellitory), *Pterostylis pyramidalis* (snail orchid) and *Wurmbea monantha* (a lily).
>
> Honeymyrtle shrubland typically includes the grass *Austrostipa flavescens* (coast spear-grass); and commonly includes *Rytidosperma occidentale* (a wallaby grass) and *A. compressa* (compact needlegrass), which is most obvious following fire.

Diagnostic 2.2.1.4 states that restored (including reconstructed) areas and regrowth, are part of this nationally defined ecological community, as long as they meet the Key diagnostic characteristics (DCCEEW, 2023a), with this key diagnostic implying that the three diagnostic criteria relating to vegetation structure do not necessarily need to be met (although this is not stated clearly in the conservation advice):

> The structure and diversity of Honeymyrtle shrubland may be altered by recent disturbances (e.g. fire may damage or remove above-ground cover and stems) and cause a shift to a regenerative state. Under these circumstances the loss is likely to be a temporary phenomenon if natural regeneration is not disrupted. Recovering/ regenerating areas are still included in the nationally protected ecological community. See **Section 2.2.2** Survey requirements.

The DCCEEW (2023a) survey requirements section states the following with respect to disturbance:

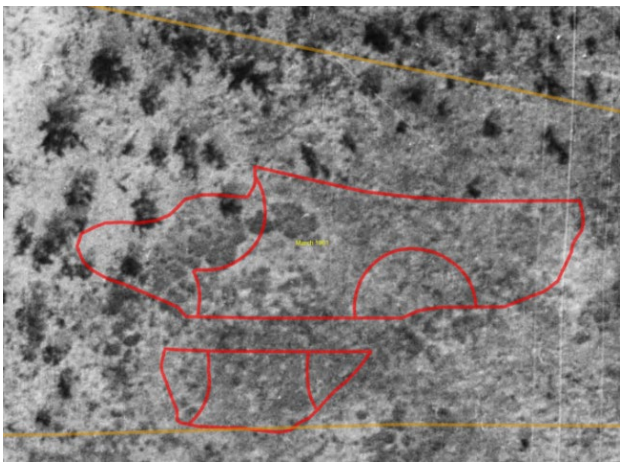
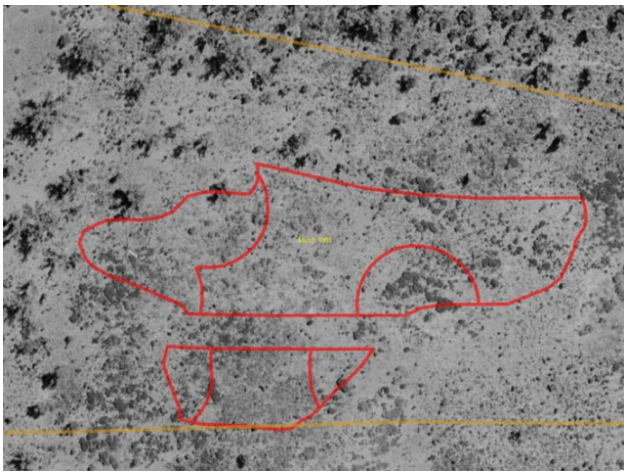
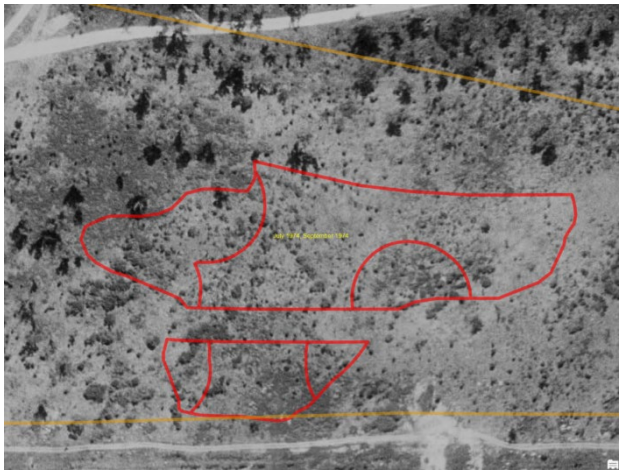
> Surveys should be delayed until there has been opportunity for regeneration (ideally at least two years after the disturbance event (natural or human-induced), and at least two months after adequate rainfall to initiate some recovery). During this recovery period, all patches 0.01 ha or larger that were previously identified, or likely to have been identified, as Honeymyrtle shrubland, are considered to be part of the nationally protected ecological community.

Therefore, assessment of the of Biota (2024) quadrat data / mapping against the DCCEEW (2023a) conservation advice indicates that Biota have assumed that, despite the significantly impacted ground layer of this vegetation community as recorded in the quadrats, it could represent the TEC on the basis that the site has been subject to recent disturbance, but has had a minimum of two years to recover.

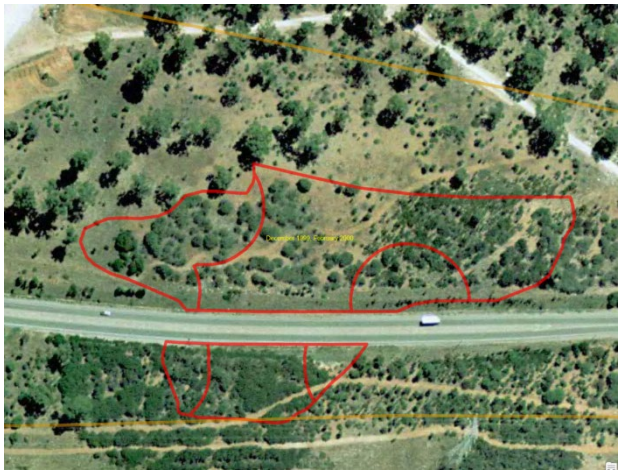
3.1.5 Review of Historical Aerial Imagery

Main Roads provided historical aerial imagery of the Biota (2024) mapped extent of the TEC, to provide context for the site history in terms of previous and recent disturbances. The imagery dates from March 1961 to January 2024, including 28 images in total. Interpretation of imagery was somewhat limited by the quality of historical imagery in comparison to more recent imagery, with imagery from 1961 to 1979 being black and white, and image clarity generally improving over time. However, it is evident that the area was largely cleared (likely for agriculture) prior to when the first images were provided in March 1961, and that significant regrowth has occurred from 1961 to 2021, with relatively minimal regrowth occurring from 2021 to 2024. A subset of aerial imagery displaying the level of previous site impacts is provided in **Table 3.1**.

Table 3.1 Subset of Historical Aerial Imagery with Biota (2024) Mapped Extent of the TEC

Comments	Aerial Imagery
• Aerial photography dated March 1961 • Image indicates high level of historical clearing over much of the potential TEC occurrence	 **Photo 3.1 Aerial Image - 1961**
• Aerial photography dated March 1965 • Image clearer than 1961, indicates high intensity of historical clearing over much of the potential TEC occurrence	 **Photo 3.2 Aerial Image - 1965**
• Aerial photography dated July/September 1974 • Indicates high level of historical clearing over much of the potential TEC occurrence, limited regrowth evident	 **Photo 3.3 Aerial Image - 1974**

Comments	Aerial Imagery
• Aerial photography dated June/August 1981 • First colour image, clearly indicates the presence of an upper storey or shrub layer over part of the area, with a limited understorey	 **Photo 3.4 Aerial Image - 1981**
• Aerial photography dated April/June 1985 • Image displays high clarity, clearly indicates similar foliage cover to aerial imagery from 1981	 **Photo 3.5 Aerial Image - 1985**
• Aerial photography dated January/February 1995 • Image indicates regrowth of vegetation in southern polygon in comparison to aerial imagery from 1985, little to no change in foliage cover evident in northern polygon	 **Photo 3.6 Aerial Image - 1995**

Comments	Aerial Imagery
• Aerial photography dated December 1999/January 2000 • Image indicates regrowth of vegetation in southern polygon, and to east of southern polygon in comparison to aerial imagery from 1995, regrowth also evident in northern polygon • Tracks through northern polygon evident • Anketell road now present	 **Photo 3.7 Aerial Image – 1999/2000**
• Aerial photography dated 2003 • Image relatively minimal change in foliage cover in comparison to aerial imagery from 1999/2000 • Access road to the north of the northern polygon and clearing to the north now evident	 **Photo 3.8 Aerial Image - 2003**
• Aerial photography dated February/April 2010 • Image indicates regrowth and/or potential restoration in both the northern and southern polygons in comparison to aerial imagery from 2003 • Additional clearing to the north now evident	 **Photo 3.9 Aerial Image - 2010**

Comments	Aerial Imagery
• Aerial photography dated September 2012 • Image indicates regrowth in the southern polygon in comparison to aerial imagery from 2003, with track through polygon no longer evident, no significant change evident in northern polygon	 **Photo 3.10 Aerial Image - 2012**
• Aerial photography dated September/October 2021 • Image indicates some regrowth in both the northern and southern polygons in comparison to aerial imagery from 2012, with regrowth occurring over the track through the northern polygon	 **Photo 3.11 Aerial Image - 2021**
• Aerial photography dated August 2023 • Image indicates relatively minimal regrowth in comparison to aerial imagery from 2021	 **Photo 3.12 Aerial Image - 2023**

Comments	Aerial Imagery
• Aerial photography dated January 2024 • Image indicates relatively minimal regrowth in comparison to aerial imagery from 2023	

Photo 3.13 Aerial Image - 2024

3.2 Field Survey Results

3.2.1 Vegetation Types

The vegetation, soils and landforms recorded via mapping notes were qualitatively assessed against the diagnostics and descriptions provided in the Commonwealth conservation advice and State interim recovery plan for the TEC (DCCEEW, 2023a; Luu & English, 2005).

This assessment indicated two subsets of vegetation types (VTs) present in the Study Area may have previously represented the TEC as described in **Table 3.2** and presented on **Figure 3.1**:

1. There was a relictual lower herbaceous ground layer evident at two small occurrences of the VT subset 1 areas (<10 m^2); however, the taxa were unidentifiable as they had senesced. This was potentially due to the timing of the survey (late November) combined with the above average temperatures and below average rainfall received for spring 2024 (see **Section 3.1.1**).

2. The herbaceous ground layer was generally absent from occurrences of VT subset 2. The occurrence of VT Subset 2 on the southern side of Anketell Road also had areas of significant regrowth of *Acacia rostellifera* which comprised the dominant vegetation cover.

The vegetation in the remainder of the Study Area was not identified as potentially representing the TEC based on the field assessment.

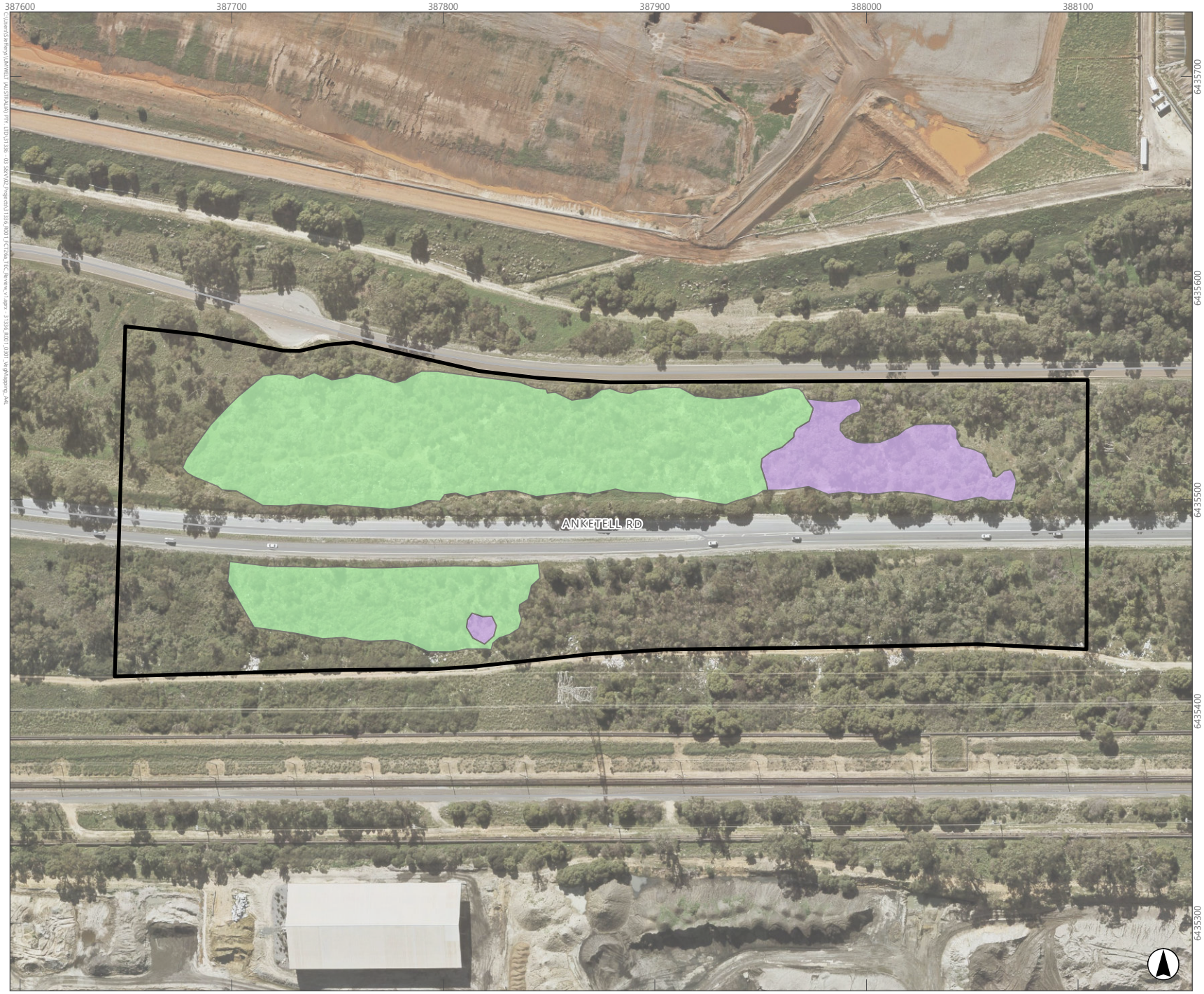
Vegetation type boundaries have been inferred from visible soil characteristics and remnant plant taxa presence and distribution, however given the intensive disturbance of the site any identified boundaries are to be viewed as indicative only.

Table 3.2 TEC Categories Described in the Study Area

VT Subset	Description	Photograph
1	**Vegetation:** Mid to tall shrubland of *Melaleuca huegelii* and *Banksia sessilis* over mid sparse shrubland of *Melaleuca systena* (planted) over mid tussock grassland of *Ehrharta calycina* and *Avena* sp. over low sparse forbland (unidentifiable senesced herbs). **Substrate:** Skeletal red-brown sandy loam or sand with limestone outcropping and/or on limestone ridges **Landform:** Upper slopes to crests **Area mapped:** 0.34 ha	 **Photo 3.14 VT Subset 1 - Mapping Note AR-12**
2	**Vegetation:** Mid to tall shrubland of *Melaleuca huegelii* and *Banksia sessilis* over mid sparse shrubland of *Melaleuca systena* (planted) over mid tussock grassland to closed tussock grassland of *Ehrharta calycina* and *Avena* sp. **Substrate:** Shallow- deep red-brown sandy loam or sand with limestone rocks or occasional limestone outcropping **Landform:** Mid to upper slopes **Area mapped:** 1.92 ha	 **Photo 3.15 VT Subset 2 - Mapping Note AR-03**

FIGURE 3.1

Vegetation Mapping of the Study Area



Legend

- Study Area
- Road

Vegetation Type

1. Mid to tall shrubland of *Melaleuca huegelii* and *Banksia sessilis* over mid sparse shrubland of *Melaleuca systena* (planted) over mid tussock grassland of *Ehrharta calycina* and *Avena* sp. over low sparse forbland (unidentifiable senesced herbs)
2. Mid to tall shrubland of *Melaleuca huegelii* and *Banksia sessilis* over mid sparse shrubland of *Melaleuca systena* (planted) over mid tussock grassland to closed tussock grassland of *Ehrharta calycina* and *Avena* sp.

0 50 100

Metres

Scale 1:2,500 at A4
GDA2020 MGA Zone 50

Image Source: Landgate (2024) | **Data Source:** Landgate (2024), Biota (2024), MRWA (2024), Umwelt (2025)

3.2.2 Vegetation Condition

The vegetation condition of VT subsets 1 and 2 was mapped as Degraded (total area of 2.3 ha), as per the condition ratings described the EPA Technical Guidance ((EPA, 2016); scale presented in **Appendix A**). The vegetation structure and species richness has been severely impacted by disturbance caused by the presence of aggressive weeds at high density, and previous clearing and grazing. There is evidence of some restoration efforts undertaken in the past including evidence that much of the *Melaleuca huegelii* and *Melaleuca systena* individuals have been planted (**Photo 3.16**). As mentioned in **Section 3.1.3**, the condition of the TEC occurrence in the Study Area is described in the interim recovery plan for the TEC, described as degraded and appearing to have been heavily grazed historically, with the land managers intending to rehabilitate the area by using methods that include replanting and weed control (S. Sandover1 personal communication) (Luu & English, 2005). However, it does not appear that restoration efforts have been ongoing, with no recent plantings or weed control evident.

Photo 3.16 Plant Guards Indicating Previous Evidence of Restoration and Planting

3.3 Assessment of Vegetation Against the TEC Diagnostics

The two subsets of vegetation types (VTs) described in the Study Area which may have previously represented the TEC were assessed against the diagnostic criteria presented in the conservation advice for the TEC as outlined in **Table 3.3**.

Overall, the vegetation of VT Subset 1 and 2 do not meet the required characteristics for the TEC in their current form, and likely did not meet the requirements when it was registered as a site of SCP 26a in the Interim Recovery Plan for the community (Luu & English, 2005) based on the site condition listed as Degraded. The interim recovery plan listed several sites that were totally degraded and identified potential original areas of occupation based on soil characteristics and other local occurrences. Given its condition as Degraded in the Interim Recovery Plan, it is possible that the site was registered at that time as a potential recovery site considering the site was under the control of Alcoa of Australia who had agreed to undertake recovery actions. However, as evident in the historical aerial imagery (**Section 3.1.5**) and supported by field survey observations, the disturbances are not recent, and the area is not within a state of recovery or regeneration, with a lack of ongoing restoration efforts apparent. The assessment indicates that VT Subset 1 likely represented the TEC prior to historical disturbance, and VT Subset 2 possibly represented the TEC prior to disturbance based on landform, soils and relictual native species presence; however, neither VT Subset represents the TEC now based on the current diagnostic criteria and given that the vegetation condition is not suitable to support a floristic analysis as required by the DBCA.

Table 3.3 Assessment of Site Against Diagnostic Characteristics Described in DCCEEW (2023a)

Characteristic	Assessment of VT Subset 1	Assessment of VT Subset 2
It occurs in the Perth subregion of the Swan Coastal Plain IBRA9 Bioregion in WA	Meets Characteristic	Meets Characteristic
It occurs on shallow to skeletal soils, on the ridge slopes and tops of limestone ridges and outcrops associated with Tamala Limestone	Generally, meets characteristic. VT Subset 1 has skeletal soils* on the small crests tending to shallow soils. History of soil disturbance through land clearing and preparation for grazing has obscured the surface soil development and original species distribution patterns – soil studies would be required to map shallow and skeletal soils across the site.	Generally, does not meet characteristic. VT Subset 2 has limited shallow soils, with soils generally mosaicking with deeper materials on the slopes. As per VT Subset 1, the history of soil disturbance has obscured the surface soil development and original species distribution patterns, with soil studies required to map shallow and skeletal soils across the site.
It occurs as shrubland, heath, or thickets; and it has less than 10% canopy cover of *Eucalyptus* species or other tall trees	Generally meets characteristic. Native vegetation cover is discontinuous across the site and largely comprised of planted tall shrub layer (*Melaleuca huegelii*) with regenerated *Banksia sessilis*. *Eucalyptus gomphocephala* are present around the site, many of which may have been planted. However, these are restricted largely to the sides and lower slopes of this small limestone rise.	Generally meets characteristic. Native vegetation cover is discontinuous across the site and largely comprised of planted tall shrub layer (*Melaleuca huegelii*) with regenerated *Banksia sessilis* and some remnant *Xanthorrhoea preissii*. *Eucalyptus gomphocephala* are present around the site many of which may have been planted however these are restricted largely to the sides and lower slopes of this small limestone rise.

Characteristic	Assessment of VT Subset 1	Assessment of VT Subset 2
The shrub layer is dominated by *Melaleuca huegelii* (chenille honeymyrtle), and/or *M. systena* (coastal honeymyrtle), and/or *Banksia sessilis* (parrot bush) — commonly over *Acacia lasiocarpa* (pajang), *Grevillea preissii* (spider net grevillea) and *Spyridium globulosum* (basket bush)	Partially meets characteristic. VT Subset 1 is largely dominated by *Melaleuca huegelii*, *Banksia sessilis.*	Partially meets characteristic. VT Subset 2 is largely dominated by *Melaleuca huegelii*, with other areas dominated by *Banksia sessilis* regrowth, as well as the presence of *M. systena* in the lower stratum which appears to be mostly planted.
The ground layer is typically rich with numerous herbs (including grasses) and smaller shrubs and may develop a mossy ground cover	Two small areas of approximately 10 m^2 each were observed that somewhat meet this characteristic, with limited areas of possibly original herbs identified on small crest areas on skeletal soil.	VT Subset 2 doesn't meet characteristic. Generally, no understorey was present due to historical clearing and grazing, with introduced grasses dominant.
The structure and diversity of Honeymyrtle shrubland may be altered by recent disturbances (e.g. fire may damage or remove above-ground cover and stems) and cause a shift to a regenerative state. Under these circumstances the loss is likely to be a temporary phenomenon if natural regeneration is not disrupted. Recovering/ regenerating areas are still included in the nationally protected ecological community	Doesn't meet characteristic. Impacts are old and intensive with little to no unaided recovery present. The disturbance opportunist *B. sessilis* has re-established significant cover over portions of the site.	Doesn't meet characteristic. As per VT Subset 1, impacts are old and intensive with little to no unaided recovery. The disturbance opportunist *B. sessilis* has re-established significant cover over portions of the site.

**Skeletal soils are shallow soils that contain 35% or more of rock fragments, cobbles, gravel, and concretions or outcrop. Shallow soils are generally those that are less than 50 cm deep over an impeding layer or basement material.*

4.0 Conclusion

This assessment has determined that the vegetation of the Study Area does not support the federally listed Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Critically endangered) TEC or the state (BC Act) listed *Melaleuca huegelii – Melaleuca systena* shrublands of limestone ridges (Swan Coastal Plain Community type 26a - Gibson et al. 1994) (Critically endangered) TEC, in its current state.

The assessment identified that a portion of the site is likely to have historically hosted the community, with some areas having a higher likelihood to have previously represented the TEC (0.34 ha mapped as VT Subset 1, characterised by skeletal soils with limestone outcropping) than others (1.92 ha mapped as VT Subset 2, characterised by shallower to deeper soils with limestone rocks and cobbles).

The vegetation of the site is classified as Degraded due to a loss of vegetation structure and species diversity, with the vegetation impacted by previous clearing, grazing and displaying a high cover of aggressive weed species.

The site is narrow and bounded by Anketell Road, Alcoa's Waste Residue Facility and a power line, significantly influencing its potential to be sustainable in the long term. Historical aerial imagery and available information on the site history indicates that the vegetation may have undergone regrowth and regeneration in the past (aided by restoration effort); however, there is no evidence of recent regeneration, and given the site has had many years to regenerate following the initial disturbance event, it is unlikely to regenerate in future in the absence of intensive ongoing management.

5.0 References

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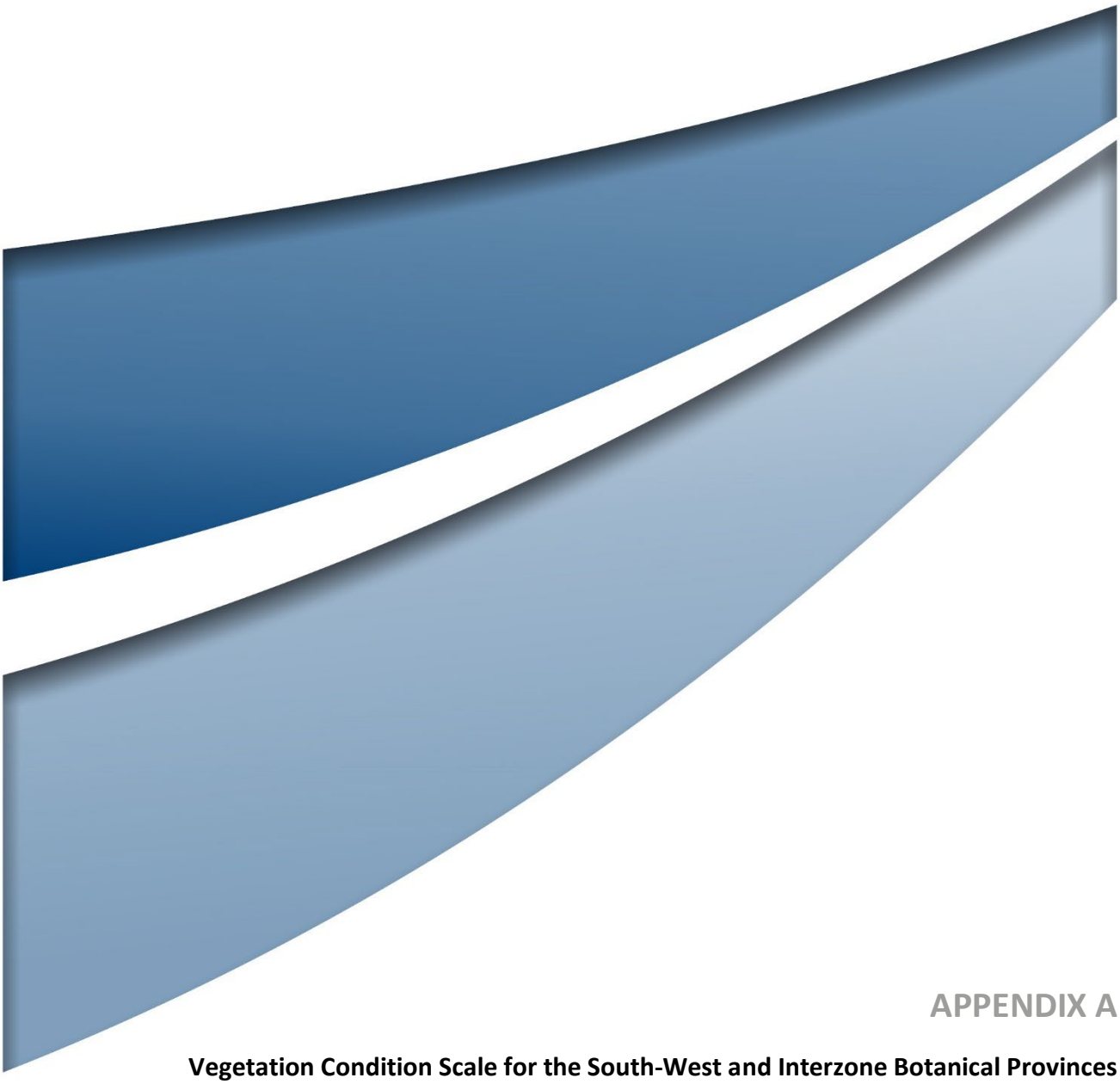
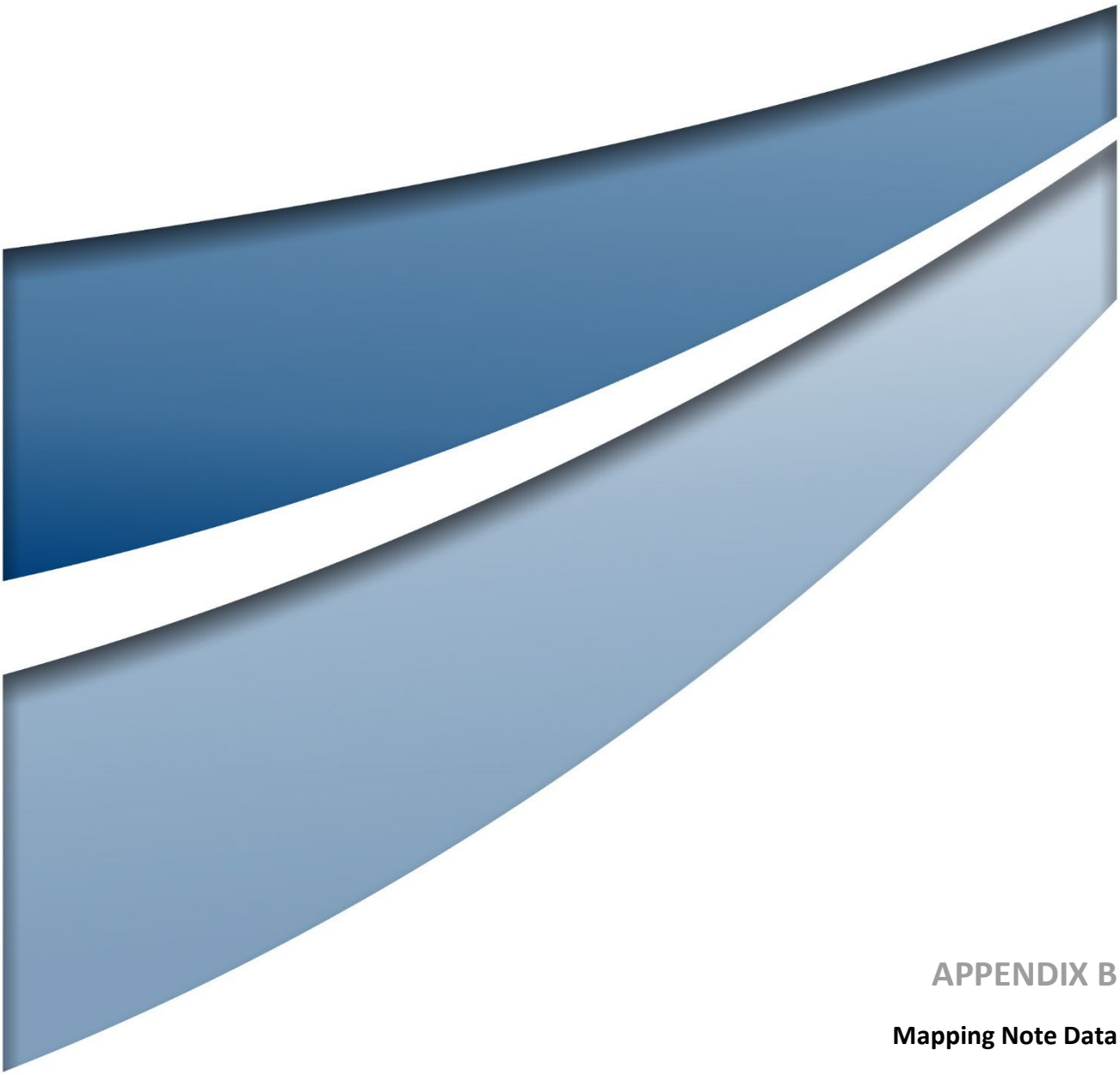


APPENDIX A

Vegetation Condition Scale for the South-West and Interzone Botanical Provinces (EPA, 2016)

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



APPENDIX B

Mapping Note Data

Site Name:	AR-01
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387676E 6435546N
CF Types:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded

SPECIES LIST

Taxon Name
Acacia rostellifera
**Avena* sp.
**Ehrharta calycina*
**Gomphocarpus fruticosus*
Melaleuca huegelii

PHOTO

Site Name:	AR-02
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387688E 6435524N
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Grazing, Clearing, Weeds
Comments:	Previous planting of Melaleuca huegelii. Site disturbance (earthworks) evident. Occasional large limestone rocks

SPECIES LIST

Taxon Name
Acacia rostellifera
**Ehrharta calycina*
Melaleuca huegelii

PHOTO

Site Name:	AR-03
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387730E 6435523N
CF Types:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded

SPECIES LIST

Taxon Name
**Ehrharta calycina*
**Euphorbia terracina*
Melaleuca huegelii
Melaleuca systena

PHOTO

Site Name:	AR-04
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387757E 6435515N
Landform Type:	Upper Slope
Soil Type:	Sandy Loam
Soil Colour:	Brown
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds, Animal
Comments:	Occasional large limestone rocks

SPECIES LIST

Taxon Name
Acacia rostellifera
**Asparagus asparagoides*
Banksia sessilis
Clematis linearifolia
**Euphorbia terracina*
Melaleuca huegelii
Melaleuca systena

PHOTO

Site Name:	AR-05
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387827E 6435546N
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds
Comments:	History of soil disturbance. Some surface limestone rocks. Weeds form dominant understorey.

SPECIES LIST

Taxon Name
Banksia sessilis
Macrozamia ?riedlei
Xanthorrhoea preissii

PHOTO

Site Name:	AR-06
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387835E 6435532N
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Soil Depth:	Deep
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds, Animal - Rabbits
Comments:	Occasional large limestone rocks

SPECIES LIST

Taxon Name
Banksia sessilis
**Ehrharta calycina*
**Euphorbia terracina*
Xanthorrhoea preissii

PHOTOS

Site Name:	AR-07
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387860E 6435519N
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds
Comments:	Occasional large limestone rocks

SPECIES LIST

Taxon Name
Banksia sessilis
**Ehrharta calycina*
Hibbertia hypericoides
Melaleuca huegelii
Xanthorrhoea preissii

PHOTO

Site Name:	AR-08
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387923E 6435502N
Landform Type:	Crest
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds
Comments:	Occasional limestone rocks

SPECIES LIST

Taxon Name
Banksia sessilis
Eucalyptus gomphocephala
Rhagodia preissii
Xanthorrhoea preissii

PHOTOS

Site Name:	AR-09
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387929E 6435504N
Landform Type:	Crest
Soil Type:	Sandy Loam
Soil Depth:	Skeletal
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded

SPECIES LIST

Taxon Name
Banksia sessilis
Clematis linearifolia
Hardenbergia comptoniana
Melaleuca huegelii

PHOTO

Site Name:	AR-10
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387958E 6435512N
Landform Type:	Upper Slope
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Soil Depth:	Skeletal
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds

SPECIES LIST

Unidentifiable senesced herbs species

PHOTO

Site Name:	AR-11
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387973E 6435534N
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Soil Depth:	Skeletal
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds

SPECIES LIST

Taxon Name
Banksia sessilis
Clematis linearifolia
Hibbertia hypericoides
Melaleuca huegelii

PHOTO

Site Name:	AR-12
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387995E 6435542N
Landform Type:	Ridge
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds

SPECIES LIST

Taxon Name
**Avena* sp.
Banksia sessilis
Melaleuca huegelii
Xanthorrhoea preissii

PHOTO

Site Name:	AR-13
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 388018E 6435533N
Landform Type:	Lower Slope
Soil Type:	Sandy Loam
Soil Colour:	Red-Brown
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded

SPECIES LIST

Taxon Name
Acacia xanthina
Clematis linearifolia
Eucalyptus gomphocephala
Rhagodia preissii

PHOTO

Site Name:	AR-14
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 388031E 6435524N
Landform Type:	Lower Slope
Soil Type:	Sandy Loam
Soil Colour:	Grey-brown (other)
Soil Depth:	Skeletal
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds
Comments:	Topography drops to the east

SPECIES LIST

Taxon Name
**Avena* sp.
Banksia sessilis
Melaleuca huegelii
Melaleuca systena

PHOTO

Site Name:	AR-15
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387748E 6435452N
Landform Type:	Upper Slope
Soil Type:	Sandy Loam
Soil Colour:	Brown
Soil Depth:	Deep
Rock Outcrop:	Limestone, <2% bedrock exposed
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds

SPECIES LIST

Taxon Name
Acacia rostellifera
Acacia saligna
**Avena* sp.
Banksia sessilis
Clematis linearifolia
**Ehrharta calycina*
**Gomphocarpus fruticosus*
Grevillea sp.
Hardenbergia comptoniana
Hibbertia hypericoides
Macrozamia ?riedlei
Melaleuca huegelii

PHOTO

Site Name:	AR-16
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387779E 6435454N
Landform Type:	Upper Slope
Soil Type:	Sandy Loam
Soil Colour:	Brown
Soil Depth:	Deep
Rock Outcrop:	Limestone
Disturbance:	Clearing, Weeds

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
Acacia rostellifera		
Banksia sessilis		
Clematis linearifolia		
Dianella revoluta		
**Ehrharta calycina*		
Thysanotus ?patersonii		
Xanthorrhoea preissii		

PHOTOS

Site Name:	AR-17
Site Type:	MAPPING_NOTE
Survey Date:	21/11/2024
GPS Location:	GDA2020 Zone 50 387822E 6435438N
Landform Type:	Crest
Soil Type:	Sandy Loam
Soil Colour:	Brown
Soil Depth:	Shallow
Rock Outcrop:	Limestone
Vegetation Condition:	Southern Vegetation Condition - 5 - Degraded
Disturbance:	Clearing, Weeds
Comments:	Area of 10 m x 10 m of skeletal sand. A native herb layer is present, however, weed grass species dominate.

SPECIES LIST

Taxon Name	Avg. Height	Cover Alive
**Avena* sp.		
Banksia sessilis		
Eucalyptus gomphocephala		
**Euphorbia terracina*		
Melaleuca huegelii		

PHOTOS

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