

Environmental Assessment Report

10 (Lot 500) Lampiter Drive, Mardella

Project No: EP23-004(01)

**Prepared for the Shire of Serpentine Jarrahdale
June 2023**

Environmental Assessment Report

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Executive Summary

The Shire of Serpentine Jarrahdale (SoSJ) (referred to as ‘the Shire’) is exploring options to progress a range of development opportunities within 10 (Lot 500) Lampiter Drive, Mardella. This has included consideration of immediately surrounding areas for road access, which along with Lot 500 is collectively referred to herein as ‘the site’. The location and extent of the site is shown in **Figure 1**. The site is approximately 55 ha and situated 40 km south-east of the Perth central business district, within the Shire of Serpentine Jarrahdale.

The site is mostly reserved for ‘parks and recreation’ under the Metropolitan Region Scheme (MRS) and not designated under the Shire of Serpentine Jarrahdale’s Town Planning Scheme No. 2 (TPS). The site comprises two distinct portions, the northern portion with intact remnant vegetation and the southern portion (Lot 500) which has been subject to historical clearing and ongoing rural land uses and currently supports pasture grasses with limited intact vegetation.

The Shire is considering potential commercial development within the site including a Shire operations facility/depot, a Department of Fire and Emergency Services (DFES) training facility and a roadhouse. The site is located south-west of the Mundijong-Whitby District Structure Plan (DPS) area which is identified as a significant future residential and commercial growth area. In addition the land to the north of the site has been identified for industrial development, as guided by the West Mundijong Industrial Area Structure Plan (SoSJ 2022). The site is also adjacent to the future Tonkin Highway extension proposed east of the site.

The purpose of this Environmental Assessment Report (EAR) is to identify environmental values and considerations that would be relevant for any potential future development within the site. This includes reviewing relevant publicly available datasets and databases to identify environmentally significant flora and vegetation, ecological communities, fauna and habitat protected areas and significant wetland features that may affect the proposed development, in addition to undertaking a site visit and investigations to validate the publicly available information.

The environmental attributes and values relevant to the site are summarised below and include:

- **Topography:** The topographic contours indicate that the site decreases in slope from east to west and ranges from 25 m Australian Height Datum (m AHD) in the eastern extents to 20m AHD in the western extents.
- **Acid Sulfate Soils (ASS):** Available regional mapping has identified the entirety of the site as having ‘moderate to low risk’ of ASS occurring within 3 m of the natural soil surface.
- **Site observations and vegetation condition:** The portion of intact remnant vegetation within the northern portion of the site contains vegetation in ‘excellent to very good’ and ‘very good to good’ conditions based on the Keighery scale. Vegetation observed within the southern portion of the site is considered to be in ‘degraded’ or lesser condition. Site observations completed on site would indicate that should conservation significant values (such as threatened or priority flora and fauna) be present, these will be largely restricted to the better-quality vegetation in the northern portion of the site.

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- Conservation significant flora:** Database search results identified a total of 50 conservation significant flora species as occurring or potentially occurring with 10 km of the site. Of the 50 species of conservation significance identified, 10 threatened and 24 priority flora were classified as having a ‘high’ or ‘moderate’ likelihood of occurrence within the site. The likelihood of these occurring would need to be confirmed through detailed survey and would occur in the northern portion of the site.
- Conservation significant fauna:** A total of 38 conservation significant fauna species were identified from database searches as occurring or potentially occurring within 10 km of the site. These include 17 threatened, 11 priority, eight migratory fauna and two other specially protected species. Of the 38 species of conservation significance identified, 11 were considered to have a ‘high’ or ‘moderate’ likelihood of occurring in the site based on potential habitat and species distributions. Fauna habitat values are highest in the northern portion of the site.
- Regional Ecological Linkages:** One mapped regional ecological linkage (Local Ecological Linkage – Link ID 63) aligns the north border of the site associated with Bush Forever Site 360. It is identified as a 500m corridor which includes some vegetation in the northern portion of the site, but the remainder has been historically cleared and is in a ‘degraded’ or lesser condition. Any ecological linkage functions are likely to be limited to the intact vegetation in the northern portion of the site.
- Threatened Ecological Communities (TECs):** Database search results identified two TECs as occurring within the northern portion of the site ‘herb rich shrublands in clay pans’ and ‘*Corymbia calophylla* - *Kingia australis* woodlands on heavy soils’. These communities are listed as ‘critically endangered’ and ‘endangered’ under the *Environmental Planning and Biodiversity Conservation Act* (EPBC Act) and ‘endangered’ and ‘critically endangered’ in Western Australia. One occurrence of each community is mapped as occurring within the site. The extent of these TECs and any others that could occur would need to be confirmed through detailed survey.
- Bush Forever Site:** Bush Forever Site 360 is situated in the northern portion of the site and contains a range of significant flora and vegetation, fauna, ecological linkage and wetland values.
- Conservation Category Wetland (CCW):** A CCW has been mapped within the northern portion of the site, associated with the intact remnant vegetation.
- Environmentally Sensitive Areas (ESAs):** An ESA is identified in the northern portion of the site relating to the environmental values for conservation significant flora and fauna, TECs, fauna habitat and CCW values. Clearing permit regulation exemptions would not apply within the ESA.

The EAR findings indicate that while any proposed future development within the southern portion of the site (Lot 500) would be relatively unconstrained, there are some considerations associated with buffers to CCW, bushfire setbacks, and addressing native vegetation clearing requirements as it applies to ‘degraded’ and ‘completely degraded’ areas of native vegetation.

Conversely, any proposal to secure road access into the site involving the northern portion of the site is more constrained and would require further consideration. Detailed ecological surveys would be required to fully understand the extent of flora and vegetation, fauna habitat and wetland values within the northern portion of the site which will confirm the extent of these constraints. It is recommended that the Shire explore opportunities to avoid or in the very least minimise any impacts to the values in the northern portion of the site.

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The extent and complexity of environmental approvals will be dictated by the required planning process (i.e. whether amendments to the MRS or TPS are required) and the extent of impacts on significant environmental values. Any impacts to TECs, CCW, threatened flora and/or threatened fauna habitat are likely to require mitigation and offsets to address approval requirements pursuant to the *Environmental Protection Act 1986* (EP Act) and the EPBC Act.

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Abbreviation Tables

Table A1: Abbreviations – General terms

General terms	
AHIS	Aboriginal Heritage Inquiry System
ASS	Acid Sulfate Soils
CCW	Conservation Category Wetland
MUW	Multiple-Use Wetland
EAR	Environmental Assessment Report
ESA	Environmentally Sensitive Area
ha	Hectares
km	Kilometre
LBS	Local Biodiversity Strategy
LPS	Local Planning Scheme
LNA	Local Natural Area
MRS	Metropolitan Region Scheme
MUW	Multiple Use Wetland
m AHD	Metres Australian Height Datum
PDWSA	Public Drinking Water Source Area
PEC	Priority Ecological Community
TEC	Threatened Ecological Community

Table A2: Abbreviations – Legislation

Legislation	
ACH Act	<i>Aboriginal Cultural Heritage Act 2021</i>
AH Act	<i>Aboriginal Heritage Act 1972</i>
EP Act	<i>Environmental Protection Act 1986</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>

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Table A3: Abbreviations – Organisations

Organisations	
Shire	Shire of Serpentine Jarrahdale
DBCA	Department of Biodiversity Conservation and Attractions
DFES	Department of Fire and Emergency Services
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority

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1 Introduction

1.1 Background

The Shire of Serpentine Jarrahdale (SoSJ) (referred to as 'the Shire') is exploring options to progress a range of development opportunities within 10 (Lot 500) Lampiter Drive, Mardella which also includes consideration of some immediately adjacent areas (including a portion of Lot 556), which is collectively referred to herein as 'the site'. The location and extent of the site is shown in **Figure 1**. The site is approximately 55 ha and situated 40 km south-east of the Perth central business district, within the Shire of Serpentine Jarrahdale.

The Shire is considering opportunities for the potential commercial development of the site including a Shire operations facility/depot, a Department of Fire and Emergency Services (DFES) training facility and a roadhouse. The site is located south-west of the Mundijong-Whitby District Structure Plan area which is identified as a significant future residential and commercial growth area. In addition, the land to the north of the site has been identified for industrial development, as guided by the West Mundijong Industrial Area Structure Plan (SoSJ 2022). The site is also adjacent to the future Tonkin Highway extension to the east of the site as shown in **Figure 2**.

The site comprises two distinct areas:

- The 'northern portion', consisting of Lot 556 and an unconstructed portion of an existing road reserve, and is situated between Mundijong Road and Lot 500. The northern portion contains intact native vegetation.
- The 'southern portion' encompasses the entirety of Lot 500 and has been subject to significant disturbance with limited intact vegetation due to historic clearing for agricultural purposes.

Currently access into the site is provided via Lampiter Drive, however given the proposed future industrial development north of the site and traffic access requirements for the proposed uses within the site, it is envisaged that a new site access option off Mundijong Road that also services the industrial area to the north will be explored by the Shire. Given the importance of considering access to the site from Mundijong Road, and the opportunity to combine this with the road access needs for the industrial area to the north, the northern portion has been included as part of the site in addition to Lot 500 for the purposes of the Shire's assessment and consideration.

Given the intention to progress more detailed consideration of development within the site and the associated site access via Mundijong Road, the Shire engaged Emerge Associates to undertake preliminary environmental investigations and prepare an Environmental Assessment Report (EAR) to inform the early considerations around the relevant environmental constraints and opportunities.

1.2 Purpose of this report

The purpose of this EAR is to identify environmental values and considerations that would be relevant for potential commercial development within the site (referred to herein as the 'development proposal').

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This has included reviewing relevant publicly available datasets and databases to identify environmentally significant flora and vegetation, ecological communities, fauna and habitat protected areas and significant wetland features that may affect the development proposal, in addition to undertaking a site visit and investigations to validate the publicly available information.

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2 Desktop Assessment

2.1 Land characteristics and tenure

The site is bounded by Mundijong Road to the north, and rural residential land holdings to the south, east and west as shown in **Figure 2**. A review of historical aerial photography is described below for the northern and southern portions and surrounding area:

- **Northern portion**
 - A review of the historical aerial photography for the northern portion indicates historical clearing circa 1953 likely for agricultural purposes. Circa 1965 vegetation regeneration within the northern portion is evident and continues to regenerate with minimal disturbance up to recent photography circa 2023.
- **Southern portion**
 - The historical aerial photography indicates significant historical clearing before 1953 to enable agricultural land uses. Vegetation regeneration along and adjacent to the eastern boundary is evident circa 1965 and continues to regenerate up to recent aerials.
 - The central portion of the site remains relatively consistent up to circa 2000 with the introduction of a circular track within the central portion of the lot and built agricultural structures within the north-east corner evident up to circa 2023.
- **Surrounding areas**
 - The surrounding areas were cleared prior to 1953 up to circa 2000 where evidence of subdivision for rural residential lots adjacent to the west of the site is apparent.
 - As mentioned prior, the eastern boundary shows evidence of vegetation regeneration circa 1965.
 - Distinct vegetation corridors indicate replanting circa 2000 adjacent to the western and southern boundaries of the site within rural residential lots. These areas are suspected to be replanted with native and non-native species indicated by the uniformity of these vegetation corridors.
 - Further subdivision for rural residential lots is evident within the adjacent south and east areas, with similar replanted vegetation corridors circa 2008.

Recent aerial photography shows the two distinct portions of the site, the northern portion with intact vegetation and southern portion being mostly cleared with some vegetation present within Lot 500. The surrounding areas are indicative of rural residential lots with subdivision development for rural residential living.

2.2 Land use planning context

The Metropolitan Region Scheme (MRS) defines the future use of land and provides a basis for future planning in the Perth metropolitan region through designated zones and reserves. Under the MRS the site is mostly reserved for 'parks and recreation' and a lesser area zoned 'rural', as shown in **Figure 2**.

The Shire of Serpentine Jarrahdale's Town Planning Scheme No. 2 (TPS) classifies land uses within the local government area. No land use designation is provided for the site, however the surrounding

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areas include 'farmlet' associated with the rural residential properties to the north-east, south, west and east, 'drainage purposes' west of the site, 'public open space' to the north-west and 'urban development' north and east relating to the West Mundijong Industrial Area Structure Plan area and Mundijong-Whitby DSP area as shown in **Figure 3**.

2.3 Landforms and soils

2.3.1 Topography

The elevation across the site is slightly variable and generally slopes from east downward to the west. The minimum elevation within the site is approximately 20 m AHD and occurs in the western portion of the site. The maximum elevation within the site is approximately 25 m AHD, occurring within the eastern portion of the site. Topographic contours across the site and surrounding areas are shown in **Figure 4**.

2.3.2 Landform, soils and geology

The site is located in the eastern portion of the Swan Coastal Plain. The Swan Coastal Plain is approximately 20 to 30 km wide and consists of a series of geomorphic entities aligned parallel to the coastline. The youngest and western-most geomorphic entity is the Quindalup Dunes, followed by the progressively older Spearwood Dunes and the Bassendean Dunes, all of which are of aeolian origin. The alluvial Pinjarra Plain and Ridge Hill Shelf comprise the eastern portions of the Swan Coastal Plain, situated adjacent to the Darling escarpment.

The majority of the site is situated in the Pinjarra Plain system, with the north-eastern portion within the Bassendean Dune system (Gozzard 2011), as shown in **Figure 4**. The Pinjarra system is characterised by poorly drained coastal plain with variable alluvial and aeolian soils. The older Bassendean Dune system is characterised by lower relief, with variable depth to groundwater, consisting of lower sandy hills interspersed with permanent and seasonal wetlands. The Pinjarra system and Bassendean Dune system within the site are characterised by gently undulating slopes rising to the east.

Department of Primary Industries and Regional Development (DPIRD) identifies the soil-landscape units across the site (DPIRD 2022). The units which intersect the site are detailed in **Table 1** below. In summary, the majority of the site is mapped as comprising deep pale brown to yellow, sandy soils over clay loam, typical of the Pinjarra system.

The site is not known to contain any restricted landforms or unique geological features, such as any geoheritage sites identified by the Department of Mines, Industry Regulations and Safety (DMIRS).

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Table 1: Soil types occurring within the site (DPIRD 2022)

Map unit	Soil type	Description
213PJ P1c	Pinjarra Plain system	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Deep pale brown to yellowish sand to sandy loam over clay; imperfectly drained and moderately susceptible to salinity in limited areas.
213PJ P1d	Pinjarra Plain system	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and moderately susceptible to salinity.
212Bs	Bassendean Dune system	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.

2.3.3 Acid Sulfate Soils

Acid Sulfate Soils (ASS) refers to naturally occurring soils and sediment containing iron sulphide (iron pyrite) materials. In their natural state, ASS are generally present in waterlogged and/or anoxic conditions and do not present any risk to the environment. However, when oxidised, ASS can pose issues through sulphuric acid production, which can present a range of risks for the surrounding environment, infrastructure, and human health.

The Department of Water and Environmental Regulation (DWER) provides broad-scale ASS risk mapping (DWER 2019), which assigns the following risk categories:

- **Class 1:** high to moderate risk of ASS occurring within 3 m of natural soil surface.
- **Class 2:** moderate to low risk of ASS occurring within 3 m of natural soil surface, but high to moderate risk of ASS beyond 3 m of natural soil surface.

As shown in **Figure 5**, the site is shown as having a 'moderate to low' (Class 2) risk. Class 2 ASS risk areas appear to be associated with the Pinjarra and Bassendean soil-landscape units, as shown in **Figure 4**.

2.4 Biodiversity and natural assets

2.4.1 Flora and vegetation

2.4.1.1 Historical context

As described in **Section 2.1**, a review of historical aerial photography indicates significant clearing of the site and surrounding areas prior to 1953. Natural regenerative growth, where historically cleared areas have had the opportunity to naturally regenerate is evident within the northern portion of the site circa 1965. The southern portion of the site remains disturbed and cleared with isolated pockets of natural regenerative growth within the western and eastern portions of Lot 500. The areas of regrowth within the southern portion of the site appears to be in poorer condition based on the sparseness of the vegetation, compared with the dense vegetation regrowth evident in the northern portion, likely due to the discontinuation of disturbance within the northern portion of the site, whereas agricultural activities have continued in the southern portion.

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Establishment of planted vegetation south and west of the site is evident circa 1965, indicated by the uniformity of the established vegetation corridors within the rural residential lots. In addition, the majority of the surrounding areas remain clear of vegetation with some isolated paddock trees and associated gardens evident up to recent historical aerial photography.

2.4.1.2 Regional context

Vegetation complex mapping by Heddle *et al.* (1980) shows that one vegetation complex occurs over the site area which is shown on **Figure 6** and is described in **Table 2** below.

Table 2: Vegetation complexes within the site.

Complex	Description (Heddle, Loneragan et al. 1980)	Extent remaining (DBCA 2018)
Guildford Complex	A mixture of open forest to tall open forest of <i>Corymbia calophylla</i> (Marri) - <i>Eucalyptus wandoo</i> (Wandoo) - <i>Eucalyptus marginata</i> (Jarrah) and woodland of Wandoo (with rare occurrences of <i>Eucalyptus lane-poolei</i> (Salmon White Gum)). Minor components include <i>Eucalyptus rudis</i> (Flooded Gum) - <i>Melaleuca raphiophylla</i> (Swamp Paperbark).	5.09%

The Environmental Protection Authority's (EPA) *Environmental Guidance for Planning and Development* (EPA 2008) (referred to as 'the Guidance') states that the loss of biodiversity caused by habitat fragmentation is significantly greater once a habitat type falls below 30% of its original extent. The Guidance also references the national objectives and targets for biodiversity conservation's objective of retaining 30% of the original extent of each vegetation complex and the minimum target of 10% for constrained urban areas such as the Swan Coastal Plain. The remaining extent of the Guildford vegetation complex is below the minimum 10% target.

Native vegetation extent mapping (DPIRD 2019) indicates the potential actual extent of native remnant vegetation within and surrounding the site and is shown in **Figure 6**.

2.4.1.3 Site visit and vegetation condition

Emerge Associates visited the site on 23 March 2023 to conduct a basic flora and vegetation assessment. Vegetation condition within the site was assessed using methods from Keighery (1994), which is the condition scale used for vegetation on the Swan Coastal Plain.

The site generally comprised of intact vegetation underlain by claypans in the north, and pasture with some degraded native vegetation in the southern portion of the site. Evidence of a trench along the northern boundary of Lot 500 was observed bordering the intact vegetation, however no other evidence of any waterways and/or riparian vegetation was observed within the site. Unsealed tracks intercept the central portion of the site and isolated paddock trees were observed across the southern portion of the site.

The site inspection confirmed portions of intact native vegetation consisting of shrubland and grassland populated by *Melaleuca viminea* in the northern portion of the site (**Plate 1**). An area of *Corymbia calophylla* open forest was also observed within the northern portion (**Plate 2**), with *Xanthorrhoea preissii* interspersed throughout the northern portion of the site.

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Evidence of previous clearing was observed with pasture grasses and regenerated vegetation apparent within the eastern portion of the site (**Plate 3** and **Plate 4**). Low woodland of *Casuarina obesa* over grassland was observed within the western portion of the site (**Plate 5**). Some replanted vegetation was evident within and adjacent to the south boundary (**Plate 6**) however the majority of Lot 500 remains cleared pasture land with limited paddock trees (**Plate 7**).

The extent of the vegetation units identified during the site inspection are listed below in **Table 3** with each vegetation unit shown in **Plate 1** to **Plate 7**. The distribution of the identified vegetation units is shown in **Figure 7**.

Table 3: Description and extent of vegetation units identified within the site

Vegetation Units	Description	Area (ha)
MHa	Low closed to open shrubland of <i>Melaleuca viminea</i> and <i>M. ossullivanii</i> over <i>Hypocalymma angustifolium</i> over sedgeland and forbland and grassland of predominantly native species (Plate 1).	3.84
CcXp	Tall woodland to forest of <i>Corymbia calophylla</i> over shrubland of <i>Xanthorrhoea preissii</i> , <i>Hypocalymma angustifolium</i> over sedgeland and forbland and grassland of predominantly native species (Plate 2).	1.00
Er	Open forest of <i>Eucalyptus rudis</i> over grassland and forbland of predominantly non-native species (Plate 3).	3.31
Ec	Open forest of <i>Eucalyptus camaldulensis</i> over grassland and forbland of predominantly non-native species (Plate 4).	0.30
Co	Low woodland of <i>Casuarina obesa</i> over grassland and forbland of predominantly non-native species (Plate 5).	7.08
Revegetation	Heavily disturbed areas comprising predominantly non-native or vegetation with occasional native species. Buildings, planted crops and bare ground were also included in this community (Plate 6).	0.11
Non-native	Low closed grassland and forbland of predominantly non-native species (Plate 7).	39.11

Vegetation is typically considered to represent an intact occurrence of its overarching vegetation complex when it is in 'good' or better condition. Based on the survey results, vegetation condition within the site ranges from 'excellent to very good' to 'completely degraded.' The northern portion of the site supports vegetation condition ranging from 'excellent to very good' to 'very good to good' while the majority of the remainder of the site has been subject to previous clearing and consists of predominately non-native species such as planted trees and pasture grasses. Vegetation condition is shown in **Figure 8**.

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Plate 1: Vegetation unit **MHa** in 'excellent to very good' and 'very good to good' condition.



Plate 2: Vegetation unit **CcXp** in 'excellent to very good' condition.

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Plate 3: Vegetation unit Er in 'degraded' and 'degraded to completely degraded' condition.



Plate 4: Vegetation unit Ec in 'completely degraded' condition.

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Plate 5: Vegetation unit *Co* in 'degraded to completely degraded' condition.



Plate 6: Vegetation unit *revegetation* in 'degraded to completely degraded' condition.

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Plate 7: Vegetation unit *non-native* in 'completely degraded' condition.

2.4.1.4 Likelihood of occurrence of threatened and priority flora and fauna species and ecological communities

The distribution and habitat preferences of the threatened and priority flora and fauna species and ecological communities that have the potential to occur within the site and surrounding areas as listed in **Appendix A**, **Appendix B** and **Appendix C** was reviewed against site context information. Likelihood of occurrence of threatened and priority flora species and ecological communities within the site was classified as 'high', 'moderate', 'low' or 'negligible' as outlined below in **Table 4**.

Table 4: Decision matrix for likelihood of occurrence of threatened and priority flora and ecological communities

		Distribution ¹	
		Reliable record within search area	No reliable record within search area
Habitat	Suitable	High	Negligible
	Potentially suitable	Moderate	
	Unsuitable	Low	

¹ Reliable record defined as validated, recent (within the last ~40 years for flora or ~20 years for fauna) and spatially accurate (refer DBCA search meta data) in order to exclude unverified range or habitat projections.

2.4.1.5 Conservation significant flora

A search was conducted for threatened and priority flora that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), *NatureMap* (DBCA 2022) and Department of Biodiversity, Conservation and Attractions' (DBCA) threatened and priority flora database (reference no. 01-0623FL).

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Database search results identified a total of 50 conservation significant flora species as occurring or potentially occurring within 10 km of the site. Of the 50 species of conservation significance identified, 10 threatened and 24 priority flora were classified as having a 'high' or 'moderate' likelihood of occurrence within the site, as outlined below in **Table 5**. The complete likelihood of occurrence assessment is provided as **Appendix A**.

Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
<i>Caladenia huegelii</i>	CR	EN	PG	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov	Moderate
<i>Drakaea elastica</i>	CR	EN	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically, in banksia woodland or thickets of <i>Kunzea glabrescens</i> .	late Sep-Oct/Nov, survey Jul-Aug	Moderate
<i>Lasiopetalum pterocarpum</i>	CR	EN	P	Dark brown or red brown loam or clayey-sand over granite, near creek lines and on sloping banks. Associated with riparian vegetation including flooded gum, marri and swamp peppermint.	Aug-Nov	Moderate
<i>Synaphea</i> sp. Fairbridge Farm (D. Papenfus 696)	CR	CR	P	Low woodland on grey, clayey sand with lateritic pebbles (Pinjarra Plain) near winter wet flats.	Sep-Nov	Moderate
<i>Synaphea</i> sp. Pinjarra Plain (A.S. George 17182)	EN	CR	P	White grey clayey sand on edges of seasonally inundated low lying areas.	Sep-Oct	High
<i>Synaphea</i> sp. Serpentine (G.R. Brand 103)	CR	CR	P	Seasonally damp areas, loam - sand.	Sep-Oct	High
<i>Diuris purdiei</i>	EN	EN	PG	Sand to sandy clay soils in areas subject to winter inundation.	late September to mid-October, but only after a summer or early autumn fire (Brown et al., 1998)	Moderate
<i>Grevillea curviloba</i>	EN	EN	P	Grey sand, sandy loam. Winter-wet heath.	Aug-Oct	Moderate

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Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences (continued)

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
<i>Lepidosperma rostratum</i>	EN	EN	P	Peaty sand and clay amongst low heath, in winter-wet swamps.	May-Jun (survey late Jun-Aug)	High
<i>Morelotia australiensis</i>	VU	VU	P	Sand over clay, winter wet depressions and drainage lines.	Nov-Dec	High
<i>Acacia lasiocarpa</i> var. <i>bracteolata</i> long peduncle variant (G.J. Keighery 5026)	P1	-	P	Grey or black sand over clay. Swampy areas, winter wet lowlands.	May or Aug	Moderate
<i>Boronia juncea</i> subsp. <i>juncea</i>	P1	-	P	Sand in low scrub.	Apr	Moderate
<i>Synphea odocoileops</i>	P1	-	P	Brown orange loam and sandy clay, granite, in swamps and winter wet areas.	Aug-Oct	Moderate
<i>Calectasia grandiflora</i>	P2	-	P	White, grey or yellow sand.	Jun-Nov	High
<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>	P2	-	P	Grey white yellow sands on flats and seasonally wet areas.	Sep	Moderate
<i>Millotia tenuifolia</i> var. <i>laevis</i>	P2	-	A	Granite or lateritic soils.	Sep-Oct	Moderate
<i>Acacia horridula</i>	P3	-	P	Gravelly soils over granite, sand, rocky hillsides.	May-Aug	Moderate
<i>Angianthus drummondii</i>	P3	-	A	Grey or brown clay soils, ironstone. On seasonally wet flats.	Oct-Dec	Moderate
<i>Babingtonia urbana</i>	P3	-	P	Grey sand, lateritic gravel.	Jan-Mar	High
<i>Cyathochaeta teretifolia</i>	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan	Moderate
<i>Dampiera triloba</i>	P3	-	P	Damp peat/loam soil.	Aug-Dec	Moderate
<i>Dillwynia dillwynioides</i>	P3	-	P	Winter wet depressions on sandy soils.	Aug - Dec	Moderate
<i>Eryngium pinnatifidum</i> subsp. <i>palustre</i> (G.J. Keighery 13459)	P3	-	P	Grey brown sand or clay in winter wet flats.	Sep-Nov	Moderate

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Table 5: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences (continued)

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
<i>Isopogon autumnalis</i>	P3	-	P	Yellow-grey sand.	Feb, Mar, Apr, May or June	Moderate
<i>Jacksonia gracillima</i>	P3	-	P	Sand, often adjacent to winter wet areas.	Sep-Dec	High
<i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>	P3	-	P	Brown clay loam on slopes.	Sep-Dec	Moderate
<i>Schoenus pennisetis</i>	P3	-	A	Grey or peaty sand in swamps and winter-wet depressions.	Aug-Sep	Moderate
<i>Schoenus</i> sp. Waroona (G.J. Keighery 12235)	P3	-	A	Clay or sandy clay. Winter-wet flats.	Oct-Nov	Moderate
<i>Aponogeton hexatepalus</i>	P4	-	P	Mud. Freshwater: ponds, rivers, claypans.	Jul-Oct	Moderate
<i>Drosera occidentalis</i>	P4	-	P	Flat, brown/white/yellow moist sand/clay/peat, often near swamps.	Oct-Dec/Jan	Moderate
<i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>	P4	-	P	Loam on flats and hillsides.	Jul-Sep	Moderate
<i>Parsonsia diaphanophleba</i>	P4	-	P	Alluvial soils along rivers.	Jan-Feb or Apr-Sep	Moderate
<i>Senecio leucoglossus</i>	P4	-	A	Gravelly lateritic or granitic soils on outcrops or slopes.	Aug-Dec	Moderate
<i>Verticordia lindleyi</i> subsp. <i>lindleyi</i>	P4	-	P	Sand and sandy clay in winter wet areas.	May or Nov-Jan	Moderate

CR=critically endangered, EN=endangered, VU=vulnerable, P1-P4=Priority 1-Priority 4, A=Annual, P=perennial, PG=perennial geophyte.

In most instances there is a very low likelihood that conservation significant flora would occur where there is no intact vegetation, these species are more likely to occur within intact vegetation, and generally speaking in 'good' or better condition. Within the site these areas are limited to the northern portion of the site. A targeted (i.e. detailed) flora survey undertaken in the key flowering season (Spring) would be required to confirm the extent to which any conservation significant flora occur or do not occur within the site.

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2.4.1.6 Threatened and priority ecological communities

A search was conducted for threatened ecological communities (TECs) and priority ecological communities (PECs) that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022) and DBCA's threatened and priority ecological communities' database (reference no. 39-0523EC) which are listed in **Appendix B**.

Database search results identified two TECs as occurring within the site, specifically 'herb rich shrublands in clay pans' and '*Corymbia calophylla* - *Kingia australis* woodlands on heavy soils'. These communities are listed as 'critically endangered' and 'endangered' under the *Environmental Planning and Biodiversity Conservation Act* (EPBC Act) and 'endangered' and 'critically endangered' in Western Australia. One occurrence of each community is mapped/identified as occurring within the site as shown in **Figure 9**.

The following TECs/PECs were also considered to have a high or moderate likelihood of occurrence within the site:

- 'Banksia woodland of the Swan Coastal Plain ecological community' PEC/TEC (moderate) which is listed as 'critically endangered' in Western Australia and 'endangered' under the EPBC Act.
- SCP02 'Southern wet shrublands, Swan Coastal Plain' TEC (moderate)
- SCP07 'Herb rich saline shrublands in clay pans' TEC (moderate)
- SCP09 'Dense shrublands on clay flats' TEC (moderate)
- SCP10a 'Shrublands on dry clay flats' TEC (moderate)
- SCP3b '*Corymbia calophylla* - *Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain' TEC (moderate)
- SCP3c '*Corymbia calophylla* - *Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain' TEC (high)
- 'Clay pans of the Swan Coastal Plains' TEC (high)

As the intact vegetation occurs in the northern portion of the site, the likelihood of TECs or PECs to occur within the site are likely limited to the northern portion of the site, as shown in **Figure 7**.

Observations of the clay soils within the northern portion of the site during the site visit would also suggest a likelihood of the communities 'SCP07' and 'Clay pans of the Swan Coastal Plains' to be present.

Further investigation will be required to confirm the presence or absence of TECs and PECs within the site, although these are likely to be relevant for the northern portion of the site where some TECs are already known to occur.

2.4.2 Fauna

A search was conducted for fauna species that have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), and *Atlas of Living Australia* (Atlas of Living Australia 2022) attached in **Appendix C**. A *Naturemap* search and a search of DBCA's conservation significant fauna database, using a 10 km search radius (reference no. FAUNA7723) was also conducted.

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A total of 38 conservation significant fauna species were identified from database searches as occurring or potentially occurring within 10 km of the site. This includes 17 threatened, 11 priority, eight migratory fauna and two other specially protected species. Of the 38 species of conservation significance identified, 11 were considered to have a 'high' or 'moderate' likelihood of occurring in the site based on potential habitat and species distributions, as shown in **Table 6**.

Table 6: Summary of conservation significant fauna species deemed possible to occur within the site

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Birds					
<i>Calyptorhynchus banksii naso</i>	Forest red-tailed black cockatoo	VU	VU	Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding <i>Corymbia calophylla</i> , <i>Eucalyptus marginata</i> , introduced <i>Melia azedarach</i> and <i>Eucalyptus</i> spp. trees (Johnstone et al. 2013).	High
<i>Falco peregrinus</i>	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	Moderate
<i>Zanda baudinii</i>	Baudin's black cockatoo	EN	EN	Mainly eucalypt forests. Attracted to seeding <i>Corymbia calophylla</i> , <i>Banksia</i> spp., <i>Hakea</i> spp., and to fruiting apples and pears (Johnstone and Storr 1998).	High
<i>Zanda latirostris</i>	Carnaby's black cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of <i>Pinus</i> spp. Attracted to seeding <i>Banksia</i> spp., <i>Hakea</i> spp., <i>Eucalyptus</i> spp., <i>Corymbia calophylla</i> , <i>Grevillea</i> spp., and <i>Allocasuarina</i> spp. (Johnstone and Storr 1998).	High
Mammals					
<i>Dasyurus geoffroii</i>	Chuditch	VU	VU	Wide range of habitats from woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. Appears to utilise native vegetation along roadsides in the wheatbelt (DEC 2012).	Moderate
<i>Isoodon fusciventer</i>	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	High
<i>Notamacropus eugenii derbianus</i>	Tammar wallaby	P4	-	Dry sclerophyll forest, <i>Banksia</i> spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	High

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Table 6: Summary of conservation significant fauna species deemed possible to occur within the site (continued)

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Notamacropus irma</i>	Western brush wallaby	P4	-	Dry sclerophyll forest, <i>Banksia</i> spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	High
<i>Phascogale tapoatafa wambenger</i>	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	High
Invertebrates					
<i>Euoplos inornatus</i>	Inornate trapdoor spider	P3	-	Has previously been recorded in jarrah forest, including near clay banks and granite outcrop. Most records are from the Darling scarp/Jarrahdale Forest Region, with limited records from the Swan Coastal Plain (DBCA 2020).	Moderate
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	P3	-	Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003). Species predominantly recorded from remnant banksia woodland vegetation and heath on sandy soils (Rix et. al 2018).	Moderate

CR=critically endangered, EN=endangered, VU=vulnerable, P1-P4=Priority 1-Priority 4, MI=Migratory

Whist fauna can exist in areas where vegetation is less than 'good' condition, fauna habitat values and likelihood of occurrence are considered to exist in areas of intact vegetation in 'good' or better condition. Within the site, these areas are limited to the northern portion of the site within the intact vegetation.

The southern portion of the site, though the vegetation is in 'degraded' or less condition (see **Figure 8**), may provide some foraging value for black cockatoo and needs to be considered as part of future fauna surveys to confirm the presence or absence of foraging habitat.

2.4.3 Bush Forever

The Government of Western Australia's *Bush Forever Policy* (Government of WA 2000) (Bush Forever) is a strategic plan for conserving regionally significant bushland within the Swan Coastal Plain portion of the Perth Metropolitan Region. The objective of Bush Forever is to protect comprehensive representations of all original vegetation complexes by targeting a minimum of 10% of each for protection (Government of WA 2000). BF sites represent regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

As shown in **Figure 2**, Bush Forever Site 360 includes parts of Lot 556 and an unconstructed portion of a road reserve in the northern portion of the site. A portion of the intact vegetation contiguous with that from within Bush Forever Site 360 extends into Lot 500, however the Bush Forever Site 360 boundary occurs to the north of the Lot 500 boundary. The full extent of the Bush Forever site which intersects the site occurs on publicly owned land, and is reserved for 'parks and recreation' under the MRS.

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Bush Forever Site 360 is part of a continuous strip of Bush Forever sites that continues east and west aligning Mundijong Road and connects with Bush Forever sites along Paterson Street heading north and Wright Road heading south, approximately 1.5 km east of the site.

Based on *Bush Forever Volume 2* (Government of WA 2000) the key values for Bush Forever Site 360 are summarised below:

- Landforms and soils
 - Guildford formation
 - Bassendean sands over Guildford formation
- Vegetation and flora
 - Vegetation complexes representing the Guildford Complex
 - Floristic community types
 - *Eucalyptus calophylla* – *Kingia australis* woodlands on heavy soils (critically endangered)
 - *Eucalyptus calophylla* – *Xanthorrhoea preissii* woodlands and shrublands (critically endangered)
 - Herb-rich shrublands in clay pans (endangered)
 - Dense shrublands on clay flats (endangered).

2.4.4 DBCA managed or legislated lands

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA 2022) and *Lands of Interest* (DBCA 2022) datasets. The *Legislated Lands and Waters* (DBCA 2022) dataset includes lands subject to the following legislation; the *Conservation and Land Management Act 1984* (CALM Act 1984), *Swan and Canning Rivers Management Act 2006* (SCRM Act) and lands identified under the *Land Administration Act 1997* (LA Act). The *Lands of Interest* (DBCA 2017) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise crown land and freehold land which DBCA has been acknowledged by the Department of Lands as the responsible agency.

No DBCA managed or legislated lands are mapped as occurring within or immediately surrounding the site.

2.4.5 Shire of Serpentine Jarrahdale Local Biodiversity Strategy

The Shire's Local Biodiversity Strategy (LBS) (SoSJ 2008) outlines targets for the retention, protection and management of local natural areas (LNAs), which are defined in the LBS as all unprotected natural areas over which the City can exercise the most control through its decision-making powers, policies and reserve management. LNAs are identified within private property, public or regional open space and state government freehold land not zoned 'parks and recreation' under the MRS.

The LBS outlines four goals regarding the retainment, protection and management of LNAs, summarised below:

- Retention

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- Goal 1: This goal aims to prevent further loss of LNAs and retain at least 4000 ha of LNAs in the Shire.
- Protection
 - Goal 2: Protect and manage a portion of each basic type of vegetation and ecosystem typical of the shire. Approximately 1690 ha would be protected.
 - Goal 3: Protect specific ecological features and processes including rare species, TECs, wetland vegetation and ecological linkages throughout the Shire.
- Management and restoration
 - Goal 4: Manage and restore LNAs and revegetate new areas to increase native fauna habitat.

No LNAs are mapped within or surrounding the site. Approximately 1.80 ha of native vegetation is mapped occurring within the northern portion of the site relating to the intact vegetation, however LNAs are defined under the LBS as natural areas that exist outside of Bush Forever sites. As it is situated within the Bush Forever site, it is not identified as an LNA.

2.4.6 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). The City's LBP also identifies local-level linkages, and highlights the importance to protect high priority LNAs and areas within ecological linkages as far as reasonable practicable (SoSJ 2008).

One mapped regional ecological linkage (Local Ecological Linkage – Link ID 63) is aligned along the northern boundary of the site associated with BF Site 360, as shown in **Figure 6**. It is noted that the linkages are generally considered to be 500m corridors, but a large portion of the site that this occurs over has been historically cleared and is in a 'degraded' or lesser condition and is unlikely to support any material ecological linkage function. The ecological linkage function is likely to be limited to the intact vegetation in the northern portion of the site.

2.4.7 Environmentally Sensitive Areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding values such as significant wetlands, threatened flora, threatened communities and BF sites.

Three ESAs intersect the site (Object ID 10006, 17194 and 20839) extending across the central and northern portions. The ESAs relate to the Bush Forever Site 360, Conservation Category Wetland (CCW) and TEC buffers for '*Corymbia calophylla*' (SPC3a) and 'Herb rich shrublands' (SPC08) TECs. The extent of these ESA areas is shown in **Figure 9**.

Given the environmental values associated with these ESAs, the exemptions under the *Native Vegetation (Clearing of Native Vegetation) Regulations 2004* do not apply and clearing permits will be required for any proposed vegetation clearing within the identified ESAs.

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2.5 Hydrology

2.5.1 Groundwater

Information on the regional groundwater resources obtained from the DWER Water Register (DWER 2022) indicates that the site is underlain by a multi-layered aquifer system comprised of the following resources:

- Perth – Superficial Swan (unconfined)
- Perth – Leederville (confined)
- Perth – Cattamarra Coal Measures (unconfined)

The DWER *Water Information Reporting Tool* (DWER 2020) includes groundwater and surface water monitoring information from bores and wells across the state. The current depth to groundwater below the site varies between approximately 1 m to 2 m below the natural soil surface, which reflects the variable topography and low-lying wetland areas.

2.5.2 Wetlands

Wetlands include “areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh and saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries” (Wetlands Advisory Committee 1977). Wetlands can further be recognised by the presence of vegetation associated with waterlogging or the presence of hydric soils such as peat, peaty sand or carbonate mud (Hill, Semeniuk et al. 1996).

Wetlands of national or international significance may be afforded special protection under Commonwealth or international agreements. The following lists of important wetlands were reviewed as part of this assessment:

- *Ramsar List of Wetlands of International Importance* (DFCA 2017)
- *A Directory of Important Wetlands in Australia* (DFCA 2018).

No Ramsar or listed ‘important wetlands’ are located within the site.

The Department of Biodiversity Conservation and Attractions (DFCA) maintains the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DFCA 2018), which categorises geomorphic wetland features into specific management categories to guide land use and conservation.

As shown in **Figure 10**, the site supports one multiple use wetland (MUW) (unique feature identifier (UFI) 16021) and one conservation category wetland (CCW) (UFI 14817), the latter situated in the northern portion of the site, associated with the areas of intact vegetation. The actual extent of the CCW is likely to be different from the mapping from the Geomorphic wetland dataset, and likely to reflect the extent of the intact vegetation, as shown in **Figure 8**, within the intact vegetation observed in ‘good’ or better condition.

2.5.3 Surface water

The DWER maintain the ‘Hydrography, Linear’ dataset ‘DWER-031’ (DWER 2020) which includes streams and hydrography from a broad scale perspective. Based on the DWER Hydrography linear a

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minor non-perennial watercourse is identified (object ID 420899) within the north-west portion of the site. No other natural surface water features (such as streams, creeks or rivers) intersect the site.

During the site visit, a drain aligning the intact vegetation in the northern portion of the site was observed, which is reflective of the 'drain' feature shown in **Figure 10**. No vegetation observed within and surrounding the drain was specifically identified as being riparian vegetation. Vegetation observed within the drain and directly adjacent included non-native pasture grasses, and being adjacent to *Corymbia calophylla*, *Kingia australis*, *Xanthorrhoea preissii* and various other native and non-native species (**Plate 8**). Though portions of the drain are situated adjacent to vegetation in 'excellent to very good' and 'very good to good' condition, the majority of the drain exhibited vegetation in 'degraded' condition and is not anticipated to contribute to waterway values beyond the conveyance of water through the site.

The minor non-perennial stream is situated within an area of vegetation in 'completely degraded' condition (**Figure 8**) and comprises of non-native paddock grasses and does not support any native riparian vegetation.



Plate 8: Vegetation observed within and surrounding the 'drain' comprising of native and non-native species.

2.5.4 Public Drinking Water Source Areas

Public Drinking Water Source Areas (PDWSAs) are proclaimed by DWER to protect identified drinking water sources, including surface water and groundwater sources (DoW 2009). They are proclaimed under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909* or the *Country Areas Water Supply Act 1947* as Water Reserves, Catchment Areas or Underground Water Pollution Control Areas. PDWSAs supply drinking water to local populations and can be vulnerable to contamination from a range of land uses. Once an area is identified as a PDWSA, consideration needs to be given to the

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intended land uses and associated activities within the area, to ensure that they are appropriate in meeting the PDWSA's water protection quality objectives.

No PDWSA's are located within or immediately surrounding the site.

2.6 Heritage

2.6.1 Indigenous heritage

The Aboriginal Heritage Inquiry System (AHIS) is maintained pursuant to Section 38 of the *Aboriginal Heritage Act 1972* (AH Act) by the Department of Planning, Lands and Heritage (DPLH) and contains information on Registered Aboriginal Heritage Sites and Other Heritage Places throughout Western Australia. Western Australia is currently in a transition period from the AH Act to the new *Aboriginal Cultural Heritage Act 2021* (ACH Act), for which regulations, statutory guidelines and operational policies have recently been released, and will take effect from 1 July 2023.

In accordance with the *Aboriginal Heritage Due Diligence Guidelines* (DAA 2013), a search of the AHIS online database was undertaken. No Registered Aboriginal Heritage Sites have been identified within or immediately surrounding the site.

Under the new ACH Act framework, a Due Diligence Assessment (DDA) would need to be progressed after 1 July 2023 in order to understand the extent to which Aboriginal Cultural Heritage (ACH) is known to occur within the site and any additional investigations or other requirements that would be required.

2.6.2 Non-indigenous heritage

A desktop search of the State Heritage Office database (Heritage Council 2021) and the Shire of Serpentine Jarrahdale Local Government Heritage List indicates that there is no non-indigenous heritage place located within or immediately surrounding the site.

2.7 Other land use considerations

2.7.1 Historical and existing land uses

As described in **Section 2.4.1.1** the site was historically cleared for agricultural purposes since circa 1953. The site has remained relatively unchanged with some apparent vegetation regrowth and/or revegetation and minor development within the site including track development and built agricultural structures within the north-east corner of the site. The immediate surrounding areas have been subdivided into rural residential lots with observed revegetation within the rear of the lots adjoining the site from circa 2000.

The site is mostly reserved for 'parks and recreation' under the MRS and a small portion in the south is zoned 'Rural' as shown in **Figure 2**.

No TPS zoning has been applied under to the site under Shire of Serpentine Jarrahdale Town Planning Scheme (**Figure 3**).

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2.7.2 Potential site contamination

A review of the DWER *Contaminated Sites Database* indicates that no contaminated sites registered pursuant to the *Contaminated Sites Act 2003* occur within or immediately adjacent to the site.

2.7.3 Surrounding land uses

The site is located in an area that has been predominantly developed, with surrounding land uses generally being a mix of largely rural and rural residential uses. The area to the north of the site is anticipated to undergo further industrial development based on the West Mundijong Industrial Area Structure Plan (SoSJ 2022).

As mentioned in **Section 2.2** notable development toward the north-east includes the Mundijong-Whitby DSP zoned 'Urban' under the MRS (**Figure 2**).

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3 Summary of Significant Environmental Values

Based on the information provided in **Section 2**, there are a number of significant environmental values within the site that would require consideration in terms of any future proposed development and associated environmental and planning approvals. These would be the key environmental considerations for any development of the site including any proposed site access from Mundijong Road. For some of these there would be a high expectation that avoidance of impacts is the preference in terms of any development proposal, and it would need to be clearly demonstrated that avoidance has been considered, cannot be achieved and that any impacts have been minimized. The key environmental considerations in this respect are summarised in further below. Additionally, **Figure 11** shows a summary of the extent of environmental considerations and associated constraints identified within the site.

3.1 Key environmental considerations

3.1.1 Occurrence and extent of TEC vegetation

While the occurrence of TEC vegetation is relatively certain in the northern portion of the site, the extent of these would need to be specifically determined by undertaking a detailed vegetation survey targeting the target TECs.

Notwithstanding this, it has been assumed the minimum extent of these will be contained within the vegetation in 'very good – good' or better condition as shown in **Figure 8**. Avoidance of impacts on TECs should be the first consideration when developing any development proposal, and if this cannot be achieved, any impact to TECs is likely to trigger a range of environmental approval considerations as discussed further below in **Section 4**.

3.1.2 Conservation significant flora

Fifty conservation significant flora species are considered possible or likely to occur within the site. Of the 50, 10 threatened and 24 priority flora were classified as 'high' or 'moderate' likelihood of occurrence within the site. These values are most likely to exist within the areas of intact remnant vegetation within the northern portion of the site.

A detailed flora survey targeting the conservation significant flora species identified will be required to be undertaken to determine the likely presence or absence of those species within the site. In the case of any occurrences of conservation significant flora within the proposed development, the opportunity to avoid impacts on any confirmed occurrences would be a key consideration.

3.1.3 Conservation significant fauna

Eleven conservation significant species are considered possible or likely to occur within the site being: *Calyptorhynchus banksii naso* (Forest red-tailed black cockatoo), *Falco peregrinus* (Peregrine falcon), *Zanda baudinii* (Baudin's black cockatoo), *Zanda latirostris* (Carnaby's black cockatoo), *Dasyurus geoffroi* (Chuditch), *Isodon fusciventer* (Quenda), *Notamacropus eugenii derbianus* (Tamar wallaby), *Notamacropus Irma* (Western brush wallaby), *Phascogale tapoatafa wambenger* (South-western brush-tailed phascogale), *Euoplos inornatus* (Inornate trapdoor spider) and *Idiosoma*

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sigillatum (Swan Coastal Plain shield-backed trapdoor spider). Further targeted surveys would be required to confirm if and to what extent the following species utilise the site.

Any conservation significant fauna are likely to occur within the areas of intact remnant vegetation within the northern portion of the site. Potential impacts to potential foraging habitat for black cockatoo that might occur in the southern portion of the site will raise future environmental approval considerations but are not expected to raise present fundamental barriers to the proposed development within the site.

3.1.4 Bush Forever Sites

The extent of Bush Forever Site 360 includes the northern portion of the site and adjacent Mundijong Road reserve, as shown in **Figure 9**. This is a key consideration and represents a range of significant environmental values including poorly represented vegetation complexes, TECs and PECs, significant fauna and flora species and habitat and CCW.

It is important that avoidance of these values is given consideration and potential alternatives that have no impact on the values identified within the intact remnant vegetation be explored. Any impacts to Bush Forever Site 360 would need to be minimised.

3.1.5 Ecological Linkages

One mapped regional ecological linkage is identified north of the site, as shown in **Figure 6**. The ecological linkages are a key value of Bush Forever Site 360 and any proposed access from Mundijong Road would likely impact upon this and would need to be considered in terms of mitigation opportunities.

3.1.6 Conservation Category Wetland

A CCW is identified in the northern portion of the site, as shown in **Figure 10**. Consideration around impact avoidance to this CCW would need to be considered, and any proposed development within the site would need to accommodate a 50 m buffer, where more intensive development is avoided. In addition, the actual extent of the CCW boundary is most likely to reflect the intact vegetation in 'very good to good' and 'excellent to very good' condition as illustrated in **Figure 8**.

3.2 Indicative Site Constraints and Considerations

The likely site constraints and considerations relating to the environmental values identified within the site are illustrated in **Figure 11** and discussed below.

3.2.1 Highly strained and significantly constrained areas

As indicated, the likely extent of TECs and CCW within the northern portion of the site that supports intact native vegetation will require careful consideration to avoid and minimise impacts to TECs, CCW, and potentially the avoidance of significant flora and fauna and fauna habitat. The actual extent of these will need to be specifically investigated and clearly understood.

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3.2.2 CCW 50 m buffer and TEC interface

As described in **Section 3.1** the CCW identified in the northern portion of the site would require a 50 m buffer from any development to protect the integrity of the significant wetland values. Given the 50 m buffer overlays pastureland with vegetation identified in 'degraded' and 'completely degraded' condition (**Figure 8**), there are opportunities to revegetate and rehabilitate this area as part of mitigation of environmental impacts associated with development within the site.

3.2.3 Bushfire setbacks

The site is located within a 'bushfire prone area' under the state-wide Map of Bush Fire Prone Areas prepared by the Office of Bushfire Risk Management (OBRM 2021). It is anticipated as part of the development approvals process, considerations regarding bushfire will be implemented in accordance with *Australian Standard 3959:2018 Construction of buildings in bushfire prone areas* (AS 3959) and the policy measures described in *State Planning Policy 3.7 Planning in Bushfire Prone Areas* (SPP 3.7) (WAPC 2015) and the *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (the Guidelines) (DPLH & WAPC 2021).

An indicative 21 m setback is shown in **Figure 11** as a conservative approach where vegetation classified forest (Class A) under AS 3959 is assumed to surround the site. A 21 m setback within the site allows for considered placement of habitable buildings to be situated in BAL-29 or less.

3.2.4 Native vegetation within Lot 500

Though the vegetation identified in the southern portion of the site is in 'degraded' or lesser condition, areas of native vegetation do occur within the southern portion of the site including the vegetation units Ec, Er and Co (**Figure 7**) as described in **Section 2.4.1.3**. A clearing permit/s would be required for the clearing of any native vegetation within the site for which exemptions do not apply, particularly regarding those areas situated within the ESAs (**Figure 9**).

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4 Future Planning Framework and Environmental Approval and Management Requirements

4.1 Future MRS and TPS amendments and planning approvals

It is expected that amendment to the MRS and TPS is likely to be required to allow for the development proposal and associated access from Mundijong Road reserve to Lot 500. The exact extent of the development proposal and road access is yet to be determined and would be informed by a range of considerations, which include the outcomes of this EAR and additional environmental assessments/investigations. Once the extent of the proposed land uses and road access requirements are defined, the Shire would need to determine the extent to which amendments to the MRS and TPS are required. This would be material for the environmental assessment/approval requirements as outlined further below.

In addition to this, any future development within the site would need to be progressed through the development approval process, where additional considerations associated with bushfire risk, stormwater management and other environmental management requirements would need to be resolved as part of the development application and approval process.

4.2 Western Australian environmental assessment and approval processes

Any future MRS and/or TPS amendments would be referred to the EPA under Part IV section 48A of the EP Act. The EPA would then decide:

- Whether the proposed scheme amendment requires assessment
- Provide informal advice on the proposed scheme amendment without assessing the scheme
- Determine that the proposed amendment is not capable of being environmentally acceptable.

Following the EPA referral of any MRS and/or TPS amendment/s (and assuming the proposed amendment is not deemed incapable of being environmentally acceptable), the MRS amendment would progress. The extent of the amendments, and particularly whether this needs to reflect road access off Mundijong Road, would determine the likely outcome in terms of any EPA assessment (or not) of any amendments.

Notwithstanding the above, it is possible that scheme amendments do not need to resolve the location of any Mundijong Road access, but if a proposal to provide road access from Mundijong Road was progressed separately this would require a referral to and potentially assessment of that proposal by the EPA pursuant to Part IV (Section 38) of the EP Act given the environmental values and potential impacts involved. This would involve assessment of the proposal by the EPA before the Minister for Environment makes an approval decision.

The key consideration for both of the above processes (scheme amendments or any proposal to establish a new Mundijong Road intersection) will be demonstrating impact avoidance as the first priority has been considered and how any impacts on significant environmental values have been minimised and are ultimately acceptable given the EPA's policy framework.

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Any commercial development within Lot 500 is likely to be less sensitive in terms of potential impacts, and when removing road access considerations is unlikely to be significant to the extent that referral to or assessment by EPA is not warranted. Notwithstanding this, a native vegetation clearing permit pursuant to Part V of the EP Act is likely to be required if native vegetation will be cleared as part of the works and an associated scheme amendment was not assessed by the EPA. It is highly likely that the future works would involve the clearing of some native vegetation, and as such this is expected to be required as a minimum (unless a valid clearing permit exemption applies). This would involve assessment of the permit by DWER, with the approval decision made by the DWER CEO. Given the condition and nature of this vegetation this is not likely to be a particularly complicated or constrained process.

4.3 Aboriginal Cultural Heritage Act

Given the new *Aboriginal Cultural Heritage Act 2021* becomes active on July 1 2023, further consideration will be needed in future to address the requirements of this new Aboriginal Cultural Heritage (ACH) framework.

In the very least with would involve the completion of a Due Diligence Assessment (DDA) under the recently released guidelines, and may involve the completion of ACH investigations (involving consultation with appropriate persons) and at the fullest extent the preparation and approval of an Aboriginal Cultural Heritage Management Plan (ACHMP).

It is recommended that once the framework is in place that a DDA be completed which will identify the next steps to ensure that the ACH Act requirements are appropriately addressed in relation to any identified ACH.

4.4 Commonwealth environmental assessment and approval processes

The database searches identified two TECs as occurring within the site 'herb rich shrublands in clay pans' and '*Corymbia calophylla* - *Kingia australis* woodlands on heavy soils', in addition to nine TECs potentially occurring within the site which are all Matters of National Environmental Significance (MNES). Additionally, areas of vegetation within the site potentially support foraging, potential roosting and potential breeding habitat for black cockatoos (namely Baudin's black cockatoo, Carnaby's black cockatoo and Forest Red-tailed black cockatoos), which are listed as MNES therefore afforded protection under the EPBC Act.

The specific impacts on MNES within the site would need to be determined following targeted surveys within the site and determination of the likely future development proposal, including access from Mundijong Road.

Notwithstanding this, it is anticipated that the future development proposal would impact upon black cockatoo habitat to some degree even if impacts to TEC's can be avoided. If the future works within the site will or are likely to have significant impacts on any MNES, then referral of the proposed action under the EPBC Act would be required. In this respect, determination of the presence or absence of MNES would be required through appropriate surveys and the development proposal would need to be considered to determine if impacts upon any MNES within the site would likely be significant. This will be the responsibility of the proponent (i.e. the Shire) of the

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development proposal works, including the access way, and would be addressed when the extent and scope of these works are defined in the future.

It is anticipated that any EPBC Act referral and approvals process would be undertaken following the resolution of the necessary MRS/TPS amendment processes and once the specific impacts of the road access and development proposal are known and defined.

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5 Impact avoidance, mitigation and offsets to respond to potential environmental impacts

A key consideration for addressing both state and federal environmental regulatory/approval frameworks will be ensuring that where possible impacts are avoided to the significant environmental values in the northern portion of the site, and where these impacts cannot be avoided justification will need to be provided as to why and then also the provision of impact mitigation and offset requirements to respond to residual impacts. These considerations would be material for any unavoidable impacts in the northern portion of the site, and less material (if relevant at all) for the broader development proposed within the southern portion of the site (i.e. Lot 500).

In relation to the likely avoidance, mitigation and offset considerations, we recommend the following be considered:

- Given the significance of the environmental values within the northern portion of the site, serious consideration is given to impact avoidance and minimisation, particularly to the known extent of TECs that occur in the northern portion of the site. This will need to be further confirmed through detailed flora and vegetation survey.
- As part of progressing any proposed development, serious consideration is given to impact mitigation opportunities within the site, including the provision of development separations/buffers and opportunities for ecological restoration of these areas to not only mitigate impacts but improve the site's ecological values in relation to TEC vegetation, wetlands and ecological linkage functions.
- Should unavoidable impacts be considered for State and Federally listed TECs, that offset opportunities be considered and progressed very early in the overall planning process as these are likely to be material and possibly complex to resolve to the extent required to support State and Federal environmental approval processed.

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6 Recommendations to progress considerations of future proposed development within the site

Given the site conditions and significant environmental values that are likely to occur within portions of the site, and the associated constraints and likely future environmental approval considerations, the following recommendations are made in relation to potential next steps to consider development opportunities and constraints.

6.1 Completion of detailed ecological surveys

Given the potential for significant ecological values occurring within the site, it is recommended that a detailed flora and vegetation and fauna surveys be undertaken as a priority so that the extent of significant values in the northern portion of the site is known.

6.2 Mundijong Road intersection resolution

Once detailed flora and vegetation and fauna surveys are completed, and the extent of significant environmental values is known, resolve the need for Mundijong Road access/intersection and opportunities to avoid/minimise impacts, and determine likely road access preferences and designs/layouts.

6.3 Resolution of future planning/approvals pathway

Given the relevance of the required future planning process for the Western Australian environmental assessment and approval pathways, it is suggested that the future planning requirements be confirmed so that the relevant EP Act pathways can be clearly understood.

6.4 Quantification of impacts and approvals strategy

Once the extent of impacts is specifically known, use this to specifically confirm approvals requirements and pathways and commence:

- Planning for mitigation and any likely offset requirements.
- Initial discussions with State and Federal environmental agencies.

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10 (Lot 500) Lampiter Drive, Mardella



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Figures



Figure 1: Site Location

Figure 2: MRS Zones and Reserves

Figure 3: TPS Zones and Reserves

Figure 4: Soils and Topography

Figure 5: Acid Sulfate Soil Risk

Figure 6: Regional Native Vegetation Extent, Vegetation Complexes and Regional Ecological Linkages

Figure 7: Vegetation Units

Figure 8: Vegetation Condition

Figure 9: Threatened Ecological Communities and Environmentally Sensitive Areas

Figure 10: Wetlands and Waterways

Figure 11: Indicative Site Constraints

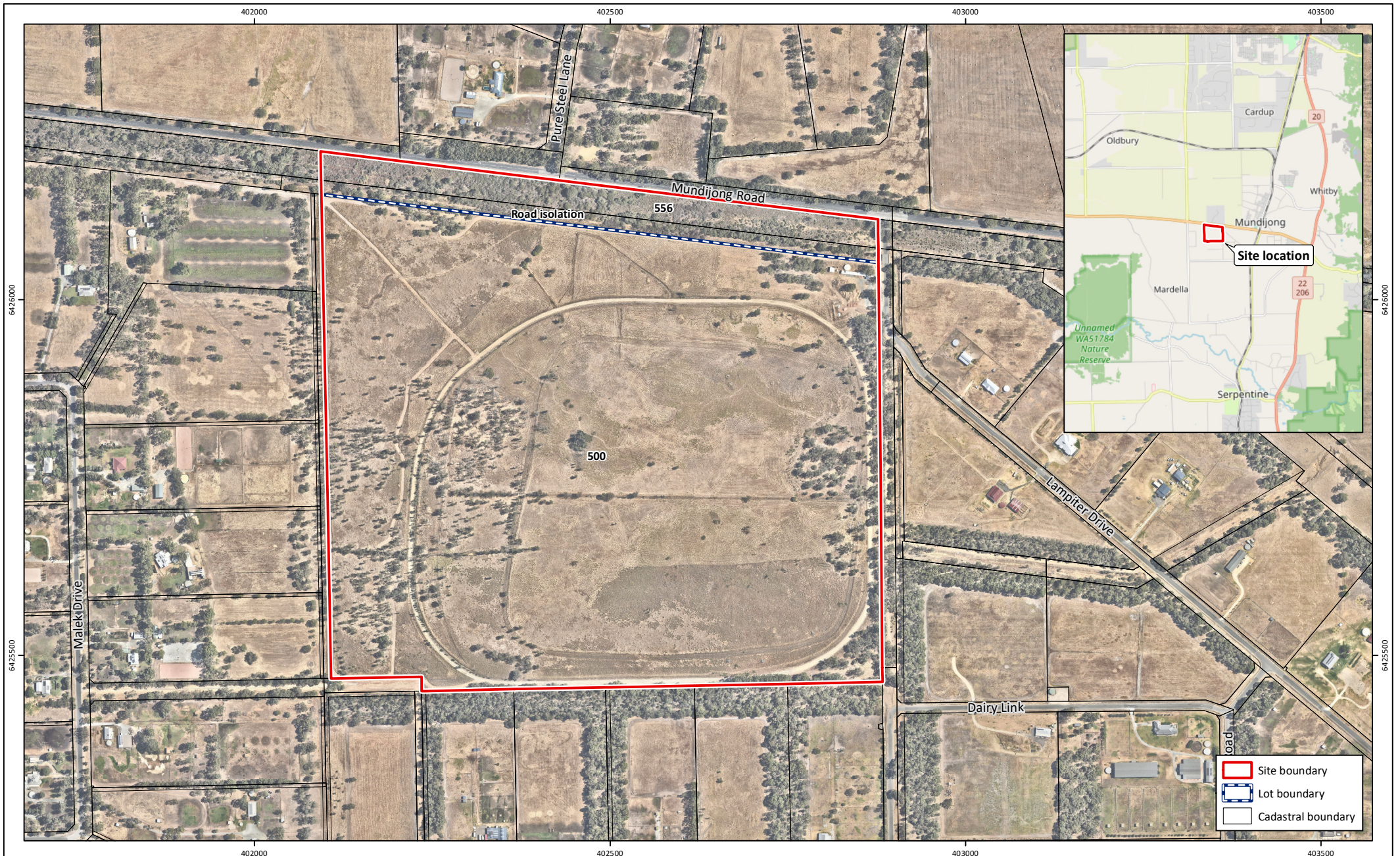
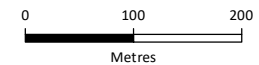


Figure 1: Site Location

Project: Environmental Assessment Report
 Lot 500 Lampiter Drive, Mardella
Client: Shire of Serpentine Jarrahdale

Plan Number:
 EP23-004(01)-F04
Drawn: WJC
Date: 31/05/2023
Checked: SAM
Approved: JDH
Date: 21/06/2023



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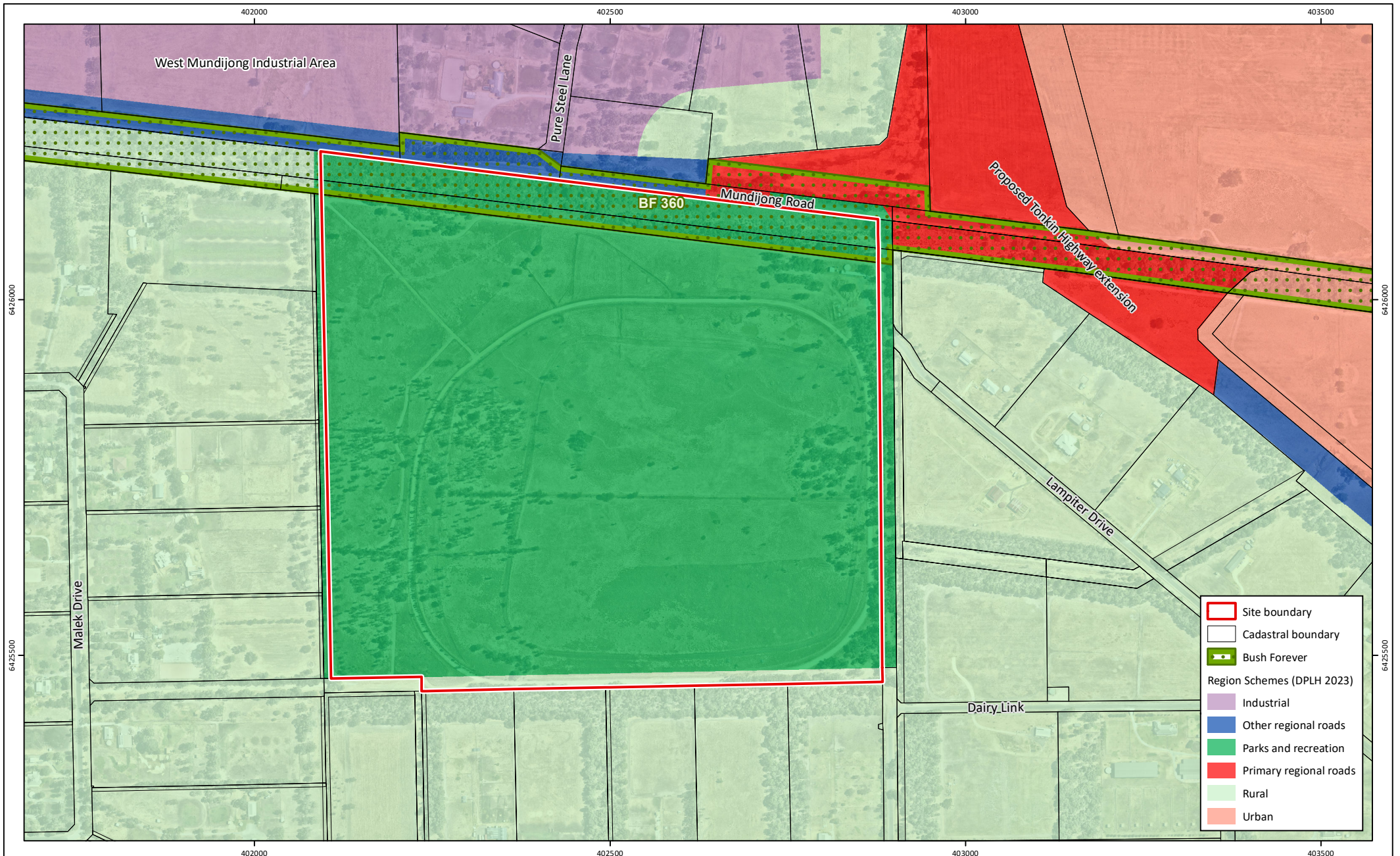


Figure 2: MRS Zones and Reserves

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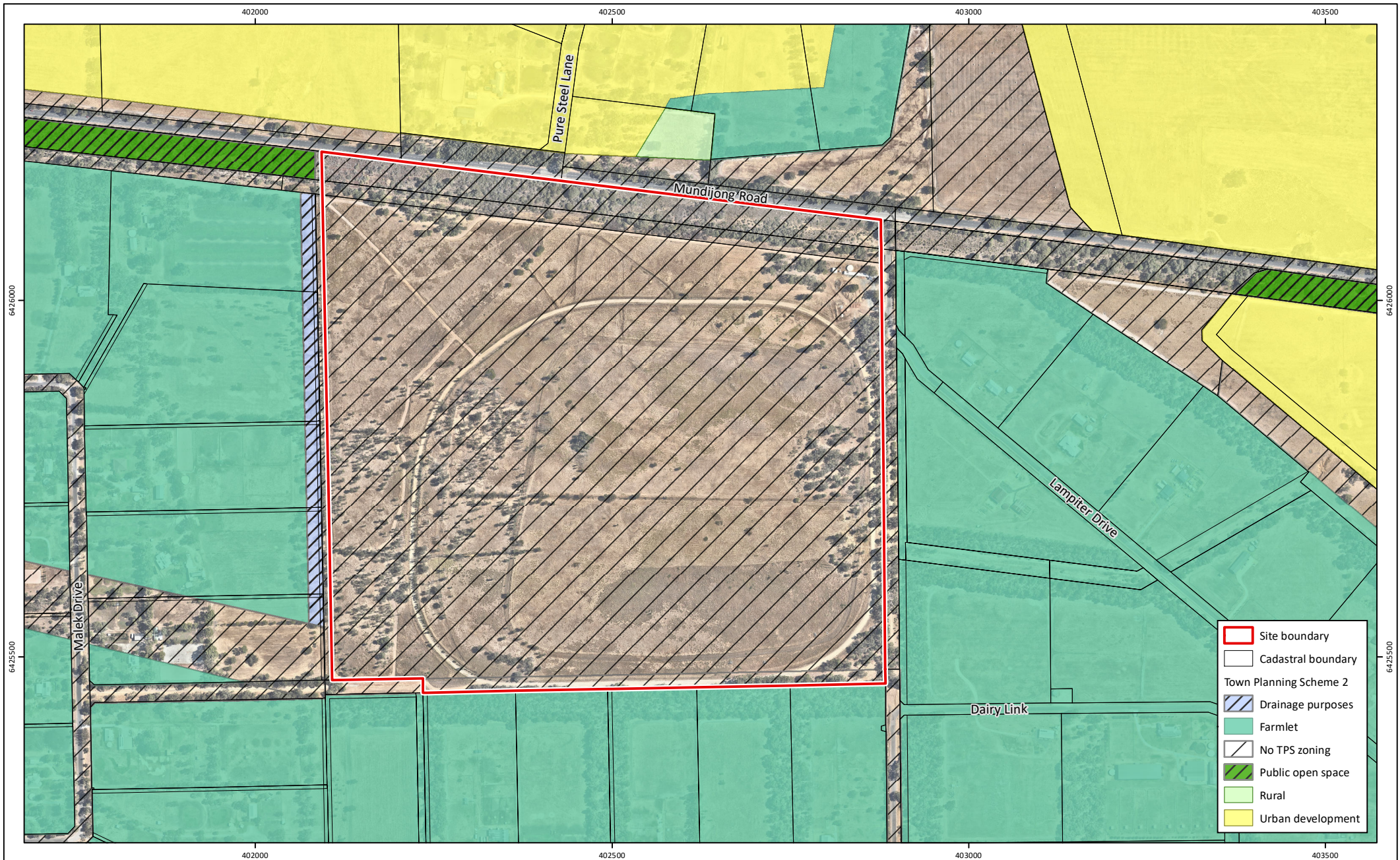
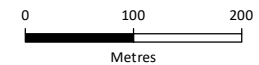


Figure 3: TPS Zones and Reserves

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 Lot 500 Lampiter Drive, Mardella
Client: Shire of Serpentine Jarrahdale

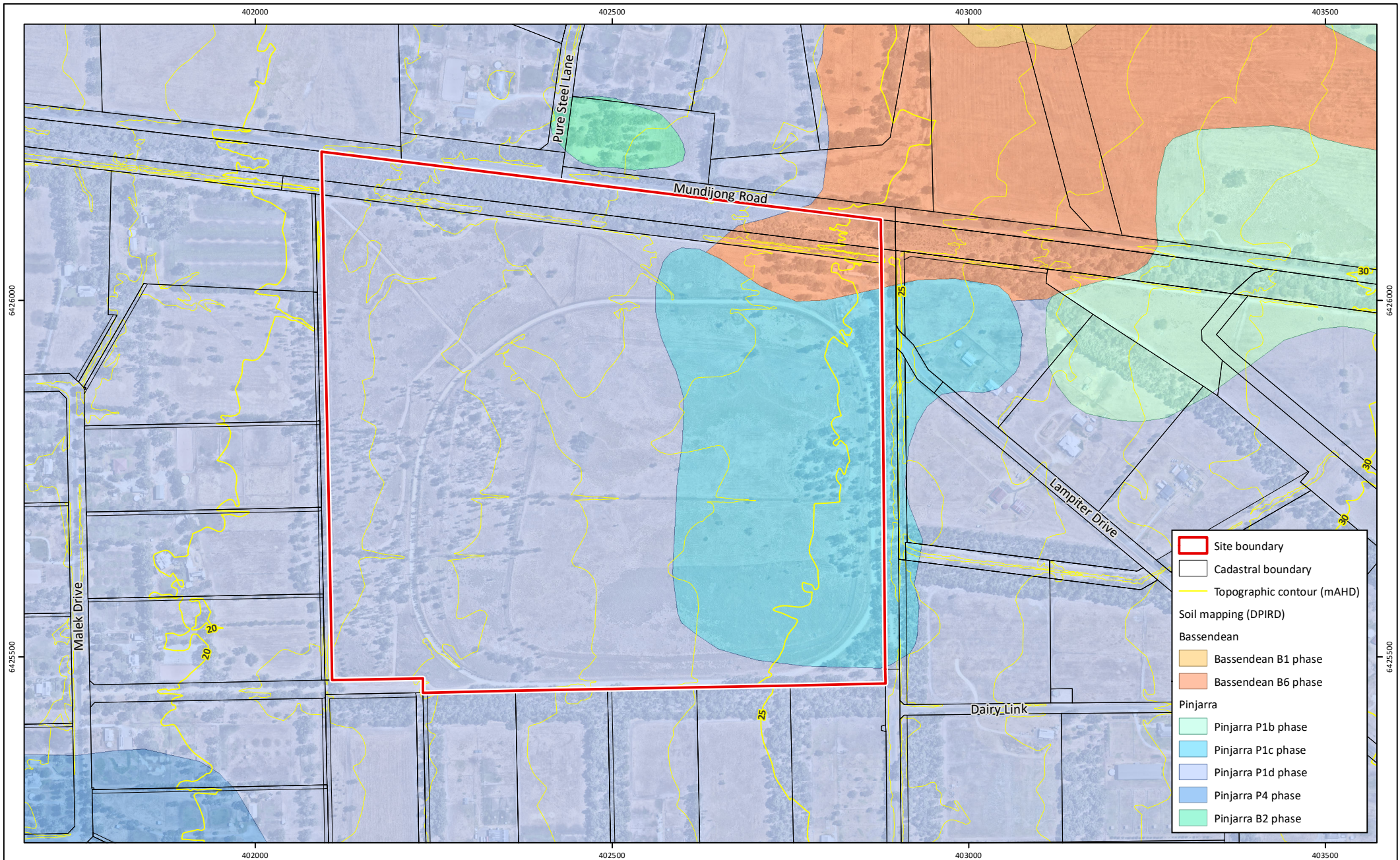
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- Site boundary
- Cadastral boundary
- Topographic contour (mAHD)

Soil mapping (DPIRD)

Bassendeane

- Bassendeane B1 phase
- Bassendeane B6 phase

Pinjarra

- Pinjarra P1b phase
- Pinjarra P1c phase
- Pinjarra P1d phase
- Pinjarra P4 phase
- Pinjarra B2 phase

Figure 4: Soils and Topography

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 Lot 500 Lampiter Drive, Mardella
Client: Shire of Serpentine Jarrahdale

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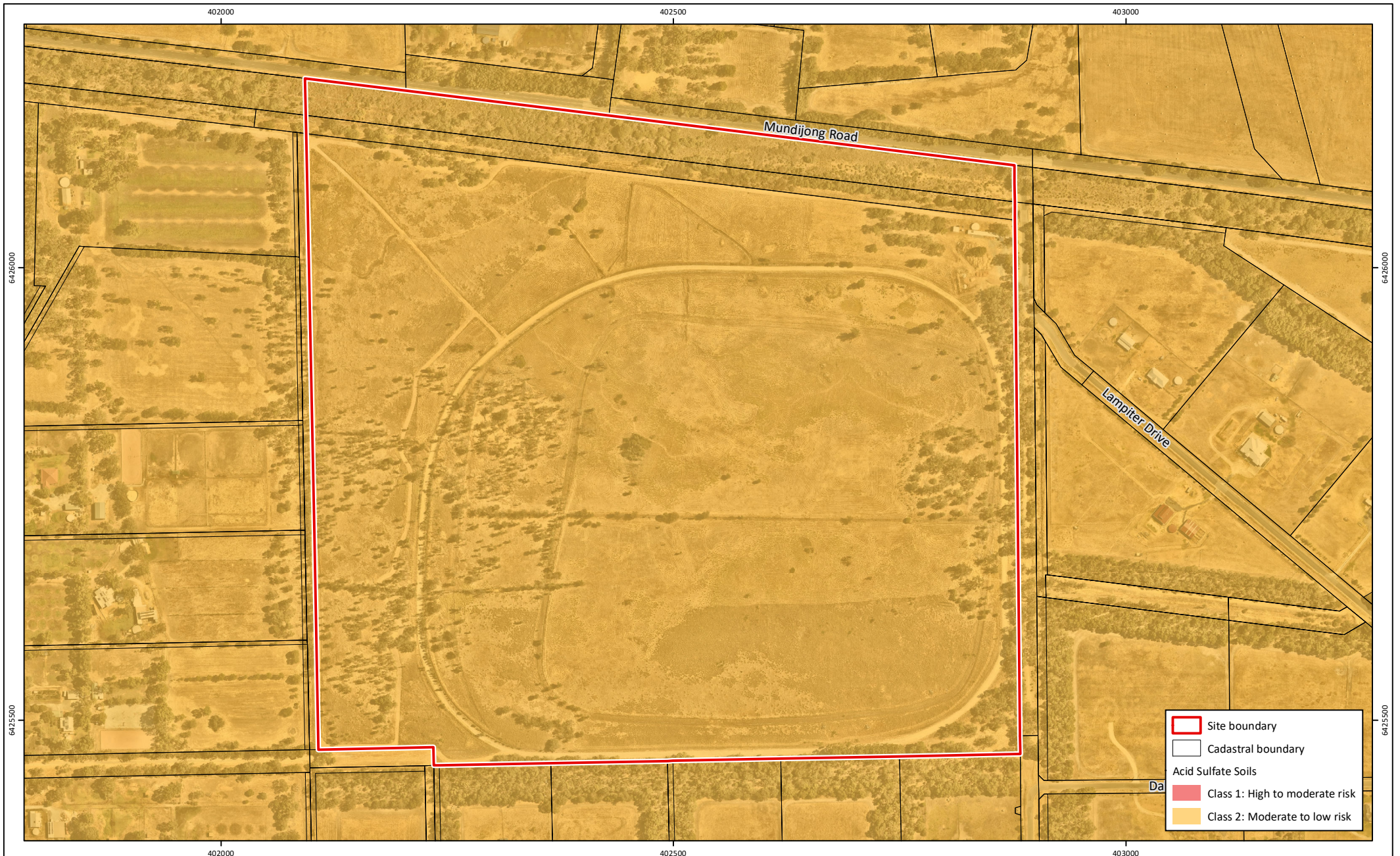


Figure 5: Acid Sulfate Soil Risk

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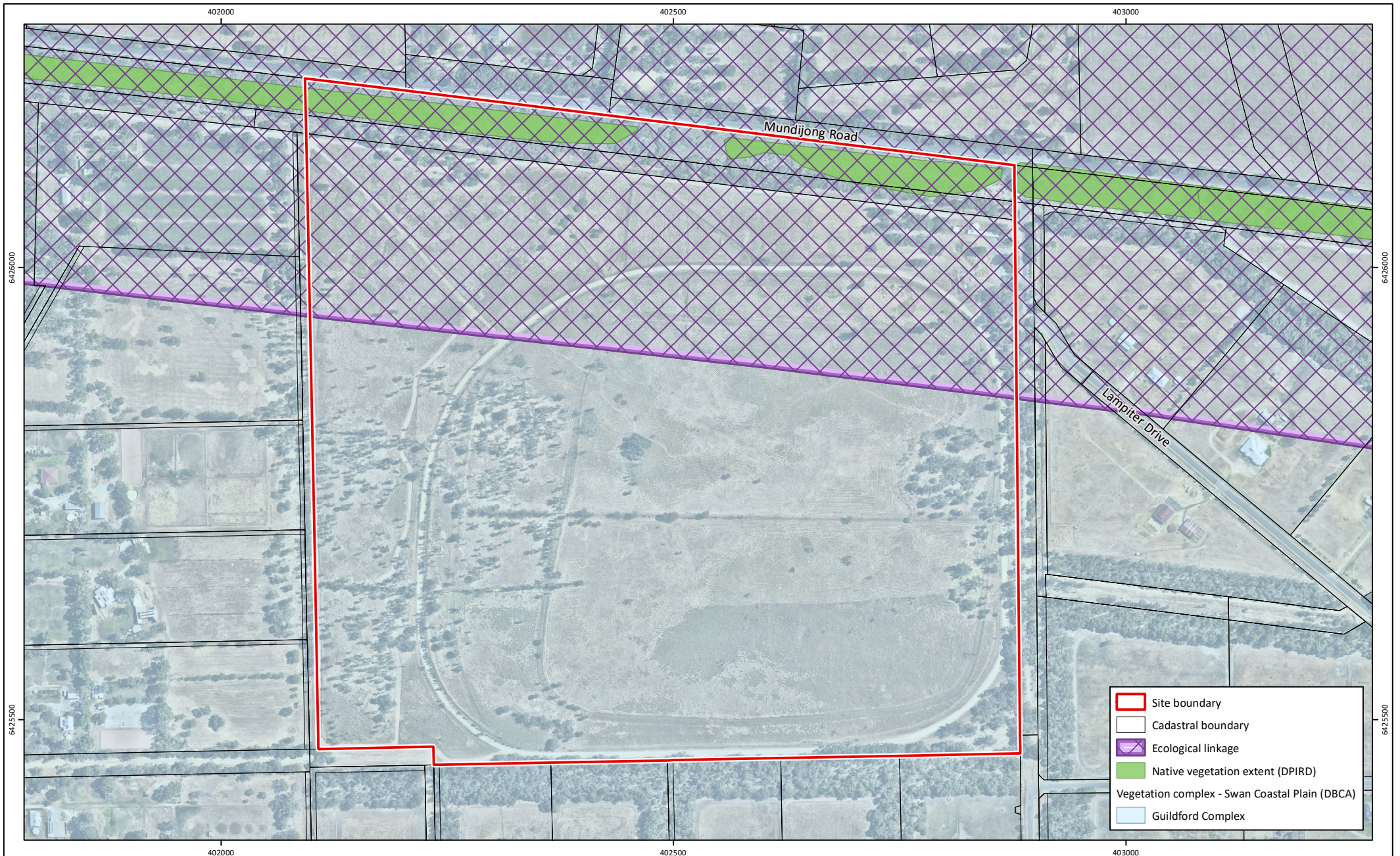


Figure 6: Regional Native Vegetation Extent, Vegetation Complexes and Regional Ecological Linkages

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Client: Shire of Serpentine Jarrahdale

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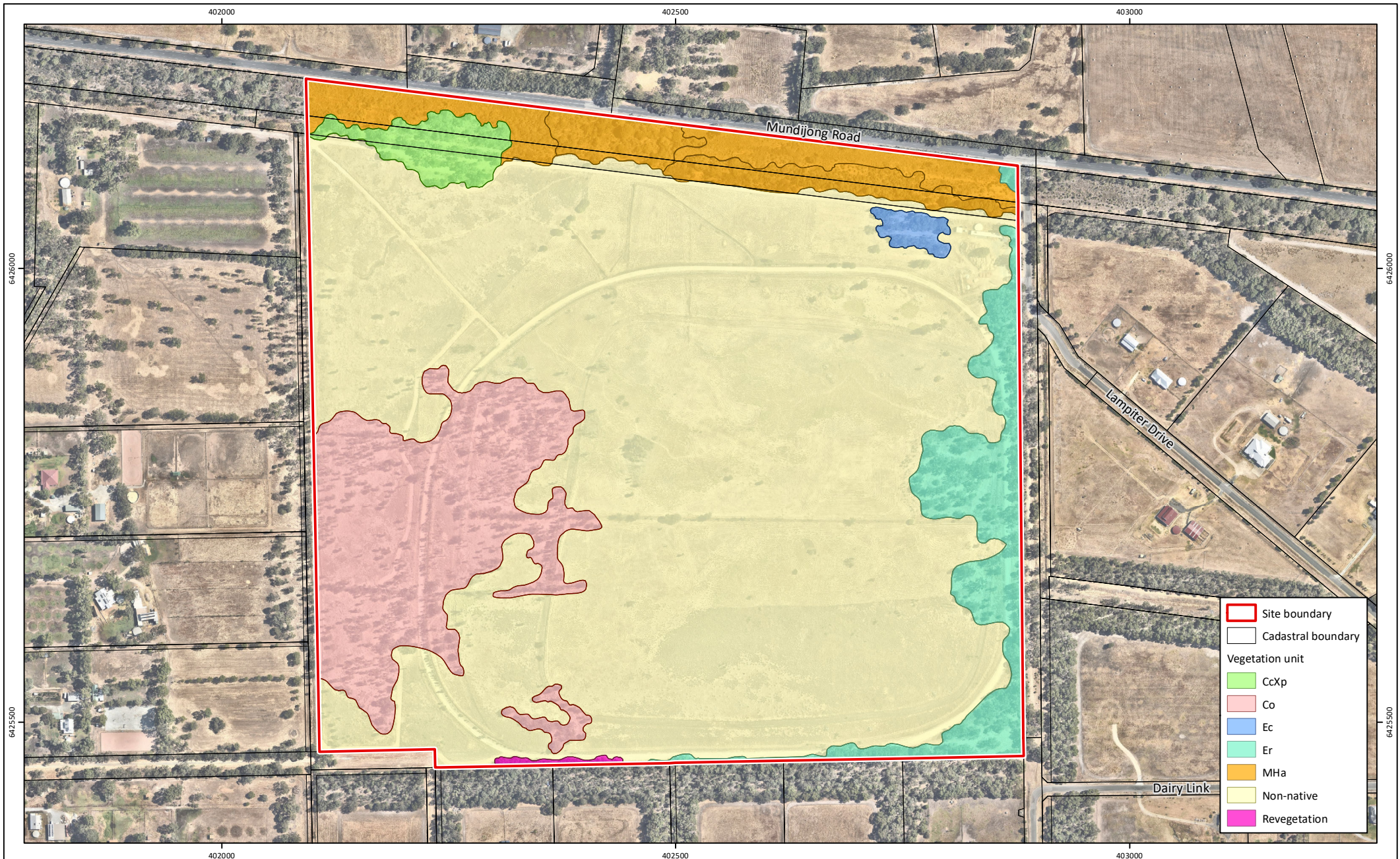


Figure 7: Vegetation Units

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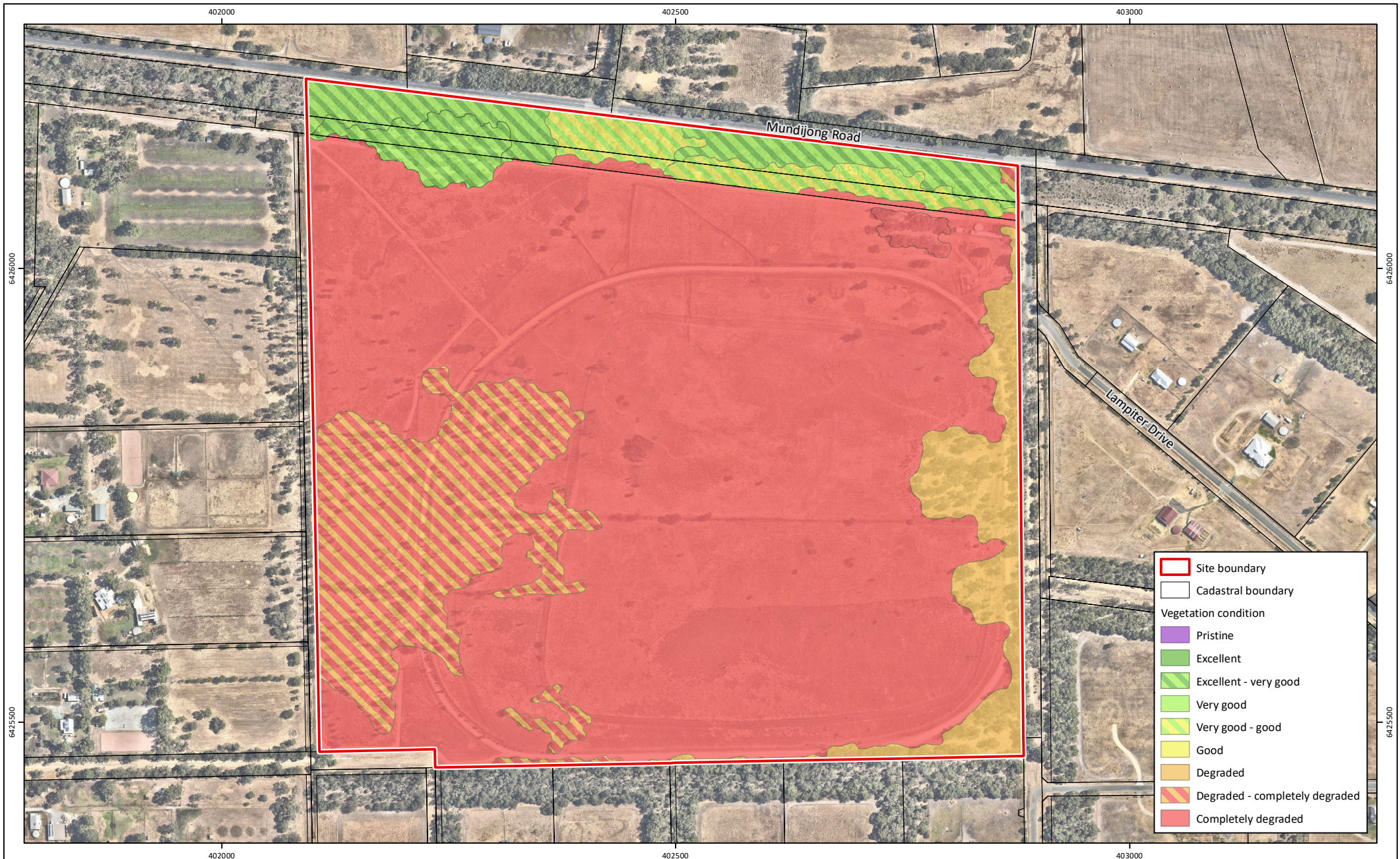


Figure 8: Vegetation Condition

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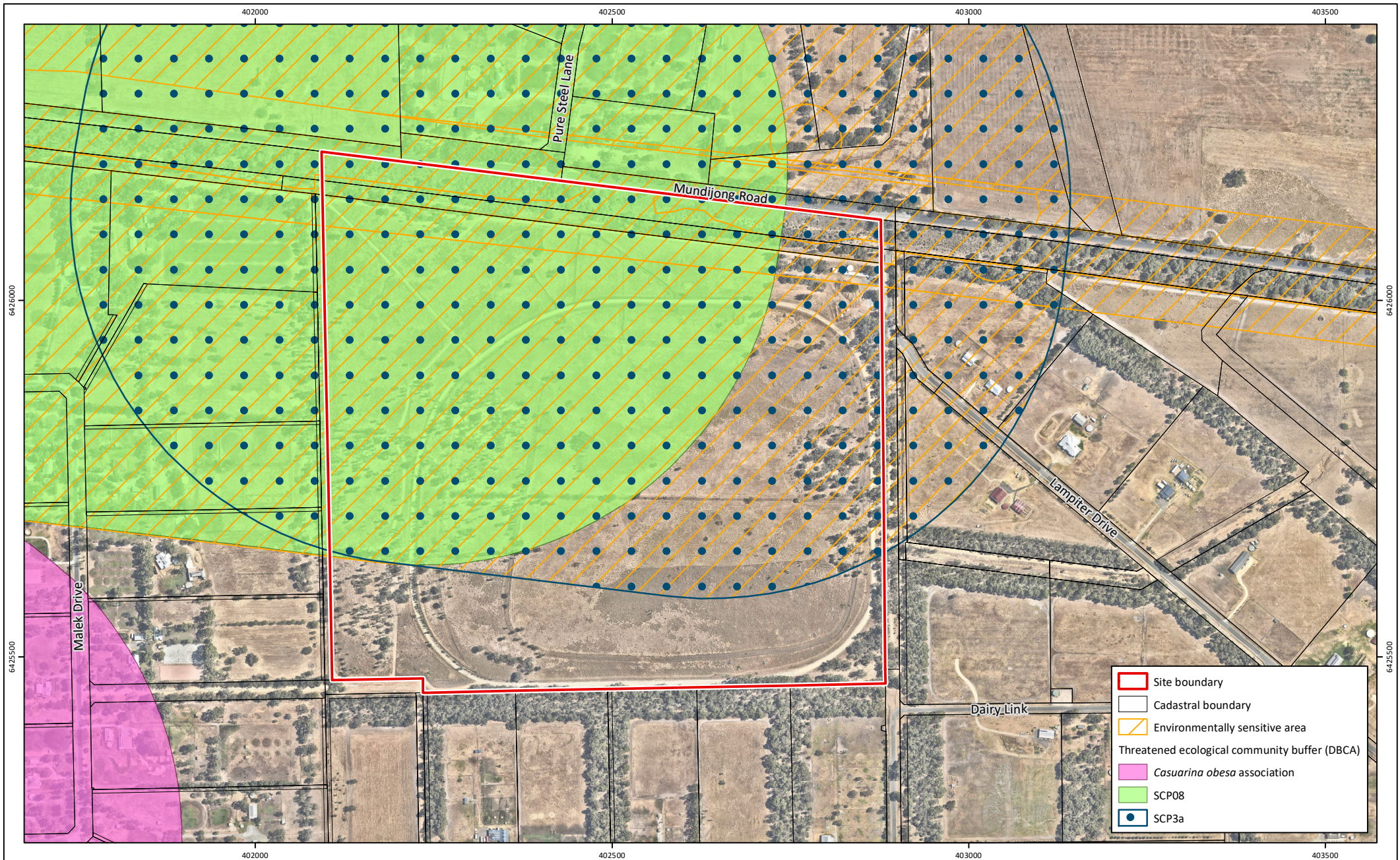


Figure 9: Threatened Ecological Communities and Environmentally Sensitive Areas

Project: Environmental Assessment Report
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Client: Shire of Serpentine Jarrahdale

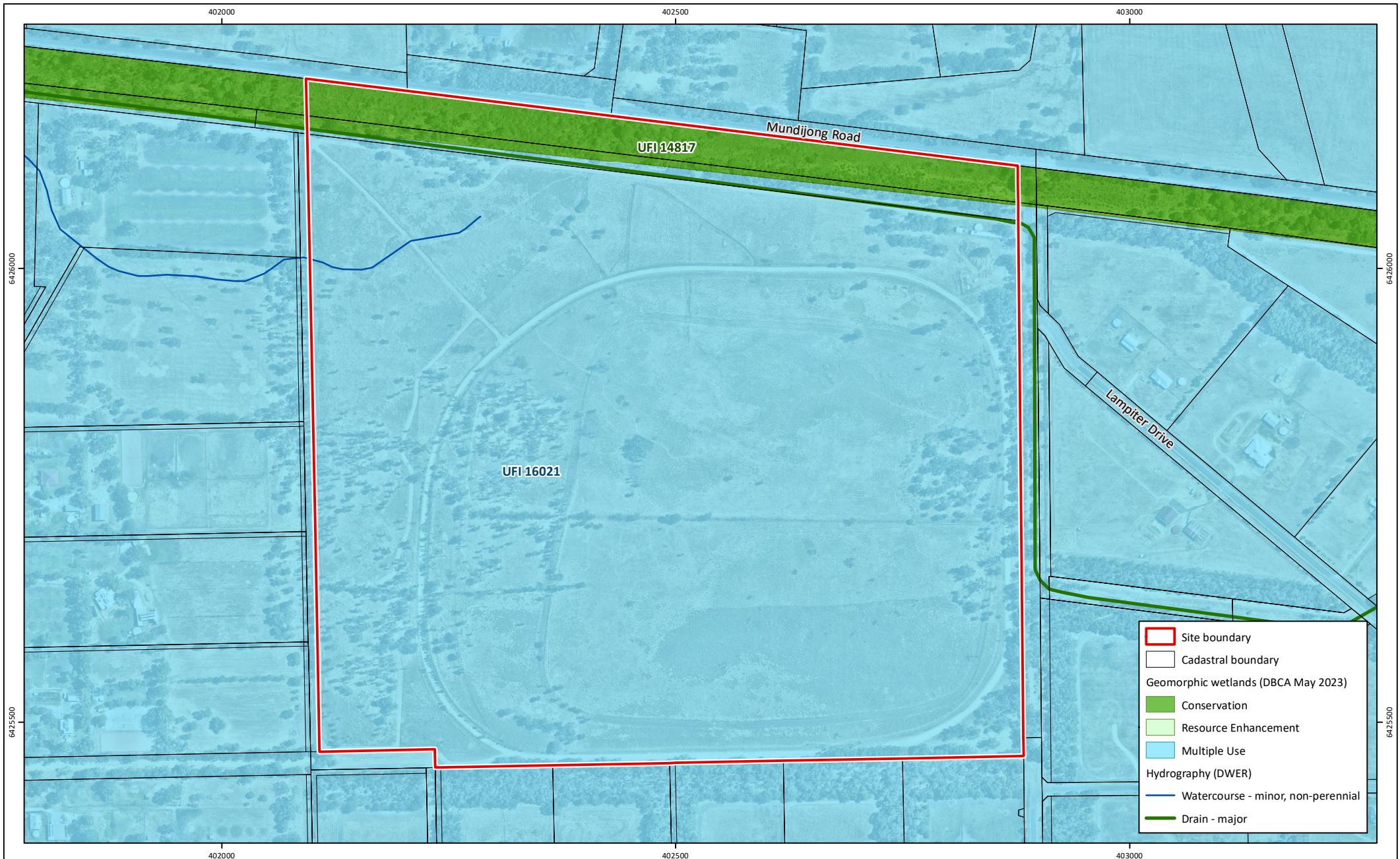
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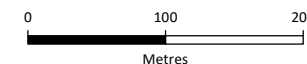


	Site boundary
	Cadastral boundary
Geomorphic wetlands (DBCA May 2023)	
	Conservation
	Resource Enhancement
	Multiple Use
Hydrography (DWER)	
	Watercourse - minor, non-perennial
	Drain - major

Figure 10: Wetlands and Waterways

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 Lot 500 Lampiter Drive, Mardella
Client: Shire of Serpentine Jarrahdale

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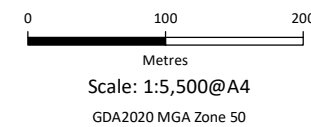
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Figure 11: Indicative Site Constraints

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Appendix A

DBCA list of Conservation Significant Flora Species within 10 km of site



Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
<i>Babingtonia urbana</i>	P3	-	P	Grey sand, lateritic gravel.	Jan-Mar	High
<i>Calectasia grandiflora</i>	P2	-	P	White, grey or yellow sand.	Jun-Nov	High
<i>Jacksonia gracillima</i>	P3	-	P	Sand, often adjacent to winter wet areas.	Sep-Dec	High
<i>Lepidosperma rostratum</i>	EN	EN	P	Peaty sand and clay amongst low heath, in winter-wet swamps.	May-Jun (survey late Jun-Aug)	High
<i>Morelotia australiensis</i>	VU	VU	P	Sand over clay, winter wet depressions and drainage lines.	Nov-Dec	High
<i>Synaphea sp. Pinjarra Plain (A.S. George 17182)</i>	EN	CR	P	White grey clayey sand on edges of seasonally inundated low lying areas.	Sep-Oct	High
<i>Synaphea sp. Serpentine (G.R. Brand 103)</i>	CR	CR	P	Seasonally damp areas, loam - sand.	Sep-Oct	High
<i>Carex tereticaulis</i>	P3	-	P	Black peaty sand.	Sep-Oct	Low
<i>Pithocarpa corymbulosa</i>	P3	-	P	Gravelly or sandy loam, amongst granite outcrops.	Jan-Apr	Low
<i>Schoenus capillifolius</i>	P3	-	A	Brown mud in claypans.	Oct-Nov	Low
<i>Stylidium aceratum</i>	P3	-	A	Sandy soils in swamp heathland.	Oct-Nov	Low
<i>Stylidium longitubum</i>	P4	-	A	Sandy clay, clay. Seasonal wetlands.	Oct-Dec	Low
<i>Acacia horridula</i>	P3	-	P	Gravelly soils over granite, sand, rocky hillsides.	May-Aug	Moderate
<i>Acacia lasiocarpa var. bracteolata long peduncle variant (G.J. Keighery 5026)</i>	P1	-	P	Grey or black sand over clay. Swampy areas, winter wet lowlands.	May or Aug	Moderate
<i>Angianthus drummondii</i>	P3	-	A	Grey or brown clay soils, ironstone. On seasonally wet flats.	Oct-Dec	Moderate
<i>Aponogeton hexatepalus</i>	P4	-	P	Mud. Freshwater: ponds, rivers, claypans.	Jul-Oct	Moderate
<i>Boronia juncea subsp. juncea</i>	P1	-	P	Sand in low scrub.	Apr	Moderate
<i>Caladenia huegelii</i>	CR	EN	PG	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov	Moderate
<i>Cyathochaeta teretifolia</i>	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan	Moderate
<i>Dampiera triloba</i>	P3	-	P	Damp peat/loam soil.	Aug-Dec	Moderate
<i>Dillwynia dillwynioides</i>	P3	-	P	Winter wet depressions on sandy soils.	Aug - Dec	Moderate
<i>Diuris purdiei</i>	EN	EN	PG	Sand to sandy clay soils in areas subject to winter inundation.	late September to mid-October, but only after a summer or early autumn fire (Brown et al., 1998)	Moderate

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
<i>Drakaea elastica</i>	CR	EN	PG	Bare patches of sand within otherwise dense vegetation in low-lying areas alongside winter-wet swamps. Typically in banksia woodland or thickets of <i>Kunzea glabrescens</i> .	late Sep-Oct/Nov, survey Jul-Aug	Moderate
<i>Drosera occidentalis</i>	P4	-	P	Flat, brown/white/yellow moist sand/clay/peat, often near swamps.	Oct-Dec/Jan	Moderate
<i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459)	P3	-	P	Grey brown sand or clay in winter wet flats.	Sep-Nov	Moderate
<i>Eucalyptus rudis</i> subsp. <i>cratyantha</i>	P4	-	P	Loam on flats and hillsides.	Jul-Sep	Moderate
<i>Grevillea curviloba</i>	EN	EN	P	Grey sand, sandy loam. Winter-wet heath.	Aug-Oct	Moderate
<i>Isopogon autumnalis</i>	P3	-	P	Yellow-grey sand.	Feb, Mar, Apr, May or June	Moderate
<i>Johnsonia pubescens</i> subsp. <i>cygnorum</i>	P2	-	P	Grey white yellow sands on flats and seasonally wet areas.	Sep	Moderate
<i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>	P3	-	P	Brown clay loam on slopes.	Sep-Dec	Moderate
<i>Lasiopetalum pterocarpum</i>	CR	EN	P	Dark brown or red brown loam or clayey-sand over granite, near creek lines and on sloping banks. Associated with riparian vegetation including flooded gum, marri and swamp peppermint.	Aug-Nov	Moderate
<i>Millotia tenuifolia</i> var. <i>laevis</i>	P2	-	A	Granite or lateritic soils.	Sep-Oct	Moderate
<i>Parsonsia diaphanophleba</i>	P4	-	P	Alluvial soils along rivers.	Jan-Feb or Apr-Sep	Moderate
<i>Schoenus pennisetis</i>	P3	-	A	Grey or peaty sand in swamps and winter-wet depressions.	Aug-Sep	Moderate
<i>Schoenus</i> sp. <i>Waroona</i> (G.J. Keighery 12235)	P3	-	A	Clay or sandy clay. Winter-wet flats.	Oct-Nov	Moderate
<i>Senecio leucoglossus</i>	P4	-	A	Gravelly lateritic or granitic soils on outcrops or slopes.	Aug-Dec	Moderate
<i>Synaphea odocoileops</i>	P1	-	P	Brown orange loam and sandy clay, granite, in swamps and winter wet areas.	Aug-Oct	Moderate
<i>Synaphea</i> sp. <i>Fairbridge Farm</i> (D. Papenfus 696)	CR	CR	P	Low woodland on grey, clayey sand with lateritic pebbles (Pinjarra Plain) near winter wet flats.	Sep-Nov	Moderate

Species name	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	EPBC Act				
<i>Verticordia lindleyi subsp. lindleyi</i>	P4	-	P	Sand and sandy clay in winter wet areas.	May or Nov-Jan	Moderate
<i>Acacia oncinophylla</i>	P3	-	P	Granitic soils.	Aug-Oct	Negligible
<i>Andersonia gracilis</i>	VU	EN	P	Seasonally damp, black sandy clay flats near or on the margins of swamps.	Sep-Nov	Negligible
<i>Anthocercis gracilis</i>	VU	VU	P	Steep granite slopes along the Darling Scarp in shallow, humis-rich sandy or loamy soils.	Sep-Oct, Apr	Negligible
<i>Banksia mimica</i>	VU	EN	P	Flat to gentle slopes in grey and white sand in open woodlands.	Dec-Jan	Negligible
<i>Diuris drummondii</i>	VU	VU	PG	In low-lying depressions in peaty and sandy clay swamps.	Nov-Jan	Negligible
<i>Diuris micrantha</i>	VU	VU	PG	Dark grey-black sandy clay-loam in winter wet depressions or swamps. Often in shallow standing water.	Aug/Sep- early Oct	Negligible
<i>Drakaea micrantha</i>	EN	VU	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct	Negligible
<i>Eleocharis keigheryi</i>	VU	VU	P	Clay or sandy loam in freshwater creeks and transient waterbodies such as seasonally wet clay pans.	Aug-Dec	Negligible
<i>Eucalyptus x balanites</i>	CR	EN	P	Light coloured sandy soils over laterite. Habitat consists of gently sloping heathlands; open mallee woodland over shrubland (Population 2) or heathland with emergent mallees (Population 1).	Oct - Feb	Negligible
<i>Thelymitra stellata</i>	EN	EN	PG	Sandy loam, clay or gravel over laterite or gravel.	Sep-Nov	Negligible
<i>Verticordia plumosa var. ananeotes</i>	CR	EN	P	Sand in open jarrah woodland or sandy/clay soils with marri.	Nov-Dec	Negligible

Note: T=threatened, CE=critically endangered, E=endangered, V=vulnerable, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4, P=perennial, PG=perennial geophyte, A=annual. Species considered to potentially occur within the site are shaded green

Appendix B

DBCA list of Threatened Ecological Communities and Priority Ecological Communities within 10 km of site



Code	Community name	TEC/ PEC	Level of significance		Likelihood of occurrence
			State	EPBC Act	
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	PEC/TEC	P3	EN	Moderate
Casuarina obesa association	<i>Casuarina obesa</i> Association	PEC	P1	-	Low
Mound Springs SCP	Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)	TEC	CR	EN	Low
SCP02	Southern wet shrublands, Swan Coastal Plain (floristic community type 2 as originally described in Gibson et al. 1994)	TEC	CR	-	Moderate
SCP07	Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson et al. 1994)	TEC	EN	CR	Moderate
SCP08	Herb rich shrublands in clay pans (floristic community type 8 as originally described in Gibson et al. 1994)	TEC	EN	CR	High
SCP09	Dense shrublands on clay flats (floristic community type 9 as originally described in Gibson et al. 1994)	TEC	EN	CR	Moderate
SCP10a	Shrublands on dry clay flats (floristic community type 10a as originally described in Gibson et al. 1994)	TEC	EN	CR	Moderate
SCP20b	<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain (floristic community type 20b as originally described in Gibson et al. 1994)	TEC	CR	EN	Low
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	PEC/TEC	P3	EN	Low
SCP22	<i>Banksia ilicifolia</i> woodlands	PEC/TEC	P3	EN	Low
SCP3a	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils (floristic community type 3a as originally described in Gibson et al. 1994)	TEC	CR	EN	High
SCP3b	<i>Corymbia calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern Swan Coastal Plain (floristic community type 3b as originally described in Gibson et al. 1994)	TEC	EN	-	Moderate
SCP3c	<i>Corymbia calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, Swan Coastal Plain (floristic community type 3c as originally described in Gibson et al. 1994)	TEC	EN	EN	High

		PEC	State	EPBC Act	occurrence
-	Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain ecological community	PEC/TEC	P3	CR	Low
-	Clay Pans of the Swan Coastal Plain	TEC	EN	CR	High
Note: TEC=threatened ecological community, PEC=priority ecological community, CR=critically endangered, EN=endangered, VU=vulnerable, P1=priority 1, P3=priority 3. Species considered to have a moderate or high likelihood to occur within the site are shaded green.					

Appendix C

DBCA list of Conservation Significant Fauna Species within 10 km of site



Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
Birds					
<i>Actitis hypoleucos</i>	Common sandpiper	MI	MI	Edge of sheltered waters salt or fresh, e.g. estuaries, mangrove creeks, rocky coasts, near-coastal saltlakes (including saltwork ponds), river pools, lagoons, claypans, drying swamps, flood waters, dams and sewage ponds. Preferring situations where low perches are available (Johnstone & Storr 1998).	Negligible
<i>Botaurus poiciloptilus</i>	Australasian bittern	EN	EN	In or over water, in tall reedbeds, sedges, rushes, cumbungi, lignum. Also occurs in ricefields, drains in tussocky paddocks and occasionally in saltmarshes and brackish wetlands (TSSC 2019).	Negligible
<i>Calidris ferruginea</i>	Curlew sandpiper	CR	CR (MI)	Mainly shallows of estuaries and near-coastal saltlakes (including saltwork ponds) and drying near-coastal freshwater lakes and swamps. Also beaches and near-coastal sewage ponds (Johnstone & Storr 1988).	Negligible
<i>Calidris ruficollis</i>	Red-necked stint	MI	MI	Tidal mudflats, saltmarshes, sandy or shelly beaches, saline and freshwater wetlands (coastal and inland), saltfields, sewage ponds (Pizey & Knight 2012).	Low
<i>Calyptorhynchus banksii naso</i>	Forest red-tailed black cockatoo	VU	VU	Eucalypt and Corymbia forests, often in hilly interior. More recently also observed in more open agricultural and suburban areas including Perth metropolitan area. Attracted to seeding Corymbia calophylla, Eucalyptus marginata, introduced Melia azedarach and Eucalyptus spp. trees (Johnstone et al. 2013).	High
<i>Charadrius leschenaultii</i>	Great sand plover	VU	VU (MI)	Wide sandy or shelly beaches, sandpits, tidal mudflats, reefs, sand cays, mangroves, saltmarsh, dune wilderness, bare paddocks, seldom far inland (Pizey & Knight 2012).	Negligible
<i>Falco peregrinus</i>	Peregrine falcon	OS	-	Mainly found around cliffs along coasts, rivers, ranges and around wooded watercourses and lakes (Johnstone and Storr 1998).	Moderate
<i>Hydroprogne caspia</i>	Caspian tern	MI	MI	Mainly sheltered areas, estuaries (when not laden with silt) and tidal creeks; occasionally near-coastal saltlakes (including saltwork ponds) and brackish pools in lower courses of rivers; rarely fresh waters (DCCEEW 2023).	Negligible
<i>Leipoa ocellata</i>	Malleefowl	VU	VU	Scrubs and thickets of Eucalyptus spp., Melaleuca lanceolata and Acacia linophylla; also other dense litter-forming shrublands. Attracted to fallen wheat in stubbles and along roads (Johnstone and Storr 1998).	Negligible
<i>Numenius madagascariensis</i>	Eastern curlew	CR	CR (MI)	Mainly tidal mudflats; also reef flats, sandy beaches and rarely near-coastal lakes (including saltwork ponds) (Johnstone and Storr 1998).	Negligible
<i>Oxyura australis</i>	Blue-billed duck	P4	-	Mainly deeper freshwater swamps and lakes; occasionally saltlakes and estuaries freshened by flood waters (Johnstone and Storr 1998).	Negligible
<i>Plegadis falcinellus</i>	Glossy Ibis	MI	MI	Well-vegetated wetlands, wet pasture, ricefields, floodwaters, floodplains, brackish or occasionally saline wetlands, mangroves, mudflats and occasionally dry grassland (Pizey & Knight 2012).	Negligible
<i>Rostratula australis</i>	Australian painted snipe	EN	EN	Mainly shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans (Marchant and Higgins 1993).	Negligible
<i>Sternula nereis nereis</i>	Australian fairy tern	VU	VU	Sheltered blue-water seas close to land, estuaries (when free of silt) and near-coastal lakes (Johnstone and Storr 1998).	Negligible
<i>Tringa nebularia</i>	Common greenshank	MI	MI	Mudflats, estuaries, saltmarshes, margins of lakes, wetlands, claypans (fresh and saline), commercial saltfields, sewage ponds (Pizey & Knight 2012).	Negligible
<i>Zanda baudinii</i>	Baudin's black cockatoo	EN	EN	Mainly eucalypt forests. Attracted to seeding Corymbia calophylla, Banksia spp., Hakea spp., and to fruiting apples and pears (Johnstone and Storr 1998).	High
<i>Zanda latirostris</i>	Carnaby's black cockatoo	EN	EN	Mainly proteaceous scrubs and heaths and adjacent eucalypt woodlands and forests; also plantations of Pinus spp. Attracted to seeding Banksia spp., Hakea spp., Eucalyptus spp., Corymbia calophylla, Grevillea spp., and Allocasuarina spp. (Johnstone and Storr 1998).	High
Invertebrates					
<i>Euoplos inornatus</i>	Inornate trapdoor spider	P3	-	Has previously been recorded in jarrah forest, including near clay banks and granite outcrop. Most records are from the Darling scarp/Jarrah Forest Region, with limited records from the Swan Coastal Plain (DBCA 2020).	Moderate

Species name	Common name	Level of significance		Habitat	Likelihood of occurrence
		WA	EPBC Act		
<i>Idiosoma sigillatum</i>	Swan Coastal Plain shield-backed trapdoor spider	P3	-	Widely distributed in sandy areas on the Swan Coastal Plain and on Rottnest Island (Prince 2003). Species predominantly recorded from remnant banksia woodland vegetation and heath on sandy soils (Rix et. al 2018).	Moderate
<i>Leioproctus douglasiellus</i>	a short-tongued bee	EN	CR	Life history and habits are poorly documented/ unknown. It has been recorded only on the flowers of <i>Goodenia filiformis</i> and <i>Anthotium junciforme</i> (Houston 2000).	Negligible
<i>Westralunio carteri</i>	Carter's freshwater mussel	VU	VU	Occurs in greatest abundance in slower flowing streams with stable sediments that are soft enough for burrowing amongst woody debris and exposed tree roots. Also occupies lentic systems including large water supply dams and even on-stream farm dams. Salinity tolerance quite low (Morgan et al. 2011).	Low
Mammals					
<i>Bettongia penicillata ogilbyi</i>	Woylie	CR	EN	Woodlands and adjacent heaths with a dense understorey of shrubs, particularly <i>Gastrolobium</i> spp. (TSSC 2018).	Negligible
<i>Dasyurus geoffroi</i>	Chuditch	VU	VU	Wide range of habitats from woodlands, dry sclerophyll forests, riparian vegetation, beaches and deserts. Appears to utilise native vegetation along roadsides in the wheatbelt (DEC 2012).	Moderate
<i>Falsistrellus mackenziei</i>	Western false pipistrelle	P4	-	High rainfall forests dominated by jarrah, karri, marri, and tuart. Occupies hollow logs for breeding and resting (Van Dyck and Strahan 2008). Also known to utilise Banksia woodland on the Swan Coastal Plain (Hosken and O'Shea 1995).	Negligible
<i>Hydromys chrysogaster</i>	Rakali	P4	-	Areas with permanent water, fresh, brackish or marine. Likely to occur in all major rivers and most of the larger streams as well as bodies of permanent water in the lower south-west (Christensen et al. 1984).	Low
<i>Isaodon fusciventer</i>	Quenda	P4	-	Dense scrubby, often swampy, vegetation with dense cover up to one metre high (DEC 2012)	High
<i>Myrmecobius fasciatus</i>	Numbat	EN	EN	Generally dominated by <i>Eucalyptus</i> spp. that provide hollow logs and branches for shelter and termites for food (van Dyck & Strahan 2008).	Negligible
<i>Notamacropus eugenii derbianus</i>	Tammar wallaby	P4	-	Dry sclerophyll forest, Banksia spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	High
<i>Notamacropus irma</i>	Western brush wallaby	P4	-	Dry sclerophyll forest, Banksia spp. woodlands and shrublands, typically favouring dense low vegetation that provides dense cover (Christensen and Strahan 1983).	High
<i>Phascogale tapoatafa wambenger</i>	South-western brush-tailed phascogale	CD	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover (Triggs 2003).	High
<i>Pseudocheirus occidentalis</i>	Western ringtail possum	CR	CR	On the Swan Coastal Plain in <i>Agonis flexuosa</i> woodlands and <i>Agonis flexuosa</i> / <i>Eucalyptus gomphocephala</i> forests. Also <i>Eucalyptus marginata</i> forests (DBCA 2017).	Negligible
<i>Setonix brachyurus</i>	Quokka	VU	VU	On the mainland mostly dense streamside vegetation or shrubland and heath areas, particularly around swamps (Cronin 2007).	Negligible
Reptiles					
<i>Acanthophis antarcticus</i>	Southern death adder	P3	-	Mostly in woodlands, grasslands and heaths. In the Darling Range this species is typically found within <i>Eucalyptus marginata</i> woodlands adjacent to granite outcrops and along densely vegetated creeks (Bush et al. 2010).	Negligible
<i>Lerista lineata</i>	Perth slider	P3	-	Sandy coastal heath and low scrubland. Banksia spp. woodland, <i>Eucalyptus gomphocephala</i> open woodland over deep sands, and coastal dunes immediately adjacent to the beach (Wilson and Swan 2021).	Low
<i>Neelaps calonotos</i>	Black-striped snake	P3	-	Coastal and near-coastal dunes, sandplains supporting heathlands and Banksia spp. woodlands (Bush et al. 2010).	Low
<p>Note: CE=critically endangered, EN=endangered, VU=vulnerable, CD=conservation dependent, MI=migratory, OS=other specially protected, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4. Species considered to have a moderate or high likelihood to occur within the site are shaded green.</p>					