Reconnaissance Flora and Vegetation Survey

Part of 150 Runnymede Road

Prepared for MBS Environmental
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Executive Summary

A Reconnaissance flora and vegetation survey was undertaken in the southwest corner of 150 Runnymede Road on 1 February 2022. The survey was undertaken in accordance with the Environmental Protection Authority Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (2016), apart from being outside the preferred spring survey season.

The total area surveyed was approximately 19.31 hectares in size of which approximately 9.82 ha was vegetated to some degree. Sixty-four species of vascular flora were identified within the survey area, of which 24 (37.5%) were introduced taxa. No flora listed as threatened under the Commonwealth *EPBC Act (1999)* or the *Western Australian Biodiversity Conservation Act 2016* was found within the survey area. One State-listed Priority 1 flora species *Acacia* sp. Binningup was recorded within the survey area. No other State-listed Priority flora or other flora of significance were found. One Declared Pest plants (under the *Biosecurity and Agriculture Management Act 2007*), **Solanum linnaeanum* (Apple of Sodom) was found within the survey area.

Two native vegetation units were identified within the survey area:

- **Unit P1 Marri Woodland:** *Corymbia calophylla* (with occasional *Eucalyptus marginata* subsp. *marginata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over **Acacia longifolia* Isolated Tall Shrubs over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland (covering 7.56 ha).
- **Unit P2 Jarrah-Marri-Banksia Woodland**: *Corymbia calophylla*, *Eucalyptus marginata* subsp. *marginata* (with occasional *Banksia attenuata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over *Xanthorrhoea brunonis* s.l. Low Sparse Shrubland over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland (covering 2.17 ha).

The majority of this vegetation was in Degraded condition, with 1.12 ha in Good and 0.05 ha in Very Good condition. Approximately 9.49 ha of the survey area was already cleared.

The 0.05 ha area of Very Good condition vegetation along the northern boundary of the survey area met the criteria to qualify as 'Banksia Woodlands of the Swan Coastal Plain' that is a federal TEC and state PEC. This is based on an assumption that the 0.05 ha area forms part of a larger patch of the Banksia Woodlands of SCP TEC/PEC extending north, outside of the survey area. The rest of the vegetation in the survey area does not represent a TEC or PEC.

The identified vegetation units are associated with wetland or riverine species.

One vegetation complex, Karrakatta Complex-Central and South, occurs within the survey area. This complex has less than 30% of its pre-European extent remaining within the Swan Coastal Plain, however more than 30% remain within Shire of Harvey.

One vegetation association is mapped across the survey area, Association 6 'Medium woodland; tuart & jarrah'. This association has less than 30% of its pre-European extent remaining on the Swan Coastal Plain, however more than 30% remain within Shire of Harvey.

A regional ecological linkage axis line mapped by Molloy et al. (2009) runs north-south across 150 Runnymede Road, to the east of the survey area. Some parcels of vegetation within the survey area have been assigned the highest 1a or second highest 1b proximity value.

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Statement of Limitations

Reliance on data

In the preparation of this report, Ecoedge has relied on data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report. Unless stated otherwise in the report, Ecoedge has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report are based in whole or in part on the data, those conclusions are contingent upon the accuracy and completeness of the data. Ecoedge will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, unavailable, misrepresented or otherwise not fully disclosed to Ecoedge.

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1 Introduction

Ecoedge was engaged by McDougall Quarries Pty Ltd (McDougall Quarries) to undertake a Reconnaissance flora and vegetation survey at 150 Runnymede Road in Binningup. The survey area comprised approximately 19.31 ha of partly cleared native vegetation in the southwest corner of the property ('the survey area') (Figure 1, Figure 2).

The flora and vegetation survey was undertaken on 1 February 2022. This report compiles findings of the survey.

2 Scope and objectives

McDougall Quarries required the survey to identify key flora and vegetation values of the survey area to inform environmental impact assessment of a potential future development proposal. Survey focus was in particular on determining whether Threatened and Priority ecological communities (TECs/PECs) and/or Threatened and Priority flora were present or likely to be present within the survey area.

The scope required a desktop assessment to be conducted prior to the field survey to identify significant biological features and constraints (relating to flora and vegetation) that have been recorded in or nearby the survey area, such as significant flora, TEC and PECs, riparian vegetation, unusual soil/landscape systems (e.g. granite outcrops), conservation estates, poorly represented vegetation associations and/or vegetation complexes and Environmentally Sensitive Areas (ESA's).

The survey and report were required to be undertaken in accordance with the Environmental Protection Authority (EPA) Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016) and meet requirements of other relevant State and Commonwealth guidelines for threatened species and communities, such approved conservation advice for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) threatened species and communities.

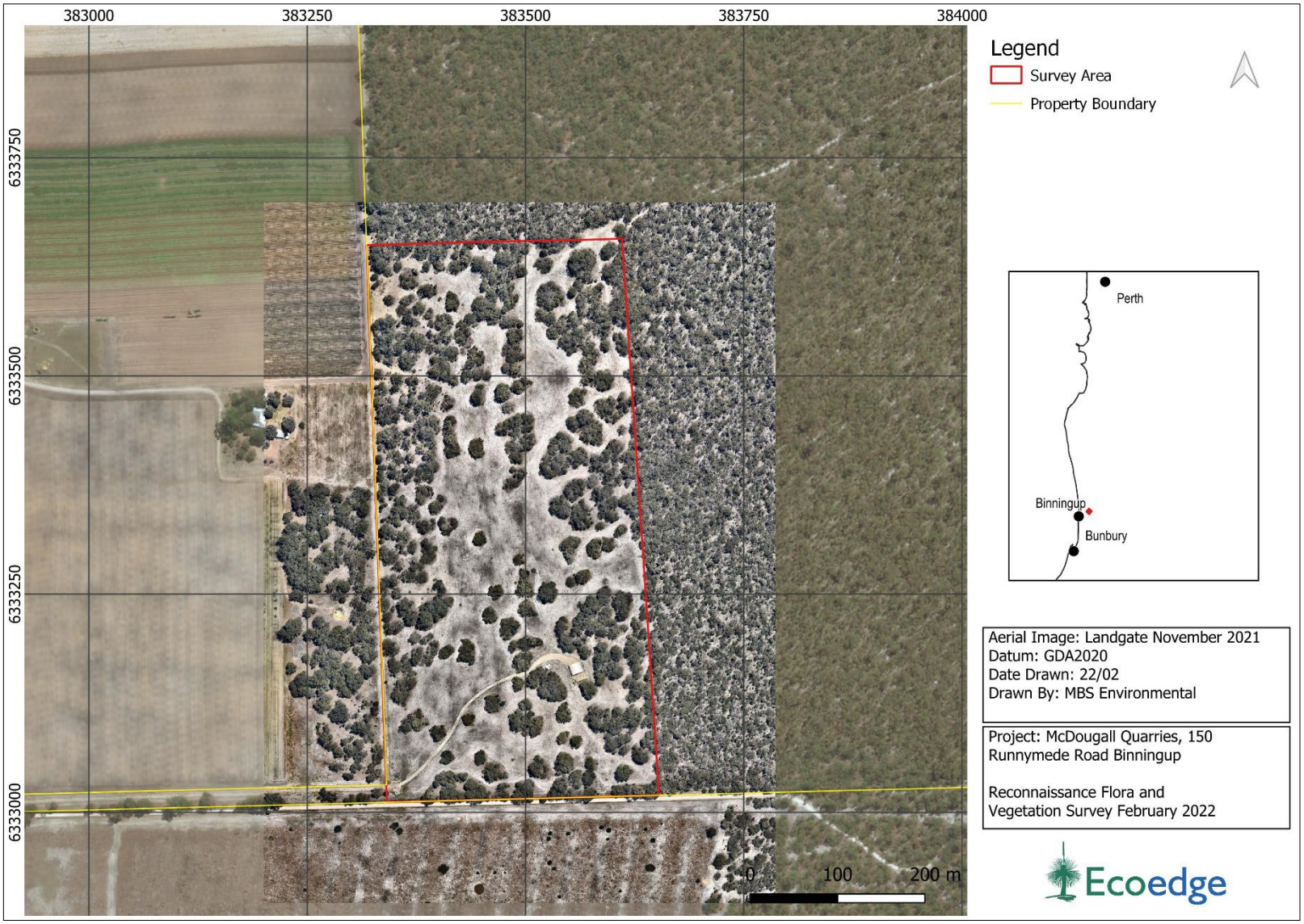


Figure 1. Aerial photograph showing the location of the survey area.

3 Methods

3.1 Desktop assessment

Prior to the field survey, a desktop assessment was undertaken to provide contextual information on the flora and vegetation within the survey area. The desktop assessment area (the 'study area') encompassed a 5-kilometre (km) buffer to the survey area (Figure 2). The desktop assessment included a review of the following information. Where this desktop review utilised GIS data layers available through DataWA (Government of Western Australia 2022), the layers are referenced using their identifier e.g., DWER-031.

- Regional landscape and soil mapping - Land resources from Harvey to Capel on the Swan Coastal Plain (Barnesby and Proulx-Nixon 2000), as digitally presented in the Soil Landscape Mapping – Best Available Data Set, DPIRD-027.
- Vegetation complex mapping of the South West Forest Region of Western Australia (Mattiske and Havel 1998) and the System 6 area (Heddle et al. 1980) as updated by Webb et al. (2016) and mapped in DBCA-046.
- Beard's Pre-European vegetation association mapping dataset (DPIRD-006) (Beard et al. 2013).
- WA Threatened and Priority Ecological Communities DBCA database extracts (DBCA 2020c) and TEC and PEC listings (DBCA 2018a, DBCA 2021d).
- Federal Protected Matters Search Tool results (DAWE 2022).
- Threatened and Priority flora Naturemap search results (DBCA 2021a).
- Extract from the Department's Threatened Flora database and the Western Australian Herbarium database (DBCA 2021b).
- Environmentally sensitive areas distribution maps and data, DWER-046 (DWER 2020).
- Geomorphic Wetlands, Swan Coastal Plain data set, DBCA-019 (DBCA 2021e)
- Directory of Important Wetlands in Australia – Western Australia data set, DBCA-045 (DBCA 2018c).
- Surface Hydrology Lines (National) (Crossman & Li 2015).
- Regional Ecological Linkages (Molloy et al. 2009).

3.1.1 Significant flora likelihood of occurrence

Prior to undertaking the survey, an assessment of the likelihood of occurrence of Threatened and Priority flora occurring within the survey area was undertaken. The rationale for determining the pre and post likelihood of occurrence is provided in **Appendix 1.**

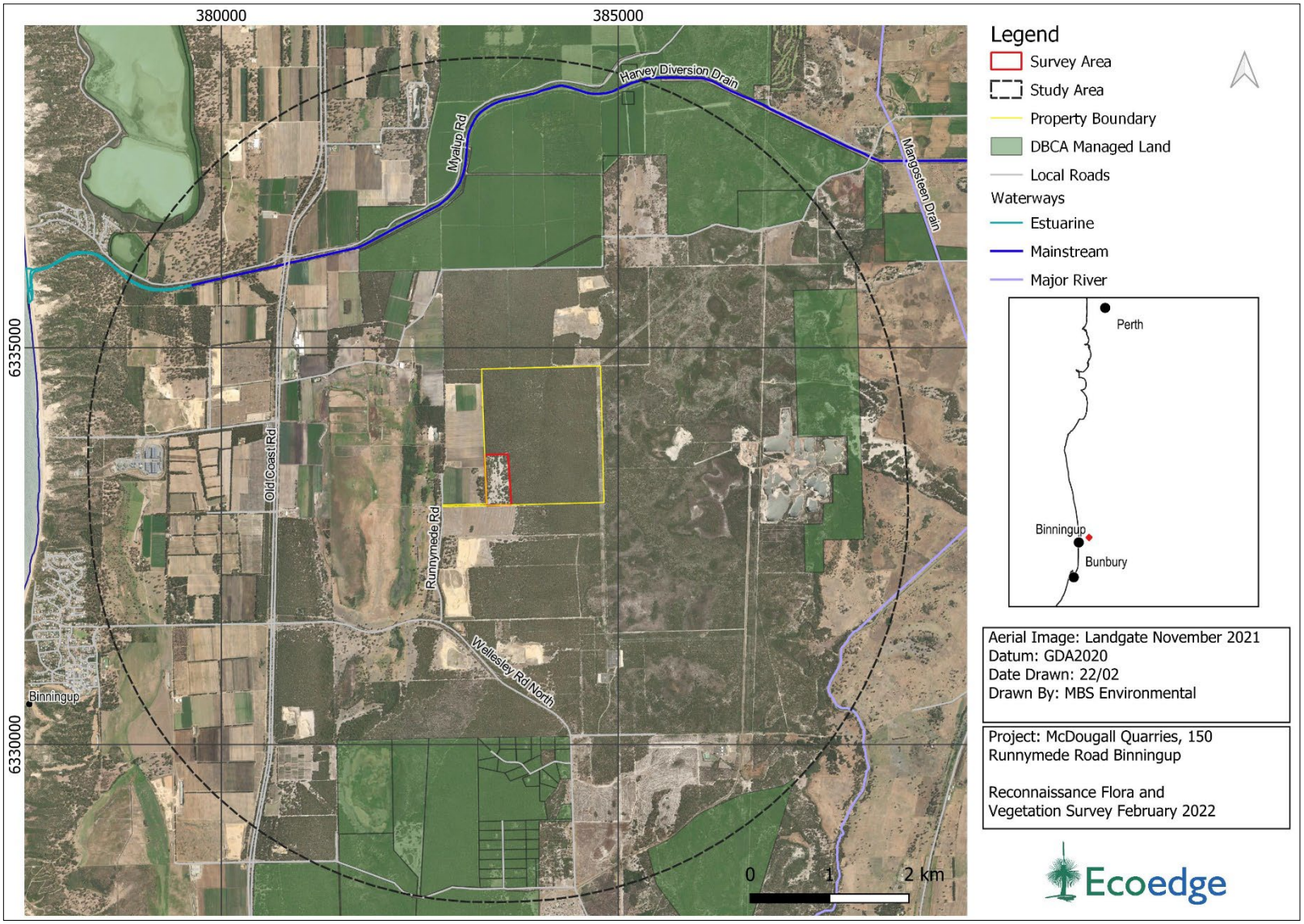


Figure 2. Aerial photograph showing the location of the survey and study area.

3.2 Field survey

The flora and vegetation survey was undertaken on 1 February 2022 by Russell Smith (flora permit FB61000473) and Ben Eckermann (flora permit FB62000262) in accordance with EPA 2016 guidelines. The survey area of 19.31 ha was traversed on foot.

Flora species not identified in the field were either photographed or collected for later identification. Taxonomy and conservation status were checked against the latest WA Herbarium census download (DBCA 2022).

Plant communities were described using data collected at relevés or vegetation condition waypoints as well as recent aerial photography. The relevé information was used to identify and describe vegetation units using the NVIS system (Level 5; NVIS 2017).

Vegetation condition was assessed using the method of the EPA (2016) (**Appendix 2**).

3.3 Survey limitations

Limitations with regards to the assessment are addressed in **Table 1.**

Table 1. Limitations of the field survey with regard to assessment adequacy and accuracy.

Aspect	Constraint	Comment
Scope	Negligible	The survey scope was prepared in consultation with the client and was designed to comply with EPA requirements for a reconnaissance survey.
Proportion of flora identified	Minor	The survey was carried out on 1 February which is outside the optimal spring survey season for the southwest. Considering the disturbance history of the site and the degraded and parkland cleared nature of the vegetation in the survey area, this was considered a minor constraint in terms of the proportion of flora identified. 95% of native species recorded were identified to species level.
Climatic and seasonal effects	Low	Rainfall recorded at Bunbury, the nearest open weather station, for 12 months preceding the survey was 133% of the long-term mean however the survey was undertaken in February, outside the main spring survey season and the conditions were dry. Considering the disturbance history of the site and the degraded and parkland cleared nature of the vegetation in the survey area, this was considered a 'low' constraint for a reconnaissance only survey.
Availability of contextual information	Negligible	Comprehensive regional surveys of remnant vegetation, and more localised surveys, have been carried out on the southern Swan Coastal Plain.
Completeness of the survey	Negligible	All of the survey area vegetation was easily accessible.
Skill and knowledge of the botanists	Negligible	The senior botanist has 30 years' experience in flora surveys in the south-west of WA and within this IBRA region.
Disturbance (fire, grazing, clearing etc.)	Minor	All of the survey area has been disturbed in the past through grazing of livestock or clearing.

4 Results desktop assessment

4.1 Biogeographic region and location

The survey area is located within the Swan Coastal Plain Bioregion classified by the Interim Biogeographic Regionalisation for Australia (IBRA) (Commonwealth of Australia 2016). It is characterised as a low lying coastal plain, mainly covered by Banksia or Tuart woodlands over sandy soils with paperbark prevalent in swampy areas (Thackway and Cresswell 1995).

The Swan Coastal Plain Bioregion is divided into two subregions the Dandaragan Plateau (SWA01) and Perth (SWA02), of which the survey area is located within the Perth subregion. This subregion is comprised of colluvial and aeolian sands, alluvial river flats and coastal limestone. Native vegetation varies from Heath and/or Tuart woodlands on limestone, Banksia and Jarrah woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvials. This subregion also includes a complex series of seasonal wetlands (Mitchell, Williams, and Desmond 2002).

The survey area is located on 150 Runnymede Road in Binningup, approximately 23 km north of Bunbury and 5.5 km east-northeast of the Binningup town centre, in the Shire of Harvey. The survey area is located on the western slope of a large, north-south oriented sand dune ridge (Figure 2).

4.2 Landform and soils

The survey area occurs within the Spearwood System (211 Sp) of the Swan Coastal Plain. The Spearwood System is characterised by sand dunes and plains, with deposits of aeolian sand and limestone over sedimentary rocks (Barnesby and Proulx-Nixon 2000, DPIRD-064).

The Spearwood system has been further separated into landform-soil mapping units or "land units" based on landscape position and soil characteristics (Barnesby and Proulx-Nixon 2000, DPIRD-027). Three land units have been described for the survey area and are described in **Table 2** and **Figure 3**.

Table 2. Soil mapping units occurring within the survey area (Barnesby and Proulx-Nixon 2000, DPIRD-027)

System	Land units	Description
Spearwood System (211 Sp)	211Sp_S1c	Lower slopes (1-5%) of dune ridge with bleached or pale sands with a yellow-brown or pale brown subsoil (like S1c). Usually occurs on the eastern edge of the Spearwood Dunes.
	211Sp_S1b	Dune ridges with deep siliceous yellow brown sands or pale sands with yellow-brown subsoil and slopes up to 15%.
	211Sp_S3	Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow-brown sands.

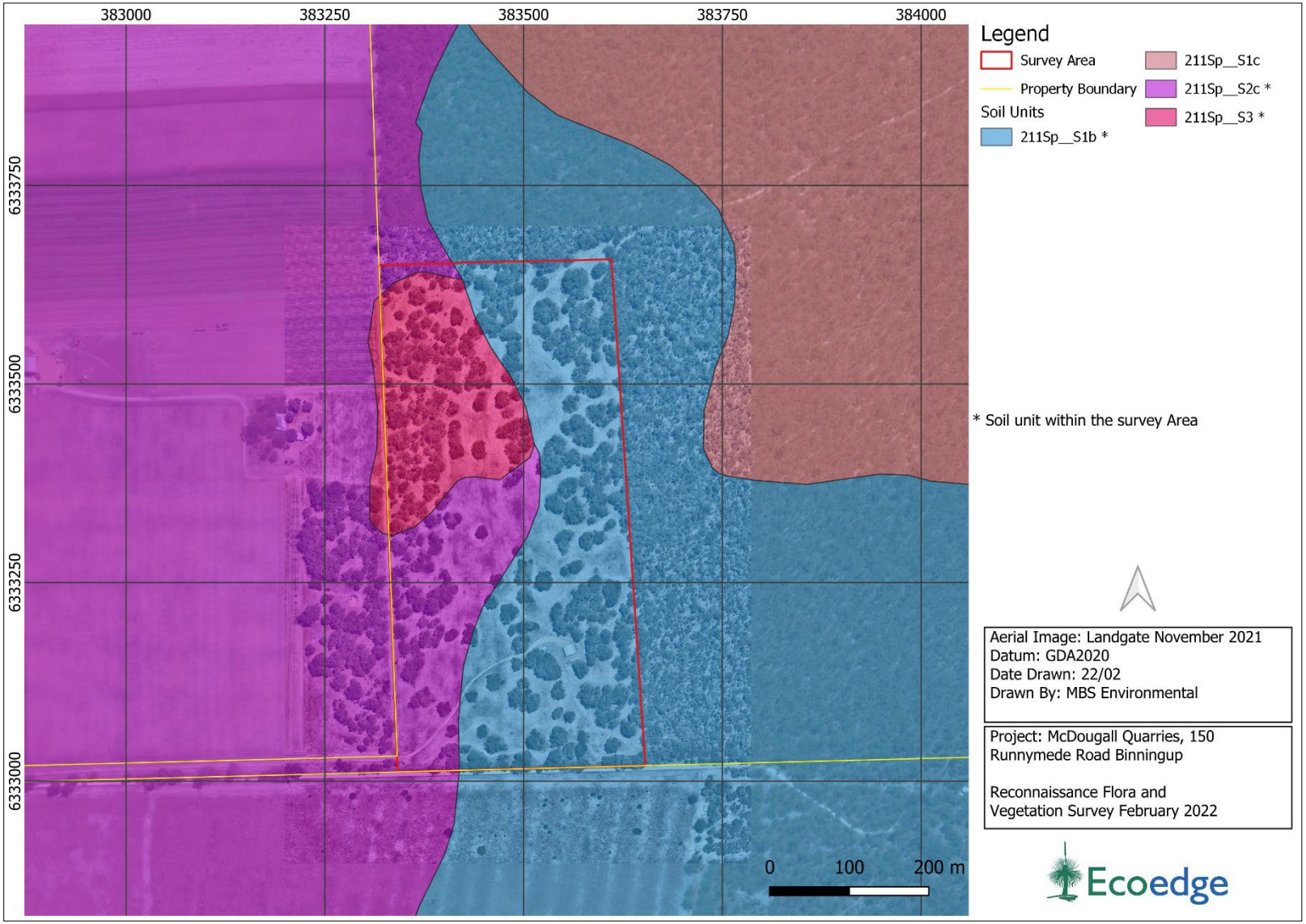


Figure 3. Land units mapped in and nearby the survey area (DPIRD-027).

4.3 Vegetation description according to pre-European mapping datasets

The 19.31 ha survey area contains approximately 9.82 ha of remnant native vegetation.

4.3.1 Vegetation Complexes

The comprehensive pre-1750 distribution of vegetation complexes[1] across the southwest of Western Australia is based on two main data sets, Heddle et al.'s 1980 1:250,000 scale vegetation complex mapping of the 'System 6' area comprising the greater Perth and Darling Range Region and Mattiske and Havel's 1998 1:50,000 scale mapping of forest vegetation covered by the Regional Forest Agreement 1999[2] (Webb et al. 2016). Both data sets were prepared in order to inform the adequacy of biodiversity conservation through state-managed reserves (EPA 1993, South West Regional Forest Agreement 1999). In 2016 these data sets were revised by DPaW (Webb et al. 2016) in order to fill data gaps and improve alignment and correlation between the data sets.

One vegetation complex occurs within the survey area, according to the 1:250,000 mapping of Swan Coastal Plain Vegetation Complexes (Heddle et al. 1980) as updated by Webb et al. (2016). This is described in **Table 3** and shown in **Figure 4.**

Table 3. Vegetation complex mapped for the survey area (Webb et al. 2016).

Vegetation Complex	Description
Karrakatta Complex-Central and South	Vegetation consisting predominantly of an open-forest of *Eucalyptus gomphocephala (*Tuart), Eucalyptus *marginata* (Jarrah) and *Corymbia calophylla* (Marri). Common species include *Banksia attenuata, B. menziesii* (north of Mandurah), *B. grandis, A. fraseriana* and to a lesser extent peppermint (*Agonis flexuosa*). Shrub species include *Jacksonia sternbergiana, J. furcellata, Acacia cyclops, A. saligna, Hibbertia spp., Allocasuarina humilis, Calothamnus quadrifidus* and *Grevillea preissii.* On deeper sands of the jarrah woodland, the understory species show changes and include *Hibbertia hypericoides, Conospermum stoechadis, Hovea trisperma* and *Bossiaea eriocarpa*

[1] Vegetation complex mapping is based on broadscale assessment of regional patterns of vegetation in relation to underlying landforms, soils and climatic trends.

[2] Mattiske and Havel's (1998) mapping also included an assessment of an area of the very southern portion of the Swan Coastal Plain landform (Webb etal. 2016).

4.3.2 Vegetation associations

A systematic survey of native vegetation in Western Australia was undertaken by J. S. Beard (along with others) during the 1970s, which described vegetation systems in the southwest of Western Australia at a scale of 1:250,000. Beard's vegetation maps attempted to depict the vegetation as it might have been prior to European settlement in terms of type and extent (Beeston et al. 2001). The Beard Vegetation Association dataset, also referred to as the pre-European native vegetation extent dataset, was digitised by Shepherd et al. (2002).

Beard vegetation associations have been described to a minimum standard of Level 3 "Broad Floristic Formation" for the National Vegetation Inventory System (NVIS) (state-wide to regional scale) [3].

The survey area comprised only one Beard vegetation association: Association 6 'Medium woodland; tuart & jarrah' (DPIRD-006).

[3] Beard's vegetation mapping units are referred to as 'associations' however these do not correspond to the NVIS Level 5 'Associations'. The NVIS system was developed long after Beard's work was completed, and while both classification systems use the same term, NVIS 'Associations' describe vegetation in more detail than do Beard's.

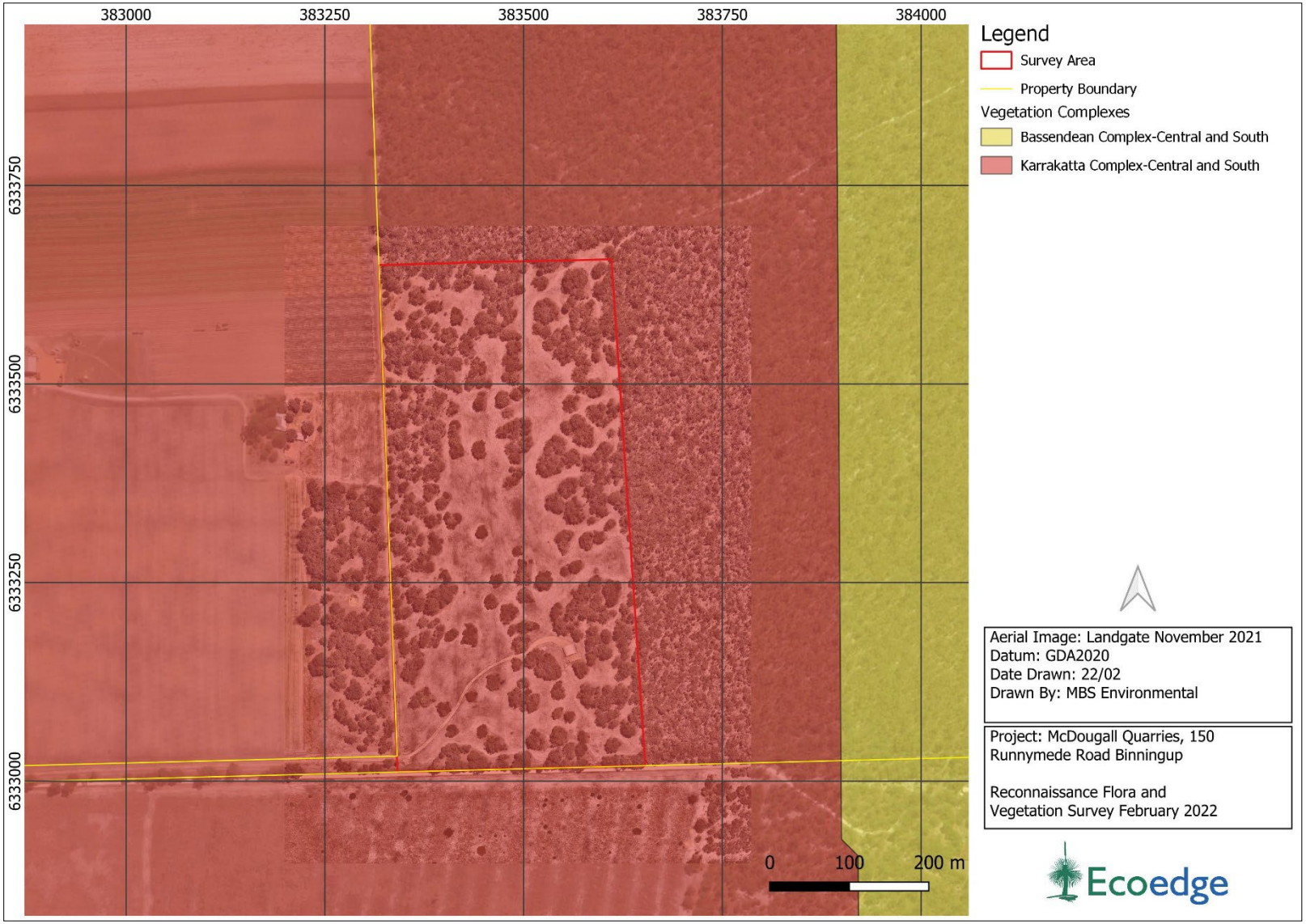


Figure 4. Vegetation complexes mapped in and nearby the survey area (Webb et al. 2016).

4.3.3 Assessment of remaining extent against pre-European extent

In 2001, the Commonwealth of Australia stated National Targets and Objectives for Biodiversity Conservation, which recognised that the retention of 30%, or more, of the pre-clearing extent of each ecological community, was necessary if Australia's biological diversity was to be protected (Environment Australia 2001).

In its report on the Statewide Vegetation Statistics incorporating the Comprehensive, Adequate and Representative (CAR) Reserve Analysis, the Government of Western Australia provides information on the pre-European and current extent of the ecological communities of Western Australia and reports on the status of the CAR reserve system for WA (Government of Western Australia 2019). This system is also based on the National retention targets of 30% overall. Only reserves managed by DBCA under the *Conservation and Land Management Act 1984* are considered for inclusion in the "CAR Reserve Analysis".

Table 4 presents the statistics as they relate to the percentage remaining of pre-European extent vegetation and the percentage of current extent in DBCA managed land of the vegetation complex identified within the survey area. The Karrakatta Complex (Central and South), has 23.49% of its pre-European extent remaining. The complex has over 30% of its pre-European extent remaining within the bounds of the Shire of Harvey.

Table 5 presents the same statistics for the Beard vegetation association mapped across the survey area: Association 6. Association 6 retains 23.72% of its pre-European extent at state level and IBRA region and subregion levels, and 38.18% within the Shire of Harvey.

The red, orange and yellow shading in the tables indicates the status of the Commonwealth 30% retention target.

Status of the commonwealth retention target	>30%	<30%	<10%

Table 4. Vegetation complexes mapped within the survey area with regard to the Commonwealth retention targets (Government of Western Australia 2019a).

Vegetation Complex	Pre-European (ha)	Current Extent (ha)	% Remaining	% remaining in DBCA reserves
Karrakatta Complex-Central and South				
Swan Coastal Plain	53,080.99	12,467.20	23.49	8.07
Shire of Harvey	5,113.94	1,852.93	36.23	No data

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

Table 5. Vegetation associations within the survey area with regard to the Commonwealth retention targets (Government of Western Australia 2019b).

Beard Vegetation Association	Pre-European (ha)	Current Extent (ha)	% Remaining	% remaining in DBCA Managed Land*
Association 6				
State-wide	56,343.01	13,362.25	23.72	9.45
IBRA region:				
Swan Coastal Plain (SWA)	56,343.01	13,362.25	23.72	9.45
IBRA sub-region				
Perth (SWA02)	56,343.01	13,362.25	23.72	9.45
Shire of Harvey	6,232.23	2,379.30	38.18	23.59

* Excludes Crown Freehold Department Interest Lands that are managed under Section 8(a) of the CALM Act.

4.4 Threatened and Priority ecological communities

Ecological communities are defined by Western Australia's DBCA as "...naturally occurring biological assemblages that occur in a particular type of habitat. They are the sum of species within an ecosystem and, as a whole, they provide many of the processes which support specific ecosystems and provide ecological services." (DEC 2013).

Under Section 27 of the *Biodiversity Conservation Act 2016* (BC Act), the Western Australian Minister for Environment may list communities considered to be under significant threat as a TEC. These TECs can be listed under one of three conservation categories: critically endangered (CR), endangered (EN), vulnerable (VU). The BC Act also provides for listing ecological communities as presumed totally destroyed if no representative or previously extant occurrences have been located or its range has been so extensively modified that no occurrence of it is likely to recover species composition/structure in the immediate future.

Ecological communities (community types and sub-types) with insufficient information available to be considered a TEC, or which are rare but not currently threatened, are placed on a 'Priority list' and referred to as Priority Ecological Communities (PECs). PECs are listed as Priorities 1, 2 or 3 (referred to as P1, P2, P3), dependent upon survey properties and/or definition of the community. Ecological communities that are adequately known are rare but not Threatened, that meet criteria for near Threatened, or that have been recently removed from the Threatened list, are placed in Priority 4 (P4). These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (P5) (DEC 2013).

The current listing of Threatened and Priority ecological communities is specified in DBCA (2018a, 2021d). The conservation categories for these Threatened and Priority ecological communities are defined in **Appendix 3**.

TECs can also be listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are three categories of TEC under the EPBC Act: Critically Endangered (CR), Endangered (EN) and Vulnerable (VU) (Department of Agriculture, Water and the Environment) (DAWE 2020b). These are defined in **Appendix 4.**

The desktop assessment, which included a Protected Matters Search (DAWE 2022) and review of DBCA TEC and PEC database extracts (DBCA 2021c), found four EPBC Act listed TECs, three BC Act listed TECs, and three State listed PECs within the 5 km study area.

Outcomes of these searches are presented in **Table 6.** The results of the DBCA records are shown in **Figure 5.**

Table 6. Threatened and Priority ecological communities occurring within study area (DAWE 2022, DBCA 2021c).

Community Name	Community Description	Status (WA)	Status (EPBC Act)
'Claypans of the Swan Coastal Plain' – a federally listed TEC consisting of four State-listed communities, two of which occur in the study area: 1. SCP08: Herb rich shrublands in clay pans 2. SCP09: Dense shrublands on clay flats		1. T (VU) 2. T (VU)	T (CR)
Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the of the Swan Coastal Plain		P3	T (CR)
'Banksia Woodlands of the Swan Coastal Plain' – a federally listed TEC consisting of numerous State-listed communities, one of which occurs in the study area 1. SCP21c Low lying *Banksia attenuata* woodlands or shrubland		P3	T (EN)
SCP24 Northern Spearwood shrublands and woodlands		P3	-
Muchea Limestone: Shrublands and woodlands on Muchea Limestone of the Swan Coastal Plain		T (EN)	T (EN)

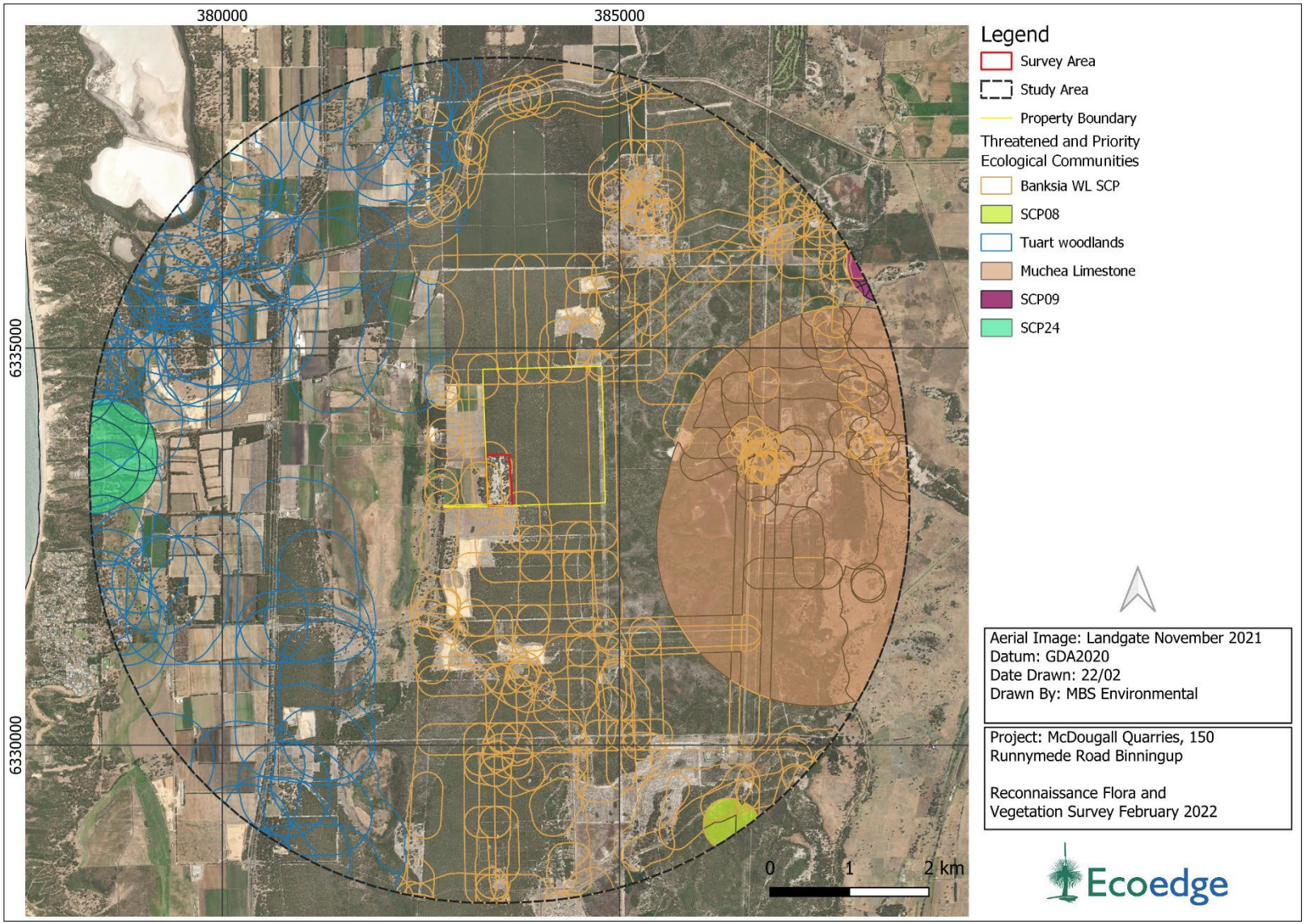


Figure 5. Threatened and Priority ecological communities within the study area. (DBCA 2021c)

4.5 Threatened and Priority flora

Species of flora and fauna are defined as having a Threatened or Priority conservation status where their extant populations are restricted geographically and/or under threat of possible extinction. The DBCA recognises these threats and consequently applies regulations towards population and species protection.

Threatened extant flora species are listed under Section 19 of the BC Act and are ranked according to their level of threat using the International Union for Conservation of Nature (IUCN) Red List categories and criteria of; Critically Endangered (CE), Endangered (EN), Vulnerable (VU). It is an offence to "take" or damage Threatened flora without Ministerial approval. Section 5 of the Act defines "to take" as "… to gather, pluck, cut, pull up, destroy, dig up, remove, harvest or damage flora by any means".

Priority flora is under consideration for future declaration as "Threatened flora", dependent on more information. Species classified as Priority One to Three (referred to as P1, P2 and P3) are in need of further survey to determine their status, while Priority Four (P4) species are adequately known rare or Threatened species that require regular monitoring.

Threatened flora lists are formally reviewed annually, whilst the Priority flora list is subject to a less formal ongoing review. The current listing of Threatened and Priority flora was updated on 5 December 2018 (DBCA 2018b).

Categories of Threatened and Priority flora as defined by the BC Act are presented in **Appendix 5** (DBCA 2019a).

Threatened flora may also be protected under the Commonwealth EPBC Act and be listed in one of six categories; the definitions of these categories are summarised in **Appendix 6** (DAWE 2020c).

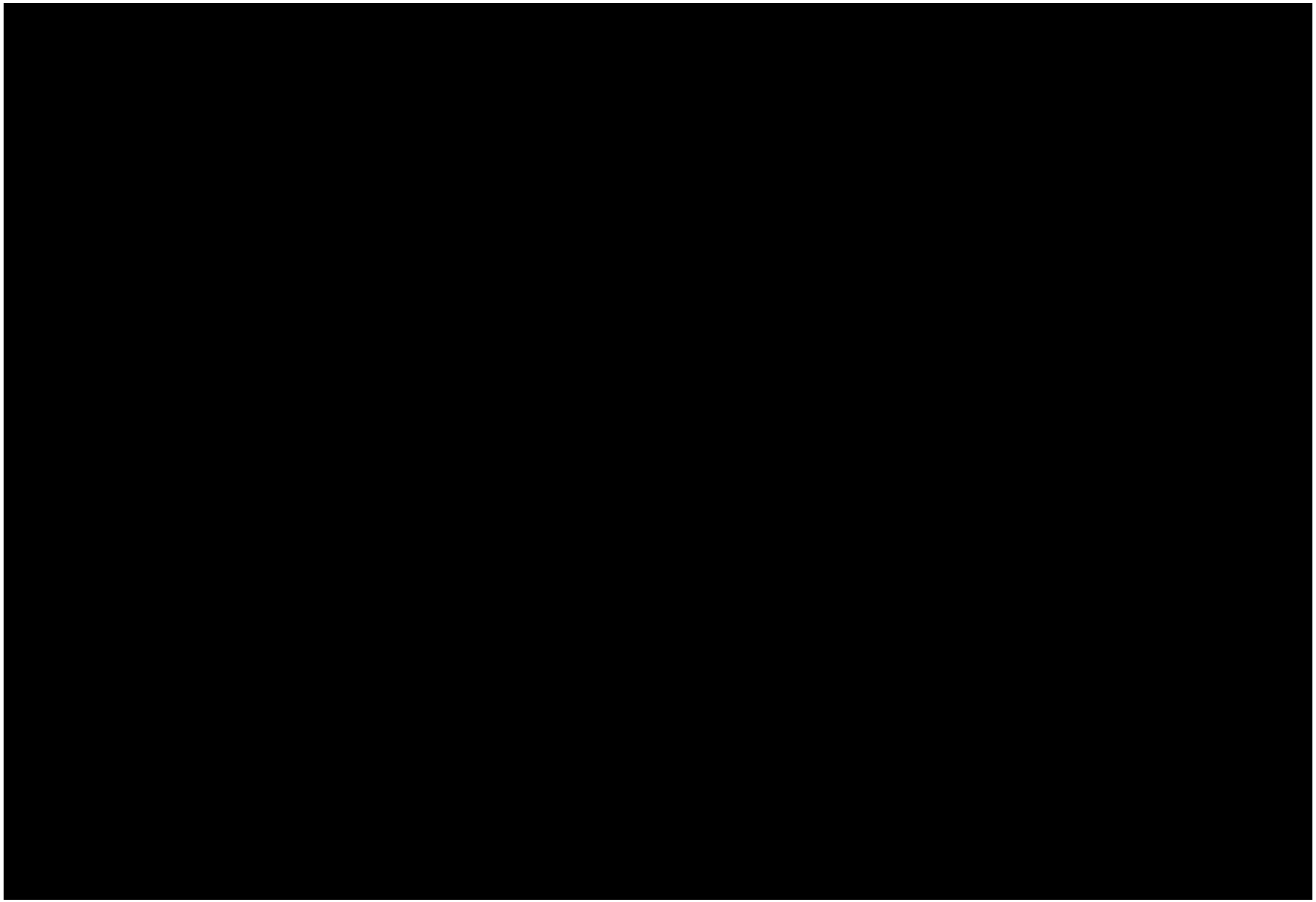
Threatened or Priority flora occurring within 5 km of the survey area were identified from DBCA Threatened and Priority flora database search (DBCA 2021b), NatureMap search (DBCA 2021a), and a Protected Matters Search Tool query (DAWE 2022). NatureMap and Protected Matters Search Tool results are provided in **Appendix 7**.

Fifteen conservation significant species with known records within 5 km of the survey area were identified. These are shown in **Figure 6**. Of these, none were considered likely to occur in the survey area based on pre-survey information due to the type and condition of habitat available, but four species were considered possible to occur. The rest of the species were considered unlikely to occur based on lack of preferred habitat**.**

A breakdown of the likelihood of occurrence of all potential species according to conservation status is provided in **Table 7** based on pre-survey information, with the complete likelihood of occurrence assessment (pre and post survey) provided in **Appendix 8**.

Table 7 Likelihood of occurrence according to conservation status.

Likelihood of occurrence	Total number	Priority 1	Priority 2	Priority 3	Priority 4	Threatened
Likely	**0**	0	0	0	0	0
Possible	**4**	1	0	0	2	1
Unlikely	**11**	1	0	4	2	4
Total	**15**	**2**	**0**	**4**	**4**	**5**



4.6 Wetlands

Wetlands on the SCP have been classified into types using the geomorphic wetland classification system of Semeniuk & Semeniuk (1995), which is based on the characteristics of landform and water permanence, for example, lakes, palusplains and damplands. These are described in **Table 8.** The SCP wetlands have also been evaluated and assigned an appropriate management category and corresponding category objective, providing guidance on the nature of the management and protection the wetland should be afforded. These categories are described in **Table 9.**

Table 8. Wetland types (adapted from Semeniuk & Semeniuk, 1995).

Management Category	Basin	Flat	Channel	Slope	Highland
Permanently inundated	Lake		River		
Seasonally inundated	Sumpland	Floodplain	Creek		
Intermittent inundation	Playa	Barlkarra	Wadi		
Seasonally waterlogged	Dampland	Palusplain	Trough	Paluslope	Palusmont

Table 9. Definitions of and objectives for the different wetland management categories EPA 2008).

Management Category	Definition	Category Objective
Conservation	Wetlands with high conservation value for both natural or human use	To preserve wetland (natural) attributes and functions
Resource Enhancement	Wetlands with moderate natural and human use attributes that can be restored or enhanced	To restore wetlands through maintenance and enhancement of wetland functions and attributes
Multiple Use	Wetlands that score poorly on both natural and human use attributes	To use, develop and manage wetlands in the context of water, town and environmental planning

There are no wetlands within the survey area or the immediate surrounds (**Figure 7**). The closest wetland is a Multiple use dampland (UFI 13249) located approximately 650 m to the west of the survey area, with the closest conservation category wetland (UFI 13255) approximately 1.2 km to the northeast (DBCA 2021e, DBCA-019) (**Figure 7, Figure 8**).

4.7 Watercourses

There are no permanent or ephemeral rivers, creeks or drainage lines within the survey area or the property overall (Crossman & Li 2015, DWER-031; DBCA-019; DBCA-010; DBCA-045). The closest watercourse is Harvey Diversion Drain approximately 3.2 km north of the proposal area (Crossman & Li 2015, DWER-031) **Figure 7** and **Figure 8.**

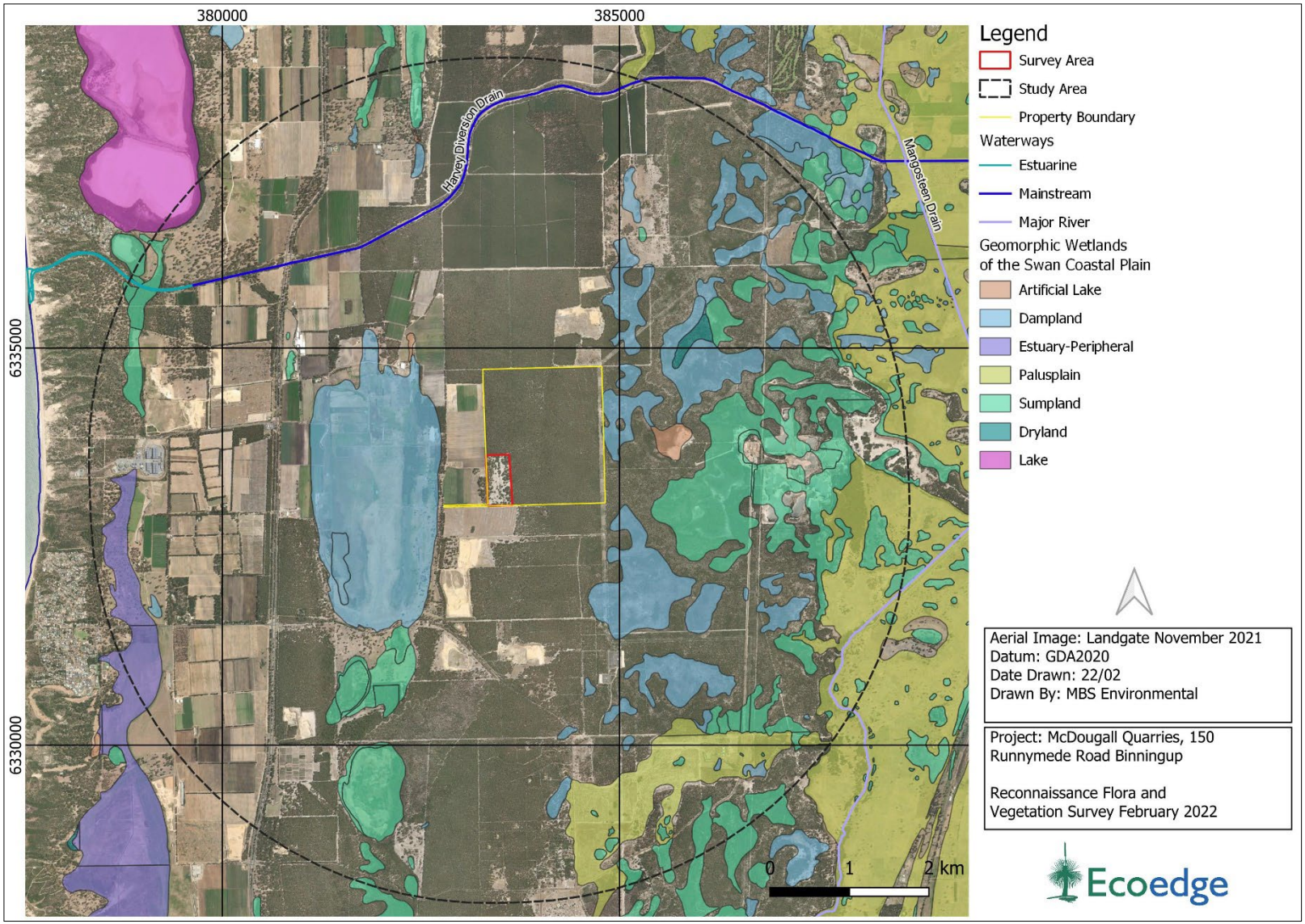


Figure 7. Geomorphic wetland type and waterways in proximity to the survey area (DBCA 2021e).

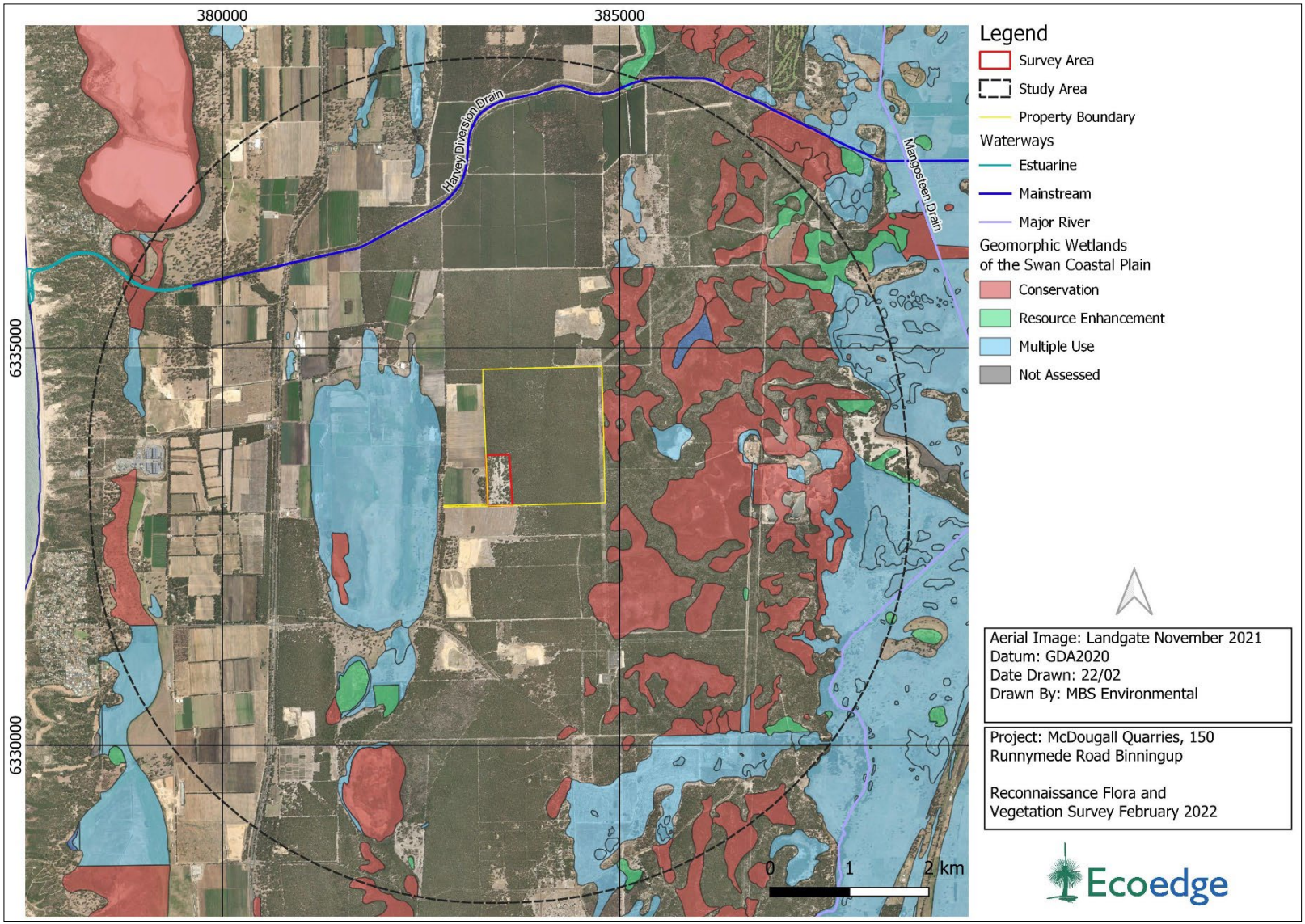


Figure 8. Status of geomorphic wetlands in proximity to the survey area (DBCA 2021e).

4.8 Regional ecological linkages

Regional ecological linkages "link protected patches of regional significance by retaining the best (condition) patches available as steppingstones for flora and fauna between regionally significant areas" (Molloy et al. 2009).

Regional ecological linkages have been mapped by Molloy et al. (2009) across the SW of Western Australia in an area spanning between just north of Mandurah to Walpole in the south-east.

Molloy et al. (2009) assessed and assigned "proximity value" (pv) ratings to all patches of remnant native vegetation as a way of indicating the value of their connectivity with regional ecological linkages. This was based on their distance from the nearest mapped regional ecological linkage axis line and connected parcels of remnant vegetation (**Table 10**).

Table 10. Linkage proximity values rating assigned to patches of remnant vegetation within a landscape (from Molloy et al. 2009).

Proximity value	Description	
1a	with an edge touching or	< 100 m from a linkage
1b	with an edge touching or	< 100 m from a natural area selected in 1a
1c	with an edge touching or	< 100 m from a natural area selected in 1b
2a	with an edge touching or	< 500 m from a linkage
2b	with an edge touching or	< 500 m from a natural area selected in 2a
2c	with an edge touching or	< 500 m from a natural area selected in 2b
3a	with an edge touching or	< 1000 m from a linkage
3b	with an edge touching or	< 1000 m from a natural area selected in 3a
3c	with an edge touching or	< 1000 m from a natural area selected in 3b

A regional ecological linkage axis line mapped by Molloy et al. (2009) runs north-south across 150 Runnymede Road, to the east of the survey area **Figure 9.** This linkage is associated with the McLarty/Kemerton/Twin Rivers/Preston River/Gwindinup Ecological Linkage. Patches of vegetation along the northern and eastern boundaries of the survey area are directly connected to vegetation associated with this linkage and have been assigned the highest 1a pv rating. Vegetation in the western portion of the survey area has been assigned a 1b pv rating.

Patches of vegetation in the central and southern portions of the survey area have not been assigned a pv, most likely due to the small size and fragmented nature of these patches within a predominately cleared part of the property.

4.9 Environmentally Sensitive Areas

ESAs are protected under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. They are selected for their environmental values at State or National levels (Government of Western Australia 2005). They include:

- Defined wetlands and riparian vegetation within 50 m
- Areas covered by Threatened ecological communities
- Area of vegetation within 50 m of Threatened flora
- Bush Forever sites
- Declared World Heritage property sites.

There are no areas defined as ESA's within the survey area (DWER-046). The closest ESA, associated with a conservation category wetland, is located 1.3 km to the east.

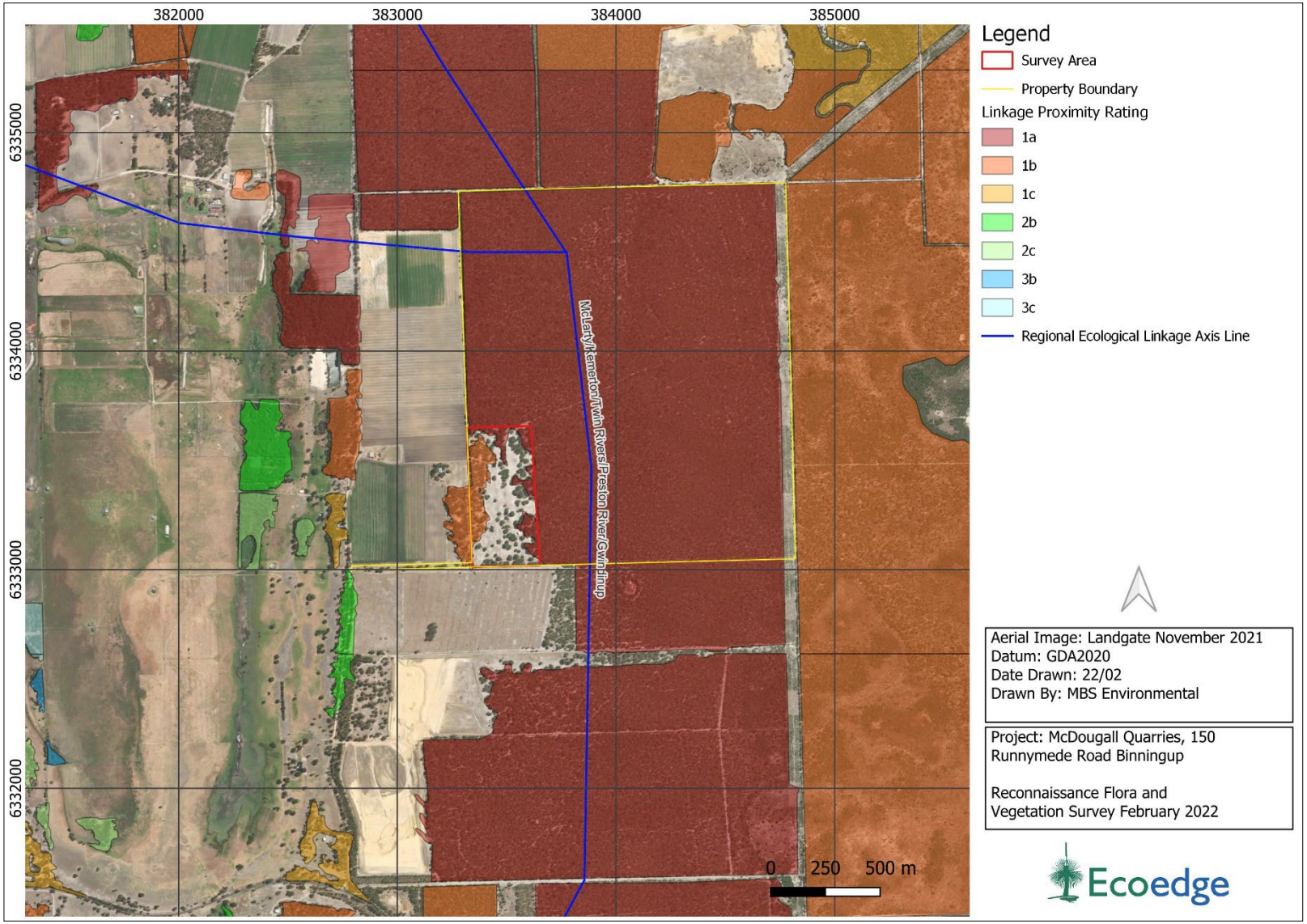


Figure 9. The survey area in relation to regional ecological linkages (Molloy et al. 2009).

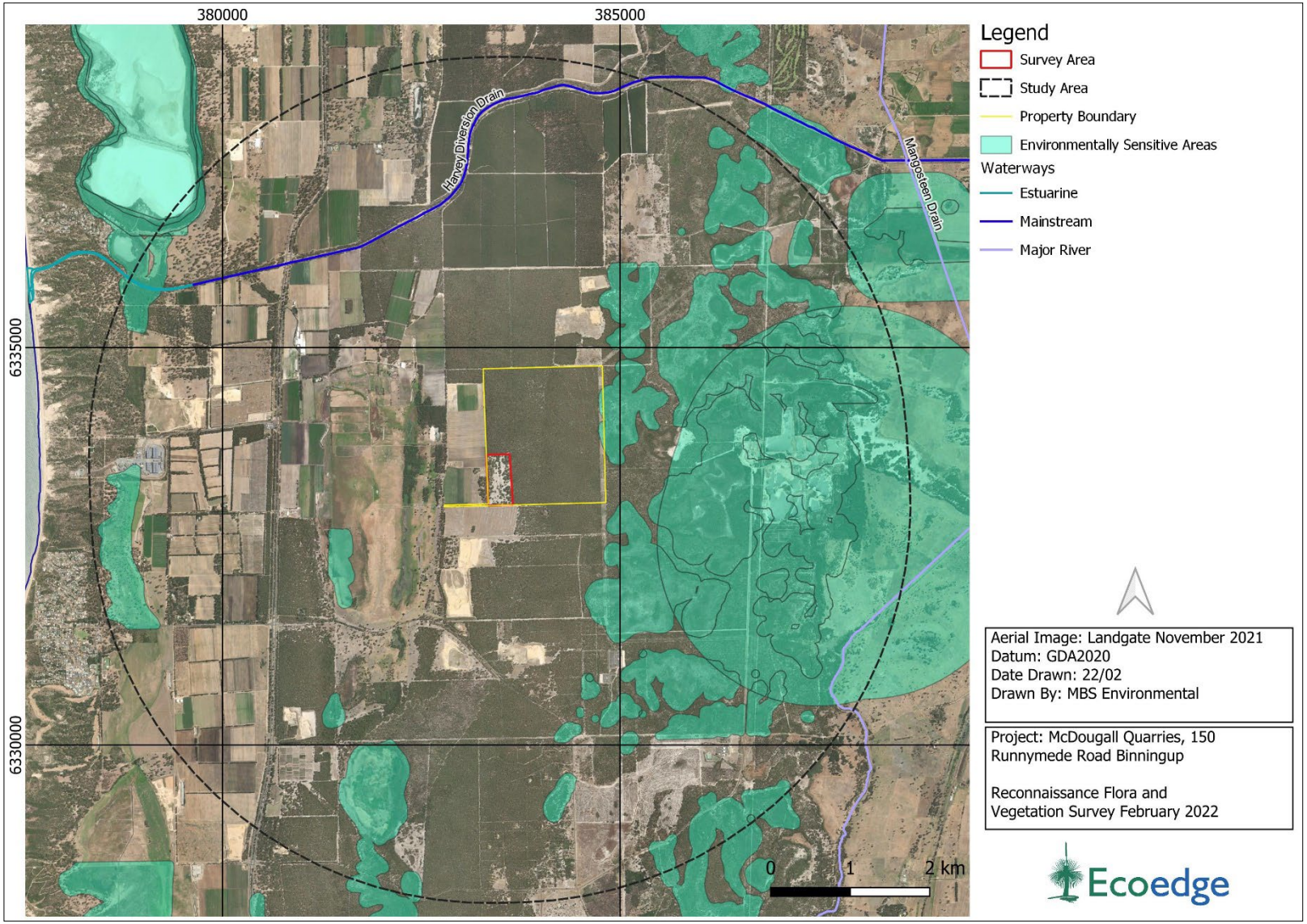


Figure 10. ESAs within study area (DWER 2020).

5 Survey results

Tracklog and relevés were recorded, and locations are shown in **Appendix 9**.

5.1 Flora

Sixty-four species of vascular flora were identified within the survey area, of which 24 (37.5%) were introduced taxa. The most numerous plant family was Poaceae, with 9 species, only one of them being native.

The list of vascular flora for each area recorded during the field survey is included in **Appendix 10**.

5.1.1 Flora of conservation significance

No flora listed as Threatened under the Commonwealth EPBC Act or under the State BC Act were found within the survey area. One State-listed Priority 1 flora species *Acacia* sp. Binningup (**Figure 11**) was recorded as shown in **Figure 12.** No other Priority flora or other flora of conservation significance were found. Further information on *Acacia* sp. Binningup is provided below.

Of the 15 significant flora taxa known to occur within 5 km of the survey area, one (*Acacia* sp. Binningup P1) was recorded in the survey area. Two cryptic orchid species, *Drakaea micrantha* (Threatened) and *Caladenia speciosa* (P4) would have been dormant at the time of the survey and their post-survey likelihood of occurrence remains 'Possible'. The rest were considered to have an 'Unlikely' residual (post-survey) likelihood of occurrence based on suitable habitat not being available or potentially suitable habitat being degraded, and the species not being recorded as part of the survey (**Appendix 8**).

Acacia sp. Binningup

A potentially new acacia was first observed in 2015 in the vicinity of the desalination plant in Binningup. It is a suckering, clumping low shrub (to approximately 1.5 m) with small feathery leaves. It is similar to *A. pulchella* var. *goadbyi* and was initially placed in the *Acacia pulchella* group of species. This group currently has four varieties that are all widespread and variable and their taxonomy has not been settled (DBCA 2019b).

The Binningup plants were considered to represent a new species by WA Herbarium and for the time being, they have been given a temporary name on the Western Australian plant census (they are called *Acacia* sp. Binningup). This species currently includes plants later found growing on roadsides and along drainage canals south of Harvey that could be yet another distinct species (closely related to but different in some respects from the Binningup plants). Preferred habitat of the species is inland sub-coastal dunes in a combination of tuart,

peppermint and banksia woodlands. More work is needed before *Acacia* sp. Binningup can be formally named and described (DBCA 2019b).

FloraBase currently lists 11 known locations *Acacia* sp. Binningup in three local government areas: Shire of Harvey, City of Rockingham and City of Busselton. The records show total abundance of approximately 1,250 plants (Western Australian Herbarium, 1998-).

As part of this survey on 150 Runnymede Road, thirty-nine individuals of *Acacia* sp. Binningup were recorded at seven point locations, all within 100 m of each other. These are expected to be the only individuals within the survey area as it was covered on foot to a sufficient degree. These individuals are the eastern most known records, approximately 3 km further east than the existing records on FloraBase.

Figure 11: *Acacia* sp. Binningup on 150 Runnymede Road in Binningup

5.1.2 Declared pest plants

One species of Declared Pest plants listed under the *Biosecurity and Agriculture Management Act 2007* were found within the survey area, **Solanum linnaeanum* (Apple of Sodom). The location of these pest plants is shown in **Figure 12.**

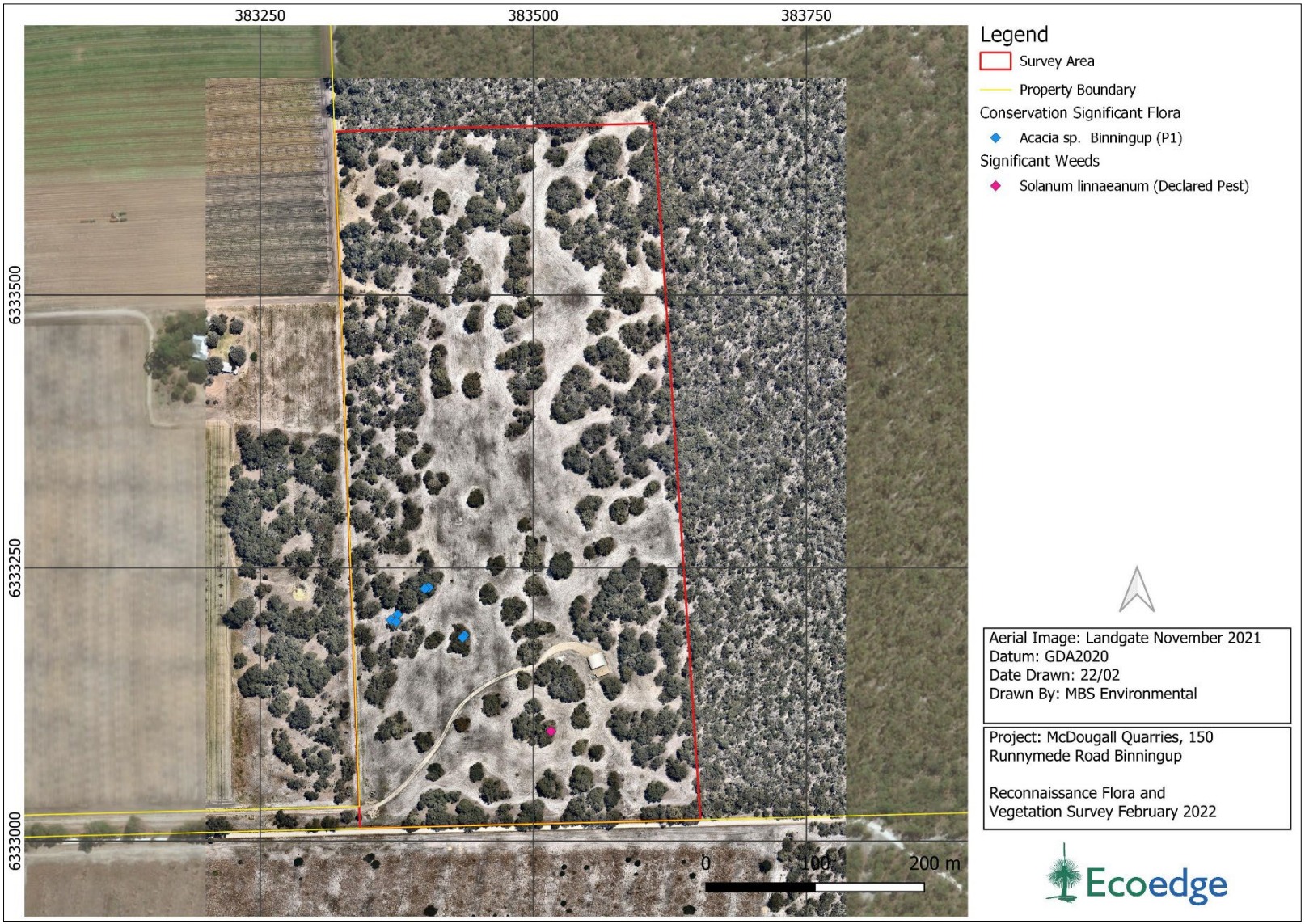


Figure 12. Significant flora and Declared plants within the survey area.

5.2 Vegetation units

Two native vegetation units were identified within the survey area as described below. Photographs are provided in **Appendix 11**.

- **Unit P1 Marri Woodland:** *Corymbia calophylla* (with occasional *Eucalyptus marginata* subsp. *marginata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over **Acacia longifolia* Isolated Tall Shrubs over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland.
- **Unit P2 Jarrah-Marri-Banksia Woodland**: *Corymbia calophylla*, *Eucalyptus marginata* subsp. *marginata* (with occasional *Banksia attenuata* and *Agonis flexuosa* var. *flexuosa*) Woodland to Open Forest over *Xanthorrhoea brunonis* s.l. Low Sparse Shrubland over **Ehrharta calycina*, **Avena* spp. Open Grassland with **Trachyandra divaricata*, **Ursinia anthemoides* subsp. *anthemoides* Sparse to Open Herbland.

These two units may be degraded forms of the same vegetation type occurring in better condition in other parts of the property. The extent and proportion of the total vegetated area of each of these vegetation units is presented in **Table 11**.

Table 11. Vegetation units by area and condition rating in the survey area.

Vegetation Unit	Area (ha)	%
P1 Marri Woodland	7.61	39.4%
P2 Jarrah-Marri-Banksia Woodland	2.21	11.4%
Sub-total	**9.82**	**50.8%**
Cleared	9.49	49.2%
Total	**19.31**	**100.0%**

5.2.1 Significant vegetation

The survey area may have originally supported Banksia Woodlands of the SCP TEC/PEC. However, the disturbance history of the site has resulted in significant changes in species composition and vegetation condition of the survey area. As a result, the vegetation remaining does not meet the criteria for Banksia Woodlands of the SCP TEC/PEC, apart from a small 0.05 ha area along the northern boundary of the survey area in Very Good condition. This area qualifies as the TEC/PEC based on the assumption that it is part of a larger area of Banksia Woodlands on SCP TEC/PEC outside the current survey area. The balance of vegetation on 150 Runnymede Road (outside the survey area) has not been formally surveyed but at least parts of it are expected to represent Banksia Woodlands on SCP TEC/PEC. None of the other TECs or PECs identified in the desktop assessment as having potential to occur in the area, were recorded in the survey area.

5.3 Vegetation condition

Approximately half (49.2%) of the survey area was cleared and the rest largely contained vegetation in Degraded condition (43.9%). On the western side of the survey area, 1.12 ha of vegetation remained in Good condition and 0.05 ha along the northern survey area boundary was in Very Good condition. Summary of vegetation condition classes is shown in Table 12. No vegetation was found to be in Excellent or Pristine condition. The main reason for the generally poor condition of remnant native vegetation in the survey area is the high level of past disturbance caused by partial clearing, grazing, introduction of non-native understorey species and other anthropogenic disturbances over several decades. The distribution of vegetation condition is shown in **Appendix 12**.

Table 12. Summary of vegetation condition classes in the survey area.

Vegetation Condition	Area (ha)	%
Very Good	0.05	0.3%
Good	1.12	5.8%
Degraded	8.39	43.7%
Completely Degraded	0.17	0.9%
Sub-total	9.82	50.8%
Cleared	9.49	49.2%
Total	**19.31**	**100.0%**

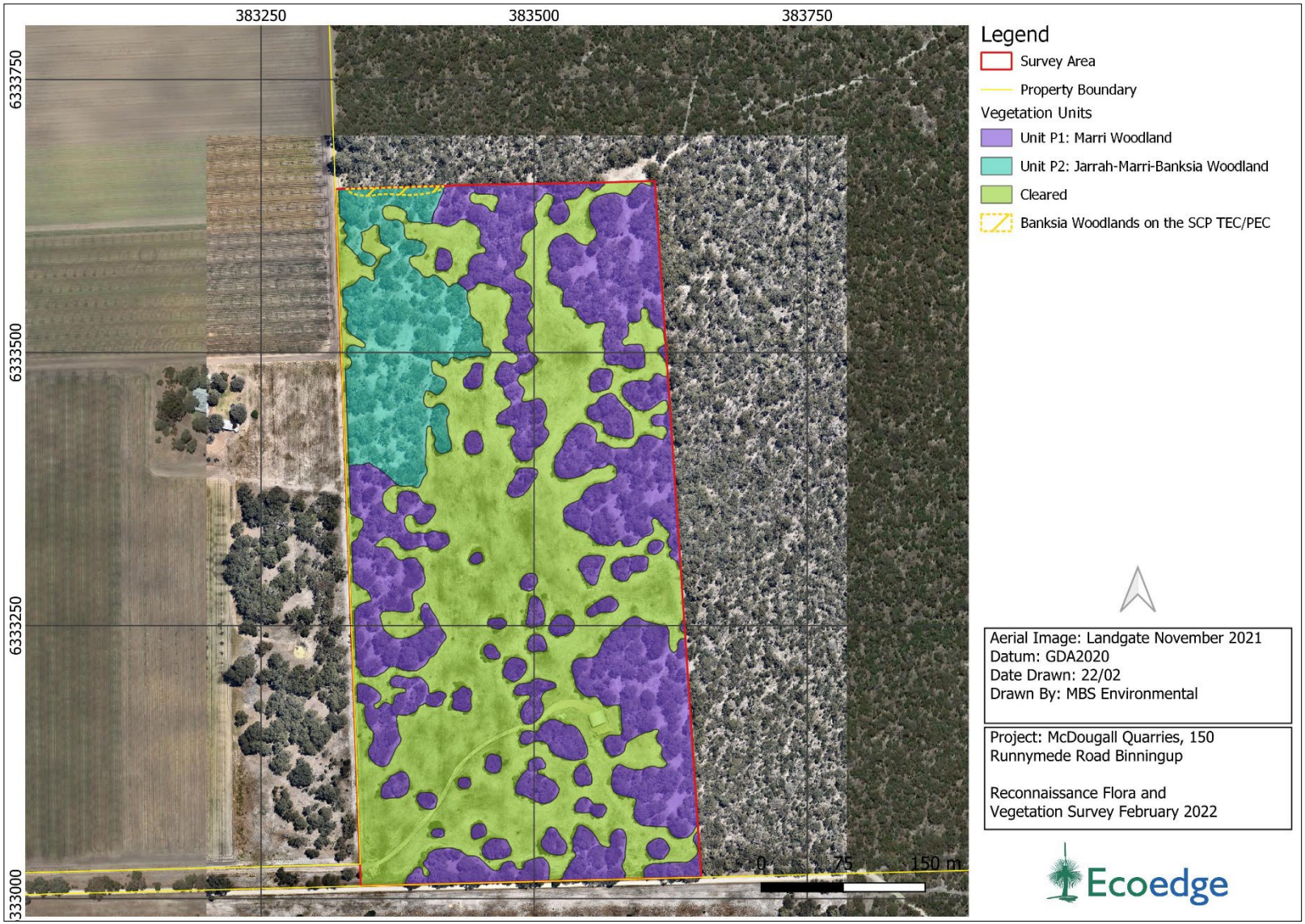


Figure 13. Vegetation units within the survey area.

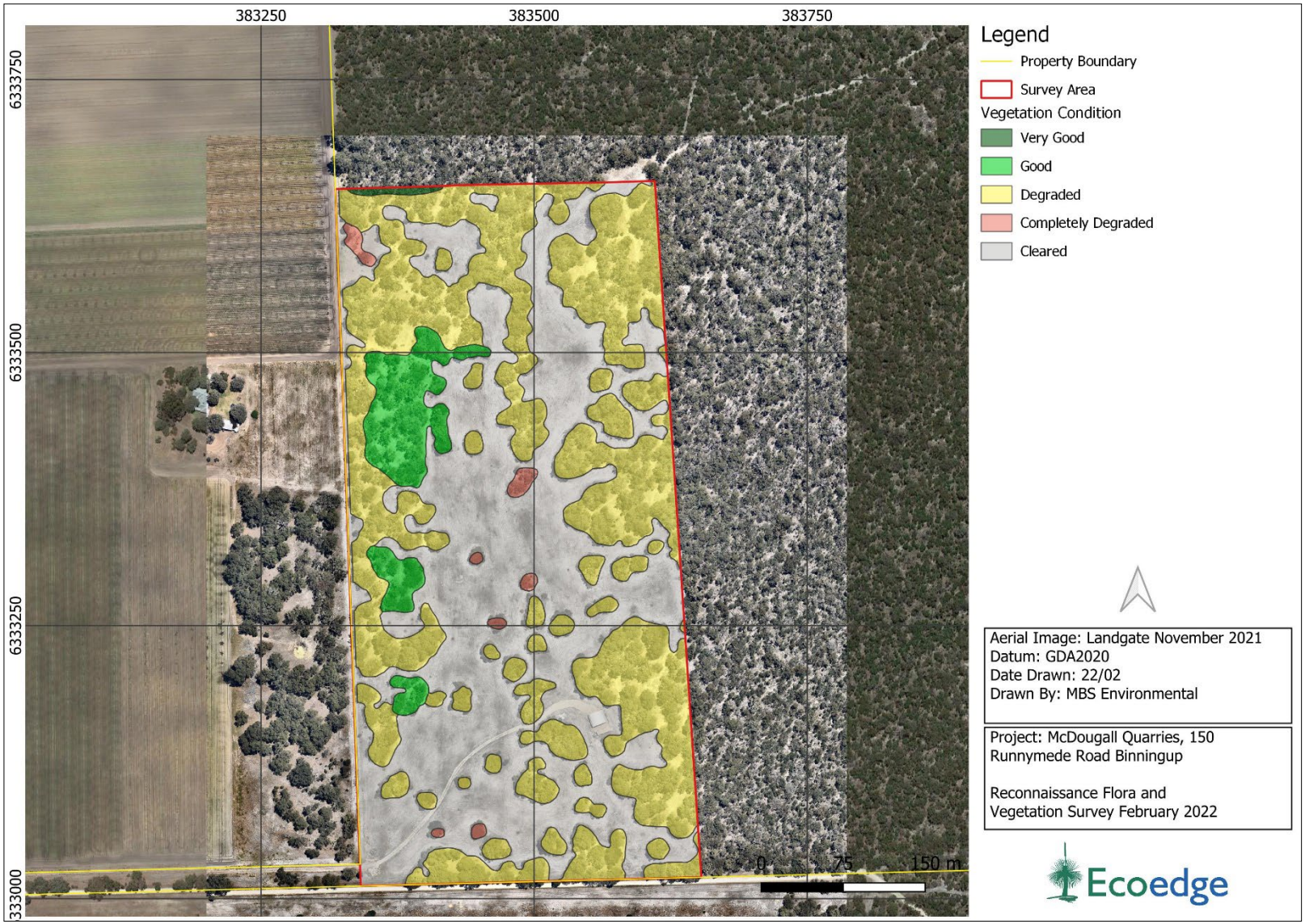


Figure 14. Vegetation condition within the survey area.

6 Discussion and conclusions

A summer survey of about 9.82 ha of native vegetation within a total survey area of 19.31 ha (9.49 ha cleared already) on 150 Runnymede Road in Binningup resulted in 64 flora taxa being identified, of which 24 were introduced species, including one Declared Pest plant.

6.1 Significant flora

No Threatened flora species were recorded, however 39 individuals of *Acacia* sp. Binningup P1 were recorded within the survey area. The species belongs to the *Acacia pulchella* group but has been recognised as a separate species. More work is needed before *Acacia* sp. Binningup can be formally named and described. Considering the similarity of the species to the others in the *Acacia pulchella* group and that identification requires partial excavation of the roots (to determine suckering), it is likely that the species has been under detected in the past and rather reported as one of the other varieties of *Acacia pulchella* that are common in the general area. The individuals recorded as part of this survey were the eastern most known records in DBCA and WA Herbarium databases, by approximately 3 km. As habitat similar to the survey area (but in better condition) is widely available in the local area along the sand dune, there is no obvious reason for the species to be limited to the survey area.

Two cryptic orchid species, *Drakaea micrantha* (Threatened) and *Caladenia speciosa* (P4) would have been dormant at the time of the survey and their post-survey likelihood of occurrence remains 'Possible' in the patches of remnant vegetation that retain native understorey. The remaining significant flora identified in the desktop assessment were considered to have an 'Unlikely' residual (post-survey) likelihood of occurrence based on suitable habitat not being available or potentially suitable habitat being degraded, and the species not being recorded as part of the survey.

6.2 Vegetation units

Two vegetation units were recognised within the survey area: Marri Woodland and Jarrah-Marri-Banksia Woodland. Both of these are likely to be degraded and heavily modified forms of the better condition vegetation found elsewhere on the property. A small 0.05 ha area of Very Good condition vegetation along the northern boundary of the survey area meets the criteria to qualify as Banksia Woodlands of SCP that is a federal TEC and state PEC. This is based on an assumption that the 0.05 ha area forms part of a larger patch of the Banksia Woodlands of SCP TEC/PEC extending north, outside of the survey area. The rest of the vegetation in the survey area does not represent a TEC or PEC.

6.3 Vegetation complexes and associations

One vegetation complex is mapped to occur across the survey area: the Karrakatta Complex - Central and South. This complex has 23.49% of its pre-European extent remaining which is

under the 30% target for an unconstrained area, however 36.23% of the complex remains within Shire of Harvey.

The one Beard vegetation association, Association 6, mapped for the survey area has 23.72% of its pre-European extent remaining at state, IBRA region and IBRA sub-region levels, which is under the 30% target for an unconstrained area, however again 38.18% of the association remains within shire of Harvey.

The vegetation within the survey area is generally characteristic of the mapped complex and association in terms of their dominant species and structure but the vegetation is largely in Degraded condition.

6.4 Regional ecological linkages

Some of the vegetation within the survey area has been assigned the highest 1a or the second highest 1b linkage proximity rating. The 1a areas have vegetation directly linked with an ecological axis line associated with the McLarty/Kemerton/Twin Rivers/Preston River/Gwindinup ecological linkage mapped by Molloy et al. (2009) and the 1b areas are <100 m from the 1a areas. There is no statutory basis for the protection of regional ecological linkages. However, in general, the importance of ecological linkages has been recognised as an environmental policy consideration in EPA and Planning policy over the last decade (EPA 2008 and references therein).

150 Runnymede Road retains more than 230 ha of remnant native vegetation in what appears to be Good or better condition and that vegetation contributes to the same ecological linkage as a 1a area. Therefore, the less than 10 ha of vegetation within the survey area that is in largely degraded condition would not be expected to make a significant contribution to the overall functions of or services provided by the McLarty/Kemerton/Twin Rivers/Preston River/Gwindinup ecological linkage.

7 References

Barnesby, B.A. and Proulx-Nixon, M.E. (2000). Land resources from Harvey to Capel on the Swan Coastal Plain, Western Australia - Sheet 2. Land Resources Map No. 23/2. Agriculture Western Australia. https://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1262&context=rmtr

Beeston, G.R., Hopkins, A.J.M. and Shepherd, D.P. (eds) (2001). *Land-use and Vegetation, Western Australia*. Agriculture Western Australia, South Perth and National Land and Water Resources Audit, Canberra, from: http://www.agriculture.gov.au/abares/aclump/Documents/WA%20Luse%201997%20Report.pdf

Commonwealth of Australia (2016). *Interim Biogeographic Regionalisation for Australia (IBRA), Version 7 (Subregions)*. Department of the Environment and Energy. https://data.gov.au/dataset/interim-biogeographic-regionalisation-for-australia-ibra-version-7.

Commonwealth of Australia (2001) *National Objectives and Targets for Biodiversity Conservation 2001-2005*. Environment Australia, Department of Environment and Heritage, Canberra, Australian Capital Territory.

Crossman, S., Li, O. (2015). Surface Hydrology Lines (National). Geoscience Australia, Canberra. http://pid.geoscience.gov.au/dataset/ga/83130

Department of Agriculture, Water and the Environment (DAWE) (2022). *Protected Matters Search Tool query*. Generated 29 January 2022.

Department of Agriculture, Water and the Environment (DAWE) (2020a). Categories of Threatened ecological communities under the EPBC Act. http://www.environment.gov.au/biodiversity/threatened/communities/about#What_is_a_threatened_ecological_community_TEC.

Department of Agriculture, Water and the Environment (DAWE) (2020b). Categories of Threatened species under the EPBC Act. https://www.environment.gov.au/biodiversity/threatened/species.

Department of Biodiversity, Conservation and Attractions (2018a). Threatened ecological communities endorsed by the Minister for the Environment (June 2018). https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/threatened_ecological_communities_endorsed_by_the_minister_for_the_environment_june_2018.pdf.

Department of Biodiversity, Conservation and Attractions (2018b). Threatened and Priority Flora list (5 December 2018). Department of Biodiversity Conservation and Attractions. https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants.

Department of Biodiversity, Conservation and Attractions (2018c). Vegetation Complexes - Swan Coastal Plain (DBCA-046). https://catalogue.data.wa.gov.au/dataset/vegetation-complexes-swan-coastal-plain.

Department of Biodiversity, Conservation and Attractions (2019a). Conservation codes for Western Australian Flora and Fauna (03/01/2019).

Department of Biodiversity, Conservation and Attractions (2019b). Bushland News. Issue 109, Autumn 2019. https://www.dpaw.wa.gov.au/images/documents/news/newsletters/bushlandnews/BushlandNews_iss109.pdf.

Department of Biodiversity, Conservation and Attractions (2021a). NatureMap search results, *Western Australian Herbarium*. http://naturemap.dpaw.wa.gov.au/default.aspx accessed 2 December 2021.

Department of Biodiversity, Conservation and Attractions (2021b). Threatened and Priority Flora database search for 150 Runnymede Road and surrounds, DBCA Species and Communities Branch, December 2021.

Department of Biodiversity, Conservation and Attractions (2021c). Threatened and Priority Ecological Communities database search for 150 Runnymede Road and surrounds, DBCA Species and Communities Branch, December 2021.

Department of Biodiversity, Conservation and Attractions (2021d). Priority ecological communities for Western Australia, Version 30. Species and Communities Program, Department of Biodiversity, Conservation and Attractions 21 July 2021. https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Priority%20Ecological%20Communities%20list.pdf

Department of Biodiversity, Conservation and Attractions (2021e). Geomorphic Wetlands, Swan Coastal Plain Data Set DBCA-019, last updated 18/10/21. https://catalogue.data.wa.gov.au/dataset/geomorphic-wetlands-swan-coastal-plain

Department of Biodiversity, Conservation and Attractions (2022). Download from the WA Herbarium plant species database (7/04/2022).

Department of Environment and Conservation (DEC) (2013). *Definitions, categories and criteria for threatened and priority ecological communities*. Department of Environment and Conservation, Perth, Western Australia.

Department of Primary Industries and Regional Development (DPIRD) (2019a). Pre-European Vegetation (DPIRD-006). https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006 (accessed January 2022).

Department of Primary Industries and Regional Development (DPIRD) (2019b). Soil Landscape Mapping - Best Available (DPIRD-027). https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available (accessed January 2022).

Department of Water Environment Regulation (DWER) (2022). Clearing Regulations - *Environmentally Sensitive Areas* (DWER-046). https://catalogue.data.wa.gov.au/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046.

Environment Australia (2001). National objectives and targets for biodiversity conservation 2001–2005. http://www.environment.gov.au/resource/national-objectives-and-targets-biodiversity-conservation-2001%E2%80%932005.

Environmental Protection Authority (2008). Environmental Guidance for Planning and Development. Guidance Statement 33.

Environmental Protection Authority of WA (2016). *Technical Guidance Flora and Vegetation Surveys for Environmental Impact.* EPA, Perth, Western Australia. http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/EPA/Technical/Guidance/FloraandVegetationsurvey_Dec13.pdf

Government of Western Australia (2005). Environmental Protection (Environmentally Sensitive Areas) Notice 2005 (Environmental Protection Act 1986). *Government Gazette, No.55*.

Government of Western Australia. (2019a). 2018 South West Vegetation Complex Statistics. Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth, https://catalogue.data.wa.gov.au/dataset/dbca

Government of Western Australia. (2019b). 2018 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). Current as of March 2019. WA Department of Biodiversity, Conservation and Attractions, Perth. https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

Heddle, E.M., Loneragan, O.W. and Havel, J.J. (1980). Vegetation of the Darling System. In: Atlas of Natural Resources, Darling System, Western Australia. Department of Conservation and Environment, Western Australia.

Keighery B.J., Dell J, Keighery G.J., Madden S., Longman V.M., Green B. et al. (2006). The vegetation, flora, fauna and natural areas of the Peel Harvey eastern estuary area

catchment (Swan Coastal Plain): a report for the Department of Environment and Conservation as a contribution to the Peel Harvey Eastern Estuary Area Catchment Environmental Assessment Project and the Swan Bioplan Project. Department of Environment and Conservation, Perth. 241 p.

Mattiske, E.M. and Havel, J.J. (1998). Vegetation Mapping in the South West of Western Australia and Regional Forest Agreement vegetation complexes. Map sheets for Pemberton, Collie, Pinjarra, Busselton-Margaret River, Mt Barker, and Perth, Western Australia. Scale 1:250,000. Department of Conservation and Land Management, Perth.

McArthur, W.M., Churchward H.M. and Hick P.T. (1977). Landforms and soils of the Murray river catchment area of Western Australia. CSIRO Australia. Division of Land Resources Management. Land Resources Management Series No.3.

Molloy, S., O'Connor, T., Wood, J. and Wallrodt, S. (2009). South West Regional Ecological Linkages Technical Report. Western Australian Local Government Association (WALGA) and the Department of Environment and Conservation (DEC). West Perth.

NVIS Technical Working Group (2017) Australian Vegetation Attribute Manual: National Vegetation Information System, Version 7.0. Department of the Environment and Energy, Canberra. Prep by Bolton, M.P., deLacey, C. and Bossard, K.B. (Eds)

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

Shepherd, D., Beeston, G. and Hopkins, A. (2002). *Native Vegetation in Western Australia – Extent, Type and Status*. Department of Agriculture, Perth.

Webb, A., Kinloch, J., Keighery, G. and Pitt, G. (2016). The Extension of Vegetation Complex Mapping to Landform boundaries within the Swan Coastal Plain Landform and Forested Region of South West Western Australia. Department of Parks and Wildlife, Bunbury, WA.

Wells, M. R. (1989). Land capability study of the Shires of Mandurah and Murray. Department of Agriculture and Food, Western Australia, Perth. Report 2.

Western Australian Herbarium. (1998–). Florabase - the Western Australian Flora. Department of Biodiversity, Conservation and Attractions. https://florabase.dpaw.wa.gov.au/. Accessed 27 April 2022.

van Gool, D. (1990), Land resources in the northern section of the Peel-Harvey catchment, Swan Coastal Plain, Western Australia Map. Department of Agriculture and Food, Western Australia, Perth. Map.

Appendix 1 Threatened and Priority flora Likelihood of occurrence assessment methodology.

Rating	Presurvey rationale	Post survey rationale
Recorded		Taxon was or has been recorded in the survey area.
Likely	Known to occur within one kilometre (km) of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known to occur within one km of the survey area and very suitable habitat was present, but the taxon was not observed for one of the following reasons. **L1.** The taxon was dormant at the time of survey and could therefore not be located. **L2.** The habitat was compromised, for example due to a recent fire. **L3.** The survey area is challenging to survey.The taxon is non- descript and difficult to find because, for example, it occurs in large areas of rocky granite outcrops, or within an expanse of open water.
Possible	Known to occur within a five-ten km of the survey area with suitable habitat known or predicted to occur within the survey area.	The taxon is known from within a five to ten km radius of the survey area, and suitable habitat for the species was present, but despite a thorough search being carried out, the species was not observed. The taxon may however be present for any of the following reasons. **P1.** The taxon was dormant at the time of survey and could therefore not be located. **P2.** The habitat was compromised, for example, due to a recent fire. **P3.** The survey area is challenging to survey. Te taxon is non- descript and difficult to find because, for example, it occurs in large areas of rocky granite outcrops, or within an expanse of open water.
Unlikely	Known or predicted to occur within ten km, but no suitable habitat is known or predicted to occur within the survey area.	The taxon was not found and is unlikely to be present for one or more of the following reasons: **U1.** No suitable habitat was observed, and the taxon is known to be restricted to a narrow and clearly defined habitat type. **U2.** Suitable or potential habitat was present and appropriately searched, but the taxon was not observed. **U3.** Suitable habitat present, but these areas were too degraded for the taxon to occur, for example, due to weed invasion and/or clearing.

Example of application of pre and post-survey likelihood of occurrence

Taxon	Cons Status	Flowering	Description	Pre survey likelihood	Post Survey Likelihood
Drakaea elastica	T (EN)	Oct-Nov	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red, green, yellow. White or grey sand. Low-lying situations adjoining winter-wet swamps.	**Likely**	**Unlikely (U3)**

Appendix 2. Vegetation condition scale (EPA 2016).

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

Appendix 3. Categories of Threatened ecological communities under the EPBC Act.

Category	Definition
Critically endangered (CR)	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered (EN)	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable (VU)	If, at that time, an ecological, community is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium–term future (indicative timeframe being the next 50 years).

Appendix 4. Categories of threatened and priority ecological communities under the BC Act.

Conservation code	Category
(T) Threatened ecological community pursuant to Sect 27 of the *Biodiversity Conservation Act 2016.*	
T	(T) CR – Critically endangered An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.
	(T) EN - Endangered An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.
	(T) VU - Vulnerable An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.
(P) Priority species – possible threatened communities.	
P1	Poorly known communities 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.

Conservation code	Category
P2	Poorly known communities 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.
P3	Poorly known communities a) 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: b) 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; c) 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. 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.
P4	Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	Conservation dependent ecological communities Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix 5. Definitions of conservation codes for Threatened and Priority flora.

Conservation code	Category
(T) Threatened species pursuant to Sect 19 of the BC Act 2016.	
T	(T) CR – Critically endangered Threatened species considered to be "*facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) EN - Endangered Threatened species considered to be "*facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines*".
	(T) VU - Vulnerable Threatened species considered to be "*facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines*".
(P) Priority species – possible Threatened species.	
P1	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.

Conservation code	Category
P3	Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix 6. Categories of Threatened species under the EPBC Act.

Category	Definition
Extinct (Ex)	A native species is eligible to be included in the ***extinct*** category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (ExW)	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium term future, as determined in accordance with the prescribed criteria.
Conservation Dependent (CD)	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

Appendix 7. Protected Matters Search Tool and NatureMap reports

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 29-Jan-2022

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	32
Listed Migratory Species:	28

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	36
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	20
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Peel-yalgorup system	Within Ramsar site	In feature area

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Banksia Woodlands of the Swan Coastal Plain ecological community	Endangered	Community likely to occur within area	In feature area
Clay Pans of the Swan Coastal Plain	Critically Endangered	Community likely to occur within area	In buffer area only
Tuart (Eucalyptus gomphocephala) Woodlands and Forests of the Swan Coastal Plain ecological community	Critically Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area	In feature area
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding likely to occur within area	In feature area
Zanda latirostris listed as Calyptorhynchus latirostris Carnaby's Black Cockatoo, Short-billed Black-cockatoo [87737]	Endangered	Species or species habitat known to occur within area	In feature area
FISH			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Galaxiella nigrostriata](#) Blackstriped Dwarf Galaxias, Black-stripe Minnow [88677]	Endangered	Species or species habitat known to occur within area	In feature area
MAMMAL			
[Dasyurus geoffroii](#) Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Pseudocheirus occidentalis](#) Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area	In feature area
OTHER			
[Westralunio carteri](#) Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
PLANT			
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat may occur within area	In feature area
[Austrostipa bronwenae](#) [87808]	Endangered	Species or species habitat known to occur within area	In feature area
[Caladenia huegelii](#) King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat likely to occur within area	In feature area
[Caladenia procera](#) Carbunup King Spider Orchid [68679]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Diuris drummondii](#) Tall Donkey Orchid [4365]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Diuris micrantha](#) Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Diuris purdiei](#) Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Drakaea elastica Glossy-leafed Hammer Orchid, Glossy-leaved Hammer Orchid, Warty Hammer Orchid [16753]	Endangered	Species or species habitat known to occur within area	In feature area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eleocharis keigheryi Keighery's Eleocharis [64893]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Synaphea sp. Fairbridge Farm (D. Papenfus 696) Selena's Synaphea [82881]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Synaphea sp. Serpentine (G.R. Brand 103) [86879]	Critically Endangered	Species or species habitat may occur within area	In feature area
Synaphea stenoloba Dwellingup Synaphea [66311]	Endangered	Species or species habitat may occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In buffer area only
Migratory Terrestrial Species			
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Arenaria interpres](#) Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
[Calidris alba](#) Sanderling [875]		Species or species habitat known to occur within area	In buffer area only
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area	In buffer area only
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Tringa brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area	In buffer area only
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area	In buffer area only
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
[Calidris ruficollis](#) Red-necked Stint [860]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris subminuta](#) Long-toed Stint [861]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Calidris tenuirostris](#) Great Knot [862]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Charadrius mongolus](#) Lesser Sand Plover, Mongolian Plover [879]	Endangered	Species or species habitat known to occur within area	In buffer area only
[Charadrius ruficapillus](#) Red-capped Plover [881]		Species or species habitat known to occur within area overfly marine area	In buffer area only
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Himantopus himantopus Pied Stilt, Black-winged Stilt [870]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Philomachus pugnax Ruff (Reeve) [850]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pluvialis fulva Pacific Golden Plover [25545]		Species or species habitat known to occur within area	In buffer area only
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Dotterel, Hooded Plover [87735]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa brevipes as Heteroscelus brevipes Grey-tailed Tattler [851]		Species or species habitat known to occur within area	In buffer area only
Tringa glareola Wood Sandpiper [829]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa stagnatilis Marsh Sandpiper, Little Greenshank [833]		Species or species habitat known to occur within area overfly marine area	In buffer area only
Tringa totanus Common Redshank, Redshank [835]		Species or species habitat known to occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
NTWA Bushland covenant (0004)	Conservation Covenant	WA	In buffer area only
NTWA Bushland covenant (0095)	Conservation Covenant	WA	In buffer area only
Yalgorup	National Park	WA	In buffer area only

Nationally Important Wetlands [Resource Information]

Wetland Name	State	Buffer Status
Yalgorup Lakes System	WA	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Clear 2.86 ha of native vegetation for the purpose of horticulture	2010/5655	Controlled Action	Post-Approval	In feature area
Lot 4 Runnymede Road, Wellesley - Proposed Sand Extraction	2020/8862	Controlled Action	Assessment Approach	In buffer area only
Production horticulture in Lot 6 and Lot 8 Old Coast Road, Myalup	2020/8827	Controlled Action	Assessment Approach	In buffer area only
Sand Extraction Project Lot 5 Wellesley Road, Wellesley Shire of Harvey	2021/9034	Controlled Action	Assessment Approach	In buffer area only
Sand Mine, Lot 122 Old Coast Road, Parkfield, Binningup, WA	2014/7164	Controlled Action	Post-Approval	In buffer area only
Sand Mining on Lot 7 Runnymede Road	2011/5996	Controlled Action	Post-Approval	In feature area
Silica Sand Mine Expansion	2002/910	Controlled Action	Post-Approval	In buffer area only
Southern Seawater Desalination Project	2008/4173	Controlled Action	Post-Approval	In buffer area only
WA Offshore Windfarm	2021/8961	Controlled Action	Assessment Approach	In feature area
Yarragadee Water Supply Development	2005/2073	Controlled Action	Completed	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Kemerton Lateral Gas Pipeline Project	2005/2388	Not Controlled Action	Completed	In feature area
Limestone quarry expansion	2005/2268	Not Controlled Action	Completed	In buffer area only
Limestone Quarry Expansion, Lots 3618 and 1794, Finn Road	2005/2332	Not Controlled Action	Completed	In buffer area only
Limestone quarry mining	2006/2942	Not Controlled Action	Completed	In buffer area only
Vegetation Clearance for Horticulture Operation Expansion, Lot 2, Springfield Rd, Parkfield, WA	2014/7196	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
Construct and operate a 132kV transmission line and upgrade Kemerton Terminal Si	2008/4484	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
Limestone Extraction on Lot 5 Old Coast Road, Myalup, WA	2012/6468	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 02/12/2021

Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 45' 26" E,33° 07' 39" S
Buffer	5km
Group By	Conservation Status

Conservation Status	Species	Records
Non-conservation taxon	273	1023
Priority 1	2	9
Priority 3	7	21
Priority 4	6	18
Rare or likely to become extinct	10	155
TOTAL	**298**	**1226**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	38480	*Austrostipa bronwenae*		T	
2.	18038	*Caladenia procera*		T	
3.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
4.	24734	*Calyptorhynchus latirostris (Carnaby s Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
5.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
6.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
7.	1639	*Drakaea elastica (Glossy-leaved Hammer Orchid)*		T	
8.	13635	*Drakaea micrantha*		T	
9.	34027	*Galaxiella nigrostriata (Black-stripe Minnow, black-striped dwarf galaxias)*		T	
10.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
Priority 1					
11.	48762	*Acacia sp. Binningup (G. Cockerton et al. WB 37784)*		P1	
12.	16633	*Boronia juncea subsp. juncea*		P1	
Priority 3					
13.	11612	*Boronia capitata subsp. gracilis*		P3	
14.	41641	*Ctenotus ora (Coastal Plains Skink)*		P3	
15.	16245	*Cyathochaeta teretifolia*		P3	
16.	3863	*Dillwynia dillwynioides*		P3	
17.	5038	*Lasiopetalum membranaceum*		P3	
18.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
19.	48297	*Styphelia filifolia*		P3	
Priority 4					
20.	3339	*Acacia flagelliformis*		P4	
21.	3537	*Acacia semitrullata*		P4	
22.	13862	*Caladenia speciosa*		P4	
23.	24189	*Falsistrellus mackenziei (Western False Pipistrelle, Western Falsistrelle)*		P4	
24.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
25.	44444	*Tripterococcus sp. Brachylobus (A.S. George 14234)*		P4	
Non-conservation taxon					
26.	15466	*Acacia applanata*			
27.	3331	*Acacia extensa (Wiry Wattle)*			
28.	3374	*Acacia huegelii*			
29.	3482	*Acacia paradoxa (Kangaroo Thorn)*	Y		
30.	15481	*Acacia pulchella var. glaberrima*			
31.	30036	*Acacia saligna subsp. stolonifera*			
32.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
33.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
34.	24262	*Acanthiza inornata (Western Thornbill)*			
35.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
36.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
37.	1790	*Adenanthos meisneri*			
38.	1791	*Adenanthos obovatus (Basket Flower)*			
39.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
40.	154	*Alisma lanceolatum (Water Plantain)*	Y		
41.	2655	*Amaranthus albus (Tumbleweed)*	Y		
42.	7820	*Ambrosia artemisiifolia (Annual Ragweed, Bitterweed, Hay-feverweed, Hog-weed)*	Y		
43.	200	*Amphipogon turbinatus*			
44.	24312	*Anas gracilis (Grey Teal)*			
45.	24315	*Anas rhynchotis (Australasian Shoveler)*			
46.	24316	*Anas superciliosa (Pacific Black Duck)*			
47.	24561	*Anthochaera carunculata (Red Wattlebird)*			
48.	25670	*Anthus australis (Australian Pipit)*			
49.	3686	*Aotus cordifolia*			
50.	3688	*Aotus gracillima*			
51.	25558	*Ardea ibis (Cattle Egret)*			
52.	41324	*Ardea modesta (great egret, white egret)*			
53.	24340	*Ardea novaehollandiae (White-faced Heron)*			
54.	24341	*Ardea pacifica (White-necked Heron)*			
55.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
56.	6323	*Astroloma ciliatum (Candle Cranberry)*			
57.	17233	*Austrostipa campylachne*			
58.	24318	*Aythya australis (Hardhead)*			
59.	1800	*Banksia attenuata (Slender Banksia, Piara)*			
60.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
61.		*Barnardius zonarius*			
62.	3165	*Billardiera variifolia*			
63.	24319	*Biziura lobata (Musk Duck)*			
64.	4438	*Boronia ramosa*			
65.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
66.	6341	*Brachyloma preissii (Globe Heath)*			
67.	244	*Briza maxima (Blowfly Grass)*	Y		
68.	12770	*Burchardia congesta*			
69.	25716	*Cacatua sanguinea (Little Corella)*			
70.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
71.	1276	*Caesia micrantha (Pale Grass Lily)*			
72.	1592	*Caladenia flava (Cowslip Orchid)*			
73.	15348	*Caladenia flava subsp. flava*			
74.	5415	*Calothamnus lateralis*			
75.	5458	*Calytrix flavescens (Summer Starflower)*			
76.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
77.	1162	*Cartonema philydroides*			
78.	13489	*Cerastium pumilum*	Y		
79.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
80.	1280	*Chamaescilla corymbosa (Blue Squill)*			
81.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
82.	24980	*Christinus marmoratus (Marbled Gecko)*			
83.	25601	*Chrysococcyx lucidus (Shining Bronze Cuckoo)*			
84.	24288	*Circus approximans (Swamp Harrier)*			
85.	27691	*Cladonia ramulosa*			
86.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
87.	6348	*Conostephium pendulum (Pearl Flower)*			
88.	6349	*Conostephium preissii*			
89.	1418	*Conostylis aculeata (Prickly Conostylis)*			
90.	1436	*Conostylis juncea*			
91.	1438	*Conostylis laxiflora*			
92.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
93.	25592	*Corvus coronoides (Australian Raven)*			
94.	24671	*Coturnix pectoralis (Stubble Quail)*			
95.	25595	*Cracticus tibicen (Australian Magpie)*			
96.	25596	*Cracticus torquatus (Grey Butcherbird)*			
97.	13354	*Craspedia variabilis*			
98.	25398	*Crinia georgiana (Quacking Frog)*			
99.	25399	*Crinia glauerti (Clicking Frog)*			
100.	25400	*Crinia insignifera (Squelching Froglet)*			
101.	30893	*Cryptoblepharus buchananii*			
102.	25047	*Ctenotus impar*			
103.	24322	*Cygnus atratus (Black Swan)*			
104.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
105.	7454	*Dampiera linearis (Common Dampiera)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
106.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
107.	3834	*Daviesia polyphylla*			
108.	18541	*Diplopeltis huegelii subsp. huegelii*			
109.	19649	*Disa bracteata*	Y		
110.	48253	*Diuris porphyrochila*			
111.	46858	*Diuris tinctoria*			
112.	24470	*Dromaius novaehollandiae (Emu)*			
113.	48751	*Drosera drummondii*			
114.	3106	*Drosera macrantha (Bridal Rainbow)*			
115.	3118	*Drosera pallida (Pale Rainbow)*			
116.	29178	*Drosera porrecta*			
117.	3131	*Drosera stolonifera (Leafy Sundew)*			
118.	11105	*Echinochloa crus-galli*	Y		
119.	332	*Echinochloa frumentacea (Siberian Millet)*	Y		
120.	338	*Echinochloa telmatophila (Swamp Barnyard Grass)*	Y		
121.	25100	*Egernia napoleonis*			
122.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
123.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
124.	15410	*Eriochilus dilatatus subsp. dilatatus*			
125.	6219	*Eryngium pinnatifidum (Blue Devils)*			
126.	5708	*Eucalyptus marginata (Jarrah, Djara)*			
127.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			
128.	5763	*Eucalyptus rudis (Flooded Gum, Kulurda)*			
129.	3872	*Euchilopsis linearis (Swamp Pea)*			
130.	835	*Evandra pauciflora*			
131.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
132.	25623	*Falco longipennis (Australian Hobby)*			
133.	24041	*Felis catus (Cat)*	Y		
134.	894	*Fimbristylis velata*			
135.	27748	*Flavoparmelia rutidota*			
136.	25727	*Fulica atra (Eurasian Coot)*			
137.	25530	*Gerygone fusca (Western Gerygone)*			
138.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
139.	24295	*Haliastur sphenurus (Whistling Kite)*			
140.	24296	*Hamirostra isura (Square-tailed Kite)*			
141.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
142.	25410	*Heleioporus eyrei (Moaning Frog)*			
143.	6839	*Hemiandra pungens (Snakebush)*			
144.	25119	*Hemiergis quadrilineata*			
145.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
146.	45534	*Hibbertia hypericoides subsp. hypericoides*			
147.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
148.		*Hibbertia sp.*			
149.	5173	*Hibbertia subvaginata*			
150.	5176	*Hibbertia vaginata*			
151.	25734	*Himantopus himantopus (Black-winged Stilt)*			
152.	24491	*Hirundo neoxena (Welcome Swallow)*			
153.	6222	*Homalosciadium homalocarpum*			
154.	3968	*Hovea trisperma (Common Hovea)*			
155.	12859	*Hovea trisperma var. trisperma*			
156.	12741	*Hyalosperma cotula*			
157.	35070	*Hypocalymma angustifolium subsp. Swan Coastal Plain (G.J. Keighery 16777)*			
158.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
159.	1070	*Hypolaena exsulca*			
160.	917	*Isolepis marginata (Coarse Club-rush)*			
161.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
162.	5832	*Kunzea ericifolia (Spearwood, Pondil)*			
163.	15498	*Kunzea glabrescens (Spearwood)*			
164.	1309	*Laxmannia squarrosa*			
165.	925	*Lepidosperma angustatum*			
166.	1653	*Leporella fimbriata (Hare Orchid)*			
167.	46382	*Leptocarpus roycei*			
168.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
169.	25133	*Lerista elegans*			
170.	6374	*Leucopogon conostephioides*			
171.	6444	*Leucopogon sprengelioides*			
172.	6445	*Leucopogon squarrosus*			
173.	6454	*Leucopogon verticillatus (Tassel Flower)*			
174.	25005	*Lialis burtonis*			
175.	25661	*Lichmera indistincta (Brown Honeyeater)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
176.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
177.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
178.	1228	*Lomandra hermaphrodita*			
179.	1232	*Lomandra micrantha (Small-flower Mat-rush)*			
180.	1234	*Lomandra nigricans*			
181.	1243	*Lomandra sericea (Silky Mat Rush)*			
182.	1246	*Lomandra suaveolens*			
183.	1198	*Luzula meridionalis (Field Woodrush)*			
184.	1097	*Lyginia barbata*			
185.	18049	*Lyginia imberbis*			
186.	5281	*Lythrum hyssopifolia (Lesser Loosestrife)*	Y		
187.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
188.	85	*Macrozamia riedlei (Zamia, Djiridji)*			
189.	25654	*Malurus splendens (Splendid Fairy-wren)*			
190.	5952	*Melaleuca preissiana (Moonah)*			
191.	18598	*Melaleuca systena*			
192.	5980	*Melaleuca thymoides*			
193.	24598	*Merops ornatus (Rainbow Bee-eater)*			
194.		*Microcarbo melanoleucos*			
195.	485	*Microlaena stipoides (Weeping Grass)*			
196.	15419	*Microtis media subsp. media*			
197.	8106	*Millotia tenuifolia (Soft Millotia)*			
198.		*Missulena granulosa*			
199.	25191	*Morethia lineoocellata*			
200.	24223	*Mus musculus (House Mouse)*	Y		
201.	6201	*Myriophyllum verrucosum (Red Water Milfoil)*			
202.	25248	*Neelaps bimaculatus (Black-naped Snake)*			
203.	2401	*Nuytsia floribunda (Christmas Tree, Mudja)*			
204.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
205.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
206.	8133	*Olearia elaeophila*			
207.	8143	*Olearia paucidentata (Autumn Scrub Daisy)*			
208.	24085	*Oryctolagus cuniculus (Rabbit)*	Y		
209.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
210.	25253	*Parasuta gouldii*			
211.	25682	*Pardalotus striatus (Striated Pardalote)*			
212.	1762	*Parietaria debilis (Pellitory)*			
213.	533	*Paspalum vaginatum (Salt Water Couch)*			
214.	1550	*Patersonia occidentalis (Purple Flag, Koma)*			
215.	4346	*Pelargonium littorale*			
216.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
217.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
218.	16477	*Pericalymma ellipticum var. ellipticum*			
219.	48061	*Petrochelidon nigricans (Tree Martin)*			
220.	48066	*Petroica boodang (Scarlet Robin)*			
221.	2299	*Petrophile linearis (Pixie Mops)*			
222.	25698	*Phalacrocorax melanoleucos (Little Pied Cormorant)*			
223.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
224.	25699	*Phalacrocorax varius (Pied Cormorant)*			
225.	24409	*Phaps chalcoptera (Common Bronzewing)*			
226.	18529	*Philotheca spicata (Pepper and Salt)*			
227.	1478	*Phlebocarya ciliata*			
228.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
229.		*Phytophthora cinnamomi*			
230.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
231.	24747	*Platycercus spurius (Red-capped Parrot)*			
232.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
233.	6249	*Platysace compressa (Tapeworm Plant)*			
234.	4524	*Platytheca galioides*			
235.	8175	*Podolepis gracilis (Slender Podolepis)*			
236.	25510	*Pogona minor (Dwarf Bearded Dragon)*			
237.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
238.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
239.	25722	*Polytelis anthopeplus (Regent Parrot)*			
240.	4691	*Poranthera microphylla (Small Poranthera)*			
241.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
242.	24767	*Porphyrio porphyrio subsp. bellus (Purple Swamphen)*			
243.	25511	*Pseudonaja affinis (Dugite)*			
244.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
245.		*Pterostylis aff. nana*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
246.	10875	*Pterostylis concava*			
247.	1693	*Pterostylis recurva (Jug Orchid)*			
248.	12217	*Pterostylis sanguinea*			
249.	1698	*Pterostylis vittata (Banded Greenhood)*			
250.	4181	*Pultenaea reticulata*			
251.		*Purpureicephalus spurius*			
252.	16367	*Pyrorchis nigricans (Red beaks, Elephants ears)*			
253.	24245	*Rattus rattus (Black Rat)*	Y		
254.	48096	*Rhipidura albiscapa (Grey Fantail)*			
255.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
256.	2440	*Rumex pulcher (Fiddle Dock)*	Y		
257.	40426	*Rytidosperma occidentale*			
258.	20063	*Salix babylonica*	Y		
259.	7602	*Scaevola calliptera*			
260.	7614	*Scaevola globulifera*			
261.	984	*Schoenus curvifolius*			
262.	1020	*Schoenus sublateralis*			
263.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
264.	30948	*Smicrornis brevirostris (Weebill)*			
265.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
266.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
267.	25597	*Strepera versicolor (Grey Currawong)*			
268.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
269.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
270.	7798	*Stylidium schoenoides (Cow Kicks)*			
271.	7799	*Stylidium spathulatum (Creamy Triggerplant)*			
272.	24259	*Sus scrofa (Pig)*	Y		
273.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
274.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
275.	48341	*Tetratheca hirsuta subsp. viminea*			
276.	10856	*Thelymitra benthamiana (Leopard Orchid)*			
277.	11143	*Thelymitra graminea*			
278.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
279.	1338	*Thysanotus manglesianus (Fringed Lily)*			
280.	25519	*Tiliqua rugosa*			
281.	25207	*Tiliqua rugosa subsp. rugosa*			
282.	6280	*Trachymene pilosa (Native Parsnip)*			
283.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
284.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
285.	4292	*Trifolium campestre (Hop Clover)*	Y		
286.	8255	*Ursinia anthemoides (Ursinia)*	Y		
287.	28087	*Usnea inermis*			
288.	33537	*Vallisneria australis*	Y		
289.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
290.	25225	*Varanus rosenbergi (Heath Monitor)*			
291.	6101	*Verticordia nitens (Morrison Featherflower, Kodjeningara)*			
292.	24206	*Vespadelus regulus (Southern Forest Bat)*			
293.	24040	*Vulpes vulpes (Red Fox)*	Y		
294.	7389	*Wahlenbergia preissii*			
295.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
296.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
297.	6289	*Xanthosia huegelii*			
298.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix 8. Likelihood of occurrence of species within survey area.

Threatened and Priority List flora known to occur within 5 km of the survey area (DBCA 2021a, DBCA 2021b, DAWE 2022).

Taxon	Cons Status	Flowering	Description	Pre survey likelihood	Post Survey Likelihood
Acacia sp. Binningup (G. Cockerton et al. WB 37784)	P1	Aug	Suckering, clumping low shrub (to approximately 1.5 m) with small feathery leaves. Inland sub-coastal dunes in a combination of tuart, peppermint and banksia woodlands.	Possible	Recorded
Acacia flagelliformis	P4	May to Sep	Rush-like, erect or sprawling shrub, 0.3-0.75(-1.6) m high. Fl. yellow. Sandy soils. Winter-wet areas.	Unlikely	Unlikely (U1)
Acacia semitrullata	P4	May to Oct	Slender, erect, pungent shrub, (0.1-)0.2-0.7(-1.5) m high. Fl. cream-white. White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas.	Possible	Unlikely (U2)
Austrostipa bronwenae	T-EN (EN)		Tufted, perennial grass to 0.8 (1.5) m high. Sand, loam, clay. Winter wet/damp.	Unlikely	Unlikely (U1)
Boronia capitata subsp. *gracilis*	P3	Jun to Nov	Slender shrub, 0.3-0.6(-3) m high, branches pilose. Fl. pink. White/grey or black sand. Winter-wet swamps, hillslopes.	Unlikely	Unlikely (U1)
Boronia juncea subsp. *juncea*	P1	Apr	Slender or straggly shrub, pedicels and sepals glabrous. Fl. pink. Sand. Low scrub.	Unlikely	Unlikely (U1)
Caladenia procera	T-CR (CR)	Sep to Oct	Tuberous, perennial, herb, 0.35-0.9 m high. Fl. yellow. Rich clay loam, Alluvial loamy flats, jarrah/marri/peppermint woodland, dense heath, sedges.	Unlikely	Unlikely (U1)
Caladenia speciosa	P4	Sep to Oct	Tuberous, perennial, herb, 0.35-0.6 m high. Fl. white-pink. White, grey or black sand	Possible	Possible (P1)
Cyathochaeta teretifolia	P3		Rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2 m high, to	Unlikely	Unlikely (U1)

Taxon	Cons Status	Flowering	Description	Pre survey likelihood	Post Survey Likelihood
			1.0 m wide. Fl. brown. Grey sand, sandy clay. Swamps, creek edges.		
Dillwynia dillwynioides	P3	Aug to Dec	Decumbent or erect, slender shrub, 0.3-1.2 m high. Fl. red & yellow/orange. Sandy soils. Winter-wet depressions.	Unlikely	Unlikely (U1)
Diuris drummondii	T-VU (VU)	Nov to Dec or Jan	Tuberous, perennial, herb, 0.5-1.05 m high. Fl. yellow. Low-lying depressions, swamps.	Unlikely	Unlikely (U1)
Drakaea elastica	T-CR (EN)	Oct to Nov	Tuberous, perennial, herb, 0.12-0.3 m high. Fl. red & green & yellow. White or grey sand. Low-lying situations adjoining winter-wet swamps.	Unlikely	Unlikely (U1)
Drakaea micrantha	T-EN (VU)	Sep to Oct	Tuberous, perennial, herb, 0.15-0.3 m high. Fl. red & yellow. White-grey sand.	Possible	Possible (P1)
Lasiopetalum membranaceum	P3	Sep to Dec	Multi-stemmed shrub, 0.2-1 m high. Fl. pink-blue-purple. Sand over limestone.	Unlikely	Unlikely (U1)
Tripterococcus sp. Brachylobus (A.S George 14234)	P4	Nov-Dec or Feb	Erect perennial herb to 0.3-0.7 m high Fl. yellow. Grey/black sand. Winter wet depressions.	Unlikely	Unlikely (U1)

*Note: The BC Act Conservation Status is shown, EPBC Act status, where relevant, is in brackets.

Appendix 9. Tracklogs and Relevés

Legend

- Survey Area
- Property Boundary
- Track Logs
- Re evés

Aerial Image: Landgate November 2021
Datum: GDA2020
Date Drawn: 22/02
Drawn By: MBS Environmental

Project: McDougall Quarries, 150 Runnymede Road Binningup

Reconnaissance Flora and Vegetation Survey February 2022

Ecoedge

Appendix 10. List of vascular flora found within the survey area.

No.	FAMILY NAME	SPECIES NAME	NATURALISED	LISTING
1	Anarthriaceae	*Lyginia imberbis*		
2	Apiaceae	*Daucus glochidiatus*		
3	Asparagaceae	*Lomandra micrantha subsp. micrantha*		
4	Asparagaceae	*Lomandra sp. indet*		
5	Asphodelaceae	**Trachyandra divaricata*	X	
6	Asteraceae	**Carduus pycnocephalus*	X	
7	Asteraceae	**Erigeron sumatrensis*	X	
8	Asteraceae	**Hypochaeris glabra*	X	
9	Asteraceae	**Hypochaeris radicata*	X	
10	Asteraceae	**Ursinia anthemoides subsp. anthemoides*	X	
11	Asteraceae	*Olearia axillaris*		
12	Asteraceae	*Podotheca angustifolia*		
13	Caryophyllaceae	**Cerastium glomeratum*	X	
14	Colchicaceae	*Burchardia congesta*		
15	Dilleniaceae	*Hibbertia cuneiformis*		
16	Dilleniaceae	*Hibbertia hypericoides s.l.*		
17	Dilleniaceae	*Hibbertia racemosa*		
18	Ericaceae	*Brachyloma preissii*		
19	Ericaceae	*Styphelia propinqua*		
20	Ericaceae	*Styphelia racemulosa*		
21	Fabaceae	**Acacia longifolia*	X	
22	Fabaceae	*Acacia extensa*		
23	Fabaceae	*Acacia saligna s.l.*		
24	Fabaceae	*Acacia sp. Binningup (G. Cockerton et al. WB 37784)*		P1
25	Fabaceae	*Bossiaea eriocarpa*		
26	Fabaceae	*Daviesia divaricata*		
27	Fabaceae	*Daviesia physodes*		
28	Fabaceae	*Gompholobium tomentosum*		
29	Fabaceae	*Hardenbergia comptoniana*		
30	Fabaceae	*Hovea trisperma s.l.*		
31	Fabaceae	*Jacksonia furcellata*		
32	Fabaceae	*Kennedia prostrata*		
33	Hemerocallidaceae	*Dianella revoluta s.l.*		

No.	FAMILY NAME	SPECIES NAME	NATURALISED	LISTING
34	Iridaceae	**Romulea rosea s.l.*	X	
35	Loranthaceae	*Nuytsia floribunda*		
36	Myrtaceae	*Agonis flexuosa var. flexuosa*		
37	Myrtaceae	*Corymbia calophylla*		
38	Myrtaceae	*Eucalyptus marginata subsp. marginata*		
39	Myrtaceae	*Kunzea glabrescens*		
40	Orchidaceae	**Disa bracteata*	X	
41	Orchidaceae	*Microtis media s.l.*		
42	Orchidaceae	*Pterostylis sp. indet*		
43	Orobanchaceae	**Orobanche minor*	X	
44	Phyllanthaceae	*Phyllanthus calycinus*		
45	Phytolaccaceae	**Phytolacca octandra*	X	
46	Pinaceae	**Pinus pinaster*	X	
47	Poaceae	**Aira cupaniana*	X	
48	Poaceae	**Avena barbata*	X	
49	Poaceae	**Avena sp. indet*	X	
50	Poaceae	**Briza maxima*	X	
51	Poaceae	**Briza minor*	X	
52	Poaceae	**Bromus sp. indet*	X	
53	Poaceae	**Ehrharta calycina*	X	
54	Poaceae	**Ehrharta longiflora*	X	
55	Poaceae	**Lagurus ovatus*	X	
56	Poaceae	*Austrostipa flavescens*		
57	Proteaceae	*Banksia attenuata*		
58	Proteaceae	*Banksia ilicifolia*		
59	Restionaceae	*Desmocladus flexuosus*		
60	Rubiaceae	*Opercularia vaginata*		
61	Solanaceae	**Solanum nigrum*	X	
62	Solanaceae	**Solanum linnaeanum*	X	DP
63	Xanthorrhoeaceae	*Xanthorrhoea brunonis s.l.*		
64	Zamiaceae	*Macrozamia riedlei*		

Appendix 11. Vegetation Units within survey area.

Unit P1 Marri Woodland: Corymbia calophylla (with occasional Eucalyptus marginata subsp. marginata and Agonis flexuosa var. flexuosa) Woodland to Open Forest over *Acacia longifolia Isolated Tall Shrubs over *Ehrharta calycina, *Avena spp. Open Grassland with *Trachyandra divaricata, *Ursinia anthemoides subsp. anthemoides Sparse to Open Herbland. [Condition mainly Degraded].

Unit P2 Jarrah-Marri-Banksia Woodland: Corymbia calophylla, Eucalyptus marginata subsp. marginata (with occasional Banksia attenuata and Agonis flexuosa var. flexuosa) Woodland to Open Forest over Xanthorrhoea brunonis s.l. Low Sparse Shrubland over *Ehrharta calycina, *Avena spp. Open Grassland with *Trachyandra divaricata, *Ursinia anthemoides subsp. anthemoides Sparse to Open Herbland. [Condition mainly Degraded to Good; small portion in Very Good condition representative of Banksia Woodlands of the Swan Coastal Plain TEC/PEC].