Appendix A
Flora and vegetation assessment, Swann Road borefield (RPS, 2023)

MAKING COMPLEX EASY

A TETRA TECH COMPANY

FLORA AND VEGETATION ASSESSMENT

Swann Road borefield, Walpole

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EXECUTIVE SUMMARY

Survey objectives and scope of works

RPS AAP Consulting Pty Ltd (RPS) was commissioned by the Water Corporation to undertake a detailed flora and vegetation survey of the Swann Road borefield near Walpole, Western Australia (the study area, Figure 1). The borefield was scheduled to commence trial groundwater abstraction for a six-month period commencing December 2023, subject to regulatory approvals. The results of this survey will form part of the environmental impact assessment for the project.

The study area is located approximately 1.3 kilometres (km) north-west of Walpole in the Shire of Manjimup. The study area encompasses a 502.1-hectare (ha) extent within the modelled drawdown area from the Swann Road borefield, and an additional 250 metre (m) buffer. Part of the study area was affected by fire in 2021. This area includes large areas of farmland, the upper Walpole River, and the Keystone State Forest. The Walpole Nornalup National Park is on the southern boundary of the study area and a small area is included within the southern boundary.

This report details the survey and findings after two season of survey. The primary survey was conducted in November–December 2022 (late spring–early summer) with the supplementary survey undertaken in April–May 2023.

The objectives of this detailed flora and vegetation assessment were to:

- Identify and characterise the flora and vegetation within the study area, via provision of a comprehensive flora inventory and vegetation unit and condition mapping.
- Identify the presence and extent of conservation significant flora and ecological communities that are currently listed under the state *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) within the study area.
- Describe the flora and vegetation values, including condition, present or likely to be present within the study area that may be directly or indirectly impacted by the predicted drawdowns during groundwater abstraction from the Swann Road borefield, including an analysis of the significance of flora and vegetation in local, regional and state contexts.
- Map the location and extent of conservation significant flora and vegetation within the study area.

This detailed flora and vegetation assessment included a:

- Detailed flora and vegetation survey
- Targeted Threatened flora (TF) and Priority flora (PF) survey of known or potentially suitable habitat for each of the target species within the study area at the appropriate time (the documented peak flowering time).

This report documents the methods and outcomes of the desktop study and detailed flora and vegetation assessment undertaken between November and December 2022.

Flora and vegetation survey findings

The EPA's objective is to retain at least 30% of the pre-clearing extent of each ecological community in a bioregion (EPA 2008). As such, the remaining extent of the vegetation associations identified within the study area have exceeded this threshold level in the Warren bioregion (WAR).

One hundred and forty-one taxa were recorded, 12 of which are introduced and 129 native taxa in surveyed vegetation. The Fabaceae and the Myrtaceae recorded the highest representation (23 and 22 taxa respectively), with the Cyperaceae (Rushes) with 11 taxa. This proportional representation is similar to that reported in the literature reviewed as part of the desktop assessment. One conservation significant taxon, *Aotus carinata* (P4), was recorded during the survey.

Twelve vegetation types were described, including two that represented the farm paddocks and regrowth therein. One further mapping unit was created to cover cleared land and infrastructure. One of these vegetation types represents potentially conservation significant vegetation nominated for listing under the EPBC Act.

One Priority Ecological Community (PEC) was recorded as potentially present in the DBCA database searches as part of the desktop assessment. Examples of the P1 ecological community '*Reedia spathacea* – *Empodisma gracillimum* – *Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warrren Biogeographical Region' and buffer zones were shown to be present in the desktop search area, although the exact boundaries of the community itself are difficult to interpret from the results. However, elements of the PEC were recorded, with the Threatened taxon *Reedia spathacea* not recorded as present. The response of this Threatened taxon to fire is known and documented, and it is one that is highly impacted and slow to return. It is suggested that monitoring be undertaken to determine if the taxon is indeed present in the **CcTBsLt** vegetation type that was burnt in the two years prior to the survey. Without this taxon the vegetation type cannot be confirmed to be the PEC.

It is noted that this particular community is nominated for listing as a Threatened Ecological Community (TEC) under the EPBC Act, under the umbrella description '*Empodisma* peatlands of southwestern Australia', with the recommendations of the Threatened Species Scientific Committee and advice to the Minister due by 30 April 2023. The *Reedia spathacea* (T) is not a criterion for identification of the TEC. At the time of writing this listing advice had not been updated.

Vegetation condition ranged from Excellent to Completely Degraded, with a range of three categories. The most common was Completely Degraded, covering 55% of the study area. Given the agricultural history of the location and its effects on remnant vegetation in terms of disturbance and weed invasion this was to be expected. Vegetation in Excellent condition accounted for 41.8% of the study area, with 3.2% assessed as being in Very Good to Good condition.

1 INTRODUCTION

1.1 Background

RPS AAP Consulting Pty Ltd (RPS) was commissioned by the Water Corporation to undertake a detailed flora and vegetation survey of the Swann Road borefield near Walpole, Western Australia (the study area, Figure 1). The borefield was scheduled to undertake a trial groundwater abstraction for a six-month period commencing December 2023, subject to regulatory approvals. The results of this survey will form part of the environmental impact assessment for the project. This report details the survey and findings of a detailed two-season survey undertaken during 2022–2023.

The study area is located approximately 1.3 kilometres (km) to the north-west of Walpole in the Shire of Manjimup. The study area encompasses a 502.1-hectare (ha) extent impacted by predicted drawdowns from the Swann Road borefield and a surrounding 250 metre (m) buffer predicted by Water Corporation modelling. This area includes large areas of farmland, the upper Walpole River, and the Keystone State Forest. The Walpole Nornalup National Park is on the southern boundary of the study area and a small area is included within the southern boundary.

Part of the study area was affected by fire in 2021.

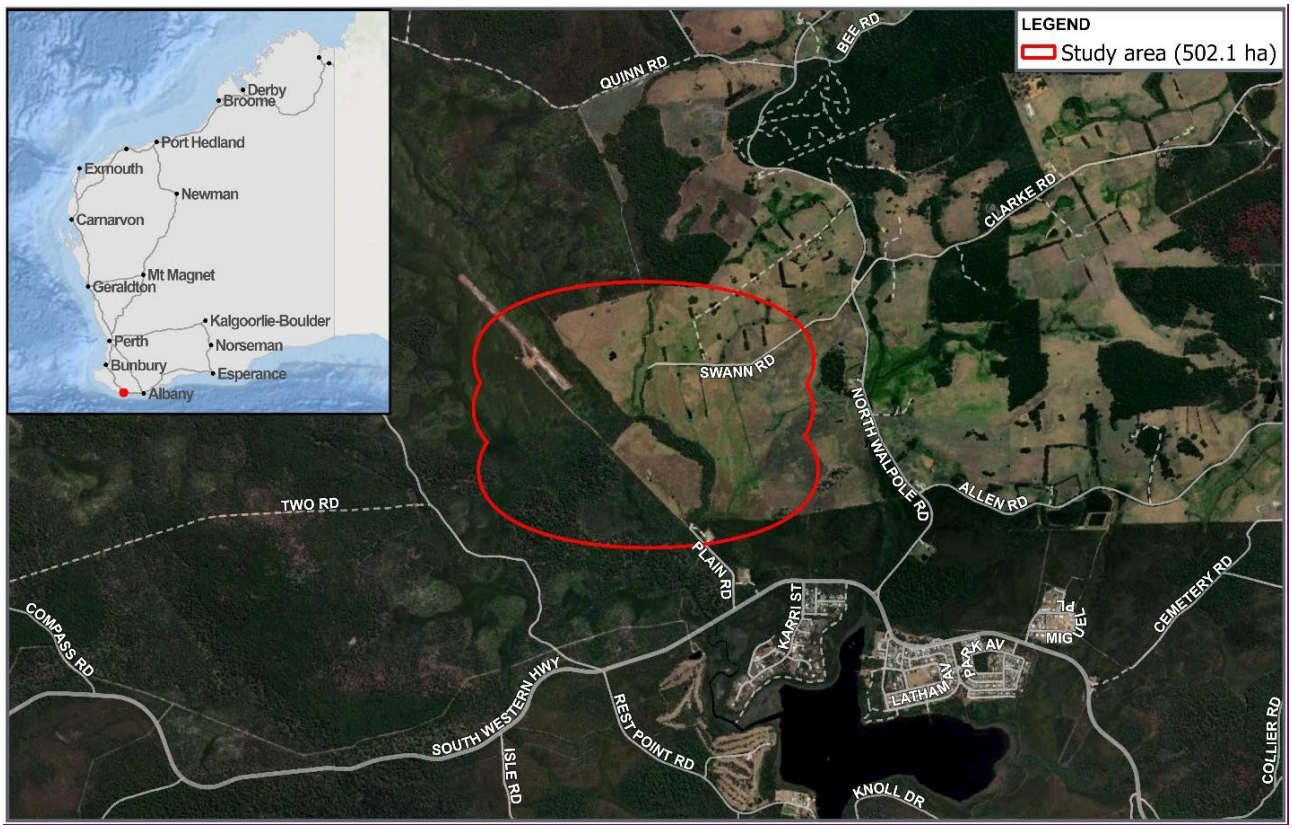


Figure 1: Swann Road borefield study area, Walpole

1.2 Objectives

The objectives of this detailed flora and vegetation assessment were to:

- Identify and characterise the flora and vegetation within the study area, via provision of a comprehensive flora inventory and vegetation unit and condition mapping.
- Identify the presence and extent of conservation significant flora and ecological communities that are currently listed under the state *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) within the study area.

- Describe the flora and vegetation values present, or likely to be present within the study area that may be directly or indirectly impacted by the predicted drawdowns during groundwater abstraction from the Swann Road borefield, including an analysis of the significance of flora and vegetation in local, regional and state contexts.
- Map the location and extent of conservation significant flora and vegetation within the study area.

1.3 Scope of work

This detailed flora and vegetation assessment included a:

- Detailed flora and vegetation survey
- Targeted Threatened flora (TF) and Priority flora (PF) survey of known or potentially suitable habitat for each of the target species within the study area at the appropriate time (the documented peak flowering time).

This report documents the methods and outcomes of the desktop study and detailed flora and vegetation assessment undertaken between November and December 2022.

1.4 Guiding principles and legislative framework

Commonwealth and state legislation pertaining to the conservation of native flora and vegetation include the *Environment Protection and Biodiversity Conservation Act* (EPBC Act, 1999), *Biodiversity Conservation Act* (BC Act, 2016) and *Environmental Protection Act* (EP Act, 1986). The BC Act came into full effect on 1 January 2019 and replaced the *Wildlife Conservation Act 1950* (WC Act).

1.4.1 Commonwealth – EPBC Act

The EPBC Act is administered by the Federal Department of Climate Change, Energy, the Environment and Water (DCCEEW). The EPBC Act provides for the listing of Threatened flora and Threatened Ecological Communities (TECs) as Matters of National Environmental Significance (MNES). Under the EPBC Act, actions that have, or are likely to have, a significant impact on MNES require approval from the Australian Government, Minister for the Environment through a formal referral process.

Conservation categories applicable to Threatened flora under the EPBC Act are as follows:

- Extinct (EX)[1] – there is no reasonable doubt that the last individual has died
- Extinct in the Wild (EW) – taxa known to survive only in captivity
- Critically Endangered (CR) – taxa facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – taxa facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – taxa facing a high risk of extinction in the wild in the medium-term
- Conservation Dependent (CD)[1] – taxa whose survival depends upon ongoing conservation measures; without these measures, a conservation dependent taxon would be classified as Vulnerable, Endangered or Critically Endangered.

Ecological communities are defined as ‘naturally occurring biological assemblages that occur in a particular type of habitat’ (English & Blyth 1997). There are three categories under which ecological communities can be listed as TECs under the EPBC Act: Critically Endangered, Endangered and Vulnerable.

[1] Species listed as Extinct and Conservation Dependent are not matters of NES and therefore do not trigger the EPBC Act.

1.4.2 State – EP Act

The EP Act governs environmental impact assessment and protection in Western Australia. The aim of the EP Act is "to provide for an EPA, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with foregoing".

The EP Act states that the following principles, applicable to native flora and vegetation should be adhered to for protection of the environment of Western Australia:

1. The precautionary principle – where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
2. The principle of intergenerational equity – the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
3. The principle of the conservation of biological diversity and ecological integrity – conservation of biological diversity and ecological integrity should be a fundamental consideration.

1.4.3 State – BC Act

In WA, the BC Act provides for the listing of Threatened flora (Government of Western Australia 2018a, b) in the following categories:

- Critically Endangered (CR) – species facing an extremely high risk of extinction in the wild in the immediate future
- Endangered (EN) – species facing a very high risk of extinction in the wild in the near future
- Vulnerable (VU) – species facing a high risk of extinction in the wild in the medium-term future.

Species may also be listed as specially protected (SP) under the BC Act in one or more of the following categories:

- Species of special conservation interest (conservation dependent, CD) – species with a naturally low population, restricted natural range, of special interest to science, or subject to or recovering from a significant population decline or reduction in natural range
- Migratory species (Mig.), including birds subject to international agreement
- Species otherwise in need of special protection (OS).

The Department of Biodiversity, Conservation and Attractions (DBCA) administers the BC Act and maintains non-statutory lists of Priority flora and ecological communities. Taxa and communities listed as Priority are still considered to be of conservation significance – that is they may be Threatened but cannot be considered for listing under the BC Act until there is adequate understanding of threat levels imposed on them. Species on the Priority flora list are assigned to one of four Priority (P) categories, P1 (highest) – P4 (lowest), based on level of knowledge/concern.

1.4.4 Vegetation of conservation significance

Under the BC Act, habitat is eligible for listing as critical habitat if it is critical to the survival of a Threatened species or ecological community and its listing is otherwise in accordance with the ministerial guidelines.

The BC Act provides for the listing of Threatened Ecological Communities (TECs) in the following categories:

- Critically Endangered – facing an extremely high risk of becoming eligible for listing as a collapsed ecological community in the immediate future
- Endangered – facing a very high risk of becoming eligible for listing as a collapsed ecological community in the near future
- Vulnerable – facing a high risk of becoming eligible for listing as a collapsed ecological community in the medium-term future.

An ecological community may be listed as a collapsed ecological community under the BC Act if there is no reasonable doubt that the last occurrence of the ecological community has collapsed, or the ecological community has been so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure.

The DBCA also maintains a non-statutory list of Priority Ecological Communities (PECs) that may become TECs in the future, but do not currently meet survey criteria or that are not adequately defined. PECs are assigned to one of five categories depending on their priority for survey or definition, with Priority 1 of highest concern and Priority 5 of lowest concern.

1.4.5 Other significant flora and vegetation

Under the EPA's environmental factor guideline, flora and vegetation may be considered significant for a range of reasons, other than listing as a Threatened or Priority species or ecological community, including:

- Flora may be significant for:
  - Local endemism or association with a restricted habitat type (e.g. surface water or Groundwater Dependent Ecosystems [GDE])
  - New species or anomalous features that indicate a potential new species
  - Representing the range of a species (particularly at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
  - Being unusual species, including restricted subspecies, varieties or naturally occurring hybrids
  - Having relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.
- Vegetation may be significant for:
  - Having restricted distribution
  - Being subject to a degree of historical impact from threatening processes
  - Having a role as a refuge
  - Providing an important function required to maintain ecological integrity of a significant ecosystem.

1.4.6 Environmentally Sensitive Areas

Under section 51B of the EP Act the Minister for Environment may declare by notice either a specified area of the state or a class of areas of the state to be an Environmentally Sensitive Area (ESA). ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, which was gazetted on 8 April 2005.

The following areas are declared to be ESAs:

- Declared World Heritage property as defined in section 13 of the EPBC Act
- Area that is included on the Register of the National Estate, because of its natural heritage value, under the *Australian Heritage Council Act 2003*
- Defined wetland and the area within 50 m of the wetland. Defined wetlands include Ramsar wetlands, Conservation Category Wetlands and nationally important wetlands
- Area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located
- Area covered by a TEC
- Bush Forever site listed in Bush Forever: Volumes 1 and 2 (Government of Western Australia 2000), except to the extent to which the site is approved to be developed by the Western Australian Planning Commission.

1.4.7 Introduced species

Introduced flora (weeds) are plants that require action to reduce their negative effects on the economy, environment and human health or amenity. Weeds can reduce the quality of Australia's agricultural, horticultural and forestry industries. They can affect the structure and function of ecosystems, posing threats to biodiversity and natural values by successfully out-competing native species for available nutrients, water, space and sunlight. Weeds can also increase the biomass of ecosystems, leading to more intense bushfires and changing the composition and structure of native vegetation (Invasive Plants and Animals Committee 2016).

Management of some weed species is required under Commonwealth or state frameworks. Key classifications for significant introduced flora that are relevant to this report are:

- Declared Pest – the *Biosecurity and Agriculture Management Act 2007* (BAM Act), Section 22 makes provision for a plant taxon to be listed as a Declared Pest organism in parts of, or the entire, state. Under the Biosecurity and Agriculture Management Regulations 2013, Declared Pests are assigned to one of three control categories that dictate the level of management required (Department of Primary Industries and Regional Development [DPIRD] 2023a).
- Weed of National Significance (WoNS) – high impact, established introduced flora causing major economic, environmental, social and/or cultural impacts in a number of states/territories, and which have strong potential for further spread (Invasive Plants and Animals Committee 2016). Management is required in accordance with DPIRD guidelines for particular WoNS. Not all WoNS are recognised as Declared Pests in WA.

Throughout this report, introduced flora species are indicated with an asterisk and non-endemic native species (often planted) are indicated with an octothorp (#).

2 METHODS

2.1 Desktop review

As a component of the detailed flora and vegetation assessment, a desktop review was undertaken prior to the field surveys to make the best possible use of existing data from the area and to identify specific flora and vegetation values that may occur within, or proximate to, the study area. This involved a review of:

- High resolution aerial imagery including bushfire records
- Available literature including previous flora and vegetation survey reports and spatial datasets
- Search results of Commonwealth Government databases for Threatened flora and TECs protected under the EPBC Act
- DBCA databases and mapping for Threatened and Priority flora.

2.1.1 Literature review

A selection of available literature was reviewed to provide context to the study area. This included:

- Walpole Wilderness and Adjacent Parks and Reserves Management Plan (Department of Environment and Conservation [DEC] 2008)
- Report for Samuels Brook Pipeline Flora Survey (GHD 2011a)
- Report for Walpole Woodlot – Pipeline. Flora and Fauna Report (GHD 2011b)
- Report for Walpole Woodlot. Flora and Fauna Survey (GHD 2011c)
- *Reedia spathacea* (Reedia) Listing Advice (DEWHA, 2008).

2.1.2 State and Commonwealth Government database searches

Database searches were conducted to determine a list of conservation significant flora and ecological communities (i.e., those protected under the BC Act and / or the EPBC Act or considered Priority species / communities by the DBCA) that may occur within the study area. The searches were centred on the point 34.99 S, 116.7055 E. The databases searched and the corresponding search areas are provided in Table 1.

Conservation significant flora species reported by the database searches were reviewed on FloraBase (Western Australian Herbarium [WAH] 1998-). Conservation significant ecological communities reported by the database searches were studied by reference to relevant conservation advice.

Table 1: Flora and ecological communities databases searched and corresponding search areas

Database name	Governing organisation	Search area defined
Western Australian DBCA Threatened and Priority Flora database WAH Specimen database	DBCA (Ref. 52-1022FL)	10 km buffer from a central point
Western Australian DBCA TEC/PEC database	DBCA (Ref. 25-1022EC)	10 km buffer from a central point
Protected Matters database for MNES	Department of Climate Change, Energy, the Environment and Water (DCCEEW)	10 km buffer from the study area

2.2 Field survey

The phase one field surveys were coordinated and conducted by RPS' Lead Botanist Martin Henson, assisted by Environmental Scientist Margaret McCormack (Table 2). Taxonomic identifications were undertaken by Bethea Loudon.

Table 2: Botanical team personnel

Personnel	Role	Licensing	Survey date
Martin Henson	Field survey, taxonomy, analysis, reporting	FB62000110-2, TFL 2223-0050	7–15 November 2022 12–15 December 2022 14–18 April 2023 9–12 May 2023
Margaret McCormack	Field survey, reporting	N/A	7–15 November 2022 12–15 December 2022 14–18 April 2023
Zoe Webber	Field survey	FB62000441	9–12 May 2023
Bethea Loudon	Taxonomy	N/A	

2.2.1 Detailed flora and vegetation survey

The primary phase of a detailed (plot-based) flora and vegetation survey was undertaken in accordance with Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016). Detailed surveys are required if the study area supports a high diversity of flora or vegetation, restricted landforms or vegetation types or significant flora or vegetation (amongst other criteria). A targeted survey was also undertaken to search for known conservation significant species within the study area and for occurrences of taxa assessed as potentially occurring following the results of the desktop review.

The purpose of the detailed and targeted surveys was to provide adequate local and regional context for the flora and vegetation values of the study area.

Field methods for the surveys included:

- Surveying of quadrats and relevés
- Targeted searches
- Vegetation type and condition mapping
- TEC/PEC assessment.

Prior to the commencement of the field survey, data including satellite imagery, survey boundary, and pre-selected vegetation quadrats were loaded onto electronic field devices. The field survey involved assessing and mapping vegetation boundaries, conducting quadrat and relevé sampling and collecting opportunistic flora specimens. GPS locations of vegetation and condition boundaries, survey sites and flora specimen data were recorded digitally.

2.2.1.1 Surveying of quadrats and relevés

Quadrat locations were chosen to ensure adequate coverage of the major vegetation types (as assessed from aerial photography) present in the study area. Quadrats were pre-selected in this manner, but final placement was determined in the field during the Primary survey. Relevés were used to provide context in vegetation similar to that described by quadrat. Occasionally a simple vegetation note was made with a GPS waypoint for reference.

In total, 15 quadrats and nine relevés (unbounded) were surveyed across the study area. Relevés were floristically described to the same standard as quadrats without the edaphic data.

A minimum of three quadrats should be sampled in each vegetation type to allow a measure of statistical accuracy. Initially, quadrat locations were chosen from aerial photography and selected to cover the perceived number of vegetation types. Locations were adapted in the field to cover conditions encountered on the ground. Relevés were used to provide supporting data - while each relevé is unbounded, as opposed to the defined 10 m × 10 m quadrat, the data was collected with the same rigour.

Quadrats were established at 10 m × 10 m as required in the Warren bioregion (EPA 2016). Information collected included:

- Location: Waypoints were taken of each quadrat corner using a hand-held GPS unit in GDA2020 datum

- Vegetation description: A broad description of the vegetation using the National Vegetation Information System (NVIS) framework (Department of the Environment and Energy 2017)
- Geology: A broad description of soil and rock type
- Disturbance: Observed disturbances (e.g. weed invasion, tracks, rubbish dumping)
- Vegetation condition: Using the scale of Keighery (1994) as required for the South West and Interzone Botanical Province (EPA 2016)
- Comprehensive species list of flora in quadrat, with height and percentage foliar cover estimates
- Digital photograph taken from the north-west corner of the quadrat.

Collections were made of all species not known to the botanists. All collections were pressed and later identified using the resources of the WAH, relevant keys and literature.

2.2.1.2 Targeted flora survey

Spring targeted searches are undertaken for conservation significant flora. Vegetation is traversed on foot in meandering transects concentrated on habitat likely to support significant flora. Where an individual or population is recorded, a GPS point is taken, and a count made of individuals within a 5 m radius of the point. Waypoints are then mapped.

Following the field survey, the likelihood of occurrence for each significant flora species identified in the desktop review was assessed and assigned to one of three ratings:

- Recorded – species recorded within the study area by previous or current survey
- Possible – study area within known range of species; potential habitat within the study area, records within 5 km of study area and may not have been detectible during survey (e.g. survey conducted outside flowering period, annual plant survey conducted outside likely period of occurrence, small herbaceous plant in dense vegetation), or entire area of habitat not thoroughly searched
- Unlikely – study area outside known range of species and/or no suitable habitat present in study area and/or suitable/potential habitat present but study area considered adequately searched for the species.

2.2.1.3 Vegetation unit mapping

Vegetation mapping was undertaken at a scale of 1:10,000 using NVIS sub-association (Level 5) for structural descriptions (Department of the Environment and Energy 2017) (Appendix A, Table A-6 and Table A-7).

2.2.1.4 Vegetation condition mapping

The condition of the vegetation across the study area was mapped using the appropriate condition scale recommended by EPA (2016) for the South-West Botanical Province (Keighery, 1994, Appendix A, Table A-8).

Vegetation condition rankings are defined by the integrity of the vegetation structure, the level of disturbance from various sources with the most common being weed presence/cover, and an assessment of the vegetation's ability to regenerate. Condition ranges from Pristine, meaning that there are no obvious signs of disturbance, to Completely Degraded in which only a few native trees or shrubs may be present with most of the flora introduced.

2.2.1.5 TEC/PEC assessment

An assessment of TEC/PECs not reported in the study area as a result of the DBCA database search is based on the description and key diagnostics of the ecological community in relevant conservation advice or referral guidelines.

2.2.2 Data analysis

2.2.2.1 Vegetation types

Data analysis was used to support definition of vegetation types based on species presence/absence in each quadrat and relevé. Data was entered into an Access database then exported to Excel and entered into a Primer 7 (Clarke and Gorley 2015) worksheet as a site × species matrix.

Data was 'cleaned' by removing annuals and singletons (species that only appear once but may affect the analysis) from the site/species matrix, and names checked for any changes in nomenclature. A cluster analysis was performed on the remaining data. Data was pre-treated using a square root transformation then Bray-Curtis association for resemblance. The resulting dendrogram illustrated the similarities in the vegetation types identified, showing structurally different units at the local scale.

2.2.2.2 Analysis of survey completeness

Following the completion of the survey, a species accumulation curve was made to aid in assessment of the thoroughness of the survey. The graph will indicate if an adequate number of taxa have been recorded, based on the rate of new records as the survey unfolds. It is unlikely that any survey will record every single taxon endemic to the study area due to variances in flowering and growing times and the survey effort required. The aim of the survey is to make sufficient records to comprehensively describe the vegetation, and collect and record any flora of conservation significance, while building a species list as comprehensive as possible.

3 EXISTING ENVIRONMENT

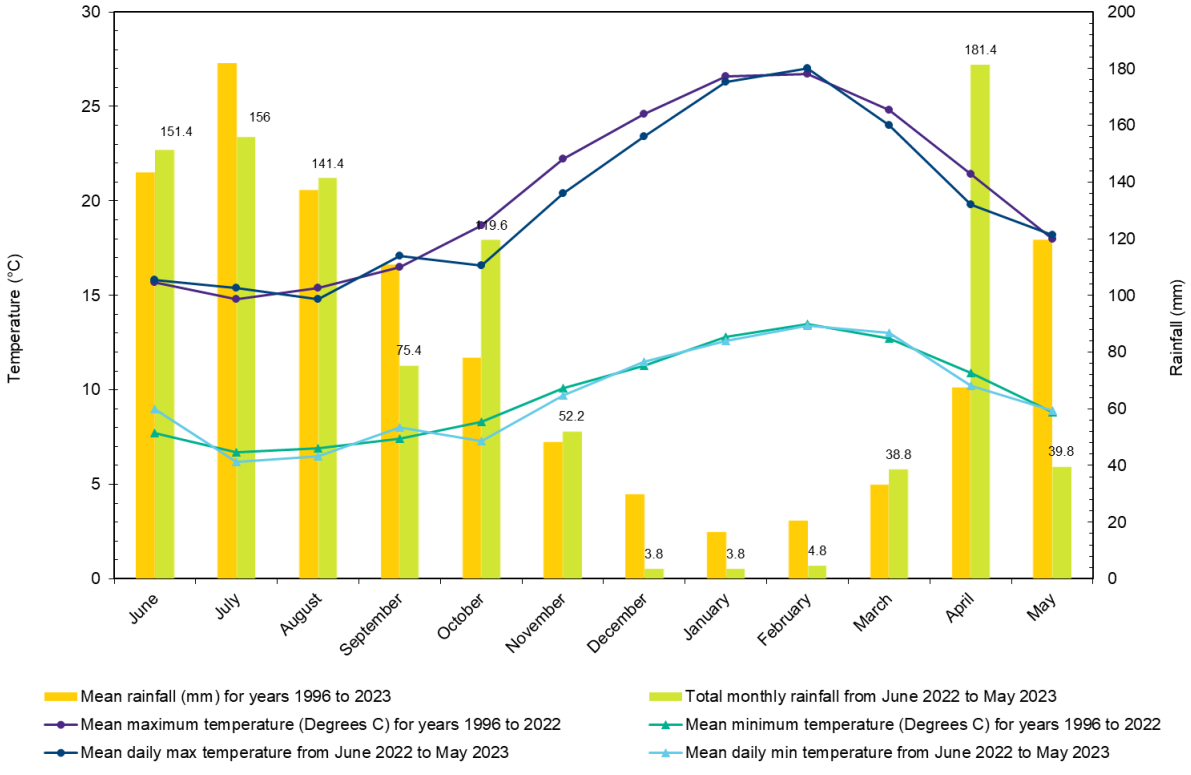
3.1 Interim Biogeographical Regionalisation of Australia

The Interim Biogeographical Regionalisation of Australia (IBRA) currently recognises 89 bioregions based on common climate, geology, landform native vegetation and species information. These bioregions are further split into 419 subregions – units that are more localised and geomorphologically homogenous within the bioregions. The study area is situated in the Warren (WAR01) subregion of the Warren bioregion (DCCEEW 2021). The bioregion is not further divided into subregions.

The Warren subregion is composed of dissected undulating country, with loamy soils supporting Karri forest, laterites supporting Jarrah-Marri forest, leached sandy soils in plains and depressions supporting low Jarrah woodlands and paperbark / sedge swamps and marine dunes supporting *Agonis flexuosa* and *Banksia* woodlands and heaths (Hearn, Williams and Comer 2002). The subregion covers 844,771 ha and its climate is considered unique for its high rainfall and low evapotranspiration.

3.2 Climate and weather

The climate is classified as moderate Mediterranean (Hearn, Williams and Comer 2002), experiencing dry and mild to hot summers and wet and mild to cool winters. The closest open weather station to Walpole that has available climate and weather data from a similar geographic location is Shannon (No. 009968), 58 km away to the north-east (Bureau of Meteorology 2023a). Rocky Gully (No. 009964) is marginally closer but further inland. While neither may completely accurately reflect climate and weather statistics from Walpole, Shannon was chosen because it is closer to the coast, as Walpole is. Graph 1 shows the mean climatic conditions for the study area and the recorded values for the 12 months preceding and including the survey, sourced from the Shannon weather station (No. 009968).



(Bureau of Meteorology 2023a)

Graph 1: Average and actual temperature and rainfall for the study area before and during the fieldwork

As can be seen from Graph 1, rainfall was higher than average before and during the first survey visit in November 2022, but drier during the second visit in December 2022. Rainfall around the April 2023 field visit was well above average, while May of 2023 was below average. Survey timing following the rainfall was therefore good, while the average temperatures were marginally lower during the 2022 survey timing, which may have slowed germination or flowering in some species.

3.3 Geology and soils

Geological mapping at the 1:250,000 scale identified six geological units within the study area, which are described in Table 3 (Wilde, Walker and Geological Survey of Western Australia 1984, Department of Mines, Industry Regulation and Safety 2023).

Table 3: Geological units within the study area

Code	Geological age	Description
Czl	?Tertiary	Laterite – chiefly massive, but includes overlying pisolithic gravel and lateralised sand
Czw	?Tertiary	White colluvial sand, in various landscape positions, derived from earlier Tertiary deposits (especially Plantagenet Group)
Tpe	Tertiary subdivision ?Pliocene	Estuarine, lagoonal and lacustrine deposits – numerous small lakes and swamps. Linear dunes common.
Tg	Tertiary subdivision Eocene	Alluvial, lacustrine and (?) shallow, marine deposits, strongly lateralised in part – conglomerate, grit, sand and clay (includes and overlies some Werillup Formation of the Plantagenet Group). Preserved mainly along drainage divides.
Tep	Tertiary subdivision Eocene, Plantagenet Group	Pallinup Siltstone: grey-brown siltstone and rare spongolite overlain by white residual sand. Local marine fossils.
Png	Proterozoic	Granitic gneiss, coarse-grained orthogneiss

The DPIRD soil landscape mapping shows five soil units across the study area, as described in Table 4 and illustrated in Figure A (DPIRD 2023b).

Table 4: Soil landscape units within the study area

Map unit	Name	Description	Area	% within study area
254BrKO	Kordabup subsystem	Broad drainage floors in lower reaches of streams. Humus podzols; tea tree scrub and kangaroo grass sedgeland.	392.97	78.26
254WhHA	Hazelvale subsystem	Narrow sandy plains; slight stream incision. Humus podzols on crests of spurs; Teatree scrub. Yellow duplex soils on valley flanks; Jarrah-Marri low forest. Peaty podzols on minor valley floors; sedges and reeds.	59.04	11.76
254BrWA	Walpole subsystem	Flat to gently sloping benches; some shallow dissections. Podzols and deep sands; tea tree scrub, sheoak woodland and kangaroo grass sedgeland	1.17	0.23
254BrCOb	Collis brown gravelly duplex phase	Brown gravelly duplex soils; Marri-Jarrah-Karri forest	39.74	7.91
254WhCOb	Collis brown gravelly duplex phase	Brown gravelly duplex soils; Marri-Jarrah-Karri forest	4.13	0.82
254WhAN	Angove System (Walpole)	Gently sloping sandy terrain; slight dissections. Humus podzols on broad crests; Kangaroo Grass sedgeland, Teatree heath. Sandy yellow duplex soils in shallow dissections; Jarrah woodland	5.04	1.00
254WhMTb	Mattaband brown gravelly duplex phase	Brown gravelly duplex soils; Karri-Marri-Yellow Tingle-Jarrah forest		0.01

3.4 Flora and vegetation

3.4.1 Beard vegetation associations

Regional scale pre-European vegetation mapping for Western Australia identified six mapped vegetation associations in the study area (Beard et al. 2013, DPIRD 2019). Table 5 presents the remnant extent and reservation status of these vegetation associations within the Warren bioregion (WAR).

Table 5: Pre-European vegetation associations, remnant extent and reservation status

Vegetation association	Pre-European extent (ha)	2018 extent (ha)	% remaining state-wide	% of present extent in secure tenure	Ha within study area	% of study area
1 Tall forest; karri (*Eucalyptus diverscolor*)	69,118.21	53,852.13	77.91	35.85	10.119604	9.76%
3 Medium forest; jarrah-marri	250,262.10	195,318.18	78.05	39.89	10.119604	2.02%
23 Low woodland; jarrah-*banksia*	37,736.16	27,083.22	71.77	48.74	10.119604	65.40%
51 Sedgeland; reed swamps, occasionally with heath	35,867.03	24,029.98	67.00	54.20	10.119604	17.64%
1139 Tall forest; karri and yellow tingle (*Eucalyptus guilfoyleii*)	15,253.85	13,988.94	91.71	83.01	10.119604	1.12%
1144 Tall forest; karri and marri (*Corymbia calophylla*)	159,668.36	127,836.26	80.06	34.17	10.119604	4.06%

(Source: Government of Western Australia 2019)

The EPA's objective is to retain at least 30% of the pre-clearing extent of each ecological community in a bioregion (EPA 2008). As such, the remaining extent of the vegetation associations identified within the study area have exceeded this threshold level in the Warren bioregion (WAR).

The pre-European vegetation association mapping for the study area is presented in Figure B.

3.4.2 Mattiske and Havel vegetation complexes

Vegetation complexes are vegetation associations that are characteristic of various combinations of soil, landform and rainfall. The South West forest region of Western Australia was mapped for vegetation complexes by Mattiske and Havel (1998) at a scale of 1:50,000. There are six vegetation complexes within the study area (DBCA 2018a).

- Angove: Open forest of *Eucalyptus marginata* subsp. *marginata-Banksia ilicifolia-Nuytsia floribunda* with some *Eucalyptus diversicolor* on gently sloping sandy terrain in hyperhumid and perhumid zones.
- Collis: Tall open forest of *Eucalyptus diversicolor-Corymbia calophylla* on crests of hills arising above the southern coastal plain in the hyperhumid zone.
- Hazelvale: Mosaic of a low woodland to woodland of *Eucalyptus marginata* subsp. *marginata-Eucalyptus patens*, low forest of *Agonis juniperina–Callistachys lanceolata* with closed heath of *Myrtaceae* spp. on sandy plains in the hyperhumid zone.
- Kordabup: Mosaic of low forest of *Agonis juniperina*, closed heath of *Myrtaceae-Proteaceae-Papilionaceae* spp. with occasional emergent *Melaleuca preissiana* and *Banksia littoralis* on broad swampy plains in hyperhumid and perhumid zones.
- Mattaband: Mixture of tall open forest of *Eucalyptus diversicolor-Corymbia calophylla* and woodland of *Eucalyptus marginata* subsp. *marginata-Corymbia calophylla-Agonis flexuosa* on small hills arising above the coastal plain with some outcrops in hyperhumid and perhumid zones.
- Walpole: Low woodland of *Allocasuarina fraseriana-Banksia attenuata-Banksia ilicifolia* with stunted *Eucalyptus marginata* subsp. *marginata* on flats in the hyperhumid zone.

The vegetation complex mapping for the study area is presented in Figure C. Table 6 shows the area and percentage of each vegetation complex in the study area as well as the state-wide area and the percentage potentially impacted by this project.

Table 6: Vegetation complexes in the study area

Name	Area in study area (ha)	% of study area	State-wide area (ha)	State-wide % in study area
Angove, A	5.09895	1.015	39,698.49	0.013
Collis, COb	42.586913	8.482	22,136.44	0.19
Hazelvale, HA	58.700247	11.691	2,726.42	2.15
Kordabup, KO	394.478074	78.566	2,972.23	13.27
Mattaband, MTb	0.020996	0.004	11,816.79	0.000178
Walpole, Wp	1.213424	0.241	1,478.36	0.08

3.4.3 Environmentally Sensitive Areas and conservation areas

Environmentally Sensitive Areas (ESA)s are mapped in relation to the study area in Figure D using the latest state government datasets. The 502.1 ha study area is overlapped by 295.5 ha of ESAs. The majority of the ESAs are associated with defined wetlands and the area within 50 m of the wetlands (Figure E) (Landgate 2023).

One ESA along the study area's southern extent is associated with an area included on the Register of the National Estate because of its natural heritage value, listed under the Commonwealth *Australian Heritage Council Act 2003*. This heritage place is understood to be Walpole-Nornalup National Park (1986 boundary) and Adjacent Area, South Western Highway, Walpole, WA, Australia (DCCEEW 2023a).

The Keystone State Forest is adjacent to the study area on the western boundary, and forms part of the study area.

The Walpole-Nornalup National Park is on the southern boundary of the study area and 10,02 ha is included within the southern boundary (1.99% of the study area). Table 7 indicates the areas of conservation significance in the study area.

Table 7: ESAs and conservation areas in the study

Name	Area in study area (ha)	% of study area
Walpole-Nornalup National Park	10.02	1.99
Keystone State Forest	91.69	18.26
ESA	295.5	58.85

3.5 Inland waters

3.5.1 Surface water

Geomorphic wetland mapping in Augusta to Walpole identified three wetland classifications in the study area, as shown in Figure E (DBCA 2017). Table 8 summarises these wetlands and their extents within the study area.

There are a number of farm dams located within and surrounding the study area and the Walpole River runs through the study area, flowing into the Walpole Inlet, the Nornalup Inlet and eventually into the Southern Ocean.

The majority of the study area is situated within the Priority 2 and Priority 3 of the Walpole Weir Catchment Area drinking water source (Landgate 2023), as shown in Figure E. Table 8 indicates the different wetlands and the percentage of the study area covered by them.

Table 8: Geomorphic wetlands within the study area

Geomorphic wetland classification	% of study area
Paluslope (seasonally waterlogged slope)	45.64%
Palusplain (seasonally waterlogged flat)	0.07%
Sumpland (seasonally inundated basin)	0.09%
Not wetland	55.2%

3.5.2 Groundwater

A search of the Bureau of Meteorology's Groundwater Dependent Ecosystems Atlas identified one high potential terrestrial GDE (from national assessment) and two aquatic GDEs in the study area (Bureau of Meteorology 2023b).

Inflow dependence describes a GDE that is wetter than the surrounding areas either seasonally or permanently because it receives water from inflows in addition to rainfall. The likelihood of inflow dependence is expressed as a value between 1 and 10. A value above 6 indicates that the GDE is more likely to be accessing water beyond rainfall, a value below 6 represents a GDE that is more likely to rely solely on rainfall (Bureau of Meteorology 2023b).

These GDEs have Inflow Dependent Ecosystem Likelihood values less than 6, which indicates that the landscapes are more likely to rely solely on rainfall and are not considered to be inflow dependent. The terrestrial and aquatic GDEs are illustrated in Figure F and their extents within the study area are provided in Table 9.

Table 9: Groundwater Dependent Ecosystems within the study area (Bureau of Meteorology, 2023b)

Groundwater Dependent Ecosystems	Inflow dependent ecosystem likelihood (out of 10)	Area (ha) in study area	% of study area
High potential terrestrial GDE (from national assessment)	2	59.535	11.86%
High aquatic potential GDE (from national assessment)	1	229.935	45.79%
High aquatic potential GDE (from national assessment)	2		

4 RESULTS

4.1 Desktop review

It was observed that a large proportion of the western portion of the site had been burnt in 2021 (Firewatch, 2022), shown in Figure 2. For this reason it was decided to delay survey until late 2022 to allow some time for the vegetation to recover.

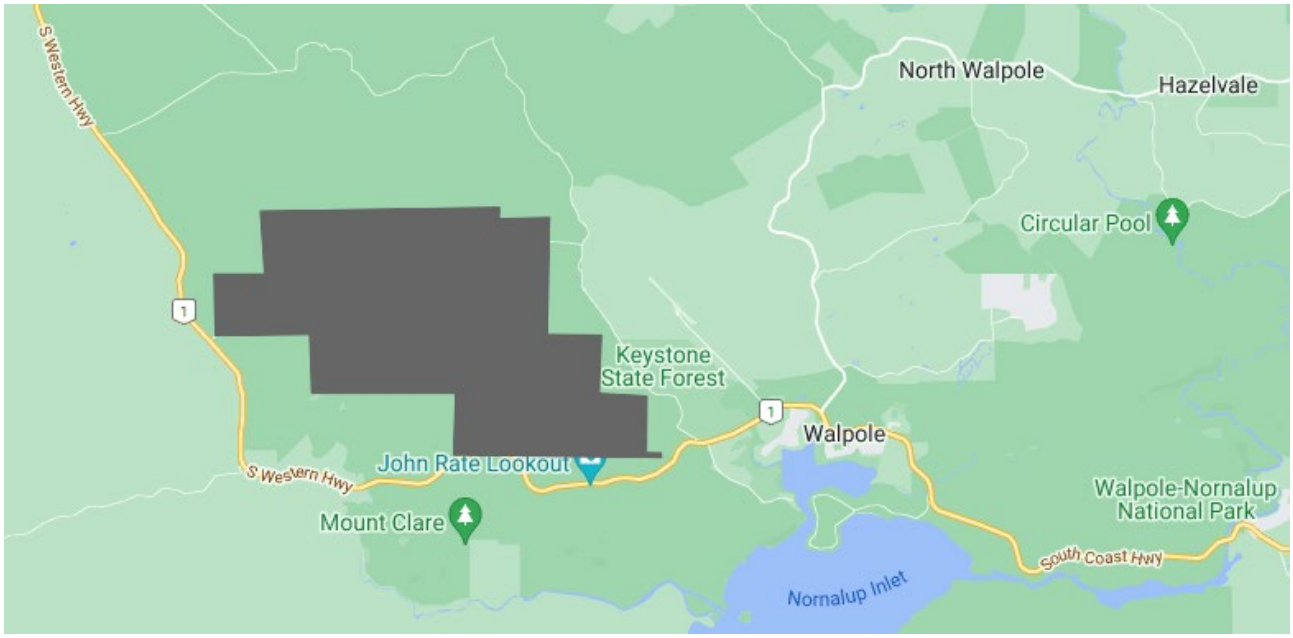


Figure 2: Burnt areas from 2021 fire (Firewatch, 2023)

4.1.1 Flora

4.1.1.1 Literature review

4.1.1.1.1 Walpole Wilderness and Adjacent Parks and Reserves Management Plan

The Department of Environment and Conservation (DEC, 2008) prepared a management plan to address the 'Walpole Wilderness' and several surrounding conservation reserves, encompassing 325,116 ha in its planning area. This includes the Walpole-Nornalup National Park, which extends into the study area.

The DEC (2008) noted that there were approximately 1,996 native flora taxa recorded within the planning area, of which there were 19 Threatened and 145 Priority flora taxa.

4.1.1.1.2 Report for Samuels Brook Pipeline Flora Survey

GHD (2011a) recorded a total of 207 taxa, from 49 families and 125 genera, from the November 2010 survey area of the proposed pipeline alignment to Samuels Broom Dam. Nine taxa were introduced, representing 4% of the species list. GHD's study area intersected the current study area, particularly along Plain Road and within and adjacent to agricultural paddocks. Fabaceae were the dominant family with 27 taxa, followed by the Myrtaceae (20) and Cyperaceae (18).

GHD (2011a) recorded two conservation significant species in its northern extent (Table 10).

Table 10: Conservation significant species recorded by GHD (2011a) within the study area

Taxon	State status	Habitat	Location
Aotus carinata	Priority 4	Sandy soils. Seasonally wet flats.	• Twenty individuals recorded just within the study area's northern extent (50H; 473127 m E, 6132448 m S) • One individual recorded to the north of the study area (50H; 472858 m E, 6133028 m S) • One individual recorded to the north of the study area (50H; 472835 m E, 6133053 m S) • One individual recorded to the north of the study area (50H; 472915 m E, 6132939 m S)
Boronia virgata	Priority 4	Peaty sand or clay. Swampy or waterlogged places.	Ten individuals recorded near Samuels Road (50H; 471262 m E, 6134805 m S)

4.1.1.1.3 Report for Walpole Woodlot Pipeline Flora and Fauna Report

GHD (2011b) recorded a total of 111 taxa, from 38 families and 76 genera, from their November 2010 survey area of the pipeline corridor between the current Allen Road woodlot and the proposed woodlot on Clarke Road. Fabaceae was the dominant family (12 taxa), followed by the Cyperaceae and Restionaceae (eight each) and Myrtaceae (seven). Five taxa were introduced, representing 5% of the species list. GHD's study area is located approximately 1.6 km east of the study area.

No conservation significant species were recorded by GHD (2011b) during the survey.

4.1.1.1.4 Report for Walpole Woodlot Flora and Fauna Survey

GHD (2011c) recorded a total of 93 taxa, from 38 families and 69 genera, from its November 2010 survey area of the proposed woodlot on Clarke Road. The Fabaceae were the dominant family with 14 taxa, followed by the Myrtaceae (11), Ericaceae (seven) and Cyperaceae (six). Four taxa were introduced, representing 4% of the species list. GHD's study area is located approximately 4.4 km north-east of the study area.

No conservation significant species were recorded by GHD (2011c) during the survey.

4.1.1.1.5 *Reedia spathacea* (Reedia) listing advice

This document takes the form of advice to the Minister for the Environment, Heritage and the Arts from the Threatened Species Committee regarding an amendment to the Threatened Species List under the EPBC Act.

The issue subject to advice was the elevation of the taxon's ranking to Critically Endangered. Of relevance to this survey is the information regarding its ecology and especially response to fire. Even the coolest fires have been observed to kill a significant proportion of adult shoots and around half of juveniles up to eight years old. Hotter fires generally cause greater losses (DEWHA, 2008).

4.1.1.2 DBCA flora database search

Searches of the DBCA Threatened and Priority Flora database and the WAH specimen database were undertaken within a 10 km radius of a central point.

A total of 53 species of conservation significance were found to occur within the search radius comprising six Threatened, 14 Priority 2, 15 Priority 3 and 18 Priority 4 flora taxa. The list of conservation significant species identified by the DBCA flora database searches is presented in Table 11. The conservation significant records are mapped in relation to the study area in Figure G.

Table 11: DBCA flora database search results

Taxon	BC Act / state status	Common name	Habitat	Closest record
Acacia euthyphylla	Priority 3		Margins of salt lakes and marshes, seasonal swamps	9 km to E. This is thought to be an incorrect record as usual range is near Salmon Gums
Acacia semitrullata	Priority 4		Sometimes over laterite, clay. Sandplains, swampy areas	3.12 km to SW
Actinotus repens	Priority 3		Slopes, creek banks, brown sandy loam, forest or shrubland	0.76 km to S
Adelphacme minima	Priority 3		Ridges, swamps, lower slopes, flats	4.9 km to E
Andersonia auriculata	Priority 3		Grey or peaty sand, often over laterite. Swampy areas, granite outcrops	3.4 km to SW
Anthocercis sylvicola	Priority 3		Sand	2.96 km to WSW
Anzybas abditus (previously known as *Corybas abditus*)	Priority 3	Small helmet orchid	No data available	0.85 km to S
Aotus carinata	Priority 4		Sandy soils. Seasonally wet flats	2.5 km to NW. At southern edge of range
Banksia serra	Priority 4	Serrate-leaved dryandra	Gravel, sand or clay loam over laterite. Hillslopes	In study area. Incorrect location according to description (PERTH 04128656)
Banksia sessilis var. *cordata*	Priority 4		Coastal limestone	1.2 km to SE
Banksia verticillata	Threatened (CR)	Albany banksia	Sandy loam. On or beside granite outcrops	3.1 km to SW
Boronia anceps	Priority 3		White sand, gravelly laterite. Seasonally swampy heaths	7.9 km to SW
Boronia virgata	Priority 4		Peaty sand or clay. Swampy or waterlogged places	1.66 km to S
Caladenia abbreviata	Priority 3	Coastal spider orchid	Sand. Sand dunes	8.2 km to WSW
Caladenia interjacens	Priority 4	Walpole spider orchid	Sand. Consolidated coastal dunes	1.18 km to SSE
Carpobrotus sp. Lateral Flowers (N. Gibson & M. Lyons 973) PN	Priority 2		No data available	9.2 km to S, on Casuarina Isles, offshore
Caustis sp. Boyanup (G.S. McCutcheon 1706)	Priority 3		White or grey sand, yellow sand, clay. Low plain, gentle slopes	2.7 km to N
Chamaexeros longicaulis	Priority 2		Grey or white sand, sandy clay with lateritic gravel	1.54 km to S
Chamelaucium floriferum subsp. *diffusum*	Priority 2		Grey sandy loam, base of granite outcrops, duplex sands	5.8 km to WSW
Chamelaucium floriferum subsp. *floriferum*	Priority 2		Coastal heath, laterite, granite outcrop	2.7 km to WSW
Diuris drummondii	Threatened (VU)	Tall donkey orchid	Low-lying depressions, swamps	6 km to S
Drakaea micrantha	Threatened (EN)	Dwarf hammer orchid	White-grey sand	7.6 km to SE
Drosera binata	Priority 2		Black peat. Winter-wet swamps	0.82 km to NW
Drosera huegelii var. *phillmanniana*	Priority 2		Sandy clay, steep slopes, hillsides, granite outcrops	3.1 km to SE
Eriochilus scaber subsp. *orbifolius*	Priority 2		Interdunal flats and swales, often over granite	7.8 km to SW
Eucalyptus brevistylis	Priority 4	Rate's tingle	Sandy loam, sand	Location appears to be in Nornalup inlet. Approx 2 km to SE
Gahnia sclerioides	Priority 4		Loam, sandy soils. Moist shaded situations	3.1 km to SW
Gastrolobium formosum	Priority 3		Clay loam. Along river banks or in swamps	8.1 km to SW
Gonocarpus pusillus	Priority 4		Grey sandy clay. Winter-wet swamps	8 km to SW
Gonocarpus simplex	Priority 4		Peaty sand. Swamps, seasonally inundated areas	Location appears to be in Nornalup Inlet (PERTH 01462792). Approx 1.2 km to SE
Hemigenia microphylla	Priority 3		Sandy clay, peaty clay, granite. Winter-wet depressions	1 km to SE
Juncus meianthus	Priority 3		Black sand, sandy clay. Creeks, seepage areas	1.1 km to SE
Kennedia glabrata	Threatened (VU)		Soil pockets, sandy soils. Granite outcrops	7.1 km to WSW
Leptinella drummondii	Priority 3		Clay loam, mud. Along rivers	7.1 km to WSW
Leucopogon alternifolius	Priority 3		Grey/white sand. Swampy areas, seasonally wet areas	1.7 km to S
Microtis globula	Threatened (VU)	South-coast mignonette orchid	Peaty soils. Winter-wet swamps	1.35 km to N
Microtis pulchella	Priority 4	Beautiful mignonette orchid	Peaty sand. Winter-wet swamps	1.87 km to NW
Microtis quadrata	Priority 4	South coast onion orchid	Swamps, drainage, winter wet flats	8.4 km to SW
Myriophyllum trifidum	Priority 4	Three-lobed meziella	Flood plain, wetland, drainages, black peaty loam/sand	6.4 km to S
Reedia spathacea	Threatened (EN)	Reedia	Peaty sand. Swamps, river edges	In study area (PERTH 01127128)
Rorippa cygnorum	Priority 2		Damp depressions, drainages, granite. Brown loam	3.25 km to S
Schizaea rupestris	Priority 2	Grass fern	Sand. Gullies, creek banks, shaded moist rock faces	Location appears to be in Nornalup Inlet. PERTH 03768562 record says Coalmine Beach, approx. 3 km to SE
Stylidium leeuwinense	Priority 4		Winter-wet habitats and depressions. Shrubland, heath, sedgeland or low woodland	3.1 km to SW
Styphelia graniticola	Priority 2		Loam, loam over granite. on hills, slopes	7.3 km to S
Synaphea intricata	Priority 3		Sand, peaty sand. Flats, swampy areas	8.1 km to SSW
Thomasia quercifolia	Priority 4	Oak leaved thomasia	Limestone heath, coastal. Karri forest on loam	1.8 km to SSW
Tripterococcus sp. Brachylobus (A.S. George 14234)	Priority 4		Grey sandy loam, Eucalypt woodland	8.1 km to W
Verticordia lehmannii	Priority 4		Sandy clay. Winter-wet flats	8.1 km to WSW

(Source: WAH 1998-)

4.1.1.3 Protected Matters database search for MNES

The nine Threatened species identified by the Protected Matters database search are presented in Table 12.

The EPBC Act Protected Matters Report is provided in Appendix B.

Table 12: Protected matters database search results

Taxon	EPBC Act status	Common name	Habitat	Closest record
Banksia verticillata	Vulnerable	Albany banksia	Sandy loam. On or beside granite outcrops	3.3 km to SE
Caladenia harringtoniae	Vulnerable	Pink spider-orchid	Sandy loam. Winter-wet flats, margins of lakes, creek lines, granite outcrops	35 km to N
Calectasia cyanea	Critically Endangered	Blue tinsel lily	White, grey or yellow sand, gravel	98 km to E
Diuris drummondii	Vulnerable	Tall donkey orchid	Low-lying depressions, swamps	32 km to ESE
Drakaea micrantha	Vulnerable	Dwarf hammer-orchid	White-grey sand	7.7 km to SE
Kennedia glabrata	Vulnerable	Northcliffe kennedia	Soil pockets, sandy soils. Granite outcrops	7.2 km to W
Microtis globula	Vulnerable	South-coast mignonette orchid	Peaty soils. Winter-wet swamps	1.35 km to N
Reedia spathacea	Critically Endangered	Reedia	Peaty sand. Swamps, river edges	In study area (PERTH 01127128)
Sphenotoma drummondii	Endangered	Mountain paper-heath	Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks	14.5 km to NE

(Source: DCCEEW 2023, WAH 1998-))

4.1.2 Vegetation

4.1.2.1 Literature review

4.1.2.1.1 Walpole Wilderness and Adjacent Parks and Reserves Management Plan

The DEC (2008) noted that there were 81 vegetation complexes within the planning area, representing 26% of all vegetation complexes in the Regional Forest Agreement for the South West Forest Region of Western Australia (RFA) area. One TEC has been recorded in the planning area, Mt Lindesay – Little Lindesay Vegetation Complex, which is currently listed as a Vulnerable TEC under the BC Act (DBCA 2018b),. However it was acknowledged there are a large number of communities, habitats and areas of ecological significance present in the planning area.

4.1.2.1.2 Report for Samuels Brook Pipeline Flora Survey

GHD (2011a) identified nine vegetation types within the study area, one of which was a modified vegetation complex:

1. Open Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Tall Open Shrubland of *Kingia australis* over Closed Heath of *Taxandria parviceps*, *Eutaxia parvifolia* and *Acacia myrtifolia* over Low Open Shrubland of *Xanthorrhoea preissii*, *Macrozamia riedlei* and *Lysinema ciliatum* over Sedgeland of *Cyathochaeta avenacea*, *Mesomelaena tetragona* and *Schoenus efoliatus* in grey sand on undulating slopes (EmCc)
2. Tall Scrub of *Homalospermum firmum*, *Taxandria parviceps* and *Taxandria juniperina* over Open Heath of *Beaufortia decussata*, *Banksia quercifolia* and *Adenanthos obovatus* over Open Herbland of *Dampiera linearis*, *Diaspasis filifolia* and *Johnsonia lupulina* and Closed Sedgeland dominated by *Anarthria scabra*, *Anarthria prolifera* and *Evandra aristate* (HfTpTj)

3. Open Forest of *Eucalyptus patens* over Tall Open Scrub of *Callistachys lanceolata* over Shrubland of *Taxandria* sp. over Very Open Herbland of *Dampiera hederacea* and Sedgeland of *Anarthria scabra* on grey sand (Ep)
4. Closed Forest *Eucalyptus marginata*, *Eucalyptus guilfoylei* and *Corymbia calophylla* over Closed Tall Scrub dominated by *Banksia grandis* and *Hakea amplexicaulis* over Shrubland of *Agonis theiformis*, *Acacia pentadenia* and *Bossiaea webbii* over Low Open Shrubland of *Macrozamia riedlei*, *Petrophile diversifolia* and *Boronia gracilipes* over Very Open Sedgeland of *Anarthria scabra*, *Anarthria prolifera* and *Desmocladus flexuosus* on lateritic slopes and hill crests (EmEgCc)
5. Open Forest of *Allocasuarina fraseriana* and *Eucalyptus marginata* over Tall Open Shrubland of *Persoonia longifolia* and *Banksia grandis* over Open Heath dominated by *Taxandria* species, *Beaufortia decussata* and *Adenanthos obovatus* over mixed Low Open Shrubland over a diverse Very Open Herbland and Closed Sedgeland dominated by *Anarthria scabra*, *Anarthria prolifera* and *Hypolaena exsulca* in grey sands on undulating slopes (AfEm)
6. Closed Tall Scrub of *Taxandria linearifolia*, *Homalospermum firmum* and *Taxandria parviceps* over Open Shrubland *Taxandria juniperina*, *Acacia divergens* and *Hakea linearis* over mixed Sedgeland including *Gahnia decomposita*, *Cyathochaeta avenacea* and *Evandra aristata* in seasonally inundated areas (TlHfTp)
7. Tall Open Forest of *Eucalyptus diversicolor* over Tall Open Scrub of *Taxandria linearifolia* over Open Shrubland of *Haloragodendron racemosum* over Closed Grassland of pasture grasses and Open Sedgeland of *Lepidosperma effusum* and *Empedisma gracillima* along the banks of a creek line (Ed)
8. Low Open Woodland of *Eucalyptus marginata* with occasional Very Open Tree Mallee of *Eucalyptus patens* over Tall Open Shrubland of *Xanthorrhoea preissii* and *Kingia australis* over mixed Open Low Heath dominated by *Taxandria parviceps*, *Taxandria juniperina* and *Adenanthos obovatus* over a diverse Very Open Herbland and Closed Sedgeland of *Anarthria scabra*, *Anarthria prolifera*, *Evandra aristata* and *Mesomelaena tetragona* on a lower slope (EmH)
9. The alignment traverses paddock areas near the Plain Road section of the alignment. The paddocks have been extensively cleared of native vegetation and contain pasture grasses (Pa).

GHD (2011a) assessed the vegetation along the alignment to be generally in Excellent to Pristine condition, with the exception of a section adjacent to agricultural paddocks in the southern extent.

No state or Commonwealth listed TECs or PECs were recorded by GHD (2011a).

4.1.2.1.3 Report for Walpole Woodlot Pipeline Flora and Fauna Report

GHD (2011b) identified seven vegetation types within the study area, three of which contain planted / modified vegetation complexes:

1. Open Forest of *Eucalyptus diversicolor* (karri), *Eucalyptus guilfoylei* (yellow tingle) and *Eucalyptus jacksonii* (red tingle) on laterite
2. Open Forest of *Eucalyptus diversicolor*, *E. guilfoylei*, *E. jacksonii* and *Corymbia calophylla* over Low Woodland of *Allocasuarina decussata* and *Chorilaena quercifolia* Open Shrubland of *Pteridium esculentum**, *Taxandria juniperina* and *Taxandria linearifolia* over Sedgeland of *Lepidosperma effusum* and *Lepidosperma gracile* on a lateritic slopes and hills
3. Open Forest of *Eucalyptus diversicolor* (karri) and *Eucalyptus guilfoylei* on granite
4. Open Forest of *Eucalyptus diversicolor* and *Eucalyptus guilfoylei* over Low Woodland of *Allocasuarina decussata* over Tall Open Scrub of *Chorilaena quercifolia* and *Trymalium ledifolium* over Shrubland of *Acacia pentadenia* and *Leucopogon verticillatus* over Sedgeland of *Lepidosperma effusum* and *Leptocarpus laxus* on hill slope with some granite
5. Open Forest of *Eucalyptus marginata* and *Corymbia calophylla*
6. Open Forest of *Eucalyptus marginata* and *Corymbia calophylla* occasionally over a Low Woodland of *Allocasuarina decussata* and *Chorilaena quercifolia* over Shrubland of *Acacia pentadenia*, *Pteridium esculentum**, *Taxandria juniperina*, *Taxandira parviceps* and *Taxandria linearifolia* occasionally with a Low Shrubland of *Leucopogon australis*, *Leucopogon* sp. Southern Forests, *Xanthorrhoea preissii* , *Macrozamia riedlei* and *Eutaxia parvifolia* over Sedgeland of *Anarthria scarbra*, *Lepidosperma effusum*, *Anarthria prolifera* and *Meeboldina scariosa* on a grey sand

7. Drainage Line Vegetation
8. The alignment traverses minor drainage features along the alignment, there are also several locations of paluslope and palusplain (seasonally waterlogged areas) in the southern end of the alignment. These drainage lines generally contained a Woodland of Eucalypt species including *Eucalyptus megacarpa*, *Eucalyptus marginata* and *Eucalyptus diversicolor* over Tall Open Scrub of *Chorilaena quercifolia* and *Taxandria linearifolia* over Open Shrubland of *Acacia pentadenia* and *Trymalium ledifolium* over Sedgeland *Lepidosperma effusum*, *Juncus pallidus* and *Empedisma gracillima*
9. Road Verge Vegetation
10. Along Allen Road and sections of Clarke Road the vegetation is regrowth vegetation or planted non-native species within the road verge
11. Plantation
12. There are several eucalypt plantations along the alignment
13. Pasture
14. The alignment traverses areas cleared of vegetation and converted to grazing land.

GHD (2011b) assessed the vegetation to range in condition from Excellent (*Eucalyptus* Forests and Woodlands) to Completely Degraded (paddock areas).

No state or Commonwealth listed TECs or PECs were recorded by GHD (2011b).

4.1.2.1.4 Report for Walpole Woodlot Flora and Fauna Survey

GHD (2011c) identified five vegetation types within the study area, two of which contain planted / modified vegetation complexes:

1. Open Forest of *Eucalyptus diversicolor* (karri), *Eucalyptus guilfoylei* (yellow tingle) and *Eucalyptus jacksonii* (red tingle) on laterite
    a. Open Forest of *Eucalyptus diversicolor, Eucalyptus guilfoylei* and *Eucalyptus jacksonii* over Tall Open Shrubland of *Chorilaena quercifolia* over Open Shrubland of *Pteridium esculentum*, Lasiopetalum floibundum* and *Leucopogon verticillatus* over Closed Sedgeland of *Lepidosperma effusum* on a hill crest
2. Open Forest of *Eucalyptus marginata* and *Corymbia calophylla*
    a. Open Forest of *Eucalyptus marginata* and *Corymbia calophylla* over Low Woodland of *Allocasuarina fraseriana* and *Allocasuarina decussata* over Tall Shrubland of *Hovea elliptica, Taxandria linearifolia* and *Banksia grandis* over Open Heath of *Acacia pentadenia, Taxandria parviceps* and *Podocarpus drouynianus* over Low Shrubland of *Leucopogon australis, Hibbertia serrata* and *Xanthosia rotundifolia* over a mixed Sedgeland of *Anarthria scabra, Anarthria prolifera* and *Hypolaena exsulca* over Open Herbland of *Dampiera hederacea, Patersonia occidentalis* and *Dampiera linearis*
3. Closed Tall Scrub of *Homalospermum firmum* and *Taxandria* species in a dampland
    a. Closed Tall Scrub of *Taxandria linearifolia*, *Homalospermum firmum* and *Taxandria parviceps* over *Pteridium esculentum** (bracken), *Rubus ulmifolius** (blackberry) and pasture grasses in a drainage depression
4. Planted Eucalypt
    a. A stand of planted eucalypts over pasture grasses is present in the southern portion of the site
5. Pasture
    a. The site has been largely cleared of vegetation and converted to grazing land.

GHD (2011c) assessed the vegetation to range in condition Pristine to Excellent (*Eucalyptus* Forests and Woodlands) to Completely Degraded (paddock areas).

No state or Commonwealth listed TECs or PECs were recorded by GHD (2011c).

4.1.2.2 DBCA vegetation database search

A search of DBCA's TEC/PEC database for known TEC and PEC records within a 10 km radius of a central point returned three ecological communities.

1. *Reedia spathacea - Empodisma gracillimum - Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region is listed as a Priority 1 ecological community
    a. This ecological community is characterised by sedges / rushes of *Reedia spathacea*/*Empodisma gracillimum*/*Schoenus multiglumis*, approximately 1.5 m high, with *Homalospermum firmum* low open shrubs to scrub (DBCA 2022)
    b. Eight records of the PEC and buffer zones were shown to intersect with the study area
2. Subtropical and Temperate Coastal Saltmarsh is listed as a Priority 3 ecological community
    a. This ecological community is equivalent to the Subtropical and Temperate Coastal Saltmarsh TEC, listed as Vulnerable under the EPBC Act in 2013. The description, area and condition thresholds that apply to the Subtropical and Temperate Coastal Saltmarsh TEC also apply to the Priority 3 PEC
    b. It consists of mainly salt-tolerant vegetation including grasses, herbs, sedges, rushes and shrubs (Department of Sustainability, Environment, Water, Population and Communities 2013). Vegetation is generally less than 0.5 m in height and succulent herbs, shrubs and grasses generally dominate. Species diversity of Western Australian saltmarsh is high (at least 90 species). Major vegetation units that generally correspond with the Subtropical and Temperate Coastal Saltmarsh PEC and TEC in Western Australia include:
        i. Samphire shrublands dominated by *Tecticornia* species or *Sarcocornia* saltmarsh complex
        ii. Grasslands dominated by *Sporobolus virginicus*
        iii. Sedgelands dominated by *Bolboschoenus caldwellii* or *Gahnia trifida*
        iv. Rushlands dominated by *Juncus kraussiii*
        v. Herblands dominated by *Wilsonia humilis*/*W. backhousei* with *Frankenia* spp.
        vi. *Triglochin striata* or *Samolus repens*
    c. No records of the PEC and TEC were shown to intersect with the study area
3. Sphagnum Communities of the Tingle Forest is listed as a Priority 2 ecological community
    a. No records of the PEC were shown to intersect with the study area.

The PEC/TEC records are mapped in relation to the study area in Figure G.

4.1.2.3 Protected Matters database search for MNES

One TEC was identified by the Protected Matters database search as being likely to occur in the study area:

- Subtropical and Temperate Coastal Saltmarsh TEC (Vulnerable). See s4.1.2.2(2).

The EPBC Act Protected Matters Report is provided in Appendix B.

Reference to the DCCEEW website indicates that the ecological community '*Empodisma* peatlands of southwestern Australia' has been nominated for listing as an Endangered TEC under the EPBC Act. The draft conservation advice for this ecological community indicates that it is predominately found within the Warren IBRA Bioregion and the Southern Jarrah Forest IBRA subregion, although it may be found near the southern boundary of the Swan Coastal Plain IBRA subregion and the far western boundary of the Fitzgerald IBRA subregion on the Esperance Plains. It is located in the higher rainfall regions of the south-west corner of Western Australia, in an arc bounded by Cheyne's Beach in the east and Stratham (near Bunbury) in the west (DCCEEW, 2023d).

Empodisma peatlands typically form in localised areas where water collects seasonally, and typically have no connection to or inflows from other bodies of water such as rivers although there may be groundwater interactions. They are closely associated with the presence of peat-forming species such as *Empodisma gracillimum*, and other plant species that are indicative of the presence of peat such as *Homalospermum firmum, Taxandria linearifolia* and *T. parviceps* (DCCEEW, 2023d).

The Threatened Species Scientific Committee was due to provide its assessment and advice to the Minister by 30 April 2023 (DCCEEW 2023c). At the time of writing no further information is available on the listing status of this community.

The broad diagnostic criteria of this ecological community indicate that the DBCA listed PEC '*Reedia spathacea - Empodisma gracillimum - Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region' will form a component of the TEC if listed.

5 FIELD SURVEY

The Primary spring and summer survey was carried out over 13 days (7 to 15 November 2022 and 12 to 15 December 2022)

The detailed survey involved the sampling of the full range of vegetation communities and flora within the study area. A total of fifteen 10 metre (m) × 10 m (or equivalent) floristic quadrats and nine relevés (unbounded) were sampled. Ten vegetation notes were made to provide complementary descriptions of vegetation at various points in the study area. These locations are shown in Figure H.

Part of the Primary survey was undertaken in December 2022, which is outside the recommended spring survey timing (September–November) for the South-West Botanical Province (Environmental Protection Authority [EPA] 2016). The planned work program for the November 2022 visit encountered delays due to heavy rainfall, high vegetation density, difficulty placing monitoring quadrats away from water bodies and lack of available accommodation to extend the field trip. In order to complete the work program, the study area was therefore revisited in December 2022. Due to the higher-than-average rainfall in late 2022 (Graph 1), it is not expected that this compromised the quality of the survey.

The Supplementary survey was conducted in April and May 2023.

Figure I shows the track logs recorded from the survey.

5.1 Flora

One hundred and forty-one taxa, both endemic (91.5%) and introduced (8.5%), were recorded during the survey.

5.1.1 Native flora

One hundred and twenty-nine native taxa were recorded from 44 families and 98 genera. The Fabaceae and the Myrtaceae were the families with the greatest representation, with 23 and 22 taxa respectively, followed by the Cyperaceae represented by 11 taxa.

A complete species list for the survey is included as Appendix C.

5.1.2 Significant flora

No conservation significant flora were recorded during the Primary survey. One Priority listed species was recorded during the secondary survey.

Aotus carinata (P4) was recorded opportunistically at the northern edge of the study area and adjacent to the Walpole airstrip. It is recorded in FloraBase (W.A. Herbarium 1998-) as an erect, slender shrub to 1.5 m tall, although specimens were recorded in the study area at 4 m (see Plate 1). It's preferred habitat appears to be in dense low-lying scrub, which made targeted searching difficult, and it was therefore recorded close to tracks where access was possible. Thirty-two individuals were recorded.

Aotus carinata (P4) is found primarily in the Cape Leeuwin region and is here at the southern extent of its range, with two records near Walpole and Mount Roe. It is likely that more individuals occur than have been recorded due to the cryptic nature of the habitat it is recorded in.

Locations of *Aotus carinata* (P4) are mapped in Figure J and will be reported to DBCA via the Rare Flora Report Form.

Plate 1: ***Aotus carinata*** **(P4)**

5.1.3 Likelihood of occurrence – conservation significant flora

Following the field component of the survey, an assessment of the likelihood of conservation significant species occurring in the study area was conducted using the criteria outlined in Section 2.2.1.2 (Table 13).

Table 13: Likelihood of occurrence assessment

Taxon	Conservation status	Habitat	Closest record	Likelihood of Occurrence
Acacia euthyphylla	Priority 3 DBCA	Margins of salt lakes and marshes, seasonal swamps.	9 km to E. This is thought to be an incorrect record as usual range is near Salmon Gums	Unlikely, out of usual range and record does not appear on FloraBase.
Acacia semitrullata	Priority 4 DBCA	Sometimes over laterite, clay. Sandplains, swampy areas.	3.12 km to SW	Possible. Suitable habitat occurs.
Actinotus repens	Priority 3 DBCA	Slopes, creek banks, brown sandy loam, forest or shrubland	0.76 km to S	Possible. Suitable habitat occurs.
Adelphacme minima	Priority 3 DBCA	Ridges, swamps, lower slopes, flats	4.9 km to E	Possible. Suitable habitat occurs.
Andersonia auriculata	Priority 3 DBCA	Grey or peaty sand, often over laterite. Swampy areas, granite outcrops.	3.4 km to SW	Possible. Suitable habitat occurs.
Anthocercis sylvicola	Priority 3 DBCA	Sand.	2.96 km to WSW	Unlikely. No suitable substrate.
Anzybas abditus (previously known as *Corybas abditus*)	Priority 3 DBCA	No data available	0.85 km to S	Possible due to close record.
Aotus carinata	Priority 4 DBCA	Sandy soils. Seasonally wet flats.	2.5 km to NW. At southern edge of range	Recorded
Banksia serra	Priority 4 DBCA	Gravel, sand or clay loam over laterite. Hillslopes.	Recorded in study area but incorrect location according to description (PERTH 04128656)	Unlikely. Suitable habitat may not occur. See Footnote [1]
Banksia sessilis var. *cordata*	Priority 4 DBCA	Coastal limestone.	1.2 km to SE	Unlikely. Suitable habitat may not occur.
Banksia verticillata	DBCA Threatened (CR) EPBC Vulnerable	Sandy loam. On or beside granite outcrops.	3.1 km to SW	Unlikely. Suitable habitat may not occur.
Boronia anceps	Priority 3 DBCA	White sand, gravelly laterite. Seasonally swampy heaths.	7.9 km to SW	Unlikely. Suitable substrate may not occur.
Boronia virgata	Priority 4 DBCA	Peaty sand or clay. Swampy or waterlogged places.	1.66 km to S	Possible. Suitable habitat occurs.
Caladenia abbreviata	Priority 3 DBCA	Sand. Sand dunes.	8.2 km to WSW	Unlikely. Suitable habitat may not occur.
Caladenia harringtoniae	DBCA Threatened (VU) EPBC Vulnerable	Sandy loam. Winter-wet flats, margins of lakes, creek lines, granite outcrops.	35 km to N	Possible. Suitable habitat may occur
Caladenia interjacens	Priority 4 DBCA	Sand. Consolidated coastal dunes.	1.18 km to SSE	Unlikely. Suitable habitat may not occur.
Calectasia cyanea	DBCA Threatened (CR) EPBC Critically Endangered	White, grey or yellow sand, gravel.	98 km to E	Unlikely. Suitable habitat may not occur
Carpobrotus sp. Lateral Flowers (N. Gibson & M. Lyons 973) PN	Priority 2 DBCA	No data available	9.2 km to S, on Casuarina Isles, offshore	Unlikely. Suitable habitat may not occur
Caustis sp. Boyanup (G.S. McCutcheon 1706)	Priority 3 DBCA	White or grey sand, yellow sand, clay. Low plain, gentle slopes	2.7 km to N	Unlikely. Suitable habitat may not occur.
Chamaexeros longicaulis	Priority 2 DBCA	Grey or white sand, sandy clay with lateritic gravel.	1.54 km to S	Unlikely. Suitable habitat may not occur.
Chamelaucium floriferum subsp. *diffusum*	Priority 2 DBCA	Grey sandy loam, base of granite outcrops, duplex sands	5.8 km to WSW	Unlikely. Suitable habitat may not occur.
Chamelaucium floriferum subsp. *floriferum*	Priority 2 DBCA	Coastal heath, laterite, granite outcrop	2.7 km to WSW	Unlikely. Suitable habitat may not occur.
Diuris drummondii	DBCA Threatened (VU) EPBC Vulnerable	Low-lying depressions, swamps.	6 km to S	Possible. Suitable habitat may occur.
Drakaea micrantha	DBCA Threatened (EN) EPBC Vulnerable	White-grey sand.	7.6 km to SE	Unlikely. Suitable habitat may not occur.
Drosera binata	Priority 2 DBCA	Black peat. Winter-wet swamps.	0.82 km to NW	Possible. Suitable habitat may occur.
Drosera huegelii var. *phillmanniana*	Priority 2 DBCA	Sandy clay, steep slopes, hillsides, granite outcrops	3.1 km to SE	Unlikely. Suitable habitat may not occur.

Taxon	Conservation status	Habitat	Closest record	Likelihood of Occurrence
Eriochilus scaber subsp. *orbifolius*	Priority 2 DBCA	Interdunal flats and swales, often over granite.	7.8 km to SW	Unlikely. Suitable habitat may not occur.
Eucalyptus brevistylis	Priority 4 DBCA	Sandy loam, sand.	Location appears to be in Nornalup inlet. Approx 2 km to SE	Unlikely. Suitable habitat may not occur.
Gahnia sclerioides	Priority 4 DBCA	Loam, sandy soils. Moist shaded situations.	3.1 km to SW	Possible. Suitable habitat may occur.
Gastrolobium formosum	Priority 3 DBCA	Clay loam. Along river banks or in swamps.	8.1 km to SW	Possible. Suitable habitat may occur.
Gonocarpus pusillus	Priority 4 DBCA	Grey sandy clay. Winter-wet swamps.	8 km to SW	Possible. Suitable habitat may occur.
Gonocarpus simplex	Priority 4 DBCA	Peaty sand. Swamps, seasonally inundated areas.	Location appears to be in Nornalup Inlet (PERTH 01462792). Approx 1.2 km to SE	Possible. Suitable habitat may occur.
Hemigenia microphylla	Priority 3 DBCA	Sandy clay, peaty clay, granite. Winter-wet depressions.	1 km to SE	Unlikely. Suitable habitat may not occur.
Juncus meianthus	Priority 3 DBCA	Black sand, sandy clay. Creeks, seepage areas.	1.1 km to SE	Possible. Suitable habitat may occur.
Kennedia glabrata	DBCA Threatened (VU) EPBC Vulnerable	Soil pockets, sandy soils. Granite outcrops.	7.1 km to WSW	Unlikely. Suitable habitat may not occur.
Leptinella drummondii	Priority 3 DBCA	Clay loam, mud. Along rivers.	7.1 km to WSW	Unlikely. Suitable habitat may not occur.
Leucopogon alternifolius	Priority 3 DBCA	Grey/white sand. Swampy areas, seasonally wet areas.	1.7 km to S	Possible. Suitable habitat may occur.
Microtis globula	DBCA Threatened (VU) EPBC Vulnerable	Peaty soils. Winter-wet swamps.	1.35 km to N	Possible. Suitable habitat may occur.
Microtis pulchella	Priority 4 DBCA	Peaty sand. Winter-wet swamps.	1.87 km to NW	Possible. Suitable habitat may occur.
Microtis quadrata	Priority 4 DBCA	Swamps, drainage, winter wet flats.	8.4 km to SW	Possible. Suitable habitat may occur.
Myriophyllum trifidum	Priority 4 DBCA	Flood Plain, wetland, drainages, black peaty loam/sand.	6.4 km to S	Possible. Suitable habitat may occur.
Reedia spathacea	DBCA Threatened (EN) EPBC Critically Endangered	Peaty sand. Swamps, river edges.	In study area (PERTH 01127128)	Recorded. See footnote [2]. Possible. Suitable habitat may occur.
Rorippa cygnorum	Priority 2 DBCA	Damp depressions, drainages, granite. Brown loam	3.25 km to S	Unlikely. Suitable habitat may not occur.
Schizaea rupestris	Priority 2 DBCA	Sand. Gullies, creek banks, shaded moist rock faces.	Location appears to be in Nornalup Inlet. PERTH 03768562 record says Coalmine Beach, approx. 3 km to SE	Unlikely. Suitable habitat may not occur.
Sphenotoma drummondii	DBCA Threatened (EN) EPBC Endangered	Stony or shallow soils over granite or quartzite. Steep rocky slopes, crevices of rocks.	14.5 km to NE	Unlikely. Suitable habitat may not occur.
Stylidium leeuwinense	Priority 4 DBCA	Winter-wet habitats and depressions. Shrubland, heath, sedgeland or low woodland.	3.1 km to SW	Possible. Suitable habitat may occur.
Styphelia graniticola	Priority 2 DBCA	Loam, loam over granite. on hills, slopes.	7.3 km to S	Unlikely. Suitable habitat may not occur.
Synaphea intricata	Priority 3 DBCA	Sand, peaty sand. Flats, swampy areas.	8.1 km to SSW	Possible. Suitable habitat may occur.
Thomasia quercifolia	Priority 4 DBCA	Limestone heath, coastal. Karri forest on loam	1.8 km to SSW	Possible. Suitable habitat may occur.
Tripterococcus sp. Brachylobus (A.S. George 14234)	Priority 4 DBCA	Grey sandy loam, Eucalypt woodland	8.1 km to W	Possible. Suitable habitat may occur.
Verticordia lehmannii	Priority 4 DBCA	Sandy clay. Winter-wet flats.	8.1 km to WSW	Possible. Suitable habitat may occur.

[1] The record of *Banksia serra* recorded in the study area by the search (Accession PERTH 04128656) was made in 1994 with the location described as 'Middle Road, 4.3 km north of Rose Rd'. Both Middle Road and Rose Road are in the locality of Bow Bridge, approximately 20 km to the east of the study area.

[2] The record of *Reedia spathacea* located within the study area by the search (Accession PERTH 01127128) was made in 1933. A definite map reference may have been more difficult to define at that time, but also clearing may have occurred since as the area is now pasture.

5.1.4 Introduced flora

Twelve introduced taxa were recorded, or 8.6% of the total species list. Introduced species are listed in Table 14.

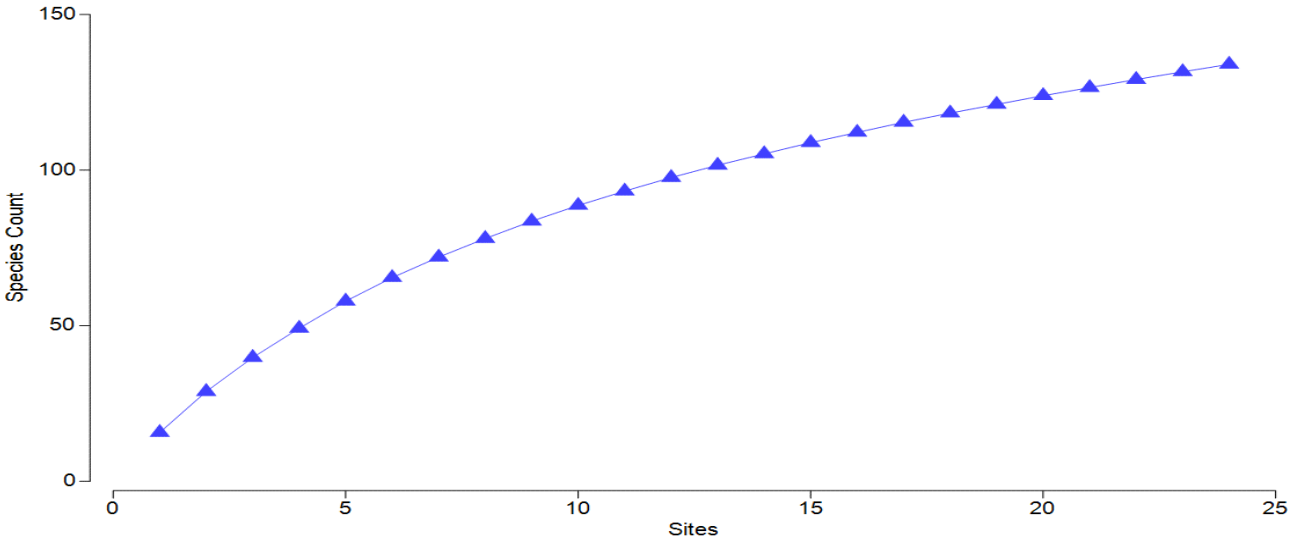
Table 14: Introduced taxa in the study area

Family	Scientific name	Common name
Asteraceae	*Hypochaeris glabra*	Smooth cat's-ear
Fabaceae	*Lotus subbiflorus*	Hairy bird's-foot trefoil
	Melilotus albus	White melilot
	Ornithopus pinnatus	Orange birdsfoot
	Trifolium repens var. *repens*	White clover
Myrtaceae	*Eucalyptus globulus*	Tasmanian bluegum (planted)
Poaceae	*Bromus diandrus*	Great brome
	Cenchrus clandestinus	Kikuyu
	Holcus lanatus	Yorkshire fog
	Lolium perenne	Perennial ryegrass
Polygonaceae	*Rumex acetosella*	Sheep sorrel
Rosaceae	*Rosa canina*	Dog rose

None of these species are WoNS (Weeds Australia, 2023) or Declared Pests under the BAM Act (2007).

5.1.5 Analysis of survey completeness

Following the survey, a species accumulation curve was made to aid in assessment of the thoroughness of the survey. As can be seen in Graph 2, while the curve is flattening it is still rising, indicating that not all taxa have been recorded. However it can be confidently said that the majority of taxa have been recorded.



Graph 2: Species accumulation curve for Swann Road borefield survey

5.2 Vegetation

5.2.1 Vegetation types

Twelve vegetation types were described for the study area based on the cluster analysis (Figure 3).

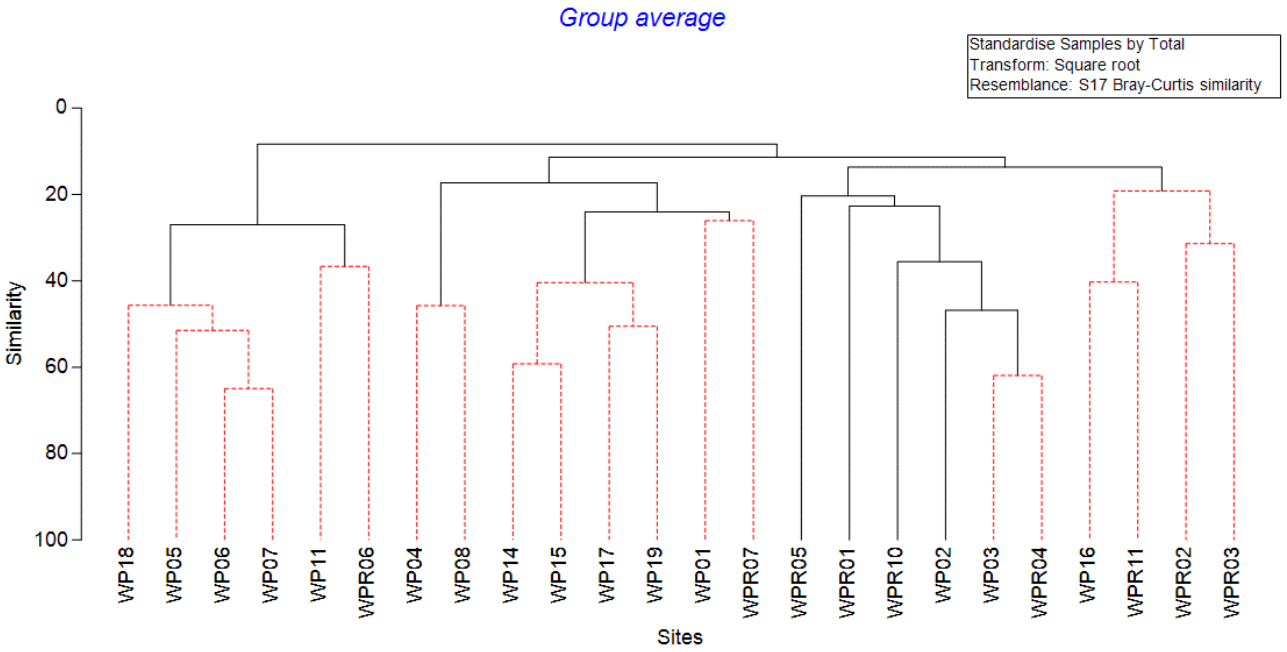


Figure 3: Dendrogram from cluster analysis

The sites in the dendrogram group together according to the presence/absence of species and can be jumbled when there are a number of common understorey species that occur in a variety of groupings, as is the case with this analysis. Despite the variety in the taxa present in the overstorey the commonality of understorey species, in particular the ubiquitous genus *Taxandria*, provides a background 'noise' that the analysis cannot cut through. When this situation occurs it can often be illuminated by a greater number of survey sites: however, the number required may be impractical in the context of a survey. For the purpose of this report the following vegetation units have been described for the study area, based on observed characteristics and species lists. A map of the vegetation is provided as Figure K. Survey site details are included as Appendix E.

Plate 2: EdAbLg vegetation unit (Photo WP05)

EdAbLg: *Eucalyptus diversicolor* tall woodland/open forest over *Eucalyptus patens, Allocasuarina decussata* mid closed/open forest/woodland over *Acacia browniana* var. *browniana* sparse shrubland, *Pteridium esculentum* tall sparse forbland, *Lepidosperma gladiatum* sparse sedgeland

Sites: WP18, WP05, WP06, WP07, WP11

Plate 3: EgAbToLg vegetation unit

EgAbToLg: *Eucalyptus guilfoylei* mid woodland over *Acacia browniana* var. *browniana*, *Trymalium odoratissimum* subsp. *trifidum*, *Kunzea sulphurea* tall shrubland over *Gahnia trifida*, *Lepidosperma gladiatum* tall open sedgeland, *Anarthria scabra* low sparse sedgeland

Sites: WPR06

Plate 4: PJh vegetation unit (Photo WPR05)

PJh: *Juncus holoschoenus* tall forbland over *Juncus pauciflorus*, **Hypochaeris glabra* low forbland, **Holcus lanatus* open low grassland

Sites: WPR05, VN3

Plate 5: EpmCec vegetation unit

EpmCec: *Eucalyptus patens, E. megacarpa, Taxandria linearifolia* mid open woodland over *Cenchrus clandestinus closed grassland

Sites: WPR01

Plate 6: CcEg vegetation unit

CcEg: *Corymbia calophylla, Eucalyptus guilfoylei* closed mid forest over *Cyathochaeta avenacea* mid sedgeland over **Holcus lanatus* open low grassland

Sites: WPR02

Plate 7: CcEpTICa vegetation unit

CcEpTICa: *Corymbia calophylla, Eucalyptus patens* closed mid woodland over *Kingia australis* sparse tall shrubland, *Taxandria linearifolia*, *Xanthorrhoea preissii* sparse mid shrubland over *Cyathochaeta avenacea* open mid sedgeland over **Cenchrus clandestinus, *Holcus lanatus* sparse grassland, *Opercularia hispidula, *Trifolium repens* var. *repens* sparse low forbland

Sites: WP02

Plate 8: TICa*HI vegetation type

TICa*HI: *Taxandria linearifolia* open tall shrubland over *Taraxis grossa, Cyathochaeta avenacea* closed sedgeland over **Holcus lanatus* sparse grassland

Sites: WP03

Plate 9: EmAfrTpLg vegetation unit (Photo WP14)

EmAfrTpLg: *Eucalyptus marginata* var. *marginata, Allocasuarina fraseriana* open mid forest/woodland over *Taxandria parviceps* mid shrubland over *Lepidosperma gladiatum* tall sedgeland

Sites: WP14, WP15, WP17, WPR07, WPR10

Plate 10: EpTpDh vegetation unit (Photo WP04)

EpTpDh: *Eucalyptus patens* open mid woodland over *Taxandria parviceps, Xanthorrhoea preissii* mid shrubland over *Dampiera hederacea* sparse low shrubland, *Anarthria prolifera* open low sedgeland

Sites: WP19, WP04, WP08

Plate 11: CcTBsLt (Photo WPR04)

CcTBsLt: *Corymbia calophylla*, (*Eucalyptus patens*) sparse low trees over *Taxandria* spp., *Beaufortia sparsa, Homalospermum firmum* mid shrubland over *Leptocarpus thysananthus*, *Anarthria scabra, Lepidosperma gladiatum* sparse sedgeland

Sites: WP16, WP01, WPR03, WPR04, WPR11

Eglo: *Eucalyptus globulus* shelter belt plantations

Sites: VN01, VN02

Paddock: A mix of introduced species including **Holcus lanatus, *Trifolium repens* var. *repens, *Cenchrus clandestinus*

A mapping unit was also described to cover the areas that had been cleared for infrastructure, for example the Walpole airstrip and associated Plain Road.

Table 15 shows the total areas of each vegetation unit within the study are and the percentage of each unit (allowing for rounding errors).

Table 15: Vegetation type areas

Vegetation type name	Area (ha)	% of study area
EdAbLg	36.8	7.33
EgAbToLg	4.7	0.94
EpmCec	2.3	0.46
CcEg	0.8	0.16
CcEpTlCa	7.3	1.45
TlCa*Hl	1.1	0.22
EmAfrTpLg	2.6	0.52
EpTpDh	51.0	10.15
CcTBsLt	178.1	35.46
Eglo	5.6	1.11
PJh	67.8	13.50
Paddock	131.6	26.20
Cleared	12.7	2.53
Total	**502.3 (502.1)**	**100.03**

5.2.2 Vegetation condition

Three condition classifications were assigned for the mapping vegetation units in the study area, using the scale of Keighery (1994) as outlined in EPA (2016). Table 16 outlines these and breaks down the total areas by vegetation unit. Vegetation condition is mapped as Figure L.

Table 16: Vegetation condition in the study area

Condition	Vegetation type	Area (ha)	Total area (ha)
Excellent	AbToLg	0.395386	209.962436 (41.8%)
	CcTBsLt	121.753835	
	EdAbLg	34.320669	
	EgAbToLg	0.414467	
	EmAfrTpLg	2.124253	
	EpTpDh	50.953826	
Very Good-Good	CcEg	0.752428	15.893124 (3.2%)
	CcEpTlCa	7.254864	
	AbToLg	3.828701	
	CcTBsLt	0.524531	
	EdAbLg	2.430585	
	TlCa*Hl	1.102015	
Completely Degraded	Eglo	5.566012	276.243043 (55%)
	EmAfrTpLg	0.51455	
	EpmCec	2.250981	
	Paddock	187.393185	
	PJh	67.816399	
	Cleared/infrastructure	12.701916	
Total			**502.098603**

5.2.3 Significant vegetation

No conservation significant vegetation was recorded in the study area.

It should be noted, however, that the vegetation type **CcTbsLt** contains floristic elements of the state listed PEC '*Reedia spathacea – Empodisma gracillimum – Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region', albeit without the presence of the Threatened taxon *Reedia spathacea*. If at any time present, this taxon may have been significantly impacted by the recent fire and not yet be recovering. However, it is also noted that the community type '*Empodisma* peatlands of southwestern Australia' has been nominated for listing as a TEC under the EPBC Act with a decision from the Threatened Species Scientific Committee due 30 April 2023 (DCCEEW, 2023c). This umbrella community type will include the PEC and will also include the surveyed vegetation type here described even if the *Reedia spathacea* is not shown to occur. At the time of writing this listing status had not changed.

5.3 Survey limitations

Botanists who conduct flora and vegetation surveys for environmental impact assessment in Western Australia are obliged to report on the limitations and constraints in such studies. Some potential limitations / constraints on surveys may adversely impact on the scientific rigour, completeness or validity of the survey results. The EPA (2016b) identifies standard limitations that can limit and constrain the validity of flora and vegetation surveys, and these are addressed in Table 17.

Table 17: Potential survey limitations

Constraint	Limitation?	Discussion
Availability of contextual information at a regional and local scale	No	Reports of vegetation surveys conducted in the local area were available
Competence and experience of the field team	No	The lead botanist has over 20 years' experience in botanical survey across Western Australia and has previously conducted surveys in the Walpole–Denmark region
Proportion of flora recorded and/or collected, and problems with taxonomic determinations	No	No problems with taxonomy, but conditions may have restricted the proportion of flora collected (see Disturbance below)
The effort and extent of the survey	No	All areas were visited, the analysis showed two that needed better coverage
Survey timing, rainfall, season of survey	No	Both the Primary and Supplementary surveys were interrupted by rain, however rainfall over the survey periods was above average and the flowering season appeared to be excellent
Disturbances that may have affected the results of survey such as fire, flood or clearing.	Yes	Parts of the study area had been burnt two years prior to the survey being undertaken, resulting in some areas (particularly wetlands) being dense with regrowth. The density made it difficult to thoroughly search quadrats and also contributed to trampling of the vegetation
Access restrictions within the survey area	No	The western and southern sides of the study area required a Regulation 4 permit to enter but all areas were otherwise accessible. The first survey visit was constrained by the volume of surface water flowing through parts of the study area but the second visit in December had better conditions

6 DISCUSSION

6.1 Flora

One hundred and twenty-nine native taxa were recorded from 35 families and 81 genera. The Fabaceae and the Myrtaceae were the families with the greatest representation, with 23 and 22 taxa respectively. The Cyperaceae were represented by 11 taxa.

This proportional representation of families aligns with the previous surveys reviewed for the Desktop study phase of this survey. Fabaceae was the family with the highest representation in each of these, with Myrtaceae and Cyperaceae variable but also dominant.

6.1.1 Significant flora

One conservation significant species was recorded during the survey.

Aotus carinata (P4) was recorded at several sites on the northern edge of the study area and near the Walpole airstrip. This taxon is described as a slender shrub to 1.5 m tall (Western Australian Herbarium, 1998-), although it was recorded at 4 m tall in the study area.

Thirty-two individuals were recorded in low-lying dense scrub. Because of this apparent habitat preference searching for and identifying this taxon was difficult and systematic searching was impossible. Specimens recorded are located alongside tracks where access is possible.

The desktop assessment revealed the existence of a record of *Reedia spathacea* (T) in the south of the study area. Reference to the record held by the WA Herbarium (Western Australian Herbarium 1998-) indicates that the record was made in 1933 (PERTH 01127128). It was found during the survey that even if an accurate location was recorded, the area it purportedly grew in has now been cleared for agriculture and the specimen does not occur here.

Banksia serra (P4) was also identified as occurring in the study area by the desktop assessment. Examination of the record held by the WA Herbarium (Western Australian Herbarium, 1998-) ”PERTH 04128656”, shows that this particular record was made from “Middle Road, 4.3 km south of Rose Road” in 1994. Both Middle Road and Rose Road are in the locality of Bow Bridge, which is approximately 20 km to the east of the study area. The placement of this record within the study area is perhaps an indication of the difficulty of transforming pre-digital records or of the difficulty of arriving at exact coordinates using compass and map references.

6.1.2 Introduced flora

Thirteen introduced taxa were recorded during the survey. With the exception of the *Eucalyptus globulus* and *Pinus radiata* most appear to be common weeds of pasture and farmland. The *Eucalyptus* has been planted in stands to provide windbreaks and shelter in the exposed paddocks.

No Weeds of National Significance or Declared Pests were recorded during the survey.

6.2 Vegetation

6.2.1 Significant vegetation

No conservation significant vegetation was recorded during this survey.

It should be noted, however, with regards to the Priority 1 ecological community ‘*Reedia spathacea* - *Empodisma gracillimum* - *Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region’. The two taxa *Empodisma gracillimum* and *Schoenus multiglumis* were recorded in dampland at the site WP08. *Homalospermum firmum* was also recorded at this site. These taxa are not, individually, of conservation significance. *Reedia spathacea* is a Threatened species under the BC Act, and without its presence this vegetation is not considered to align with the PEC.

Reedia spathacea is also listed as Critically Endangered under the EPBC Act (1999) as it has undergone a decline in numbers and has a restricted geographic range (DEWHA, 2008).

However, as the site was burnt two years previously and fire is known to cause considerable damage to the taxon, it is therefore possible that the vegetation mapping unit **CcTBsLt**, in which WP08 is recorded, will develop (or redevelop) populations of the *Reedia* as the wetland/dampland vegetation matures following the 2020 fire. This would then fulfil the requirements to be considered as the Priority 1 Ecological Community. Monitoring of the vegetation should occur to check for the emergence or re-emergence of the *Reedia*.

'Empodisma peatlands of southwestern Australia' has been nominated as an Endangered TEC under the EPBC Act, with the recommendations of the Threatened Species Scientific Committee due to the Minister for the Environment by 30 April 2023. This umbrella category will encompass various community types on peatlands and include the DBCA listed PEC and the mapped vegetation type **CcTBsLt** in the study area. No final listing advice is available at the time of writing.

No vegetation representative of the Priority 3 ecological community 'Subtropical and Temperate Coastal Saltmarsh' equivalent to the EPBC listed TEC of the same name was recorded during the survey, and RPS is confident this PEC does not occur in the study area.

6.2.2 Vegetation condition

The study area has been subject to considerable disturbance, with 55% classified as Completely Degraded. The majority of this area is the result of clearing for agriculture, roads and infrastructure. Some adjacent areas of remnant vegetation have been degraded due largely to weed invasion from the agricultural land. The remaining 45% of the vegetation in the study area is classified as in Good to Excellent condition.

6.3 Conclusions

No conservation significant vegetation was recorded during this survey.

One conservation significant flora species *Aotus carinata* (P4) was recorded in dense low-lying scrub.

Over 50% of the study area is classified as Completely Degraded condition. The remainder is Good to Excellent condition, with over 40% assessed as Excellent.

The potential exists that a percentage of the remnant native vegetation in damplands will prove to be the Priority 1 ecological community '*Reedia spathacea – Empodisma gracillimum – Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region' as the pyrosere communities mature. Monitoring should be undertaken to address this possibility as the project continues.

It should also be noted that even if this proves not to be the case, the **CcTBsLt** vegetation type mapped in the study area may be listed in the future as an Endangered TEC under the EPBC Act.

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Figures

Figure A

Soil landscape units

GDA2020 MGA Zone 50

0 250 500 1,000 m

Job Number: EP4220-001
Date: 2/05/2023
Scale: Map 1:10,000 @ A3
Created by: clare.thatcher
Source: DMIRS, 2023

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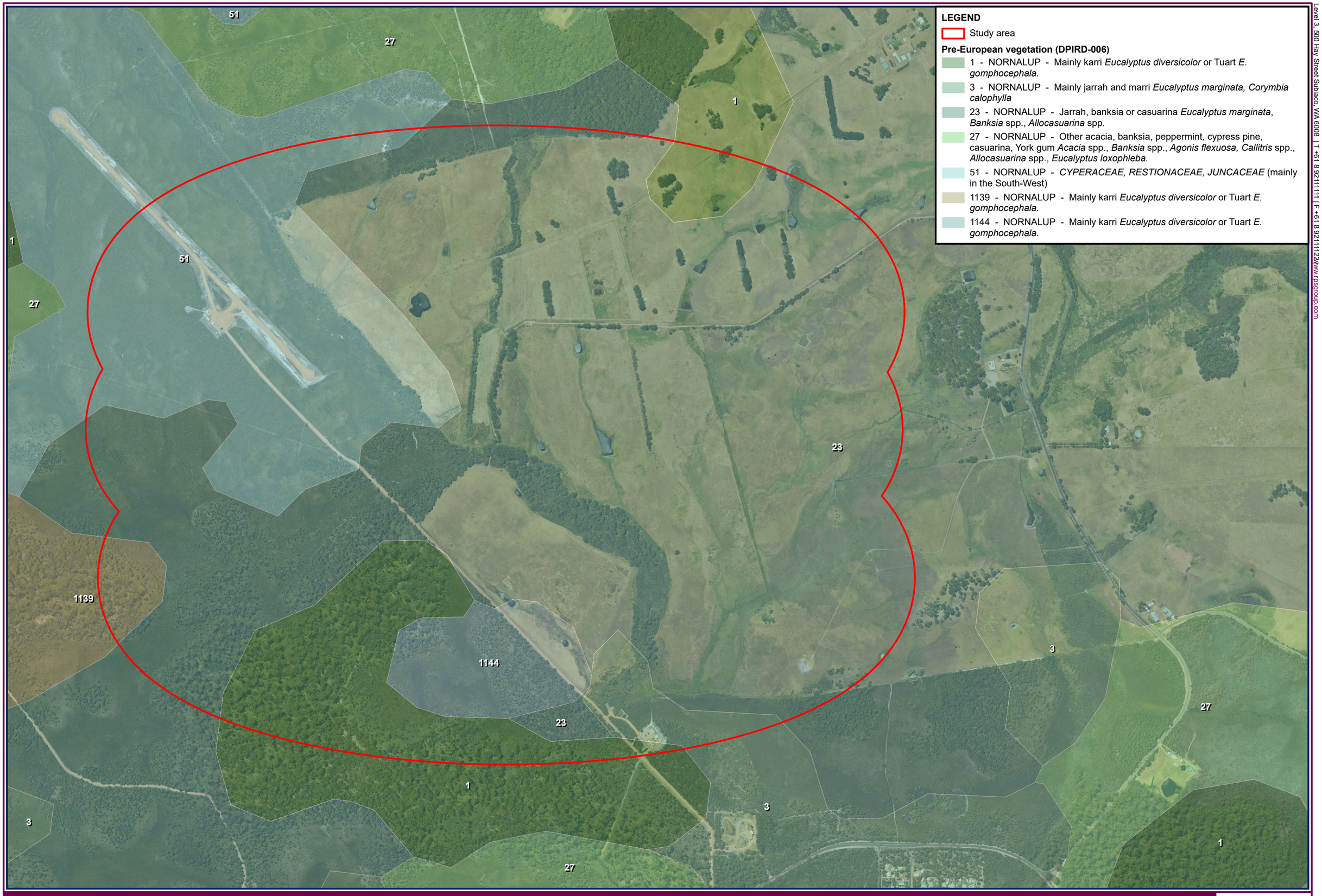

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Figure B

Pre-European vegetation association

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 2/05/2023
Scale: Map 1:11,000 @ A3
Created by: clare.thatcher
Orthophoto - Landgate, 2023

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Figure C

Mattiske and Havel vegetation complexes

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 2/05/2023
Scale: Map 1:10,000 @ A3
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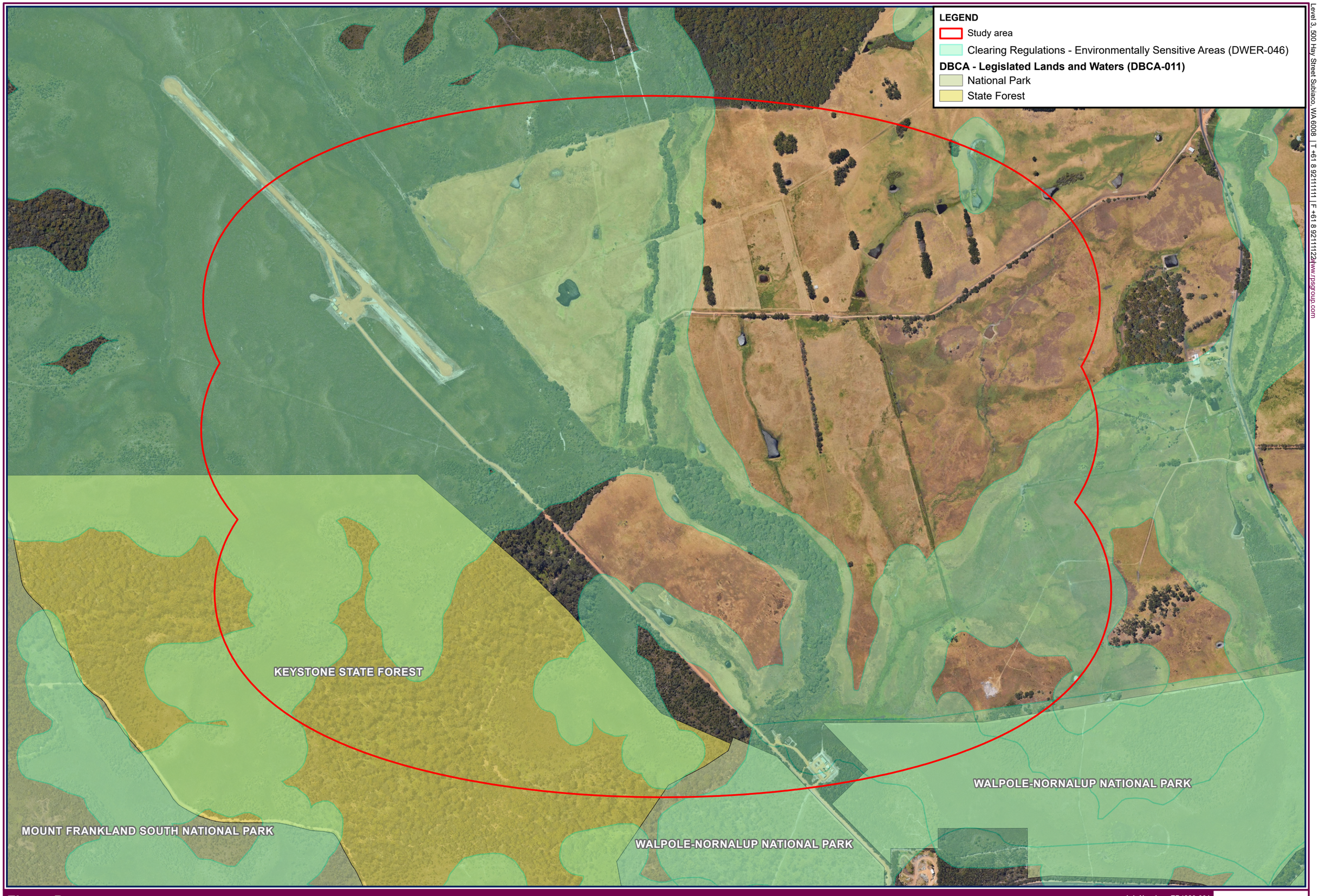

Figure D

Environmentally Sensitive Areas and conservation areas

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:10,000 @ A3
Created by: clare.thatcher
Orthophoto - Landgate, 2023

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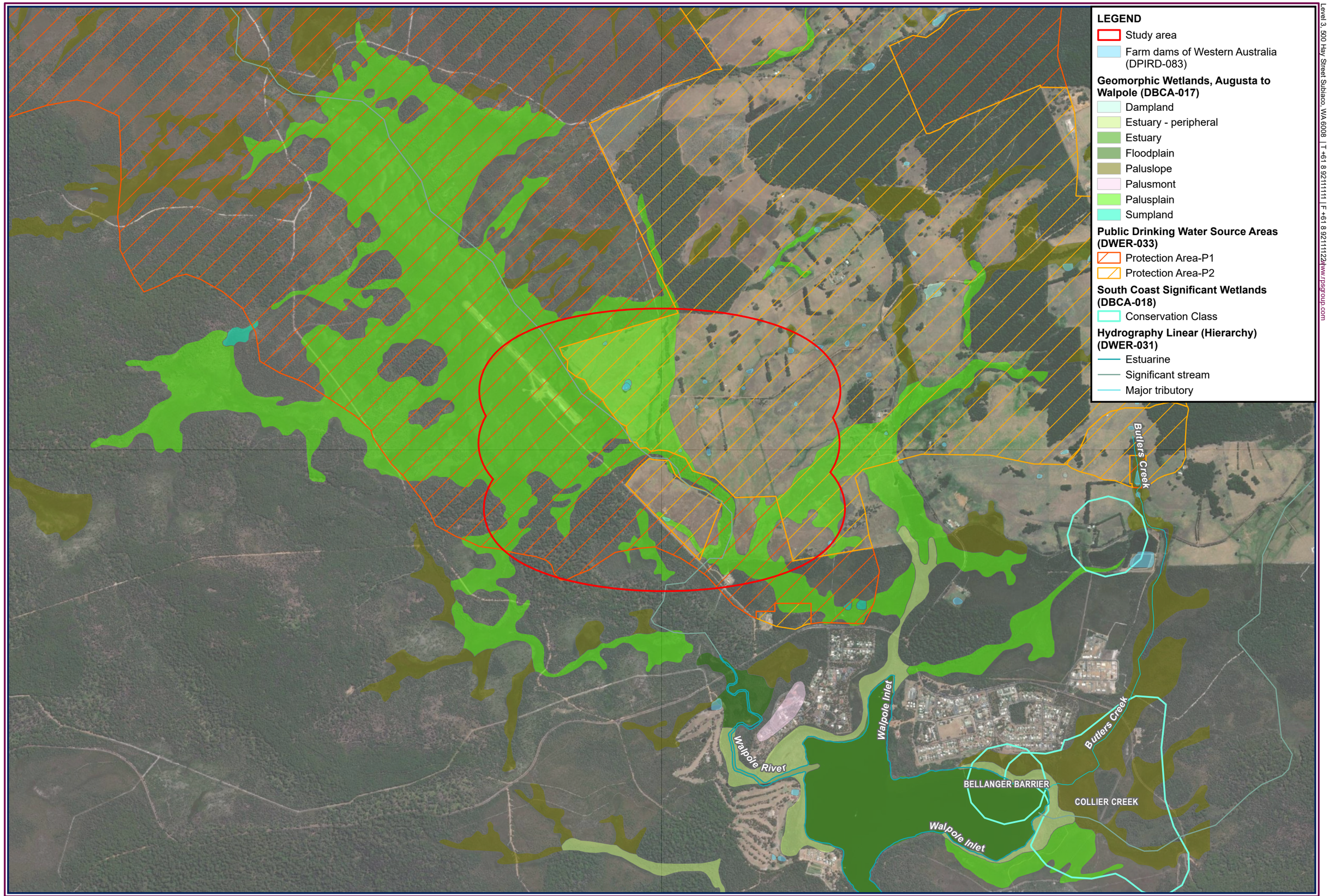

Figure E
Geomorphic and significant wetlands, watercourses and Public Drinking Water Source Areas

GDA2020 MGA Zone 50

0 0.5 1 2 km

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:25,000 @ A3
Created by: clare.thatcher
Orthophoto - ESRI, 2023

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Document Path: \\rpsperfs02\cartography\Jobs\EP_Jobs\EP4220 WC Flora Swann Rd Borefield Enviro Surveys\Figures EP4220.001\EP4220_001_BorefieldRequest_230315.aprx

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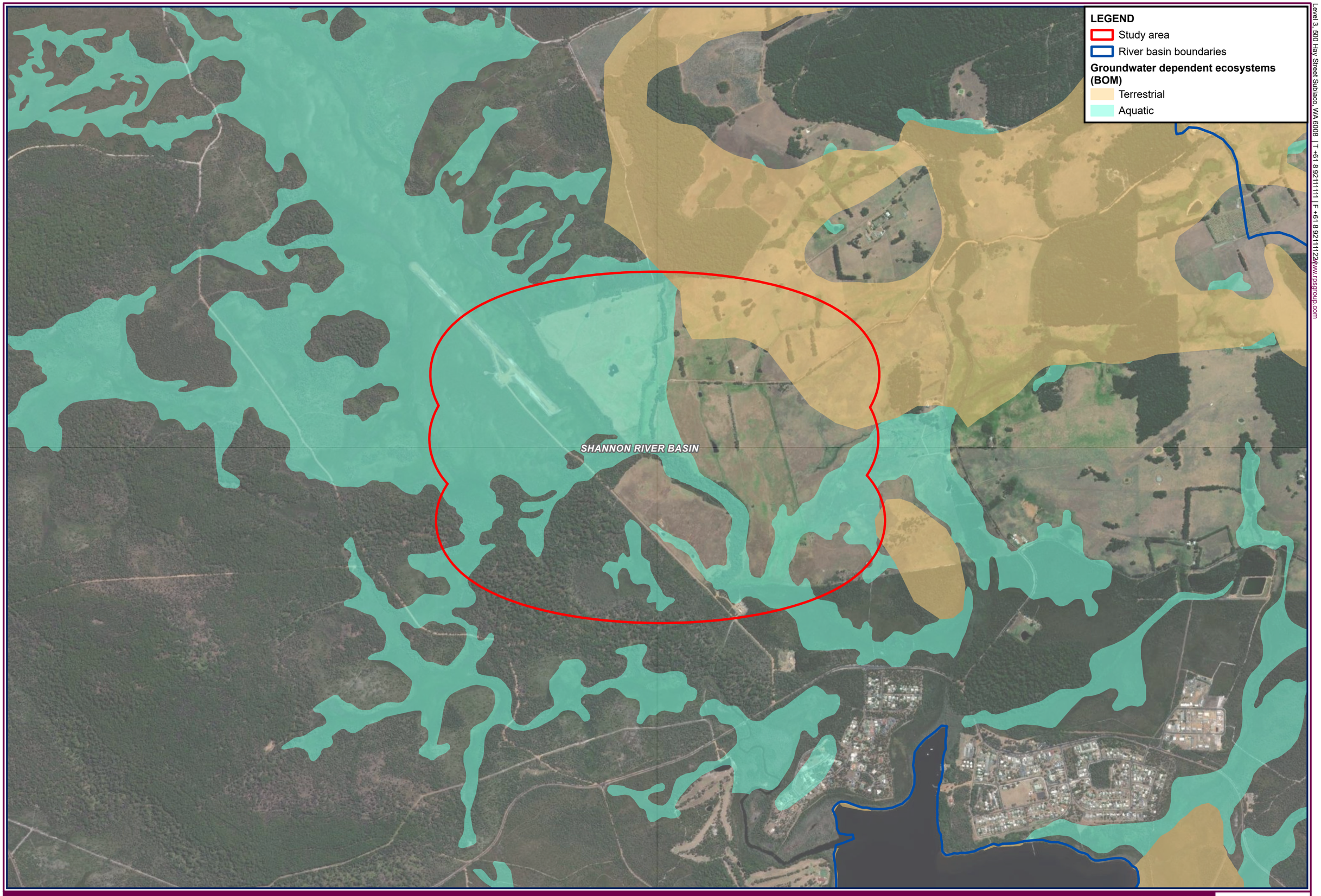

Figure F

Groundwater Dependent Ecosystems

GDA2020 MGA Zone 50

0 0.5 1 2 km

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:20,000 @ A3
Created by: clare.thatcher
Orthophoto - Landgate, 2023

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Document Path: \\rpsperfs02\cartography\Jobs\EP_Jobs\EP4220 WC Flora Swann Rd Borefield Enviro Surveys\Figures EP4220.001\EP4220_001_BorefieldRequest_230315.aprx

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LEGEND

- Study area
- 10km search area

Threatened and Priority Ecological Communities data (DBCA)

- Priority 1, *Reedia spathacea - Empodisma gracillimum - Schoenus multiglumis* dominated peat paluslopes and sandy mud floodplains of the Warren Biogeographical Region.
- Priority 2, Sphagnum Communities of the Tingle
- Priority 3, Subtropical and Temperate Coastal Saltmarsh

Threatened and Priority flora data (DBCA)

- Priority 2
- Priority 3
- Priority 4
- Threatened

GDA2020 MGA Zone 50

0 1.25 2.5 5 km

Figure G

DBCA flora and ecological community database searches

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:80,000 @ A3
Created by: clare.thatcher
Orthophoto - ESRI 2023

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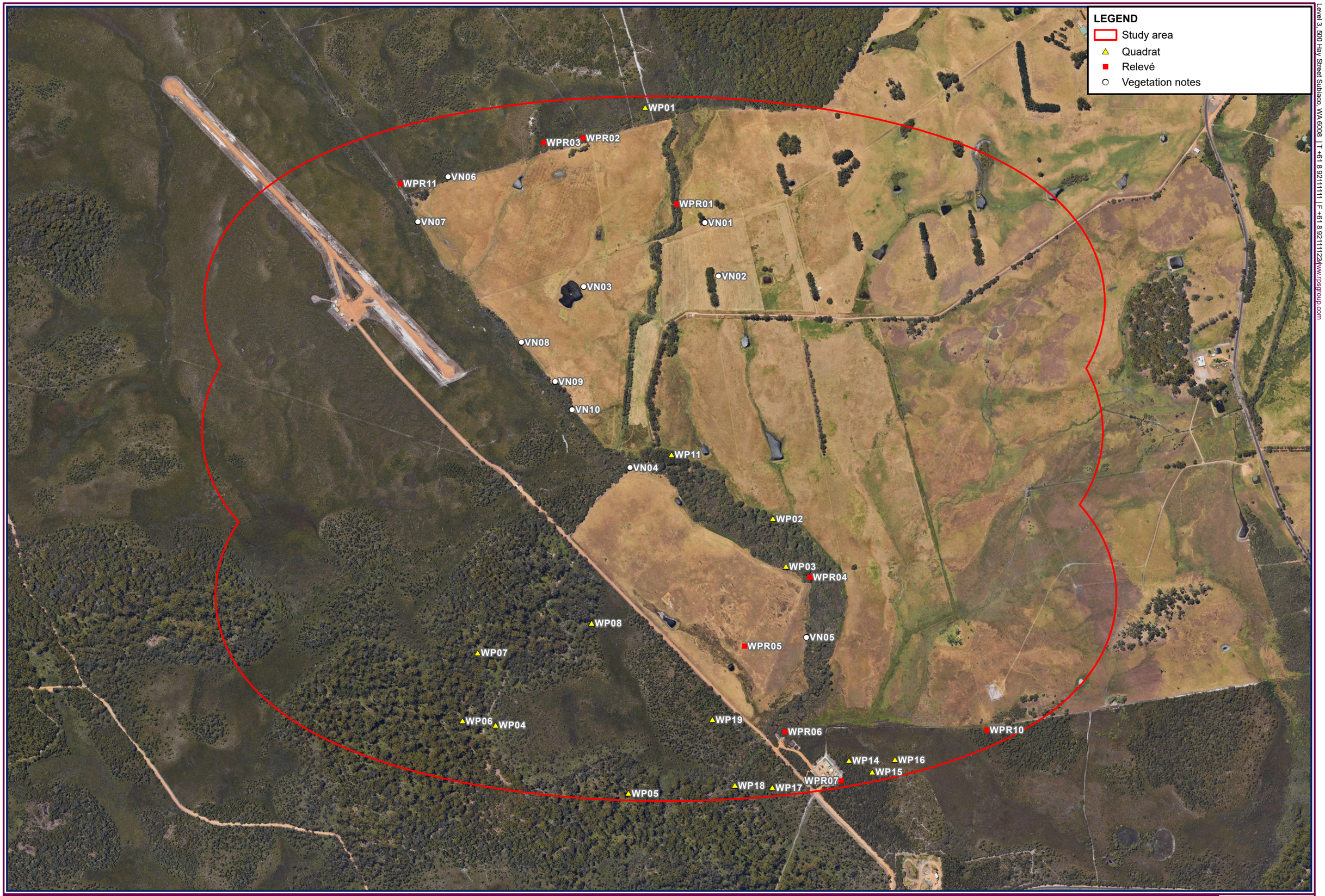

Figure H

Quadrat, relevé and vegetation note locations

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:10,000 @ A3
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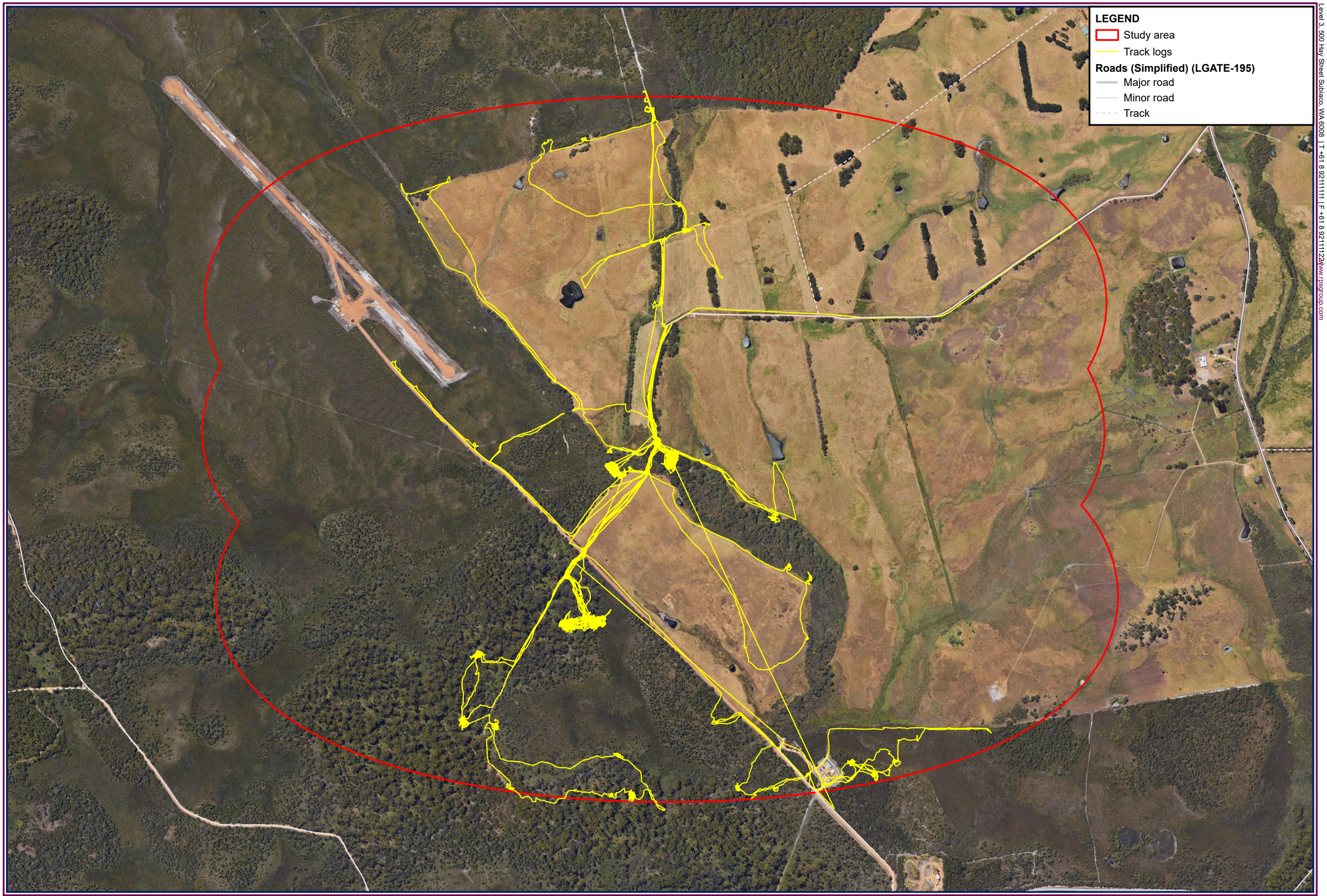

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Figure I

Track logs

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:10,000 @ A3
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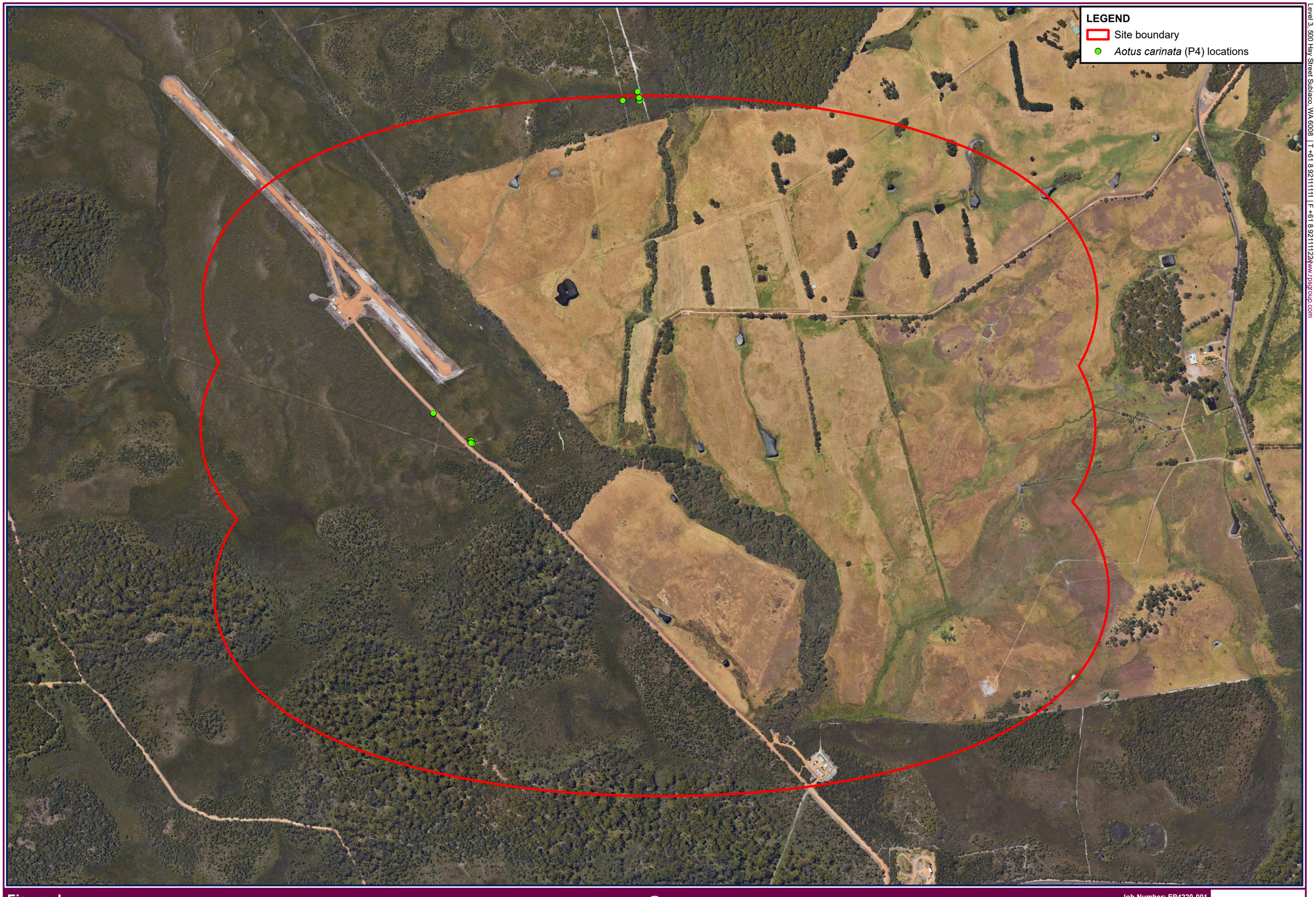

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Figure J

***Aotus carinata* (P4) locations**

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:10,000 @ A3
Created by: clare.thatcher
Source: Cadastre - Landgate, 2023 Orthophoto - Landgate, 2023

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Vegetation type	Description
CcEg	*Corymbia calophylla, Eucalyptus guilfoylei* closed mid forest over *Cyathochaeta avenacea* mid sedgeland over **Holcus lanatus* open low grassland
CcEpTlCa	*Corymbia calophylla, Eucalyptus patens* closed mid woodland over *Kingia australis* sparse tall shrubland, *Taxandria linearifolia*, *Xanthorrhoea preissii* sparse mid shrubland over *Cyathochaeta avenacea* open mid sedgeland over **Cenchrus clandestinus, *Holcus lanatus* sparse grassland, *Opercularia hispidula, *Trifolium repens* var. *repens* sparse low forbland
CcTBsLt	*Corymbia calophylla*, (*Eucalyptus patens*) sparse low trees over *Taxandria* spp., *Beaufortia sparsa, Homalospermum firmum* mid shrubland over *Leptocarpus thysananthus*, *Anarthria scabra, Lepidosperma gladiatum* sparse sedgeland
EdAbLg	*Eucalyptus diversicolor* tall woodland/open forest over *Eucalyptus patens, Allocasaurina decussata* mid closed/open forest/woodland over *Acacia browniana* var. *browniana* sparse shrubland, *Pteridium esculentum* tall sparse forbland, *Lepidosperma gladiatum* sparse sedgeland
EgAbToLg	*Eucalyptus guilfoylei* mid woodland over *Acacia browniana* var. *browniana*, *Trymalium odoratissimum* subsp. *trifidum*, *Kunzea sulphurea* tall shrubland over *Gahnia trifida*, *Lepidosperma gladiatum* tall open sedgeland, *Anarthria scabra* low sparse sedgeland
Eglo	*Eucalyptus globulus* shelter belt plantations
EmAfrTpLg	*Eucalyptus marginata* var. *marginata, Allocasuarina fraseriana* open mid forest/woodland over *Taxandria parviceps* mid shrubland over *Lepidoserma gladiatum* tall sedgeland
EpTpDh	*Eucalyptus patens* open mid woodland over *Taxandria parviceps, Xanthorrhoea preissii* mid shrubland over *Dampiera hederacea* sparse low shrubland, *Anarthria prolifera* open low sedgeland
EpmCec	*Eucalyptus patens, E. megacarpa, Taxandria linearifolia* mid open woodland over **Cenchrus clandestinus* closed grassland
PJh	*Juncus holoschoenus* tall forbland over *Juncus pauciflorus*, **Hypochaeris glabra* low forbland, **Holcus lanatus* open low grassland
TlCa*Hl	*Taxandria linearifolia* open tall shrubland over *Taraxis grossa, Cyathochaeta avenacea* closed sedgeland over **Holcus lanatus* sparse grassland
Paddock	A mix of introduced species including **Holcus lanatus, *Trifolium repens* var. *repens, *Cenchrus clandestinus*

Figure K

Vegetation units

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:12,500 @ A3
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Figure L

Vegetation condition

GDA2020 MGA Zone 50

0 125 250 500 m

Job Number: EP4220-001
Date: 27/06/2023
Scale: Map 1:10,000 @ A3
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Appendix A
Conservation category definitions

APPENDIX A: CONSERVATION CATEGORY DEFINITIONS

Table A-1: Conservation codes for Western Australian flora

Category	Definition
Threatened species	
T	**Threatened species** Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). **Threatened flora** is the species of flora that are listed as critically endangered, endangered or vulnerable threatened species.
CR	**Critically endangered species** 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".
EN	**Endangered species** 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".
VU	**Vulnerable species** 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".
Extinct species	
Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	**Extinct species** Species where "there is no reasonable doubt that the last member of the species has died".
EW	**Extinct in the wild species** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form".
Priority species	
P	Species that may possibly be threatened species that do not meet the criteria for listing under the BC Act because of insufficient survey or are otherwise data deficient, are added to the Priority Flora list under Priorities 1, 2 or 3. These three categories are ranked in order of prioritisation for survey and evaluation of conservation status so that consideration can be given to potential listing as threatened. Species that are adequately known, meet criteria for near threatened, or are rare but not threatened, or that have been recently removed from the threatened species list for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.
P1	**Priority 1: Poorly-known species – known from few locations, none on conservation lands** 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 for threatened listing and appear to be under immediate threat from known threatening processes. These species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species – known from few locations, some on conservation lands** 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.

Category	Definition
P3	**Priority 3: Poorly known species – known from several locations** 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. These species need further survey.
P4	**Priority 4: Rare, near threatened and other species in need of monitoring** a. Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. b. Near threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as a conservation dependent specially protected species. c. Species that have been removed from the list of threatened species or lists of conservation dependent or other specially protected species, during the past five years for reasons other than taxonomy. d. Other species in need of monitoring.

Table A-2: EPBC Act conservation codes

Category	Definition
EX	**Extinct** A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual) throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
EW	**Extinct in the Wild** A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual) throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
CR	**Critically Endangered** A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
EN	**Endangered** A taxon is Endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
VU	**Vulnerable** A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

Table A-3: Threatened ecological communities category of threat

Category	Definition
Presumed Totally Destroyed (PD)	An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies: a. Records within the last 50 years have not been confirmed despite thorough searches or known or likely habitats or b. All occurrences recorded within the last 50 years have since been destroyed.
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (a, b or c): a. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i. Geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately ten years) ii. Modification throughout its range is continuing such that in the immediate future (within approximately ten years) the community is unlikely to be capable of being substantially rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. Geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately ten years) ii. There are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes iii. There may be many occurrences, but total area is very small, and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. c. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately ten years).
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b, or c): a. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. The estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short-term future (within approximately 20 years) ii. Modification throughout its range is continuing such that in the short-term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. b. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. Geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short-term future (within approximately 20 years) ii. There are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii) there may be many occurrences, but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. c. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Category	Definition
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium (within approximately 50 years) to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (a, b or c): a. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. b. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations. c. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long-term future because of existing or impending threatening processes.

Table A-4: Priority ecological communities category of threat

Category	Definition
P1	**Priority one: Poorly known ecological communities** Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). 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.
P2	**Priority two: Poorly known ecological communities** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat (within approximately ten 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	**Priority three: Poorly known ecological communities** 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: 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 ten years), or 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	**Priority four: Ecological communities that are adequately known, rare but not threatened or meet criteria for near threatened or that have been recently removed from the threatened list. These communities require regular monitoring** Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These communities are usually represented on conservation lands. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for a higher threat category. Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	**Priority five: 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.

Table A-5: EPBC Act listed threatened ecological communities category of threat

Category	Definition
CE	**Critically endangered** Extremely high risk of extinction in the next ten years, or three generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 60 years.
E	**Endangered** Extremely high risk of extinction the next 20 years, or five generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 100 years.
V	**Vulnerable** Extremely high risk of extinction in the next 50 years, or within ten generations of any long-lived or key species believed to play a major role in sustaining the community (whichever is the longer), up to a maximum of 100 years.

Table A-6: NVIS vegetation structure classes

Growth form	Height	Structural formation classes (% cover)					
		80–100	50–80	20–50	0.25–20	0–0.25	Unknown
Tree, palm	Tall; Mid; Low	Closed forest	Open forest	Woodland	Open woodland	Isolated trees	Isolated clumps of trees
Tree mallee	Tall; Mid; Low	Closed mallee forest	Open mallee forest	Mallee woodland	Open mallee woodland	Isolated mallee trees	Isolated clumps of mallee trees
Shrub, cycad, grass-tree, tree-fern	Tall; Mid; Low	Closed shrubland	Shrubland	Open shrubland	Sparse shrubland	Isolated shrubs	Isolated clumps of shrubs
Mallee shrub	Tall; Mid; Low	Closed mallee shrubland	Mallee shrubland	Open mallee shrubland	Sparse mallee shrubland	Isolated mallee shrubs	Isolated clumps of mallee shrubs
Heath shrub	Tall; Mid; Low	Closed heathland	Heathland	Open heathland	Sparse heathland	Isolated heath shrubs	Isolated clumps of heath shrubs
Chenopod shrub	Tall; Mid; Low	Closed chenopod shrubland	Chenopod shrubland	Open chenopod shrubland	Sparse chenopod shrubland	Isolated chenopod shrubs	Isolated clumps of chenopod shrubs
Samphire shrub	Mid; Low	Closed samphire shrubland	Samphire shrubland	Open samphire shrubland	Sparse samphire shrubland	Isolated samphire shrubs	Isolated clumps of samphire shrubs
Hummock grass	Mid; Low	Closed hummock grassland	Hummock grassland	Open hummock grassland	Sparse hummock grassland	Isolated hummock grasses	Isolated clumps of hummock grasses
Tussock grass	Mid; Low	Closed tussock grassland	Tussock grassland	Open tussock grassland	Sparse tussock grassland	Isolated tussock grasses	Isolated clumps of tussock grasses
Other grass	Mid; Low	Closed grassland	Grassland	Open grassland	Sparse grassland	Isolated grasses	Isolated clumps of grasses
Sedge	Mid; Low	Closed sedgeland	Sedgeland	Open sedgeland	Sparse sedgeland	Isolated sedges	Isolated clumps of sedges
Rush	Mid; Low	Closed rushland	Rushland	Open rushland	Sparse rushland	Isolated rushes	Isolated clumps of rushes
Forb (herb)	Mid; Low	Closed forbland	Forbland	Open forbland	Sparse forbland	Isolated forbs	Isolated clumps of forbs
Fern		Closed fernland	Fernland	Open fernland	Sparse fernland	Isolated ferns	Isolated clumps of ferns

Table A-7: NVIS vegetation height classes

Height		Growth form			
Height class	Height range (m)	Tree, vine (m and u), palm (single-stemmed)	Shrub, heath shrub, chenopod shrub, ferns, samphire shrub, cycad, tree-fern, grass-tree, palm (multi-stemmed)	Tree mallee, mallee shrub	Tussock grass, hummock grass, other grass, sedge, rush, forbs, vine (g)
8	>30	Tall			
7	10–30	Mid		Tall	
6	<10	Low		Mid	
5				Low	
4	>2		Tall		Tall
3	1–2		Mid		Tall
2	0.5–1		Low		Mid
1	<0.5		Low		Low

Table A-8: Vegetation condition scale

Condition		South West and Interzone Botanical provinces	Eremaean and Northern Botanical provinces
P	Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	NA
E	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.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
V	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.	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
G	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.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
	Poor	NA	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
D	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.	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
C	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.	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

Appendix B
Protected Matters database for MNES

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: 03-Mar-2023

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

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	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	56
Listed Migratory Species:	45

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 environment anywhere.

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 https://www.dcceew.gov.au/parks-heritage/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:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	65
Whales and Other Cetaceans:	12
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:	6
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	6
Key Ecological Features (Marine):	None
Biologically Important Areas:	11
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

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
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur within area	In buffer area only

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 likely to occur within area	In feature area
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 may occur within area	In buffer area only
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area	In feature area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area	In feature area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Zanda baudinii listed as Calyptorhynchus baudinii Baudin's Cockatoo, Baudin's Black-Cockatoo, Long-billed Black-cockatoo [87736]	Endangered	Breeding known 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
CRUSTACEAN			
Engaewa walpolea Walpole Burrowing Crayfish [82676]	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
Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat known to occur within area	In feature area
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only
FROG			
Spicospina flammocaerulea Sunset Frog [64782]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
MAMMAL			
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat known to occur within area	In feature area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area	In feature area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In buffer area only
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In buffer area only
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat likely to occur within area	In feature area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat known to occur within area	In feature area
OTHER			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area	In feature area
PLANT			
Banksia verticillata Granite Banksia, Albany Banksia, River Banksia [8333]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Caladenia harringtoniae Harrington's Spider-orchid, Pink Spider-orchid [56786]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Calectasia cyanea Blue Tinsel Lily [7669]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
Diuris drummondii Tall Donkey Orchid [4365]	Vulnerable	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
Kennedia glabrata Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat known to occur within area	In feature area
Microtis globula South-Coast Mignonette Orchid [6780]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Reedia spathacea Reedia [2995]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Sphenotoma drummondii Mountain Paper-heath [21160]	Endangered	Species or species habitat may occur within area	In buffer area only
REPTILE			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Chelonia mydas			
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Dermochelys coriacea			
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
SHARK			
Carcharias taurus (west coast population)			
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Carcharodon carcharias			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Galeorhinus galeus			
School Shark, Eastern School Shark, Snapper Shark, Tope, Soupfin Shark [68453]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
Rhincodon typus			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
SPIDER			
Bertmainius tingle			
Tingle Pygmy Trapdoor Spider [89126]	Endangered	Species or species habitat known to 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]		Breeding known to occur within area	In feature area
Ardenna grisea			
Sooty Shearwater [82651]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Hydroprogne caspia Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Onychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In buffer area only
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In buffer area only
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In buffer area only
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat may occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat may occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may 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
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may 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 likely to occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		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 may occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Unknown		
Commonwealth Land - [51550]	WA	In buffer area only

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]		Breeding known to occur within area	In feature area
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may 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 may occur within area	In feature area
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 likely 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
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area	In buffer area only
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Species or species habitat may occur within area	In buffer area only
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Breeding known to occur within area	In buffer area only
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour known to occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within 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 may occur within area	In feature area
Onychoprion anaethetus as Sterna anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In feature area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Puffinus assimilis Little Shearwater [59363]		Breeding known to occur within area	In buffer area only
Stercorarius skua as Catharacta skua Great Skua [823]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area	In feature area
Fish			
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area	In buffer area only
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area	In buffer area only
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area	In buffer area only
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area	In buffer area only
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area	In buffer area only
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area	In buffer area only
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area	In buffer area only
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area	In buffer area only
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area	In buffer area only
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area	In buffer area only
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area	In buffer area only
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area	In buffer area only
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area	In buffer area only
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area	In buffer area only
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area	In buffer area only
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area	In buffer area only
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area	In buffer area only
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area	In buffer area only
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area	In buffer area only
Mammal			
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area	In buffer area only
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Endangered	Species or species habitat may occur within area	In buffer area only
Reptile			
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area	In buffer area only

Whales and Other Cetaceans [Resource Information]

Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area	In buffer area only
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area	In buffer area only
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
D'Entrecasteaux	National Park	WA	In buffer area only
Mount Frankland South	National Park	WA	In feature area
Unnamed WA29777	Nature Reserve	WA	In buffer area only
Unnamed WA42255	5(1)(g) Reserve	WA	In buffer area only
Walpole And Nornalup Inlets	Marine Park	WA	In buffer area only
Walpole-Nornalup	National Park	WA	In feature area

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State	Buffer Status
South West WA RFA	Western Australia	In feature area

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
Construction of a water soak dam for fire suppression Lot 304 Rest Point Road, Walpole, WA	2014/7409	Not Controlled Action	Completed	In buffer area only
Geo-science Investigations	2005/2069	Not Controlled Action	Completed	In feature area
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Tea Tree Planting, Walpole region, WA	2019/8397	Not Controlled Action	Completed	In feature area

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action (particular manner)				
INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area

Biologically Important Areas

Scientific Name	Behaviour	Presence	Buffer Status
Seabirds			
Ardenna carneipes Flesh-footed Shearwater [82404]	Foraging (in high numbers)	Known to occur	In buffer area only
Eudyptula minor Little Penguin [1085]	Foraging (provisioning young)	Known to occur	In buffer area only
Hydroprogne caspia Caspian Tern [808]	Foraging (provisioning young)	Known to occur	In buffer area only
Larus pacificus Pacific Gull [811]	Foraging (in high numbers)	Known to occur	In buffer area only
Onychoprion anaethetus Bridled Tern [82845]	Foraging (in high numbers)	Known to occur	In buffer area only
Puffinus assimilis tunneyi Little Shearwater [59363]	Foraging (in high numbers)	Known to occur	In buffer area only
Sternula nereis Fairy Tern [82949]	Foraging (in high numbers)	Known to occur	In buffer area only
Whales			
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur	In buffer area only
Eubalaena australis Southern Right Whale [40]	Calving buffer	Known to occur	In buffer area only
Eubalaena australis Southern Right Whale [40]	Seasonal calving	Known to occur	In buffer area only

Scientific Name	Behaviour	Presence	Buffer Status
	habitat		
Megaptera novaeangliae			
Humpback Whale [38]	Migration (north)	Known to occur	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.

Appendix C
Complete species list for Swann Road study area

APPENDIX C: Complete species list for Swann Road

Family	Taxon
Anarthriaceae	*Anarthria prolifera*
	Anarthria scabra
Apiaceae	*Platysace filiformis*
	Platysace pendula
	Xanthosia candida
Asparagaceae	*Lomandra caespitosa*
	Thysanotus sparteus
Aspleniaceae	*Asplenium flabellifolium*
Asteraceae	**Hypochaeris glabra*
	Senecio glomeratus subsp. *glomeratus*
	Senecio minimus
Campanulaceae	*Lobelia anceps*
Casuarinaceae	*Allocasuarina decussata*
	Allocasuarina fraseriana
Colchicaceae	*Burchardia congesta*
Cyperaceae	*Cyathochaeta avenacea*
	Cyathochaeta clandestina
	Evandra aristata
	Ficinia nodosa
	Gahnia trifida
	Gymnoschoenus anceps
	Lepidosperma gladiatum
	Lepidosperma gracile
	Lepidosperma striatum
	Mesomelaena tetragona
	Schoenus multiglumis
Dasypogonaceae	*Dasypogon bromeliifolius*
	Kingia australis
Dennstaedtiaceae	*Pteridium esculentum*
Dilleniaceae	*Hibbertia amplexicaulis*
	Hibbertia cuneiformis
	Hibbertia serrata
Droseraceae	*Drosera macrantha*
Elaeocarpaceae	*Tremandra diffusa*
	Tremandra stelligera
Ericaceae	*Dielsiodoxa lycopodioides*
	Leucopogon australis
	Leucopogon interstans
	Leucopogon obovatus subsp. *revoluta*
	Leucopogon sp. Southern Forests (B.G. Hammersley 1000)
	Leucopogon verticillatus
	Sphenotoma capitatum
	Sphenotoma squarrosum
Euphorbiaceae	*Amperea protensa*
Fabaceae	*Acacia applanata*
	Acacia browniana var. *browniana*

Family	Taxon
	Acacia chrysocephala
	Acacia myrtifolia
	Acacia pentadenia
	Aotus carinata (P4)
	Aotus sp. Scott River (K.F. Kenneally 2371)
	Bossiaea linophylla
	Chorizema cordatum
	Chorizema ilicifolium
	Gastrolobium brownii
	Gompholobium confertum
	Hardenbergia comptoniana
	Hovea pungens
	Jacksonia furcellata
	Kennedia coccinea
	Labichea lanceolata
	**Lotus subbiflorus*
	**Melilotus albus*
	**Ornithopus pinnatus*
	Pultenaea reticulata
	Sphaerolobium hygrophilum
	**Trifolium repens* var. *repens*
Goodeniaceae	*Dampiera hederacea*
	Dampiera leptoclada
	Scaevola calliptera
	Scaevola filifolia
Haemodoraceae	*Anigozanthos flavidus*
	Haemodorum sp. East Northcliffe (E.M. Sandiford et al 2174)
	Phlebocarya ciliata
Haloragaceae	*Haloragodendron racemosum*
Hemerocallidaceae	*Johnsonia lupulina*
Iridaceae	*Patersonia occidentalis* var. *occidentalis*
Juncaceae	*Juncus holoschoenus*
	Juncus pallidus
	Juncus pauciflorus
Lauraceae	*Cassytha glabella* forma *casuarinae*
	Cassytha racemosa forma *pilosa*
Lindsaeaceae	*Lindsaea linearis*
Malvaceae	*Thomasia foliosa*
	Thomasia sp. Vasse (C. Wilkins & K. Shepherd CW581)
Myrtaceae	*Agonis flexuosa*
	Astartea scoparia
	Beaufortia sparsa
	Callistemon glaucus
	Corymbia calophylla
	Eucalyptus diversicolor
	#*Eucalyptus globulus*
	Eucalyptus guilfoylei
	Eucalyptus marginata subsp. *marginata*
	Eucalyptus megacarpa

Family	Taxon
	Eucalyptus patens
	Eucalyptus sp. ?*capillosa*
	Homalospermum firmum
	Kunzea sulphurea
	Melaleuca incana subsp. *incana*
	Melaleuca microphylla
	Melaleuca rhaphiophylla
	Melaleuca thymoides
	Taxandria fragrans
	Taxandria juniperina
	Taxandria linearifolia
	Taxandria parviceps
Orchidaceae	*Microtis alba*
	Thelymitra mucida
Pinaceae	**Pinus radiata*
Pittosporaceae	*Billardiera heterophylla*
	Cheiranthera preissiana
Poaceae	**Bromus diandrus*
	**Cenchrus clandestinus*
	**Holcus lanatus*
	**Lolium perenne*
	Microlaena stipoides
Polygalaceae	*Comesperma confertum*
Polygonaceae	*Persicaria hydropiper*
	**Rumex acetosella*
Proteaceae	*Adenanthos obovatus*
	Persoonia longifolia
Ranunculaceae	*Clematis pubescens*
Restionaceae	*Empodisma gracillimum*
	Hypolaena grandiuscula
	Leptocarpus tenax
	Leptocarpus thysananthus
	Taraxis grossa
	Tyrbastes glaucescens
Rhamnaceae	*Trymalium odoratissimum* subsp. *trifidum*
Rosaceae	**Rosa canina*
Rubiaceae	*Opercularia hispidula*
Rutaceae	*Boronia crenulata*
	Boronia stricta
Stylidiaceae	*Stylidium adnatum*
	Stylidium scandens
	Stylidium spathulatum
Thymelaeaceae	*Pimelea spectabilis*
Xanthorrhoeaceae	*Xanthorrhoea preissii*
Xyridaceae	*Xyris lanata*
Zamiaceae	*Macrozamia riedlei*

Appendix D
Rare Flora Report Form

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

Please complete as much of the form as possible, with emphasis on those sections bordered in black. For information on how to complete the form please refer to the Threatened & Priority Flora Report Form (TPRF) manual on the DBCA website at www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-plants

TAXON: Aotus carinatus **TPFL Pop. No:**

OBSERVATION DATE: 11/05/2023 **CONSERVATION STATUS:** P4 **New population** ☐

OBSERVER/S: Martin Henson, Zoe Webber **PHONE** 0427 437 495

ROLE: Lead Botanist **ORGANISATION:** RPS AAP Consulting

EMAIL: Martin.henson@rpsgroup.com.au

DESCRIPTION OF LOCATION (Provide at least nearest town/named locality, and the distance and direction to that place)**:**

Approximately 2 km N of Walpole, Felix Brook off Swann Road, and Plain Road (Walpole airstrip)

Reserve No:

DBCA DISTRICT: Frankland **LGA:** Manjimup Land manager present: ☐

DATUM:
GDA94 / MGA94 X
AGD84 / AMG84 ☐
WGS84 ☐
Unknown ☐

COORDINATES: (If UTM coords provided, **Zone** is also required)
DecDegrees ☐ DegMinSec ☐ UTMs X
Lat / Northing: See table and PX file
Long / Easting:
ZONE: 50H

METHOD USED:
GPS X Differential GPS ☐ Map ☐
No. satellites: ____ Map used: _____
Boundary polygon captured: ☐ Map scale: _____

LAND TENURE:

Nature reserve ☐	Timber reserve ☐	Private property ☐	Rail reserve ☐	Shire road reserve ☐
National park ☐	State forest ☐	Pastoral lease ☐	MRWA road reserve ☐	Other Crown reserve ☐
Conservation park ☐	Water reserve ☐	UCL ☐	SLK/Pole _____ to _____	Specify other: _____

AREA ASSESSMENT: Edge survey ☐ Partial survey X Full survey ☐ Area observed (m²): _____

EFFORT: Time spent surveying (minutes): 120 No. of minutes spent / 100 m²: _____

POP'N COUNT ACCURACY: Actual X Extrapolation ☐ Estimate ☐ Count method: _____
(Refer to field manual for list)

WHAT COUNTED: Plants X Clumps ☐ Clonal stems ☐

TOTAL POP'N STRUCTURE:

	Mature:	Juveniles:	Seedlings:	Totals:
Alive	31			
Dead				

Area of pop (m²): _____

Note: Pls record count as numbers (not percentages) for database.

QUADRATS PRESENT: No. ___ Size _____ Data attached ☐ Total area of quadrats (m²): _____

Summary Quad. Totals: Alive				

REPRODUCTIVE STATE: Clonal ☐ VegetativeX Flowerbud ☐ Flower ☐
Immature fruit ☐ Fruit ☐ Dehisced fruit ☐ Percentage in flower: _____%

CONDITION OF PLANTS: Healthy ☐ Moderate ☐ Poor ☐ Senescent ☐

COMMENT:

THREATS - type, agent and supporting information: Eg clearing, too frequent fire, weed, disease. Refer to field manual for list of threats & agents. **Specify agent** where relevant. Rate current and potential threat impact: N=Nil, L=Low, M=Medium, H=High, E=Extreme Estimate time to potential impact: S=Short (<12mths), M=Medium (<5yrs), L=Long (5yrs+)	**Current impact (N-E)**	**Potential Impact (L-E)**	**Potential Threat Onset (S-L)**
•			
•			
•			

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

Threatened and Priority Flora Report Form

Version 1.4 March 2021

HABITAT INFORMATION:

LANDFORM:
Crest ☐
Hill ☐
Ridge ☐
Outcrop ☐
Slope ☐
Flat ☐
Open depression ☐
Drainage line ☐
Closed depression ☐
Wetland X

ROCK TYPE:
Granite ☐
Dolerite ☐
Laterite ☐
Ironstone ☐
Limestone ☐
Quartz ☐
Specify other: _____

LOOSE ROCK:
(on soil surface; eg gravel, quartz fields)
0-10% X
10-30% ☐
30-50% ☐
50-100% ☐

SOIL TYPE:
Sand ☐
Sandy loam X
Loam ☐
Clay loam ☐
Light clay ☐
Peat X
Specify other: _____

SOIL COLOUR:
Red ☐
Brown ☐
Yellow ☐
White ☐
Grey X
Black ☐
Specify other: _____

DRAINAGE:
Well drained ☐
Seasonally inundated X
Permanently inundated ☐
Tidal ☐

Specific **Landform** Element: _____
(Refer to field manual for additional values)

CONDITION OF SOIL: Dry ☐ Moist ☐ Waterlogged ☐ Inundated ☐

VEGETATION CLASSIFICATION*:
Eg: **1**. Banksia woodland (B. attenuata, B. ilicifolia); **2**. Open shrubland (Hibbertia sp., Acacia spp.) ; **3**. Isolated clumps of sedges (M.tetragona)

1. Closed shrubland, Taxandria spp, Homalospermum firmum, Beaufortia sparsa
2.
3.
4.

ASSOCIATED SPECIES:

Other (non-dominant) spp

* Please record up to four of the most representative vegetation layers (with up to three dominant species in each layer). Structural Formations should follow 2009 *Australian Soil and Land Survey Field Handbook* guidelines – refer to field manual for further information and structural formation table.

CONDITION OF HABITAT: Pristine ☐ Excellent ☐ Very good ☐ Good ☐ Degraded ☐ Completely degraded ☐

COMMENT: Excellent condition dense vegetation alongside tracks

FIRE HISTORY: **Last Fire:** Season/Month: _____ Year: _____ **Fire Intensity:** High ☐ Medium ☐ Low ☐ No signs of fire ☐

FENCING: Not required ☐ Present ☐ Replace / repair ☐ Required ☐ Length req'd: _____

ROADSIDE MARKERS: Not required ☐ Present ☐ Replace / reposition ☐ Required ☐ Quantity req'd: _____

OTHER COMMENTS: (Please include recommended management actions and/or implemented actions - include date. Also include details of additional data available, and how to locate it.)

FLORA AUTHORISATION / LICENCE No: FB62000110-2 Note if only observing plants (i.e. no specimens or plant matieral is taken) then no authorisation/licence is required. For further information on authorisation and licening requirements see the Threatened Flora and Wildlife Licensing pages on DBCA's website. Any actions carried out under authorisations/licences should be recorded above in the OTHER COMMENTS section.

SPECIMEN: Collectors No: _____ WA Herb. ☐ Regional Herb. ☐ District Herb. ☐ Other: _____

LODGEMENT: WA Herb Lodgement No: _____

ATTACHED: Map ☐ Mudmap ☐ Photo ☐ GIS data ☐ Field notes ☐ Other: _____

COPY SENT TO: Regional Office ☐ District Office ☐ Other: _____

Submitter of Record: _____ Role: _____ Signed: _____ Date: / /

Please return completed form to **Species And Communities Program** DBCA,
Locked Bag 104, BENTLEY DELIVERY CENTRE WA 6983 **OR** email to: flora.data@dbca.wa.gov.au

RECORDS: Please forward to **Flora Administrative Officer,** Species and Communities Program.

Record entered by:_____ **Sheet No.:**_____ **Record Entered in Database** ❑

Aotus carinata

Location (50H)	Number
473176.63 E, 6132444.9 S	15
473175.59 E, 6132453.34 S	2
473170.88 E, 6132472.18 S	4
473126.03 E, 6132446.54 S	1
472554.63 E, 6131502.44 S	1
472672.13 E, 6131411.08 S	2
472668.27 E, 6141421.50 S	3
472667.84 E, 6131412.95 S	4

Appendix E
Survey data

Swann Rd Borefield Walpole **Site** OPP

Described by **Date** **Type**

Season **Uniformity**

Location

MGA Zone **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Aotus carinata					
Melaleuca incana subsp. incana					
Persicaria hydropiper					
Eucalyptus sp.			8		

Swann Rd Borefield Walpole **Site** VN01

Described by MJH **Date** 8/11/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Eucalyptus globulus, Pinus radiata

Veg Condition

Fire Age

Notes Tasmanian bluegum plantation (Eucalyptus globulus) and Pinus radiata over paddock weeds

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Eucalyptus globulus					
Pinus radiata					

Swann Rd Borefield Walpole **Site** VN02

Described by MJH **Date** 8/11/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Eucalyptus globulus

Veg Condition

Fire Age

Notes Bluegum plantation/shelter belt

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes

Swann Rd Borefield Walpole **Site** VN03

Described by MJH **Date** 8/11/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Juncus holoschoenus, Trifolium repens, Rumex acetosella
Paddock water point

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes

Swann Rd Borefield Walpole **Site** VN04

Described by MJH **Date** 8/11/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation

Veg Condition

Fire Age

Notes Corymbia calophylla, Eucalyptus patens woodland. Lowland veg of Taxandria linearifolia (+ T juniperina?) between here and other karri boundary

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes

Swann Rd Borefield Walpole **Site** VN05

Described by MJH **Date** 9/11/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation

Veg Condition

Fire Age

Notes Eucalyptus guilfoylei. Corymbia calophylla over Taxandria linearifolia. *Holcus lanatus, *Cenchrus clandestinus

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes

Swann Rd Borefield Walpole **Site** VN06

Described by MJH **Date** 14/12/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Eucalyptus patens woodland over Lepidosperma gladiatum, Taxandria parviceps, Opercularia hispidula, *Holcus lanatus and Acacia myrtifolia

Veg Condition

Fire Age

Notes Scattered E. patens to N in dense Taxandria tall shrubland

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes

Swann Rd Borefield Walpole **Site** VN07

Described by MJH **Date** 14/12/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Taxandria linearifolia, T. parviceps shrubland over Lepidosperma gladiatum

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia myrtifolia					
Dasypogon bromeliifolius					
Kingia australis					
Lepidosperma gladiatum					
Leucopogon obovatus subsp. revoluta					
Pimelea spectabilis					
Pteridium esculentum					
Taxandria linearifolia					
Taxandria parviceps					
Thysanotus sparteus					

Swann Rd Borefield Walpole **Site** VN08

Described by MJH **Date** 14/12/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Tall closed shrubland of Taxandria linearifolia, T. parviceps. Scattered Labichea lanceolata, Gahnia trifida, Eucakyptus patens, Xanthorrhoes preissii, Kingia australis

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes

Swann Rd Borefield Walpole **Site** VN09

Described by MJH **Date** 15/12/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Edge of swampland

Soil

Rock Type

Vegetation Eucalyptus patens over Acacia myrtifolia, Gahnia trifida, Taxandria parviceps on edge of swamp. Scattered Eucalyptus patens, Labichea lanceolata in swamp

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes

Swann Rd Borefield Walpole **Site** VN10

Described by MJH **Date** 15/12/2022 **Type** V

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat swamp edge

Soil

Rock Type

Vegetation Eucalyptus patens mid open woodland over Labichea lanceolata, Taxandria parviceps tall open shrubland, Taxandria linearifolia, Xanthorrhea preissii mid sparse shrubs

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Eucalyptus patens	20		10		
Gahnia trifida	+		2		
Labichea lanceolata	10		8		
Lepidosperma gladiatum					
Taxandria linearifolia	5		1.5		
Taxandria parviceps	8		2.5		
Xanthorrhoea preissii					

Swann Rd Borefield Walpole **Site** WP01

Described by MJH **Date** 8/11/2022 **Type** Q 10*10

Season E **Uniformity**

Location Walpole

MGA Zone 50 473180 **mE** 6132427 **mN** 116.706266 **E** -34.950198 **S**

Habitat Low lying swampy area

Soil sandy clay

Rock Type

Vegetation Beaufortia sparsa, Taxandria parviceps closed mid shrubland over Anarthria scabra, Dasypogon bromeliifolius, Gymnoschoenus anceps mid-low open sedgeland

Veg Condition Excellent (Pristine except for tracks and farmland nearby?)

Fire Age 2 yr

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Adenanthos obovatus	5		1	07	
Anarthria scabra	10		1.5	08	
Astartea scoparia	1		1.5		
Beaufortia sparsa	40		2	01	
Comesperma confertum	+		1.5	12	
Dampiera hederacea	+		0.3	13	
Dasypogon bromeliifolius	10		0.3	05	
Evandra aristata	+		1.2	15	
Gymnoschoenus anceps	5		1	14	
Johnsonia lupulina	+		0.5	06	
Lomandra caespitosa	+		1	17	
Phlebocarya ciliata	+		0.25	11	
Taxandria linearifolia	2		2		
Taxandria parviceps	40		2	03	
Xanthorrhoea preissii	+		1	10	
Boronia stricta	+		0.5		
Homalospermum firmum	2		2	02	

Swann Rd Borefield Walpole **Site** WP02

Described by MJH **Date** 9/11/2022 **Type** Q 10*10

Season E **Uniformity**

Location

MGA Zone 50 473563 **mE** 6131193 **mN** 116.710421 **E** -34.961335 **S**

Habitat Riparian woodland/forest

Soil sandy clay

Rock Type

Vegetation Corymbia calophylla, Eucalyptus patens closed forest over Kingia australis tall sparse shrubs, Xanthorrhoea preissii mid open shrubland over Cyathochaeta avenacea, Tyrbastes glaucescens tall-mid open sedgeland

Veg Condition Very Good

Fire Age

Notes Weed disturbance

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Anarthria scabra	1		1.2		
Anigozanthos flavidus	+		1.2		
Bromus diandrus	+		0.3	0.4	
Cenchrus clandestinus	2		0.1		
Cheiranthera preissiana	+			02	
Corymbia calophylla	90		25		
Cyathochaeta avenacea	20		1.2		
Drosera macrantha	+			01	
Eucalyptus patens	15		15		
Hibbertia cuneiformis	0.5		1.2		
Holcus lanatus	2		0.8		
Hypochaeris glabra	1		0.01		
Juncus holoschoenus	+		1.5		
Kingia australis	1		4		
Lepidosperma gracile	+		1	201	
Leucopogon sp.	+		0.5	07	
Opercularia hispidula	2		0.2	03	
Rumex acetosella	+		0.3	05	
Taxandria linearifolia	1		1.8		
Taxandria parviceps	3		1.8		
Trifolium repens var. repens	2		0.3		
Tyrbastes glaucescens	10		0.5	06	
Xanthorrhoea preissii	2.5		1.5		

Swann Rd Borefield Walpole **Site** WP03

Described by MJH **Date** 9/11/2022 **Type** Q 10*10

Season E **Uniformity**

Location Walpole

MGA Zone 50 473602 **mE** 6131051 **mN** 116.710844 **E** -34.962617 **S**

Habitat Riparian shrubland

Soil Sandy clay

Rock Type

Vegetation Taxandria linearifolia tall shrubland T. parviceps, Astartea scoparia mid sparse shrubs over Taraxis grossa, Cyathochaeta avenacea closed mid-tall sedgeland over *Holcus lanatus low sparse grassland

Veg Condition VG-G

Fire Age 10+

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Anigozanthos flavidus	+		2		
Asplenium flabellifolium	1		2	04	
Astartea scoparia	1		1.2		
Cyathochaeta avenacea	3		2	02	
Holcus lanatus	10		0.3		
Hypochaeris glabra	+		0.05		
Juncus pallidus	2		2		
Taraxis grossa	80		2	01	
Taxandria linearifolia	60		5		
Taxandria parviceps	1		1.8		
Trifolium repens var. repens	+		0.4	03	
Cassytha glabella forma casuarinae					
Lobelia anceps	+		0.5	302	
Senecio minimus	+		0.5	301	

Swann Rd Borefield Walpole **Site** WP04

Described by MJH **Date** 10/11/2022 **Type** Q 10x10

Season E **Uniformity**

Location Walpole

MGA Zone 50 472732 **mE** 6130575 **mN** 116.701299 **E** -34.966886 **S**

Habitat Blackbutt woodland

Soil Balck loam

Rock Type

Vegetation Eucalyptus patens mid open forest over Labichea lanceolata mid shrubland over Pteridium esculentum mid open forbland over Dampiera hederacea low open shrubland

Veg Condition E

Fire Age 2 yrs

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Anigozanthos flavidus	5		2		
Boronia stricta	+		0.3		
Cheiranthera preissiana	+				
Dampiera hederacea	15		0.5	04	
Eucalyptus patens	60		15		
Labichea lanceolata	50		1.5	06	
Lindsaea linearis	+		0.2	402	
Macrozamia riedlei	1		1.2		
Pimelea spectabilis	+		1	01	
Platysace filiformis	+		0.3	401	
Pteridium esculentum	20		1		
Taxandria parviceps	+		1		
Acacia chrysocephala	2		1	02	
Opercularia hispidula	2		0.15	08	
Anarthria scabra	1		1	=01-09	
Cyathochaeta avenacea	2		1	03	
Tremandra stelligera	+		0.3	07	
Stylidium scandens	+		0.25	05	

Swann Rd Borefield Walpole **Site** WP05

Described by MJH **Date** 10/11/2022 **Type** Q 10x10

Season E **Uniformity**

Location

MGA Zone 50 473130 **mE** 6130371 **mN** 116.705652 **E** -34.968736 **S**

Habitat Karri/Blackbutt woodland

Soil Brown loamy sand

Rock Type

Vegetation Eucalyptus diversicolor tall open forest, over E. patens mid woodland over Acacia browniana var. browniana sparse mid shrubs over Scaevola calliptera, Dampiera hederacea low open shrubland

Veg Condition E

Fire Age 2

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Clematis pubescens	3			04	
Dampiera hederacea	2		0.5		
Eucalyptus diversicolor	40		40		
Eucalyptus patens	20		25		
Hardenbergia comptoniana	+		0.05	01	
Hardenbergia comptoniana	+				
Lepidosperma gladiatum	5		1.2		
Acacia browniana var. browniana	5		1	03	
Allocasuarina decussata	adj		10		
Corymbia calophylla	adj		25		
Microlaena stipoides	+		0.25	05	
Scaevola calliptera	40		0.2	02	

Swann Rd Borefield Walpole **Site** WP06

Described by MJH **Date** 11/11/2022 **Type** Q 10x10

Season E **Uniformity**

Location

MGA Zone 50 472633 **mE** 6130588 **mN** 116.700215 **E** -34.966766 **S**

Habitat Karri woodland

Soil black loamy sand

Rock Type

Vegetation Eucalyptus diversicolor tall woodland over Allocasuarina decussata mid woodland over Lepidosperma gladiatum mid sparse sedgeland, Pteridium esculentum mid sparse forbs, Hibbertia serrata mid low shrubs

Veg Condition E

Fire Age 2 yrs

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia browniana var. browniana	20		1		
Allocasuarina decussata	50		20		
Anigozanthos flavidus	+		1		
Clematis pubescens	2				
Eucalyptus diversicolor	60		40		
Hardenbergia comptoniana	+				
Hibbertia cuneiformis	+		1.2		
Lepidosperma gladiatum	5		1		
Leucopogon verticillatus	+		0.5		
Microlaena stipoides	+		0.2		
Microtis alba					
Opercularia hispidula	+		0.5		
Pteridium esculentum	5		1		
Thomasia sp. Vasse (C. Wilkins & K. Shepherd CW581)	1		0.3		
Stylidium adnatum	+		0.25	02	
Hibbertia serrata	2		1	01	
Senecio glomeratus subsp. glomeratus	+		0.8	03	
Microlaena stipoides	+		0.1		
Scaevola calliptera	+		0.2		
Tremandra stelligera	+		0.3		

Swann Rd Borefield Walpole **Site** WP07

Described by MJH **Date** 11/11/2022 **Type** Q 10*10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Karri/Blackbutt woodland

Soil black loamy sand

Rock Type

Vegetation Eucalytpus diversicolor tall woodland over E. patens, Allocasuarina decussata mid open woodland over Lepidosperma gladiatum mid sedgeland, Pteridium esculentum tall sparse forbs

Veg Condition E

Fire Age 2 yrs

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia browniana var. browniana	1		0.8		
Allocasuarina decussata	25		20		
Chorizema cordatum	3		0.1	01	
Clematis pubescens	1				
Eucalyptus diversicolor	50		50		
Eucalyptus patens	40		20		
Hibbertia serrata	1		0.5		
Lepidosperma gladiatum	60		1.2		
Leucopogon verticillatus	+		0.5		
Pteridium esculentum	2		1		
Stylidium adnatum	+		0.2		
Thomasia foliosa	+		0.3	02	
Microlaena stipoides	+		0.2		
Haloragodendron racemosum	1		0.3	03	
Tremandra stelligera	+		0.3		

Swann Rd Borefield Walpole **Site** WP08

Described by MJH **Date** 12/11/2022 **Type** Q 10*10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Eucalyptus patens mid woodland over Taxandria linearifolia, Taxandria parviceps closed mid-tall shrubland

Veg Condition E

Fire Age 2 yrs

Notes Euc. patens woodland over Taxandria linearifolia, Taxandria parviceps closed mid-tall shrubland over Anarthria scabra low-mid sparse sedgeland over Dampiera hederacea, Tremandra stelligera low sparse shrubs,

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia myrtifolia	+		0.3		
Anigozanthos flavidus	3		1.5		
Eucalyptus patens	50		10		
Hibbertia amplexicaulis	+		0.3	06	
Taxandria linearifolia	40		2		
Taxandria parviceps	40		1.8		
Anarthria scabra	15		1	02	
Acacia pentadenia	+		0.3		
Schoenus multiglumis	2		1.2	07	
Dielsiodoxa lycopodioides	+		0.1	10	
Empodisma gracillimum	+		0.1	05	
Homalospermum firmum	1		1.5		
Dampiera hederacea	4		0.25	01	
Billardiera heterophylla	+			08	
Tremandra stelligera	1		1		
Aotus sp. Scott River (K.F. Kenneally 2371)	+		0.3	09	
Stylidium scandens	+		0.25	04	
Boronia stricta	+		0.25	03	
Drosera macrantha	+				

Swann Rd Borefield Walpole **Site** WP11

Described by MJH **Date** 14/11/2022 **Type** Q 10*10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Eucalyptus diversicolor tall forest over Allocasuarina decussata sparse mid trees over Lepidosperma gladiatum, Gahnia trifida tall closed sedgeland

Veg Condition E

Fire Age 10+

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Allocasuarina decussata	8		12		
Eucalyptus diversicolor	70		50		
Lepidosperma gladiatum	60		1.8	01	
Pteridium esculentum	2		1.5		
Trymalium odoratissimum subsp. trifidum	5		10		
Gahnia trifida	20		2	02	

Swann Rd Borefield Walpole **Site** WP14

Described by MJH **Date** 14/12/2022 **Type** Q 10x10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Woodland

Soil Grey sandy loam

Rock Type

Vegetation Eucalyptus marginata subsp. marginata, Allocasuarina fraseriana mid woodland over Xanthorrhoea preissii, Bossiaea linophylla, Taxandria parviceps mid-tall sparse shrubland over Anarthria scabra mid sedgeland

Veg Condition Excellent

Fire Age 10+?

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia applanata	+		0.4	09	
Agonis flexuosa	5		12		
Allocasuarina fraseriana	30		20		
Anarthria scabra	50		1.5		
Anigozanthos flavidus	1		2		
Eucalyptus marginata subsp. marginata	30		20		
Gastrolobium brownii	1		1.5		
Hibbertia cuneiformis	+		0.5		
Macrozamia riedlei	+		1		
Patersonia occidentalis var. occidentalis	1		1		
Taxandria parviceps	2		1.8		
Thelymitra mucida	+		1	06	
Xanthorrhoea preissii	3		2		
Persoonia longifolia	+		1	10	
Adenanthos obovatus	+		1.2		
Anarthria prolifera	+		0.5	07	
Cheiranthera preissiana	+				
Dasypogon bromeliifolius	+		1	08	
Dielsiodoxa lycopodioides	1		1		
Melilotus albus	+		0.25	05	
Leucopogon obovatus subsp. revoluta	+		2	02	
Bossiaea linophylla	2		2.2	01	
Opercularia hispidula	+		0.25	03	

Swann Rd Borefield Walpole **Site** WP15

Described by MJH **Date** 14/12/2022 **Type** Q 10x10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Woodland

Soil Grey sandy loam

Rock Type

Vegetation Eucalyptus marginata subsp. marginata, Allocasuarina fraseriana, Agonis flexuosa mid woodland over Anarthria scabra mid sedgeland

Veg Condition Excellent

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Adenanthos obovatus	+		0.3		
Agonis flexuosa	20		15		
Allocasuarina fraseriana	20		15		
Anarthria scabra	75		1.2	01	
Cheiranthera preissiana	+		0.1		
Dasypogon bromeliifolius	2		1.2		
Eucalyptus marginata subsp. marginata	25		15		
Hovea pungens	+		0.25		
Patersonia occidentalis var. occidentalis	2		0.1		
Platysace pendula				adj	
Asplenium flabellifolium	+		0.05		
Acacia applanata	+		1		
Anarthria prolifera	2		0.3		
Hypolaena grandiuscula	+		0.6	05	
Leucopogon obovatus subsp. revoluta	2		0.3		
Melaleuca thymoides	+		1.2	04	
Tremandra diffusa	+		0.1	03	
Bossiaea linophylla	1		1.8		
Opercularia hispidula	2		0.3		

Swann Rd Borefield Walpole **Site** WP16

Described by MJH **Date** 14/12/2022 **Type** Q 10x10

Season E **Uniformity**

Location Walpole

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Swamp

Soil Grey/black sandy loam

Rock Type

Vegetation Beaufortia sparsa, Homalospermum firmum, Taxandria fragrans mid closed shrubland over Lepidosperma gladiatum, Evandra aristata sparse mid-tall sedgeland

Veg Condition Excellent

Fire Age 10+

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Beaufortia sparsa	50		1.5		
Billardiera heterophylla	+				
Dampiera leptoclada	+		0.1		
Lepidosperma gladiatum	4		1.5		
Sphaerolobium hygrophilum	+		1.5	07	
Sphenotoma squarrosum	+		0.5		
Taxandria parviceps	1		1.5		
Amperea protensa	+		0.5	12	
Anarthria prolifera	2		0.3		
Leptocarpus thysananthus	2		1	09	
Cassytha racemosa forma pilosa	2			05	
Leucopogon australis	+		0.5	10	
Cyathochaeta clandestina	1		0.3	02	
Evandra aristata	2		2	04	
Homalospermum firmum	25		1.5		
Xyris lanata	1		1.2	13	
Sphenotoma squarrosum	2		1	01	
Leptocarpus tenax	2		0.5	08	
Opercularia hispidula	1		0.3		
Taxandria fragrans	6		1.5	06	
Holcus lanatus	+		1		
Scaevola filifolia	3		0.8	03	

Swann Rd Borefield Walpole **Site** WP17

Described by MJH **Date** 14/12/2022 **Type** Q 10x10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Woodland

Soil Grey sandy loam

Rock Type

Vegetation Eucalyptus marginata subsp. marginata mid open woodland over Taxandria parviceps, Pteridium esculentum mid shrubland over Dielsiodoxa lycopodioides low sparse forbland

Veg Condition Excllent

Fire Age 2 years

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia applanata	+		0.2		
Dampiera leptoclada	+		0.2		
Dasypogon bromeliifolius	2		1		
Eucalyptus marginata subsp. marginata	15		15	01	
Haemodorum sp. East Northcliffe (E.M. Sandiford et al 2174)					
Lepidosperma gracile					
Leucopogon sp. Southern Forests (B.G. Hammersley 1000)	+		0.15		
Patersonia occidentalis var. occidentalis	2		1		
Persoonia longifolia	1		3		
Pteridium esculentum	30		1.8		
Taxandria parviceps	15		1.5		
Xanthorrhoea preissii	1		1		
Acacia pentadenia	+		0.3		
Gompholobium confertum			0.5	07	
Anarthria prolifera	1		0.4		
Astartea scoparia			1.5	06	
Cheiranthera preissiana	+				
Dielsiodoxa lycopodioides	10		0.2		
Gastrolobium brownii	3		1.8	05	
Opercularia hispidula	+		0.1	03	
Evandra aristata	+		1.5		
Xanthosia candida	+		0.01	02	
Sphenotoma squarrosum	1		0.25		
Hypolaena grandiuscula	1		0.3	04	
Stylidium spathulatum	+		0.1		
Stylidium scandens	+		0.3		

Swann Rd Borefield Walpole **Site** WP18

Described by MJH **Date** 14/12/2022 **Type** Q 10x10

Season E **Uniformity**

Location

MGA Zone **mE** **mN** **E** **S**

Habitat Woodland

Soil grey sany loam

Rock Type

Vegetation Eucalyptus diversicolor tall forest over Eucalyptus patens, Allocasuarina decussata mid closed woodland over Acaacia browniana var. browniana, Pteridium esculentum mid sparse shrubland over Lepidosperma gladiatum mid sparse sedgeland, Opercularia hispidula low open forbland

Veg Condition Excellent

Fire Age 2 yrs

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia browniana var. browniana	4		1.5		
Allocasuarina decussata	70		15		
Anigozanthos flavidus	30		1.5		
Cyathochaeta avenacea	*		1		
Eucalyptus diversicolor	50		40		
Eucalyptus patens	20		20		
Ficinia nodosa	+		1	01	
Kennedia coccinea	+				
Lepidosperma gladiatum	4		1		
Macrozamia riedlei	+		1.2		
Microlaena stipoides	+		0.15	02	
Microlaena stipoides	+		0.5		
Pteridium esculentum	5		1		
Taraxis grossa	+		0.5		
Taxandria parviceps	+		1		
Opercularia hispidula	10		0.25		

Swann Rd Borefield Walpole **Site** WP19

Described by MJH **Date** 14/12/2022 **Type** Q 10x10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Woodland

Soil Grey sandy loam

Rock Type

Vegetation Eucalyptus patens mid open woodland overTaxandria parviceps, Xanthorrhoea preissii mid shrubland over Lepidosperma gladiatum, Anarthria scabra mid sparse sedgeland

Veg Condition Very good

Fire Age 2 yrs

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Adenanthos obovatus	1		0.3		
Anarthria scabra	1		1.2		
Boronia crenulata	+		0.4	01	
Dampiera hederacea	1		00.2		
Dampiera leptoclada	+		0.3		
Dasypogon bromeliifolius	1		1		
Eucalyptus patens	15		12		
Lepidosperma gladiatum	2		1		
Leucopogon sp. Southern Forests (B.G. Hammersley 1000)	1		1.2		
Lolium perenne	5		0.8		
Patersonia occidentalis var. occidentalis	+		0.3		
Platysace filiformis			0.3		
Stylidium spathulatum	+		0.1		
Taxandria parviceps	70		1.8		
Xanthorrhoea preissii	4		1.8		
Ficinia nodosa	+		0.6		
Acacia pentadenia	+		0.3		
Anarthria prolifera	25		0.3		
Cheiranthera preissiana	+				
Cassytha racemosa forma pilosa	+				
Sphenotoma capitatum				1901	
Gastrolobium brownii	+		1.2		
Lotus subbiflorus	+		0.2		
Asplenium flabellifolium	+		0.01		
Sphenotoma squarrosum	2		0.4		
Hypolaena grandiuscula	1		0.3		
Holcus lanatus	+		1		

Swann Rd Borefield Walpole **Site** WPM01

Described by MJH **Date** 13/11/2022 **Type** Q 20*20

Season E **Uniformity**

Location

MGA Zone **mE** **mN** **E** **S**

Habitat Low lying swampland

Soil Black, clay or sandy loam

Rock Type

Vegetation Eucalyptus patens mid open woodland over Taxandria linearifolia, Homalospermum firmum, Beaufortia sparsa mid-tall closed shrubland over Taxandria parviceps, Dampiera hederacea low-mid sparse shrubland, Cyathochaeta avenacea sparse sedgeland

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Beaufortia sparsa	2		2		
Cyathochaeta avenacea	20		1.2		
Dampiera hederacea	2		1		
Eucalyptus patens	5		10		
Kingia australis	+		3.5		
Taxandria linearifolia	90		2.5		
Taxandria parviceps	2		1.2		
Anarthria scabra	+		1		
Homalospermum firmum	2		2		
Aotus sp. Scott River (K.F. Kenneally 2371)	+		0.5		
Boronia stricta	+		1		

Swann Rd Borefield Walpole **Site** WPR01

Described by MJH **Date** 8/11/2022 **Type** R

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Riparian

Soil

Rock Type

Vegetation Taxandria juniperina, Eucalyptus patens, E. megacarpa mid woodland over Melaleuca rhaphiophylla, M. microphylla low open woodland over *Cenchrus clandestinus low closed grassland

Veg Condition Completely Degaded

Fire Age 10+

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Billardiera heterophylla	+				
Callistemon glaucus	+		4	04	
Cenchrus clandestinus	85		.2		
Eucalyptus megacarpa	3		15	08	
Lepidosperma gladiatum	+		1.5		
Melaleuca microphylla	+		4		
Melaleuca rhaphiophylla	15		8	02	
Rosa canina	+		2	09	
Rumex acetosella	2		0.3		
Eucalyptus patens	15		15	03	
Taxandria juniperina	30		15	01	
Holcus lanatus	+		0.5	06	
Trifolium repens var. repens	+		0.2	07	

Swann Rd Borefield Walpole **Site** WPR02

Described by MJH **Date** 8/11/2022 **Type**

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat on upper slope with taxandria swamp behind

Soil

Rock Type

Vegetation Corymbia calophylla, Eucalyptus guilfoylei, Taxandria juniperina closed forest over Cyathochaeta avanacea mid sedgeland over Opercularia hispidula low sparse sedgeland, *Holcus lanatus low tussock grassland

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia myrtifolia	+		1.5	03	
Corymbia calophylla	60		20		
Hibbertia cuneiformis	+		1		
Hypochaeris glabra	+		0.01		
Kingia australis	+		2.5		
Opercularia hispidula	10		0.2	02	
Patersonia occidentalis var. occidentalis	+		1	04	
Taxandria juniperina	+		15	05	
Cyathochaeta avenacea	60		1.2	01	
Eucalyptus guilfoylei	30		10		
Holcus lanatus	10		0.3		
Anarthria scabra	+		1.5		
Holcus lanatus	15		0.5		

Swann Rd Borefield Walpole **Site** WPR03

Described by MJH **Date** 8/11/2022 **Type** R

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat low-lying

Soil

Rock Type

Vegetation Corymbia calophylla low open woodland over Acacia myrtifolia, Taxandria juniperina mid-tall open shrubland over Taxandria parviceps, Beaufortia sparsa, Homalospermum firmum mid shrubland ovr Leptocarpus thysananthus, Lepidosperma striatum, Mesomelaena tetragona sparse sedgeland/rushland

Veg Condition

Fire Age 2 yrs

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Beaufortia sparsa	10		1.8		
Corymbia calophylla	10		8		
Dampiera leptoclada	2		0.3		
Johnsonia lupulina	+		1		
Mesomelaena tetragona	1		1.2		
Taxandria juniperina	30		2		
Acacia myrtifolia	30		2		
Taxandria parviceps	40		1.8		
Leptocarpus thysananthus	2		1		
Homalospermum firmum	5		1.5		
Sphaerolobium hygrophilum	+		1.5	02	
Anarthria scabra	1		1		
Lepidosperma striatum	2		1	01	

Swann Rd Borefield Walpole **Site** WPR04

Described by MJH **Date** 9/11/2022 **Type** R

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Corymbia calophylla, Eucalyptus patens mid closed forest over Taxandria linearifolia, T. parviceps mid-tall open shrubland over Cyathochaeta avenacea, Taraxis grossa, Leptocarpus thysananthus mid sparse sedgeland

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Anigozanthos flavidus	+		2		
Corymbia calophylla	80		25		
Cyathochaeta avenacea	10		1.2		
Eucalyptus patens	10		15		
Hypochaeris glabra	+		0.02		
Juncus holoschoenus	2		1.5		
Kingia australis	+		2		
Taraxis grossa	5		1		
Taxandria parviceps	5		2		
Taxandria linearifolia	20		2		
Leptocarpus thysananthus	4		1.5		
Leucopogon interstans	+		1		
Trifolium repens var. repens	+		0.3		
Holcus lanatus	2		0.5		

Swann Rd Borefield Walpole **Site** WPR05

Described by MJH **Date** 9/11/2022 **Type** Q 10*10

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Wetland in paddock, GDE

Soil

Rock Type

Vegetation Juncus holoshoenus nid sparse sedgs over *Hypochaeris glabra, *Rumex acetosella low forbland, Juncus pauciflorus low open sedgeland, *Holcus lanatus low opwn tussock grassland

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Hypochaeris glabra	60		0.1		
Juncus holoschoenus	10		1.8		
Juncus pauciflorus	15		0.3	01	
Rumex acetosella	2		0.25	03	
Ornithopus pinnatus	+		0.2	02	
Holcus lanatus	20		0.3		

Swann Rd Borefield Walpole **Site** WPR06

Described by MJH **Date** 14/11/2022 **Type** R

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Dampland

Soil

Rock Type

Vegetation Eucalyptus guilfoylei mid woodland over Kunzea sulphurea sulphurea, Acacia browniana var. browniana, Trymalium odoratissimum subsp. trifidum tall shrubland over Lepidosperma gladiatum, Gahnia trifida tall sedgeland, Anarthria scabra low open sedgeland

Veg Condition

Fire Age 10+

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia browniana var. browniana	20		4		
Anigozanthos flavidus	+		1.5		
Dampiera leptoclada	1		0.25		
Kunzea sulphurea	10		6	01	
Lepidosperma gladiatum	25		3		
Pteridium esculentum	1		2.5		
Taxandria linearifolia	+		2.5		
Trymalium odoratissimum subsp. trifidum	10		6		
Labichea lanceolata	+		2.5		
Chorizema ilicifolium	1		2		
Eucalyptus guilfoylei	40		10		
Anarthria scabra	20		0.3		
Gahnia trifida	10		4		

Swann Rd Borefield Walpole **Site** WPR07

Described by MJH **Date** 14/11/2022 **Type** R

Season E **Uniformity**

Location

MGA Zone 50 **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Allocasuarina fraseriana, Agonis flexuosa, Eucalyptus marginata subsp. marginata mid open woodland over Bossiaea linifolia tall open shrubland over Pultanaea reticulata mid sparse shrubs

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Adenanthos obovatus					
Agonis flexuosa	5		10		
Allocasuarina fraseriana	6		15		
Burchardia congesta					
Dasypogon bromeliifolius					
Eucalyptus marginata subsp. marginata	+		15		
Jacksonia furcellata					
Johnsonia lupulina	+		1		
Xanthorrhoea preissii					
Bossiaea linophylla	10		2.5	01	
Pultenaea reticulata	2		1.5	02	

Swann Rd Borefield Walpole **Site** WPR10

Described by **Date** **Type** R

Season **Uniformity**

Location

MGA Zone **mE** **mN** **E** **S**

Habitat

Soil

Rock Type

Vegetation Eucalyptus guilfoylei mid woodland over Pteridium esculentum tall forbland, Gahnia trifida tall sparse sedgeland ove *Trifolium repens var. repens low forbland

Veg Condition

Fire Age

Notes Very dense and difficult to penetrate, edge disturbed from paddock

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Acacia applanata	2		2		
Billardiera heterophylla	3				
Eucalyptus guilfoylei	30		15		
Gahnia trifida	10		2.2		
Holcus lanatus	+		1		
Pimelea spectabilis	+		0.8		
Pteridium esculentum	50		2.5		
Taraxis grossa	1		1.2		
Taxandria linearifolia	1		1.5		
Taxandria parviceps	5		2		
Trifolium repens var. repens	15		0.2		
Xanthorrhoea preissii	2		1.5		

Swann Rd Borefield Walpole **Site** WPR11

Described by **Date** **Type** R

Season **Uniformity**

Location Photo 1, Martins phone 15/12/2022

MGA Zone 50 **mE** **mN** **E** **S**

Habitat Swamp shrubland

Soil

Rock Type

Vegetation Kingia australis sparse shrubs over Taxandria fragrans, Beaufortia sparsa, Homalospermum firmum mid closed shrubland over Evandra aristata, Leptocarpus thysananthus, Gahnia trifida mid sparse sedgeland

Veg Condition Excellent-Very Good

Fire Age 2 yrs

Notes Scattered Euc. patens nearby

SPECIES LIST:

Name	Cover	C Class	Height	Specimen	Notes
Beaufortia sparsa	2		1.5		
Homalospermum firmum	+		2		
Kingia australis	1		7		
Taxandria fragrans	80		2		
Anarthria prolifera	+		0.3		
Leptocarpus thysananthus	2		1.5		
Cassytha racemosa forma pilosa	+				
Evandra aristata	2		2		
Gahnia trifida	+		2		