

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook

Project No: EP21-088(02)

**Prepared for Department of Finance
March 2022**



Reconnaissance Flora and Vegetation Assessment
 Lots 51-53 Park Street, Henley Brook



Document Control

Doc name: Reconnaissance Flora and Vegetation Assessment Lots 51-53 Park Street, Henley Brook					
Doc no.: EP21-088(02)--004 MS					
Version	Date	Author	Reviewer		
1	March 2022	Melanie Schubert	MS	Rachel Weber	RAW
	Submitted for client review				

© 2022 Emerge Associates All Rights Reserved. Copyright in the whole and every part of this document belongs to Emerge Associates and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or in or on any media to any person without the prior written consent of Emerge Associates.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Executive Summary

The Department of Finance - Building Management and Works engaged Emerge Associates to conduct a reconnaissance flora and vegetation assessment within Lots 51-53 Park Street in Henley Brook (referred to herein as the 'site').

As part of the assessment a desktop review of relevant background information was completed and a field survey was undertaken on 22 November 2021. During the field survey an assessment was made on the type, condition and values of vegetation across the site.

Outcomes of the survey include the following:

- A total of five native and 56 non-native (weed) species were recorded in the site.
- No threatened or priority flora species were recorded within the site and none are expected to occur due to the lack of suitable habitat.
- The vegetation within the site was classified into the following two plant communities:
 - **Cc** which occurs as a small patch in 'degraded' condition in the south-eastern portion of the site and extends over 0.04 ha (0.67% of the site).
 - **Parkland cleared** vegetation which occurs in 'completely degraded' condition across the remaining 5.96 ha (99.33%) of the site.
- No TECs or PECs occur within the site.
- *Eucalyptus* and *Corymbia* trees within the site have the potential to provide breeding, roosting and foraging habitat for threatened species of black cockatoo, along with other ecological services.
- The western portion of the site is mapped as forming part of a 'multiple use' category wetland. However, no wetland vegetation or other indicators that a wetland occurs within the site was recorded during the field survey.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



This page has been left blank intentionally.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Table of Contents

1	Introduction	1
1.1	Project background	1
1.2	Purpose and scope of work	1
2	Environmental Context	2
2.1	Climate	2
2.2	Geomorphology and soils	2
2.3	Topography	3
2.4	Hydrology and wetlands	3
2.5	Regional vegetation	3
2.6	Historical land use	4
2.7	Conservation significant values	4
2.7.1	Threatened and priority flora	4
2.7.2	Threatened and priority ecological communities	5
2.8	Weeds and pests	5
2.9	Bush Forever	5
2.10	Ecological linkages	6
2.11	Previous surveys	6
3	Methods	7
3.1	Database searches	7
3.2	Field survey	7
3.3	Mapping and analysis	8
3.3.1	Conservation significant flora and communities	8
3.3.2	Plant community identification and description	8
3.3.3	Floristic community type assignment	9
3.3.4	Threatened and ecological communities	9
3.4	Survey limitations	9
4	Results	11
4.1	General site conditions	11
4.2	Flora	11
4.2.1	Desktop assessment	11
4.2.2	Species inventory	13
4.2.3	Threatened and priority flora	13
4.2.4	Locally and regionally significant flora	13
4.2.5	Declared pests	13
4.3	Vegetation	13
4.3.1	Desktop assessment	13
4.3.2	Plant communities	14
4.3.3	Vegetation condition	15
4.3.4	Threatened and priority ecological communities	16
4.3.5	Locally and regionally significant vegetation	16
5	Discussion	17
6	Conclusions	18
7	References	19
7.1	General references	19
7.2	Online references	21

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



List of Tables

Table 1: Vegetation condition scale applied during the field assessment	7
Table 2: Likelihood of occurrence assessment categories and definitions	8
Table 3: Evaluation of survey methodology against standard constraints outlined in EPA (2016).....	9
Table 4: Conservation significant flora species considered to have potential to occur in the site based on known habitat preferences.....	11
Table 5: Conservation significant communities considered to have potential to occur in the site based on known habitat preferences.....	13
Table 6: Description and extent of plant communities identified within the site.....	14
Table 7: Extent of vegetation condition categories within the site.....	15

List of Plates

Plate 1: Plant community Cc in 'degraded' condition	14
Plate 2: Parkland cleared vegetation in 'completely degraded' condition.....	15

Figures

Figure 1: Site Location
Figure 2: Soils, Topography and Hydrology
Figure 3: Environmental Features
Figure 4: Plant Communities
Figure 5: Vegetation Condition

Appendices

Appendix A

Additional Information

Appendix B

Conservation Significant Flora Species and likelihood of Occurrence Assessment

Appendix C

Species List

Appendix D

Conservation Significant Communities and Likelihood of Occurrence Assessment

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



This page has been left blank intentionally.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Abbreviation Tables

Table A1: Abbreviations – Organisations

Organisations	
EPA	Environmental Protection Authority
DBCA	Department of Biodiversity, Conservation and Attractions
DoW	Department of Water (now DWER)
DWER	Department of Water and Environmental Regulation
DPaW	Department of Parks and Wildlife
WALGA	Western Australia Local Government Association

Table A2: Abbreviations – General terms

General terms	
FCT	Floristic community type
IBRA	Interim Biogeographic Regionalisation of Australia
MUW	Multiple use wetland
NVIS	National Vegetation Inventory System (ESCAVI 2003)
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
P5	Priority 5
PEC	Priority ecological community
TEC	Threatened ecological communities
UFI	Unique feature identifier

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Table A3: Abbreviations – Legislation

Legislation	
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i>
EP Act	<i>Environmental Protection Act 1986</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
BC Regs	Biodiversity Conservation Regulations 2018

Table A4: Abbreviations – Units of measurement

Units of measurement	
ha	Hectare
m	Metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



1 Introduction

1.1 Project background

Emerge Associates (Emerge) were engaged the Department of Finance to characterise the flora and vegetation values within Lots 51-53 Park Street in Henley Brook (referred to herein as the 'site'). The site is located approximately 19 kilometres (km) north-east of the Perth Central Business District within the City of Swan.

The site is approximately 6 hectares (ha) in size and is bounded by Park Street to the south and residential lots to the east, north and west. The location and extent of the site is shown in **Figure 1**.

1.2 Purpose and scope of work

The scope of work was specifically to undertake a flora and vegetation assessment within the site to the standard required of a reconnaissance survey with reference to the Environmental Protection Authority's (EPA's) technical guidance (EPA 2016).

As part of this scope of work, the following tasks were undertaken:

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for threatened flora species and ecological communities.
- A field survey to record a comprehensive list of flora species and assess vegetation type and condition.
- Mapping of plant communities, vegetation condition and conservation significant flora and vegetation.
- Identification of potential habitat for conservation significant flora and vegetation and an assessment of likelihood of occurrence.
- Documentation of the desktop assessment, methodology, field survey and results into a report.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



2 Environmental Context

2.1 Climate

Climate influences the types of vegetation that grow in a region and the life cycles of the flora present. It is therefore critical for a flora and vegetation survey to respond appropriately to climatic conditions to ensure that surveys are conducted during times when flora species are easiest to detect and identify.

The south-west of Western Australia experiences a Mediterranean climate of hot dry summers and cool wet winters. In Mediterranean type climates some flora species will typically spend part of their lifecycle as either underground storage organs or as seed. This is an adaptation to unfavourable environmental conditions such as excessive heat and drought that occur over the summer period. These species, known as 'geophytes' or 'annuals', tend to re-emerge during winter when favourable conditions return and are most visible during spring, which is the flowering period for a majority of plant species. Therefore, spring is the optimal time to complete flora and vegetation surveys in the south-west of WA.

An average of 827 millimetres (mm) of rainfall is recorded annually from the Herne Hill weather station (no. 009057), located approximately 7 km east of the site. The majority of this rainfall is received between the months of May and September. Mean maximum temperatures at the Perth Airport weather station (no. 009021), which is the nearest temperature recording station approximately 14 km south of the site, range from 18.0°C in July to 31.9°C in February, while mean minimum temperatures range from 8.1°C in July and August to 17.5°C in February (BoM 2022).

A total of 564.4 mm of rain was recorded from May to September 2021 prior to the survey at the Millendon weather station (no. 009057), which is the closest weather station located approximately 5 km east of the site. This is approximately 68% of the mean of 827 mm for this period (BoM 2022). Although lower than the mean this amount of rainfall was considered to have been sufficient to promote the flowering and emergence of native flora.

2.2 Geomorphology and soils

Landform and soils influence vegetation types at regional and local scales. The site occurs on the Swan Coastal Plain, which is the geomorphic unit that characterises much of the Perth metropolitan area. The Swan Coastal Plain is approximately 500 km long and 20 to 30 km wide and is roughly bound by the Indian Ocean to the west and the Darling Scarp to the east. Broadly the Swan Coastal Plain consists of two sedimentary belts of different origin. Its eastern side comprises the Pinjarra Plain which formed from the deposition of alluvial material washed down from the Darling Scarp, while its western side comprises three dune systems that run roughly parallel to the Indian Ocean coastline (Seddon 2004). These dune systems, referred to as Quindalup, Spearwood and Bassendean associations, represent a succession of coastal deposition that has occurred since the late Quaternary period (approximately two million years ago) (Kendrick *et al.* 1991) and, as a result, they contain soils at different stages of leaching and formation.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Examination of broad scale soil mapping places the site within the southern river association of the Bassendean dune system (Churchward and McArthur 1980). The southern river association comprises sand plains with low dunes and occasional swamps, iron and humus podzols, peats and clays. The soil types mapped within the site are shown in **Figure 2**.

The site is not known to contain any restricted landforms or unique geological features.

2.3 Topography

The elevation of the site ranges from 34 m in relation to the Australian height datum (mAHD) in the south-eastern portion of the site to 36 mAHD in the northern portion (DoW 2008) (**Figure 2**).

2.4 Hydrology and wetlands

Wetlands are areas of seasonally, intermittently or permanently waterlogged land such as poorly drained soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetlands Advisory Committee 1977). Wetlands can 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 *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 checked as part of this assessment:

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

No Ramsar or listed 'important wetlands' are located within or near the site.

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) show that an earth dam occurs in the south-eastern portion of the site.

The Department of Biodiversity, Conservation and Attractions (DBCA) has developed the *Geomorphic Wetlands of the Swan Coastal Plain* dataset (DBCA 2021). This dataset maps geomorphic wetland features and classifies them based on their landform shape and water permanence. Each feature is assigned to one of three management categories which guides land use and conservation.

A review of the *Geomorphic Wetlands, Swan Coastal Plain* dataset indicated that a 'multiple use' category wetland features (UFI 13396) occurs within the western portion of the site (DBCA 2021). This feature is classified as palusplain wetland. The locations of the geomorphic wetland and the hydrological feature in the site are shown in **Figure 2**.

2.5 Regional vegetation

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. At a continental scale the *Interim Biogeographic Regionalisation of Australia* (IBRA) divides Australia into floristic subregions (Environment Australia 2000).

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



The site is contained within the Swan Coastal Plain IBRA region and within the 'SWA02' or Perth subregion. The Perth subregion is characterised by mainly banksia low woodland on leached sands with melaleuca swamps where ill-drained; and woodland of *Eucalyptus gomphocephala* (tuart), *E. marginata* (jarrah) and *Corymbia calophylla* (marri) on less leached soils (Beard 1990). This subregion is recognised as a biodiversity hotspot and contains a wide variety of endemic flora and vegetation types.

Variations in native vegetation can be further classified based on regional vegetation mapping. Hedde *et al.* (1980) mapping shows the site as comprising the 'southern river complex', which is described as vegetation ranging from open woodland of *Corymbia calophylla*, *Eucalyptus marginata*, and *Banksia* spp. to fringing woodland of *Eucalyptus rudis* and *Melaleuca raphiophylla* along creek beds.

The southern river complex was determined to have 18.43% of its pre-European extent on the SCP remaining, of which 1.37% is protected for conservation purposes (Government of Western Australia 2019).

2.6 Historical land use

Review of historical images available from 1953 onwards shows that the majority of the site was cleared of native vegetation prior to 1965, with only a few scattered trees remaining (WALIA 2022). Since then, a number of buildings were constructed and associated gardens were planted. Aerial imagery from 1985 to 2003 shows a dam in the south-eastern portion of the site.

2.7 Conservation significant values

2.7.1 Threatened and priority flora

Certain flora taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora taxa may be listed as 'threatened' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Threatened flora species listed under the EPBC Act are assigned a conservation status according to attributes such as population size and geographic distribution. Any action likely to have a significant impact on a taxon listed under the EPBC Act requires Ministerial approval.

In Western Australia flora species may also be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act). Similarly, it is an offence to 'take' or 'disturb' threatened flora listed under the BC Act without Ministerial approval.

Flora species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Flora List*. These species are classified into 'priority' levels based on threat. Whilst priority species are not under direct statutory protection, they are considered during State approval processes.

Further information on threatened and priority species and their categories is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.2.1**).

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



2.7.2 Threatened and priority ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat. An ecological community's structure, composition and distribution are influenced by environmental factors such as soil type, position in the landscape, altitude, climate and water availability (DAWE 2021a). 'Threatened ecological communities' (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under the EPBC Act. Similar to flora species, TECs listed under the EPBC Act are assigned a conservation status. Any action likely to have a significant impact on a community listed under the EPBC Act requires Ministerial approval.

TECs are also listed within Western Australia under the BC Act and the BC Regulations. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

An ecological community that is under consideration for listing as a TEC in Western Australia but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). Listing as a PEC is similarly considered during State approval processes.

Further information on categories of TECs and PECs is provided in **Appendix A**. An assessment of the likelihood of occurrence of threatened and priority flora within the site was undertaken (refer to **Sections 3.1** and **4.3.1**).

2.8 Weeds and pests

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native flora species and some native species are considered to be weeds. The likelihood of weeds occurring is higher in areas disturbed areas, especially areas that have been agricultural or urban landuse.

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to *Western Australia's Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread.

The Commonwealth government has further compiled a list of 32 *Weeds of National Significance* (WoNS) (DAWE 2021b). Whilst the WoNS list is non-statutory, many WoNS are also listed under the BAM Act. Further information on weeds and declared pests is provided in **Appendix A**.

2.9 Bush Forever

The Government of Western Australia's *Bush Forever* policy 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 ecological communities by targeting a minimum of 10% of each vegetation complex for protection

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



(Government of WA 2000). *Bush Forever* sites are representative of regional ecosystems and habitat and have a key role in the conservation of Perth's biodiversity.

No *Bush Forever* sites occur within the site. Bush Forever Site 304 (Whiteman Park, Whiteman/West Swan) lies approximately 420 metres (m) west of the site. This site is associated with a very large area of native vegetation that extends to the west, north-west and south-west of the site. Significant flora species are known to occur in this site. The location of the part of Bush Forever Site 304 associated with the site is shown in **Figure 3**.

2.10 Ecological linkages

Ecological linkages are linear landscape elements that allow the movement of fauna, flora and genetic material between areas of remnant habitat. This exchange of genetic material between vegetation remnants improves the viability of those remnants by allowing greater access to breeding partners and food sources, refuge from disturbances such as fire and maintenance of genetic diversity of plant communities and populations. Ecological linkages are ideally continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

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). This study was extended beyond the Perth Metropolitan Region through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

There are no mapped ecological linkages within or in close proximity to the site. One regional ecological linkage (No. 13) occurs approximately 1.7 km west of the site running from north to south and is associated with Bush Forever Site 304. Ecological linkage No. 13 intersects multiple other ecological linkage running east to west. These ecological linkages connect areas of *Bush Forever* located in the wider local area. The location of the ecological linkage near the site is shown in **Figure 3**.

Review of aerial imagery indicates that the vegetation in the site is disconnected from other areas of native vegetation and is separated from ecological linkage No. 13 by Drumpellier Drive.

2.11 Previous surveys

Emerge have previously undertaken a spring flora and vegetation survey over the wider Henley Brook area which included the site (Emerge Associates 2018). The previous survey was undertaken on 10 October and 4 September 2018. Lot access was limited and much of the survey was undertaken from adjacent road reserves and tracks. The entirety of the site was mapped as comprising 'parkland cleared' vegetation in completely degraded condition. No threatened or priority flora species or communities were recorded in the site (Emerge Associates 2018).

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



3 Methods

3.1 Database searches

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) and DBCA's threatened and priority flora database (reference no. 46-0222FL).

A search was also conducted for TECs and PECs that may occur or have been recorded within a 10 km radius of the site using the *Protected Matters Search Tool* (DAWE 2022), the *weed and native flora dataset* (Keighery *et al.* 2012) and DBCA's threatened and priority ecological communities' databases (reference no. 28_0222EC).

Prior to undertaking the field survey, information on the habitat preferences of threatened and priority flora species and communities identified from database searches was reviewed. This was compared to existing environmental information available for the site, such as geomorphology, soils, regional vegetation and historic land use, to identify species and communities for which habitat may occur in the site.

3.2 Field survey

Two botanists from Emerge visited the site on 22 November 2021 to conduct the flora and vegetation field survey.

No samples were collected due to the disturbed condition of the vegetation in the site. Plant taxa were systematically recorded as the ecologist traversed the site. Photographs were taken throughout the field visit to show particular site conditions.

The suitability of habitat within the site for conservation significant flora and communities identified in the desktop assessment was assessed (refer **Section 3.1**). Where identified, areas of suitable habitat were traversed to search for conservation significant species.

Vegetation condition was assigned at each sample and changes in vegetation condition were also noted and mapped across the site. The condition of the vegetation was assessed using the Keighery (1994) scale (

Table 1).

Table 1: Vegetation condition scale applied during the field assessment

Condition category	Definition (Keighery 1994)
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very good	Vegetation structure altered obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Table 1: Vegetation condition scale applied during the field assessment (continued)

Condition category	Definition (Keighery 1994)
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely degraded	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

3.3 Mapping and analysis

3.3.1 Conservation significant flora and communities

All plant specimens collected during the field survey were dried, pressed and identified through comparison with named material and through the use of taxonomic keys. All flora was named in accordance with requirements of the Western Australian Herbarium. Flora species not native to Western Australia (weeds) are denoted by an asterisk (*) in text and raw data.

Broad plant communities were identified based on dominant flora species and were mapped on aerial imagery, with the boundaries interpreted from aerial photography and notes taken in the field.

Based on the database searches and information recorded during the field survey, an assessment of the likelihood of occurrence of threatened and priority flora species and communities within the site was undertaken using the categories outlined in **Table 2**.

Table 2: Likelihood of occurrence assessment categories and definitions

Likelihood	Definition
Recorded	The species was recorded during the current field survey.
Likely	The site contains suitable habitat for the species and it is likely the species may occur based on presence of a recent historical record within or close to the site.
Possible	The site contains suitable habitat for the species but there is no other information to suggest that the species may occur within or close to the site.
Unlikely	The site does not contain suitable habitat for the species or the site contains suitable habitat for the species within which thorough targeted searches were completed and conclusion has been made that the species is unlikely to be present.

3.3.2 Plant community identification and description

The plant communities within the site were identified from the sample data collected during the field survey. The vegetation was described according to the dominant species present using the structural

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



formation descriptions of the *National Vegetation Inventory System* (NVIS) (NVIS Technical Working Group 2017). The identified plant communities were mapped on aerial photography from the sample locations and boundaries were interpreted from aerial photography and notes taken in the field. Vegetation condition was mapped on aerial photography based on the samples and notes recorded during the field survey to define areas with differing condition.

3.3.3 Floristic community type assignment

No floristic community type (FCT) analysis was completed due to the high level of disturbance and because the vegetation was considered unlikely to currently represent an FCT.

3.3.4 Threatened and ecological communities

Areas of native vegetation potentially representing a TEC were assessed against key diagnostic characteristics and, if available, size and/or vegetation condition thresholds.

3.4 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) is provided in **Table 3**.

Table 3: Evaluation of survey methodology against standard constraints outlined in EPA (2016)

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information described in Section 2 is adequate to place the site and vegetation in context. A spring flora and vegetation survey was previously undertaken over the wider Henley Brook area, including the site (Emerge Associates 2018).
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by two qualified ecologists with four years of botanical experience in Western Australia. Technical review was undertaken by a senior botanist with over 11 years' experience in environmental science in Western Australia.
Suitability of timing	No limitation	The survey was conducted in November and thus at the end of the main flowering season. The degraded nature of the site limits the potential habitat for native geophytic plants such as orchids and the majority of threatened and priority flora species with potential to occur are perennial species. The survey timing was considered adequate to allow the detection of species for which seasonal timing is critical. The survey timing was acceptable for a reconnaissance level survey.
Temporal coverage	Minor limitation	Comprehensive flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was only surveyed once, and the survey was undertaken at the end of the spring main flowering period. However, the site is highly disturbed and one visit was considered sufficient for a reconnaissance survey.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Table 3: Evaluation of survey methodology against standard constraints outlined in EPA (2016)(continued)

Constraint	Degree of limitation	Details
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	Minor limitation	Lot 52 Park Street could not be accessed during the survey. However, this is not considered much of a limitation given the highly disturbed condition of the vegetation in this lot and as the vegetation could be viewed sufficiently from the two neighbouring properties and the road reserve.
Sampling intensity	Minor limitation	With the exception of Lot 52, the site was traversed comprehensively and a total of 61 species were recorded. No formal sampling was undertaken or considered necessary due to the highly disturbed condition of the site. Opportunistic records of flora, plant communities and vegetation condition were sufficient to accurately characterise the vegetation within the site.
Influence of disturbance	Minor limitation	Time since fire is greater than 65 years as interpreted from aerial imagery and therefore short-lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance was evident in parts of the site and the disturbance history of the site was considered during the survey.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



4 Results

4.1 General site conditions

The site is generally flat and comprises sandy soils that are light in colour. The site is used for rural residential purposes with multiple buildings, planted gardens/orchards and tracks present. A small area of native vegetation, associated with a stand of marri trees, is present in the south-eastern portion of the site.

4.2 Flora

4.2.1 Desktop assessment

The database search results identified a total of 26 threatened and 44 priority flora species occurring or potentially occurring within a 10 km radius of the site. Information on these species including their habitat preferences and flowering period is provided in **Appendix B**.

Based on background information available for the site, suitable habitat was considered to potentially occur within the site for 6 threatened flora species and 20 priority flora species as shown in **Table 4**.

Table 4: 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
	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
<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
<i>Grevillea curviloba</i> subsp. <i>curviloba</i>	CR	EN	P	Winter wet, deep peaty grey sands over limestone at depth.	Sep-Oct
<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
<i>Drakaea micrantha</i>	EN	VU	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct
<i>Grevillea curviloba</i> subsp. <i>incurva</i>	EN	EN	P	Sand, sandy loam. Winter-wet heath.	Aug-Sep
<i>Bolboschoenus fluviatilis</i>	P1	-	P	Floodplain with grey/brown wet sand.	Nov

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Table 4: 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
	State	EPBC Act			
<i>Drosera patens</i>	P1	-	P	Sandy soils on margins of winter-wet depressions, swamps and lakes.	Aug-Dec
<i>Levenhookia preissii</i>	P1	-	A	Grey or black, peaty sand. Swamps	Sep-Dec/Jan
<i>Stachystemon exilis</i>	P1	-	P	Low lying areas on sand.	Oct-Nov
<i>Acacia benthamii</i>	P2	-	P	Sand, typically on limestone breakaways	Aug-Sept
<i>Calectasia elegans</i>	P2	-	P	Grey yellow sand on plains.	Sep-Oct
<i>Poranthera moorokatta</i>	P2	-	A	Sandy or clay soils. Dampland or low sandy dunes in banksia woodland.	Oct or Feb
<i>Cyathochaeta teretifolia</i>	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan
<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
<i>Haemodorum loratum</i>	P3	-	P	Grey or yellow sand, gravel.	Nov
<i>Isopogon autumnalis</i>	P3	-	P	Yellow-grey sand.	Feb, Mar, Apr, May or June
<i>Styphelia filifolia</i>	P3	-	P	Brown over pale yellow sand.	Feb-Apr
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	-	P	Grey or yellow sand	Jul-Oct
<i>Drosera occidentalis</i>	P4	-	P	Flat, brown/white/yellow moist sand/clay/peat, often near swamps.	Oct-Dec/Jan
<i>Hydrocotyle lemnoides</i>	P4	-	A	Floating in swamps.	Aug-Oct
<i>Hypolaena robusta</i>	P4	-	P	White sand. Sandplains	Sep-Oct
<i>Jacksonia sericea</i>	P4	-	P	Calcareous and sandy soils on Swan Coastal Plain	Dec-Feb
<i>Schoenus natans</i>	P4	-	A	Aquatic, in winter-wet depressions.	Oct
<i>Thysanotus glaucus</i>	P4	-	P	White, grey or yellow sand, sandy gravel.	Oct-Mar
<i>Verticordia lindleyi</i> subsp. <i>Lindleyi</i>	P4	-	P	Sand and sandy clay in winter wet areas.	May or Nov-Jan

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

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



4.2.2 Species inventory

A total of five native and 56 non-native (weed) species were recorded within the site during the field survey, representing 23 families and 51 genera. The dominant family containing native taxa was Myrtaceae (three native taxa and eight weed taxa). The most common genus was *Eucalyptus* with three taxa. The family containing the most taxa was Poaceae (no native and 13 non-native species). A complete species list is provided in **Appendix C**.

4.2.3 Threatened and priority flora

No threatened or priority flora species were recorded within the site.

The threatened and priority flora species identified in the desktop assessment are not considered to occur in the site due to the high level of disturbance which has resulted in a lack of suitable habitat. The likelihood of occurrence for flora species known to occur in the wider local area is provided in **Appendix B**.

4.2.4 Locally and regionally significant flora

No locally or regionally significant flora species were recorded within the site.

4.2.5 Declared pests

No declared pests pursuant to the BAM Act were recorded within the site.

No weeds of national significance (WoNS) were recorded.

4.3 Vegetation

4.3.1 Desktop assessment

The database search results identified 15 TECs and 7 PECs occurring or potentially occurring within a 10 km radius of the site. Information on these communities is provided in **Appendix D**.

Based geomorphology, soils and regional vegetation patterns, three TECs and four PECs were considered to have potential to occur in the site, as listed in **Table 5**.

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

Code	Community name	TEC/PEC	Level of significance	
			WA	EPBC
Banksia WL SCP	Banksia woodlands of the Swan Coastal Plain	TEC/PEC	P3	EN
SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain	TEC	VU	-
SCP20a	<i>Banksia attenuata</i> woodlands over species rich dense shrublands	TEC	EN	-
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	PEC	P3	-
SCP22	<i>Banksia ilicifolia</i> woodlands	PEC	P3	-

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



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

Code	Community name	TEC/PEC	Level of significance	
			WA	EPBC
SCP23b	Swan Coastal Plain <i>Banksia attenuata</i> - <i>Banksia menziesii</i> woodlands	PEC	P3	-

4.3.2 Plant communities

Two plant communities were identified within the site. Plant community **Cc** occurs as a small patch in the south-eastern portion of the site and plant community **Parkland cleared** exists across the remainder of the site.

A description and the area of each plant community is provided in **Table 6** and representative photographs of each are provided in **Plate 1** to **Plate 2**. The location of each plant community is shown in **Figure 4**.

Table 6: Description and extent of plant communities identified within the site

Plant community	Description	Area (ha)
Cc	Open forest <i>Corymbia calophylla</i> over occasional shrubs and herbs <i>Kennedia prostrata</i> and <i>Microtis media</i> over non-native grassland and weeds (Plate 1).	0.04
Non-native	Heavily disturbed areas comprising scattered planted trees and shrubs over grassland and weeds with occasional native species. Buildings and tracks were also included in this community (Plate 2)	5.96



Plate 1: Plant community **Cc** in 'degraded' condition

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Plate 2: **Parkland cleared** vegetation in 'completely degraded' condition

4.3.3 Vegetation condition

The vegetation in the site has been subject to a high level of historical disturbance. The highest condition vegetation in the site is associated with plant community **Cc**. This plant community comprises a small stand of *Corymbia calophylla* trees and two native understorey species which occur at very low cover. Due to the low cover and diversity of native species and a high cover of weed species this plant community was mapped as occurring in 'degraded' condition.

The remainder of the site was mapped as occurring in 'completely degraded' condition as it consists of predominantly non-native species such as pasture grasses, planted trees and shrubs and occasional native species. Building, paved areas and sandy tracks within the site were also mapped as being in 'completely degraded' condition.

The extent of vegetation by condition category is detailed in **Table 7** and shown in **Figure 5**.

Table 7: Extent of vegetation condition categories within the site

Condition category (Keighery 1994)	Size (ha)
Pristine	0
Excellent	0
Very good	0
Good	0
Degraded	0.04
Completely degraded	5.96

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



4.3.4 Threatened and priority ecological communities

No TECs or PECs occur within the site.

4.3.5 Locally and regionally significant vegetation

Mature eucalypt trees including *Corymbia calophylla* (marri) and *Eucalyptus rudis* (flooded gum) are present in the site. These trees have the potential to provide foraging, roosting and nesting habitat for threatened black cockatoos, along with other ecological services.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



5 Discussion

No threatened or priority flora species were recorded within the site and none are expected to occur due to the lack of suitable habitat and as they were not recorded during the site visit.

The majority of the vegetation within the site (5.96 ha/99.33%) is in 'completely degraded' condition, with only one small patch of native vegetation present in 'degraded' condition (0.04 ha/0.67%). The vegetation within the site showed obvious signs of long-term historical disturbance and clearly met the Keighery (1994) descriptions for degraded and completely degraded categories.

No TECs or PECS occur within the site as the vegetation does not meet any applicable criteria.

Eucalyptus and *Corymbia* trees within the site have the potential to provide breeding, roosting and foraging habitat for threatened species of black cockatoo, along with other ecological services.

The western portion of the site is mapped as forming part of a 'multiple use' category wetland. However, no wetland vegetation or other indicators that a wetland occurs within the site was recorded during the field survey.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



6 Conclusions

The site has been subject to significant historical disturbance and now supports predominantly non-native vegetation 'completely degraded' condition.

No threatened or priority flora species were recorded, and none are considered likely to occur due to a lack of suitable habitat.

Two plant communities were identified within the site:

- **Cc** which occurs as a small patch in 'degraded' condition in the south-eastern portion of the site and extends over 0.04 ha (0.67% of the site).
- **Parkland cleared** vegetation which occurs in 'completely degraded' condition across the remaining 5.96 ha (99.33%) of the site.

No TECs or PECs occur within the site.

Eucalyptus and *Corymbia* trees within the site have the potential to provide breeding, roosting and foraging habitat for threatened species of black cockatoo, along with other ecological services.

The western portion of the site is mapped as forming part of a 'multiple use' category wetland. However, no wetland vegetation or other indicators that a wetland occurs within the site was recorded during the field survey.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



7 References

7.1 General references

Alan Tingay and Associates 1998, A Strategic Plan for Perth's Greenways - Final Report. December 1998.

Bureau of Meteorology (BoM) 2022, Climate Data Online, <<http://www.bom.gov.au/climate/data/>>.

Churchward, H. M. and McArthur, W. M. 1980, 'Landforms and Soils of the Darling System, Western Australia', in Department of Conservation and Environment (ed.), Atlas of Natural Resources Darling System Western Australia, Department of Conservation and Environment.

Department of Agriculture, Water and the Environment (DAWE) 2021a, Threatened Ecological Communities, <<https://www.awe.gov.au/environment/biodiversity/threatened/communities>>.

Department of Agriculture, Water and the Environment (DAWE) 2021b, Weeds of National Significance (WoNS), Centre for Invasive Species Solutions (CISS), <<https://weeds.org.au/weeds-profiles/>>.

Department of Agriculture, Water and the Environment (DAWE) 2022, Protected Matters Search Tool, <<https://pmst.awe.gov.au/#>>.

Department of Biodiversity, Conservation and Attractions (DBCA) 2017, Ramsar Sites (DBCA-010).

Department of Biodiversity, Conservation and Attractions (DBCA) 2018, Directory of Important Wetlands in Australia - Western Australia (DBCA-045).

Department of Biodiversity, Conservation and Attractions (DBCA) 2021, Geomorphic Wetlands, Swan Coastal Plain (DBCA-019), <<https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-swan-coastal-plain>>.

Department of Water (DoW) 2008, LiDAR Elevation Dataset, Swan Coastal Plain, Perth.

Department of Water and Environmental Regulation (DWER) 2018, Hydrography Linear (Hierarchy) (DWER-031), Perth.

Emerge Associates 2018, Spring Flora and Vegetation Assessment - Brooklands Structure Plan Support, EP18-098(01)--002, revision B.

Environment Australia 2000, Revision of the Interim Biogeographic Regionalisation for Australia (IBRA) and Development of Version 5.1 - Summary Report, Department of Environment and Heritage.

Environmental Protection Authority (EPA) 2016, Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment Perth.

Government of WA 2000, Bush Forever - Volume 1: Policies, principles and processes, Perth.

Government of Western Australia 2019, 2018 South West Vegetation Complex Statistics. Current as of March 2019, WA Department of Biodiversity, Conservation and Attractions, Perth.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



Hedde, E. M., Loneragan, O. W. and Havel, J. J. 1980, 'Vegetation Complexes of the Darling System Western Australia', in Department of Conservation and Environment (ed.), Atlas of Natural Resources Darling System Western Australia, Perth.

Hill, A. L., Semeniuk, C. A., Semeniuk, V. and Del Marco, A. 1996, Wetlands of the Swan Coastal Plain: Volume 2A - Wetland Mapping, Classification and Evaluation, Water and Rivers Commission and the Department of Environmental Protection, Perth.

Keighery, B. 1994, Bushland Plant Survey: A guide to plant community survey for the community, Wildflower Society of WA (Inc), Nedlands.

Keighery, B. J., Keighery, G. J., Longman, V. M. and Clarke, K. A. 2012, Weed and Native Flora Data for the Swan Coastal Plain, Departments of Environmental Protection and Conservation and Land Management, Western Australia.

Kendrick, G. W., Wyrwoll, K. H. and Szabo, B. J. 1991, Pliocene-Pleistocene coastal events and history along the western margin of Australia, Quaternary Science Reviews, 10: 419-439.

Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. 2009, South West Regional Ecological Linkages Technical Report, Western Australian Local Government Association and Department of Environment and Conservation, Perth.

NVIS Technical Working Group 2017, Australian Vegetation Attribute Manual: National Vegetation Information System, Department of the Environment and Energy, Canberra.

Seddon, G. 2004, A Sense of Place: a response to an environment, the Swan Coastal Plain Western Australia, Blooming Books, Melbourne.

Western Australian Local Government Association and Perth Biodiversity Project (WALGA and PBP) 2004, Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region, Perth.

Western Australian Land Information Authority (WALIA) 2022, Landgate Map Viewer, <<https://map-viewer-plus.app.landgate.wa.gov.au/index.html>>.

Wetlands Advisory Committee 1977, The status of reserves in System Six, Environmental Protection Authority, Perth.

Reconnaissance Flora and Vegetation Assessment

Lots 51-53 Park Street, Henley Brook



7.2 Online references

The online resources that have been utilised in the preparation of this report are referenced in **Section 7.1**, with access date information provided in **Table R 1**.

Table R 1 Access dates for online references

Reference	Date accessed	Website or dataset name
BoM (2022)	16 February 2022	Climate Data Online
DAWE (2021a)	Date Month 2022	Threatened Ecological Communities
DAWE (2021b)	11 March 2022	Weeds of National Significance (WoNS)
DAWE (2022)	9 March 2022	Protected Matters Search Tool
WALIA (2022)	17 February 2022	Landgate Map Viewer
Western Australian Herbarium (2022)	10 March 2022	Florabase

Figures



Figure 1: Site Location

Figure 2: Soils, Topography and Hydrology

Figure 3: Environmental Features

Figure 4: Plant Communities

Figure 5: Vegetation Condition

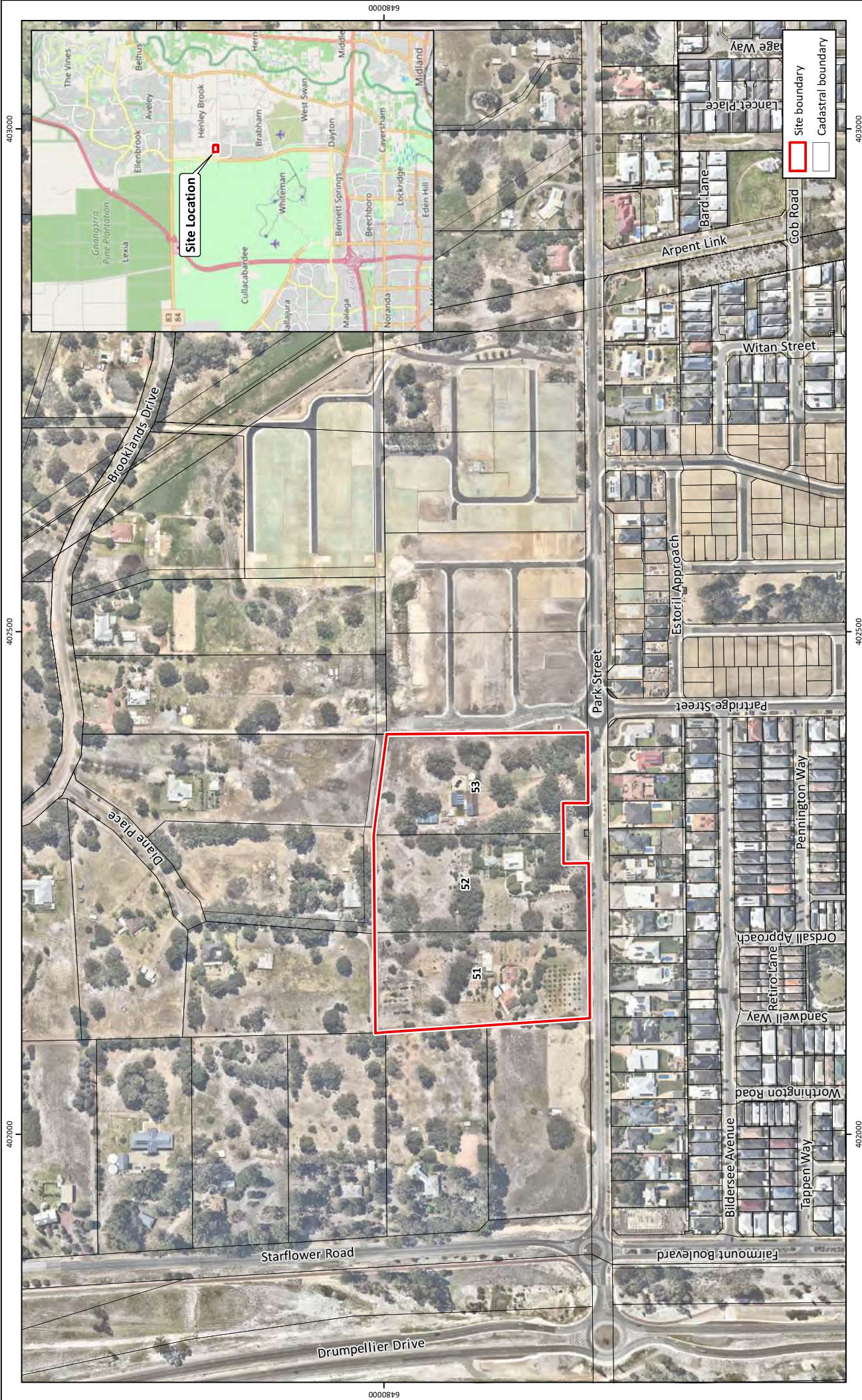


Figure 1: Site Location

Project: Reconnaissance Flora and Vegetation Assessment
Lots 51-53 Park Street, Henley Brook
Client: Department of Finance

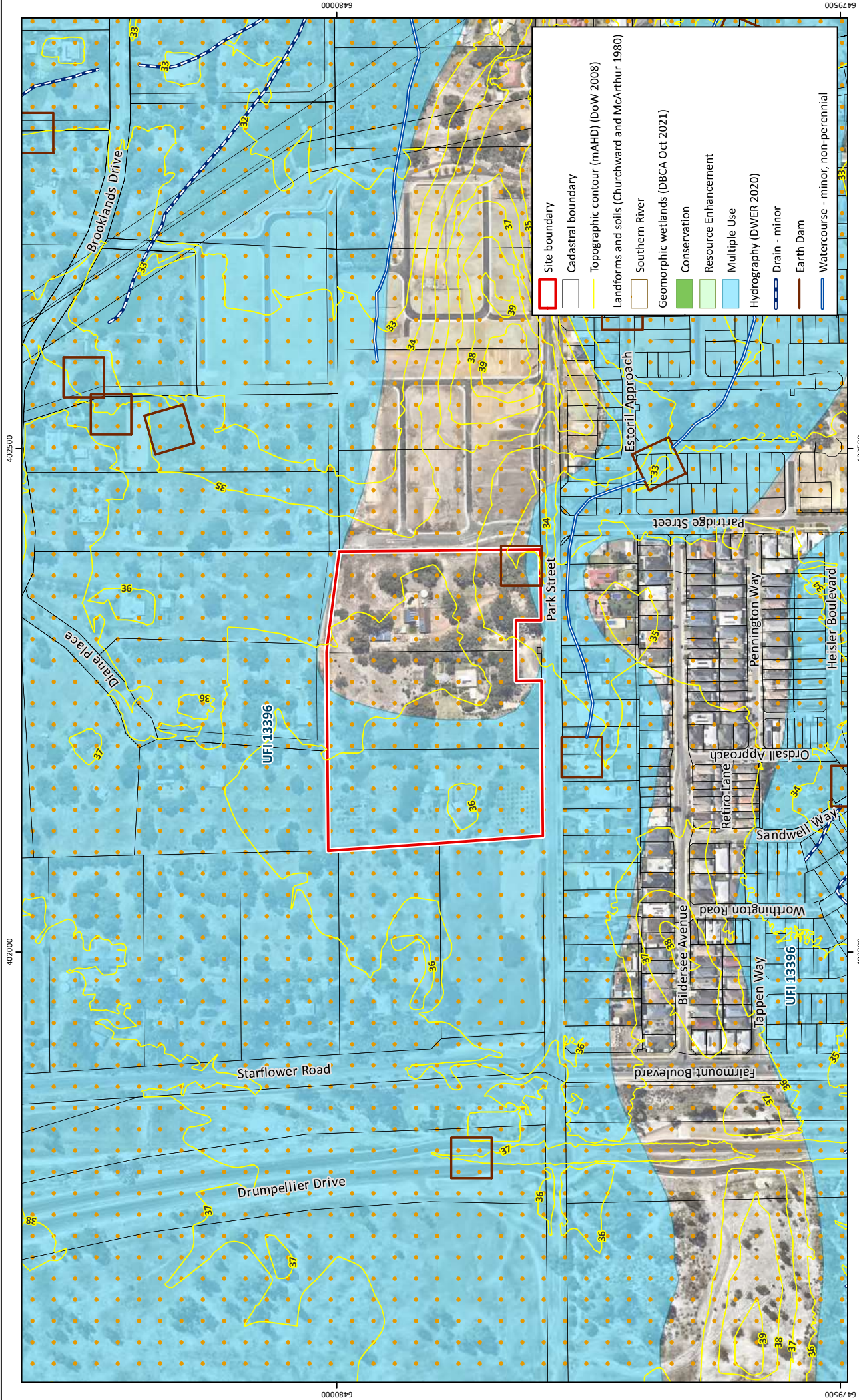
Plan Number: EP21-088(02)-F18
Drawn: GAR
Date: 21/02/2022
Checked: MS
Approved: RAW
Date: 18/03/2022

Metres

0 50 100 150

Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

While Emmerge Associates makes every attempt to ensure the accuracy and completeness of data, Emmerge accepts no responsibility for externally sourced data used ©Landgate (2021). Nearmap imagery date: 13/11/2021.



Plan Number:
EP21-088(02)-F19

Drawn:
GAR

Date:
21/02/2022

Checked:
MS

Approved:
RAW

Date:
18/03/2022

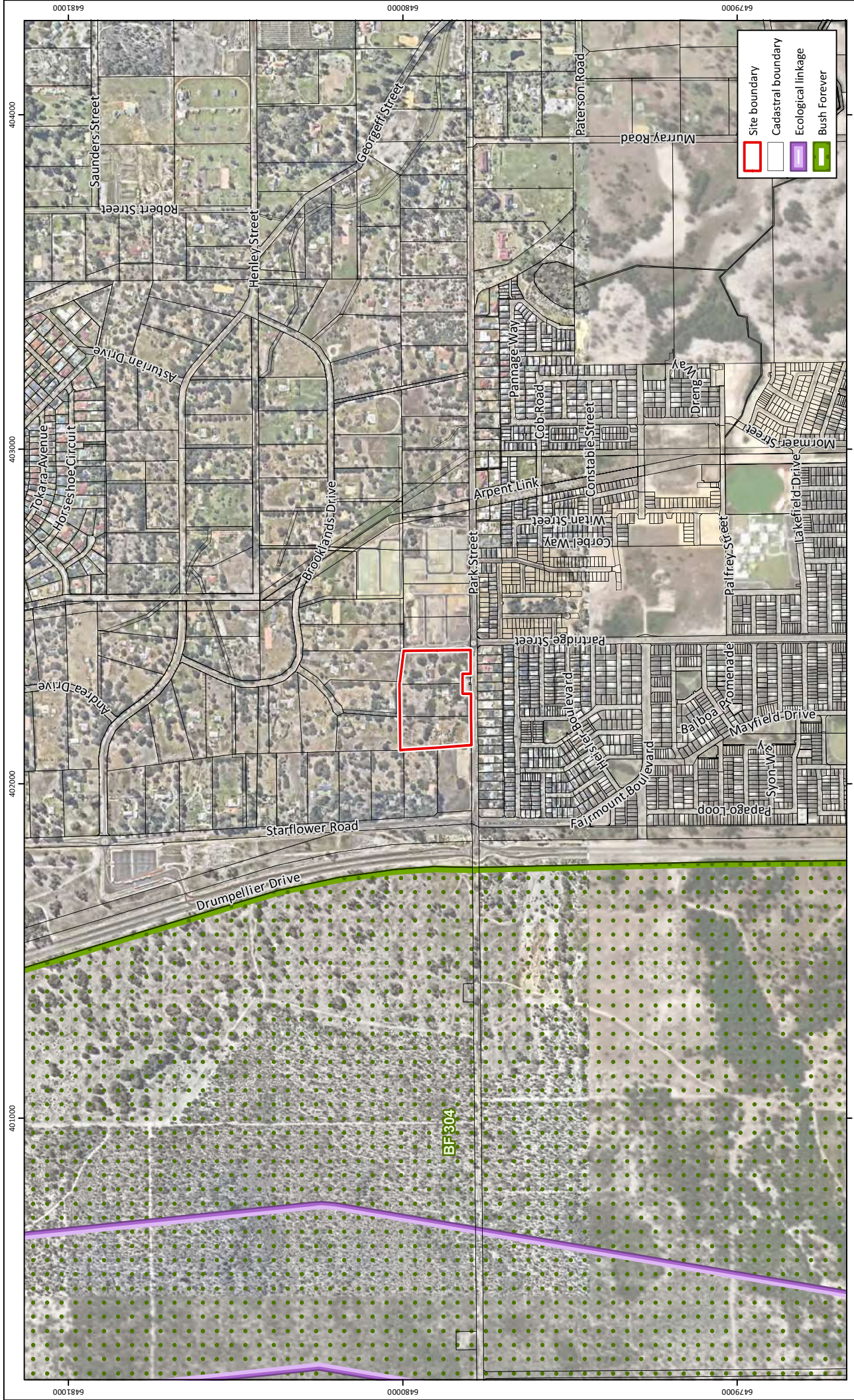
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

Figure 2: Soils and Topography

Project: Reconnaissance Flora and Vegetation Assessment
Lots 51-53 Park Street, Henley Brook
Department of Finance

Client: Department of Finance

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used ©Landgate (2021). Nearmap imagery date: 13/11/2021



Site boundary
 Cadastral boundary
 Ecological linkage
 Bush Forever



0 200 400 600
 Metres
 Scale: 1:15,000@A4
 GDA 1994 MGA Zone 50



Plan Number: EP21-088(02)-F20
Drawn: GAR
Date: 21/02/2022
Checked: MS
Approved: RAW
Date: 18/03/2022

Figure 3: Environmental Features

Project: Reconnaissance Flora and Vegetation Assessment
 Lots 51-53 Park Street, Henley Brook
Client: Department of Finance

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used ©Landgate (2021). Nearmap Imagery date: 13/11/2021



	Site boundary
	Cadastral boundary
	Plant community
	Cc
	Parkland cleared



0 20 40 60
Metres
Scale: 1:1,500@A4
GDA 1994 MGA Zone 50

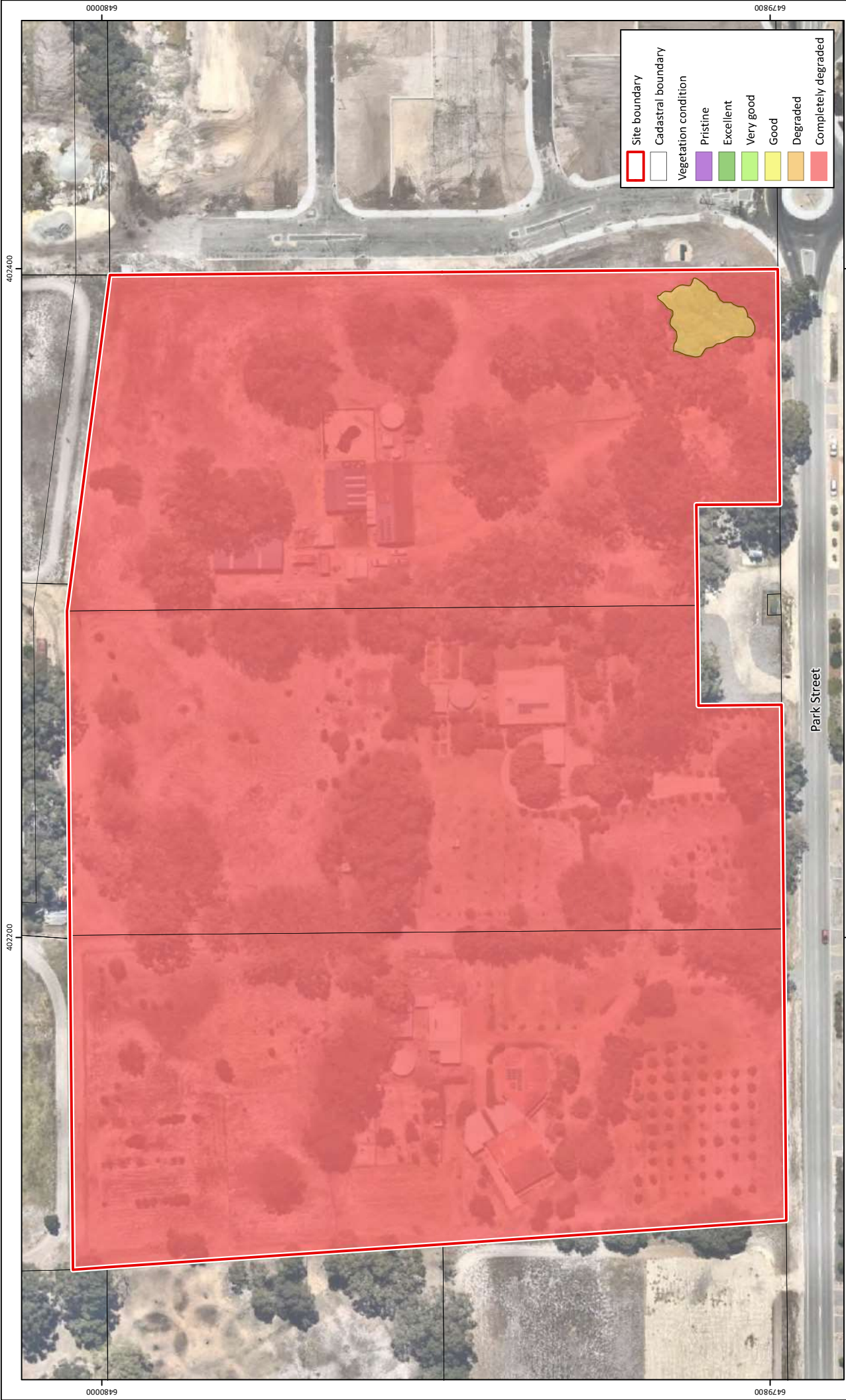


Plan Number: EP21-088(02)-F21
 Drawn: GAR
 Date: 21/02/2022
 Checked: MS
 Approved: RAW
 Date: 18/03/2022

Figure 4: Plant Communities

Project: Reconnaissance Flora and Vegetation Assessment
 Lots 51-53 Park Street, Henley Brook
Client: Department of Finance

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used ©Landgate (2021). Nearmap imagery date: 13/11/2021



Scale: 1:1,500@A4
GDA 1994 MGA Zone 50

Plan Number: EP21-088(02)-FZ2
 Drawn: GAR
 Date: 21/02/2022
 Checked: MS
 Approved: RAW
 Date: 18/03/2022

Figure 5: Vegetation Condition

Project: Reconnaissance Flora and Vegetation Assessment
 Lots 51-53 Park Street, Henley Brook

Client: Department of Finance

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used ©Landgate (2021). Nearmap imagery date: 13/11/2021

Appendix A

Additional Information



Conservation Significant Flora and Vegetation

Threatened and priority flora

Flora species considered rare or under threat warrant special protection under Commonwealth and/or State legislation. At the Commonwealth level, flora species can be listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Flora species considered 'threatened' pursuant to Schedule 1 of the EPBC Act are assigned categories according to their conservation status, as outlined in **Table 1**.

In Western Australia, plant taxa may be classed as 'threatened' under the *Biodiversity Conservation Act 2016* (BC Act) which is enforced by Department of Biodiversity Conservation and Attractions (DBCA). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Section 5(1)1 of the Act defines to take as including "... to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means" or to cause or permit the same to be done. The definition of threatened flora under the BC Act is provided in **Table 1**.

Section 43 of the BC Act requires that an occurrence of a threatened species or threatened ecological community is reported to DBCA where the occurrence has been identified as part of field work completed:

- as part of an assessment under Part IV of the *Environmental Protection Act 1986*; or
- in relation to an application for a clearing permit under the *Environmental Protection Act 1986* section 51E(1)(d).

Penalties apply to individuals and organisations that fail to provide accurate reports of threatened species or communities.

The *Biodiversity Conservation Regulations 2018* (BC Regulations 2018) came into effect on January 1 2019. The BC Regulations include provisions for licencing, charges, penalties and other provisions associated with the BC Act.

Flora species that may be threatened or near threatened but lack sufficient information to be listed under the BC Act may be added to the DBCA's *Priority Flora List* (DBCA 2018c). Priority flora species are considered during State approval processes. Priority flora categories and definitions are listed in **Table 1**.

Additional Background Information

Table 1: Definitions of conservation significant flora species pursuant to the EPBC Act and BC Act and on DBCA's Priority Flora List (DBCA 2018c)

Conservation code	Description
EX [†]	Threatened Flora – Presumed Extinct Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
T [†]	Threatened Flora – Extant Taxa which are declared to be likely to become extinct or is rare, or otherwise in need of special protection.
CR [^]	Threatened Flora – Critically Endangered Taxa which are considered to be facing an extremely high risk of extinction in the wild.
EN [^]	Threatened Flora – Endangered Taxa which are considered to be facing a very high risk of extinction in the wild.
VU [^]	Threatened Flora – Vulnerable Taxa which are considered to be facing a high risk of extinction in the wild.
P1 [□]	Priority One – Poorly Known Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat e.g. road verges, urban areas, farmland, active mineral leases etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2 [□]	Priority Two – Poorly Known Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but urgently need further survey.
P3 [□]	Priority Three – Poorly Known Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but needs further survey.
P4 [□]	Priority Four – Rare Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

[^]pursuant to the EPBC Act, [†]pursuant to the BC Act, [□]on DBCA's *Priority Flora List*

Threatened and priority ecological communities

'Threatened ecological communities' (TECs) are recognised as ecological communities that are rare or under threat and therefore warrant special protection. Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. TECs nominated for listing under the EPBC Act are considered by the Threatened Species Scientific Committee and a final decision is made by the Commonwealth Minister for the Environment. Once listed under the EPBC Act, communities are categorised as either 'critically endangered', 'endangered' or 'vulnerable' as defined in **Table 2**. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Minister for the Environment.

Additional Background Information

Within Western Australia TECs are determined by the Western Australian Threatened Ecological Communities Scientific Advisory Committee (WATECSAC) and endorsed by the State Minister for the Environment. The WATECSAC is an independent group comprised of representatives from organisations including tertiary institutions, the Western Australian Museum and DBCA. The TECs endorsed by the State Minister are published by DBCA (DBCA 2018b).

TECs are assigned to one of the categories outlined in **Table 2** according to their status (in relation to the level of threat). TECs are afforded direct statutory protection at a State level under the BC Act and BC Regulations. Ecological communities are listed under Section 27(1) and 33 of the BC Act. Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Table 2: Categories of threatened ecological communities (English and Blyth 1997; DEC 2009)

Conservation code	Description
PD	Presumably Totally Destroyed An ecological community that has been adequately searched for but for which no representative occurrences have been located.
CE	Critically Endangered An ecological community that has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future.
E	Endangered An ecological community that has been adequately surveyed and is not critically endangered but is facing a very high risk of total destruction in the near future.
V	Vulnerable An ecological community that has been adequately surveyed and is not critically endangered or endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future.

An ecological community that is under consideration for listing as a TEC, but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). PECs are categorised as priority category 1, 2 or 3 as described in **Table 3**. Ecological communities that are adequately known and are rare but not threatened, or meet criteria for 'near threatened', or that have been recently removed from the threatened list, are placed in 'priority 4'. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in 'priority 5' (DEC 2013). Listed PECs are published by DBCA (DBCA 2017b).

Additional Background Information

Table 3: Categories of priority ecological communities (DEC 2013)

Priority code	Description
P1	<p>Priority One: Poorly known ecological communities</p> <p>Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.</p>
P2	<p>Priority Two: Poorly known ecological communities</p> <p>Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200ha). At least some occurrences are not believed to be under immediate threat (within approximately 10 years) of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.</p>
P3	<p>Priority Three: Poorly known ecological communities</p> <p>(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:</p> <p>(ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat (within approximately 10 years), or;</p> <p>(iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, inappropriate fire regimes, clearing, hydrological change etc.</p> <p>Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.</p>
P4	<p>Priority Four: Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.</p> <p>(i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands.</p> <p>(ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category.</p> <p>(iii) Ecological communities that have been removed from the list of threatened communities during the past five years.</p>
P5	<p>Priority Five: Conservation Dependent ecological communities</p> <p>Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.</p>

Additional Background Information

Weeds

A number of legislative and policy documents exist in relation to weed management at state and national levels. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) is the principle legislation guiding weed management in Western Australia and lists declared pest species. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2018), of which many are also listed under the BAM Act.

Declared Pests

Part 2.3.23 of the BAM Act requires a person must not; “a) keep, breed or cultivate the declared pest; b) keep, breed or cultivate an animal, plant or other thing that is infected or infested with the declared pest; c) release into the environment the declared pest, or an animal, plant or other thing that is infected or infested with the declared pest; or d) intentionally infect or infest, or expose to infection or infestation, a plant, animal or other thing with a declared pest”.

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 7**. Species assigned to the ‘declared pest, prohibited - s12’ category are placed in one of three control categories, as described in **Table 8**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the ‘declared pest - s22(2)’ category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 9**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DPIRD 2020).

Table 4: Legal status of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Declared Pest Prohibited - s12	May only be imported and kept subject to permits. Permit conditions applicable to some species may only be appropriate or available to research organisations or similarly secure institutions.
Declared Pest s22(2)	Must satisfy any applicable import requirements when imported, and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia

Table 5: Control categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their

Additional Background Information

Category	Description
	damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DPIRD 2020)

Category	Description
Prohibited	Can only be kept under a permit for public display and education purposes, and/or genuine scientific research, by entities approved by the state authority.
Exempt	No permit or conditions are required for keeping.
Restricted	Organisms which, relative to other species, have a low risk of becoming a problem for the environment, primary industry or public safety and can be kept under a permit by private individuals.

Additional Background Information

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017a) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 10**.

Table 7: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)

Level of inundation	Geomorphology			
	Basin	Flat	Channel	Slope
Permanently inundated	Lake	-	River	-
Seasonally inundated	Sumpland	Floodplain	Creek	-
Seasonally waterlogged	Dampland	Palusplain	-	Paluslope

Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 11**.

Table 8: Geomorphic Wetlands of the Swan Coastal Plain classification categories (DBCA 2017a)

Management category	Description of wetland	Management objectives
Conservation (CCW)	Support high levels of attributes	Preserve wetland attributes and functions through reservation in national parks, crown reserves and state owned land. Protection provided under environmental protection policies.
Resource enhancement (REW)	Partly modified but still supporting substantial functions and attributes	Restore wetland through maintenance and enhancement of wetland functions and attributes. Protection via crown reserves, state or local government owned land, environmental protection policies and sustainable management on private properties.
Multiple use (MUW)	Few wetland attributes but still provide important hydrological functions	Use, development and management considered in the context of water, town and environmental planning through land care.

The management categories of wetland features are determined based on hydrological, biological and human use features. The DBCA document *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain, Western Australia* (DBCA 2017a) details the methodology by which wetlands on the Swan Coastal Plain are assigned management categories based on a two tiered evaluation system, with preliminary and secondary evaluation stages. The preliminary evaluation aims to identify any features of conservation significance that would immediately place the wetland within the CCW management category. Examples of these significant features include presence on significant wetland lists, presence of TECs or PECs (Priority 1 and 2), presence of threatened flora and

Additional Background Information



over 90% of vegetation in good or better condition based on the Keighery (1994) scale. If such environmental values are identified the wetland would be categorised as CCW without further evaluation.

Should the preliminary evaluation indicate that no such features occur, the secondary evaluation and site assessment are then applied. In the secondary evaluation, an appropriate management category is determined through the assessment of a range of environmental attributes, functions and values.

Wetland reclassification

DBCA have a protocol for proposing changes to the wetland boundaries and management categories of the existing geomorphic wetland dataset (DEC 2007). The procedure involves a wetland desktop evaluation and site assessment which culminates in a recommended management category. Relevant information should be obtained in the optimal season for vegetation condition and water levels, which is usually spring (DEC 2007). In the case of larger wetlands that have undergone a degree of disturbance, a separate management category may be assigned to parts of the wetland in order to reflect the current values.

References

General references

Department of Biodiversity, Conservation and Attractions (DBCA) 2017a, *A methodology for the evaluation of wetlands on the Swan Coastal Plain*, draft prepared by the Wetlands Section of the Department of Biodiversity, Conservation and Attractions and the Urban Water Branch of the Department of Water and Environmental Regulation, Perth.

Department of Biodiversity Conservation and Attractions (DBCA) 2017b, *Priority Ecological Communities for Western Australia Version 27*, Species and Communities Branch, Department of Biodiversity, Conservation and Attractions.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018a, *Geomorphic Wetlands, Swan Coastal Plain (DBCA-019)*.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018b, *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment*, Perth.

Department of Biodiversity, Conservation and Attractions (DBCA) 2018c, *Threatened and Priority Flora List 16 January 2018*, Perth.

Department of Environment and Conservation (DEC) 2007, *Protocol for proposing modifications to the Geomorphic Wetlands Swan Coastal Plain dataset*, Perth.

Department of Environment and Conservation (DEC) 2009, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, Perth.

Department of Environment and Conservation (DEC) 2013, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*, Perth.

English, V. and Blyth, J. 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, ANCA National Reserves System Cooperative Program, Project Number N702, Perth.

Keighery, B. 1994, *Bushland Plant Survey: A guide to plant community survey for the community*, Wildflower Society of WA (Inc), Nedlands.

Semeniuk, C. A. 1987, *Wetlands of the Darling System - a geomorphic approach to habitat classification*, Journal of the Royal Society of Western Australia, 69: 95-112.

Semeniuk, C. A. and Semeniuk, V. 1995, *A Geomorphic Approach to Global Classification for Inland Wetlands*, Vegetatio, 118(1/2): 103-124.

Online references

Department of Environment and Energy (DoEE) 2018, Weeds of National Significance, <<http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/lists/wons.html>>.

Additional Background Information



Department of Primary Industries and Regional Development (DPIRD) 2020, The Western Australian Organism List (WAOL), < <https://www.agric.wa.gov.au/bam/western-australian-organism-list-waol>>.

Appendix B

Conservation Significant Flora Species and likelihood of
Occurrence Assessment



Species name	Level of		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	WA	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	Unlikely
<i>Calytrix breviseta</i> subsp. <i>breviseta</i>	CR	EN	P	Seasonally wet sandy-clay soil on swampy flats	Oct-Nov	Unlikely
<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	Unlikely
<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	Unlikely
<i>Grevillea curviloba</i> subsp. <i>curviloba</i>	CR	EN	P	Winter wet, deep peaty grey sands over limestone at depth.	Sep-Oct	Unlikely
<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	Unlikely
<i>Thelymitra dedmaniarum</i>	CR	EN	PG	Red brown sandy loam with dolerite and granite outcrops.	Oct-Nov	Unlikely
<i>Trithuria occidentalis</i>	CR	EN	A	Partly submerged on the edge of shallow winter-wet clay pans in very open shrubland.	Oct-Nov	Unlikely
<i>Andersonia gracilis</i>	VU	EN	P	Seasonally damp, black sandy clay flats near or on the margins of swamps.	Sep-Nov	Unlikely
<i>Chamelaucium lullfitzii</i>	VU	EN	P	White yellow sand in low woodland.	Oct-Nov	Unlikely
<i>Darwinia foetida</i>	EN	EN	P	Grey-white sand on swampy, seasonally wet sites.	Oct-Nov	Unlikely
<i>Diplolaena andrewsii</i>	EN	EN	P	Granite outcrops & hillsides.	Jul-Oct	Unlikely

	WA	EPBC Act	strategy		period	occurrence
<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)	Unlikely
<i>Drakaea micrantha</i>	EN	VU	PG	Open sandy patches often adjacent to winter-wet swamps.	Sept- early Oct	Unlikely
<i>Grevillea christineae</i>	EN	EN	P	Clay loam, sandy clay, often moist.	Aug-Sep	Unlikely
<i>Grevillea curviloba</i> subsp. <i>incurva</i>	EN	EN	P	Sand, sandy loam. Winter-wet heath.	Aug-Sep	Unlikely
<i>Macarthuria keigheryi</i>	EN	EN	P	Low-lying winter-wet damp grey/white sands in open patches.	Sep-Dec or Feb-Mar	Unlikely
<i>Thelymitra stellata</i>	EN	EN	PG	Sandy loam, clay or gravel over laterite or gravel.	Sep-Nov	Unlikely
<i>Anigozanthos viridis</i> subsp. <i>terraspectans</i>	VU	VU	P	Grey sand, clay loam. Winter-wet depressions.	Aug-Sep	Unlikely
<i>Anthocercis gracilis</i>	VU	VU	P	Steep granite slopes along the Darling Scarp in shallow, humic-rich sandy or loamy soils.	Sep-Oct, Apr	Unlikely
<i>Conospermum undulatum</i>	VU	VU	P	Sand and sandy clay soils, on flat or gently sloping sites between the Swan and Canning Rivers	May-Oct	Unlikely
<i>Diuris drummondii</i>	VU	VU	PG	In low-lying depressions in peaty and sandy clay swamps.	Nov-Jan	Unlikely
<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	Unlikely
<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	Unlikely

	WA	EPBC Act	strategy		period	occurrence
<i>Eucalyptus argutifolia</i>	VU	VU	P	Shallow soils over limestone. Slopes or gullies of limestone ridges, outcrops	Mar-Apr	Unlikely
<i>Grevillea flexuosa</i>	VU	VU	P	Red-brown sand with laterite & gravel, sand over granite, on hilltops, slopes and in gullies.	May-Oct	Unlikely
<i>Bolboschoenus fluviatilis</i>	P1	-	P	Floodplain with grey/brown wet sand.	Nov	Unlikely
<i>Drosera patens</i>	P1	-	P	Sandy soils on margins of winter-wet depressions, swamps and lakes.	Aug-Dec	Unlikely
<i>Drosera x sidjamesii</i>	P1	-	P	Along lake margins, close to winter high-water line	Nov-Dec or Jan-Mar	Unlikely
<i>Hydrocotyle striata</i>	P1	-	A	Sand and clay in springs and creeklines.	Nov	Unlikely
<i>Levenhookia preissii</i>	P1	-	A	Grey or black, peaty sand. Swamps	Sep-Dec/Jan	Unlikely
<i>Stachystemon exilis</i>	P1	-	P	Low lying areas on sand.	Oct-Nov	Unlikely
<i>Acacia benthamii</i>	P2	-	P	Sand, typically on limestone breakaways	Aug-Sept	Unlikely
<i>Calectasia elegans</i>	P2	-	P	Grey yellow sand on plains.	Sep-Oct	Unlikely
<i>Millotia tenuifolia</i> var. <i>laevis</i>	P2	-	A	Granite or lateritic soils.	Sep-Oct	Unlikely
<i>Poranthera moorokatta</i>	P2	-	A	Sandy or clay soils. Dampland or low sandy dunes in banksia woodland.	Oct or Feb	Unlikely
<i>Thysanotus</i> sp. Badgingarra (E.A. Griffin 2511)	P2	-	P	Grey sand with lateritic gravel.	Dec	Unlikely
<i>Acacia oncinophylla</i> subsp. <i>oncinophylla</i>	P3	-	P	Granitic soils	Aug-Oct	Unlikely
<i>Beaufortia purpurea</i>	P3	-	P	Lateritic or granitic soils on rocky slopes.	Oct-Feb	Unlikely
<i>Byblis gigantea</i>	P3	-	P	Sandy-peat swamps. Seasonally wet areas.	Sep-Jan	Unlikely
<i>Carex tereticaulis</i>	P3	-	P	Black peaty sand.	Sep-Oct	Unlikely
<i>Cyathochaeta teretifolia</i>	P3	-	P	Grey sand, sandy clay in swamps and creek edges.	Oct-Jan	Unlikely
<i>Dampiera triloba</i>	P3	-	P	Damp peat/loam soil.	Aug-Dec	Unlikely
<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	Unlikely

	WA	EPBC Act	strategy		period	occurrence
<i>Haemodorum loratum</i>	P3	-	P	Grey or yellow sand, gravel.	Nov	Unlikely
<i>Halgania corymbosa</i>	P3	-	P	Gravelly soils, soils over granite.	Aug-Nov	Unlikely
<i>Isopogon autumnalis</i>	P3	-	P	Yellow-grey sand.	Feb,Mar,Apr,May or June	Unlikely
<i>Lasiopetalum glutinosum</i> subsp. <i>glutinosum</i>	P3	-	P	Brown clay loam on slopes	Sep-Dec	Unlikely
<i>Meionectes tenuifolia</i>	P3	-	P	Clay loam in seasonally wet areas.	Oct-Dec	Unlikely
<i>Myriophyllum echinatum</i>	P3	-	A	Clay in winter-wet flats.	Nov	Unlikely
<i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i>	P3	-	P	White or grey sand, lateritic gravel.	Aug-Oct	Unlikely
<i>Pithocarpa corymbulosa</i>	P3	-	P	Gravelly or sandy loam, amongst granite outcrops.	Jan-Apr	Unlikely
<i>Schoenus capillifolius</i>	P3	-	A	Brown mud in claypans.	Oct-Nov	Unlikely
<i>Schoenus</i> sp. Waroona (G.J. Keighery 12235)	P3	-	A	Clay or sandy clay. Winter-wet flats.	Oct-Nov	Unlikely
<i>Stylidium paludicola</i>	P3	-	P	Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland	Oct-Dec	Unlikely
<i>Stylidium trudgenii</i>	P3	-	P	Grey sand, dark grey to black sandy peat. Margins of winter-wet swamps, depressions	Sep-Jan	Unlikely
<i>Styphelia filifolia</i>	P3	-	P	Brown over pale yellow sand.	Feb-Apr	Unlikely
<i>Tetratheca pilifera</i>	P3	-	P	Gravelly soils.	Aug-Oct	Unlikely
<i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i>	P4	-	P	Grey or yellow sand	Jul-Oct	Unlikely
<i>Cyanicula ixioides</i> subsp. <i>ixioides</i>	P4	-	P	Laterite, gravel.	Aug-Oct	Unlikely
<i>Darwinia pimelioides</i>	P4	-	P	Loam, sandy loam on granite outcrops.	Sep-Oct	Unlikely
<i>Drosera occidentalis</i>	P4	-	P	Flat, brown/white/yellow moist sand/clay/peat, often near swamps.	Oct-Dec/Jan	Unlikely
<i>Hydrocotyle lemnoides</i>	P4	-	A	Floating in swamps.	Aug-Oct	Unlikely
<i>Hypolaena robusta</i>	P4	-	P	White sand. Sandplains	Sep-Oct	Unlikely

	WA	EPBC Act	strategy		period	occurrence
<i>Jacksonia sericea</i>	P4	-	P	Calcareous and sandy soils on Swan Coastal Plain	Dec-Feb	Unlikely
<i>Persoonia sulcata</i>	P4	-	P	Lateritic or granitic soils.	Sep-Nov	Unlikely
<i>Schoenus natans</i>	P4	-	A	Aquatic, in winter-wet depressions.	Oct	Unlikely
<i>Stylidium longitubum</i>	P4	-	A	Sandy clay, clay. Seasonal wetlands.	Oct-Dec	Unlikely
<i>Thysanotus glaucus</i>	P4	-	P	White, grey or yellow sand, sandy gravel.	Oct-Mar	Unlikely
<i>Verticordia lindleyi</i> subsp. <i>Lindleyi</i>	P4	-	P	Sand and sandy clay in winter wet areas.	May or Nov-Jan	Unlikely
Note: CR=critically endangered, EN=endangered, VU=vulnerable, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4, P=perennial, PG=perennial geophyte, A=annual.						

Appendix C

Species List



Family	Status	Species
Aizoaceae	*	<i>Carpobrotus edulis</i>
Apiaceae	*	<i>Foeniculum vulgare</i>
Araliaceae	*	<i>Schefflera actinophylla</i>
Araucariaceae	*	<i>Araucaria</i> sp.
Areceaceae	*	<i>Washingtonia filifera</i>
Asparagaceae	*	<i>Dracaena trifasciata</i>
Asteraceae	*	<i>Arctotheca calendula</i>
	*	<i>Cichorium intybus</i>
	*	<i>Erigeron</i> sp.
	*	<i>Hypochaeris</i> sp.
	*	<i>Lactuca serriola</i>
	*	<i>Senecio condylus</i>
	*	<i>Sonchus</i> sp.
	*	<i>Ursinia anthemoides</i>
Bignoniaceae	*	<i>Jacaranda mimosifolia</i>
Brassicaceae	*	<i>Brassica</i> sp.
	*	<i>Raphanus raphanistrum</i>
Casuarinaceae	*	<i>Casuarina cunninghamiana</i>
Euphorbiaceae	*	<i>Euphorbia peplus</i>
Fabaceae	*	<i>Acacia baileyana</i>
	*	<i>Acacia podalyriifolia</i>
	*	<i>Chamaecytisus palmensis</i>
		<i>Kennedia prostrata</i>

Family	Status	Species
Fabaceae	*	<i>Lotus subbiflorus</i>
	*	<i>Trifolium arvense</i>
	*	<i>Trifolium campestre</i>
	*	<i>Vicia sativa</i> subsp. <i>nigra</i>
	*	<i>Vicia sativa</i> subsp. <i>sativa</i>
Meliaceae	*	<i>Melia azedarach</i>
Moraceae	*	<i>Ficus</i> sp.
Myrtaceae	Pl	<i>Agonis flexuosa</i>
	*	<i>Chamelaucium uncinatum</i>
		<i>Corymbia calophylla</i>
	*	<i>Corymbia citriodora</i>
	*	<i>Eucalyptus camaldulensis</i>
	*	<i>Eucalyptus globulus</i>
		<i>Eucalyptus rudis</i>
	Pl	<i>Kunzea baxteri</i>
	*	<i>Leptospermum laevigatum</i>
		<i>Melaleuca preissiana</i>
	*	<i>Melaleuca</i> sp.
Oleaceae	*	<i>Olea europaea</i>
Orchidaceae		<i>Microtis media</i>
Platanaceae	*	<i>Platanus</i> × <i>acerifolia</i>
Poaceae	*	<i>Avena barbata</i>
	*	<i>Briza maxima</i>
	*	<i>Briza minima</i>
	*	<i>Bromus diandrus</i>
	*	<i>Bromus</i> sp.
	*	<i>Cynodon dactylon</i>
	*	<i>Ehrharta calycina</i>
	*	<i>Ehrharta longiflora</i>
	*	<i>Eragrostis curvula</i>
	*	<i>Hordeum</i> sp.
	*	<i>Lolium rigidum</i>

Family	Status	Species
Poaceae	*	<i>Pentameris</i> sp.
	*	<i>Phalaris paradoxa</i>
Polygonaceae	*	<i>Rumex</i> sp.
Rutaceae	*	<i>Citrus × sinensis</i>
Solanaceae	*	<i>Solanum nigrum</i>
Zygophyllaceae	*	<i>Tribulus terrestris</i>

*=non-native, Pl=planted

Appendix D

Conservation Significant Communities and Likelihood of
Occurrence Assessment



Code	Community name	TEC/P EC	Level of significance		Likelihood of occurrence
			State	EPBC Act	
Mound Springs SCP	Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain	TEC	CR	EN	Unlikely
-	Clay Pans of the Swan Coastal Plain	TEC	-	CR	
SCP20c	Shrublands and Woodlands of the eastern Swan Coastal Plain	TEC	CR	EN	Unlikely
Tuart WLS	Tuart (<i>Eucalyptus gomphocephala</i>) Woodlands and Forests of the Swan Coastal Plain ecological community	TEC/P EC	P3	CR	Unlikely
Muchea Limestone	Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain	TEC	EN	EN	Unlikely
SCP02	Southern wet shrublands, Swan Coastal Plain	TEC	EN	-	Unlikely
SCP20a	<i>Banksia attenuata</i> woodlands over species rich dense shrublands	TEC	EN	-	Unlikely
SCP20b	<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain	TEC	EN	-	Unlikely
Banksia WL SCP	Banksia woodlands of the Swan Coastal Plain	TEC/ PEC	P3	EN	Unlikely
SCP3a	<i>Corymbia calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain	TEC	EN	EN	Unlikely
SCP3c	<i>Corymbia calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands of the Swan Coastal Plain	TEC	EN	EN	Unlikely
118	Subtropical and Temperate Coastal Saltmarsh	TEC/ PEC	P3	VU	Unlikely
SCP08	Herb rich shrublands in clay pans	TEC	VU	-	Unlikely
SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain	TEC	VU	-	Unlikely
SCP18	Shrublands on calcareous silts of the Swan Coastal Plain	TEC	VU	-	Unlikely
Central Granite Shrublands (Com 5. Markey)	Central Northern Darling Scarp Granite Shrubland Community	PEC	P4	-	Unlikely
SCP21c	Low lying <i>Banksia attenuata</i> woodlands or shrublands	PEC	P3	-	Unlikely
SCP22	<i>Banksia ilicifolia</i> woodlands	PEC	P3	-	Unlikely
SCP23b	Swan Coastal Plain <i>Banksia attenuata</i> - <i>Banksia menziesii</i> woodlands	PEC	P3	-	Unlikely

Note: CR=critically endangered, EN=endangered, VU=vulnerable, P1=Priority 1, P2=Priority 2, P3=Priority 3, P4=Priority 4, TEC=threatened ecological community, PEC=priority ecological community.