Environmental Assessment Report

Lot 101 (no. 752) Wallcliffe Road, Margaret River

Project No: EP18-128(11)

Prepared for Wallcliffe House Pty Ltd
November 2023



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Executive Summary

This *Environmental Assessment Report* (EAR) has been prepared on behalf of Wallcliffe House Pty Ltd (the proponent) to support the proposed redevelopment of Lot 101 Wallcliffe Road, Margaret River (herein referred to as 'the site') which is located within the Shire of Augusta Margaret River. The proponent is proposing to redevelop the site as a boutique hotel and the development is in line with the proposal put forward as part of the recent scheme amendment. The site is approximately 5.2 ha in size and is located approximately 8 km south-west of the Margaret River townsite. The site is generally bounded by the Margaret River and associated riparian vegetation to the north-west, a nature reserve to the south and existing residential and tourism land uses (including chalet and camping) to the east (which includes the Margaret River rowing club).

The site contains one of the original farms and homesteads built by the Bussell family (referred to as 'Wallcliffe House') with construction of the original buildings commenced in the 1850's, and is known for its Aboriginal, European, and natural values and its landscape with attractive scenery and vegetation values. The buildings within the site were significantly damaged by a bushfire in 2011. It has not been used for residential or tourism purposes since these fires, although the cultivated gardens and grounds surrounding the buildings have continued to be maintained to a high standard over this period.

The site is zoned 'tourism' under the Shire of Augusta Margaret River Local Planning Scheme (LPS) No.1., and the proposed land use is in accordance with the zoning and the requirements of the scheme. It will accommodate up to 25 keys (62 guests) and is seeking to be sensitive and sympathetic to the history of the site and landscape values as part of managing heritage values. This is less keys than that proposed through the scheme amendment process (which was 40 keys). The principles being adopted are based on new buildings being located within the footprint of the existing fire damaged buildings, as well as additional guest cottages and suites, an operations building and wastewater treatment plant, guest and staff parking, an estate management office, a guest spa and supporting utility infrastructure. The existing mature cultivated gardens and areas of remnant vegetation within the site are proposed to be retained, although some modification to this vegetation will be undertaken to support development of the project and management of bushfire risk.

This EAR has been prepared to support the development application and approval process and provides a synthesis of information relating to the environmental features, attributes, and values. It outlines how these environmental values will be managed as part of the development process. The environmental attributes and values relevant to the site are summarised below and include:

- Topography across the site ranges from approximately 2 m Australian Height Datum (AHD) along the western boundary (e.g., closest to Margaret River) to 12 mAHD at its northern extent, 22 mAHD in the south west near the Wallcliffe Cliffs and 64 mAHD at the south eastern extent (e.g. closest to Wallcliffe Road).
- A limestone feature (lithified Tamala Limestone) extends from the south-western portion of the site in a westerly direction and contains shallow caves and a limestone rock face. This feature is generally referred to as the 'Wallcliffe Cliffs'.
- A number of geotechnical investigations undertaken for the site and indicate:

  - The site is generally comprised of sandy soils, including significant zones of very loose and loose sand, overlying limestone rock (and clays in the lower portion of the site closer to the Margaret River), in turn overlying granulite and granite bedrock.
  - No karst features have been identified within 10 m of the subsurface based on the outputs from ground penetrating radar investigations undertaken by Douglas Partners (2022).
- Available regional mapping has not identified the site as having acid sulfate soil (ASS) risk within 3 m of the soil surface and this is supported by the outcomes of the geotechnical investigation. Margaret River, adjacent to the north-western boundary of the site, is identified as having a 'low to moderate risk' of ASS risk within 3 m of the natural soil surface.
- Areas of the site below the 5 m AHD contour may potentially be at risk from coastal processes such as inundation, storm surge or erosion based on the outcomes of the Shire of Augusta Margaret River Coastal Hazard Risk Management and Adaption Plan (CHRMAP).
- The majority of vegetation within the site is highly disturbed and modified ('completely degraded') and was historically cleared to support the previous farming/residential land uses. Approximately 4 ha of the site is cleared and/or planted and is dominated by landscaped gardens that include native and exotic plant species. Small areas of the site contain more intact remnant vegetation in 'degraded' and 'good' condition and show evidence of weed control. In addition:
  - One individual of the priority four species *Banksia sessilis var. cordata* was recorded in the south-eastern corner of the site adjacent to the existing driveway (with other individuals likely to be present, just not recorded). No other threatened or priority flora species were identified within the site.
  - No threatened or priority ecological communities were identified within the site.
- A number of conservation significant fauna species were identified using habitat within the site including osprey, western ringtail possum, the three black cockatoo species (Carnaby's, Baudin's and forest red tailed), with a potential breeding habitat tree in the north-western portion of the site. As part of approved demolition works (P221600) that took place in 2021, an established osprey nest was relocated from the top of the fire damaged house, over to a new purpose-built platform designed especially for the birds, with subsequent successful breeding observed.
- Groundwater monitoring has been undertaken within the site since 2021 and the results indicate that levels range between 0.43 mAHD at the western/ north west boundary adjacent to Margaret River to 3.78 mAHD within the central portion of the site. A groundwater licence is applicable to the site and enables the abstraction of up to 16,500 kL/year of groundwater (GWL207725).
- Margaret River, a major perennial watercourse, is located directly adjacent to the western boundary of the site with the majority of intact riparian vegetation located outside the site. The riparian vegetation associated with Margaret River varies in width, with a small area containing no vegetation. The proponent has recently commenced revegetation work within the riparian vegetation adjacent to the site in accordance with a bed and banks permit (issued by the Department of Water and Environmental Regulation (DWER)) and development approval (issued by the Shire of Augusta Margaret River, P222827). No wetland features have been identified within the site. A soak is present in the north-west portion of the site and is man-made, constructed historically as part of the previous agricultural activities.

- Aboriginal and non-indigenous heritage values have been identified within or nearby to the site. This includes Directory Place Aboriginal Cultural Heritage (ACH) sites 5848 (Cliffs at Wallcliffe) and 4495 (Margaret River) and one Registered Heritage Place (Place 114 - Wallcliffe House and Landscape). Section 18 consent has been granted for potential impacts to the ACH sites.
- Areas of bushfire hazard have been identified outside the site, associated with the existing nature reserve (managed by the Shire) and the Margaret River/Leeuwin Naturaliste National Park to the south and west/north-west respectively.

Based on the environmental values or attributes identified within the site, this EAR provides an environmental management framework to be implemented across the site for the proposed development. As a summary, this includes:

- **Landforms, soils and geology:** no physical disturbance of Wallcliffe Cliffs is proposed as part of the development. Access to the Cliffs (via a previously installed boardwalk) has been removed in recognition of the importance of this feature to the Aboriginal community, as per the Section 18 approval and ongoing consultation. Soil and erosion control measures will be implemented across the site, particularly during construction.
- **Flora and vegetation**: retention of existing remnant native vegetation and the mature cultivated gardens (including trees) is proposed to be maximised as part of detailed design and construction processes. Construction works will be excluded from the Margaret River and associated riparian vegetation as well as Wallcliffe Reserve, minimising impacts on vegetation values. Vegetation to be retained will be clearly identified and managed in accordance with arborist advice, and enhancement of vegetation values will occur through ongoing riparian vegetation and through the landscape design.
- **Native fauna**: impacts to native fauna will be minimal given the limited high-quality habitat within the site. Impacts, where they occur, are expected to be short-term in nature (e.g. during construction) and can be managed through the implementation of fauna management protocols, such as pre-clearing inspections and a fauna spotter being present during works. The potential black cockatoo habitat tree in the north-western portion of the site will be retained, as will the osprey nest which was relocated as part of a previous development approval. Enhancement of habitat values will occur through ongoing revegetation of the riparian vegetation and through the landscape design.
- **Hydrology:** water management within the site will be based on maintaining the existing hydrological regime of the site which includes infiltrating at source and controlling erosion. New buildings are located more than 20 m from the Margaret River, and groundwater separation can be maintained. Groundwater use (primarily to support irrigation) within the site will be managed in accordance with groundwater licence (GWL207725). Wastewater will be managed via an onsite wastewater treatment plant, treating the water to a tertiary quality, and infiltrating onsite. Further detail on the water management requirements are detailed within the WMP (Emerge Associates 2023b).
- **Heritage:** Aboriginal and European heritage will be managed in accordance with the relevant approvals, including an existing Section 18 consent and future Heritage Council requirements. Ongoing consultation with Traditional Owners will be a key component of the project.

- **Bushfire management**: bushfire hazards (classified vegetation) have been identified in the vicinity of the site. Buildings will be constructed in accordance with the determined BAL rating and AS 3959, which includes BAL-40 and BAL-FZ construction and other fire engineering determined requirements. This is as part of responding to the heritage, vegetation, and landscape values within the site. Appropriate vehicle access (which includes turn around areas), onsite shelter and appropriate water supply have been included as part of the proposed development, as outlined in the BMP (Emerge Associates 2023a).

Overall, there are no significant environmental issues or constraints within the site that would preclude the proposed redevelopment of the site. The site is a place with recognised Aboriginal, European, and natural values. The heritage listing for the site identifies the "attractive scenery and vegetation of the landscape" being features that brought settlers to the area, with the views to/from the buildings a key consideration.

The project is seeking to be sensitive and sympathetic to the history of the site and landscape values as part of managing heritage values, particularly the views, remaining plantings, and remnant vegetation. Impacts to landform, native flora and vegetation and conservation significant fauna will be minimal given the sympathetic approach taken by the project, locating buildings within existing cleared/disturbed areas, and enhancing the vegetation values through revegetation and new planting. The water quality of the Margaret River will be protected, based on the water sensitive urban design approach, management of erosion and sedimentation and appropriate management of wastewater with a tertiary quality system. Short-term impacts can be managed through the implementation of vegetation and fauna construction management protocols, as well as landscaping (including new planting and revegetation work already underway in the adjacent foreshore) within the site which will assist with enhancing existing vegetation values.

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List of Abbreviations

Table A1: Abbreviations – General terms

General terms	
ASS	Acid Sulfate Soils
BAL	Bushfire Attack Level
BMP	Bushfire Management Plan
EAR	Environmental Assessment Report
ESA	Environmentally sensitive area
FZ	Flame zone
Key	Refers to the number of lodging units, which may include a lodging unit with multiple rooms as part of a single suite or similar.
MNES	Matters of National Environmental Significance
PEC	Priority ecological community
TEC	Threatened ecological community
WMP	Water Management Plan

Table A2: Abbreviations – units of measurement

Units of measurement	
cm	Centimetre
ha	Hectare
km	Kilometre
m	Metre
m AHD	Metres in relation to the Australian Height Datum
mm	Millimetre

Table A3: Abbreviations – Organisations

Organisations	
BoM	Bureau of Meteorology
DBCA	Department of Biodiversity, Conservation and Attractions
DFES	Department of Fire and Emergency Services
DCCEEW	Department of Climate Change, Energy, the Environment and Water (federal)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
DBCA	Department of Biodiversity, Conservation and Attractions
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, Lands and Heritage
EPA	Environmental Protection Authority
OBRM	Office of Bushfire Risk Management
WALGA	Western Australia Local Government Association
WAPC	Western Australian Planning Commission

Table A4: Abbreviations –Legislation or standards

Legislation	
AS 3959	*Australian Standard 3959-2018 Construction of buildings in bushfire prone areas*
BC Act	*Biodiversity Conservation Act 2016*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
PD Act	*Planning and Development Act 2005*

Table A5: Abbreviations – Planning terms

Planning terms	
LPS	Local planning scheme
SPP	State Planning Policy
The Guidelines	Guidelines for Planning in Bushfire Prone Areas version 1.4

1 Introduction

1.1 Background

Wallcliffe House Pty Ltd (the proponent) are proposing to redevelop Lot 101 Wallcliffe Road, Margaret River (herein referred to as 'the site') as a boutique hotel. The site is located within the Shire of Augusta Margaret River and is approximately 5.2 ha in size and is found approximately 8 km south-west of the Margaret River townsite, as shown in **Figure 1**. It is generally bounded by the Margaret River and associated riparian vegetation to the north-west, a nature reserve to the south and existing residential and tourism land uses (including chalet and camping) to the east (which also includes the Margaret River rowing club).

The site contains one of the original farms and homesteads built by the Bussell family (referred to as 'Wallcliffe House') with construction of the original buildings commenced in the 1850s. It is known for its Aboriginal, European, and natural values, as well as its landscape with attractive scenery, viewscapes and vegetation values. The buildings within the site were significantly (irreparably) damaged by a bushfire in 2011. The site has not been used for residential or tourism purposes since these fires, although the cultivated gardens and grounds surrounding the buildings have continued to be maintained to a high standard over this period.

MJA Studio have prepared a detailed concept plan to support the redevelopment of the site, which is provided in **Appendix A**.

1.2 Purpose of this report

This *Environmental Assessment Report* (EAR) has been prepared by Emerge Associates to provide a synthesis of information regarding the environmental values and attributes of the site. Specifically, this report:

- Identifies the policy and framework relevant to the development of the site (**Section 2**)
- Identifies the existing environmental values and attributes of the site, including updates since the scheme amendment process (**Section 3**)
- Outlines the environmental management that will be implemented to support development (**Section 3** and **Section 4**)

The EAR is a key supporting environmental document for the development application process, to facilitate the consideration of the relevant environmental values by decision makers and the community and ensure an appropriate management framework is applied.

2 Planning Framework and Proposal

2.1 Shire of Augusta Margaret River Local Planning Scheme No.1

The site is zoned 'tourism (T5)' and 'special area' (Development Contribution Area (DCA1) under the Shire of Augusta Margaret River Local Planning Scheme (LPS) No.1, as shown in **Plate 1**. The 'tourism (T5)' zoning, based on the outcomes of a re-zoning process in 2019, requires the following (as it relates to considering environmental values):

2. *The local government may also approve applications for the following tourist uses: restaurant, tearooms, hotel or guesthouse and chalet limited to a maximum of 40 keys, small bar, spa and activities related to public viewing of the buildings and grounds, where it can be demonstrated that bushfire mitigation measures can be achieved and such uses do not conflict with the heritage values of the site. Exhibition centre, reception centre and conference uses may also be approved on the site, provided the uses are incidental to the predominant use of the land.*
3. *No development shall be approved by the local government unless:*
    a. *It is consistent with the heritage values and integrity of the site;*
    b. *It is consistent with the landscape significance and setting of the site;*
    c. *It is appropriately sited and designed to ensure that fire mitigation measures do not compromise environmental and landscape values.*
    d. *It is set back a minimum of 20m from the property boundary where it abuts the Margaret River (with the exception of existing development, landscape works and essential services).*
    e. *The adjacent foreshore values are appropriately, enhanced, protected and managed.*
5. *Removal of existing vegetation is not permitted without the approval of local government.*
6. *The following documentation is to be prepared and accompany an application for development approval for any tourism-based land use (as outlined in Condition 2):*
    - *A Bushfire Management Plan and associated Bushfire Emergency Evacuation Plan, responding to the detailed design of the proposed development and addressing the requirements of SPP 3.7 and the relevant position statements and guidelines.*

The requirements of the local planning scheme have been considered as part of the development of the design concept for the project, with particular consideration for a sensitive and sympathetic approach consistent with the Aboriginal and European history as well as landscape and natural values, minimising removal of vegetation and utilising the existing cleared areas/historic building footprints as much as possible.

Enhancement of the foreshore values (Condition 3e) has already progressed, with revegetation work being undertaken within the areas containing riparian vegetation in accordance with a bed and banks permit (issued by the Department of Water and Environmental Regulation (DWER)) and development approval (issued by the Shire of Augusta Margaret River, P222827).

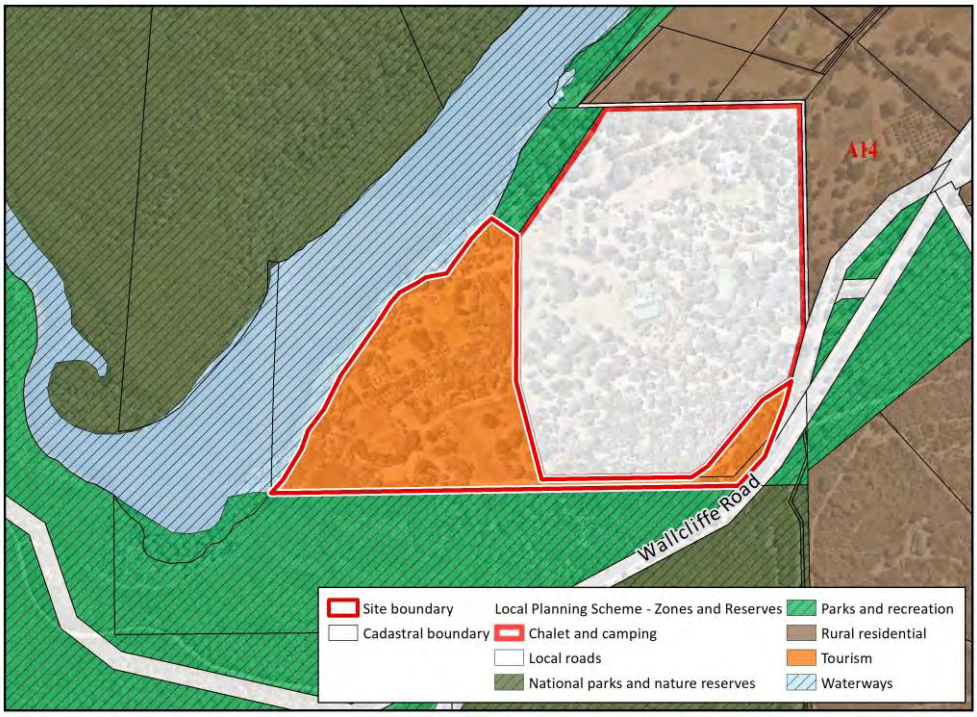


Plate 1: Shire of Augusta Margaret River Local Planning Scheme No.1 (2023)

2.2 Environmental Protection Act 1986

As part of the recent scheme amendment process, the proposal was referred to the Environmental Protection Authority (EPA) by the Shire of Augusta Margaret River under Section 48A of the *Environmental Protection Act 1986* (EP Act). The EPA concluded that the proposal did not require formal assessment under Part IV of the EP Act.

As part of considering the scheme amendment, the EPA provided advice regarding the environmental factor's flora and vegetation, terrestrial fauna, and inland waters. These considerations were factored in as part of the finalised scheme text (outlined above in **Section 2.1**). The project design has also considered the EPA advice in addition to the requirements of the scheme, noting that:

- Impacts to flora and vegetation values have been minimised, with remnant native vegetation retained and also incorporated as part of the landscape design. The approach to bushfire mitigation has been strongly aligned with protecting vegetation values.
- The identified black cockatoo habitat trees will be protected and retained as part of the project, and as part of approved demolition works in 2021 (P221600), the osprey nest within the site was relocated from the top of one of the fire damaged buildings to a new purpose-built platform designed especially for the birds.
- The foreshore area will be enhanced through the revegetation activities already commenced in that area (as discussed above) and will be protected as part of the proposed works and ongoing operation. The setback to new development is in accordance with that agreed through the scheme amendment process.
- Onsite effluent disposal is being addressed consistent with the *Government Sewerage Policy 2019* (DPLH 2019). Detailed investigations have been progressed since the scheme

amendment process to support the development of the wastewater management approach for the site.

2.3 Planning and Development Act 2005

The redevelopment of the site will need to obtain development approval in accordance with the Shire of Augusta Margaret River LPS No.1. This report, along with other supporting documents, has been prepared to support this process.

As part of any development approval, conditions will be applied to the project, which will need to be addressed as part of implementing the project. It is anticipated, that from an environmental perspective, conditions may relate to:

- Vegetation management, including protecting riparian vegetation and trees/vegetation proposed for retention.
- Fauna management and protecting fauna during demolition and construction activities.
- Water management, including protecting water quality within the Margaret River and managing stormwater in accordance with water sensitive urban design principles.
- Bushfire management and implementing the associated management plan.

Following development approval, the proponent will also be required to obtain:

- Building licences, pursuant to the *Building Act 2011* which will also factor in construction in accordance with *Australian Standard 3959-2018 Construction of buildings in bushfire prone areas* (AS 3959).
- A works approval, pursuant to Part V of the *Environmental Protection Act 1986*, for the onsite wastewater treatment plant.
- Department of Health approval, pursuant to the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974 for the onsite wastewater treatment plant.

2.4 Proposed development

As indicated, MJA Studio have prepared a concept master plan, detailing the proposed redevelopment of the site. The master plan is provided in **Appendix A**.

The site is intended to be developed as a boutique hotel, which will accommodate up to 25 keys (62 guests) and is intended to be sensitive and sympathetic to the Aboriginal and European heritage of the site, as well as the existing natural and landscape values. The principles being adopted will see new buildings be located within the footprint of the existing fire damaged buildings (which could not be restored as a result of damage from a bushfire in 2011), as well being constructed throughout the site including new additional guest cottages and suites, an operations building and wastewater treatment plant, guest and staff parking, an estate management office, a guest spa and supporting utility infrastructure. The number of keys proposed to be serviced by the project is less than that considered in the scheme amendment process (40 keys), and less than that permitted through the planning scheme (40 keys).

The uses proposed within the site can generally be summarised based on the following broad categories (generally outlined in **Plate 2**):

- Accommodation, associated with a number of Cottages, the Cliff wing, and the River wing.
- Guest facilities including:
  - Food and beverage, associated with Wallcliffe House and the Old Diary.
  - Day uses (for guests), associated with the Spa and Boat Shed.
- Operations and back-of-house, associated with the Operations barn, Estate management and the gatehouse.
- Driveway and vehicle parking.
- Landscaped grounds, including turf, manicured gardens, and managed retained vegetation.

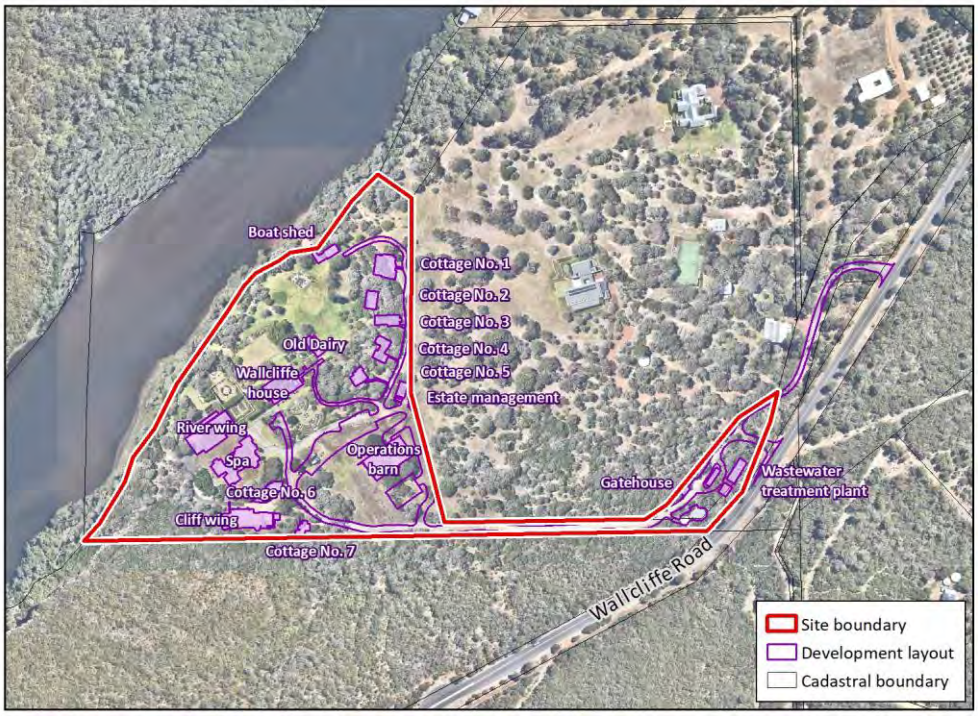


Plate 2: Summary of key buildings/features proposed as part of the development.

The proposed development of the site proposes to be sensitively integrated with the Margaret River, mature cultivated gardens, remnant vegetation and amenity values, while also providing the facilities required for a boutique hotel. It is shaped by design principles, using nature, heritage, materiality, and sustainability as inspiration. It is intended to be designed thoughtfully, built carefully, and inhabited respectfully.

3 Existing Environment

In order to understand the environmental values within or nearby to the site and consider appropriate management responses, Emerge Associates have reviewed a range of information sources, including local and regional reports, databases, mapping, and site-specific investigations. Site specific investigations and of design that have informed the preparation of this report include:

- *Bushfire Management Plan* (Emerge Associates 2023a)
- *Water Management Plan (Emerge Associates 2023b)*
- *Wallcliffe House and Landscape, Margaret River Heritage Impact Statement* (Hocking Heritage 2023)
- *Architectural Design Report* (MJA Studio 2023)
- *Landscape Architecture Development Application Report (See Design Studio 2023)*
- *Engineering Aspects (The Civil Group 2023)*
- *Sustainability Report (Cundall 2023)*
- *Waste Management Plan (Encycle 2023)*
- *Hydrogeological Assessment (Emerge Associates 2022)*
- *Geotechnical Investigation Report* (Douglas Partners 2022)
- *Spring Flora and Vegetation Assessment* (Emerge Associates 2019c)
- *Fauna Assessment* (Harewood 2019a)

3.1 Climate

3.1.1 Outline of values

The climate of the site is described as Mediterranean, with hot, dry summers and moderately wet, mild winters. The majority of rainfall within the region occurs between May and October each year, and on average is between 700 to 1200 millimetres (mm) annually. However, in the last 40 years there has been a marked decrease in rainfall, with a noticeable shift to a drier climate across the south-west of Western Australia (CSIRO 2009).

The closest weather station to the site which records rainfall and temperature data is located in Witchcliffe (Bureau of Meteorology (BoM) station number 9746), situated approximately 11.7 km south-east of the site. Based on weather data collected from 1999 to 2021 at the Witchcliffe station, the local area experiences an average of 965.2 mm of annual rainfall, as detailed in **Table 1** below. Temperature data is also recorded at the Witchcliffe station, indicating the highest a mean maximum temperature of 27.1^{o}C is in February, while the mean minimum temperature of 8.2^{o}C is in August (BoM 2023).

Table 1: Median annual rainfall from 1999 to 2021 at Witchcliffe (station number 9746) (BoM 2023)

Climate parameter	Month												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Median rainfall (mm)	5.8	6.8	27.3	48.6	123.3	172.7	201.8	161.2	107.6	58.2	32.0	13.6	965.2

3.1.2 Management

There are no specific management considerations in relation to climate, however the changing climate has been considered (and discussed further below) with regard to changing rainfall patterns and ongoing irrigation requirements to support the project.

3.2 Topography

3.2.1 Outline of values

The site has a north-westerly aspect, with elevation ranging from 2 m in relation to the Australian height datum (mAHD) along the western boundary adjacent to Margaret River, to 12 mAHD at its northern extent, 22 mAHD in the south west near the Wallcliffe Cliffs and 64 mAHD at the south eastern extent (e.g. closest to Wallcliffe Road) (DPIRD-072). Topographic contours are shown in **Figure 1**.

3.2.2 Management

There are no management considerations directly in relation to topography, however topography is a consideration in relation to coastal processes and managing erosion, as discussed further below.

3.3 Landform, soils, and geology

3.3.1 Outline of values

The regional geological mapping (*Western Australia 1:50 000 Regolith-Landform Resources Series, Cowaramup – Mentelle first edition 2000*) indicates that the site is underlain by the Leeuwin Complex comprising fresh to weathered granite, while the area immediately to the west of the site (e.g. associated with the Wallcliffe Cliffs) comprise the Spearwood dunal system, described as sand over calcarenite (coarse grained limestone). Soil landscape mapping (compiled by the Department of Primary Industries and Regional Development (DPIRD)) indicates the site is within the 'Gracetown low slopes phase' soil landscape (shown in **Figure 2**) which is described as 'deep yellow brown siliceous sands over limestone' (e.g. Spearwood Sands).

A number of detailed geotechnical investigations (CMW Geosciences 2018; Douglas Partners 2022) have been undertaken across the site and generally indicates that geology and soil aligns with the published regional information. An exception is that the sand of the Spearwood Dunal system extends further into the site, with some areas of the site containing shallow pinnacle limestone with sand.

A limestone feature (lithified Tamala Limestone) extends from the south-western portion of the site in a western direction and contains shallow caves and a limestone rock face. This feature is generally referred to as the 'Wallcliffe Cliffs'. It is located approximately 400 m from the coast and adjoins the site at its western-most boundary (with the total length of the cliffs approximately 250 m). There are a number of caverns, overhangs and caves within the cliffs that have been identified as having a diversity of significant local geological and landscape attributes (Shire of Augusta Margaret River 2018).

3.3.1.1 Karst formations

Karst is encountered all over Australia and the formation and size of karst features is reliant upon a variety of factors including water chemistry, strength of soluble rock and depth to groundwater from the surface. Karst landforms are produced as a result of the dissolution of soluble rock by weakly acidic surface water or groundwater. There are many distinctive landform features that define karst terrains including: sinkholes (dolines), caves, dry valleys, tube structures, vaults and solution flutes (Csaky 2003).

The geotechnical investigations conducted by Douglas Partners (2022) found no karst features were interpreted along the various transects within 10 m of the subsurface, indicating that it is unlikely that there is karst present within the site or a consideration for development.

3.3.1.2 Acid sulfate soils

Acid sulfate soils (ASS) is the name commonly given to naturally occurring soils and sediment containing iron sulphide materials. In their natural state ASS are generally present in waterlogged anoxic conditions and do not present any risk to the environment. When oxidised, ASS produce sulphuric acid, which can pose risks to the surrounding environment, infrastructure, and human health.

The site is not identified as having any risk of ASS based on the available regional mapping prepared by the Department of Water and Environment Regulation (DWER) (DWER 2023). This is supported by the geotechnical investigations (CMW Geosciences 2018; Douglas Partners 2022). Margaret River, adjacent to the north-western boundary of the site, is identified as having a 'low to moderate' risk of ASS within 3 m of the natural soil surface.

Given no disturbance of Margaret River is proposed, ASS is unlikely to be a risk for development within the site.

3.3.2 Management

A key feature requiring management/consideration is the Wallcliffe Cliffs. No physical disturbance of Wallcliffe Cliffs is proposed as part of the development. Direct access to the Cliffs (via a previously installed boardwalk) has been removed in recognition of the importance of this feature to the Aboriginal community, as per the Section 18 approval and ongoing consultation. Development approval was granted by the Shire of Augusta Margaret River for the proponent to redevelop the boardwalk in a different location, as per Planning Approval No. P222827. Works will be progressed in accordance with this approval. This area will be clearly demarcated and unauthorised access will be controlled.

Due to the steepness of the site, and its proximity to the Margaret River, soil and erosion control measures will need to be implemented across the site, particularly during construction, in accordance with the *Shire of Augusta Margaret River Erosion and Sediment Control Local Law 2019* (SAMR 2019). Management measures could include (but are not limited to):

- Minimising areas of the site composed of bare ground as much as possible, particularly in periods of high rainfall.

- Runoff from upstream catchments to be directed away from exposed soils and may include the use of temporary cut-off drains or flow diversion banks.
- Use of temporary sediment control fences and/or temporary sediment trapping devices (sand bags and filter socks) before the Margert River. These features will be designed to prevent flows bypassing them.

This will be documented as part of the engineering detailed design as well as the construction environmental management plan, which will need to be approved by the Shire of Augusta Margaret River.

3.4 Coastal processes

3.4.1 Outline of values

The site is situated approximately 600 m east of the coastline, with the development located adjacent to Margaret River which meanders to the river mouth (for approximately 1.2 km) and is seasonally open to the ocean. The Shire of Augusta Margaret River commissioned the preparation of a *Coastal Hazard Risk Management and Adaption Plan* (CHRMAP) (Shore Coastal 2015) to provide strategic guidance on management and adaptation in key coastal settlements that may be exposed to coastal processes such as storm surge, inundation and erosion.

The CHRMAP (Shore Coastal 2015) considered Prevelly and the areas near the mouth of the Margaret River, and while estuarine flooding for Margaret River was not specifically identified as an issue, Shore Coastal (2015) indicated that assets located below the 5 m AHD contour or at a horizontal distance of 200 m from the coast may be exposed to coastal processes such as storm surge, inundation and erosion in the 100 year planning period.

3.4.2 Management

All new buildings are located more than 200 m from the coast and will also be constructed above the 5 m AHD contour, and therefore it is unlikely that the proposed development will be significantly impacted by coastal storm surge or inundation in the future. No specific management is required to support implementation of the project.

3.5 Flora and vegetation

3.5.1 Outline of values

A detailed flora and vegetation survey (Emerge Associates 2019) has been undertaken across the site and portions of the surrounding reserves in November 2018. the outcomes of the survey have been summarised in the following sections, and a copy is provided in **Appendix B.**

The purpose of the survey was to detail the flora and vegetation characteristics of the site, and in particular determine the presence of conservation significant values such as threatened and priority ecological communities (TECs and PECs), threatened and priority flora and regionally significant vegetation values.

At the federal level, certain listed TECs and threatened flora are protected through the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and are identified as Matters of National Environmental Significance (MNES). Any action likely to have a significant impact on a listed TEC or threatened flora species requires approval from the Commonwealth Minister for the Environment.

At the state level, threatened flora species are listed under sections 19(1) and 26(2) of the *Biodiversity Conservation Act 2016* (BC Act), while TECs are listed under sections 27(1) and 33 of the BC Act. Threatened flora species and TECs are also acknowledged through other state environmental approval processes such as environmental impact assessment pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

An ecological community under consideration for listing as a TEC, but which does not yet meet survey criteria or has not been adequately defined, or which is rare but not currently threatened, is referred to as a priority ecological community (PEC). Similarly, species of flora which are potentially rare or threatened, or meet the criteria for near threatened, or have recently been removed from the threatened species list are classed as 'priority' flora species. PECs and priority flora are not protected statutorily.

These values are considered further below.

3.5.1.1 Plant communities and threatened and priority ecological communities

The site is largely comprised of non-native vegetation (approximately 4 ha) and is associated with mature cultivated garden and lawn areas. The vegetation within the site has been described as five different 'plant communities' which have been summarised in **Table 2** and shown in **Figure 3**. 'Cleared/planted' is the dominant plant community, while the other identified plant communities are relatively small and align with areas within the site where endemic species were identified in groups**.**

None of the plant communities described within the site (or surrounds) were identified as TECs or PECs.

The aquatic root mat community of the Leeuwin-Naturaliste Ridge Caves are a rare and complex TEC that live in a dark, warm, and wet environment of limestone caves. In these communities, the tree roots from endemic species such as karri, marri or peppermints reach the water in shallow caves and create microscopic fungi. The fungi in return provide a food source for other organisms. None of the Leeuwin-Naturaliste Ridge Caves TECs have been located in proximity to the site, but it is highly unlikely that this TEC occurs within the site due to the historic clearing of vegetation (including the removal of tree roots) and the planting of non-native species and the lack of karst areas within the site.

Table 2: Summary of plant communities (including area (ha)) identified within the site and broader survey area (Emerge Associates 2019b).

Plant community	Description	Area (ha)	
		Site	Additional survey area
AfW	Woodland of *Agonis flexuosus* over open shrubland of *Rhagodia baccata* subsp. *baccata*, *Olearia axillaris* and *Hibbertia cuneiformis* over open mixed forbland and open to closed grassland of weeds. See **Plate 3**.	0.63	0.21
AfSgHcW	Woodland of *Agonis flexuosus* over shrubland of *Spyridium globulosum*, *Hibbertia cuneiformis*, *Templetonia retusa* with vineland of *Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over low shrubland of *Phyllanthus calycinus* over forbland of *Tricoryne elatior* and *Thysanotus arenarius Austrostipa flavescens*. See **Plate 4**.	0.33	2.45
CcAfW	Woodland of *Corymbia calophylla* and *Agonis flexuosus* over shrubland of *Spyridium globulosum, Pteridium esculentum, Rhagodia baccata subsp. baccata* and *Exocarpos sparteus* with vineland of *Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over weeds	0.05	0.42
MhBvTrCS	Low open woodland of *Agonis flexuosus* (resprouting) with closed shrubland of *Melaleuca huegelii, Beyeria viscosa, Acacia cyclops, Diplolaena dampieri, Dodonaea aptera* and *Spyridium globulosum* with vineland of *Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over open forbland of *Tricoryne elatior, *Petrorhagia dubia* and *Thysanotus arenarius*, sparse sedgeland of *Lepidosperma spp.* and sparse grassland *of Austrostipa flavescens* and **Lagurus ovatus*.	0.16	1.96
MrLOF	Low open forest of *Melaleuca rhaphiophylla* over open to closed rush/sedgeland of *Juncus spp.* and *Baumea juncea* over sparse forbland of *Apium prostratum var. prostratum, Lobelia anceps, Samolus repens var. repens* and **Atriplex prostrata*.	0.11	0.79
Cleared/ planted	Modified vegetation comprising weeds with occasional native trees and planted vegetation. See **Plate 5**.	4.01	0.08



*Plate 3: Plant community **AfW** in degraded condition*



*Plate 4: Plant community **AfSgHcW** in good condition.*



Plate 5: Planted landscaped gardens in completely degraded condition.

3.5.1.2 Threatened and priority flora

One individual of the priority four flora species *Banksia sessilis* var. *cordata* was recorded in the south-eastern corner of the site, adjacent to the existing driveway and is shown in **Figure 3**. There are likely to be more individuals of this priority species within the remnant vegetation in the southern portion of the site, and within the adjacent reserve to the south.

No other threatened or priority species were identified within the site.

3.5.1.3 Vegetation condition

Vegetation condition within the site was assessed using methods from Keighery (1994), with descriptions of the vegetation condition ratings provided in **Appendix B.**

The vegetation within the site ranged in condition, with the majority of the site (4.01 ha) identified in 'completely degraded' condition (associated with non-native species such as turf/grasses, and garden areas with planted trees and shrubs). A number of patches of vegetation were identified throughout the site ranging from 'degraded' condition (0.39 ha, reflecting a lack of understorey structure and low species diversity) through to 'good' (0.62 ha) and 'very good' condition (0.28 ha, where moderate species diversity, <20% weed cover and relatively intact vegetation structure was identified). Vegetation condition is shown in **Figure 3**.

Adjacent to the site, within the Margaret River to the north-west and nature reserve to the south, vegetation was identified in 'very good' condition.

A detailed arborist assessment has been undertaken across the site, and document tree health to inform the landscape design (See Design Studio 2023) and retention of existing trees. A number of trees, identified as either weeds and/or in poor health, have been removed from the site in accordance with approvals granted by the Shire of Augusta Margaret River.

3.5.2 Management

A key principle guiding development within the site is to maximise the retention of the existing vegetation values including the mature cultivated gardens and enhancing values wherever possible. Management measures to be implemented as part of demolition and construction of the site include (but are not limited to):

- Where possible, avoid the priority four species *Banksia sessilis* var. *cordata*. It is possible that currently identified individual may need to be removed as part of widening the driveway to address bushfire requirements. More individuals are likely to be present, in the areas of vegetation not being disturbed.
- Utilise existing building footprints to maximise retention of the mature cultivated gardens and existing vegetation.
- Locating development to avoid any large (greater than 500 mm diameter at breast height) remnant native trees wherever possible, particularly with regard to the new vehicle cross-over and new buildings.
- Identification of works exclusion zones on engineering drawings and as part of works on the ground associated with the Margaret River (to the west), the Wallcliffe Cliffs and Wallcliffe Reserve (to the south).
- Identification of tree/vegetation retention areas on engineering drawings and delineation of tree protection zones (TPZ). These will be identified as 'no go zones' or similar and managed in accordance with arborist advice. No go zones/TPZs will be clearly demarcated on the ground, using flagging tape or fencing. No storage of machinery or equipment will be permitted under retained trees/vegetation.
- Where possible, as part of clearing, mulch vegetation in situ and utilise within landscaped areas.

- Revegetation of the riparian vegetation associated with Margaret River. The proponent has already commenced revegetation work within this area, extending outside the site, in accordance with a bed and banks permit (issued by the Department of Water and Environmental Regulation (DWER)) and development approval (issued by the Shire of Augusta Margaret River, P222827).
- Implement hygiene protocols during the clearing and construction process to minimise introduction/spread of weeds and plant pathogens. This will include:
  - Vehicles, machinery, and personnel to be free of mud/soil and plant material upon entering the site. Inspections to be completed prior to works commencing.
  - Minimising clearing and earthworks during wet conditions.
  - Using landscaping species not identified as weeds.

Clearing/modification of the existing vegetation within the site will be required as part of implementing the proposed development, particularly with regard to the construction of a new cross-over and the gatehouse area (and associated back of house operations) in the southern portion of the site, as well as that associated with bushfire risk management in/around the bush cottages, however overall these impacts will be minor. The management measures will be documented within a construction environmental management plan to support demolition and construction activities within the site and will be approved by the Shire of Augusta Margaret River.

3.6 Terrestrial fauna

3.6.1 Outline of values

A fauna survey has been undertaken within the site and broader survey area and included a targeted western ringtail possum survey in addition to a targeted black cockatoo habitat assessment. A copy of the fauna assessment is provided in **Appendix C** and the outcomes summarised in the section below.

Fauna species that are considered to be rare or under threat warrant special protection under state and/or federal legislation. At a federal level, fauna species may be listed as 'threatened' pursuant to the EPBC Act and any action likely to have a significant impact on a listed threatened species requires approval from the Commonwealth Minister for the Environment.

At a state level, fauna species listed as 'threatened' under section sections 13, 19 and 26(2) of the BC Act. In addition to this, the Department of Biodiversity Conservation and Attractions (DBCA) maintains a list of priority fauna species which, while not considered threatened under the BC Act and therefore not protected directly, involve some concern over their long-term survival.

The outcomes of the fauna survey (Harewood 2019) indicate that the areas of remnant vegetation and cultivated gardens within the site are likely to provide habitat for conservation significant fauna species, with evidence of their presence observed for a number of the species however the habitat is not considered to be 'high-quality'. A summary of the conservation significant fauna species that were observed or may potentially occur within the site or surrounds have been summarised in **Table 3**.

Table 3: The presence of conservation significant fauna species within the site and surrounds (Harewood 2019).

Species	Conservation status			Habitat present		Evidence of presence	
	BC Act	EPBC Act	DBCA List	Site	Surrounds	Site	Surrounds
Baudin's black cockatoo *(Zanda baudinii)*	Endangered	Endangered	-	✓	✓	✓	✓
Carnaby`s black cockatoo *(Zanda latirostris)*	Endangered	Endangered	-	✓	✓	✓	✓
Forest red-tailed black cockatoo *(Calyptorhynchus banksii naso)*	Vulnerable	Vulnerable	-	✓	✓	✓	✓
Eastern osprey *(Pandion haliaetus)*	Migratory	Migratory	-	✓	✓	✓	✓
Western ringtail possum (*Pseudocheirus occidentalis*)	Critically endangered	Critically endangered	-	✓	✓	✓	✓
Pouched lamprey *(Geotria australis)*	-	-	Priority 3	✕	✓	✕	✕
Peregrine falcon *(Falco peregrinus)*	Other specially protected	-	-	✓	✓	✕	✕
Masked owl (SW population) (*Tyto n. novaehollandiae)*	-	-	Priority 3	✓	✓	✕	✕
Black bittern (*Ixobrychus flavicollis*)	-	-	Priority 2	✕	✓	✕	✕
Australian little bittern (*Ixobrychus dubius)*	-	-	Priority 4	✕	✓	✕	✕
South-western brush-tailed phascogale *(Phascogale tapoatafa wambenger)*	Conservation dependent	-	-	✓	✓	✕	✕
Quenda ((*Isoodon fusciventer*)	-	-	Priority 4	✕	✓	✕	✕
Western false pipistrelle *(Falsistrellus mackenziei)*	-	-	Priority 4	✕	✓	✕	✕
Water rat, rakali (*Hydromys chrysogaster)*	-	-	Priority 4	✕	✓	✕	✕

Of the fauna species identified in **Table 3**:

- The presence of western ringtail possum throughout the site was identified through scats, dreys and identification of individuals during the nocturnal component of the survey, with the location of these observations shown in **Figure 4**. Almost all vegetation within the site can be considered habitat of some type for the western ringtail possum and may be used for refuge, foraging and/or dispersal.

- Foraging evidence of the three black cockatoo species (Carnaby's, Baudin's and forest red-tailed) was identified within site in the form of chewed marri nuts and pine cones in two areas, as shown in **Figure 5**, however overall the extent of quality foraging habitat within the site is limited. Three potential trees that could be used as breeding habitat (e.g., with a diameter at breast height ≥ 500mm) were identified in the survey area, with only one of the trees identified within the site. None of the trees were identified to contain hollows suitable for breeding and no evidence of breeding activity was observed. No roosting trees were identified.
- An osprey nest was identified near the northern-most boundary of the site and an individual observed resting on one of the buildings during the survey, and subsequent to the survey established a nest on top of one of the fire-damaged buildings. As part of approved demolition works (P221600) that took place in 2021, the osprey nest was relocated from the top of one of the fire damaged buildings to a new purpose-built platform designed especially for the birds. The new location of the nest is shown in **Figure 5**. Observations of the osprey indicate it is breeding successfully from the new nest location.
- No water rats were observed within the site or surrounds as part of the fauna survey (Harewood 2019), although it is noted that the dense swampy vegetation (e.g., riparian vegetation) associated with the Margaret River would be suitable habitat for the species. Anecdotal evidence provided by local Aboriginal people supports this and indicates water rats are present and utilise the riparian vegetation.
- Similarly, while no quenda were observed, the fauna survey (Harewood 2019) noted that the dense swampy vegetation associated with the Margaret River (e.g., the riparian vegetation) would be considered suitable habitat for the species and may be used.

While fauna species of conservation significance were identified utilising the site, the site is considered to have overall low biodiversity value from a fauna perspective (when compared to surrounding nature reserves and the Margaret River).

3.6.2 Management

Impacts to native fauna will be minimal given the long-term retention of the majority of remnant native vegetation within the site, particularly the potential black cockatoo habitat trees in the north-west portion of the site. However, impacts to fauna are possible as part of the demolition and construction activities, and in addition to the vegetation protection measures, fauna management will include (but is not limited to):

- Identification of works exclusion zones on engineering drawings and as part of works on the ground associated with the Margaret River (to the west), the Wallcliffe Cliffs and Wallcliffe Reserve (to the south).
- Identification of tree/vegetation retention areas on engineering drawings and delineation of tree protection zones (TPZ). These will be identified as 'no go zones' or similar and managed in accordance with arborist advice. No go zones/TPZs will be clearly demarcated on the ground, using flagging tape or fencing. No storage of machinery or equipment will be permitted under retained trees/vegetation.
- Where possible, as part of clearing, mulch vegetation in situ and utilise within landscaped areas.
- Revegetation of the riparian vegetation associated with Margaret River, already outlined above.

- Implementation of fauna management protocols by an experienced fauna specialist under a valid license from the Department of Biodiversity, Conservation and Attractions (DBCA). This would include fauna trapping and relocation prior to clearing if required (particularly for western ringtail possum), pre-clearing fauna inspection and having a fauna spotter present during clearing activities.
- Ensuring the project is maintained in a clean and tidy manner to ensure feral and other species are not attracted to the site. Waste material is to be disposed of appropriately through waste services and/or to licenced landfill during construction and as part of ongoing operation.

Clearing/modification of the existing vegetation within the site will be required as part of implementing the proposed development and will be the main impact to fauna species. The short-term potential impacts associated with this (e.g. during construction) can be managed as part of the development process through implementation of fauna management protocols. In the long-term fauna will still be able to persist across the site given the extensive landscaping (existing and proposed) and connection to broader vegetated areas. The management measures will be documented within a construction environmental management plan to support demolition and construction activities within the site and will be approved by the Shire of Augusta Margaret River.

3.7 Other biodiversity considerations

3.7.1 Outline of values

3.7.1.1 DBCA managed lands

DBCA has tenure of or interests in numerous areas of land across the state for a range of purposes. Tenure categories include national parks, nature reserves, conservation parks, marine parks, marine nature reserves, marine management areas, section 5(1)(g) reserves, state forest and timber reserves. These areas are mapped within the *Legislated Lands and Waters* (DBCA-011) and *Lands of Interest* (DBCA-012) datasets. The *Legislated Lands and Waters* (DBCA-011) dataset includes lands subject to the following legislation: the *Conservation and Land Management Act 1984* (CALM Act 1984), *Swan and Canning Rivers Management Act 2006* (SCRM Act) and lands identified under the *Land Administration Act 1997* (LA Act). The *Lands of Interest* (DBCA-012) dataset includes all other lands of which DBCA is recognised as the manager but is not vested under any act. These lands comprise of crown land and freehold land which DBCA has been acknowledged by the Department of Planning, Lands and Heritage (DPLH) as the responsible agency.

DBCA managed lands in the vicinity of the site include land to the west of the Margaret River (and including the portion of the river to the west and south west of the site) and south of the site and Wallcliffe Road, all of which forms part of the Leeuwin-Naturaliste National Park (R8428), as shown in **Figure 6**.

3.7.1.2 Shire managed conservation reserves

The land directly to the south of the site is vested with the Shire of Augusta-Margaret River as an A-class nature reserve, R41545 (Wallcliffe Reserve) (Shire of Augusta-Margaret River 2018), as shown in **Figure 6**. Wallcliffe Reserve contains the majority of the feature 'Wallcliffe Cliffs' which contain a number of caverns, overhangs and caves as discussed in **Section 2.1.2**. Due to increased degradation

from recreational use and its Aboriginal significance, public access to the cliff caves were prohibited by the Shire of Augusta Margaret River in 2018 (Shire of Augusta-Margaret River 2018).

A separate cave is known to be present close to the south of the site within Wallcliffe Reserve, and approximately 150 m from the Wallcliffe Cliffs (Shire of Augusta-Margaret River 2018). However, the exact location of the cave is not identified in publicly available mapping. This cave was previously accessed for tourism purposes but this cave was gated to prevent access following the preparation of the *Wallcliffe Cave Management Plan (2002-2012)* (Shire of Augusta-Margaret River 2002).

3.7.1.3 Ecological linkages

Ecological or biodiversity linkages are described as areas of native vegetation which provide a corridor or linkage (typically linear) between patches of vegetation to allow movement of flora and fauna and their genetic material through the landscape, helping to maintain metapopulations. Ecological linkages are often continuous or near-continuous as the more fractured a linkage is, the less ease flora and fauna have in moving within the corridor (Alan Tingay and Associates 1998).

The South West Biodiversity Project has identified and mapped regional ecological linkages (based on areas of vegetation being located in the vicinity of others), resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

There are no mapped ecological linkages within the site. Three regional ecological linkages (Nos 107, 108 and 109) meet to the west of the site, associated with the Margaret River, and generally extend to the north and south of the site aligned with Leeuwin-Naturaliste National Park. The general location of the ecological linkages are shown in **Figure 6**.

3.7.1.4 Environmentally sensitive areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding significant, threatened, or scheduled flora, vegetation communities or ecosystems. Exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* do not apply within ESAs. However, exemptions under Schedule 6 of the *Environmental Protection Act 1986* (EP Act) still apply, including any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act, such as the *Bush Fires Act 1954*).

No ESAs are identified within the site. One ESA is located directly to the south of the site and adjacent to the northern bank of the Margaret River. This ESA is large and extends to the north, south-west and south-east of the site over approximately 2,518 square kilometers (km^2) and is generally aligned with Leeuwin-Naturaliste National Park. The extent of the ESA in proximity to the site is shown in **Figure 6**.

3.7.2 Management

No removal of native vegetation or development works are proposed within the DBCA or Shire management lands to the west or south respectively. Works boundaries will be clearly defined within engineering drawings and demarcated on the ground, as outlined within **Section 3.5.2**.

As outlined previously, the proponent has commenced revegetation activities within the foreshore area adjacent to the Margaret River in accordance with a bed and banks permit (issued by the Department of Water and Environmental Regulation (DWER)) and development approval (issued by the Shire of Augusta Margaret River, P222827). This has included weed control and planting within the foreshore area, and repair of an existing limestone retaining wall adjacent to the foreshore area .

The relevant management measures will be documented within a construction environmental management plan to support demolition and construction activities within the site and will be approved by the Shire of Augusta Margaret River.

3.8 Hydrology

3.8.1 Outline of values

3.8.1.1 Groundwater

A review of the Water Register (DWER 2019) indicates the site is found within the Busselton-Capel Groundwater Area and the Cape to Cape North subarea. This groundwater subarea is composed of two aquifers, the surficial and fractured rock, both of which rely on rainfall for recharge.

Groundwater levels have been monitored at various locations across the site since 2021 and are shown in **Plate 6**. No groundwater was observed at MW05 and MW06 and have therefore not been subject to ongoing monitoring.

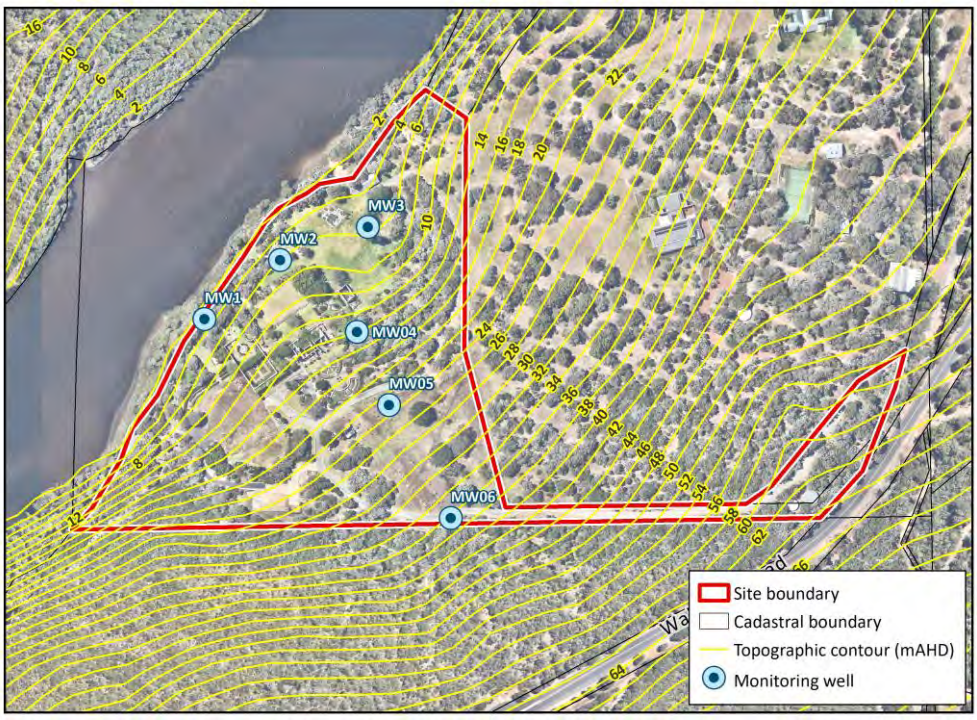


Plate 6: Groundwater monitoring locations (MW designation) within the site.

The groundwater monitoring results have been summarised in **Table 4**, and demonstrate that groundwater levels vary in depth across the site, and are generally shallowest closest to the Margaret River within the western portion of the site. Groundwater levels are influenced by the River

and become higher moving further up the hill and away from the River, following the localised topography. Separation between the natural soil surface and groundwater increases at the same time. Depth to groundwater was measured to be up to 5 m furthest from the river.

Table 4: Summary of groundwater monitoring results.

Monitoring well	Minimum groundwater level (m AHD)	Maximum groundwater level (m AHD)
MW01	0.43	2.43
MW02	0.90	2.48
MW03	1.48	2.73
MW04	2.62	3.78

A hydrogeological assessment was completed for the site (Emerge Associates 2022), to support consideration of whether groundwater could be sustainably abstracted as part of the ongoing hotel use. The investigations determined that a localised aquifer existed within the western portion of the site and has a resource of 69,298 kilolitres (kL) that is recharged at a rate of approximately 22,079 kL/year, based on the lower range of rainfall assessed.

A groundwater licence is applicable to the site and enables the abstraction of up to 16,500 kL/year of groundwater (GWL207725). This is based on detailed hydrogeological investigations that have been undertaken to understand the conditions underpinning the site. The use of groundwater will be guided by a Groundwater Operating Strategy (GOS) that was approved by Department of Water and Environmental Regulation (DWER) in 2022.

3.8.1.2 Surface water

A review of the Water Register (DWER 2023) indicates that the site is located within the 'Busselton Coast' surface water area and 'Lower Margaret' subarea.

No surface water features have been identified within the site, however the Margaret River, a major perennial watercourse, is located directly adjacent to the western boundary of the site. While the topography of the site would direct runoff towards the Margaret River, runoff from the majority of rainfall events is expected to infiltrate at source within the sandy layer of soils in the site. Major rainfall events (e.g. 1% annual exceedance probability (AEP) event) may result in localised sheet flow due to the steep slope of the site. The location of Margaret River is shown on **Figure 6**.

The portion of the Margaret River adjacent to the site forms part of the lower reaches of the river, with the river mouth (where it connects with the Indian Ocean) located approximately 1.2 km west of the site (based on the meandering river channel). Margaret River retains a diversity of habitats including pools, riffles, cascades, low flow channels, floodplains, and backwaters as well as flora, fauna, and aquatic (fish, invertebrates etc.) values.

Riparian vegetation values associated with the Margaret River are largely located outside the site boundary, within an area of land located between the site and the main waterbody. Remnant riparian vegetation is described as being dominated by *Melaleuca rhaphiophylla* and associated sedges and rushes (Nature Conservation Margaret River Region 2018). This description was supported by the findings of the flora and vegetation survey completed by Emerge Associates (2019).

The width of the riparian vegetation adjacent to the site varies between 0 m and 25 m, with a small portion of the site having direct access to Margaret River via an existing small cleared beach. As previously outlined, the proponent has commenced revegetation activities within the foreshore, as part of protecting and enhancing the existing values.

3.8.1.3 Wetlands

No wetlands of international importance (e.g. Ramsar wetlands) or geomorphic wetlands (as mapped within the federal Department of Environment and Energy Protected Matters Search Tool and the DBCA maintained *Geomorphic Wetlands Leeuwin Naturaliste Ridge and Donnybrook to Nannup* (DBCA-043) and *Geomorphic Wetlands South West (DBCA-040)* databases respectively) have been identified within the site or in close proximity.

A soak is present in the north-west portion of the site and is man-made and not a wetland, constructed historically as part of the previous agricultural activities.

3.8.1.4 Onsite wastewater treatment and disposal

The proposed project is not able to connect to the reticulated sewerage network, and accordingly onsite wastewater treatment is proposed. Package wastewater treatment plants (WWTPs) are extremely common for premises outside of the Water Corporation licence areas as well as remote/regional locations and mine camps and can treat domestic strength wastewater to a treated effluent suitable for basic liquid effluent disposal methods (such as low exposure risk recycled water reuse applications). They are commonly used in the Shire of Augusta Margaret River where development is outside the main townsites.

The *Government Sewerage Policy* (DPLH 2019) provides a best practice approach to the provision of onsite effluent treatment and disposal in WA and should be undertaken in accordance with *Australian/New Zealand Standard 1547 On-site domestic wastewater management* (Standards Australia and Standards New Zealand 2012) (AS 1547-2012)). The *Government Sewerage Policy* (DPLH 2019) recommends that on-site systems not be located within 100 m of a waterway or significant wetlands without treatment and, depending upon the system, will require between 0.6 m and 1.5 m vertical separation to groundwater. The policy notes that smaller setbacks to waterways may be considered where the reduced setbacks will not have a significant impact on the environment or public health. The Government Sewerage Policy (DPLH 2019) indicates that when seeking a reduced setback, secondary treatment systems with nutrient removal would be required, as well as the approval of governing agencies (e.g. DWER, DBCA, Department of Health and/or the local government authority (e.g. Shire of Augusta Margaret River).

The WWTP is proposed to be located near the Gatehouse, while the infiltration areas for the system will be located near the Operations Barn, more than 100 m from Margaret River. The infiltration areas are shown in **Plate 7**. The WWTP proposed to support the project will be accompanied by an effluent polishing plant to provide further filtration and treatment of the effluent. This is in addition to what is provided with secondary treatment systems (which under the *Government Sewerage Policy 2019* are generally considered the better approach to managing wastewater). The polishing plant includes membrane filtration and chemical dosing to remove phosphorous from the WWTP

effluent. Membrane filtration also removes a high fraction of viruses, pathogens, and other microorganisms. This is further detailed within the WMP (Emerge Associates 2023b).

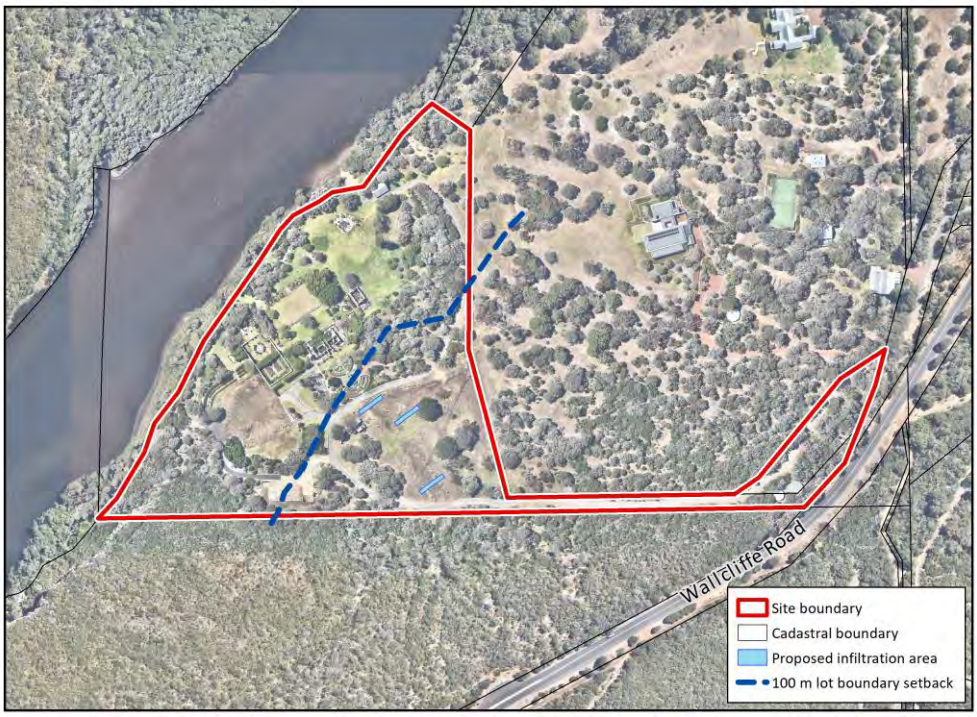


Plate 7: Proposed location of infiltrations areas for the WWTP, as documented within the WMP (Emerge Associates 2023b)

3.8.2 Management

A Water Management Plan (WMP) (Emerge Associates 2023b) has been prepared to support the development within the site and provides the framework for actions and measures to address groundwater, surface water (stormwater), water conservation and wastewater. The overall objective for the integrated water cycle management of the project is to maintain the pre-development hydrological regime. Management will be based on:

- **Potable water supply** – there is an existing connection to potable water provided by the Water Corporation which will be upgraded and utilised for the proposed project. Water efficient fixtures and appliances will be utilised throughout to minimise water use, and measures are considered further in the WMP (Emerge Associates 2023b) and Sustainability Report (Cundall 2023).
- **Wastewater servicing** –an onsite wastewater treatment plant will be utilised and will be based on a tertiary level of treatment and infiltration onsite of treated water. The WMP includes a site and soil evaluation to support the proposed wastewater servicing approach, and to demonstrate that the site can comply with the intent of *Australian Standard 1547:2012 Onsite Domestic Wastewater Management* (SAI Global 2012) (AS 1547). This is discussed further below.
- **Non-potable water supply** – will be supplied by groundwater, which has historically been used for irrigation purposes within the site and is extracted from the superficial/fractured rock aquifer beneath the site. The project has secured a groundwater licence (GWL207725), and the use of groundwater will be guided by the licence and the approved Groundwater

Operating Strategy (GOS). Waterwise gardening principles will be applied a part of the implementation of the landscape design, including improving the soil, hydrozoning, designing and scheduling irrigations systems efficiently, mulching/using hardscape materials, minimising disturbance to the existing gardens and using waterwise species.

- **Surface water management** – which will adopt an at source infiltration approach, consistent with the historical approach to water management within the site.
- **Groundwater** – management will be passive and will avoid interaction with underlying groundwater levels. Groundwater quality will be improved by removing historical agricultural uses, and by addressing surface water quality using a water sensitive urban design approach, which mimics natural processes at the surface and at source.
- **Flood protection** – to be addressed by ensuring that buildings are located above the elevation identified to be higher risk (e.g. above 5 mAHD).

With regard to the management of wastewater, as outlined, a package wastewater treatment plant (WWTP) with an effluent polishing plant will be implemented within the site. The approach to wastewater management is detailed within the WMP (Emerge Associates 2023b), however key considerations include:

- **Spatial location of the wastewater management system**. The infiltration areas for the system are located more than 100 m horizontally from the Margaret River, and in an area where the depth to groundwater is greater than 1.5 m (Emerge Associates 2023b). The distance of the wastewater management system from the Margaret River and the depth to groundwater are compliant with the required separation from water resources and groundwater as outlined in the *Government Sewerage Policy 2019*.
- **Management of water quality**. A range of features are proposed as part of the system to achieve high nutrient removal to ensure no impacts on the Margaret River. This includes: being designed to manage the maximum daily generation of wastewater (24 kL/day) based on 100 % occupancy; adding an effluent polishing plant and use of engineered soil media within the infiltration areas to reduce phosphorus output; using membrane filtration to minimise total suspended solids; and providing buffer storage and backup electricity to manage potential downtime and/or maintenance periods (Emerge Associates 2023b).

The effluent quality that will be produced from the wastewater treatment system will result in effluent output that is of a higher quality than that generated from typical utility-operated wastewater treatment plants in Western Australia, meaning a wide range of disposal methods are available for consideration. The WWTP will incorporate operation and maintenance agreements with equipment vendors to ensure that the system operates reliably to a high standard suited to the project and as required by current legislation. It will also be subject to a works approval, pursuant to Part V of the *Environmental Protection Act 1986* (through the DWER) due to its size (24 kL/day), as well as Department of Health approval, pursuant to the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974.

Overall, the WMP (Emerge Associates 2023b) provides detailed criteria for the implementation of the project and detailed design, to ensure that the water management objectives proposed can be satisfied, and that an integrated water cycle management and best practice water sensitive urban design approach can be achieved.

3.9 Heritage

3.9.1 Outline of values

3.9.1.1 Aboriginal heritage

In Western Australia, Aboriginal cultural heritage is currently managed pursuant to the *Aboriginal Cultural Heritage Act 2021*[1]. The DPLH maintain the Aboriginal Cultural Heritage Inquiry System (ACHIS), which is a directory containing locations and information about Aboriginal Cultural Heritage (ACH) in the state.

Brad Goode & Associates, Consulting Anthropologists and Archaeologists, were appointed by the proponent to undertake an Ethnographic Aboriginal Heritage Survey of the site (Brad Goode and Associates 2021). Two ACH were identified in the site and include:

- Directory Place 4495-Margaret River, which includes the river system, its major tributaries, and associated banks. It is a mythological site originally reported to have once contained a Waugal. It was also further reported to be associated with a mythological narrative of a dreamtime ancestor known as Wooditch who was responsible for making the Wooditchup or Margaret River with his magic wand.
- Directory Place 5848 Cliffs at Wallcliffe is described as a mythological site that also contains artefacts and rock shelters. The mythological component of this site is reported to be associated with the Wooditch narrative which relates how two mythological being are "buried side by side at Wallcliffe where a pile of stones marks their graves". The Wallcliffe area is known as Wainilyinup or 'dying place' in association with this mythology. The publicly mapped extent of these features are shown in **Figure 7**. In 2016 skeletal remains of Ngungargoot were repatriated from the Western Australia Museum and reburied in an undisclosed location within Directory Place 5848 Cliffs at Wallcliffe mapped extent but is not within the site.

Consultation was held with twelve representatives of the South West Boojarah Indigenous Land Use Agreement (ILUA) group on 24 March 2021 and 6 August 2021. During this consultation it was determined that there were no new ethnographic sites located within the survey area. The Traditional Owners supported the proposed works.

A Section 18 application pursuant to the *Aboriginal Heritage Act 1972* (which was in affect at the time) was made, and consent was granted by the Minister based on a number of conditions. These are detailed within the *Wallcliffe House and Landscape, Margaret River Heritage Impact Statement* (Hocking Heritage 2023). Section 18 approval obtained under the previous *Aboriginal Heritage Act 1972* is still valid under the *Aboriginal Cultural Heritage Act 2021*.

[1] In August 2023, the WA Government announced that the ACH Act would be repealed and replaced by an amended version of the *Aboriginal Heritage Act 1972* (AH Act). At the time of writing, this change to the statutory framework is yet to be legislated.

3.9.1.2 Non-Indigenous heritage

In order to determine the actual or potential presence of sites or features of non-indigenous heritage significance within the site, a review of readily available information at a federal, state, and local government level was undertaken to determine if any of the following occur within the site:

- World Heritage Sites
- National Heritage Places
- Commonwealth Heritage Places
- Sites listed in the State Register of Heritage Places
- Sites listed in the Shire of Augusta Margaret River Heritage Register.

The entire site is identified as a state and local registered heritage place, namely Place No. 114 – Wallcliffe House and Landscape.

'Wallcliffe House and Landscape' is described as containing areas of varying significance with Aboriginal, European, and natural values identified, and include visual amenity, associated with the original views and vista that have changed little since European settlement, and the construction of Wallcliffe House and Dairy in the 1850's by Alfred and Ellen Bussell.

The *Wallcliffe House and Landscape, Margaret River Heritage Impact Statement* (Hocking Heritage 2023) notes that the Statement of Significance for the property has not been altered since the 2011 bushfire, to reflect the loss of Wallcliffe House and the Diary, however the significance of the site is still relevant with regard to the landscape values, plantings, and views. It can be referred to for more detail on the heritage values.

3.9.2 Management

3.9.2.1 Aboriginal heritage

The proposed development and ongoing operation of the site will be implemented in accordance with the Section 18 approval and ongoing consultation with the Traditional Owners. Activities that will be undertaken include:

- Representatives of the South West Boojarah Indigenous Land Use Agreement (ILUA) group being present during ground disturbing works.
- Revegetation of the riparian area associated with Margaret River. These works have already commenced, as outlined previously.
- Reporting impacts on any Aboriginal site, including results of any monitoring.

A holistic approach to interpretation of the heritage values will be undertaken to ensure that all aspects of the history and significance of the site will be recognised and celebrated in appropriate ways.

3.9.2.2 European heritage

The proponent understands the heritage significance of the site and has proposed a development that will construct an interpretation of Wallcliffe House and reconstruct the Dairy building, together with a series of detached buildings that complement the design of Wallcliffe House and are respectful of the natural landscape setting (Hocking Heritage 2023). Further detail is provided within the *Wallcliffe House and Landscape, Margaret River Heritage Impact Statement* (Hocking Heritage 2023), however as part of the demolition and construction process, the proposed development is proposed to be supported by:

- Interpretation Strategy, which will detail a number of themes and storylines and how these will be considered as part of development. A draft strategy is included in the *Wallcliffe House and Landscape, Margaret River Heritage Impact Statement* (Hocking Heritage 2023).
- Archaeological Management Plan, which will detail the procedures appropriate for the site and how these should be implemented.

These plans (and any other requirements) will be submitted to the Heritage Council for approval and implemented as part of demolition, construction, and operation.

3.10 Other land use considerations

3.10.1 Outline of values

3.10.1.1 Historic and existing land uses

A review of available historical aerial imagery indicates that a majority of the site was cleared of native vegetation prior to 2004 (Landgate 2023). As outlined previously, the site was historically used to support one of the original farms and homesteads built by the Bussell family with construction of the buildings commenced in the 1850's, most notably Wallcliffe House and the Diary. The site was home to a number of large buildings and ancillary buildings (built in the early 2000s), as well as a significant manicured garden and has supported agricultural, residential and tourism land uses since the 1850's.

The site has not been used for residential or tourism purposes since the 2011 Margaret River bushfire significantly damaged the original Wallcliffe House and Diary and the majority of its ancillary buildings. The buildings constructed in the early 2000s (the 'Chaney buildings') have been demolished and removed from the site as part of a planning approval granted by the Shire of Augusta Margaret River. The Boatshed, gardens and grounds have continued to be maintained to a high standard since the 2011 bushfire and form an integral part of the proposed redevelopment of the site.

3.10.1.2 Potential site contamination

A review of the DWER *Contaminated Sites Database* (DWER 2023) did not identify any registered contaminated sites within or in proximity to the site, and previous land uses are not likely to have resulted in contamination.

A review of the Department of Defence Unexploded Ordinance (UXO) search tool did identify two potential UXO occurrences within the local area. These are detailed within **Table 5** below.

Table 5: UXO occurrence within and nearby the site (DoD 2019)

UXO Area	ID no.	Description	UXO Category
Margaret River (WA)	908	A live fire mortar shoot was conducted in 1944. Cow Rock was used by RAAF for high explosive bombing practices during WWII.	Slight Occurrence
Cape Mentelle (WA)	858	RAAF aircraft used Cow Rock Island (approximately 1.5 km west of Cape Mentelle) as a bombing target during WWII.	Other

The Department's advice on UXO area ID no. 908 is that '*all land usage and development, within these areas, may continue without further UXO investigation or remediation*', and the advice for UXO ID no. 858 is that *'these sites have been included for general information purposes only. Defence makes no recommendations in regards to this category'* (DoD 2023). It is unlikely that UXOs are located within the site given the site was developed at the time of the identified testing periods (so is unlikely to have been subject to bombing) and the extent of ground-disturbing works that have occurred in the site since the 1940s.

3.10.2 Management

There are no specific management requirements in relation to historic and existing land uses or site contamination. The management of the heritage values has been summarised in **Section 3.9.2**.

3.11 Bushfire hazard

3.11.1 Outline of values

The entire site is designated as a 'bushfire prone area' in the state *Map of Bush Fire Prone Areas* (OBRM 2021).

A Bushfire Management Plan (BMP) (Emerge Associates 2023a) has been prepared to support the proposed development application and considers the potential mitigation and management of bushfire risks in accordance with SPP 3.7 (WAPC 2015), the *Guidelines for Planning in Bushfire Prone Areas Version 1.4* (the Guidelines) (DPLH & WAPC 2021) as well as *Australia Standard 3959-2018 Construction of buildings in bushfire-prone areas* (AS 3959). It is based on the approach detailed and supported through the scheme amendment process.

The proposed uses are permitted within the site based on the zoning under the Shire of Augusta Margaret River LPS No. 1. Importantly for the site, the existing environmental, heritage and landscape values within and surrounding the site are imperative to the proposed tourism

development and therefore the management of bushfire risk has been balanced with protecting and maintaining these values.

The bushfire hazards (associated with areas of 'classified vegetation') likely to affect the development are shown in **Figure 8**, and are largely associated with areas of:

- Existing forest vegetation adjacent to the north-west boundary of the site, associated with the riparian vegetation values of the southern bank of the Margaret River. This includes areas of vegetation within and adjacent to the site, associated with the Margaret River;
- Forest and scrub vegetation associated with the Leeuwin-Naturaliste National Park to the south-east of the site (on the opposite side of Wallcliffe Road) and north-west of the site (adjacent to the northern bank of the Margaret River);
- Scrub and forest vegetation associated with Wallcliffe Reserve immediately south of the site; and
- Woodland and forest vegetation near the entrance to the site in neighbouring landholdings.

Importantly for this site, the vegetation and landscape values are an intrinsic part of understanding and celebrating its heritage value and realising the tourism potential of the site and are therefore proposed to be protected and where possible enhanced. Constructing to a higher building standard, such as BAL-40 or BAL-FZ, is considered an appropriate means to minimise impacts on these values (in particular clearing of existing remnant native vegetation) whilst improving the resilience of the proposed reconstructed and new buildings.

3.11.2 Management

Overall, the outcomes of the BMP developed for the site demonstrate that the management/ mitigation measures can satisfy the requirements of SPP 3.7 and the Guidelines and the precautionary principle by:

- Providing appropriate separation between bushfire hazards and proposed habitable buildings to achieve a bushfire attack level (BAL) rating of BAL-29, or where this is not possible based on protecting existing heritage, environment, and landscape values, increasing the construction standard of the buildings (e.g. BAL-40 or BAL-FZ) in accordance with AS 3959. Given the high level of fuel load management within the site and surrounds, the majority of the site will be subject to a BAL rating of BAL-19 or BAL-12.5. The site will be subject to a high level of management based on the existing landscape values (which includes mature cultivated gardens that are irrigated and regularly subject to weed control and removal of dead material) and type of development (boutique hotel).
- The proposed development having appropriate direct access to Wallcliffe Road, which is an existing public road that meets public road standards. This road connects to Prevelly to the west and Margaret River townsite (via Caves Road) to the east. Attendance is not expected to exceed 100 persons at any one time. Evacuation from the site is the preferred option if it is safe to evacuate. If it is not safe to evacuate, a shelter building is proposed at the site (Wallcliffe House). The design will be certified (prior to operation of the facility) by a fire engineer in compliance with the *Design and Construction of Community Bushfire Refuges Handbook* (ABCB 2014), to provide tenability and safety for all occupants in a bushfire event. The internal private driveway is able to satisfy the requirements of the Guidelines, and in

particular achieves the minimum horizontal clearance (6 m-wide) and provides suitable turn around areas for fire appliances with an internal loop road network proposed.

- Water supply for fire-fighting purposes being addressed through the existing hydrants along Wallcliffe Road (which will be within 600 m of the proposed habitable buildings). Water supply is also proposed to be supplemented through the provision of additional static water supply within the site, close to Wallcliffe Road.

It is acknowledged that while Wallcliffe House (and associated buildings) were largely destroyed by the 2011 Margaret River bushfire, this was largely as a result of embers entering the roof structures and burning the buildings from the inside out. AS 3959 did not exist at the time the previous buildings were constructed, and therefore building protection against the mechanisms of bushfire attack was not incorporated in the previous buildings. The buildings will be constructed based on their determined BAL rating in accordance with AS 3959 and the requirements of the *Building Act 2011*, increasing building resilience to the mechanisms of bushfire attack compared to the previous buildings which were constructed prior to AS 3959 being a requirement.

The BMP will be implemented as a condition of approval, and building construction will be addressed as a requirement of building licence.

4 Summary of Management Implementation Requirements

A summary of how the proposed development responds to the environmental values and attributes discussed in **Section 3** has been provided in **Table 6** below**.** Key management areas within the site are shown on **Figure 9**.

Table 6: Summary of management implementation requirements.

Factor	Summary of key management measures
Landform and karst formations	• Prepare and implement a Construction Environmental Management Plan (CEMP) (to be prepared as a condition of approval), which will exclude works from the portion of Wallcliffe Cliffs within the site and include soil erosion and sedimentation protocols. • Respond to geotechnical design recommendations a part of detailed design. .
Flora and vegetation	• Maximise the retention of vegetation within the site through the sensitive location of buildings and use of appropriate construction techniques. • Prepare and implement a CEMP (as a condition of approval), which will outline protocols for identifying tree/vegetation retention areas; for hygiene management (introduction of disease and weeds); exclusion of works from the Margaret River and associated riparian vegetation (unless associated with approved foreshore works). • Where construction occurs in the vicinity of retained trees/vegetation, protect trees/vegetation in accordance with arborist (or other professional) advice. Areas of retained vegetation and the Margaret River foreshore are shown on **Figure 9**.
Native Fauna	• Maximise the retention of vegetation within the site through the sensitive location of buildings. • Retain and protect identified potential black cockatoo habitat trees, shown on **Figure 9**. • Retain and protect the relocated osprey nest, shown on **Figure 9**. • Prepare and implement a CEMP (as a condition of approval), which will outline protocols for fauna management, such as exclusion areas associated with vegetation retention; pre-clearing fauna checks; having a fauna spotter present during vegetation clearing and ensuring the site is maintained in a clean and tidy manner.
Hydrology	• Prepare and implement a CEMP (as a condition of approval), which in particular will exclude works from the Margaret River and associated riparian vegetation. • Prepare and implement detailed design addressing the requirements of the WMP (Emerge Associates 2023b). • Implement wastewater treatment and disposal in accordance with the WMP (Emerge Associates 2023b) and relevant approvals (Environmental Protection Act 1986 and the Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974.
Heritage	• Undertake activities in accordance with the Section 18 consent. • Prepare and implement an Interpretation Strategy and Archaeological Management Plan, or other plans as required by the Heritage Council.
Bushfire	• Implement the approved Bushfire Management Plan, including addressing siting and design, vehicle access and water supply. • Update, maintain and implement the Bushfire Emergency Evacuation Plan. • Construct and maintain new habitable buildings in accordance with AS 3959, fire engineering requirements and the assessed/certified bushfire attack level (BAL) rating. • Provide additional static water supply, which can be used as a community resource. • Implement and maintain the site (where indicated) to achieve low threat in accordance with Section 2.2.3.2 of AS 3959, shown on **Figure 9**. This includes being selective of the areas where fuel load management occurs and using increased bushfire construction standards to improve building resilience.

5 Conclusions

This EAR has been prepared on behalf of the proponent (Wallcliffe House Pty Ltd) to support the redevelopment of Lot 101 Wallcliffe Road, Margaret River (the site) in accordance with the concept plan provided in **Appendix A.**

In addition to the preparation of this EAR, Emerge Associates have prepared or commissioned the following documents to support the proposed development approval:

- *Bushfire Management Plan* (Emerge Associates 2023a), including bushfire emergency evacuation plan
- *Water Management Plan* (Emerge Associates 2023b)
- *Spring Flora and Vegetation Assessment* (Emerge Associates 2019b)
- *Fauna Assessment* (Harewood 2019b)

Based on the environmental values or attributes identified within the site, this EAR provides an environmental management framework (detailed in **Section 3**) to be implemented within the site as part of development. It is relevant to note that the proponent recognises that the ongoing management of Aboriginal and European heritage values is important, and this has been addressed separately by Hocking Heritage Studio (2023). The proposed management of the identified environmental values/attributes include:

- **Landforms, soils, and geology:** no physical disturbance of Wallcliffe Cliffs is proposed as part of the development. Access to the Cliffs (via a previously installed boardwalk) has been removed in recognition of the importance of this feature to the Aboriginal community, as per the Section 18 approval and ongoing consultation. Soil and erosion control measures will be implemented across the site, particularly during construction.
- **Flora and vegetation**: retention of existing remnant native vegetation and the mature cultivated gardens (including trees) is proposed to be maximised as part of detailed design and construction processes. Construction works will be excluded from the Margaret River and associated riparian vegetation as well as Wallcliffe Reserve, minimising impacts on vegetation values. Vegetation to be retained will be clearly identified and managed in accordance with arborist advice, and enhancement of vegetation values will occur through ongoing riparian vegetation and through the landscape design.
- **Native fauna**: impacts to native fauna will be minimal given the limited high-quality habitat within the site. Impacts, where they occur, are expected to be short-term in nature (e.g. during construction) and can be managed through the implementation of fauna management protocols, such as pre-clearing inspections and a fauna spotter being present during works. The potential black cockatoo habitat tree in the north-western portion of the site will be retained, as will the osprey nest which was relocated as part of a previous development approval. Enhancement of habitat values will occur through ongoing revegetation of the riparian vegetation and through the landscape design.
- **Hydrology:** water management within the site will be based on maintaining the existing hydrological regime of the site which includes infiltrating at source and controlling erosion. New buildings are located more than 20 m from the Margaret River, and groundwater separation can be maintained. Groundwater use (primarily to support irrigation) within the

site will be managed in accordance with groundwater licence (GWL 207725). Wastewater will be managed via an onsite wastewater treatment plant, treating the water to a tertiary quality, and infiltrating onsite. Further detail on the water management requirements are detailed within the WMP (Emerge Associates 2023b).

- **Heritage:** Aboriginal and European heritage will be managed in accordance with the relevant approvals, including an existing Section 18 consent and future Heritage Council requirements. Ongoing consultation with Traditional Owners will be a key component of the project.
- **Bushfire management**: bushfire hazards (classified vegetation) have been identified in the vicinity of the site. Buildings will be constructed in accordance with the determined BAL rating and AS 3959, which includes BAL-40 and BAL-FZ construction and other fire engineering determined requirements. This is as part of responding to the heritage, vegetation, and landscape values within the site. Appropriate vehicle access (which includes turn around areas), onsite shelter and appropriate water supply have been included as part of the proposed development, as outlined in the BMP (Emerge Associates 2023a). A bushfire emergency evacuation plan has been prepared for the site.

Overall, there are no significant environmental issues or constraints within the site that are not able to be managed appropriately as part of the proposed redevelopment and would preclude the project from implementation after development approval has been obtained.

The site is a place with recognised Aboriginal, European, and natural values. The heritage listing for the site identifies the "*attractive scenery and vegetation of the landscape*" being features that brought settlers to the area, with the views to/from the buildings a key consideration. The project is seeking to be sensitive and sympathetic to the history of the site and landscape values as part of managing heritage values, particularly the views, remaining plantings, and remnant vegetation. Impacts to landform, native flora and vegetation and conservation significant fauna will be minimal given the sympathetic approach taken by the project, locating buildings within existing cleared/disturbed areas, and enhancing the vegetation values through revegetation and new planting. The water quality of the Margaret River will be protected, based on the water sensitive urban design approach, management of erosion and sedimentation and appropriate management of wastewater with a tertiary quality system. Short-term impacts can be managed through the implementation of vegetation and fauna construction management protocols, as well as landscaping (including new planting and revegetation work already underway in the adjacent foreshore) within the site which will assist with enhancing existing vegetation values.

6 References

6.1 Legislation

Aboriginal Cultural Heritage Act 2021

Aboriginal Heritage Act 1972

Biodiversity Conservation Act 2016

Building Act 2011

Bush Fires Act 1954

Contaminated Sites Act 2003

Environmental Protection Act 1986

Environment Protection and Biodiversity Conservation Act 1999

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Figure 9: Key Management Features

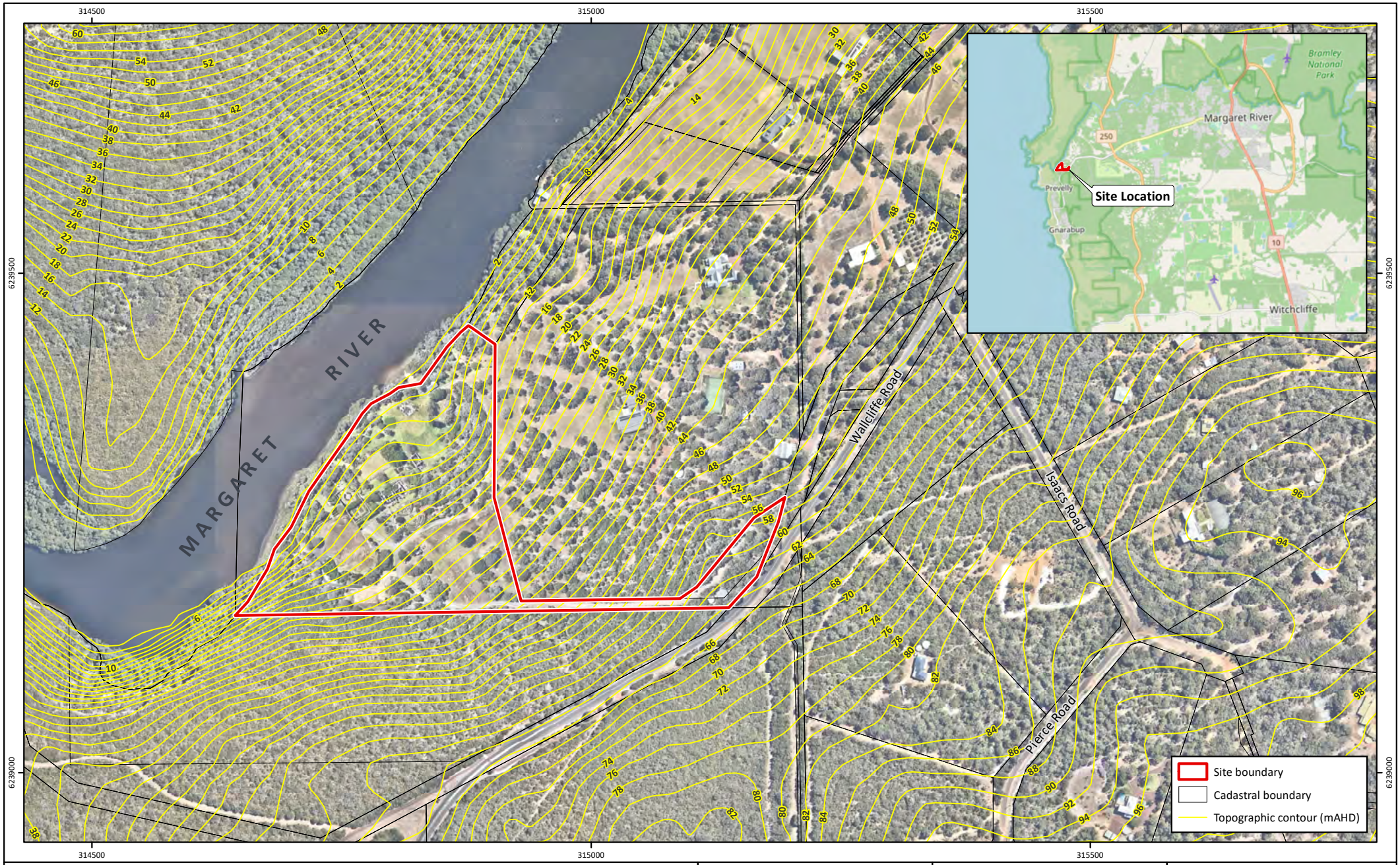


Figure 1: Site Location and Topographic Contours

Project: Environmental Assessment Report
Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F40

Drawn:	GAR
Date:	03/10/2023
Checked:	LSW
Approved:	KK
Date:	19/10/2023

N

0 100 200
Metres
Scale: 1:5,000@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

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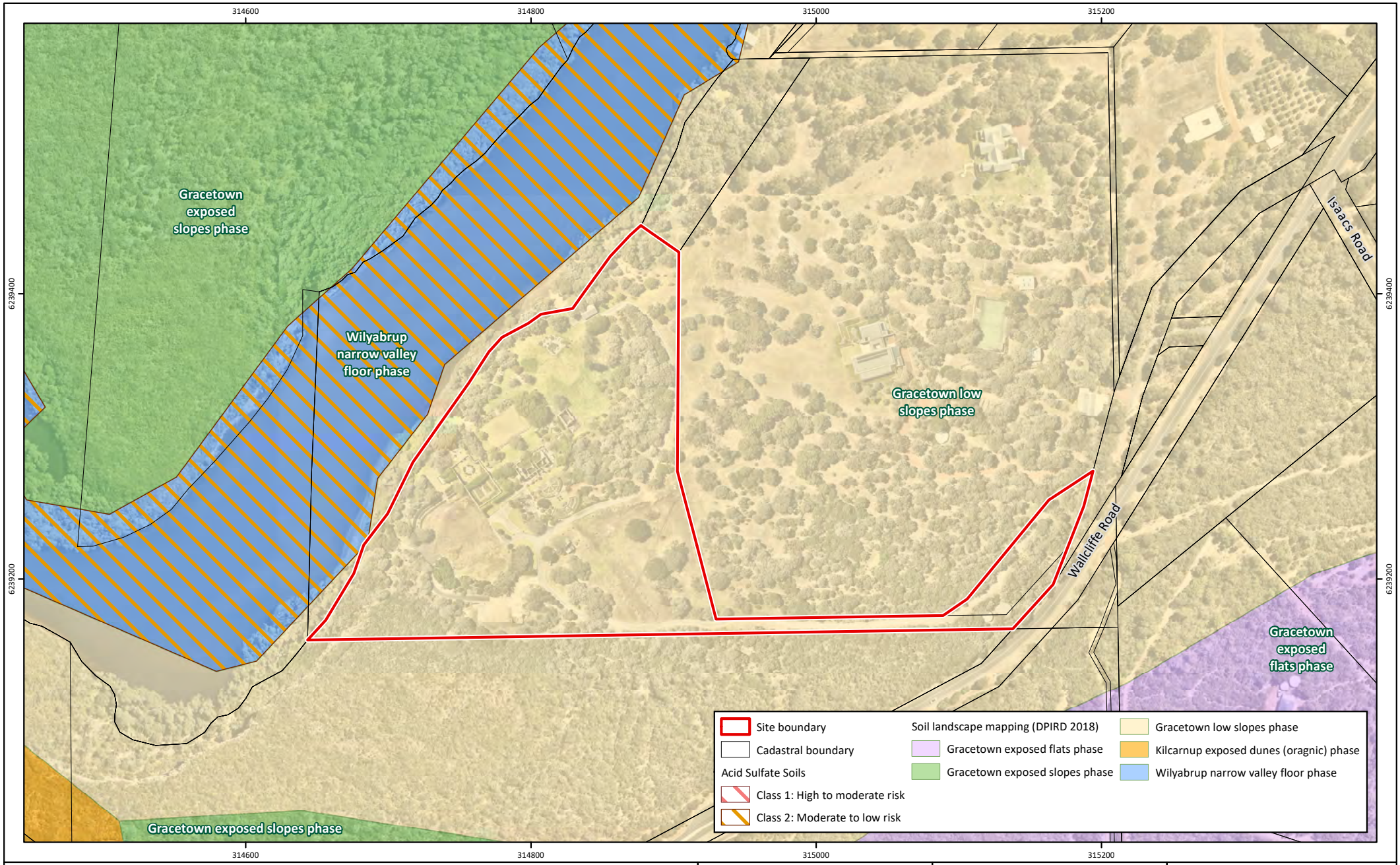


Figure 2: Soil Landscape Mapping

Project: Environmental Assessment Report
Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F41
Drawn: GAR
Date: 03/10/2023
Checked: LSW
Approved: KK
Date: 20/10/2023

N

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Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

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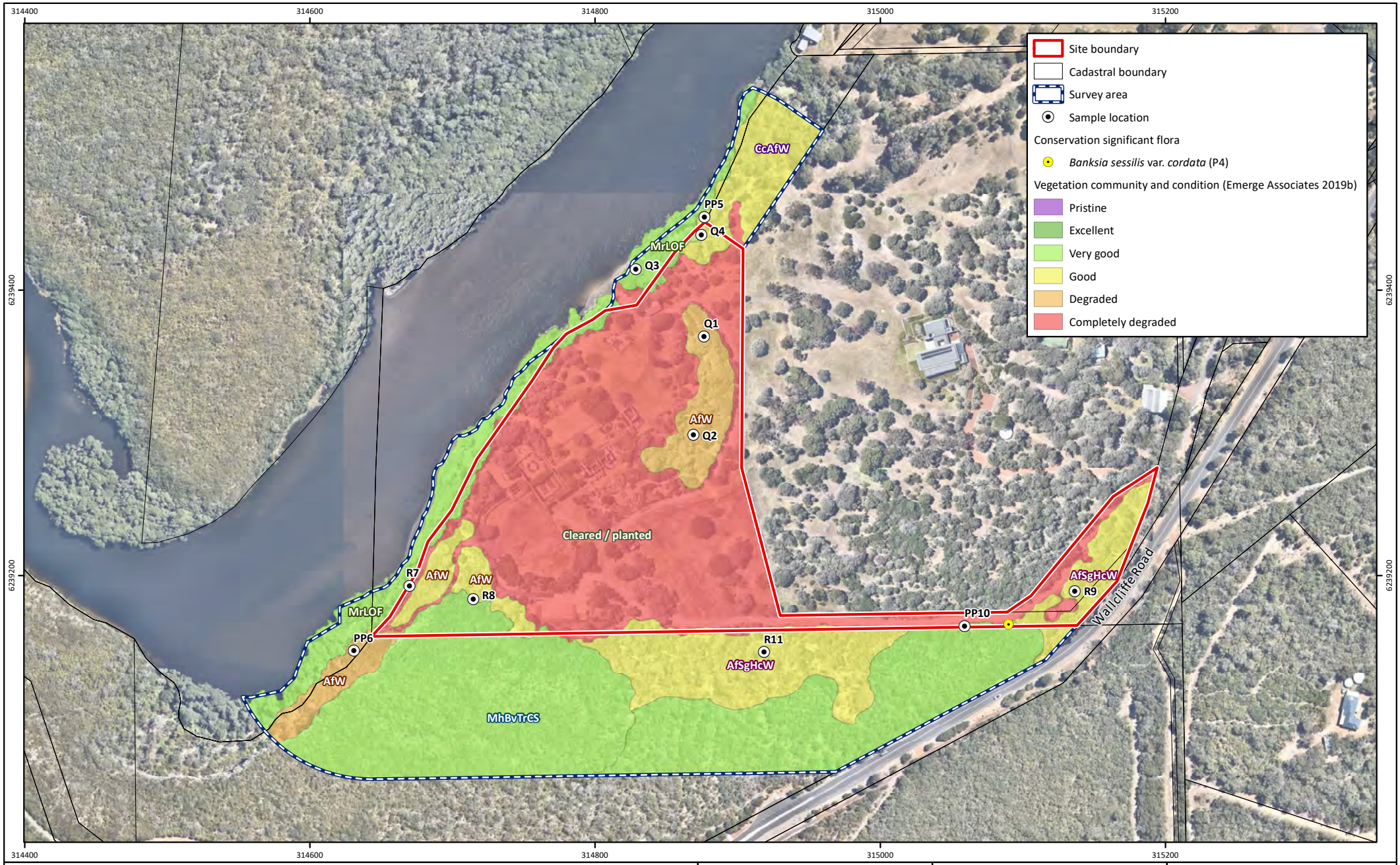


Figure 3: Plant Communities and Vegetation Condition

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Client:	Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F42

Drawn:	GAR
Date:	03/10/2023
Checked:	LSW
Approved:	KK
Date:	19/10/2023

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Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

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Figure 4: Possum Observations

Project:	Environmental Assessment Report Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client:	Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F43

Drawn:	GAR
Date:	03/10/2023
Checked:	LSW
Approved:	KK
Date:	20/10/2023

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Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

emerge ASSOCIATES

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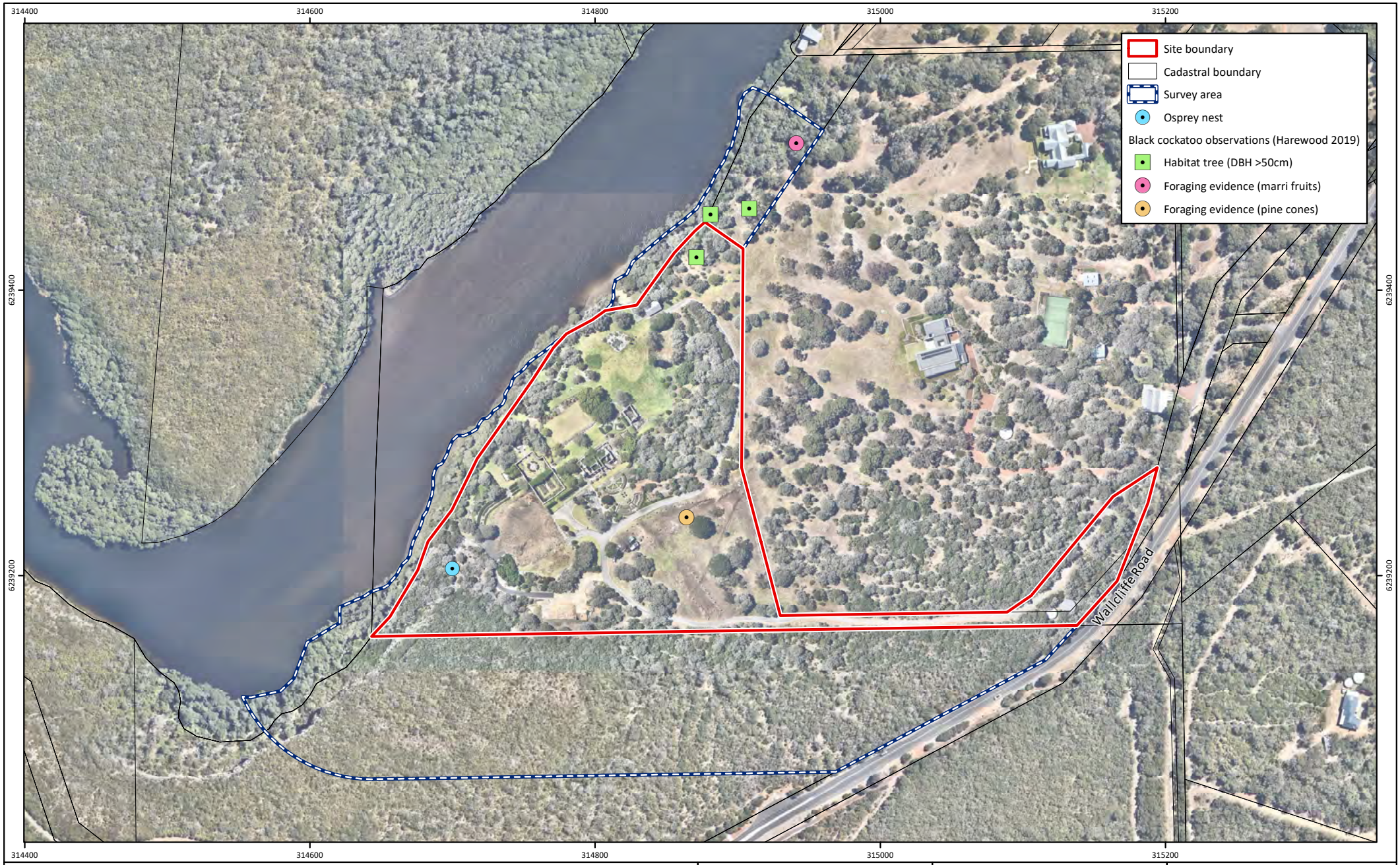


Figure 5: Avian (Bird) Observations

Project: Environmental Assessment Report
Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F44

Drawn:	GAR
Date:	03/10/2023
Checked:	LSW
Approved:	KK
Date:	20/10/2023

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Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

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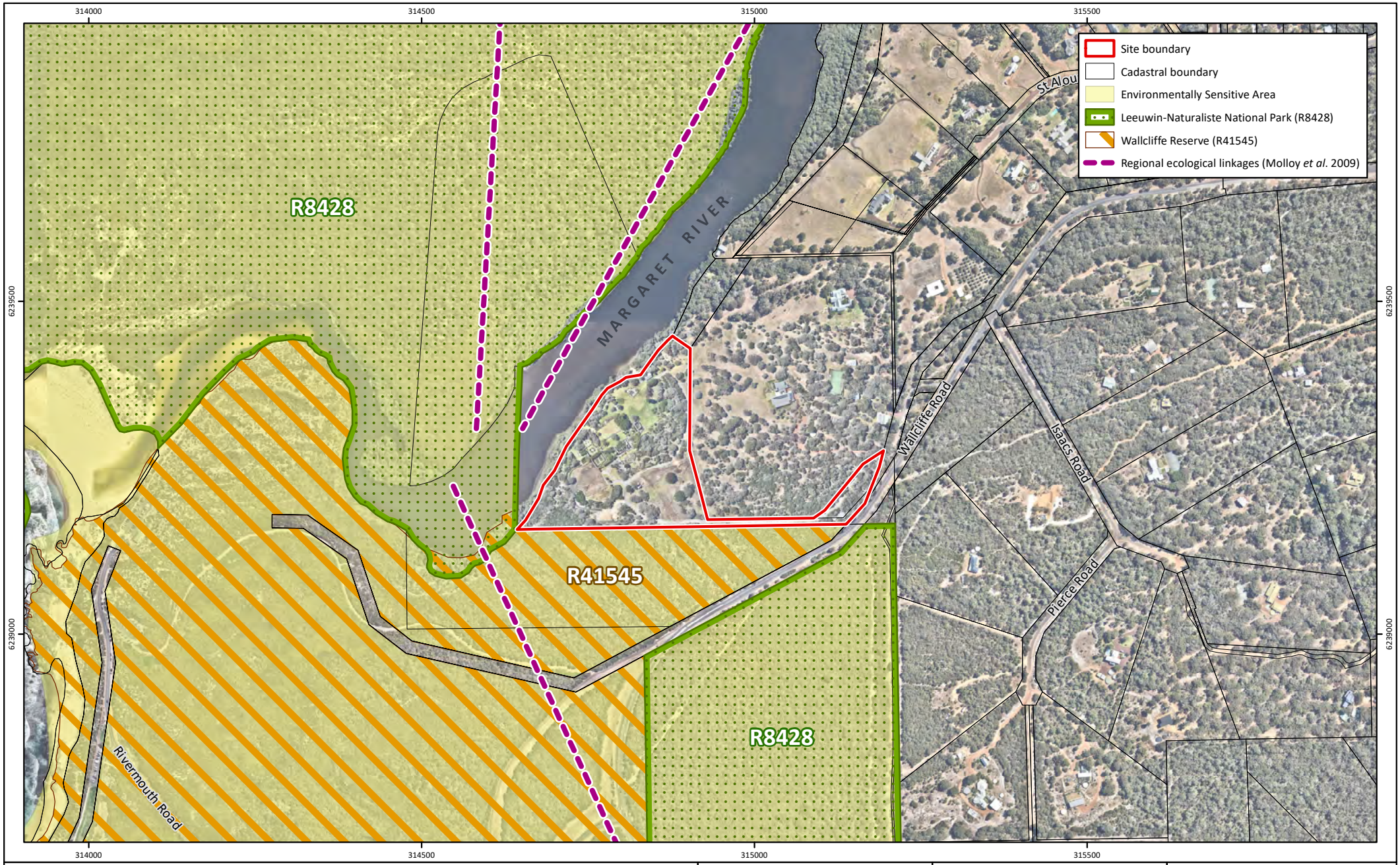


Figure 6: Environmental Features

Project: Environmental Assessment Report
Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F45

Drawn:	GAR
Date:	03/10/2023
Checked:	LSW
Approved:	KK
Date:	20/10/2023

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Scale: 1:7,500@A4
GDA 1994 MGA Zone 50

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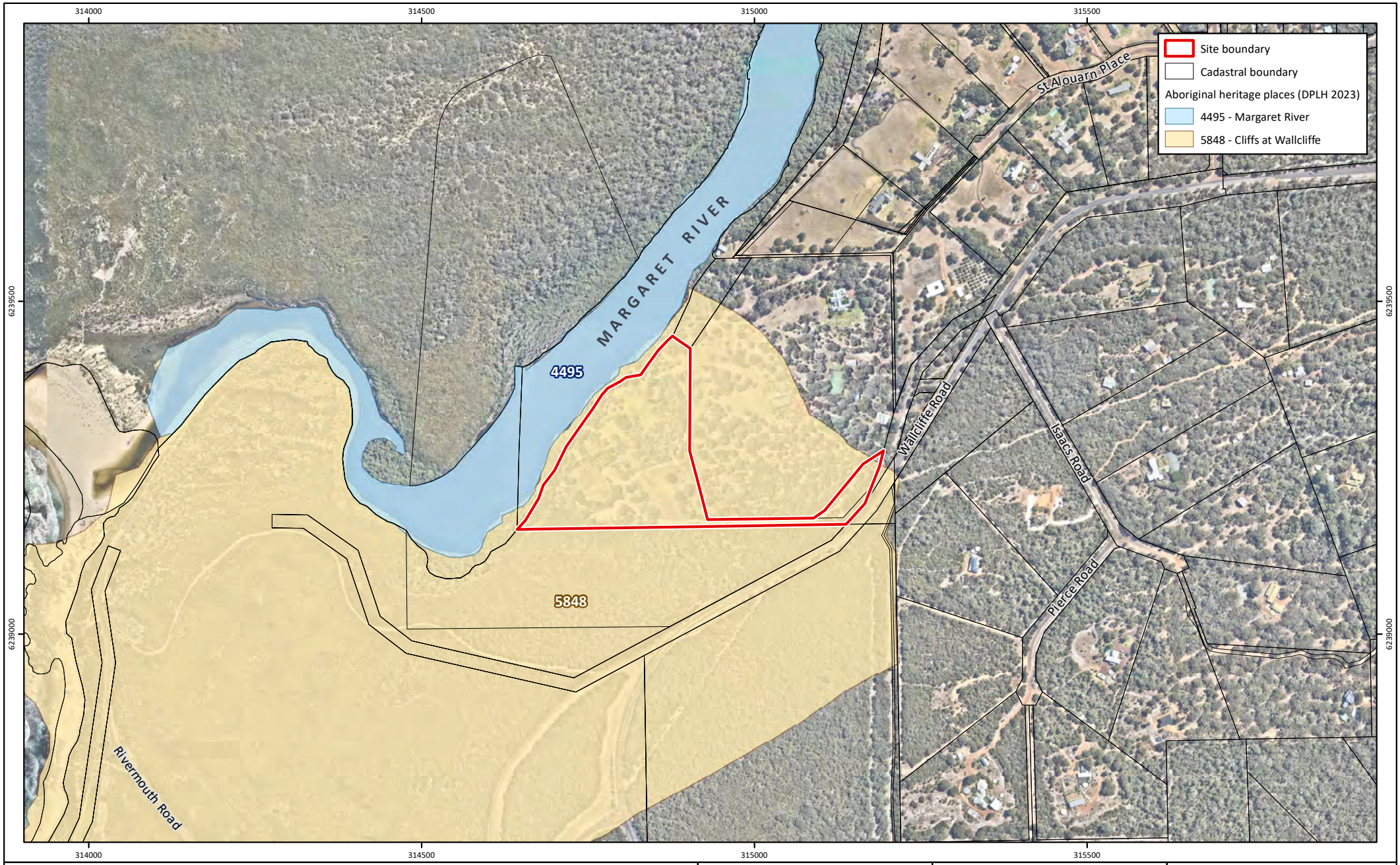


Figure 7: Aboriginal Heritage Values

Project: Environmental Assessment Report
Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F46

Drawn:	GAR
Date:	03/10/2023
Checked:	LSW
Approved:	KK
Date:	20/10/2023

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GDA 1994 MGA Zone 50

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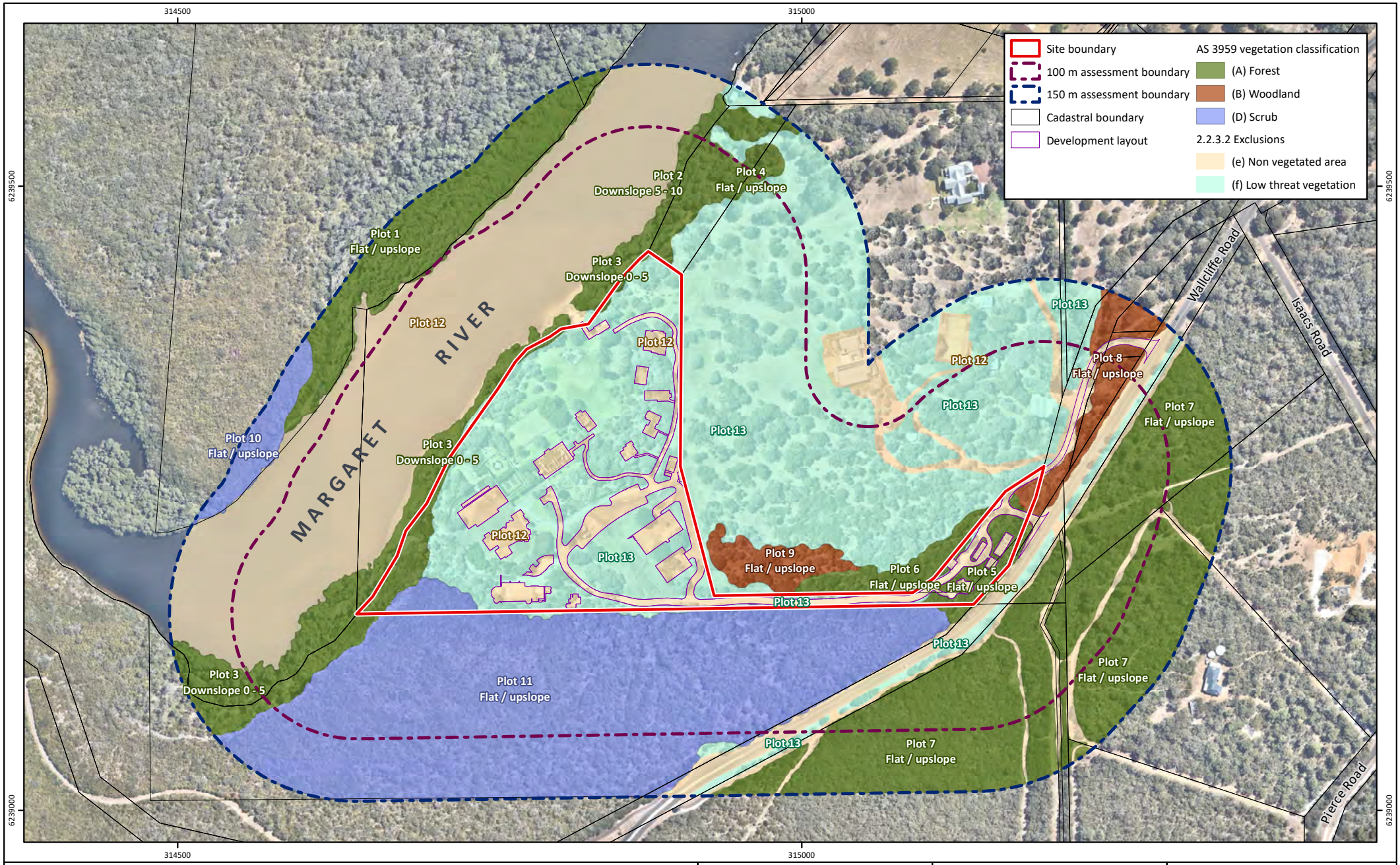


Figure 8: **AS 3959 Vegetation Classifications**

Project: Environmental Assessment Report
Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F47
Drawn: GAR
Date: 18/10/2023
Checked: LSW
Approved: KK
Date: 20/10/2023

N

0 80 160
Metres
Scale: 1:4,000@A4
GDA 1994 MGA Zone 50

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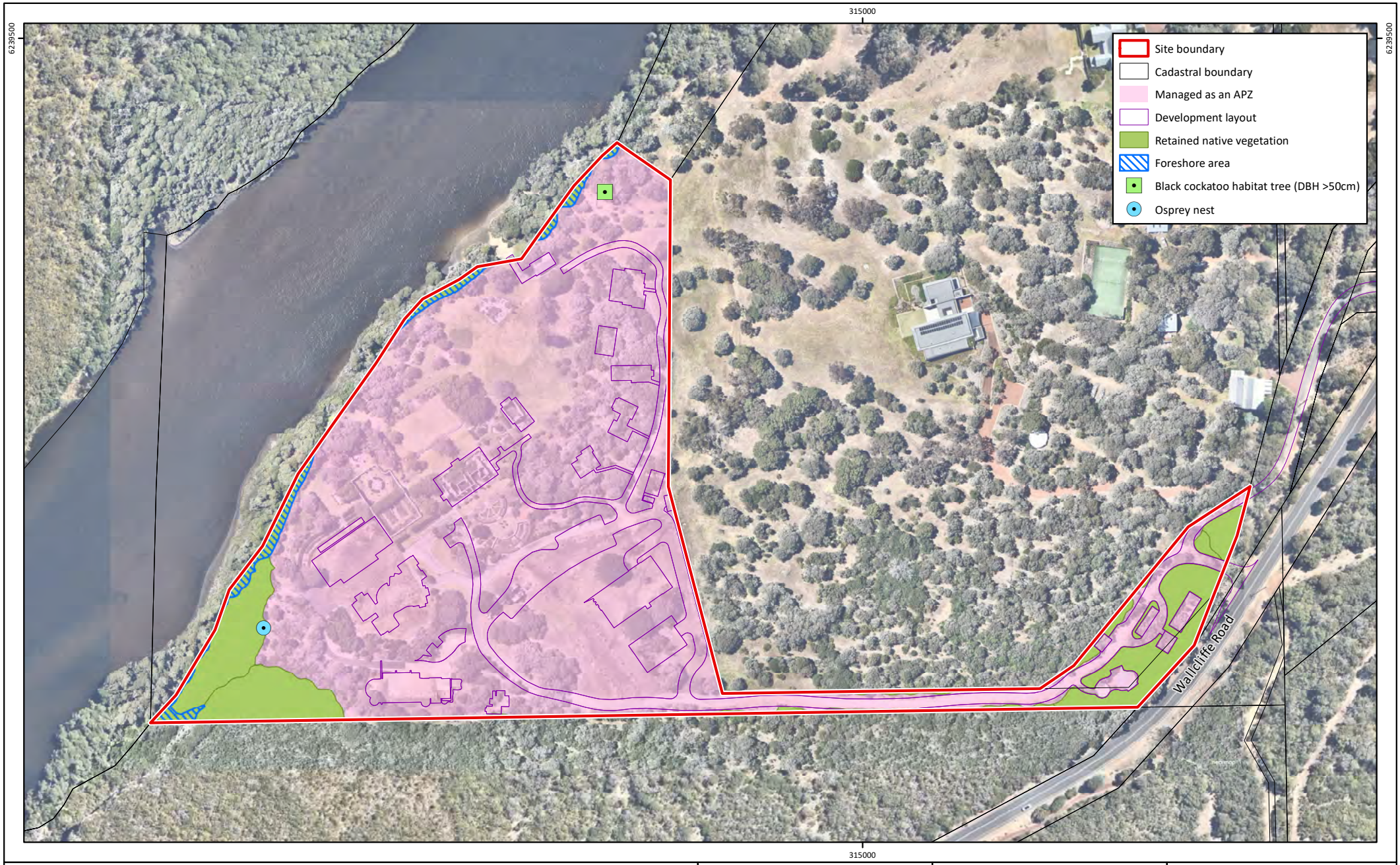


Figure 9: Key Management Features

Project:	Environmental Assessment Report Lot 101 (no. 752) Wallcliffe Road, Margaret River
Client:	Wallcliffe House Pty Ltd

Plan Number:
EP18-128(11)--F49

Drawn:	GAR
Date:	18/10/2023
Checked:	LSW
Approved:	KK
Date:	20/10/2023

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Scale: 1:2,500@A4

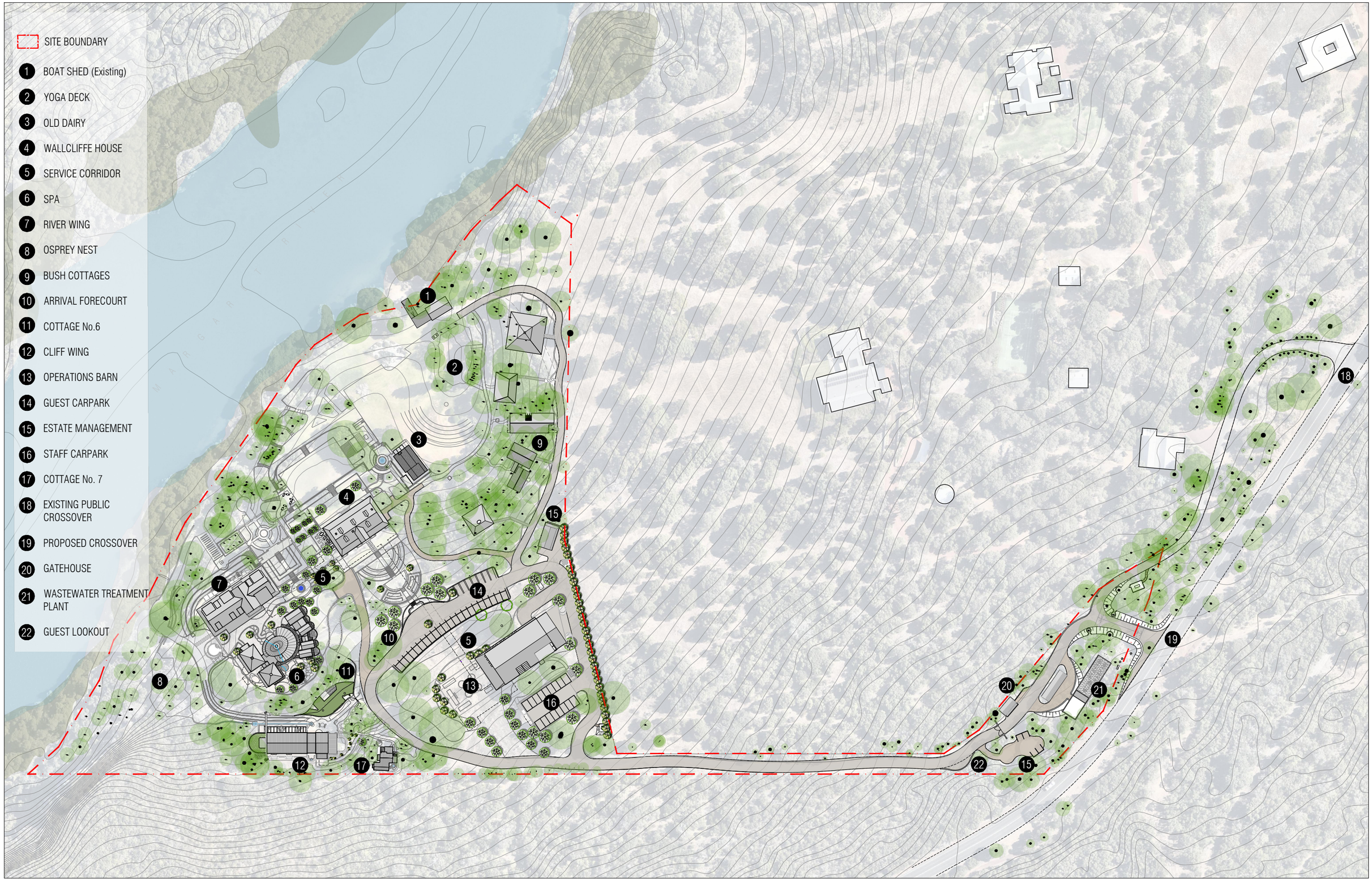
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Appendix A

Concept Master Plan (MJA Studio 2023)



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A	18.08.23	INTERIM CONSULTANT ISSUE
B	15.09.23	INTERIM CONSULTANT ISSUE
C	24.10.23	ISSUE FOR INFORMATION
D	02.11.23	ISSUE FOR DA

PROJECT MANAGER:	THE LANDSMITH COLLECTION
TOWN PLANNING:	TAYLOR BURRELL BARNETT
LANDSCAPE:	PAUL BANGAY / SEEDESIGN
HERITAGE:	HOCKING HERITAGE
ENVIRONMENTAL:	EMERGE ASSOCIATES
CIVIL:	THE CIVIL GROUP
TRAFFIC:	TRANSCORE
WASTE:	ENCYCLE
SUSTAINABILITY:	CUNDALL
CULTURAL:	BRAD GOODE & ASSOCIATES

CLIENT

THE LANDSMITH COLLECTION

PROJECT

WALLCLIFFE HOUSE

PROJECT ADDRESS

752 WALLCLIFFE ROAD (LOT 101)
MARGARET RIVER, WA

PROJECT STATUS

DEVELOPMENT APPLICATION

PROJECT NUMBER

18126

NORTH

SCALE

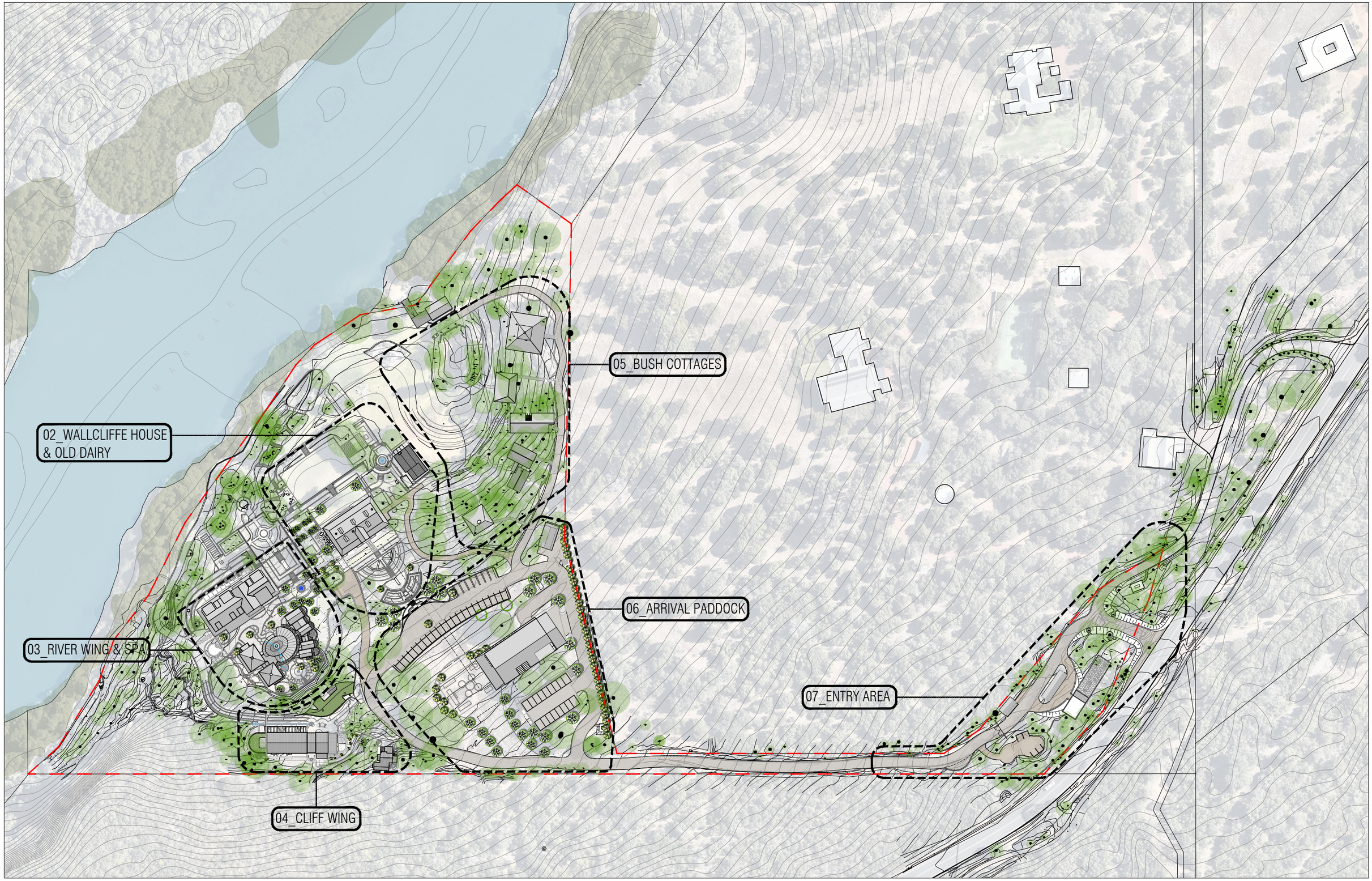
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DRAWING

PROPOSED MASTER PLAN

DRAWING NO.	DRAFTER	CHECKED	REV.
DA1.04	HBW	MM	D



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REV.	DATE	AMENDMENT
A	18.08.23	INTERIM CONSULTANT ISSUE
B	15.09.23	INTERIM CONSULTANT ISSUE
C	24.10.23	ISSUE FOR INFORMATION
D	02.11.23	ISSUE FOR DA

PROJECT MANAGER:	THE LANDSMITH COLLECTION
TOWN PLANNING:	TAYLOR BURRELL BARNETT
LANDSCAPE:	PAUL BANGAY / SEEDESIGN
HERITAGE:	HOCKING HERITAGE
ENVIRONMENTAL:	EMERGE ASSOCIATES
CIVIL:	THE CIVIL GROUP
TRAFFIC:	TRANSCORE
WASTE:	ENCYCLE
SUSTAINABILITY:	CUNDALL
CULTURAL:	BRAD GOODE & ASSOCIATES

CLIENT

THE LANDSMITH COLLECTION

PROJECT

WALLCLIFFE HOUSE

PROJECT ADDRESS

752 WALLCLIFFE ROAD (LOT 101)
MARGARET RIVER, WA

PROJECT STATUS

DEVELOPMENT APPLICATION

PROJECT NUMBER

18126

NORTH

SCALE

0 7.5 15 34.5

1:1500 @ A3

DRAWING

MASTER PLAN
SITE ZONES

DRAWING NO.	DRAFTER	CHECKED	REV.
DA1.05	HBW	MM	D

Appendix B

Spring Flora and Vegetation Assessment (Emerge Associates 2019)

Spring Flora and Vegetation Assessment

Lot 101 Wallcliffe Road, Prevelly

Project No: EP18-128(01)

Prepared for Wallcliffe House Pty Ltd
November 2019



Document Control

Doc name:	Spring Flora and Vegetation Assessment Lot 101 Wallcliffe Road, Prevelly				
Doc no.:	**EP18-128(01)—002A SKP**				
Version	**Date**	**Author**		**Reviewer**	
1	March 2019	Sarah Paul	SKP	Tom Atkinson	TAA
	Issued for client review				
A	November 2019	Heidi Becker	HPB	Kirsten Knox	KK
	Minor mapping update.				

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Executive Summary

Wallcliffe House Pty Ltd engaged Emerge Associates to undertake a spring flora and vegetation survey within Lot 101 Wallcliffe Road in Prevelly (referred to herein as 'the site'). The site, which is approximately 5.31 ha in size, is bound by Wallcliffe Road to the east, rural residential lots to the north-east, the Margaret River to the north and west and a nature reserve to the south.

A botanist and an environmental consultant from Emerge Associates visited the site on 19 November 2018 and undertook a detailed flora and vegetation survey. During the survey an assessment was made on the type, condition and values of vegetation across the site and the adjacent areas of remnant vegetation to the north west, west and south (the site including adjacent areas of remnant native vegetation are herein referred to as 'the survey area').

Outcomes of the survey include:

- Non-native vegetation is present across 4 ha of the site.
- Remnant native vegetation is present across 1.3 ha of the site in varying levels of condition.
- A total of 66 native and 51 non-native (weed) species were recorded in the survey area.
- One individual of the priority four species *Banksia sessilis* var. *cordata* was recorded in the south-eastern corner of the site adjacent to the driveway.
- No other threatened or priority flora species were recorded or are considered likely to occur within the site.
- The native vegetation within the survey area was classified into five plant communities: **AfW**, **CcAfW**, **MrLOF**, **AfSgHcW** and **MhBvTrS** that are present in 'very good', 'good', 'degraded', and 'completely degraded' condition.
- No threatened ecological communities (TECs) or priority ecological communities (PECs) were recorded within or are likely to occur within the site. There is a possibility that Wallcliffe Cave or any caves within the Wallcliffe Cliffs could potentially contain one of the aquatic root mat TECs.
- The site and surrounds are mapped as two Registered Aboriginal Sites, contain unique geological features and are adjacent to the Margaret River. As such the native vegetation within the site is likely to be locally and/or regionally significant.
- Large *Agonis flexuosa* (peppermint) and *Corymbia calophylla* (marri) trees within the site may be locally and/or regionally significant due to their habitat value for endangered western ring-tailed possum and black cockatoo species respectively.

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Abbreviation Tables

Table A1: Abbreviations – Organisations

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

Table A2: Abbreviations – General terms

General terms	
ESA	Environmentally sensitive area
IBRA	Interim Biogeographic Regionalisation of Australia
NVIS	National Vegetation Inventory System (ESCAVI 2003)
P1	Priority 1
P2	Priority 2
P3	Priority 3
P4	Priority 4
P5	Priority 5
PEC	Priority ecological community
T	Threatened
TEC	Threatened ecological community

Table A3: Abbreviations –Legislation

Legislation	
BAM Act	*Biosecurity and Agriculture Management Act 2007*
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
BC Act	*Biodiversity Conservation Act 2016*

Table A4: Abbreviations – planning

Planning terms	
LPS	Local planning scheme

Table A5: Abbreviations – units of measurement

Units of measurement	
cm	Centimetre
ha	Hectare
m	Metre
m^2	Square metre
m AHD	m in relation to the Australian height datum
mm	Millimetre

1 Introduction

1.1 Project background

Wallcliffe House Pty Ltd (Wallcliffe House) intends to develop Wallcliffe House, located at Lot 101 Wallcliffe Road in Prevelly for tourism purposes. This lot (referred to herein as 'the site') is located approximately 8 kilometres (km) south-east of Margaret River township within the Shire of Augusta Margaret River (the Shire) and is zoned 'tourism' under the Shires *Town Planning Scheme* (TPS) *No 1*.

The site is approximately 5.31 hectares (ha) in size and is bound by Wallcliffe Road to the east, rural residential lots to the north-east, the Margaret River to the north-west and a nature reserve to the south. The location and extent of the site is shown in **Figure 1**. In order to provide contextual vegetation information for the wider area, the areas in the surrounding reserves were also assessed. The site and these surrounding areas are collectively referred to as the 'survey area', and occupy 11.26 ha, which is also shown on **Figure 1**.

1.2 Purpose and scope of work

Emerge Associates (Emerge) were engaged by Wallcliffe House to provide environmental consultancy services to support the development of the site. The purpose of this survey is to provide sufficient information on the flora and vegetation values within the site to inform this process.

The scope of work was specifically to undertake a spring flora and vegetation assessment to the standard required of a detailed survey in accordance with the Environmental Protection Authority's (EPA's) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

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

- Desktop review of relevant background information pertaining to the site and surrounds, including database searches for threatened flora species and ecological communities.
- Compilation of a comprehensive list of flora species recorded as part of the field survey.
- Mapping of plant communities and vegetation condition.
- Identification of conservation significant flora and vegetation.
- Documentation of the desktop assessment, survey methodology and results into a report.

2 Background

2.1 Environmental context

2.1.1 Climate

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

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

An average of 957.6 millimetres (mm) of rainfall is recorded annually from the Witchcliffe weather station, which is the closest weather station, located approximately 11.7 km from Prevelly. The majority of this rainfall is received between the months of May and August. Mean maximum temperatures range from 16.4^{o}C in July to 27.1^{o}C in February, while mean minimum temperatures range from 8.2^{o}C in July and August to 14.4^{o}C in February (BoM 2018).

A total of 874.6 mm of rain was recorded from May to October 2018 (BOM 2019) indicating sufficient seasonal rainfall occurred at the site to promote the growth of flora species prior to this survey.

2.1.2 Geomorphology and soils

Landform and soils influence vegetation types at regional and local scales. The site lies in the Jarrah Forest bioregion and within the Southern Jarrah Forest subregion, as defined by the *Interim Biogeographic Regionalisation of Australia* (IBRA) (Environment Australia 2000). The Southern Jarrah Forest subregion extends from Collie in the north to Yallingup in the west and Albany in the south east. This subregion comprises the southern part of the Darling Plateau, where it broadens and slopes gently to the southern coastline, being dissected by multiple rivers (Beard 1990). Broadly, the soils within the Southern Jarrah Forest subregion comprise laterite gravels but clay/loam soils occur in the eastern portion where the Plateau is flatter and drainage is poor (DEC 2002). The north-western portion of the Southern Jarrah Forest subregion comprises a combination of limestone and granites as it lies on the northern tip of the Leeuwin-Naturaliste Ridge.

The Department of Primary Industries and Regional Development (DPIRD) has compiled data from various surveys to produce a soil landscape mapping dataset for Western Australia (DPIRD 2018), which places the site within the 'Gracetown low slopes Phase' soil landscape. This is described as comprising 'low slopes (gradients 5-10%) with deep yellow brown siliceous sands over limestone (i.e. Spearwood Sands)'.

The south western portion of the site contains the eastern most portion (approximately 25 m) of the Wallcliffe Cliffs. The Wallcliffe Cliffs comprise tall limestone cliffs which continue west for 235 m into the nature reserve to the south and west (as discussed below in **Section 2.3.2**). There are a number of caverns, overhangs and caves within the cliffs. The cliffs have been identified as having a diversity of significant geological and landscape attributes (Shire of Augusta-Margaret River 2018). A separate cave is present close to the south of the site within the nature reserve, and approximately 150 m from the Wallcliffe Cliffs (Shire of Augusta-Margaret River 2018).

2.1.3 Topography

The elevation of the site ranges from 2m in relation to the Australian height datum (mAHD) along the western boundary adjacent to Margaret River to 12 mAHD at its northern extent, 22 mAHD in the south west near the Wallcliffe Cliffs and 64 mAHD at the south eastern extent (DPIRD 1999).

2.1.4 Hydrology and wetlands

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

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

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

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

Examination of the Department of Water and Environmental Regulation (DWER) hydrography dataset (DWER 2018) shows no wetland or water related features in the site. However, the major, perennial watercourse (Margaret River) is present adjacent to the western boundary of the site.

2.1.5 Regional vegetation

Native vegetation is described and mapped at different scales in order to illustrate patterns in its distribution. The south-west of Western Australia is internationally recognised as a biodiversity hotspot and contains a wide variety of endemic flora and vegetation types. The Southern Jarrah Forest is characterised as mainly containing *Eucalyptus marginata* (jarrah) forest on lateritic soils of the Plateau and on the loam soils of the valleys, with *Corymbia calophylla* (marri) – *Eucalyptus wandoo* (wandoo) woodland on the drier laterite-free soils (Beard 1990).

Variations in native vegetation within the site can be further classified based on regional vegetation associations. Beard *et al.* (2013) mapping shows the majority of the site as comprising vegetation association 'Boranup_1109'. This association is described as '*Agonis* shrubland / *Boronia* mixed shrubland' (Beard *et al.* 2013). 'Boranup_1109' association has 96.02% of its pre-European extent remaining within the Southern Jarrah Forest with 52.08% protected for conservation purposes

(Government of Western Australia 2018). A small portion in the northern portion of the site is mapped as 'Boranup_3' which is described as 'open forest or woodland of *Eucalyptus marginata* and *Corymbia calophylla*'. 'Boranup_3' association has 67.21% of its pre-European extent remaining on the within the Southern Jarrah Forest with 16.11% protected for conservation purposes (Government of Western Australia 2018). The areas of each mapped vegetation association are shown in **Plate 1**.



Plate 1: Regional vegetation association mapping (Beard et al. 2013) showing the small portion of the site mapped as presenting the 'Boranup_3' association.

Studies have indicated that the loss of biodiversity caused by habitat fragmentation is significantly greater once a habitat type falls below 30% of its original extent (Miles 2001). The national objectives and targets for biodiversity conservation established an objective of retaining 30% of the original extent of each vegetation complex (Environment Australia 2001). The percentage protected for conservation of the 'Boranup_1109' association is above the 30% retention objective but the 'Boranup_3' association falls below this retention objective.

2.1.6 Historic land management

The site is the location of Wallcliffe House, which was one of the original homesteads and farms built by the Bussell family with construction of the building commenced in 1858. The site was home to a number of large sandstone buildings and ancillary buildings, as well as, a significant exotic garden (and dairy). A review of publicly available historical images from 2004 onwards shows that the majority of the site was cleared of native vegetation prior to 2004 and the site was used for residential and tourism purposes (WALIA 2018).

Fire scars are visible from between 2007-2009 (affecting the south eastern portion of the site and adjacent land) and 2011 (with the majority of vegetation within the site and adjacent area affected during the Margaret River bushfire). Wallcliffe House and a number of its ancillary buildings were also destroyed during the 2011 bushfire.

2.2 Significant flora and vegetation

2.2.1 Threatened and priority flora

Certain flora taxa that are considered to be rare or under threat warrant special protection under Commonwealth and/or State legislation. At a Commonwealth level, flora taxa may be listed as 'threatened' pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Any action likely to have a significant impact on a taxon listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment and Energy.

In Western Australia flora species may also be classed as 'threatened' under the Biodiversity *Conservation Act 2016* (BC Act). Threatened flora species are listed under sections 19(1) and 26(2) of the BC Act. It is an offence to 'take' or disturb threatened flora without Ministerial approval. Threatened flora species listed under the EPBC Act and/or BC Act are assigned a conservation status according to their national extent.

Flora species that do not currently meet the criteria for listing as threatened but are potentially rare or threatened may be added to the DBCA's *Priority Flora List*. Whilst priority species are not afforded direct statutory protection, they are considered during State approval processes. Further information on threatened and priority species and their categories is provided in **Appendix A**.

A search was conducted for threatened and priority flora within a 10 km radius of the site using the *Protected Matters Search Tool* (DoEE 2019a), *NatureMap* (DPaW 2017b) and DBCA's threatened and priority flora database (reference no. 10-1218FL). Eleven threatened and 12 priority flora species were identified as potentially occurring in the wider local area as listed in **Table 1**. None of these species were mapped as occurring within the site.

Of the flora species potentially occurring in the local area, only those with habitat preferences of sandy, limestone soils and low lying, wet soils were deemed likely to occur in the site.

On this basis three threatened flora species and eight priority flora species were identified as having potential to occur within the site (shaded green in **Table 1**).

Table 1: Significant flora species known or likely to occur within 10 km of the site

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
Caladenia lodgeana	T	CE	P	Black loam	Oct	Unlikely
Calectasia cyanea	T	CE	P	Heathland on white sand or laterite gravel over laterite.	Jun-Oct	Unlikely
Banksia nivea subsp. *Uliginosa*	T	E	P	Sandy clay, gravel.	Aug-Sep	Unlikely
Caladenia excelsa	T	E	P	White, grey or bown sand, sandy loam.	Sep-Oct	Possible
Caladenia hoffmanii	T	E	P	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies.	Aug-Oct	Possible
Caladenia huegelii	T	E	P	Well-drained, deep sandy soils in lush undergrowth in a variety of moisture levels.	Sep-early Nov	Unlikely
Gastrolobium papilio	T	E	P	Sandy clay over ironstone and laterite. Flat plains.	Oct-Dec	Unlikely
Lambertia echinata subsp. *Occidentalis*	T	E	P	White sandy soils over laterite, orange/brown-red clay over ironstone. Flats to foothills, winter-wet sites.	Feb or Apr or Dec	Possible
Sphenotoma drummondii	T	E	P	Stony or shallow soils over granite or quartzite.	Sep-Dec	Unlikely
Banksia squarrosa subsp. *Argillacea*	T	V	P	White/grey sand, gravelly clay or loam.	Jun-Nov	Unlikely
Drakaea micrantha	T	V	P	Open sandy patches often adjacent to winter-wet swamps.	September to early October	Unlikely
Synaphea macrophylla	P1	-	P	Gravelly loam.	Oct	Unlikely
Synaphea sp. Redgate Road (J. Scott 16)	P1	-	P	Grey clay, litter. Winter-wet areas, wet areas along road verges and ditches.	-	Unlikely
Amperea micrantha	P2	-	P	Sandy soils.	Oct-Nov	Possible
Acacia inops	P3	-	P	Black peaty sand, clay. Swamps, creeks.	Sep-early Nov	Unlikely
Gastrolobium formosum	P3	-	P	Clay loam. Along river banks or in swamps.	Nov	Possible
Pultenaea pinifolia	P3	-	P	Loam or clay. Floodplains, swampy areas.	Oct-Nov	Possible

Table1: Significant flora species known or likely to occur within 10 km of the site (cont.)

Species	Level of significance		Life strategy	Habitat	Flowering period	Likelihood of occurrence
	State	EPBC Act				
Stylidium lowrieanum	P3	-	P	Sand or sandy loam over limestone. Eucalypt or Agonis woodland, forest, scrub.	Oct-Nov	Possible
Acacia tayloriana	P4	-	P	Grey or yellow/orange sandy soils, lateritic gravel, clay loam. Winter-wet areas.	Jan	Unlikely
Banksia sessilis var. *cordata*	P4	-	P	White/grey sand. Coastal limestone.	Jul-Oct	Possible
Eucalyptus marginata x *megacarpa*	P4	-	P	Sandy loam. Interdunal areas.	-	Possible
Franklandia triaristata	P4	-	P	White or grey sand.	Aug-Oct	Possible
Gahnia sclerioides	P4	-	P	Loam, sandy soils. Moist shaded situations.		Possible

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

2.2.2 Threatened and priority ecological communities

An ecological community is a naturally occurring group of native plants, animals and other organisms that are interacting in a unique habitat. An ecological community's structure, composition and distribution are influenced by environmental factors such as soil type, position in the landscape, altitude, climate and water availability (DoEE 2017b). 'Threatened ecological communities' (TECs) are ecological communities that are recognised as rare or under threat and therefore warrant special protection.

Selected TECs are afforded statutory protection at a Commonwealth level under section 181 of the EPBC Act. Any action likely to have a significant impact on a community listed under the EPBC Act requires approval from the Commonwealth Minister for the Environment and Energy.

TECs will be listed within Western Australia under Section 27(1) and 33 of the BC Act and under the Biodiversity Conservation Regulations (BC Regulations). Their significance is also acknowledged through other state environmental approval processes such as 'environmental impact assessment' pursuant to Part IV of the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

A plant community that is under consideration for listing as a TEC in Western Australia, but does not yet meet survey criteria or has not been adequately defined, may be listed as a 'priority ecological community' (PEC). Listing as a PEC is similarly considered during State approval processes. Further information on categories of TECs and PECs is provided in **Appendix A**.

Known locations of TECs and PECs within 10 km of the site were searched for using the *Protected Matters Search Tool* (DoEE 2019) and DBCA's threatened and priority ecological communities' database (reference no. 17-0122018). These search results indicate no TECs or PECs are known to occur within the site, but that two TECs and one PEC occur within 10 km of the site as listed in **Table 2**.

Table 2: TECs and PECs known to occur within 10 km of the site.

Code	Community name	TEC/ PEC	Level of significance	
			State	EPBC Act
CAVES LEEUWIN02	Aquatic Root Mat Community Number 2 of Caves of the Leeuwin Naturaliste Ridge	TEC	Critically Endangered	Endangered
CAVES LEEUWIN04	Aquatic Root Mat Community Number 4 of Caves of the Leeuwin Naturaliste Ridge	TEC	Critically Endangered	Endangered
Melaleuca lanceolata forests	*Melaleuca lanceolata* forests, Leeuwin Naturaliste Ridge	PEC	Priority 2	-

*Communities considered to be potentially present within the site shaded green.

2.2.3 Local and regional significance

Flora species and ecological communities may be significant for a number of reasons irrespective of whether they have special protection under policy or legislation.

Six key reasons that vegetation within the site may be significant are listed below:

- The site and surrounds contribute to Registered Aboriginal Heritage Sites. These include Registered Aboriginal Site 5848 – Cliffs at Wallcliffe and Registered Aboriginal Site 4495 – Margaret River. Both are Mythological sites, and Site 5848 is also an Artefacts/Scatter and Rockshelter site (DPLH 2019).
- The site contains the eastern most portion of the Wallcliffe Cliffs. Within the Cliffs there is a diversity of geological, biological and landscape attributes that enhance its significance, interest and value as a natural feature worthy of protection (Shire of Augusta-Margaret River 2018).
- The site is listed on the State Heritage Register.
- The site is directly adjacent to the Margaret River waterway.
- The site is directly adjacent to Reserve 41545, which is an A-Class nature reserve to the south and west as shown in **Figure 2**.
- The vegetation within the site has potential value as habitat for threatened or priority fauna species including, in particular, western ring-tailed possum, Carnaby's black cockatoo, Baudin's black cockatoo and the forest red-tailed black cockatoo, which are listed under the EPBC Act and BC Act.

Weeds

The term 'weed' can refer to any plant that requires some form of action to reduce its effect on the economy, the environment, human health and amenity. Many non-native flora species and some native species are considered to be weeds.

A particularly invasive or detrimental weed species may be listed as a 'declared pest' pursuant to the Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act), indicating that it warrants special management to limit its spread. At a national level, the Australian government has compiled a list of 32 Weeds of National Significance (WoNS) (DoEE 2019), of which many are also listed under the BAM Act. Further information on categories of declared pests is provided in **Appendix A.**

Due to historical disturbance weed species are expected to be present at the site.

2.3 Land use considerations

A range of legislation, regulations and polices are relevant to the evaluation of vegetation in Western Australia. Key considerations applicable to the site are described below and also shown in **Figure 2**.

2.3.1 DBCA managed or legislated lands

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

The land to the west of the Margaret River (and including the portion of the river to the south west of the site) and south of Wallcliffe Road to the south east of the site comprises the Leeuwin-Naturaliste National Park (R8428) (DBCA 2017a). These are shown on **Figure 2**.

2.3.2 Shire managed conservation reserves

The land directly to the south of the site is vested with the Shire of Augusta-Margaret River as an A-class nature reserve R41545 (Wallcliffe Reserve) (Shire of Augusta-Margaret River 2018), as shown on **Figure 2**. Wallcliffe Reserve contains the majority of the Wallcliffe Cliffs, as discussed in **Section 2.1.2**. There are a number of caverns, overhangs and caves within the cliffs. Due to increased degradation from recreational use and its Aboriginal significance, public access to the cliff caves was prohibited in 2018 (Shire of Augusta-Margaret River 2018).

A separate cave is known to be present close to the south of the site within Wallcliffe Reserve, and approximately 150 m from the Wallcliffe Cliffs (Shire of Augusta-Margaret River 2018). However, the exact location of the cave is not known. This cave was previously accessed for tourism but this cave was gated to prevent access following the preparation of the *Wallcliffe Cave Management Plan (2002-2012)* (Shire of Augusta-Margaret River 2002).

2.3.3 Environmentally sensitive areas

'Environmentally sensitive areas' (ESAs) are prescribed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* and have been identified to protect native vegetation values of areas surrounding significant, threatened or scheduled flora, vegetation communities or ecosystems. Within an ESA none of the exemptions under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* apply. However, exemptions under Schedule 6 of the EP Act still apply, including any clearing in accordance with a subdivision approval under the *Planning and Development Act 2005* (a recognised exemption under the Schedule 6 of the EP Act).

One ESA is located directly to the south of the site and on the adjacent side of the Margaret River. This ESA is very large and extends to the north, south-west and south-east of the site over approximately 2518 square kilometers (km^2) area and is shown in **Figure 2**.

2.3.4 Ecological linkages

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

The Perth Biodiversity Project, supported by the Western Australia Local Government Association (WALGA), have identified and mapped regional ecological linkages within the Perth Metropolitan Region (WALGA and PBP 2004). This study was extended beyond the Perth Metropolitan Region through the South West Biodiversity Project, resulting in the identification and mapping of the South West regional ecological linkages (Molloy *et al.* 2009).

There are no mapped ecological linkages within the site. Three regional ecological linkage (Nos 107, 108 and 109) meet to the west of the site within the Margaret River and extend to the north and south of the site along the coast, and to the north east of the site, along the path of the Margaret River heading inland. The locations of these linkages are shown in **Figure 2**.

2.4 Previous flora surveys

No previous flora and vegetation surveys are known to have been undertaken within the site.

3 Methods

3.1 Field survey

One botanist and an environmental consultant from Emerge visited the site on 19 November 2018 to conduct the flora and vegetation assessment.

3.1.1 Vegetation

The site and survey area were traversed on foot and the composition and condition of vegetation was recorded. Searches were conducted for threatened and priority flora species with potential to occur in the site, with a particularly focus on identifying areas of suitable habitat within the site.

Detailed sampling of the vegetation was undertaken using a combination of non-permanent 10 x 10 m quadrats, relevés and photo points. The quadrats were established using fence droppers bound by measuring tape. The relevés were completed over an equivalent 10 x 10 m area without the use of physical markers and were included to provide a more rapid sample of patches of vegetation outside of the site boundary. The photo points were included to show specific site features at a particular location.

A total of 11 locations were sampled, comprised of four quadrats, four relevés and three photo points. The position of each sample location was recorded with a hand-held GPS unit, as shown in **Figure 3** and **Figure 4**.

The data recorded within the samples included:

- site details (site name, site number, observers, date, location)
- environmental information (slope, aspect, bare-ground, rock outcropping soil type and colour class, litter layer, topographical position, time since last fire event)
- biological information (vegetation structure and condition, foliage projective cover' (FPC), degree of disturbance and species present).

Additional plant taxa not observed within samples were recorded opportunistically as the botanist traversed the survey area. Photographs were taken throughout the field visit to show particular site conditions.

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

Vegetation condition was assigned at each sample and changes in vegetation condition were also noted and mapped across the survey area. The condition of the vegetation was assessed using methods from Keighery (1994), with the condition scale outlined in **Table 3**.

Table 3: Vegetation condition scale applied during the field assessment

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

3.2 Mapping and data analysis

3.2.1 Plant community identification and description

The local plant communities within the survey area were identified from the sample data collected during the field survey.

Once a group was defined from the cluster analysis, the vegetation was described according to the dominant species present using the structural formation descriptions of the *National Vegetation Inventory System* (NVIS) (ESCAVI 2003). The identified plant communities were then mapped on aerial photography (1:3,500) from the sample locations and boundaries were interpreted from aerial photography and notes taken in the field. Vegetation condition was mapped on aerial photography (1:3,500) based on the locations and notes recorded during the field survey to define areas with differing condition.

3.2.2 Threatened and priority ecological communities

The plant communities were compared to the TEC and PECs located within 10 km of the site (as listed in **Table 2**).

Areas of native vegetation potentially representing a TEC were assessed against the characteristics provided in the following documents:

- *Commonwealth Listing Advice on Aquatic root mat communities 1, 2, 3 and 4 in caves of the Leeuwin Naturaliste Ridge* (Endangered Species Scientific Subcommittee 2000).

3.2.3 Species accumulation curve

A species accumulation curve was plotted from sample data by generating a trendline (log) in Microsoft Excel. The trendline was forecast to locate the asymptote of the curve (the point at which the curve flattens), which provides an indication of amount of sampling that would be required before it can be assumed few species remain undetected. PRIMER v6 also offers a range of estimators to predict minimum species richness (Clarke and Gorley 2006). Both the Jacknife1 and Chao2 non-parametric estimators are reported, as these are known to perform well in comparison to simulated and real data sets and are also recommended for small sample sizes (Gotelli and Colwell 2011). Comparison between actual and estimated species accumulation assists in evaluating the adequacy of sampling effort.

3.3 Survey limitations

It is important to note the specific constraints imposed on surveys and the degree to which these may have limited survey outcomes. An evaluation of the survey methodology against standard constraints outlined in the EPA document *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) is provided in **Table 4**.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016)

Constraint	Degree of limitation	Details
Availability of contextual information	No limitation	The broad scale contextual information described in **Section 2** is adequate to place the site and vegetation in context.
	Minor limitation	There is no publicly available regional flora survey dataset available for the south-west region that would allow for statistical analysis to determine the presence or absence of conservation significant vegetation types. As such the plant communities identified were compared to the TECs and PECs within the wider local area based on the species presence, soils, landforms and location information available.
Experience level of personnel	No limitation	This flora and vegetation assessment was undertaken by a qualified botanist with eight years of botanical experience in Western Australia. Technical review was undertaken by a senior environmental consultant with 16 years' experience in environmental science in Western Australia.
Suitability of timing	No limitation	The survey was conducted in November and thus within the main flowering season. High rainfall was recorded from May to October 2018 in the months preceding the site visit. Therefore it is likely that many plant species would have been in flower and/or visible at the time of survey. The degraded nature of most of the site limits the potential habitat for native geophytic plants such as orchids and the majority of threatened and priority flora species with potential to occur are perennial species. The survey timing was considered adequate to allow the detection of species for which seasonal timing is critical.

Table 4: Evaluation of survey methodology against standard constraints outlined in EPA Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (cont.)

Constraint	Degree of limitation	Details
Temporal coverage	Minor limitation	Comprehensive flora and vegetation assessments can require multiple visits, at different times of year, and over a period of a number of years, to enable observation of all species present. The site was visited once in late November 2018. Although only sampled once, the site data was considered conclusive as it was collected in the spring main flowering period and much of the vegetation within the site is non-native. However, the survey does not meet the full requirements of a 'detailed' survey. In order for the survey to be considered a 'detailed' survey a second visit in a different season is required.
Spatial coverage and access	No limitation	Site coverage was comprehensive (track logged).
	Minor limitation	All parts of the site could be accessed as required (with the exception of the areas in close proximity to the derelict buildings, which contained no remnant native vegetation). Wallcliffe Cave, which occurs close to the southern boundary of the site, is gated and thus was also not accessed. The survey area included adjacent vegetation providing contextual information for the native vegetation within the site.
Sampling intensity	No limitation	A total of 117 species were recorded, of which 104 were recorded from 11 sample locations and 13 were recorded opportunistically. Minimum species richness within survey area is estimated at between 149 (Jacknife1) and 158 (Chao2). (refer species accumulation curve and estimates shown in **Plate 12**). This indicates that between 74 and 79% of the estimated 149-158 species were recorded. Considering the completely degraded nature of the majority of the site and the time spent sampling and searching the remnant vegetation within the site itself, the presence of additional species is more likely to be within the portions of the survey area outside of the site. This is particularly likely for the vegetation to the south of the site within Wallcliffe Reserve. Thus the survey effort was considered to be adequate to prepare a representative species inventory for the site.
Influence of disturbance	Minor limitation	Time since fire is eight to ten years as interpreted form aerial imagery and therefore short-lived species more common after fire may not have been visible.
	No limitation	Historical ground disturbance was evident over most of the site. The disturbance history of the site was considered when undertaking field sampling.
Adequacy of resources	No limitation	All resources required to perform the survey were available.

4 Results

4.1 General site conditions

The site is predominantly cleared of native vegetation or parkland cleared with remnant *Agonis flexuosus* (peppermint) trees over managed grasses (**Plate 2**). Planted non-native vegetation was present surrounding the building remains in the centre of the site (**Plate 3**).

Small sections of disturbed native vegetation subject to some plantings, ground disturbance and weed management are present within the site. A boardwalk is present along the south western boundary of the site adjacent to Margaret River and running underneath the limestone cliffs (**Plate 4**). Portions of the boardwalk were burnt in 2011. A landscaped, rocky stream was historically built in the south western portion of the site using limestone blocks (**Plate 5**), at the time of the survey there was no water present and no evidence that this water feature is still in use. The most intact vegetation exists along the west of the site adjacent to the Margaret River and to the south of the site.



Plate 2: Cleared and parkland cleared areas of the site including Wallcliffe House.



Plate 3: Cultivated gardens through the centre of the site surrounding Wallcliffe House.



Plate 4: Base of limestone cliffs and boardwalk present in the south western corner of the site.



Plate 5: Landscaped rocky creek present within the south western portion of the site, with native species throughout.

4.2 Flora

A total of 66 native and 51 non-native (weed) species were recorded within the survey area during the field survey, representing 53 families and 101 genera. The dominant families containing native taxa were Fabaceae (eight native taxa and five weed taxa), Myrtaceae (eight native taxa and two weed taxa) and Cyperaceae (five native taxa). The most common genera were *Melaleuca* (with four taxa) and *Acacia* and *Lepidosperma* with three taxa each. The family containing the most taxa was Poaceae (two native and 11 non-native species) and Fabaceae. Of the species recorded 104 were recorded in sample locations and 13 were recorded opportunistically. A complete species list is provided in **Appendix B** and sampled data in **Appendix C**. This species list does not document all exotic planted species present within the site (given the extensive planted gardens), but does include those planted species recorded within areas of remnant native vegetation.

4.2.1 Threatened and priority flora

One priority 4 (P4) species, *Banksia sessilis* var. *cordata*, was recorded in the site. One individual of the species was recorded adjacent to the driveway in the eastern portion of the site, as shown on **Figure 4**. No other threatened or priority flora species were recorded within the site.

4.2.2 Locally and regionally significant flora

No significant flora species were recorded within the site.

4.2.3 Declared pests

Two species, **Zantedeschia aethiopica* (arum lily) and **Asparagus asparagoides* (bridal creeper) were recorded within the site that are listed as declared pests (C3) pursuant to the BAM Act.

Bridal creeper is also listed as a 'weed of national significance' (WoNS).

4.3 Vegetation

4.3.1 Plant communities

Four native plant communities were identified within the site. Plant community **AfW** exists in the south-western corner and a patch in the centre of the site and extends over 0.63 ha. Plant community **MrLOF** is located along the edges of the Margaret River to the west of the site and extends over 0.11 ha. Plant community **CcAfW** was located to the north of the site close to the Margaret River. This community extends over 0.05 ha of the site and extends to the north of the site. Plant community **MhBvTrS** is located to the south west of the site and extends over 0.16 ha. Plant community **AfSgHcW** is present to the south east of the site and extends over 0.33 ha. The remainder of the site (4 ha) contains modified vegetation with bare soil, scattered native trees over pasture grasses or planted vegetation.

A description and the area of each plant community (within the site and also within the adjacent survey area) is provided in **Table 5** and representative photographs of each are provided in **Plate 6** to **Plate 11**. The location of each plant community is shown in **Figure 3**.

Table 5: Plant communities identified within the survey area

Plant community	Description	Area (ha)	
		Site	Additional survey area
AfW	Woodland of Agonis flexuosus over open shrubland of *Rhagodia baccata* subsp. *baccata*, *Olearia axillaris* and *Hibbertia cuneiformis* over open mixed forbland and open to closed grassland of weeds (**Plate 6**).	0.63	0.21
AfSgHcW	Woodland of *Agonis flexuosus* over shrubland of *Spyridium globulosum, Hibbertia cuneiformis, Templetonia retusa* with vineland of *Hardenbergia comptoniana* and *Muehlenbeckia adpressa over low shrubland of Phyllanthus calycinus* over forbland of *Tricoryne elatior and Thysanotus arenarius Austrostipa flavescens* (**Plate 7**).	0.33	2.45
CcAfW	Woodland of *Corymbia calophylla* and *Agonis flexuosus* over shrubland of *Spyridium globulosum, Pteridium esculentum, Rhagodia baccata* subsp. *baccata* and *Exocarpos sparteus* with vineland of *Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over weeds (**Plate 8**).	0.05	0.42
MhBvTrCS	Low open woodland of *Agonis flexuosus* (resprouting) with closed shrubland of *Melaleuca huegelii, Beyeria viscosa, Acacia cyclops, Diplolaena dampieri, Dodonaea aptera* and *Spyridium globulosum with vineland of Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over open forbland of *Tricoryne elatior*, **Petrorhagia dubia and Thysanotus arenarius,* sparse sedgeland of *Lepidosperma* spp. and sparse grassland of *Austrostipa flavescens* and **Lagurus ovatus* (**Plate 9**).	0.16	1.96
MrLOF	Low open forest of *Melaleuca rhaphiophylla* over open to closed rush/sedgeland of *Juncus* spp. and *Baumea juncea* over sparse forbland of *Apium prostratum* var. *prostratum, Lobelia anceps, Samolus repens* var. *repens* and **Atriplex prostrata* (**Plate 10**).	0.11	0.79
Cleared/ planted	Modified vegetation comprising weeds with occasional native trees and planted vegetation (**Plate 11**)**.**	4.01	0.08



*Plate 6: Plant community **AfW** in degraded condition*



*Plate 7: Plant community **AfSgHcW** in good condition.*



*Plate 8: Plant community **CcAfW** in very good condition.*



*Plate 9: Plant community **MhBvTrS** in very good condition. Note fire killed/resprouting shrubs.*



*Plate 10: Plant community **MrLOF** in very good condition.*



Plate 11: Parkland cleared vegetation (left) and planted non-native landscaped gardens (right) in completely degraded condition.

4.3.2 Vegetation condition

The most intact native vegetation was located to the west along the edge of Margaret River (plant communities **MrLOF** and **CcAfW**) and in the south-western corner of the site (plant community **MhBvTrCS**). The **MrLOF** and **CcAfW** vegetation was mapped as being in very good condition as it retains the structure expected of a riparian wetland community and has moderate native species diversity. The **MhBvTrCS** vegetation in the south western portion of the site shows evidence of being significantly burnt in the 2011 fire. However as it comprises a dense shrubland of resprouting native coastal species with numerous understorey species and limited weed cover, it was also considered to be in very good condition. A portion of plant community **AfSgHcW** bordering the south eastern boundary of the site was also considered to be in very good condition. This area showed less severe evidence of fire.

Sections of plant communities **AfW** and **AfSgHcW** to the south and east of the site were mapped as being in good condition as they had higher weed cover.

A number of areas of the **AfW** vegetation consists of trees over scattered native shrubs and a high cover of pasture weeds (particularly to the south west of the site along Margaret River). This vegetation was mapped as being in degraded condition as it lacks understory structure and has low species diversity. Consequently the vegetation is effectively parkland cleared and rehabilitation would require intensive management.

Remaining areas in the site are in 'completely degraded' condition and consist of non-native species such as pasture grasses, and planted trees and shrubs. Tracks within the site were also mapped as being in 'completely degraded' condition.

The extent of vegetation by condition category within the site and also within the wider survey area is detailed in **Table 6** and shown in **Figure 4**.

Table 6: Vegetation condition categories within the site and survey area

Condition category (Keighery (1994))	Size (ha)	
	Site	Additional survey area
Pristine	0	0
Excellent	0	0
Very Good	0.28	4.26
Good	0.62	1.37
Degraded	0.39	0.21
Completely Degraded	4.01	0.08

4.3.3 Threatened and priority ecological communities

No TECs or PECs occur within the site. Wallcliffe Cave and the cliff caves in the south western portion of the site and survey area are not known to contain any aquatic root mat TEC. However, it is possible that aquatic root mat TECs occur to the south of the site.

4.3.4 Locally and regionally significant vegetation

A number of mature native trees (diameter at breast height larger than 500 mm) including *Corymbia calophylla* (marri) and peppermint are present in the site. Due to their number and size these trees have the potential to provide habitat for black cockatoos (especially Carnaby's black cockatoo) and western ring-tailed possum respectively, along with other ecological services.

4.4 Species richness and sampling adequacy

A total of 104 species were recorded from 11 samples. A species accumulation curve derived from sample data is presented in **Plate 12**. After eleven samples the curve is still increasing and has not reached its asymptote. This indicates that a proportion of species likely remain undetected by sampling.

Species richness was estimated in PRIMER v6 to be between 149 (Jacknife1) and 158 (Chao2). Based on the trend of the species accumulation curve approximately 30 to 40 samples would be required to capture that many species. Including the 13 additional species recorded opportunistically, a total of 117 species was recorded in the survey area. This indicates that between 74 and 79% of the estimated 149-158 species were recorded. Considering the completely degraded nature of the majority of the site and the time spent sampling and searching the remnant vegetation within the site itself, the presence of additional species is more likely to be within the portions of the survey area outside of the site. This is particularly likely for the vegetation to the south of the site within Wallcliffe Reserve. Thus the survey effort was considered to be adequate to prepare a representative species inventory for the site.

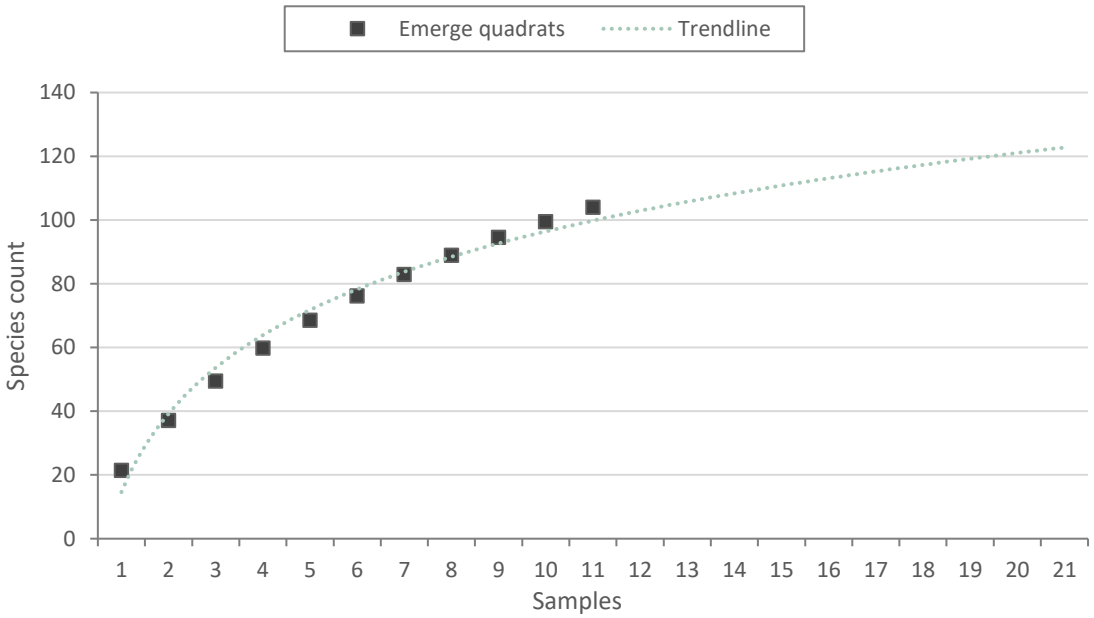


Plate 12: Species accumulation curve derived from sample data (y = 35.522ln(x) + 14.619 R^2 = 0.9816).

5 Discussion

The vegetation within the site has been subject to significant past disturbance and is largely in completely degraded condition. The central portion of the site contain the fenced remains of the buildings that were damaged in the 2011 fire. These are surrounded by maintained cultivated gardens dominated by exotic species. Approximately four hectares of the site is cleared or comprises non-native vegetation. The 1.3 ha of native vegetation remaining within as well as areas adjacent to the site shows varying levels of disturbance, including fire damage, partial clearing and weed invasion.

The **AfW** vegetation was located in a number of pockets within the site. These areas have all been subject to some disturbance, both from historical clearing and the 2011 fire. The north-eastern patch is in degraded condition and has been subject to plantings of local native and exotic species. This area is also subject to weed control. The south western pockets of the **AfW** vegetation range from degraded to good condition. The area directly south west of the site was mapped as being in degraded condition due to high grass weed loads and limited native understorey species. The **AfW** vegetation within the south western portion of the site is mapped as being in good condition as they contained less weed cover and had a number of native understorey species present. A landscaped, rocky stream was historically built in this area using limestone blocks, at the time of the survey there was no water present and no evidence that this water feature is still in use. This area was still considered to be in good condition due to the native species present and low weed cover, but showed evidence of historic modification.

The most intact native vegetation exists along the south-western, western and south eastern periphery of the site and extending outside of the site boundary. The vegetation along Margaret River comprises plant community **MrLOF** (with **CcAfW** at higher elevation at the northern extent of the site). These communities are relatively intact, riparian communities in very good condition, despite localised incursions of weed species in higher densities. The vegetation was subject to some disturbance during the 2011 fire but due to its proximity to the river was not extensively burnt.

Plant communities **AfSgHcW** and **MhBvTrS** extend to the south of the site, with small areas of each occurring within the site boundary. Based on the historical aerials, the vegetation to the south east of the site (plant community **AfSgHcW**) was burnt between 2007 and 2009. The vegetation present in the south west corner of the site (plant community **MhBvTrS**) was then subsequently burnt in 2011. Both communities are in the process of regenerating and contained high coverage of native species. The vegetation at the junction of the communities was burnt by both fires and consequently was more degraded with high weed cover. The two communities share numerous common species but showed differences in species composition and structure. **AfSgHcW** vegetation had a more intact canopy of peppermint trees. Within the **MhBvTrS** vegetation peppermint trees were more scattered and at the time of the survey were of a similar height to the dominant shrub species present (approximately two metres high). The **MhBvTrS** vegetation is located on limestone cliffs above the river with higher densities of outcropping limestone. As a result, the suite of species was slightly different to the **AfSgHcW** vegetation on sandier soil further east.

5.1 Threatened and priority flora

In the south-west of Western Australia, September to November is considered the optimal period for undertaking flora and vegetation surveys, with this period also extending into December the further south the site is located. This is when the majority of flora species are flowering and therefore easiest to detect and identify. In 2018 many species in the south-west were still in flower later than usual due to the higher (albeit average) rainfall compared to previous years and the late start to the flowering period (anecdotally, some species were nearly a month behind their typical flowering times).

The portion of the Margaret River adjacent to the site is estuarine and low level interaction with the ocean and intrusion of salt water is evident (Hanran-Smith and McKenzie 2018). The presence of *Juncus kraussii* subsp. *australiensis* confirms this. This is likely to limit those conservation significant species that have a preference for lower lying, moist habitats.

One individual of the priority flora species *Banksia sessilis* var. *cordata* (P4) was recorded in the south-eastern corner of the site alongside the driveway.

No other threatened or priority flora species were recorded within the site or adjacent portions of the survey area. The absence of the larger perennial species such as *Lambertia echinata* subsp. *occidentalis* and *Pultenaea pinifolia* was relatively easy to confirm. As it was to confirm that *Banksia sessilis* var. *cordata* was only present at the one identified location. However, due to their size, smaller geophytic species such as *Caladenia excelsa* and *C. hoffmanii* can be more difficult to detect. Considerable search effort was applied to the areas of remnant native vegetation present within the site itself therefore it is considered that further threatened and priority flora species are unlikely to occur within the site. Conservation significant species could occur within Wallcliffe Reserve to the south of the site which was not assessed in the same level of detail.

5.2 Threatened ecological communities

No TECs or PECs are considered to occur within the site.

The only TECs or PECs considered to potentially occur close to the site are aquatic root mat communities 1, 2, 3 and 4 in caves of the Leeuwin Naturaliste Ridge TECs. These TECs comprise four separate communities of aquatic invertebrates living in mats of fine tree rootlets associated with extensive growths of microscopic fungi in caves on the Leeuwin Naturaliste Ridge (ESSS 2000). The caves that contain the root mat communities occur in limestone on gneiss granites (English et al. 2000; ESSS 2000). The soil above the caves contains little water and growth of tree roots into the caves is promoted by the availability of permanent water in the cave streams and pools. Root mats are produced by *Eucalyptus diversicolor* (karri) in Easter Cave and Strongs Cave, marri in Calgardup cave and karri and peppermint in Kudjal Yolgah cave (ESSS 2000). The resulting root mats provide the primary food source for the aquatic root mat (Jasinska *et al.* 1996). The four communities are also differentiated by the invertebrate species composition and abundance and most species present are endemic to the one cave (J. 1996; ESSS 2000). As such, each community is considered to represent a separate TEC and all four communities were assessed as critically endangered (ESSS 2000). Despite new information showing a much larger extent of root mat communities, the communities still fit

criteria for critically endangered as documented within the *Interim Recovery Plan 2008-2013* (DEC 2008).

The nearest known occurrence of one of the aquatic root mat TECs is *Aquatic Root Mat Community Number 2 of Caves of the Leeuwin Naturaliste Ridge,* 9 km south of the site. This TEC occurs at Strongs Cave and the root mats are produced by karri. There are a number of caves present close to the site. These are present within the Wallcliffe Cliffs and also a separate cave 150 m south of the cliffs (referred to as Wallcliffe Cave). Due to increased degradation and Aboriginal cultural significance, public access to the cliff caves was prohibited in 2018 (Shire of Augusta-Margaret River 2018). Wallcliffe Cave was gated to prevent access in 2002. Whilst neither cave systems have been identified as containing aquatic root mat TECs previously, it is possible that these TECs occur within the area. Targeted surveys of the caves for root mats and the assemblages of invertebrate fauna would be required to determine the presence or absence of aquatic root mat TECs but are not likely to occur within the site itself.

5.3 Local and regional significance

The site and surrounds are mapped as two Registered Aboriginal Sites, contains unique geological features and abuts the Margaret River. As such the intact vegetation (that in good or better condition) within the area is likely to be locally and/or regionally significant and also contributes to regional ecological linkages.

Large peppermint and marri trees within the site may be locally and/or regionally significant due to their habitat value for endangered western ring-tailed possum and black cockatoo species respectively. However, further assessment by a fauna specialist is required to confirm these values.

6 Conclusions

The majority of vegetation within the site is highly disturbed and modified. Approximately four hectares of the site contains completely degraded, non-native vegetation. The remaining 1.3 ha of the site includes native vegetation that is largely present in degraded (0.39 ha) and good (0.62 ha) condition. However, the site contains approximately 0.28 ha of relatively intact native vegetation in very good condition.

One individual of the priority flora species *Banksia sessilis* var. *cordata* (P4) was recorded in the south-eastern corner of the site alongside the driveway. No other threatened or priority flora species were recorded or are considered likely to occur within the site.

No TECs or PECs were recorded within the site. There is a possibility that Wallcliffe Cave or caves within the Wallcliffe Cliffs to the west and south of the site could potentially contain one of the aquatic root mat TECs.

The intact vegetation in the southern portion of the site likely to be locally and/or regionally significant and contribute to the associated regional ecological linkages. The large peppermint and marri trees within the site may be locally and/or regionally significant due to their habitat potential for threatened western ring-tailed possum and black cockatoo species respectively.

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Figures

Figure 1: Site Location

Figure 2: Environmental Features

Figure 3: Plant Communities

Figure 4: Vegetation Condition

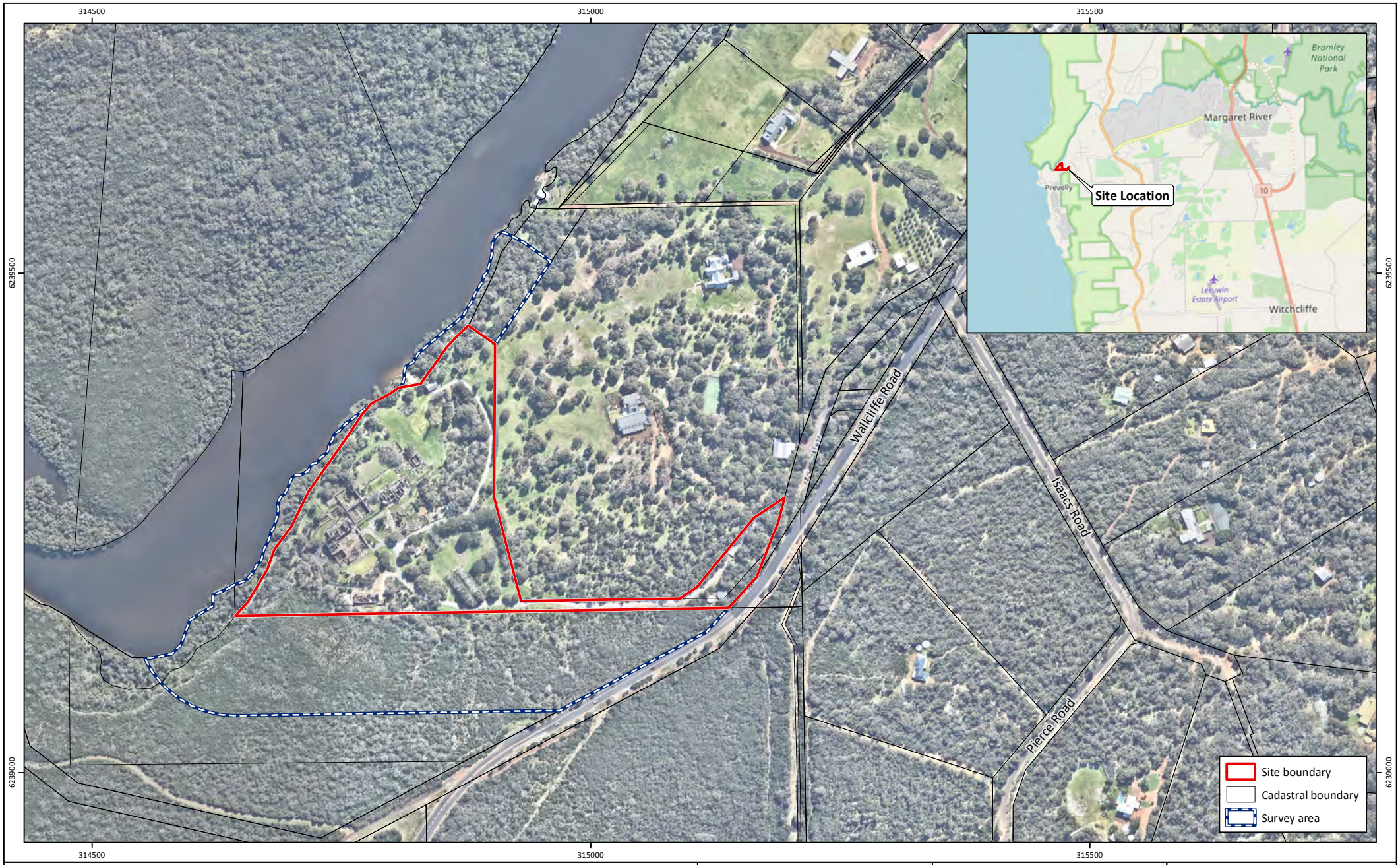


Figure 1: Site Location

Project: Spring Flora and Vegetation Assessment
Lot 101 Wallcliffe Road Amendment Support
Client: Wallcliffe House Pty Ltd

Plan Number:
EP18-128(01)--F01
Drawn: KNM
Date: 23/01/2019
Checked: SKP
Approved: TAA
Date: 11/02/2019

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

emerge ASSOCIATES

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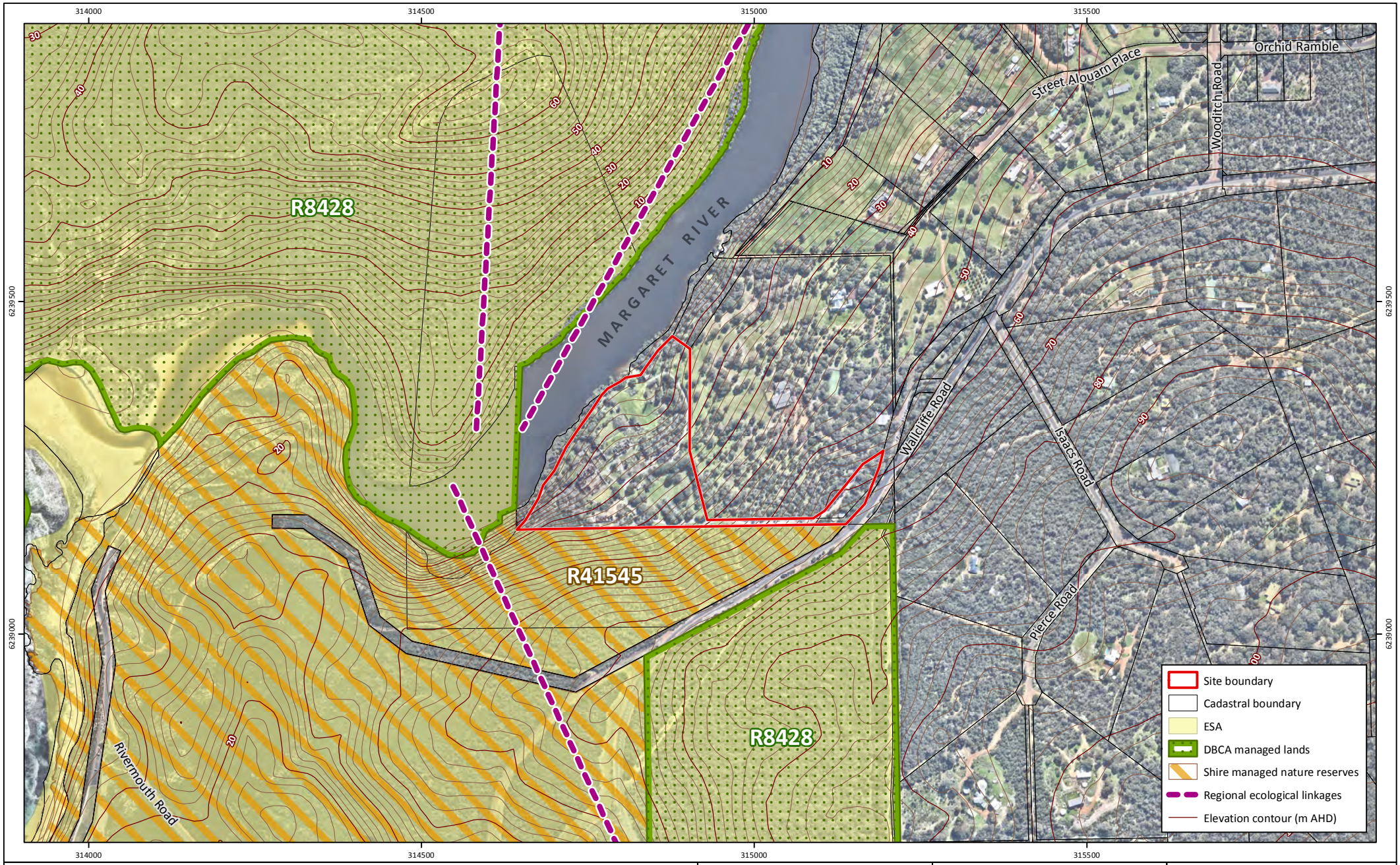


Figure 2: Environmental Features

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Approved: TAA
Date: 11/02/2019

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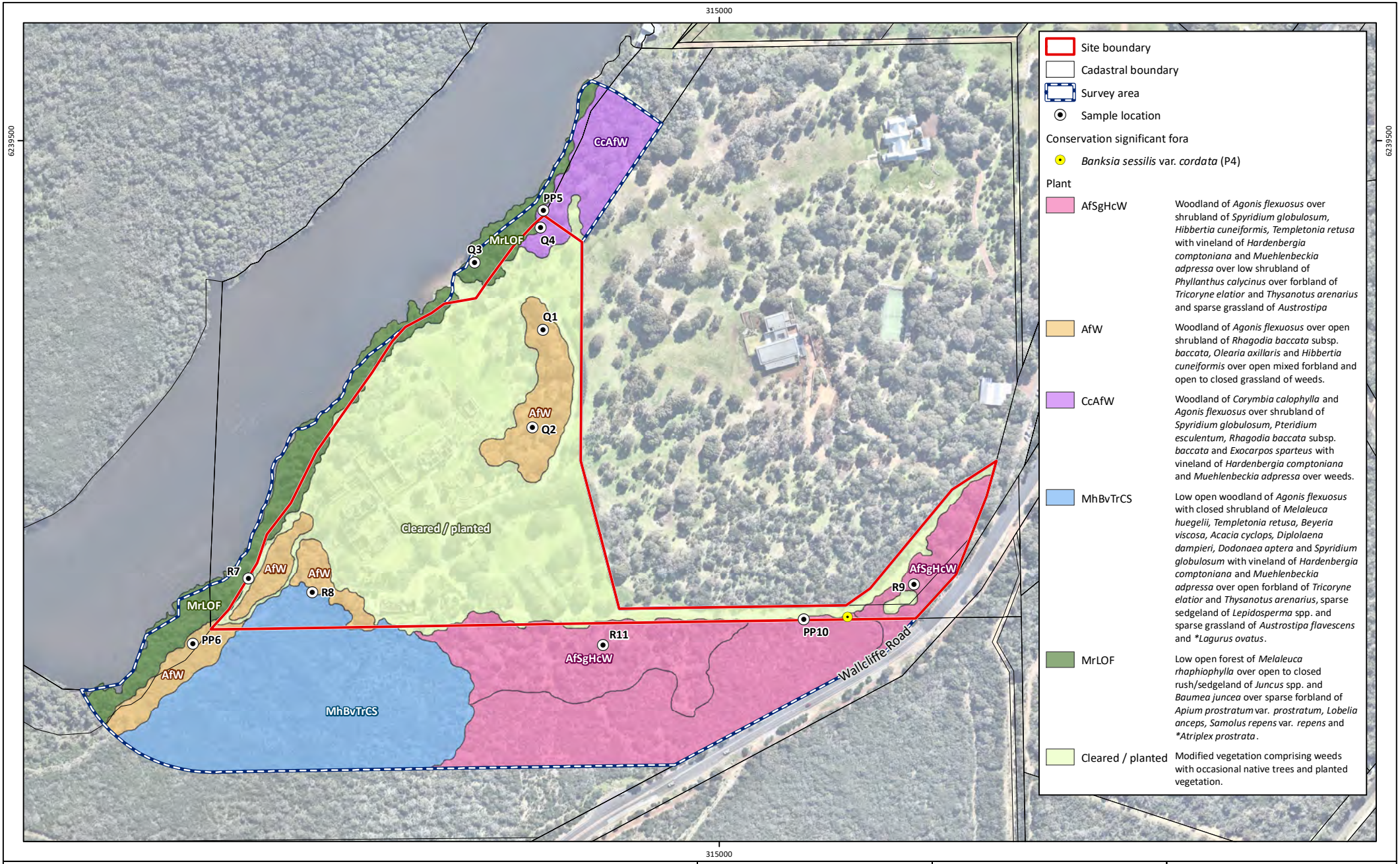


Figure 3: Plant Communities

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Lot 101 Wallcliffe Road Amendment Support
Client: Wallcliffe House Pty Ltd

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Checked: SKP
Approved: TAA
Date: 29/11/2019

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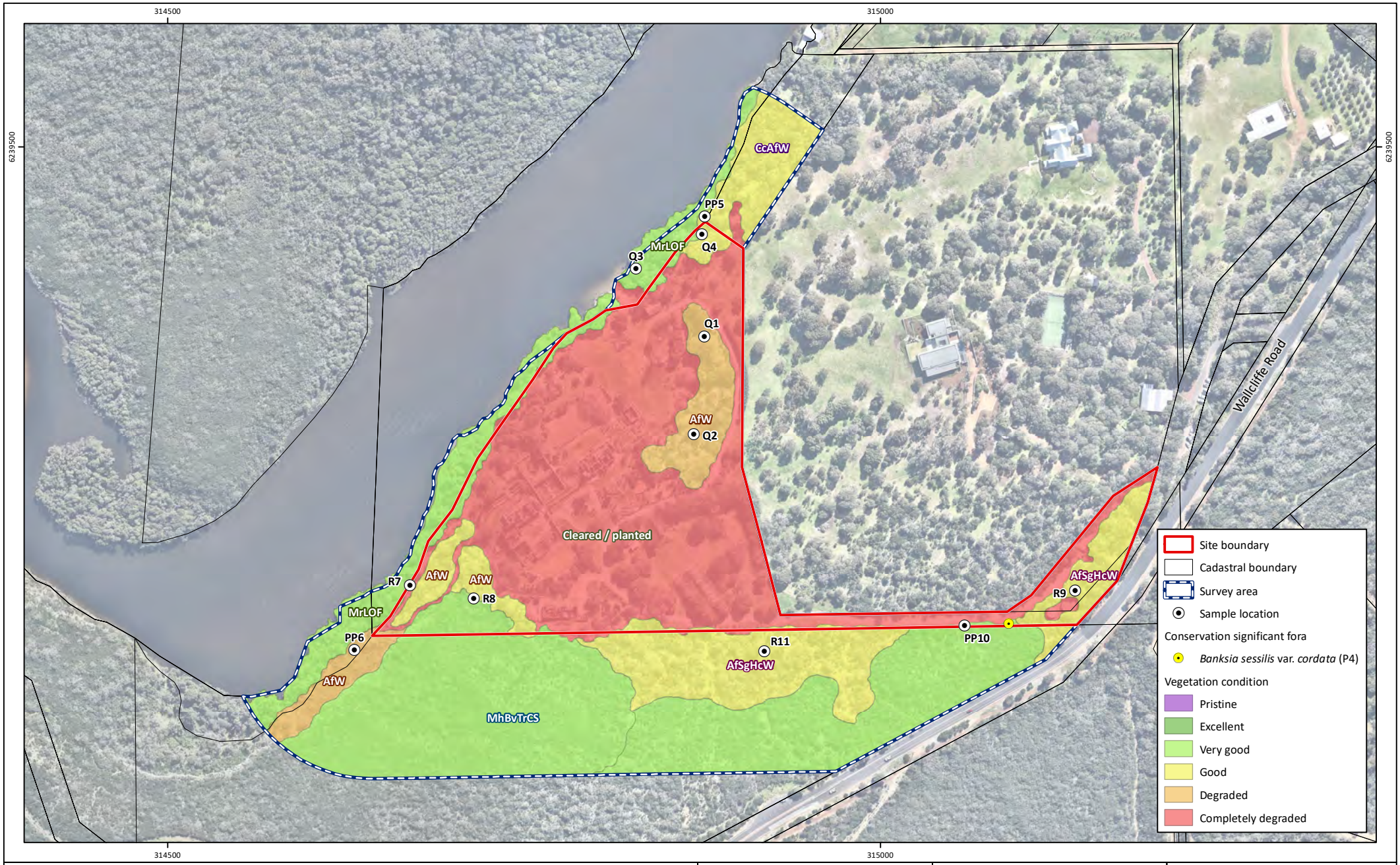


Figure 4: Vegetation Condition

Project: Spring Flora and Vegetation Assessment
Lot 101 Wallcliffe Road Amendment Support

Client: Wallcliffe House Pty Ltd

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Checked:	SKP
Approved:	TAA
Date:	29/11/2019

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Metres

Scale: 1:3,500@A4

GDA 1994 MGA Zone 50

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Appendix A

Additional Background Information

Conservation Significant Flora and Vegetation

Threatened and priority flora

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

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

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

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

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

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

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

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

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

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

Threatened and priority ecological communities

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

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

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

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

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

An ecological community that is under consideration for listing as a TEC, but does not yet meet survey criteria or has not been adequately defined may be listed as a 'priority ecological community' (PEC). PECs are categorised as priority category 1, 2 or 3 as described in **Table 3**. Ecological communities that are adequately known and are rare but not threatened, or meet criteria for 'near threatened', or that have been recently removed from the threatened list, are placed in 'priority 4'. These ecological communities require regular monitoring. Conservation dependent ecological communities are placed in 'priority 5' (DEC 2009). Listed PECs are published by DBCA (DBCA 2017b).

Table 3: Categories of priority ecological communities (DEC 2009).

Priority code	Description
P1	Priority One Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. 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 Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, unallocated Crown land, water reserves, etc.) and not under imminent threat 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 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: (i) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (ii) communities made up of large, and/or widespread occurrences, that may or 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, and inappropriate fire regimes. 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.
P5	Priority Five 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.

Weeds

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

Declared Pests

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

Under the BAM Act, all declared pests are assigned a legal status, as described in **Table 4**. Species assigned to the 'declared pest, prohibited - s12' category are placed in one of three control categories, as described in **Table 5**.

The *Biosecurity and Agriculture Management Regulations 2013* specify keeping categories for species assigned to the 'declared pest - s22(2)' category, which relate to the purposes of which species can be kept, as well as the entities that can keep them. The categories are described in **Table 6**.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DAFWA 2016).

Table 4: Legal status of declared pest species listed under the BAM Act (DAFWA 2016).

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

Table 5: Control categories of declared pest species listed under the BAM Act (DAFWA 2016).

Category	Description
C1	Exclusion Not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2	Eradication Present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3	Management Established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

Table 6: Keeping categories of declared pest species listed under the BAM Act (DAFWA 2016).

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

Wetland Habitat

Geomorphic wetland types

On the Swan Coastal Plain DBCA (2017a) have used the geomorphic wetland classification system developed by Semeniuk (1987) and Semeniuk and Semeniuk (1995) to classify wetlands based on the landform shape and water permanence (hydro-period) as outlined in **Table 7**.

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

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

Wetland management categories

DBCA maintains the *Geomorphic Wetland of the Swan Coastal Plain* dataset (DBCA 2018a), which also categorises individual wetlands into specific management categories as described in **Table 8**.

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

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

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

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

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

Wetland reclassification

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

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General references

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Appendix B

Species List

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Apiaceae		
		Apium prostratum var. *prostratum*
Amaryllidaceae		
	*	*Agapanthus praecox*
Araceae		
	D	*Zantedeschia aethiopica*
Asparagaceae		
		Acanthocarpus preissii
	D	*Asparagus asparagoides*
	*	*Liriope* sp.
		Lomandra ?micrantha subsp. *micrantha*
		Thysanotus arenarius
Asphodelaceae		
	*	*Trachyandra divaricata*
Asteraceae		
	*	*Arctotheca calendula*
	*	*Conyza sumatrensis*
	*	*Cotula coronopifolia*
	*	*Hypochaeris glabra*
		Olearia axillaris
	*	*Senecio elegans*
	*	*Senecio* sp.
	*	*?Sigesbeckia orientalis*
	*	*Sonchus oleraceus*
Brassicaceae		
		Stenopetalum robustum
Campanulaceae		
		Lobelia anceps
Caryophyllaceae		
	*	*Petrorhagia dubia*
	*	*Polycarpon tetraphyllum*
Casuarinaceae		
	*	*Allocasuarina* sp.

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Chenopodiaceae		
	*	*Atriplex prostrata*
		Rhagodia baccata subsp. *baccata*
		Threlkeldia diffusa
Convolvulaceae		
		Dichondra repens
Crassulaceae		
		Crassula colorata
Cyperaceae		
		Baumea juncea
		Isolepis sp.
		Lepidosperma gladiatum
		Lepidosperma longitudinale
		Lepidosperma squamatum
Dennstaedtiaceae		
		Pteridium esculentum
Dilleniaceae		
		Hibbertia cuneiformis
Ericaceae		
		Conostephium pendulum
Euphorbiaceae		
		Beyeria viscosa
	*	*Euphorbia terracina*
Fabaceae		
		Acacia cyclops
		Acacia littorea
		Acacia saligna
		Chorizema diversifolium
		Hardenbergia comptoniana
		Jacksonia horrida
		Kennedia prostrata
	*	*Lupinus cosentinii*
	*	*Melilotus indicus*
		Templetonia retusa
	*	*Trifolium campestre*
	*	*Trifolium glomeratum*
	*	*Vicia sativa*

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Geraniaceae		
	*	*Pelargonium capitatum*
		Pelargonium littorale
Goodeniaceae		
		Scaevola nitida
Haemodoraceae		
		Anigozanthos sp.
		Conostylis aculeata subsp. *gracilis*
Hemerocallidaceae		
		Dianella revoluta
		Tricoryne elatior
Iridaceae		
	*	*Gladiolus caryophyllaceus*
		Patersonia occidentalis
Juncaceae		
		Juncus kraussii subsp. *australiensis*
		Juncus pallidus
Juncaginaceae		
		Cycnogeton lineare
Lauraceae		
		Cassytha pomiformis
Lythraceae		
	*	*Lythrum hyssopifolia*
Malvaceae		
	*	*Malva parviflora*
	*	*Modiola caroliniana*
		Thomasia triphylla
Myrtaceae		
		Agonis flexuosa
		Corymbia calophylla
		Corymbia ficifolia
		Eucalyptus megacarpa
	*	*Melaleuca armillaris*
		Melaleuca huegelii
	*	*Melaleuca quinquenervia*

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Myrtaceae (cont.)		
		Melaleuca rhaphiophylla
Oleaceae		
	*	*Olea europaea*
Orchidaceae		
		Microtis media
Orobanchaceae		
	*	*Orobanche minor*
Oxalidaceae		
	*	*Oxalis* sp.
Papaveraceae		
	*	*Fumaria muralis* subsp. *muralis*
Phyllanthaceae		
		Phyllanthus calycinus
		Poranthera microphylla
Pittosporaceae		
		Billardiera heterophylla
Poaceae		
		Austrostipa flavescens
	*	*Avena barbata*
	*	*Avena fatua*
	*	*Briza maxima*
	*	*Bromus diandrus*
	*	*Cynodon dactylon*
	*	*Ehrharta erecta*
	*	*Ehrharta longiflora*
	*	*Ehrharta villosa*
	*	*Hyparrhenia hirta*
	*	*Lagurus ovatus*
		Poa porphyroclados
	*	Poaceae sp.
Polygalaceae		
		Comesperma confertum

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family		Species
Polygonaceae		
		Muehlenbeckia adpressa
	*	*Rumex crispus*
Primulaceae		
	*	*Lysimachia arvensis*
		Samolus repens var. *repens*
Proteaceae		
	P4	*Banksia sessilis* var. *cordata*
		Hakea oleifolia
Ranunculaceae		
		Clematis pubescens
Restionaceae		
		Desmocladus flexuosus
Rhamnaceae		
		Spyridium globulosum
Rubiaceae		
	*	*Galium murale*
Rutaceae		
		Boronia alata
		Diplolaena dampieri
Salicaeae		
	*	*Salix babylonica*
Santalaceae		
		Exocarpos sparteus
Sapindaceae		
		Dodonaea aptera
Solanaceae		
	*	*Solanum laciniatum*
	*	*Solanum nigrum*
Thymelaeaceae		
		Pimelea rosea subsp. *rosea*

Flora Taxa List -Lot 101 Wallcliffe Road

Note: * denotes introduced (weed or planted) species, D denotes declared pest species, P4 denotes 'priority 4' status

Family	Species
Zamiaceae	
	Macrozamia riedlei

Appendix C

Sample Data

Vegetation Sample Data

Sample Name: Q1

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
Q1: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314876	NW corner northing:	6239367
Altitude (m):	12.64344	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	high - clearing, fire
Soil type/texture	sand/loam	Bare ground (%):	10
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	50% (leaves,twigs,)	Vegetation condition:	degraded

Strata	Cover (%)	Height (m)	
Upper:	70 to 100	<10	Planted native and exotic shrubs present within patch. Grass weeds recently sprayed and dying at the time of survey. Burnt 2011.
Mid:	10 to 30	1 to 2	
Ground layer 1:	0%	<0.5	
Ground layer 2:	0%	0	

Vegetation description

Low closed forest *Agonis flexuosa* over open shrubland *Rhagodia baccata* subsp. *baccata* and planted *Melaleuca huegelii* and *Hibbertia cuneifolia* over grassland of **Ehrharta longifolia* and **Lagurus ovatus* over forbland **Lysimachia arvensis* , **Zantedeschia aethiopica* , **Sonchus oleraceus* and **Galium murale* .



Vegetation Sample Data

Sample Name: Q1

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP,other Q1: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia littorea	opp
	Agonis flexuosa	70
	Apium prostratum var. prostratum	0.5
*	*Atriplex prostrata*	0.5
	Billardiera heterophylla	3
	Boronia alata	opp
	Corymbia ficifolia	opp
*	*Cotula coronopifolia*	0.5
*	*Ehrharta longiflora*	30
*	*Fumaria muralis subsp. muralis*	1
*	*Galium murale*	1
	Hibbertia cuneiformis	3
*	*Hypochaeris glabra*	0.5
	Juncus pallidus	opp
*	*Lagurus ovatus*	1
*	*Liriope sp.*	opp
*	*Lupinus cosentinii*	0.5
*	*Lysimachia arvensis*	3
*	*Lythrum hyssopifolia*	0.5
*	*Malva parviflora*	opp
	Melaleuca huegelii	3
*	*Olea europaea*	opp
	Olearia axillaris	opp
*	*Polycarpon tetraphyllum*	0.5
	Rhagodia baccata subsp. baccata	4
*	*Senecio elegans*	opp
*	*Solanum laciniatum*	opp
*	*Solanum nigrum*	1
*	*Sonchus oleraceus*	1
	Spyridium globulosum	opp
*	*Trifolium campestre*	1
*	*Trifolium glomeratum*	opp
*	*Zantedeschia aethiopica*	1

Vegetation Sample Data

Sample Name: Q2

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
Q2: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314869	NW corner northing:	6239299
Altitude (m):	13.622393	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	high - clearing, weeds, plantings, fire
Soil type/texture	sand/	Bare ground (%):	5
Rocks (%) and type:	10%, limestone	Soil colour:	brown/
Litter:	20% (leaves,twigs,)	Vegetation condition:	degraded

Strata	Cover (%)	Height (m)	
Upper:	30 to 70	<10	Planted native and exotic shrubs present within patch. Grass weeds recently sprayed and dying at the time of survey. Burnt 2011
Mid:	10 to 30	1 to 2	
Ground layer 1:	<10	<0.5	
Ground layer 2:	10 to 30	<0.5	

Vegetation description

Low open forest *Agonis flexuosa* over shrubland *Olearia axillaris, Boronia alata, Rhagodia baccata* subsp. *baccata* and *Solanum nigrum* over open grassland **Ehrharta longifolia* over forbland **Galium murale* , **Trifolium campestre* and **Polycarpon tetraphyllum.*



Vegetation Sample Data

Sample Name: Q2

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP,other Q2: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Acacia saligna	opp
	Agonis flexuosa	40
*	*Allocasuarina sp.*	opp
	Billardiera heterophylla	1
	Boronia alata	2
*	*Conyza sumatrensis*	1
	Crassula colorata	opp
	Dichondra repens	1
*	*Ehrharta longiflora*	3
	Exocarpos sparteus	opp
*	*Fumaria muralis subsp. muralis*	opp
*	*Galium murale*	20
	Hibbertia cuneiformis	1
*	*Hypochaeris glabra*	1
	Isolepis sp.	0.5
	Juncus pallidus	2
*	*Lagurus ovatus*	opp
*	*Melaleuca quinquenervia*	opp
	Olearia axillaris	10
*	*Poaceae sp.*	1
*	*Polycarpon tetraphyllum*	5
	Rhagodia baccata subsp. baccata	4
*	*Salix sp.*	opp
*	*Senecio sp.*	1
*	*Solanum laciniatum*	opp
*	*Solanum nigrum*	4
*	*Sonchus oleraceus*	2
*	*Trifolium campestre*	2

Vegetation Sample Data

Sample Name: Q3

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
Q3: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314828.4955	NW corner northing:	6239414.684
Altitude (m):	-3.298827	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	waterway
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds
Soil type/texture	sand/ with organic layer	Bare ground (%):	1
Rocks (%) and type:	No rocks	Soil colour:	grey/brown
Litter:	70% (bark,twigs,branches)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)
Upper:	70 to 100	<10
Mid:	-	-
Ground layer 1:	<10	<0.5
Ground layer 2:	<10	>0.5

Vegetation description

Low closed forest *Melaleuca rhaphiophylla* over low sparse herbland *Lobelia anceps* over sparse rushland *Juncus kraussii* subsp. *australis* and *Juncus pallidus.*



Vegetation Sample Data

Sample Name: Q3

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP Q3: Page 2 of 2

Species Data

* denotes non-native species

Status		Confirmed name	Cover (%)
	*	*?Sigesbeckia orientalis*	1
		Agonis flexuosa	3
		Apium prostratum var. prostratum	1
	*	*Atriplex prostrata*	2
		Juncus kraussii subsp. australiensis	1
		Juncus pallidus	2
		Lobelia anceps	3
	*	*Lysimachia arvensis*	2
		Melaleuca rhaphiophylla	60
	*	*Modiola caroliniana*	2
		Samolus repens	1
	*	*Zantedeschia aethiopica*	1

Vegetation Sample Data

Sample Name: Q4

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
Q4: Page 1 of 2

Quadrat and landform details

Sample type:	quadrat	Size:	10 m x 10 m
NW corner easting:	314874.5163	NW corner northing:	6239438.993
Altitude (m):	0.693734	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	low - low density weeds, adjacent clearing
Soil type/texture	sand/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	25% (leaves,branches,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)
Upper:	10 to 30	<10
Mid:	30 to 70	1 to 2
Ground layer 1:	10 to 30	>0.5
Ground layer 2:	0%	0

Vegetation description

Low woodland *Corymbia caolphylla* and *Agonis flexuosa* over shrubland *Rhagodia baccata* subsp. *baccata* , *Exocarpos sparteus* , *Pteridium esculentum, Spyridium globulosum* with vineland of *Muehlenbeckia adpressa* over tall open sedgeland of *Lepidosperma* spp. and sparse forbland of **Lysimachia arvensis* and *Kennedia prostrata* .



Vegetation Sample Data

Sample Name: Q4

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP Q4: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Agonis flexuosa	10
	Billardiera heterophylla	1
*	*Bromus diandrus*	10
	Corymbia calophylla	20
	Exocarpos sparteus	3
	Hardenbergia comptoniana	4
	Hibbertia cuneiformis	1
	Kennedia prostrata	1
	Lepidosperma longitudinale	2
*	*Lysimachia arvensis*	2
	Muehlenbeckia adpressa	15
	Pteridium esculentum	3
	Rhagodia baccata subsp. baccata	5
*	*Solanum laciniatum*	2
	Spyridium globulosum	5
	Stenopetalum robustum	1
*	*Zantedeschia aethiopica*	8

Vegetation Sample Data

Sample Name: PP5

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
PP5: Page 1 of 2

Quadrat and landform details

Sample type:	photopoint	Size:	other
NW corner easting:	314876.6803	NW corner northing:	6239451.24
Altitude (m):	0.354714	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	saturated	Landform:	waterway
Time since fire:	> 5 yrs	Disturbance:	Low - low density weeds, adjacent clearing
Soil type/texture	/ with organic layer	Bare ground (%):	2
Rocks (%) and type:	No rocks	Soil colour:	/
Litter:	10% (branches,,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)	
Upper:	10 to 30	<10	Vegetation change to Melaleuca and Baumea from the upslope veg
Mid:	30 to 70	1 to 2	
Ground layer 1:	10 to 30	>0.5	
Ground layer 2:	0%	0	

Vegetation description

Low woodland *Melaleuca rhaphiophylla* and *Agonis flexuosa* over tall sedgeland *Baumea juncea* and *Lepidosperma gladiatum*



Vegetation Sample Data

Sample Name: PP5

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP PP5: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Baumea juncea
	Billardiera heterophylla
	Dianella revoluta
	Lepidosperma gladiatum
	Melaleuca rhaphiophylla
	Muehlenbeckia adpressa
	Rhagodia baccata subsp. baccata

Vegetation Sample Data

Sample Name: PP6

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
PP6: Page 1 of 2

Quadrat and landform details

Sample type:	photopoint	Size:	other
NW corner easting:	314630.8288	NW corner northing:	6239147.321
Altitude (m):	0.375583	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	slightly damp	Landform:	lower slope
Time since fire:	> 5 yrs	Disturbance:	high - aggressive weeds
Soil type/texture	sand/	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	0% (,,)	Vegetation condition:	degraded

Strata	Cover (%)	Height (m)	
Upper:	10 to 30	<10	area to south of the site, with dense grass weeds. Burnt 2011.
Mid:	10 to 30	<1	
Ground layer 1:	30 to 70	>0.5	
Ground layer 2:	0%	0	

Vegetation description

Low woodland *Agonis flexuosa* and *Melaleuca rhaphiophylla* over tall open shrubland *Spyridium globulosum, Melaleuca huegelii* and *Rhagodia baccata* subsp. *baccata* with vineland *Muehlenbeckia adpressa , Clematis pubescens* and *Hardenbergia comptoniana* over tall closed grassland **Ehrharta erecta* and Poaceae spp.



Vegetation Sample Data

Sample Name: PP6

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP PP6: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name	Cover (%)
	Agonis flexuosa	
	Billardiera heterophylla	
	Clematis pubescens	
*	*Ehrharta erecta*	60
*	*Fumaria muralis subsp. muralis*	
	Hardenbergia comptoniana	
	Melaleuca huegelii	
	Melaleuca rhaphiophylla	
	Muehlenbeckia adpressa	
	Rhagodia baccata subsp. baccata	
*	*Rumex crispus*	
	Scaevola nitida	
	Spyridium globulosum	
*	*Zantedeschia aethiopica*	

Vegetation Sample Data

Sample Name: R7

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
R7: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	314669.8685	NW corner northing:	6239192.907
Altitude (m):	0.138893	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	damp	Landform:	waterway
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, adj clearing
Soil type/texture	sand/ with organic layer	Bare ground (%):	0
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	5% (branches,,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)
Upper:	30 to 70	<10
Mid:	0%	0
Ground layer 1:	0%	0
Ground layer 2:	0%	0

Vegetation description

Low open forest *Melaleuca rhaphiophylla* over sedge/rushland *Baumea juncea* and *Juncus* spp.over forbland *Apium prostratum* var. *prostratum, Pelargonium littorale* , **Rumex crispus* and *Cycnogeton lineare* and open grassland of grass weeds.



Vegetation Sample Data

Sample Name: R7

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R7: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Apium prostratum var. prostratum
*	*Atriplex prostrata*
	Baumea juncea
	Conostylis aculeata subsp. gracilis
	Cycnogeton lineare
*	*Cynodon dactylon*
	Dichondra repens
	Dodonaea aptera
	Juncus kraussii subsp. australiensis
	Juncus pallidus
	Lobelia anceps
	Melaleuca rhaphiophylla
	Pelargonium littorale
*	*Rumex crispus*
	Samolus repens

Vegetation Sample Data

Sample Name: R8

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
R8: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	314714.6094	NW corner northing:	6239183.354
Altitude (m):	10.093226	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	sand/	Bare ground (%):	10
Rocks (%) and type:	20%, limestone	Soil colour:	brown/
Litter:	5% (twigs,branches,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)	
Upper:	30 to 70	<10	Regenerating well post fire (2011). Weed cover limited
Mid:	30 to 70	1 to 2	
Ground layer 1:	10 to 30	<0.5	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over closed tall shrubland *Melaleuca huegelii, Beyeria viscosa, Spyridium globulosum, Diplolaena dampieri* and *Templetonia retusa* over low open forbland *Dianella revoluta, Acanthocarpus preissii, Thysanotus arenarius* and *Tricoryne elatior,* sparse sedgeland of *Lepidosperma squamatum* and *L. gladiatum* and sparse grassland of grass weeds.



Vegetation Sample Data

Sample Name: R8

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R8: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia cyclops
	Acacia littorea
	Acanthocarpus preissii
	Agonis flexuosa
*	*Asparagus asparagoides*
	Austrostipa flavescens
	Beyeria viscosa
	Billardiera heterophylla
*	*Briza maxima*
	Chorizema diversifolium
	Comesperma confertum
	Conostephium pendulum
	Dianella revoluta
	Diplolaena dampieri
	Exocarpos sparteus
	Hardenbergia comptoniana
	Hibbertia cuneiformis
*	*Lagurus ovatus*
	Lepidosperma gladiatum
	Lepidosperma squamatum
	Melaleuca huegelii
*	*Melilotus indicus*
	Muehlenbeckia adpressa
	Olearia axillaris
*	*Orobanche minor*
	Patersonia occidentalis
*	*Pelargonium capitatum*
*	*Petrorhagia dubia*
*	Poaceae sp.
	Scaevola nitida
	Spyridium globulosum
	Templetonia retusa
	Thysanotus arenarius
	Tricoryne elatior

Vegetation Sample Data

Sample Name: R9

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other
Status Non-permanent
R9: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	315136.465	NW corner northing:	6239189.047
Altitude (m):	53.091671	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	sand/	Bare ground (%):	15
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	5% (branches,leaves,)	Vegetation condition:	good

Strata	Cover (%)	Height (m)	
Upper:	0%	0	
Mid:	0%	0	Weed cover 20%. Burnt 2009/?2011
Ground layer 1:	0%	0	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over tall shrubland of *Hibbertia cuneiformis, Spyridium globulosum, Jacksonia horrida, Phyllanthus calycinus* and *Templetonia retusa* with vineland *Hardenbergia comptoniana* and *Muehlenbeckia adpressa* over grassland **Avena fatua, *Briza maxima* and *Austrostipa flavescens* and forbland *Conostylis aculeata* subsp. *gracilis* , **Euphorbia terracina, Tricoryne elatior* and **Zantedeschia aethiopica.*



Vegetation Sample Data

Sample Name: R9

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R9: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia littorea
	Agonis flexuosa
*	*Arctotheca calendula*
*	*Asparagus asparagoides*
	Austrostipa flavescens
*	*Avena fatua*
	Beyeria viscosa
*	*Briza maxima*
	Conostylis aculeata subsp. gracilis
*	*Euphorbia terracina*
*	*Gladiolus caryophyllaceus*
	Hakea oleifolia
	Hardenbergia comptoniana
	Hibbertia cuneiformis
	Jacksonia horrida
*	*Lagurus ovatus*
	Lepidosperma gladiatum
	Muehlenbeckia adpressa
	Olearia axillaris
*	*Oxalis sp.*
	Patersonia occidentalis
*	*Pelargonium capitatum*
	Pelargonium littorale
	Phyllanthus calycinus
	Pimelea rosea subsp. rosea
	Poranthera microphylla
	Pteridium esculentum
	Spyridium globulosum
	Templetonia retusa
	Thysanotus arenarius
	Tricoryne elatior
*	*Zantedeschia aethiopica*

Vegetation Sample Data

Sample Name: PP10

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
PP10: Page 1 of 2

Quadrat and landform details

Sample type:	photopoint	Size:	other
NW corner easting:	315059.0224	NW corner northing:	6239164.458
Altitude (m):	46.429489	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	sand/	Bare ground (%):	20
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	5% (branches,leaves,)	Vegetation condition:	very good

Strata	Cover (%)	Height (m)	
Upper:	0%	0	
Mid:	0%	0	rassy weeds c. 20% cover. Burnt 2009/?201
Ground layer 1:	0%	0	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over tall shrubland of *Acacia littorea, Melaleuca huegelii, Beyeria viscosa, Macrozamia riedlei, Olearia axillaris, Phyllanthus calycinus* and *Templetonia retusa* over grassland **Avena barbata, *Lagurus ovatus, *Briza maxima* and *Austrostipa flavescens* and open forbland *Conostylis aculeata* subsp. *gracilis, Patersonia occidentalis* and *Thysanotus arenarius* .



Vegetation Sample Data

Sample Name: PP10

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP PP10: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia littorea
	Agonis flexuosa
	Austrostipa flavescens
*	*Avena barbata*
P4	*Banksia sessilis var. cordata*
	Beyeria viscosa
*	*Briza maxima*
*	*Briza maxima*
	Cassytha pomiformis
	Conostylis aculeata subsp. gracilis
	Desmocladus flexuosus
	Eucalyptus megacarpa
*	*Hyparrhenia hirta*
*	*Lagurus ovatus*
	Lepidosperma gladiatum
	Lomandra ?micrantha subsp. micrantha
	Macrozamia riedlei
	Melaleuca huegelii
	Microtis media
	Olearia axillaris
	Patersonia occidentalis
	Phyllanthus calycinus
	Poa porphyroclados
	Templetonia retusa
	Thomasia triphylla
	Threlkeldia diffusa
	Thysanotus arenarius
	Xanthorrhoea preissii

Vegetation Sample Data

Sample Name: R11

Project no.: EP18-128
Date: 19/11/2018
Author: SKP,other

Status Non-permanent
R11: Page 1 of 2

Quadrat and landform details

Sample type:	releve	Size:	other
NW corner easting:	314918.412	NW corner northing:	6239146.4
Altitude (m):	31.452335	Geographic datum/zone:	GDA94/Zone 50
Soil water content:	dry	Landform:	mid-slope
Time since fire:	> 5 yrs	Disturbance:	moderate - weeds, fire
Soil type/texture	Sand/	Bare ground (%):	5
Rocks (%) and type:	No rocks	Soil colour:	brown/
Litter:	10% (twigs,leaves,)	Vegetation condition:	good

Strata	Cover (%)	Height (m)	
Upper:	0%	0	Higher weed load (c. 30%) throughout area. Burnt 2009/2011
Mid:	0%	0	
Ground layer 1:	0%	0	
Ground layer 2:	0%	0	

Vegetation description

Low open woodland of *Agonis flexuosa* over tall shrubland of *Beyeria viscosa, Hakea oleifolia, Spyridium globulosum, Phyllanthus calycinus* and *Templetonia retusa* over grassland **Avena barbata, *Lagurus ovatus* and **Briza maxima* and open forbland **Melilotus indicus, *Trachyandra divaricata and *Zantedeschia aethiopica* .



Vegetation Sample Data

Sample Name: R11

Project no.: EP18-128
Date: 19/11/2018 **Status** Non-permanent
Author: SKP R11: Page 2 of 2

Species Data

* denotes non-native species

Status	Confirmed name
	Acacia littorea
	Agonis flexuosa
*	*Asparagus asparagoides*
*	*Avena barbata*
	Beyeria viscosa
	Boronia alata
*	*Briza maxima*
	Exocarpos sparteus
	Hakea oleifolia
	Hardenbergia comptoniana
	Hibbertia cuneiformis
*	*Lagurus ovatus*
	Melaleuca huegelii
*	*Melilotus indicus*
	Muehlenbeckia adpressa
	Phyllanthus calycinus
	Rhagodia baccata subsp. baccata
	Spyridium globulosum
	Templetonia retusa
*	*Trachyandra divaricata*
*	*Vicia sativa*
*	*Zantedeschia aethiopica*

Appendix C

Fauna Assessment (Harewood 2019)

Fauna Assessment



Lot 101 Wallcliffe Road Prevelly

May 2019
V2

On behalf of:
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TABLE 2: Summary of Potential Black Cockatoo Habitat Trees within the Survey area

TABLE 3: Summary of Potential Vertebrate Fauna Species (as listed in Appendix B)

TABLE 4: Likelihood of Occurrence and Potential Impacts– Fauna Species of Conservation Significance

FIGURES

FIGURE 1: Survey Area & Surrounds

FIGURE 2: Survey Area – Aerial Photograph

FIGURE 3: Vegetation Communities (Courtesy Emerge 2019)

FIGURE 4: Possum Observations

FIGURE 5: Black Cockatoo Observations

APPENDICES

APPENDIX A: Conservation Categories

APPENDIX B: Vertebrate Fauna Observed or Potentially Present

APPENDIX C: DBCA & *EPBC* Database Search Results

APPENDIX D: Black Cockatoo Habitat Tree Details

Acronyms/Abbreviations:

ALA: Atlas of Living Australia www.ala.org.au

BA: Birdlife Australia (Formerly RAOU, Birds Australia).

BC Act: Biodiversity Conservation Act 2016. WA Government.

°C: Degrees Celsius.

CALM: Department of Conservation and Land Management (now DPaW), WA Government.

CAMBA: China Australia Migratory Bird Agreement 1998.

CBD: Central Business District.

DBH: Diametre at Breast Height – tree measurement.

DEC: Department of Environment and Conservation (now DPaW), WA Government.

DEH: Department of Environment and Heritage (now DotEE), Australian Government.

DEP: Department of Environment Protection (now DER), WA Government.

DER: Department of Environment Regulation (formerly DEC, DoE), WA Government.

DEWHA: Department of the Environment, Water, Heritage and the Arts (now DotEE), Australian Government

DMP: Department of Mines and Petroleum (formerly DoIR), WA Government.

DoE: Department of Environment (now DER/DPaW), WA Government.

DoP: Department of Planning, WA Government.

DotE: Department of the Environment (now DotEE), Australian Government.

DotEE: Department of the Environment and Energy (formerly SEWPaC, DWEHA, DEH & DotE), Australian Government.

DoIR: Department of Industry and Resources (now DMP), WA Government.

DPaW: Department of Parks and Wildlife (formerly DEC, CALM, DoE), WA Government.

EP Act: *Environmental Protection Act 1986*, WA Government.

EPA: Environmental Protection Authority, WA Government.

EPBC Act: *Environment Protection and Biodiversity Conservation Act 1999,* Australian Government.

ha: Hectare (10,000 square metres).

IBRA: Interim Biogeographic Regionalisation for Australia.

IUCN: International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union.

JAMBA: Japan Australia Migratory Bird Agreement 1981.

km: Kilometre.

m: Metre.

mm: Millimetre.

P: Priority - DPaW fauna conservation ranking.

POS: Public Open Space.

RAOU: Royal Australia Ornithologist Union.

ROKAMBA: Republic of Korea-Australia Migratory Bird Agreement 2007.

S: Schedule - Western Australian *Wildlife Conservation Act (1950)* Threatened Fauna Category.

SEWPaC: Department of Sustainability, Environment, Water, Population and Communities (now DotEE), Australian Government.

SRE: Short Range Endemic.

SSC: Species Survival Commission, International.

WA: Western Australia.

WAM: Western Australian Museum, WA Government.

WAPC: Western Australian Planning Commission, WA Government.

WC Act: *Wildlife Conservation Act 1950*, WA Government.

WRP: Western Ringtail Possum

SUMMARY

This report details the results of a fauna assessment of Lot 101, Wallcliffe Road, Prevelly (referred to as "the site" or "Lot 101"). Lot 101 is approximately 5.31 ha in size. In order to provide contextual information for the wider area, areas in the surrounding reserves have also been included in the fauna assessment. The site and these surrounding areas are collectively referred to as the "survey area" and occupy about 11.26 ha (Figures 1 & 2).

Lot 101 is zoned 'tourism' under the Shires of Augusta Margaret River Local Planning Scheme (LPS) No 1 and it is understood that the landowners are proposing to redevelop the site for tourism purposes. The site contains Wallcliffe House, which was once one of the original farm and homesteads built by the Bussell family in the 1850s and contains large areas of cultivated gardens and turf. This redevelopment will require the removal/modification of some of the existing vegetation within the site, an action that has the potential to impact on current fauna habitat values.

The fauna assessment reported on here represents one of several technical reports that will be used to provide an understanding of the suite of environmental values present within the survey area which will then be used during the ongoing planning and approval process.

The scope of works was to conduct a level 1 fauna survey as defined by the EPA (EPA 2016). Because some listed threatened species (i.e. three species of black cockatoo (*Calyptorhynchus* sp.) and the western ringtail possum (WRP) (*Pseudocheirus occidentalis*)) are known to occur in the general area, the scope of the survey work was expanded to include targeted assessment of the site's significance to these particular species. To fulfil the required scope of works the assessment has therefore included a literature review ("desktop study") and a day and night survey carried out in April 2019.

With respect to native vertebrate fauna, 21 mammals (including nine bat species), 124 bird, 34 reptile, 10 frog and six fish species have previously been recorded in the general area, some of which have the potential to occur in or utilise sections of the survey area at times. Thirteen species of introduced animals could also frequent the area.

Descriptions and example images of the main fauna habitats/dominant vegetation present within the survey area are provided in Table 1, with the location and extent of each unit being depicted in Figure 3.

Lot 101 is predominantly cleared of native vegetation with some parkland cleared native trees (mainly peppermint - *Agonis flexuosa*), managed grasses and gardens with planted non-endemic and exotic plant species remaining. Small sections of disturbed native vegetation subject to some plantings, ground disturbance and weed management occur mainly in central section of the site. The most intact vegetation is present along the west of the site adjacent to the Margaret River (a major, perennial watercourse) and to the south of the site bordering the Wallcliffe Nature Reserve. A small section of a high limestone cliff enters the site near its south west corner.

Overall the fauna habitat quality of Lot 101 can be regarded as being very low given most areas are highly degraded/modified. The fauna assemblage likely to persist in these areas is likely to be highly depauperate and would only be represented by a small subset of the predicted fauna species (Appendix B). The balance of the survey area, which generally contains larger expanses of a variety of good quality habitats can be expected to harbour a higher percentage of the predicted species. While the site itself has relatively low overall fauna habitat values it still retains some value for a range of species including some of conservation significance and this fact will need to be taken into consideration during ongoing planning and subsequent development.

The locations of various possum observations made during the day and night surveys are shown in Figure 4. Nine WRP dreys were observed during the day survey. WRP scats were also observed at three locations during the same period. Seven WRPs and five common brushtail possums were observed during the nocturnal survey. Most WRPs were seen in remnant native vegetation with one individual recorded with the grove of pine trees near the centre of Lot 101.

The results of the WRP assessment suggest that almost all the vegetation present with the survey area can be considered habitat of some type and therefore maybe used either continuously or at various times for refuge, foraging and/or dispersal.

The black cockatoo habitat assessment identified only three trees within the survey area with a DBH of $\geq$50cm. None of the trees appeared to contain hollows of a size that would be suitable for black cockatoos to use for nesting purposes. Only one of the identified habitat trees is actually located within Lot 101.

Evidence of black cockatoos foraging was observed during the field survey in the form of chewed marri fruits and pine cones in two areas (Figure 5). This evidence was attributed to one or more of the three black cockatoo species depending on the plant species involved and the characteristics of the foraging activity (i.e. nature of remaining debris).

The overall extent of quality foraging habitat for black cockatoos within Lot 101 is very limited. Marri and red flowering gum, the most favoured native species present, are only represented by a few scattered specimens. A group of pine trees near the centre of the site appear to be a focal point of foraging activity with numerous chewed cones being observed under trees during the survey period. The total extent of quality foraging habitat within Lot 101 is difficult to estimate given that the favoured species (marri, red flowering gum and pine) are represented by only a small number of scattered trees or small groves of trees but would not amount to more than about 0.1 or 0.2 ha.

No existing roosting trees (trees used at night by black cockatoos to rest) were positively identified during the survey.

Besides the three black cockatoo species and the western ringtail possum, evidence of one additional fauna species of conservation significance was observed during the survey period, this being the eastern osprey (*Pandion cristatus*) (state and federally listed migratory species).

One individual of this species was observed roosting in a tree near Margaret River and on top of one of the buildings at a later time. What appears to be an osprey nest is also present in a tree near the north east boundary of Lot 101 (outside of the current development footprint).

Opportunistic fauna observations are listed in Appendix B. Including those species previously mentioned, a total of 11 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the survey area during the course of survey.

The assessment indicates that the best quality and widest range of fauna habitats within the survey area are located outside of Lot 101. As a consequence, these areas (including the reserve areas of which they from a part of) are most likely to be harbouring the greatest variety of fauna species. Any development undertaken in Lot 101 is therefore considered as unlikely to impact significantly on the current status of any fauna species presently utilising the area.

In summary five vertebrate fauna species of conservation significance were positively identified as utilising the survey area for some purpose, these being:

- Forest Red-tailed Black Cockatoo – Vulnerable;
- Baudin's Black Cockatoo – Endangered;
- Carnaby's Black Cockatoo – Endangered;
- Eastern Osprey – Migratory; and
- Western Ringtail Possum – Critically Endangered.

A number of additional vertebrate species of conservation significance may also utilise the survey area, though, as no evidence of these species' presence was identified during the field survey, the status of some in the area remains uncertain. These species are:

- Pouched Lamprey – Priority 3;
- Black Bittern – Priority 2;
- Australian Little - Priority 2;
- Masked Owl – Priority 3;
- Peregrine Falcon – Schedule 7;
- South-western Brush-tailed Phascogale - Schedule 6;
- Quenda – Priority 4;
- Western False Pipistrelle – Priority 4;
- Water Rat – Priority 4.

As indicated, most of these species would not actually utilise Lot 101 due to a lack of suitable habitats, though they may frequent nearby areas.

One invertebrate species of conservation significance has also been assessed as possibly occurring based on available information. The Cape Leeuwin freshwater snail (Vulnerable) has been collected in national park areas north and south of the survey area (DBCA 2019b) so it must be regarded as a potential species though it is considered unlikely to occur within Lot 101 itself given the disturbed nature of the site.

Overall Lot 101 has low biodiversity values and therefore impacts on fauna in general will be non-existent or negligible. Constraints on development within the subject site will largely be centred on the presence of habitat used or potentially used by threatened fauna species in particular the western ringtail possum.

The presence of this species should be taken into account during ongoing planning and subsequent development. To this end it is recommended that a fauna management plan be formulated for implementation prior to and during development. In particular the plan should define procedures for ensuring the retention and protection of existing WRP habitat wherever possible including protocols for ensuring western ringtail possums (and other fauna) are not injured or killed during site works.

It is also recommended that the tree containing the potential eastern osprey nest be specifically marked and fenced off during site works to minimise activity occurring nearby which may disturb nesting birds.

1. INTRODUCTION

This report details the results of a fauna assessment of Lot 101, Wallcliffe Road, Prevelly (referred to as "the site" or "Lot 101"). The site is located approximately 8 km south-east of Margaret River township within the Shire of Augusta-Margaret River (the Shire) (Figure 1).

Lot 101 is approximately 5.31 ha in size and is bounded by Wallcliffe Road to the east, rural residential lots to the north-east, the Margaret River to the north-west and the Wallcliffe Nature Reserve to the south (Figure 2).

In order to provide contextual information for the wider area, some areas in surrounding reserves have also been included in the fauna assessment. The site and these surrounding areas are collectively referred to as the "survey area" and occupy about 11.26 ha (Figure 2).

2. DEVELOPMENT PROPOSAL

Lot 101 is zoned 'tourism' under the Shires Local Planning Scheme (LPS) No 1 and it is understood that the landowners are proposing to redevelop the site for tourism purposes. The site contains Wallcliffe House, which was once one of the original farm and homesteads built by the Bussell family in the 1850s and contains large areas of cultivated gardens and turf. The redevelopment will require the removal/modification of some of the existing vegetation within the site, an action that has the potential to impact on current fauna habitat values.

The fauna assessment reported on here represents one of several technical reports that will be used to provide an understanding of the suite of environmental values present within the survey area which will then be used during the ongoing planning and approval process.

3. SCOPE OF WORKS

The scope of the fauna survey was to carry out a "desktop study" and a site reconnaissance survey consistent with a level 1 fauna survey as defined in EPA Guidance (2016), in addition to targeted surveys for western ringtail possums (WRP) and black cockatoo habitat. To fulfil this requirement the following has been undertaken:

- A literature review of ecological information pertaining to the survey area and surrounds, including database searches for conservation significant fauna species and locations.
- A 'level 1' (basic) fauna assessment, with additional targeted (detailed) survey for specific conservation significant fauna values, namely black cockatoos

(*Calyptorhynchus* sp.) and the western ringtail possum (*Pseudocheirus occidentalis*). As part of the survey the following sub tasks were undertaken.

- A single day survey:
  - Opportunistically collect an inventory of fauna taxa present through visual observation and secondary evidence such as tracks, scats, skeletal remains, foraging evidence or calls if observed/heard.
  - Record the location and attributes of all potential black cockatoo habitat trees (large eucalypts with trunk diameter at breast height ≥50 cm, presence type and size of hollows, evidence of use, inspection to confirm use).
  - Record the location of any dreys, obvious tree hollows, scats, habitat characteristics and individual western ringtail possums. This will involve a series of close spaced traverses across vegetated sections of the survey area (concurrent with the black cockatoo habitat tree assessment).
  - Describe fauna habitat values with particular reference to black cockatoo habitat and habitat for other 'threatened' or 'priority' fauna species with potential to occur within the survey area.
- For western ringtail possums, a single nocturnal (night) survey was undertaken in order to understand whether the possums were present within the survey area. This involved a nocturnal count to provide an estimate of the distribution and abundance of western ringtail possums.

- Documentation of fauna and fauna habitat information, field survey methods and results, into a report.

Note: For the purposes of this report the term black cockatoo is in reference to Baudin's black cockatoo *Calyptorhynchus baudinii*, Carnaby's black cockatoo *Calyptorhynchus latirostris* and the forest red-tailed black cockatoo *Calyptorhynchus banksii naso*.

4. METHODS

4.1 POTENTIAL FAUNA INVENTORY - LITERATURE REVIEW

4.1.1 Database Searches

Searches of the following databases were undertaken to aid in the compilation of a list of conservation significant fauna potentially occurring within the survey area:

- DBCA's NatureMap Database Search (combined data from DBCA, ALA, WAM, BA and consultant's reports) (DBCA 2019b); and

- Protected Matters Search Tool (DotEE 2019).

It should be noted that lists produced during the abovementioned database searches contain observations/inferred distributions from a broader area than the survey area and therefore may include species that would only ever occur as vagrants due to a lack of suitable habitat or the presence of only marginal habitat within the survey area itself. The databases also often include or are based on very old records and in some cases certain species have become locally or regionally extinct.

Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining what actual species may be present within the specific area being investigated.

4.1.2 Previous Fauna Surveys in the Area

Fauna surveys, assessments and reviews have been undertaken in nearby areas in the past, though not all are publicly available and could not be referenced. The most significant of those available have been used as the primary reference material for compiling the potential fauna assemblage for the general area.

Those reports referred to included, but were not limited to:

- ATA Environmental (2005). Fauna Survey Riverslea Subdivision. Unpublished report for Greendene Development Corporation Ltd.
- ATA Environmental (2006). Location 413 Smiths Beach Fauna Assessment Survey. Unpublished report for Canal Rocks Properties.
- Beatty, S., Morgan, D., Jury, C. & Mitchell, J. (2006). Fish and freshwater crayfish in streams in the Cape Naturaliste region & Wilyabrup Brook. Report to the Cape to Cape Catchments Group and GeoCatch.
- Christensen, P., Annels, A., Liddelow, G. and Skinner,P. (1985). Vertebrate Fauna in The Southern Forests of Western Australia, A Survey. Forest Dept. of Western Australia, Bull. No. 94. Perth.
- Ecologia Environmental Consultants (2001). Location 413 Smiths Beach Fauna Assessment. Unpublished report for ATA Environmental.
- ENV Australia (2007). Busselton to Margaret River Transmission Line – Biological Assessment. Unpublished report for Western Power.
- GHD (2012). Flora and Fauna Assessment - Report for Margaret River Bypass. Unpublished report for MRWA.

- Green Iguana (2009). Vertebrate fauna of Lot 320 Higgins Road, Margaret River, and Shire of Augusta-Margaret River Reserves R27633 and R39081. Unpublished report for Strategen.

- Harewood (2009). Fauna Survey (Level 2). Gracetown. Unpublished report for Strategen.

- Harewood, G. (2012a). Western Ringtail Possum & Black Cockatoo Survey of Trinder Drive Precinct Margaret River. Unpublished report for Trinder Drive Landowners Group.

- Harewood, G. (2012b). Fauna Assessment - Bussell Highway Bramley Forest Section (90.62 – 93.77 SLK), Margaret River. Unpublished report for GHD/MRWA.

- Harewood, G. (2013). Western Ringtail Possum Survey of Lots 72 and 73 Kevill Road, Margaret River. Unpublished report for TME Town Planning Management Engineering Pty Ltd.

- Harewood, G. (2017). Fauna Assessment Lots 4, 5, 7, 8, 9, 10 & 11 Doyle Place Margaret River. Unpublished report for Halsall and Associates.

- Harewood, G. (2018). Fauna Assessment Lots 3, 4, 111 and 113 Brumby Place; Lots 101 and 102 Exmoor Drive; and Lots 103, 104, 107 and 108 Boodjidup Road, Margaret River. Unpublished report for Halsall and Associates.

- How, R.A., Dell, J., and Humphreys, W. F. (1987). The ground vertebrate fauna of coastal areas between Busselton and Albany, Western Australia. Records of the Western Australian Museum 13(4):553-574.

- Morgan, D. and Beatty, S. (2003). Fish fauna of Margaret River Western Australia. Report to the Margaret River Regional Environment Centre.

- Western Wildlife (2007). Gracetown Development - A Fauna Assessment. Unpublished report for Strategen.

As with the database searches some reports refer to species that would not occur in the survey area due to a lack of suitable habitat (extent and/or quality) and this fact was taken into consideration when compiling the potential fauna species list. It should also be noted that the NatureMap database is likely to include some records from previous fauna surveys in the area, including some of those listed above.

4.1.3 Existing Publications

The following represent the main publications used to identify and refine the potential fauna species list for the survey area:

- Anstis, M. (2013). Tadpoles and Frogs of Australia. New Holland Publishers, Sydney.

- Barrett, G., Silcocks, A., Barry, S., Cunningham, R. and Poulter, R. (2003). The New Atlas of Australian Birds. Royal Australasian Ornithologists Union, Victoria.
- Bush, B., Maryan, B., Browne-Cooper, R. & Robinson, D. (2007). Reptiles and Frogs in the Bush: Southwestern Australia. UWA Press, Nedlands.
- Bush, B., Maryan, B., Browne-Cooper, R. & Robinson, D. (2010). Field Guide to Reptiles and Frogs of the Perth Region. UWA Press, Nedlands.
- Churchill, S. (2008). Australian Bats. Second Edition, Allen & Unwin.
- Cogger, H.G. (2014). Reptiles and Amphibians of Australia. 7th Edition. CSIRO Publishing.
- Johnstone, R.E. and Storr, G.M. (1998). Handbook of Western Australian Birds: Volume 1 – Non-passerines (Emu to Dollarbird). Western Australian Museum, Perth Western Australia.
- Johnstone, R.E. and Storr, G.M. (2004). Handbook of Western Australian Birds: Volume 2 – Passerines (Blue-winged Pitta to Goldfinch). Western Australian Museum, Perth Western Australia.
- Menkhorst, P. and Knight, F. (2011). A Field Guide to the Mammals of Australia. Oxford University Press, Melbourne.
- Morgan, D.L., Beatty, S.J., Klunzinger, M.W, Allen, M.G. and Burnham, Q.E (2011). Field Guide to the Freshwater Fishes, Crayfishes and Mussels of South Western Australia. Published by SERCUL.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1983). Lizards of Western Australia II: Dragons and Monitors. WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1990). Lizards of Western Australia III: Geckos and Pygopods. WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (1999). Lizards of Western Australia I: Skinks. Revised Edition, WA Museum, Perth.
- Storr, G.M., Smith, L.A. and Johnstone R.E. (2002). Snakes of Western Australia. Revised Edition, WA Museum, Perth.
- Tyler M.J. & Doughty P. (2009). Field Guide to Frogs of Western Australia, Fourth Edition, WA Museum, Perth.
- Van Dyck, S., Gynther, I. & Baker, A. Eds (2013). Field Companion to The Mammals of Australia. Queensland Museum.

- Wilson, S. and Swan, G. (2017). A Complete Guide to Reptiles of Australia. Reed, New Holland, Sydney.

- Woinarski, J., Burbidge, A. & Harrison, P. (2014). The Action Plan for Australian Mammals 2012. CSIRO Publishing.

4.1.4 Fauna of Conservation Significance

The conservation significance of fauna species has been assessed using data from the following sources:

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*). Administered by the Australian Government DotEE;

- *Wildlife Conservation Act 1950* (*WC Act*). Administered by the Western Australian DBCA (Govt. of WA 2018). Note: The Wildlife Conservation (Specially Protected Fauna) Notice 2018 has been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016* (*BC Act*);

- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List - the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and the

- DBCA Priority Fauna list. A non-statutory list maintained by the DBCA for management purposes (DBCA 2019a).

The *EPBC Act* also requires the compilation of a list of migratory species that are recognised under international treaties including the:

- Japan Australia Migratory Bird Agreement 1981 (JAMBA);

- China Australia Migratory Bird Agreement 1998 (CAMBA);

- Republic of Korea-Australia Migratory Bird Agreement 2007 (ROKAMBA); and

- Bonn Convention 1979 (The Convention on the Conservation of Migratory Species of Wild Animals).

(Note – Some, but not all species listed under JAMBA are also protected under Schedule 5 of the BC/WC Act.)

Most, but not all migratory bird species listed in the annexes to these bilateral agreements are also protected in Australia as matters of national environmental significance (MNES) under the *EPBC Act*.

The conservation status of all vertebrate fauna species listed as occurring or possibly occurring in the vicinity of the survey area has been assessed using the most recent lists published in accordance with the above-mentioned instruments and is indicated as such in the fauna listings of this report. A full listing of conservation codes is provided in Appendix A.

A number of other species not listed in official lists can also be considered of local or regional conservation significance. These include species that have a restricted range, those that occur in breeding colonies and those at the limit of their range.

4.1.5 Invertebrate Fauna of Conservation Significance

For this assessment the review of potential conservation significant invertebrates has been limited to those listed by the DBCA and *EPBC Act* database searches (which rely on distribution records and known habitat preferences).

No assessment of the potential for short range endemic species (SREs) to be present has been made at this stage as it can be difficult to identify significant invertebrate species due to uncertainties in determining the range-restrictions of many species due to lack of surveys, lack of taxonomic resolutions within target taxa and problems in identifying certain life stages. Where invertebrates are collected during surveys, a high percentage are likely to be unknown, or for known species there can be limited knowledge or information on their distribution (Harvey 2002).

4.1.6 Likelihood of Occurrence – Fauna of Conservation Significance

Fauna of conservation significance identified during the literature review as previously being recorded in the general area were assessed and ranked for their likelihood of occurrence within the survey area itself. The rankings and criteria used were:

- Would Not Occur: There is no suitable habitat for the species in the survey area and/or there is no documented record of the species in the general area since records have been kept and/or the species is generally accepted as being locally/regionally extinct (supported by a lack of recent records).
    - Locally Extinct: Populations no longer occur within a small part of the species natural range, in this case within 10 or 20 km of the survey area. Populations do however persist outside of this area.
    - Regionally Extinct: Populations no longer occur in a large part of the species natural range, in this case within the southern forest region. Populations do however persist outside of this area.

- Unlikely to Occur: The survey area is outside of the currently documented distribution for the species in question, or no suitable habitat (type, quality and extent) was identified as being present during the field assessment. Individuals of some species may occur occasionally as vagrants/transients especially if suitable habitat is located nearby but the survey area itself would not support a population or part population of the species.

- Possibly Occurs: The survey area is within the known distribution of the species in question and habitat of at least marginal quality was identified as being present during the field assessment, supported in some cases by recent records being documented in literature from within or near the survey area. In some cases, while a species may be classified as possibly being present at times, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

- Known to Occur: The species in question was positively identified as being present (for sedentary species) or as using the survey area as habitat for some other purpose (for non-sedentary/mobile species) during the field survey. This information may have been obtained by direct observation of individuals or by way of secondary evidence (e.g. foraging debris, tracks and scats). In some cases, while a species may be classified as known to occur, habitat may be marginal (e.g. poor quality, fragmented, limited in extent) and therefore the frequency of occurrence and/or population levels may be low.

4.1.7 Taxonomy and Nomenclature

Taxonomy and nomenclature for vertebrate fauna species used in this report is generally taken from the DBCA's WA Fauna Census Database which is assumed to follow Aplin and Smith (2001) for amphibians and reptiles and Johnstone (2001) for birds. Jackson and Groves (2015) has been used for mammals.

Common names are taken from the Western Australia Museum (WAM) recognised primary common name listings when specified, though where common names are not provided, they have been acquired from other publications. Sources include Wilson and Swan (2017), Cogger (2014), Van Dyck & Strahan (2013), Christidis and Boles (2008), Bush *et al.* (2010), Bush *et al.* (2007) and Tyler & Doughty (2009). Not all common names are generally accepted.

4.2 SITE SURVEYS

Day and night field work within the survey area was carried out on the 1 April 2019. Survey work was done by Greg Harewood (consultant Zoologist), Kirsten Knox (Environmental Scientist – Emerge Associates) and Heidi Becker (Environmental Scientist – Emerge Associates).

4.2.1 Fauna Habitat Assessment

The vegetation communities mapped by Emerge Associates (Emerge Associates 2019) during the flora and vegetation survey have been used to classify the area into broad habitat types. This information has been supplemented by observations made during the field assessment undertaken during the fauna assessment.

As part of the literature review, available information on the habitat requirements of the species of conservation significance listed as possibly occurring in the area was researched. During the daytime reconnaissance survey, the habitats within the survey area were assessed and specific elements identified, if present, to determine the likelihood of listed species of conservation significance occurring and its likely overall value to them on a local and regional scale.

4.2.2 Western Ringtail Possum Assessment

To determine if western ringtail possums were utilising the survey area the following was carried out:

- One daytime survey of the survey area which involved searching for dreys, obvious tree hollows (and other potential daytime refuge habitat), scats and individual WRPs. The day time survey was carried out using a GPS equipped PDA for guidance and as a data recorder;

- One night time survey to locate and record the distribution and abundance of WRPs. The nocturnal count involved the systematic searching of potential WRP habitats within the survey area on foot using a head torch. The nocturnal count was carried out using a GPS equipped PDA for guidance and as a data recorder.

It should be noted that vegetation with the Wallcliffe Nature Reserve (located south of the site), which forms part of the survey area, is extremely dense and it was not possible to survey this area for WRPs to the same degree as other sections of the survey area.

4.2.3 Black Cockatoo Habitat Assessment

The following methods were employed to comply with the defined scope of works and are based on guidelines published by the federal DotEE (Commonwealth of Australia 2012) which states that surveys for Carnaby's, Baudin's and forest red-tailed black cockatoo habitat should:

- be done by a suitably qualified person with experience in vegetation or cockatoo surveys, depending on the type of survey being undertaken;

- maximise the chance of detecting the species' habitat and/or signs of use;

- determine the context of the site within the broader landscape—for example, the amount and quality of habitat nearby and in the local region (for example, within 12 km);

- account for uncertainty and error (false presence and absences); and
- include collation of existing data on known locations of breeding and feeding birds and night roost locations.

Habitat used by black cockatoos have been placed into three categories by the DotEE (Commonwealth of Australia 2012) these being:

- Breeding Habitat;
- Foraging Habitat; and
- Night Roosting Habitat.

So as to comply with the requested scope of works and in line with the published guidelines the following was carried out.

4.2.3.1 Black Cockatoo Breeding Habitat

The black cockatoo breeding habitat assessment has involved the identification of all suitable breeding trees species within the survey area that have a Diameter at Breast Height (DBH) of equal to or over 50cm. The DBH of each tree was estimated using a pre-made 50 cm "caliper".

Target tree species included marri and jarrah and any other *Corymbia/Eucalyptus* species of a suitable size that were present. Peppermints, *banksia*, sheoak and melaleuca tree species (for example) were not assessed as they typically do not develop hollows that are used by black cockatoos.

The location of each tree identified as being over the threshold DBH was recorded with a GPS and details on tree species, number and size of hollows (if any) noted.

Potential hollows were placed into one of four categories, based on the size of the apparent hollow entrance, these being

- Small = ~<5cm diameter (i.e. entrance too small for a black cockatoo);
- Medium = ~5cm-10cm diameter (i.e. entrance too small for a black cockatoo);
- Large = ~>10cm diameter (entrance large enough for a black cockatoo but possible hollow appears to be unsuitable for nesting i.e. wrong orientation, too small, too low or too shallow); or
- Large (cockatoo) = ~>10cm diametre (entrance appears big enough to provide access to a possible hollow that may be suitable for a black cockatoo to use for nesting).

Based on this assessment trees present within the survey area have then been placed into one of four categories:

- Tree < 50cm DBH or an unsuitable species (not assessed/recorded);
- Tree >50cm DBH, no hollows seen;
- Tree >50cm DBH, one or more hollows seen, none of which were considered suitable for black cockatoos to use for nesting; or
- Tree >50cm DBH, one or more hollows seen, with at least one considered suitable or possibly for black cockatoos to use for nesting.

For the purposes of this study a tree containing a potential cockatoo nest hollow was defined as:

Generally, any tree which is alive or dead that contains one or more hollows or possible hollows (cavities within the trunk or branches) which appear suitable for occupation by black cockatoos for the purpose of nesting/breeding. Hollows or apparent hollows that had an entrance greater than about 10cm in diameter and would allow the entry of a black cockatoo into a suitably orientated and sized branch/trunk, were recorded as a "potential nest hollow".

Identified hollows were examined using binoculars for evidence of actual use by black cockatoos (e.g. chewing around hollow entrance, scarring and scratch marks on trunks and branches).

A review of available literature was carried out to determine the location/extent of any known/likely black cockatoo breeding habitat areas in the vicinity of the survey area.

4.2.3.2 Black Cockatoo Foraging Habitat

The location and nature of black cockatoo foraging evidence (e.g. chewed fruits around the base of trees) observed during the field survey was recorded. The nature and extent of potential foraging habitat present was also documented irrespective of the presence of any actual foraging evidence.

A review of available literature was carried out to determine the location/extent of any known/likely black cockatoo foraging habitat areas in the vicinity of the survey area.

4.2.3.3 Black Cockatoo Roosting Habitat

Direct and indirect evidence of black cockatoos roosting within trees within the survey area was noted if observed (e.g. branch clippings, droppings or moulted feathers).

A review of available literature was carried out to determine the location/extent of any known/likely black cockatoo roosting habitat areas in the vicinity of the survey area.

4.2.4 Other Species of Conservation Significance

Evidence of the presence or likely presence of other species of conservation significance (including suitable habitat) was searched for and recorded concurrent with other field work. The aim was to obtain sufficient information to make a definitive comment on the likely significance of the survey area to other species of conservation significance which may be present.

4.2.5 Opportunistic Fauna Observations

Opportunistic observations of all fauna species were made during the field survey. Secondary evidence of a species presence such as tracks, scats, skeletal remains, foraging evidence or calls were also noted if observed/heard.

5. SURVEY CONSTRAINTS

No seasonal sampling has been carried out as part of this fauna assessment. The conclusions presented are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the survey area at the time of the field assessments. It should also be recognised that site conditions can change with time.

Some fauna species are reported as potentially occurring within the survey area based on there being suitable habitat (quality and extent) within the survey area or immediately adjacent. With respect to opportunistic observations, the possibility exists that certain species may not have been detected during field investigations due to:

- seasonal inactivity during the field survey;
- species present within micro habitats not surveyed;
- cryptic species able to avoid detection; and
- transient wide-ranging species not present during the survey period.

Lack of observational data on some species should therefore not necessarily be taken as an indication that a species is absent from the survey area.

The habitat requirements and ecology of many of the species known to occur in the wider area are often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitat or microhabitat within the survey area. As a consequence of this limitation the potential fauna list produced is most likely an overestimation of those species that actually utilise the survey area for some purpose. Some

species may be present in the general area but may only use the survey area itself on rare occasions or as vagrants/transients.

In recognition of survey limitations, a precautionary approach has been adopted for this assessment. Any fauna species that would possibly occur within the survey area (or immediately adjacent), as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the Author, has been assumed to potentially occur in the survey area.

During the black cockatoo habitat survey a search for trees containing hollows was completed. It should be noted that identifying hollows suitable for fauna species from ground level has limitations. Generally, the full characteristics of any hollow seen are not fully evident (e.g. internal dimensions). It is also difficult to locate all hollows within all trees as some are not observable from ground level.

The location of observations was recorded using a handheld GPS. The accuracy of the GPS cannot be guaranteed above a level of about 5 to 10 metres, though it should be noted that in some circumstance the accuracy can increase or decrease beyond this range.

6. RESULTS

6.1 POTENTIAL FAUNA INVENTORY – LITERATURE REVIEW

A list of fauna species considered most likely to occur in the survey area has been compiled from information obtained during the literature review and is presented in Appendix B. This listing was refined after information gathered during the site reconnaissance and targeted survey was assessed.

The results of some previous fauna surveys carried out in the general area are summarised in this species listing as are the DBCA NatureMap database search results. Species considered unlikely to occur with the survey area but previously recorded in other surveys and/or which appear in the DBCA database search are not listed. The raw database search results from NatureMap (DBCA 2019b) and the Protected Matters Search Tool (DotEE 2019) are contained within Appendix C.

The list of potential fauna takes into consideration that firstly the species in question is not known to be locally/regionally extinct and secondly that suitable habitat for each species, as identified during the habitat assessment, is present within the survey area. Compiling an accurate fauna list has limitations (see Section 5 above) and therefore the listing is likely to be an overestimation of the fauna species actually present within the survey area at any one time.

With respect to native vertebrate fauna, 21 mammals (includes nine bat species), 124 bird, 34 reptile, 10 frog and six fish species have previously been recorded in the general area, some

of which have the potential to occur in or utilise sections of the survey area at times. Thirteen species of introduced animals could also frequent the area.

Of the 196 native animals that are listed as potentially occurring in the area, six are considered to be endangered/vulnerable or in need of special protection under State and/or Federal law. In addition, one migratory and seven DBCA priority species have also been listed as potentially present. One invertebrate species of conservation significance also has the potential to be present in the survey area.

These species are discussed in further detail in the following sections.

6.2 SITE SURVEYS

6.2.1 Fauna Habitat Assessment

Descriptions and example images of the main fauna habitats/dominant vegetation present within the survey area are provided in Table 1. The location and extent of each of the identified habitat/vegetation units is shown in Figure 3 (data courtesy Emerge Associates 2019).

A review of publicly available historical images from 2004 onwards shows that the majority of the site was cleared of native vegetation prior to 2004 while in use for residential purposes (WALIA 2018). Currently Lot 101 remains predominantly cleared of native vegetation with some parkland cleared native trees (mainly peppermint - *Agonis flexuosa*), managed grasses and gardens with planted non-endemic and exotic plant species remaining. Small sections of disturbed native vegetation subject to some plantings, ground disturbance and weed management occur mainly in central section of the site. The most intact vegetation is present along the west of the site adjacent to the Margaret River (a major, perennial watercourse) and to the south of the site bordering the Wallcliffe Nature Reserve. A small section of a high limestone cliff enters the site near its south west corner.

Table 1: Main Fauna Habitats within the Survey area

Unit Code (see Figure 3)	Fauna Habitat Description	Example Image
AfW	Woodland of Peppermint over open shrubland over open mixed forbland and open to closed grassland of weeds. Lot 101 = ~0.63 ha Balance of Survey Area = ~0.21 ha	

Unit Code (see Figure 3)	Fauna Habitat Description	Example Image
AfSgHcW	Woodland of Peppermint over shrubland with vineland over low shrubland of over forbland. Lot 101 = ~0.33 ha Balance of Survey Area = ~2.45 ha	
CcAfW	Woodland of Marri and Peppermint over shrubland with vineland over weeds. Lot 101 = ~0.05 ha Balance of Survey Area = ~0.42 ha	
MhBvTrCS	Low open woodland of Peppermint with closed shrubland with vineland over open forbland and sparse sedgeland or grassland. Lot 101 = ~0.16 ha Balance of Survey Area = ~1.96 ha	

Unit Code (see Figure 3)	Fauna Habitat Description	Example Image
MrLOF	Low open forest of Paperbark over open to closed rush/sedgeland over sparse forbland bordering Margaret River. Lot 101 = ~0.13 ha Balance of Survey Area = ~0.79 ha	
Cleared/ Planted	Modified vegetation comprising grassland, weeds with occasional native trees and planted vegetation. Lot 101 = ~3.98 ha Balance of Survey Area = ~0.08 ha	

As indicated in Table 1 the majority of the site (3.98 ha ~75% of total area) contains modified vegetation with bare soil, scattered native trees over pasture grasses or planted vegetation (including buildings and roads). A sparse, generally degraded peppermint woodland makes up about 12% (0.63ha) of the site. The balance of Lot 101 contains small sections of remnant native vegetation that extends into the surrounding survey area and reserves (Figure 3).

Overall the fauna habitat quality of Lot 101 can be regarded as being very low given most areas are highly degraded/modified. The fauna assemblage likely to persist in these areas is likely to be highly depauperate and would only be represented by a small subset of the predicted fauna species (Appendix B). The balance of the survey area, which generally contains larger expanses of a variety of good quality habitats can be expected to harbour a higher percentage of the predicted species. While the site itself has relatively low overall fauna habit values it still retains some value for a range of species including some of conservation significance and this fact will need to be taken into consideration during ongoing planning and subsequent development of the site.

Based on available vegetation mapping it is estimated that there is approximately 14,200 ha of native vegetation within 12 km the survey area (with large proportions of this protected in

national park or nature reserves). Remnant native vegetation (excluding scattered trees) present within Lot 101 (total ~1.33 ha) makes up ~0.009% of this total.

6.2.2 Western Ringtail Possum Assessment

The locations of various possum observations made during the day and night surveys are shown in Figure 4.

Nine WRP dreys were observed during the day survey. WRP scats were also observed at three locations during the same period.

The majority of dreys were found in dense vegetation bordering Margaret River. It should be noted that human structures (e.g. houses/sheds), forks in trees, subtle cavities in tree trunks, fallen hollow logs, rabbit burrows and dense ground cover are also used by WRPs for daytime refuge (to varying degrees) and therefore observations of dreys only provide a guide to WRP habitat use/quality as other opportunities for daytime refuge may exist.

Seven WRPs and five common brushtail possums were observed during the nocturnal survey. It should be noted that these observations represent the minimum number of WRPs present, as it unlikely that all individuals were observed during the single nocturnal survey. Most WRPs were seen in remnant native vegetation with one individual recorded with the grove of pine trees near the centre of Lot 101.

The results of the WRP assessment suggest that almost all the vegetation present with the survey area can be considered habitat of some type and therefore may be used either continuously or at various times for refuge, foraging and/or dispersal. The quality is however highly variable depending on factors such as plant species, structure (e.g. midstorey component) and canopy connectivity. Much of the native vegetation within Lot 101 itself has been removed, with areas remaining being generally fragmented and with limited intact midstorey. Other areas have been planted as gardens with non-endemic and exotic species dominating.

6.2.3 Black Cockatoo Habitat Assessment

6.2.3.1 Black Cockatoo Breeding Habitat

Trees considered potentially suitable for black cockatoos to use as nesting habitat (using DotEE criteria i.e. DBH $\geq$50cm (Commonwealth of Australia 2012) but ultimately subject to a suitable hollow being present or developing and a range of other factors) which were found within the survey area comprised the following species:

- Marri – *Corymbia calophylla.*

A summary of the potential black cockatoo habitat trees observed within the survey area is provided in Table 2 below and their location shown in Figure 5.

Table 2: Summary of Potential Black Cockatoo Habitat Trees (DBH ≥50cm) within the Survey Area

Total Number of Habitat Trees Recorded	Number of Trees with No Hollows Observed	Number of Trees with Hollows Considered Unsuitable for Nesting Black Cockatoos	Number of Trees with Hollows Considered Possibly Suitable for Nesting Black Cockatoos
3	2	1	0

The assessment identified only three trees within the survey area with a DBH of ≥50cm. None of the trees appeared to contain hollows of a size that would be suitable for black cockatoos to use for nesting purposes. Only one of the identified habitat trees is actually located within Lot 101 (Figure 5).

Additional details on each habitat tree observed can be found in Appendix D.

While there appears to be a paucity of breeding data for the general area this could simply be a consequence of a lack of survey work or a lack of publicly available data. Based on available vegetation mapping it is however estimated that there is approximately 14,200 ha of native vegetation within 12 km the subject site. A significant portion of this vegetation is located within the Leeuwin-Naturaliste and Bramley National Parks. These areas (in addition to areas of private and crown land) and in particular that further inland, are likely to contain "potential" breeding habitat (i.e. suitable tree species with a DBH ≥50cm).

6.2.3.2 Black Cockatoo Foraging Habitat

The following represents a list of native (including non-endemics) plant species recorded within the survey area by Emerge Associates (2019) which are known (or highly likely) to be used by one or more of the black cockatoo species as a food source (i.e. foraging habitat).

- Marri – *Corymbia calophylla* - flowers, seeds, nectar.
- Red Flowering Gum - *Corymbia ficifolia* - flowers, seeds, nectar.
- Parrot Bush - *Banksis sessilis* - flowers, seeds.
- Olive-leaved Hakea - *Hakea oleifolia* – seeds.
- Peppermint - *Agonis flexuosa* – bark, grubs/invertebrates.
- Orange Wattle - *Acacia saligna* – fresh bark/grubs/invertebrates.
- Sheoak – *Allocasuarina* spp. – seeds.

It should be noted that the degree to which the various plant species are utilised varies considerably. For example, marri is documented as being the primary food source for all three species, though jarrah and *banksia* make up a high proportion of some black cockatoo species in other areas where they proliferate. Jarrah is absent from the survey area and *banksia* was only represented by one single parrot bush specimen. Other more common plants such as orange wattle and peppermint (for example) are only foraged upon rarely.

Evidence of black cockatoos foraging was observed during the field survey in the form of chewed marri fruits and pine cones in two areas (Figure 5). This evidence was attributed to one or more of the three black cockatoo species depending on the plant species involved and the characteristics of the foraging activity (i.e. nature of remaining debris). Representative examples of the foraging activity observed are shown in Table 3.

The overall extent of quality foraging habitat within Lot 101 is very limited. Marri and red flowering gum, the most favoured native species present, are only represented by a few scattered specimens. A group of pine trees near the centre of the site appear to be a focal point of foraging activity with numerous chewed cones being observed under trees during the survey period. However, the total extent of this resource is also quite small.

The total extent of quality foraging habitat within Lot 101 is difficult to estimate given that the favoured species (marri, red flowering gum and pine) are represented by only a small number of scattered trees or small groves of trees but would not amount to more than about 0.1 or 0.2 ha.

Table 3: Foraging Evidence Examples

Foraging Evidence Description	Example Image
Marri Fruits – foraging activity attributed to the forest red-tailed black-cockatoo.	

Foraging Evidence Description	Example Image
Marri Fruits – foraging activity attributed to the Baudin's black cockatoo.	
Marri Fruits – foraging activity attributed to Carnaby's black cockatoo.	
Pine Cones – foraging activity attributed to Carnaby's black-cockatoo or Baudin's black cockatoo.	

Based on available vegetation mapping it is estimated that there is approximately 14,200 ha of native vegetation within 12 km the subject site (~30% of the total area, though it should be noted that a high proportion of the 12 km buffer is ocean), much of which is very likely to represent potential black cockatoo foraging habitat of some type. There is also up to 480 ha of pine plantations within 12 km of the subject site, and these areas are likely to represent a significant foraging resource for Carnaby's and Baudin's black cockatoos in this area.

6.2.3.3 Black Cockatoo Roosting Habitat

No existing roosting trees (trees used at night by black cockatoos to rest) were positively identified during the survey.

A review of the 2018 Great Cocky Count database shows no documented roost sites within the survey area. There are 14 documented roost sites with 12 km of the survey area. Seven of these roost sites were monitored during the 2018 Great Cocky Count (April 2018) but none were found to be in use at the time (Peck *et al.* 2018). The results of the 2019 survey are pending.

6.2.4 Other Species of Conservation Significance

Besides the three black cockatoo species and the western ringtail possum, evidence of one additional fauna species of conservation significance was observed during the survey period, this being the eastern osprey (*Pandion cristatus*) (state and federally listed migratory species).

One individual of this species was observed roosting in a tree near Margaret River and on top of one of the buildings at a later time. What appears to be an osprey nest is also present in a tree near the north east boundary of Lot 101 (outside of the current development footprint). While listed under state and federal legislation as migratory the eastern osprey is not a threatened species, however the fact that it may breed in close proximity to the proposed development will need to be taken into consideration.

6.2.5 Opportunistic Fauna Observations

Opportunistic fauna observations are listed in Appendix B. Including those species previously mentioned, a total of 11 native fauna species were observed (or positively identified from foraging evidence, scats, tracks, skeletons or calls) within the survey area during the course of survey. The low number of observations can be attributed to the small size of the survey area, its largely degraded state and the limited time (~ five hours over one day/night) spent on site.

6.3 FAUNA INVENTORY – SUMMARY

6.3.1 Vertebrate Fauna

Table 3 summarises the number of vertebrate fauna species potentially occurring within or utilising at times the survey area, based on results from the literature review and observations made during the field assessment. A complete list of vertebrate fauna possibly inhabiting or frequenting the survey area is located in Appendix B.

As previously discussed, despite the omission of some species it should be noted that the list provided is still very likely an over estimation of the fauna species utilising the survey area (either on a regular or infrequent basis) as a result of the precautionary approach adopted for

the assessment. At any one time only a subset of the listed potential species are likely to be present within the bounds of the survey area.

Table 3: Summary of Potential Vertebrate Fauna Species (as listed in Appendix B)

Group	Total number of Potential species	Potential number of Specially Protected species	Potential number of Migratory species	Potential number of Priority species	Number of species recorded during field survey
Fish	7[1]	0	0	1	0
Amphibians	10	0	0	0	0
Reptiles	34	0	0	0	0
Birds	130[6]	4	1	3	8
Non-Volant Mammals	18[6]	2	0	2	3
Volant Mammals (Bats)	9	0	0	1	0
Total	**208[13]**	**6**	**1**	**7**	**11**

Superscript = number of introduced species included in total.

6.3.2 Vertebrate Fauna of Conservation Significance

A review of the *EPBC Act* threatened fauna list, DBCA's Threatened Fauna Database and Priority List, unpublished reports and scientific publications identified a number of specially protected, priority or migratory vertebrate fauna species as potentially occurring in the general vicinity of the survey area. Of these species, most that have no potential whatsoever to utilise the survey area for any purpose and have been omitted from the potential list (Appendix B), principally due to lack of suitable habitat (including extent and/or quality) or known local extinction.

In summary, five vertebrate fauna species of conservation significance were positively identified as utilising the survey area for some purpose during the survey period, these being:

- Baudin's Black-Cockatoo *Calyptorhynchus baudinii* – S3 (*BC Act*), Endangered (*EPBC Act*)
  Known to occur. Not seen during the survey period but some foraging evidence attributed to this species found within the survey area (chewed marri fruits and pine cones). Lot 101 contains a single potential breeding habitat tree (DBH ≥50cm) but no suitable hollows are present. Extent of quality foraging habitat with Lot 101 is very limited and no evidence of roosting observed.

- Carnaby`s Black-Cockatoo *Calyptorhynchus latirostris* – S2 (*BC Act*), Endangered (*EPBC Act*)
  Known to occur. Not seen during the survey period but some foraging evidence attributed to this species found within the survey area (chewed marri fruits and pine cones). Lot 101 contains a single potential breeding habitat tree (DBH >50cm) but no suitable hollows are present. Extent of quality foraging habitat with Lot 101 is very limited and no evidence of roosting observed.

- Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso* – S3 (*BC Act*), Vulnerable (*EPBC Act*)
  Known to occur. Not seen during the survey period but some foraging evidence attributed to this species found within the survey area (chewed marri fruits and pine cones). Lot 101 contains a single potential breeding habitat tree (DBH >50cm) but no suitable hollows are present. Extent of quality foraging habitat with Lot 101 is very limited and no evidence of roosting observed.

- Eastern Osprey *Pandion haliaetus* – S5 (*BC Act*), Migratory (*EPBC Act*)
  Recorded during survey period and a potential nest site is located near the northern most boundary of Lot 101.

- Western Ringtail Possum *Pseudocheirus occidentalis* – S1 (BC Act), Critically Endangered (*EPBC Act*)
  Recorded during the survey period and potentially uses most vegetation in the survey area for some purpose at times.

Based on the habitats present and current documented distributions it is considered possible that several additional species may use the survey area for some purpose at times (but necessarily Lot 101). As no evidence of any was found their status within the survey area remains uncertain.

These species are:

- Pouched Lamprey *Geotria australis* – P3 (DBCA Priority Species)
  Known to migrate up Margaret River where it breeds but Lot 101 itself does not contain any habitat that this species would utilise.

- Peregrine Falcon *Falco peregrinus* – S7 (*BC Act*)
  Uncommon but this species potentially utilises the survey area as part of a much larger home range. Would not nest within Lot 101 and only likely to forage within this area very occasionally.

- Masked Owl (SW population) - *Tyto n. novaehollandiae* – P3 (DBCA Priority Species)
  Relatively uncommon but may occur, if only occasionally. Would not nest within Lot 101 and only likely to forage within this area very occasionally.

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- Black Bittern *Ixobrychus flavicollis* – P2 (DBCA Priority Species)
  Riverside vegetation (mostly outside of Lot 101) appears suitable for this species. Not often recorded but must be considered a potential species.

- Australian Little Bittern *Ixobrychus dubius* – P4 (DBCA Priority Species)
  Riverside vegetation (mostly outside of Lot 101) appears suitable for this species. Not often recorded but must be considered a potential species.

- South-western Brush-tailed Phascogale *Phascogale tapoatafa wambenger* – S6 (*BC Act*)
  Possibly occurs though the majority of the habitats present appear marginal due to a lack of hollow bearing trees, especially within Lot 101 itself where it is least likely to occur.

- Quenda *Isoodon fusciventer* – P4 (DBCA Priority Species)
  Required dense groundcover to persist so most of the survey area (and almost all of Lot 101) is unsuitable. May be present in riparian vegetation along Margaret River.

- Western False Pipistrelle *Falsistrellus mackenziei* – P4 (DBCA Priority Species)
  Uncommon species but possibly forages along the Margaret River and in open areas on land. Unlikely to roost in the survey area due to a lack of suitable hollows especially within Lot 101 itself.

- Water Rat *Hydromys chrysogaster* – P4 (DBCA Priority Species)
  Likely to forage within Margaret River and riverside vegetation (mostly outside of Lot 101) appears suitable for this species.

Note: Habitat for some of these species within the survey area, while considered possibly suitable, may be marginal in extent/quality and the species listed may only visit the area for short periods, or as rare/uncommon vagrants/transients.

A number of other species of conservation significance, while possibly present in the wider area, are not listed as potential species due to known localised extinction (and no subsequent recruitment from adjoining areas) and/or lack of suitable habitat and/or the presence of feral predators.

6.3.3 Invertebrate Fauna of Conservation Significance

Several invertebrate species of conservation significance appeared in the DBCA database search (DBCA 2019b) however most have been assessed as being unlikely to be present especially within Lot 101 itself due to a lack of suitable habitat and/or likely local extinction.

The single species which may occur at least in the wider area is:

- Cape Leeuwin Freshwater Snail - *Austroassiminea letha*- S3 (*BC Act*)
  There are no records of this species from along the Margaret River but it has been recorded north and south of Prevelly in the recent past (DBCA 2019b). Considered

unlikely to occur within Lot 101 as possible habitat (base of limestone cliff) limited in extent and no seepages noted – more likely to occur in the Wallcliffe Nature Reserve though actual status is unknown.

7. POTENTIAL IMPACTS

In general the most significant potential impacts to fauna of any development include:

- Loss of vegetation/fauna habitat that may be used for foraging, breeding, roosting, or dispersal (includes loss of hollow bearing trees);
- Fragmentation of vegetation/fauna habitat which may restrict the movement of some fauna species;
- Modifications to surface hydrology, siltation of creek lines;
- Changes to fire regimes;
- Pollution (e.g. oil spills);
- Noise/Light/Dust;
- Spread of plant pathogens (e.g. dieback) and weeds;
- Potential increase in the number of predatory introduced species (e.g. cats);
- Death or injury of fauna during clearing and construction; and
- An increase in fauna road kills subsequent to development.

Based on the likely scale of habitat loss which the proposed development may result in (which is likely to be minimal based on the proposed retention of the majority of existing vegetation) and other factors such as the extent of similar vegetation in surrounding areas, its quality and degree of fragmentation, the possible impacts on species of conservation significance previously recorded in the general area has been assessed, a summary of which is provided in Table 4 below.

It should be noted that the best quality and widest range of fauna habitats within the survey area are located outside of Lot 101. As a consequence, these areas (including the reserve areas of which they form a part of) are most likely to harbour the greatest variety of fauna species. Any development undertaken in Lot 101 is therefore considered as unlikely to impact significantly on the current status of any fauna species presently utilising the area.

Table 4: Likelihood of Occurrence and Potential Impacts – Fauna Species of Conservation Significance (continues on following pages).

Species	Conservation Status		Habitat Preferences	Habitat Present	Likelihood of Occurrence	Comments/Possible Impacts
	BC Act/ DBCA Priority	*EPBC Act*				
Western Pygmy Trapdoor Spider *Bertmainius opimus*	P3	-	Poorly documented - Lives in shallow burrows on eucalyptus bark or in topsoil.	?	Unlikely to Occur	Previously recorded in nearby Karri forest (DBCA 2019b). Considered unlikely to occur as habitat unlikely to be suitable. No impact on this species anticipated.
Cape Leeuwin Freshwater Snail *Austroassiminea letha*	S3	-	Natural seepages from limestone or lime sands	Yes?	Possibly occurs? Wallcliffe Nature Reserve only.	No records from along the Margaret River (DBCA 2019b). Considered unlikely to occur within Lot 101 as possible habitat (base of limestone cliff) limited in extent and no seepages noted – more likely in Wallcliffe Nature Reserve though actual status unknown. No impact on this species anticipated.
Margaret River Hairy Marron *Cherax tenuimanus*	S1	CR	Upper reaches of Margaret River.	No	Would Not Occur.	Would not occur in lower reaches of Margaret River. No impact on this species will occur.
Margaret River Burrowing Crayfish *Engaewa pseudoreducta*	S1	CR	Narrow creek tributaries of the Margaret River which are densely vegetated on heavy grey/yellow clay soils.	No	Would Not Occur.	Would not occur in lower reaches of Margaret River. No impact on this species will occur.
Grey Vernal Katydid *Kawaniphila pachomai*	P1	-	Not documented.	?	Would Not Occur.	Given the lack of published records and apparent knowledge on this species, its status within the survey area is difficult to determine, however the probability of it being present can be regarded as being extremely low. No impact on this species will occur.
a ground beetle *Trichosternus relictus*	P3	-	Not documented.	?	Would Not Occur.	The only records of this species in NatureMap (5) are from 1959 and 1931 (DBCA 2109b). Considered very unlikely to occur. No impact on this species will occur.
Carter's Freshwater Mussel *Westralunio carteri*	S3	VU	Occurs in greatest abundance in slower flowing streams with stable sediments that are soft enough for burrowing amongst woody debris and exposed tree roots.	No	Would Not Occur.	Would not occur in lower reaches of Margaret River. No impact on this species will occur.
Pouched Lamprey *Geotria australis*	P3	-	This species lives in mud burrows in the upper reaches of coastal streams for the first 4 years of life until migrating to the sea. Adults migrate up to 60km upstream during spawning.	Yes	Possibly Occurs (Margaret River only).	Known to migrate up Margaret River. No impact on this species anticipated.

Species	Conservation Status		Habitat Preferences	Habitat Present	Likelihood of Occurrence	Comments/Possible Impacts
	BC Act/ DBCA Priority	*EPBC Act*				
Mud Minnow *Galaxiella munda*	S3	-	Typically found in small flowing streams near submerged vegetation, occasionally in still water of ponds, swamps and roadside drains. Water is usually darkly tannin stained and acidic (pH 3.0 – 6.0).	No	Would Not Occur.	Would not occur in lower reaches of Margaret River. No impact on this species will occur.
Balston's Pygmy Perch) *Nannatherina balstoni*	S3	VU	Acidic, tannin stained freshwater pools, streams and lakes within 30km of the coast, typically situated amongst peat flats. Prefers shallow water and is commonly found in association with tall sedge thickets.	No	Would Not Occur.	Would not occur in lower reaches of Margaret River. No impact on this species will occur.
White-bellied Frog *Geocrinia alba*	S1	EN	Occurs only in the Karradale-Witchcliffe area where it persists along creeklines within agricultural landscapes, provided suitable riparian habitat remains intact.	No	Would Not Occur.	This species does not occur along Margaret River. With all records being in the Karridale-Witchcliffe area (DBCA 2019b). No impact on this species will occur.
Malleefowl *Leipoa ocellata*	S3	VU	Mainly scrubs and thickets of mallee Eucalyptus spp., boree Melaleuca lanceolata and bowgada Acacia linophylla, also dense litter forming shrublands.	No	Would Not Occur.	This species is regionally extinct. No impact on this species will occur.
Migratory Shorebirds/Wetland Species/Marine Species (various reptiles, birds and mammals)	S5, Various	Ma, Mig, Various	Varies between species but includes open ocean, beaches and permanent/temporary wetlands varying from billabongs, swamps, lakes, floodplains, sewerage farms, saltwork ponds, estuaries, lagoons, mudflats sandbars, pastures, airfields, sports fields and lawns.	No	Would Not Occur.	There is no suitable habitat for any of these species within the survey area. No impact on any of these species will occur.
Hooded Plover *Thinornis rubricollis*	P4	-	Broad sandy ocean beaches and bays, coastal and inland salt lakes.	No	Would Not Occur.	There is no suitable habitat for this species in the survey area. No impact on any of these species will occur.
Eastern Osprey *Pandion haliaetus*	S5	Ma, Mig	Coasts, estuaries, bays, inlets, islands, and surrounding waters, coral atolls, reefs, lagoons, rock cliffs and stacks. Ascends larger rivers.	Yes	Known to Occur	Recorded during survey period and a potential nest site is located near the northern most boundary of Lot 101. This area is not subject to any current development plans and therefore no impact on this species is anticipated.
Peregrine Falcon *Falco peregrinus*	S7	-	Diverse from rainforest to arid shrublands, from coastal heath to alpine Mainly about cliffs along coasts, rivers and ranges and about wooded watercourses and lakes.	Yes	Possibly Occurs.	Uncommon but the survey area may represent part of a larger home range used by individuals of this species. Would not breed within Lot 101. No impact on this species anticipated.

Species	Conservation Status		Habitat Preferences	Habitat Present	Likelihood of Occurrence	Comments/Possible Impacts
	BC Act/ DBCA Priority	*EPBC Act*				
Masked Owl (SW population) *Tyto n. novaehollandiae*	P3	-	Roosts and nests in heavy forest, hunts over open woodlands and farmlands.	Yes	Possibly Occurs.	Relatively uncommon but may occur, if only occasionally. Any proposed development is however unlikely to impact on this species.
Barking Owl (SW population) *Ninox connivens connivens*	P3	-	Dense vegetation, especially forest and thickets of waterside vegetation such as *melaleucas*. Roosts in tree hollows.	Yes	Unlikely to Occur	No suitable habitat within Lot 101 itself and only rarely recorded in the south west. Considered unlikely to occur. No impact on this species anticipated.
Australasian Bittern *Botaurus poiciloptilus*	S2	EN	Freshwater wetlands, occasionally estuarine; prefers heavy vegetation such as beds of tall dense *Typha, Baumea* and sedges in freshwater swamps.	No/Marginal	Unlikely to Occur.	Riverside vegetation (mostly outside of Lot 101) appears marginal for this species and therefore it is considered unlikely to occur. No impact on this species will occur.
Black Bittern *Ixobrychus flavicollis*	P2	-	Freshwater pools, swamps and lagoons well screened with trees. Shelters in dense waterside vegetation.	Yes	Possibly Occurs	Riverside vegetation (mostly outside of Lot 101) appears suitable for this species. Not often recorded but must be considered a potential species. Areas of preferred habitat are however not subject to any current development plans and therefore no impact on this species is anticipated.
Australian Little Bittern *Ixobrychus dubius*	P4	-	Dense vegetation surrounding/within freshwater pools, swamps and lagoons, well screened with trees. Shelters in dense beds of *Typha, Baumea* and tall rushes in freshwater swamps around lakes and along rivers.	Yes	Possibly Occurs	Riverside vegetation (mostly outside of Lot 101) appears suitable for this species. Not often recorded but must be considered a potential species. Areas of preferred habitat are however not subject to any current development plans and therefore no impact on this species is anticipated.
Noisy Scrub-bird *Atrichornis clamosus*	S2	EN	Areas of dense understorey or lower stratum of sedges and shrubs, a dense accumulation of leaf litter and an abundant population of litter-dwelling invertebrates.	No	Would Not Occur.	This species is regionally extinct. No impact on this species will occur.
Western Whipbird *Psophodes nigrogularis*	S2	EN	Dense shrubland with an open overstorey.	No	Would Not Occur.	This species is regionally extinct. No impact on this species will occur.
Carnaby`s Black Cockatoo *Calyptorhynchus latirostris*	S2	EN	Forests, woodlands, heathlands, farms; feeds on *Banksia*, *Hakea* and Marri.	Yes	Known to Occur	The survey area contains a small amount of foraging habitat, but no actual breeding hollows and no evidence of roosting found. The proposed small-scale development will not significantly impact on this species.
Baudin`s Black Cockatoo *Calyptorhynchus baudinii*	S2	EN	Mainly eucalypt forests where it feeds primarily on the marri seeds.	Yes	Known to Occur	The survey area contains a small amount of foraging habitat, but no actual breeding hollows and no evidence of roosting found. The proposed small-scale development will not significantly impact on this species.

Species	Conservation Status		Habitat Preferences	Habitat Present	Likelihood of Occurrence	Comments/Possible Impacts
	BC Act/ DBCA Priority	*EPBC Act*				
Forest Red-tailed Black Cockatoo *Calyptorhynchus 29enicil naso*	S3	VU	Eucalypt forests, feeds on marri, jarrah, blackbutt, karri, sheoak and snottygobble.	Yes	Known to Occur	The survey area contains a small amount of foraging habitat, but no actual breeding hollows and no evidence of roosting found. The proposed small-scale development will not significantly impact on this species.
Fork-tailed Swift *Apus pacificus*	S5	Ma, Mig	Low to very high airspace over varied habitat from rainforest to semi desert.	Yes	Unlikely to Occur, Flyover only on very rare occasions.	May occur very occasionally for brief periods. Entirely aerial. No impact on this species will occur.
Chuditch *Dasyurus geoffroii*	S3	VU	Forest, mallee shrublands, woodland and desert. The densest populations have been found in riparian jarrah forest.	Yes	Unlikely to Occur	Not recorded in recent times in the general area (DBCA 2019b) so considered as unlikely to occur. No impact on this species is anticipated.
South-western Brush-tailed Phascogale *Phascogale tapoatafa wambenger*	S6	-	Dry sclerophyll forests and open woodlands that contain hollow-bearing trees but a sparse ground cover.	Yes/Marginal	Possibly Occurs.	Possibly occurs though the majority of the habitats present appear marginal due to a lack of hollow bearing trees, especially within Lot 101 itself. The proposed small-scale development will not significantly impact on this species.
Numbat *Myrmecobius fasciatus*	S2	EN	Open Woodlands generally dominated by eucalypts that provide hollow logs and branches for shelter and termites for food.	No	Would Not Occur.	This species is regionally extinct. No impact on this species will occur.
Quenda *Isoodon fusciventer*	P4	-	Dense scrubby, often swampy, vegetation with dense cover.	Yes	Possibly Occurs.	Requires dense groundcover to persist so most of the survey area (and almost all of Lot 101) is unsuitable. May be present in riparian vegetation along Margaret River. This area is not subject to any current development plans and therefore no impact on this species is anticipated.
Bilby *Macrotis lagotis*	S3	VU	*Acacia* shrublands, spinifex and hummock grassland. Mitchell grass and stony downs country if cracking clay, also desert sand plains and dune fields sometimes with spinifex hummock grassland and *acacia* shrubland.	No	Would Not Occur.	This species is regionally extinct. No impact on this species will occur.
Western Ringtail Possum *Pseudocheirus occidentalis*	S1	CR	Coastal peppermint, coastal peppermint-tuart, jarrah-marri associations, sheoak woodland, and eucalypt woodland and mallee.	Yes	Known to Occur.	Recorded during the survey period and potentially uses most vegetation in the survey area for some purpose at times. The proposed small-scale development is considered as unlikely to significantly impact on the extent suitable habitat currently present. However, the potential for individuals to be injured or killed during any clearing operations will need to be managed.

Species	Conservation Status		Habitat Preferences	Habitat Present	Likelihood of Occurrence	Comments/Possible Impacts
	BC Act/ DBCA Priority	*EPBC Act*				
Quokka *Setonix brachyurus*	S3	VU	Currently restricted to densely vegetated coastal heaths, swamps, riverine habitats including tea-tree thickets on sandy soils along creek systems.	No	Would Not Occur.	This species appears to be locally extinct. No impact on this species will occur.
Woylie *Bettongia penicillate ogilbyi*	S1	EN	Open forest and woodland with a low, dense, understorey of tussock grasses or woody scrub. Formerly occurred in a wider range of habitats including spinifex hummock grasslands.	No	Would Not Occur.	This species is locally extinct. No impact on this species will occur.
Western Brush Wallaby *Notamacropus irma*	P4	-	Open forest or woodland, particularly favouring open, seasonally wet flats with low grasses and open scrubby thickets.	Yes	Unlikely to Occur	Possibly occurs in larger remnants in nearby national park areas but not likely to frequent the survey area. No impact on this species will occur.
Tammar Wallaby *Notamacropus derbianus*	P4	-	Coastal scrub, heath, dry sclerophyll forest and thickets in mallee and woodland.	No	Would Not Occur.	This species is locally extinct. No impact on this species will occur.
Gilbert's Potoroo *Potorous gilbertii*	S1	CR	Long-unburnt, dense shrubland on the valley slopes.	No	Would Not Occur.	This species is regionally extinct. No impact on this species will occur.
Western False Pipistrelle *Falsistrellus mackenziei*	P4	-	Wet sclerophyll forest dominated by karri and in high rainfall zones of the jarrah and marri forest.	Yes	Possibly Occurs.	Uncommon species but possibly forages along the Margaret River and in open areas on land. Unlikely to roost in the survey area due to a lack of suitable hollows especially within Lot 101 itself. The proposed small-scale development will not significantly impact on this species.
Water Rat *Hydromys chrysogaster*	P4	-	Permanent water, fresh, brackish or marine.	Yes	Possibly Occurs	Likely to forage within Margaret River and riverside vegetation (mostly outside of Lot 101) appears suitable for this species. Areas of preferred habitat are however not subject to any current development plans and therefore no impact on this species is anticipated.

Note: see Appendix A for conservation codes

8. CONCLUSION

The fauna assessment within the survey area was undertaken for the purposes of delineating and characterising the fauna habitats and faunal assemblages present. Targeted searches for western ringtail possums and black cockatoo habitat was also carried out.

With respect to native vertebrate fauna, 21 mammals (including nine bat species), 124 bird, 35 reptile, 10 frog species and six fish species have previously been recorded in the general area, some of which have the potential to occur in or utilise sections of the survey area at times, a conclusion largely based on the presence of apparently suitable habitat. Fauna habitat quality within Lot 101 is however low as a consequence of historical clearing and development and only a subset of the fauna species predicted to occur in the wider area are considered likely to occur.

The assessment identified the presence the western ringtail possum and it is considered to potentially utilise most areas of Lot 101 where suitable vegetation persists. Within Lot 101 black cockatoo habitat was found to be limited in extent and/or of low quality. A single migratory species, the eastern osprey was recorded during the survey period and a possible nest site is present near the boundary of Lot 101.

A number of additional federal and/or state listed threatened and DBCA priority fauna species may also occur though in most cases their use of the survey area wasn't detected during the survey period.

The best quality and widest range of fauna habitats within the survey area are located outside of Lot 101. As a consequence, these areas (including the reserve areas of which they form a part of) are most likely to harbour the greatest variety of fauna species. Any development undertaken in Lot 101 is therefore considered as unlikely to impact significantly on the current status of any fauna species presently utilising the area.

In summary five vertebrate fauna species of conservation significance were positively identified as utilising the survey area for some purpose, these being:

- Forest Red-tailed Black Cockatoo – Vulnerable;
- Baudin's Black Cockatoo – Endangered;
- Carnaby's Black Cockatoo – Endangered;
- Eastern Osprey – Migratory; and
- Western Ringtail Possum – Critically Endangered.

A number of additional vertebrate species of conservation significance may also utilise the survey area, though, as no evidence of these species' presence was identified during the field survey, the status of some in the area remains uncertain. These species are:

- Pouched Lamprey – Priority 3;
- Black Bittern – Priority 2;
- Australian Little - Priority 2;
- Masked Owl – Priority 3;
- Peregrine Falcon – Schedule 7;
- South-western Brush-tailed Phascogale - Schedule 6;
- Quenda – Priority 4;
- Western False Pipistrelle – Priority 4;
- Water Rat – Priority 4.

As described previously, most of these species would not actually utilise Lot 101 due to a lack of suitable habitats, though they may frequent nearby areas.

One invertebrate species of conservation significance has also been assessed as possibly occurring based on available information. The Cape Leeuwin freshwater snail (Vulnerable) has been collected in national park areas north and south of the survey area (DBCA 2019b) so it must be regarded as a potential species though it is considered unlikely to occur within Lot 101 itself.

Overall Lot 101 has low biodiversity values and therefore impacts on fauna in general will be non-existent or negligible. Constraints on development within the subject site will largely be centred on the presence of habitat used or potentially used by threatened fauna species in particular the western ringtail possum.

The presence of this species should be taken into account during ongoing planning and subsequent development. To this end it is recommended that a fauna management plan be formulated for implementation prior to and during development. In particular the plan should define procedures for ensuring the retention and protection of existing WRP habitat wherever possible including protocols for ensuring western ringtail possums (and other fauna) are not injured or killed during site works.

It is also recommended that the tree containing the potential eastern osprey nest be specifically marked and fenced off during site works to minimise activity occurring nearby which may disturb nesting birds.

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FIGURES



Legend

- Survey Area
- National Park

0 1 2 3 4 5
Kilometres

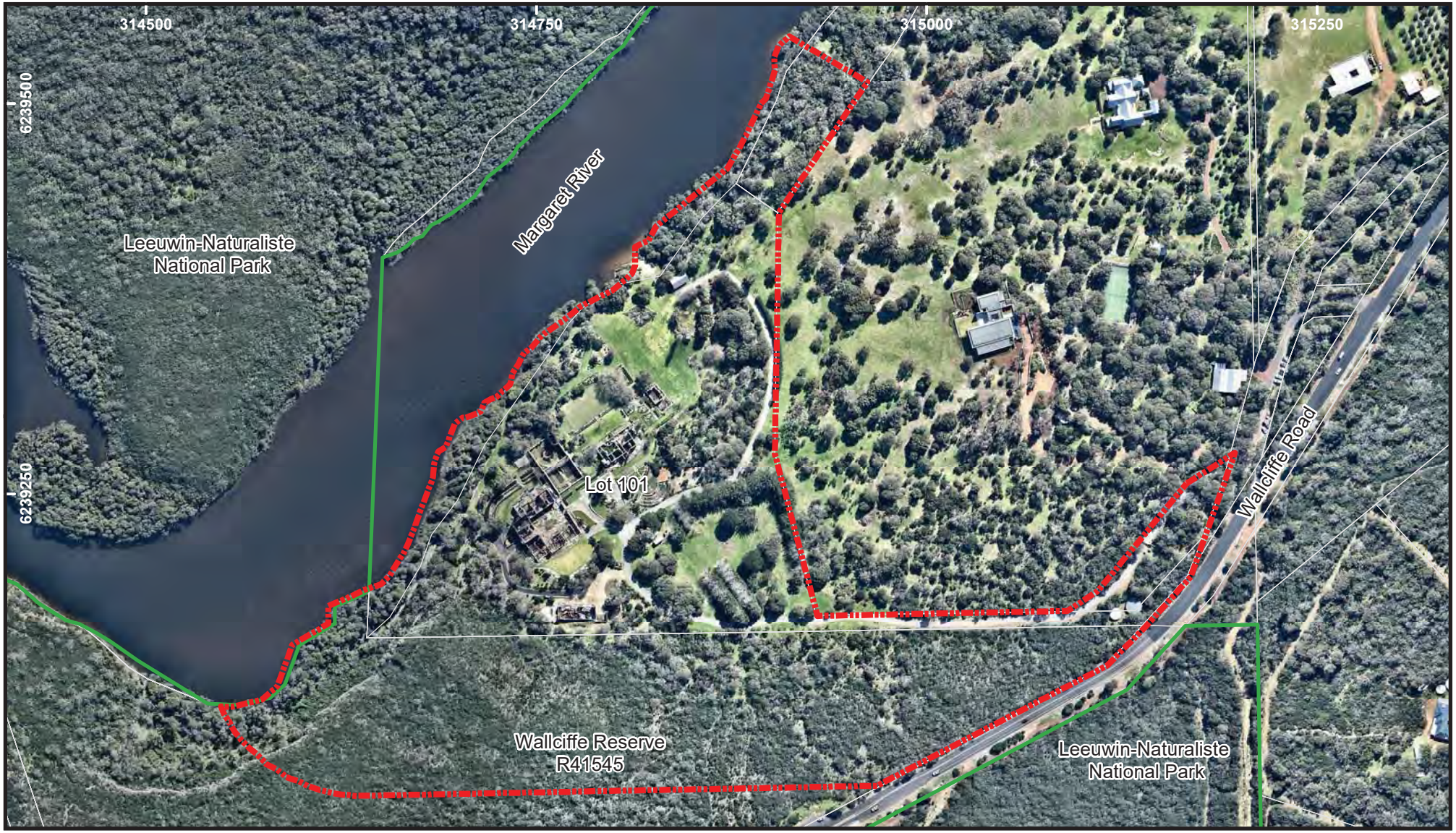
Fauna Survey

Drawn: G. Harewood
Date: April 2019
Scale: 1:50,000
Projection/Coordinate System: UTM/MGA Zone 50

Lot 101 Wallcliffe Road Prevelly

Survey Area and Surrounds

Figure: 1



Legend

- Survey Area
- National Park

0 50 100 150 200 250

Metres

Fauna Survey

Drawn: G. Harewood

Date: April 2019

Scale: 1:3,500

Projection/Coordinate System: UTM/MGA Zone 50

Figure: 2

Lot 101 Wallcliffe Road
Prevelly

Survey Area Aerial Photograph

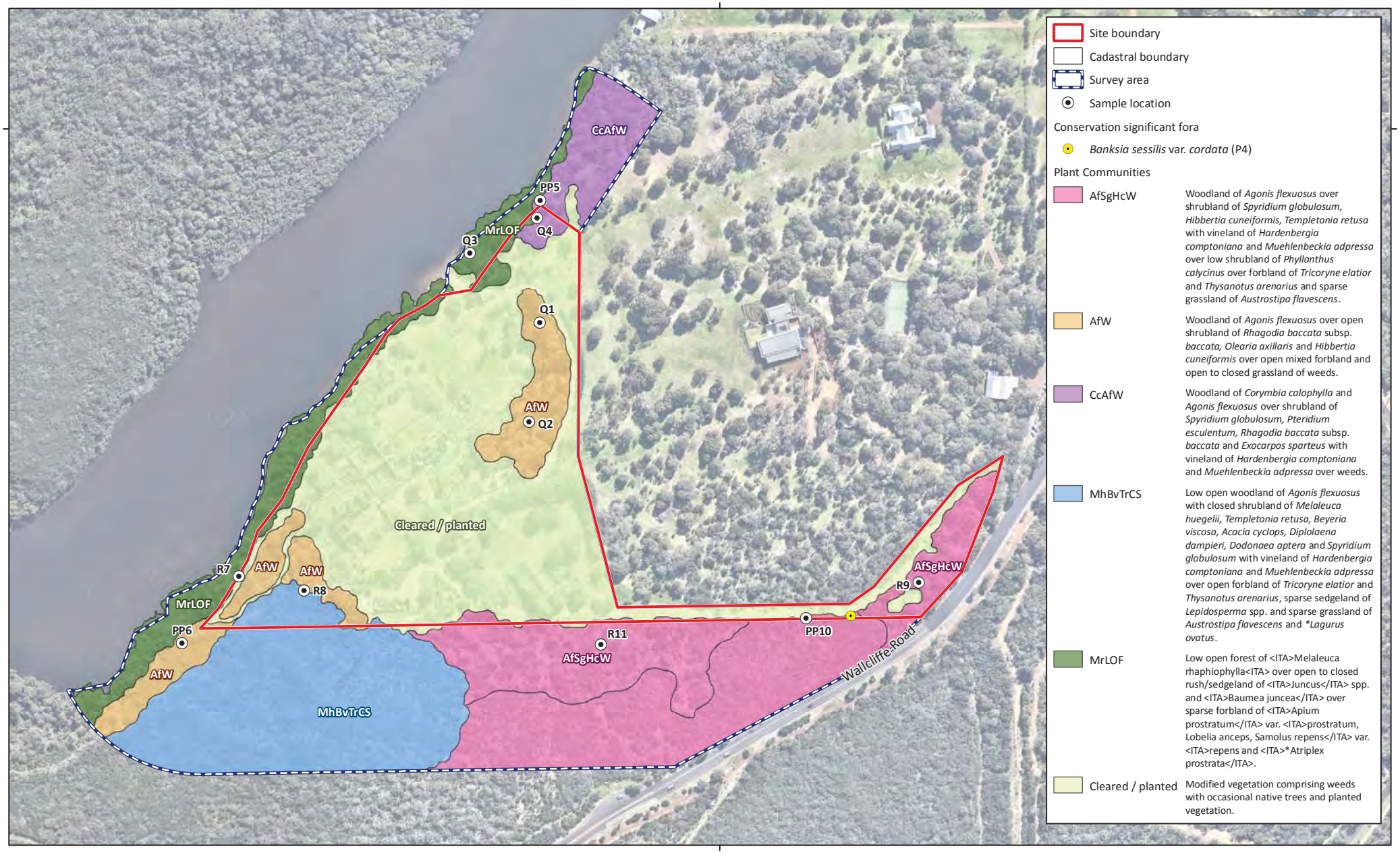


Figure 3: Plant Communities

Project: Spring Flora and Vegetation Assessment
Lot 101 Wallcliffe Road Amendment Support
Client: Wallcliffe House Pty Ltd

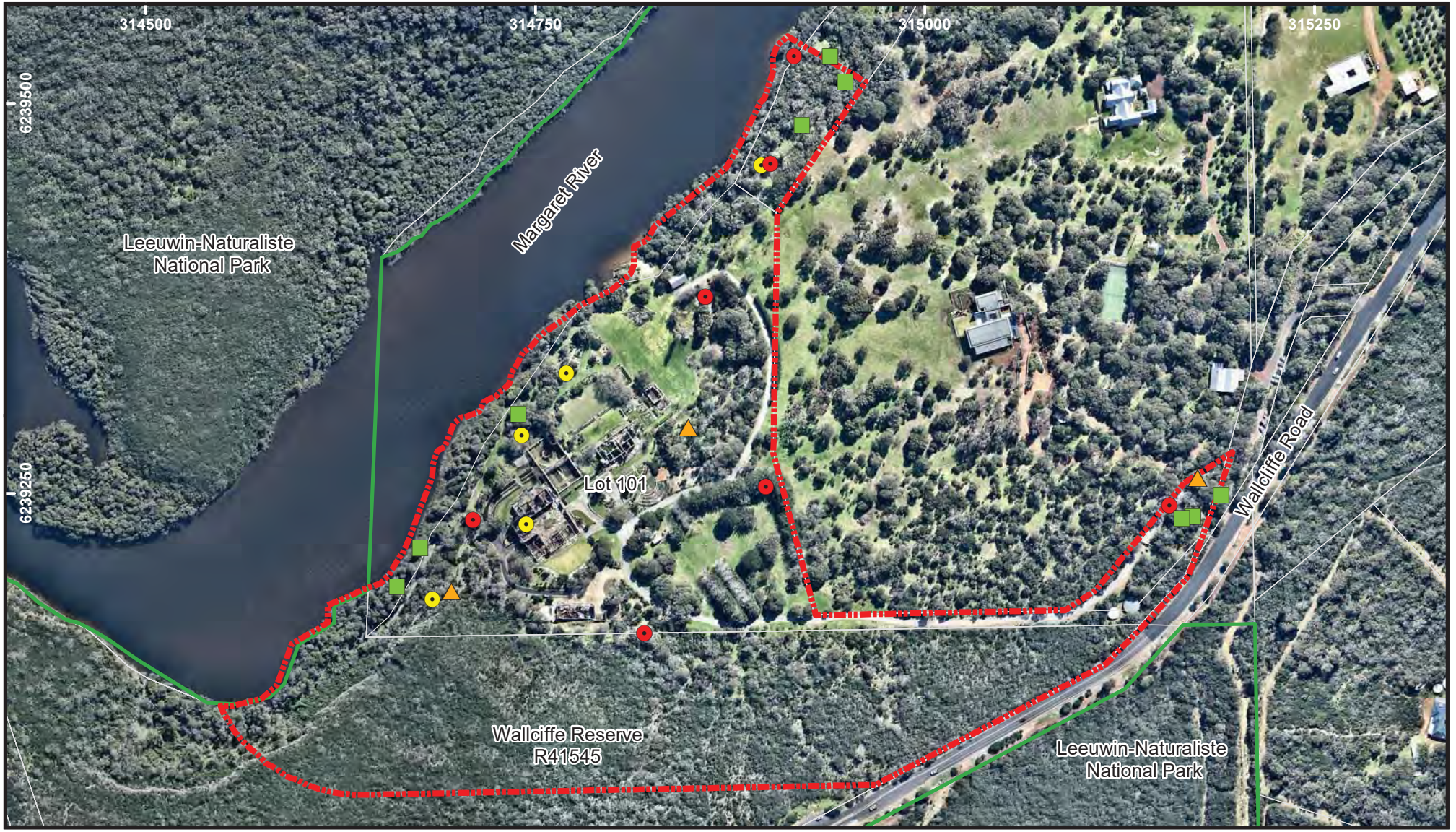
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EP18-128(01)--F03
Drawn: KNM
Date: 23/01/2019
Checked: SKP
Approved: TAA
Date: 11/02/2019

N

0 50 100
Metres
Scale: 1:3,500@A4
GDA 1994 MGA Zone 50

emerge ASSOCIATES

While Emerge Associates makes every attempt to ensure the accuracy and completeness of data, Emerge accepts no responsibility for externally sourced data used



Legend

- Survey Area
- National Park
- Western Ringtail Possum Drey
- Western Ringtail Possum Scats
- Western Ringtail Possum
- Common Brushtail Possum

0 50 100 150 200 250

Metres

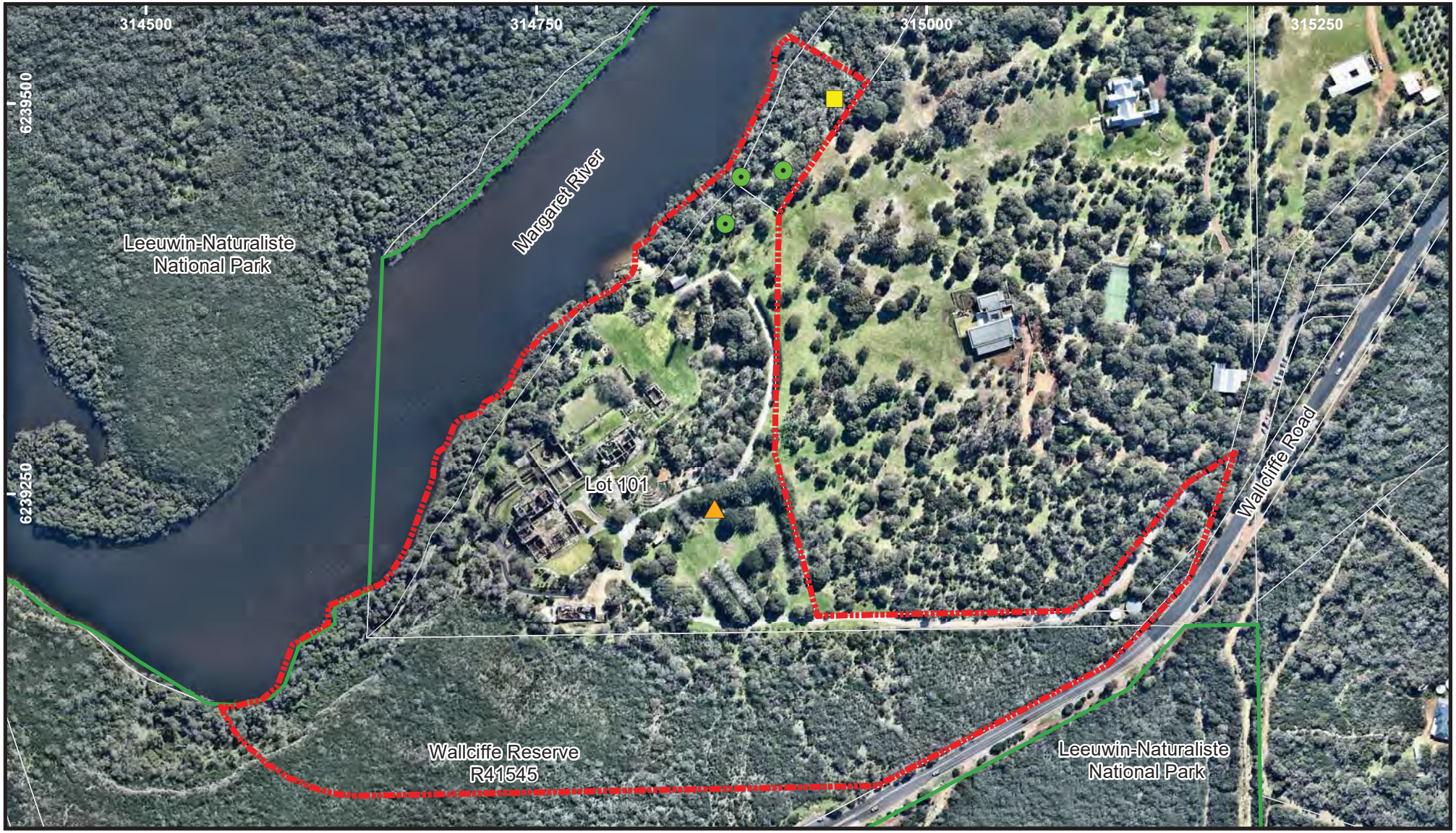
Fauna Survey

Lot 101 Wallcliffe Road
Prevelly

Possum Observations

Drawn: G. Harewood
Date: April 2019
Scale: 1:3,500
Projection/Coordinate System: UTM/MGA Zone 50

Figure: 4



Legend

- Survey Area
- National Park
- Habitat Tree (DBH >50cm)
- Foraging Evidence (Marri Fruits)
- Foraging Evidence (Pine Cones)

0 50 100 150 200 250
Metres

Fauna Survey

Lot 101 Wallcliffe Road
Prevelly

Black Cockatoo Observations

Drawn: G. Harewood
Date: April 2019
Scale: 1:3,500
Projection/Coordinate System: UTM/MGA Zone 50

Figure: 5

APPENDIX A

CONSERVATION CATEGORIES

***EPBC Act (1999)* Threatened Fauna Categories**

Threatened fauna may be listed under Section 178 of the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) in any one of the following categories:

Category	Code	Description
Extinct	E	There is no reasonable doubt that the last member of the species has died.
*Extinct in the wild	EW	A species (a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
*Critically Endangered	CE	A species is facing an extremely high risk of extinction in the wild in the immediate future.
*Endangered	EN	A species: (a) is not critically endangered; and (b) is facing a very high risk of extinction in the wild in the near future.
*Vulnerable	VU	A species (a) is not critically endangered or endangered; and (b) is facing a high risk of extinction in the wild in the medium-term future.
Conservation Dependent	CD	A species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered
*Migratory	Migratory	(a) all migratory species that are: (i) native species; and (ii) from time to time included in the appendices to the Bonn Convention; and (b) all migratory species from time to time included in annexes established under JAMBA, CAMBA and ROKAMBA; and (c) all native species from time to time identified in a list established under, or an instrument made under, an international agreement approved by the Minister.
Marine	Ma	Species in the list established under s248 of the *EPBC Act*

Note: Only species in those categories marked with an asterix are matters of national environmental significance (NES) under the *EPBC Act*.

Wildlife Conservation (Specially Protected Fauna) Notice 2018 Categories

Published as Specially Protected under the *Wildlife Conservation Act 1950*, and listed under Schedules 1 to 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Schedule 1 (S1) Critically Endangered species	CR	Threatened species considered to be facing an extremely high risk of extinction in the wild in the immediate future.
Schedule 2 (S2) Endangered species	EN	Threatened species considered to be facing a very high risk of extinction in the wild in the near future.
Schedule 3 (S3) Vulnerable species	VU	Threatened species considered to be facing a high risk of extinction in the wild in the medium-term future.
Schedule 4 (S4) Presumed extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last member of the species has died.
Schedule 5 (S5) Migratory birds protected under an international agreement	MI	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds.
Schedule 6 (S6) Fauna that is of special conservation need as conservation dependent fauna	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Schedule 7 (S7) Other specially protected fauna.	OS	Fauna otherwise in need of special protection to ensure their conservation.

Western Australian DBCA Priority Fauna Categories

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Description
Priority 1 (P1) Poorly Known Species.	P1	Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2 (P2) Poorly Known Species.	P2	Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3 (P3) Poorly Known Species.	P3	Species that are known from several locations and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4 (P4) Rare, Near Threatened and other species in need of monitoring.	P4	(a) Rare: Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened: Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

***IUCN Red List* Threatened Species Categories**

The *IUCN Red List of Threatened Species*™ is a checklist of taxa that have undergone an extinction risk assessment using the *IUCN Red List Categories and Criteria*.

Categories are summarized below.

Category	Code	Description
Extinct	EX	Taxa for which there is no reasonable doubt that the last individual has died.
Extinct in the Wild	EW	Taxa which is known only to survive in cultivation, in captivity or and as a naturalised population well outside its past range and it has not been recorded in known or expected habitat despite exhaustive survey over a time frame appropriate to its life cycle and form.
Critically Endangered	CR	Taxa facing an extremely high risk of extinction in the wild.
Endangered	EN	Taxa facing a very high risk of extinction in the wild.
Vulnerable	VU	Taxa facing a high risk of extinction in the wild.
Near Threatened	NT	Taxa which has been evaluated but does not qualify for CR, EN or VU now but is close to qualifying or likely to qualify in the near future.
Least Concern	LC	Taxa which has been evaluated but does not qualify for CR, EN, VU, or NT but is likely to qualify for NT in the near future.
Data Deficient	DD	Taxa for which there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.
Not Evaluated	NE	Taxa which has not been evaluated.

A full list of categories and their meanings are available at:

http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria

APPENDIX B

VERTEBRATE FAUNA OBSERVED OR POTENTIALLY PRESENT

Vertebrate Fauna Observed or Potentially Present

Compiled by Greg Harewood - April 2019

Lot 101 Wallcliffe Road, Prevelly

Recorded (Trapped/Sighted/Heard/Signs) = X

Harewood, G (2019). Fauna Assessment – Lot 101 Wallcliffe Road Prevelly Unpublished report for Emerge Associates.

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Fish										
Atherinidae Hardyheads or Silversides										
Leptatherina wallacei	Western Hardyhead									
Gobidae Gobies										
Pseudogobius olurum	Swan River Goby									
Percichthyidae Basses and Cods										
Bostockia porosa	Nightfish									

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Galaxiidae Galaxiids										
Galaxias occidentalis	Western Minnow									X
Geotriidae Pouched Lampreys										
Geotria australis	Pouched Lamprey	P3 DD								X
Nannopercidae Pygmy Perches										
Edelia vittata	Western Pygmy Perch									X
Poeciliidae Livebearers										
Gambusia holbrooki	Mosquito Fish	Introduced								

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Amphibians										
Myobatrachidae Ground or Burrowing Frogs										
Crinia georgiana	Quacking Frog	LC					X			X
Crinia glauerti	Glauert`s Froglet	LC					X			X
Crinia pseudinsignifera	Bleating Froglet	LC		X						X
Geocrinia leai	Lea`s Frog	LC		X			X			X
Heleioporus eyrei	Moaning Frog	LC		X		X	X	X	X	X
Heleioporus inornatus	Whooping Frog	LC					X			X
Limnodynastes dorsalis	Banjo Frog	LC			X	X	X	X	X	X
Metacrinia nichollsi	Nicholls` Toadlet	LC					X			X
Hylidae Tree or Water-Holding Frogs										
Litoria adelaidensis	Slender Tree Frog	LC					X			X
Litoria moorei	Motorbike Frog	LC					X			X
Reptiles										
Chelidae Side-necked Tortoises										
Chelodina colliei	SW Snake-necked Turtle	LC								X

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Gekkonidae Geckoes										
Christinus marmoratus	Marbled Gecko	LC			X	X	X	X	X	X
Pygopodidae Legless Lizards										
Aprasia pulchella	Pretty Worm Lizard	LC				X			X	X
Delma australis	Marbel-faced Delma	LC				X				
Lialis burtonis	Common Snake Lizard	LC								X
Pygopus lepidopodus	Southern Scaleyfoot	LC			X			X		X
Agamidae Dragon Lizards										
Pogona minor	Western Bearded Dragon	LC			X	X			X	
Varanidae Monitor's or Goanna's										
Varanus rosenbergi	Heath Monitor	LC			X	X	X			X

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Scincidae Skinks										
Acritoscincus trilineatus	South-western Cool Skink	LC			X	X	X		X	X
Cryptoblepharus buchananii	Fence Skink	LC				X		X		X
Ctenotus catenifer	Chain-striped Heath Ctenotus	LC								X
Ctenotus impar	SW Odd-striped Ctenotus	LC				X		X	X	X
Ctenotus labillardieri	Red-legged Skink	LC				X	X	X	X	X
Egernia kingii	King's Skink	LC				X	X			X
Egernia luctuosa	Mourning Skink	LC					X			
Egernia napoleonis	Salmon-bellied Skink	LC			X	X	X	X	X	X
Hemiergis gracilipes	SW Mulch Skink	LC								X
Hemiergis peronii tridactyla	Three-toed Mulch Skink	LC			X	X	X		X	
Lerista distinguenda	SW Four-toed Lerista	LC				X				X
Lerista elegans	West Coast Four-toed Lerista	LC			X				X	X
Lerista microtis	SW Five-toed Lerista	LC					X			X
Menetia greyii	Dwarf Skink	LC			X	X		X		X
Morethia lineoocellata	Western Pale-flecked Morethia	LC			X	X	X		X	X

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Morethia obscura	Dusky Morethia	LC								X
Tiliqua rugosa rugosa	Western Bobtail	LC			X	X	X	X	X	
Typhlopidae Blind Snakes										
Anilios australis	Southern Blind Snake	LC				X	X			
Boidae Pythons, Boas										
Morelia spilota imbricata	Southern Carpet Python	LC			X	X				
Elapidae Elapid Snakes										
Echiopsis curta	Bardick	LC				X			X	X
Elapognathus coronatus	Crowned Snake	LC			X	X		X		X
Notechis scutatus	Tiger Snake	LC								X
Parasuta gouldii	Gould's Hooded Snake	LC								X
Parasuta nigriceps	Black-backed Snake	LC								X
Pseudonaja affinis	Dugite	LC			X		X	X	X	X
Rhinoplocephalus bicolor	Square-nosed Snake	LC								X

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Birds										
Phasianidae Quails, Pheasants										
Coturnix pectoralis	Stubble Quail	LC								
Coturnix ypsilophora	Brown Quail	LC								
Anatidae Geese, Swans, Ducks										
Anas castanea	Chestnut Teal	LC								
Anas gracilis	Grey Teal	LC					X			X
Anas platyrhynchos	Mallard	Introduced								X
Anas rhynchotis	Australasian Shoveler	Bh LC								
Anas superciliosa	Pacific Black Duck	LC					X			X
Aythya australis	Hardhead	Bh LC								
Biziura lobata	Musk Duck	Bh LC								X
Chenonetta jubata	Australian Wood Duck	LC					X			X
Cygnus atratus	Black Swan	LC								
Malacorhynchus membranaceus	Pink-eared Duck	Bh LC								
Tadorna tadornoides	Australian Shelduck	LC					X			X

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Podicipedidae Grebes										
Poliocephalus poliocephalus	Hoary-headed Grebe	LC								
Tachybaptus novaehollandiae	Australasian Grebe	LC								X
Anhingidae Darters										
Anhinga novaehollandiae	Australian Darter	LC								
Phalacrocoracidae Cormorants										
Phalacrocorax carbo	Great Cormorant	LC								X
Phalacrocorax melanoleucos	Little Pied Cormorant	LC								
Phalacrocorax sulcirostris	Little Black Cormorant	LC								X
Phalacrocorax varius	Pied Cormorant	LC								X
Pelecanidae Pelicans										
Pelecanus conspicillatus	Australian Pelican	LC								X

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Ardeidae Herons, Egrets, Bitterns										
Ardea alba	Great Egret	CA JA LC								
Ardea pacifica	White-necked Heron	LC								
Egretta novaehollandiae	White-faced Heron	LC					X			X
Ixobrychus flavicollis	Black Bittern (SW pop.)	P2 Bp LC								X
Ixobrychus minutus	Australian Little Bittern	P4 Bp LC								
Nycticorax caledonicus	Rufous Night Heron	Bp LC								X
Threskiornithidae Iibises, Spoonbills										
Platalea flavipes	Yellow-billed Spoonbill	LC								
Threskiornis molucca	Australian White Ibis	LC					X			
Threskiornis spinicollis	Straw-necked Ibis	LC					X			X

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Accipitridae Kites, Goshawks, Eagles, Harriers										
Accipiter cirrocephalus	Collared Sparrowhawk	LC								X
Accipiter fasciatus	Brown Goshawk	LC								X
Aquila audax	Wedge-tailed Eagle	LC								X
Aquila morphnoides	Little Eagle	LC			X					
Circus approximans	Swamp Harrier	LC								X
Elanus caeruleus	Black-shouldered Kite	LC					X			
Haliastur sphenurus	Whistling Kite	LC				X		X		X
Hamirostra isura	Square-tailed Kite	LC			X					X
Pandion cristatus	Eastern Osprey	S5 Mig LC	X							X
Falconidae Falcons										
Falco berigora	Brown Falcon	LC				X		X		X
Falco cenchroides	Australian Kestrel	LC				X	X	X		X
Falco longipennis	Australian Hobby	LC					X			X
Falco peregrinus	Peregrine Falcon	S7 LC								X

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Rallidae Rails, Crakes, Swamphens, Coots										
Fulica atra	Eurasian Coot	LC	X							X
Gallinula tenebrosa	Dusky Moorhen	Bh LC								
Gallirallus philippensis	Buff-banded Rail	LC								
Porphyrio porphyrio	Purple Swamphen	LC								X
Porzana fluminea	Australian Spotted Crake	LC								
Porzana pusilla	Baillon`s Crake	LC								
Porzana tabuensis	Spotless Crake	LC								X
Turnicidae Button-quails										
Turnix varia	Painted Button-quail	LC			X					
Laridae Gulls, Terns										
Larus novaehollandiae	Silver Gull	LC			X	X				X

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Columbidae Pigeons, Doves										
Columba livia	Domestic Pigeon	Introduced								X
Ocyphaps lophotes	Crested Pigeon	LC								X
Phaps chalcoptera	Common Bronzewing	LC		X	X			X		X
Phaps elegans	Brush Bronzewing	LC		X	X	X		X		X
Streptopelia senegalensis	Laughing Turtle-Dove	Introduced								
Cacatuidae Cockatoos, Corellas										
Cacatua sanguinea gymnopis	Little Corella	Introduced					X			X
Cacatua tenuirostris	Eastern Long-billed Corella	Introduced								
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	S3 VU	X				X			X
Calyptorhynchus baudinii	Baudin`s Black Cockatoo	S2 EN EN	X	X	X	X	X	X		X
Calyptorhynchus latirostris	Carnaby`s Black Cockatoo	S2 EN EN	X							X
Eolophus roseicapilla	Galah	LC		X			X			

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Psittacidae Parrots										
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	LC					X			
Neophema elegans	Elegant Parrot	LC			X	X				X
Neophema petrophila	Rock Parrot	Bh LC						X		X
Platycercus icterotis icterotis	Western Rosella (Western ssp)	LC		X	X	X	X	X		
Platycercus spurius	Red-capped Parrot	LC			X	X	X			X
Platycercus zonarius	Australian Ringneck Parrot	LC	X	X	X	X	X	X		X
Polytelis anthopeplus	Regent Parrot	LC								X
Cuculidae Parasitic Cuckoos										
Cacomantis flabelliformis	Fan-tailed Cuckoo	LC		X	X		X	X		X
Chrysococcyx basalis	Horsfield`s Bronze Cuckoo	LC			X			X		
Chrysococcyx lucidus	Shining Bronze Cuckoo	LC			X					X
Cuculus pallidus	Pallid Cuckoo	LC								
Strigidae Hawk Owls										
Ninox novaeseelandiae	Boobook Owl	LC			X	X		X		

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Tytonidae Barn Owls										
Tyto alba	Barn Owl	LC						X		
Tyto n. novaehollandiae	Masked Owl (SW pop.)	P3								
Podargidae Frogmouths										
Podargus strigoides	Tawny Frogmouth	LC		X		X		X		X
Caprimulgidae Nightjars										
Eurostopodus argus	Spotted Nightjar	LC								
Aegothelidae Owlet-nightjars										
Aegotheles cristatus	Australian Owlet-nightjar	LC								X
Halcyonidae Tree Kingfishers										
Dacelo novaeguineae	Laughing Kookaburra	Introduced		X	X	X	X	X		X
Todiramphus sanctus	Sacred Kingfisher	LC						X		X
Meropidae Bee-eaters										
Merops ornatus	Rainbow Bee-eater	JA LC			X		X			X

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Maluridae Fairy Wrens, GrassWrens										
Malurus elegans	Red-winged Fairy-wren	LC					X	X		X
Malurus splendens	Splendid Fairy-wren	LC		X	X	X	X	X		X
Stipiturus malachurus	Southern Emu-wren	Bh LC			X	X		X		X
Pardalotidae Pardalotes, Bristlebirds, Scrubwrens, Gerygones, Thornbills										
Acanthiza apicalis	Broad-tailed Thornbill	LC		X	X	X	X	X		X
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	LC		X			X			X
Acanthiza inornata	Western Thornbill	LC				X				X
Gerygone fusca	Western Gerygone	LC			X		X			X
Pardalotus punctatus	Spotted Pardalote	LC								X
Pardalotus striatus	Striated Pardalote	LC					X			X
Sericornis maculatus	Spotted Scrubwren	LC		X	X	X	X	X		X
Smicrornis brevirostris	Weebill	LC					X			X

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Meliphagidae Honeyeaters, Chats										
Acanthorhynchus superciliosus	Western Spinebill	LC				X				X
Anthochaera carunculata	Red Wattlebird	LC	X	X	X	X	X	X		X
Anthochaera lunulata	Western Little Wattlebird	LC								X
Lichenostomus virescens	Singing Honeyeater	LC				X				
Lichmera indistincta	Brown Honeyeater	LC				X				X
Melithreptus chloropsis	Gilbert's Honeyeater	LC						X		X
Phylidonyris nigra	White-cheeked Honeyeater	LC								
Phylidonyris novaehollandiae	New Holland Honeyeater	LC			X	X		X		X
Petroicidae Australian Robins										
Eopsaltria australis	Western Yellow Robin	LC					X			X
Eopsaltria georgiana	White-breasted Robin	LC		X	X	X	X	X		X
Petroica multicolor	Scarlet Robin	LC				X	X	X		
Neosittidae Sitellas										
Daphoenositta chrysoptera	Varied Sittella	LC					X			X

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Class **Family** *Species*	Common Name	Conservation Status	Harewood ('19) Wallcliffe	Harewood ('17) Gracetown	Harewood ('09) Gracetown	ATA/ecologia ('01/06) Smith's Beach	ENV ('07) Busselton to Margaret River	Christensen ('85) Boranup	How ('87) ~7km NW Margaret River	DBCA ('19) Nature Map
Pachycephalidae Crested Shrike-tit, Crested Bellbird, Shrike Thrushes, Whistlers										
Colluricincla harmonica	Grey Shrike-thrush	LC		X	X		X			X
Falcunculus frontatus	Western Shrike-tit	LC								X
Pachycephala occidentalis	Western Whistler	LC		X	X	X	X	X		
Pachycephala rufiventris	Rufous Whistler	LC		X				X		X
Dicruridae Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo										
Grallina cyanoleuca	Magpie-lark	LC		X			X	X		X
Myiagra inquieta	Restless Flycatcher	Bh LC						X		X
Rhipidura fuliginosa	Grey Fantail	LC		X	X	X	X	X		
Rhipidura leucophrys	Willie Wagtail	LC		X	X	X	X	X		X
Campephagidae Cuckoo-shrikes, Trillers										
Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC			X	X	X	X		X
Lalage sueurii	White-winged Triller	LC								

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Artamidae Woodswallows, Butcherbirds, Currawongs										
Artamus cinereus	Black-faced Woodswallow	LC					X			X
Artamus cyanopterus	Dusky Woodswallow	LC			X			X		X
Cracticus tibicen	Australian Magpie	LC		X	X	X	X	X		X
Cracticus torquatus	Grey Butcherbird	LC		X		X	X			X
Strepera versicolor	Grey Currawong	LC						X		X
Corvidae Ravens, Crows										
Corvus coronoides	Australian Raven	LC	X	X	X	X	X	X		X
Motacillidae Old World Pipits, Wagtails										
Anthus novaeseelandiae	Australian Pipit	LC			X		X	X		
Passeridae Grass Finches, Mannikins, Sparrows										
Stagonopleura oculata	Red-eared Firetail	LC								X
Dicaeidae Flowerpeckers										
Dicaeum hirundinaceum	Mistletoebird	LC								

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Hirundinidae Swallows, Martins										
Hirundo neoxena	Welcome Swallow	LC		X	X	X	X			X
Hirundo nigricans	Tree Martin	LC					X			
Sylviidae Old World Warblers										
Cincloramphus cruralis	Brown Songlark	LC								
Cincloramphus mathewsi	Rufous Songlark	LC								
Zosteropidae White-eyes										
Zosterops lateralis	Silvereye	LC		X	X	X	X	X		X

Mammals

Tachyglossidae Echidnas										
Tachyglossus aculeatus	Echidna	LC								
Dasyuridae Carnivorous Marsupials										
Antechinus flavipes	Yellow-footed Antechinus	LC								X
Phascogale tapoatafa wambenger	SW Brush-tailed Phascogale	S6								X
Sminthopsis griseoventer	Grey-bellied Dunnart	LC		X	X		X	X		

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Peramelidae Bandicoots										
Isoodon fusciventer	Quenda	P4 LC		X	X		X	X		X
Phalangeridae Brushtail Possums, Cuscuses										
Trichosurus vulpecula	Common Brushtail Possum	LC	X	X		X	X	X		X
Burramyidae Pygmy Possums										
Cercartetus concinnus	Western Pygmy-possum	LC				X				X
Tarsipedidae Honey Possum										
Tarsipes rostratus	Honey Possum	LC			X	X				X
Pseudocheiridae Ringtail Posssums										
Pseudocheirus occidentalis	Western Ringtail Possum	S1 CR CR	X	X	X	X				X
Macropodidae Kangaroos, Wallabies										
Macropus fuliginosus	Western Grey Kangaroo	LC	X	X	X	X	X	X		X
Molossidae Freetail Bats										
Austronomus australis	White-striped Freetail-bat	LC				X	X			
Ozimops kitcheneri	Western Freetail Bat	LC				X	X			

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Vespertilionidae Ordinary Bats										
Chalinolobus gouldii	Gould`s Wattled Bat	LC				X	X	X		X
Chalinolobus morio	Chocolate Wattled Bat	LC			X	X	X		X	X
Falsistrellus mackenziei	Western False Pipistrelle	P4 NT			X		X	X		X
Nyctophilus geoffroyi	Lesser Long-eared Bat	LC			X		X			X
Nyctophilus gouldi	Gould`s Long-eared Bat	LC								
Nyctophilus major major	Western Long-eared Bat	DD					X			
Vespadelus regulus	Southern Forest Bat	LC			X	X	X	X		X
Muridae Rats, Mice										
Hydromys chrysogaster	Water Rat	P4 LC					X			X
Mus musculus	House Mouse	Introduced			X	X		X		
Rattus fuscipes	Western Bush Rat	LC		X	X	X	X	X	X	X
Rattus rattus	Black Rat	Introduced		X			X	X		X
Canidae Dogs, Foxes										
Canis lupus	Dog	Introduced			X	X				
Vulpes vulpes	Red Fox	Introduced		X		X	X	X		X

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Felidae Cats										
Felis catus	Cat	Introduced		X	X	X		X		X
Leporidae Rabbits, Hares										
Oryctolagus cuniculus	Rabbit	Introduced		X	X	X	X	X		

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APPENDIX C

DBCA & EPBC DATABASE SEARCH RESULTS

NatureMap
Mapping Western Australia's biodiversity

NatureMap - Wallcliffe House

Created By Greg Harewood on 15/04/2019

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 114° 59' 43" E,33° 58' 16" S
Buffer 20km
Group By Species Group

Species Group	Species	Records
Amphibian	11	416
Bird	151	7603
Fish	46	94
Invertebrate	215	1934
Mammal	44	917
Reptile	37	275
TOTAL	**504**	**11239**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amphibian					
1.	25398	*Crinia georgiana (Quacking Frog)*			
2.	25399	*Crinia glauerti (Clicking Frog)*			
3.	25401	*Crinia pseudinsignifera (Bleating Froglet)*			
4.	25403	*Geocrinia alba (White-bellied Frog)*		T	
5.	25404	*Geocrinia leai (Ticking Frog)*			
6.	25410	*Heleioporus eyrei (Moaning Frog)*			
7.	25411	*Heleioporus inornatus (Whooping Frog)*			
8.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
9.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
10.	25388	*Litoria moorei (Motorbike Frog)*			
11.	25419	*Metacrinia nichollsi (Forest Toadlet)*			
Bird					
12.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
13.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
14.	24262	*Acanthiza inornata (Western Thornbill)*			
15.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
16.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
17.	24281	*Accipiter cirrocephalus subsp. cirrocephalus (Collared Sparrowhawk)*			
18.	25536	*Accipiter fasciatus (Brown Goshawk)*			
19.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
20.	25544	*Aegotheles cristatus (Australian Owlet-nightjar)*			
21.	24301	*Aegotheles cristatus subsp. cristatus (Australian Owlet-nightjar)*			
22.	24312	*Anas gracilis (Grey Teal)*			
23.	24313	*Anas platyrhynchos (Mallard)*			
24.	24316	*Anas superciliosa (Pacific Black Duck)*			
25.	47414	*Anhinga novaehollandiae (Australasian Darter)*			
26.	24561	*Anthochaera carunculata (Red Wattlebird)*			
27.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
28.	24599	*Anthus australis subsp. australis (Australian Pipit)*			
29.	24285	*Aquila audax (Wedge-tailed Eagle)*			
30.	41326	*Ardenna carneipes (Flesh-footed Shearwater, Fleshy-footed Shearwater)*		T	
31.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
32.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
33.	24358	*Atrichornis clamosus (Noisy Scrub-bird, tjimiluk)*		T	
34.		*Barnardius zonarius*			
35.	24319	*Biziura lobata (Musk Duck)*			
36.	24359	*Burhinus grallarius (Bush Stone-curlew)*			
37.	25713	*Cacatua galerita (Sulphur-crested Cockatoo)*			
38.	24723	*Cacatua pastinator subsp. butleri (Butler's Corella)*			
39.	25716	*Cacatua sanguinea (Little Corella)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
40.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
41.	24427	*Cacomantis flabelliformis subsp. flabelliformis (Fan-tailed Cuckoo)*			
42.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
43.	24780	*Calidris alba (Sanderling)*		IA	
44.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
45.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
46.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
47.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
48.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
49.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
50.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		T	
51.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
52.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
53.		*Chroicocephalus novaehollandiae*			
54.	24432	*Chrysococcyx lucidus subsp. plagosus (Shining Bronze Cuckoo)*			
55.	24288	*Circus approximans (Swamp Harrier)*			
56.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
57.	24399	*Columba livia (Domestic Pigeon)*	Y		
58.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
59.	25592	*Corvus coronoides (Australian Raven)*			
60.	24417	*Corvus coronoides subsp. perplexus (Australian Raven)*			
61.	25595	*Cracticus tibicen (Australian Magpie)*			
62.	25596	*Cracticus torquatus (Grey Butcherbird)*			
63.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
64.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
65.	24439	*Dasyornis broadbenti subsp. litoralis (Rufous Bristlebird, Rufous Bristlebird (SW WA))*		□	
66.	24470	*Dromaius novaehollandiae (Emu)*			
67.		*Egretta novaehollandiae*			
68.		*Elanus axillaris*			
69.	47937	*Elseyornis melanops (Black-fronted Dotterel)*			
70.		*Eolophus roseicapillus*			
71.	24651	*Eopsaltria australis subsp. griseogularis (Western Yellow Robin)*			
72.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
73.	24567	*Epthianura albifrons (White-fronted Chat)*			
74.	25744	*Eudyptes chrysocome (Rockhopper Penguin)*			
75.	25621	*Falco berigora (Brown Falcon)*			
76.	24471	*Falco berigora subsp. berigora (Brown Falcon)*			
77.	25622	*Falco cenchroides (Australian Kestrel, Nankeen Kestrel)*			
78.	25623	*Falco longipennis (Australian Hobby)*			
79.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
80.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
81.	25677	*Falcunculus frontatus (Crested Shrike-tit)*			
82.	25727	*Fulica atra (Eurasian Coot)*			
83.	25530	*Gerygone fusca (Western Gerygone)*			
84.	24443	*Grallina cyanoleuca (Magpie-lark)*			
85.	25627	*Haematopus fuliginosus (Sooty Oystercatcher)*			
86.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
87.	24295	*Haliastur sphenurus (Whistling Kite)*			
88.	24296	*Hamirostra isura (Square-tailed Kite)*			
89.	47965	*Hieraaetus morphnoides (Little Eagle)*			
90.	24491	*Hirundo neoxena (Welcome Swallow)*			
91.	48587	*Hydroprogne caspia (Caspian Tern)*		IA	
92.	25562	*Ixobrychus flavicollis (Black Bittern)*			
93.	24511	*Larus novaehollandiae subsp. novaehollandiae (Silver Gull)*			
94.	25638	*Larus pacificus (Pacific Gull)*			
95.	24557	*Leipoa ocellata (Malleefowl)*		T	
96.	25661	*Lichmera indistincta (Brown Honeyeater)*			
97.	24582	*Lichmera indistincta subsp. indistincta (Brown Honeyeater)*			
98.		*Lophoictinia isura*			
99.	25650	*Malurus elegans (Red-winged Fairy-wren)*			
100.	25654	*Malurus splendens (Splendid Fairy-wren)*			
101.	25663	*Melithreptus brevirostris (Brown-headed Honeyeater)*			
102.	24587	*Melithreptus chloropsis (Western White-naped Honeyeater)*			
103.	24598	*Merops ornatus (Rainbow Bee-eater)*			
104.		*Microcarbo melanoleucos*			
105.	48008	*Morus serrator (Australasian Gannet)*			
106.	25610	*Myiagra inquieta (Restless Flycatcher)*			
107.	24738	*Neophema elegans (Elegant Parrot)*			

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108.	24739	*Neophema petrophila (Rock Parrot)*			
109.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
110.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
111.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
112.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
113.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
114.	25682	*Pardalotus striatus (Striated Pardalote)*			
115.	24630	*Pardalotus striatus subsp. westraliensis (Striated Pardalote)*			
116.	24674	*Pavo cristatus (Common Peafowl, Indian Peafowl)*	Y		
117.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
118.	48061	*Petrochelidon nigricans (Tree Martin)*			
119.	48066	*Petroica boodang (Scarlet Robin)*			
120.	25697	*Phalacrocorax carbo (Great Cormorant)*			
121.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
122.	25699	*Phalacrocorax varius (Pied Cormorant)*			
123.	24409	*Phaps chalcoptera (Common Bronzewing)*			
124.	25587	*Phaps elegans (Brush Bronzewing)*			
125.	48071	*Phylidonyris niger (White-cheeked Honeyeater)*			
126.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
127.	25720	*Platycercus icterotis (Western Rosella)*			
128.	24745	*Platycercus icterotis subsp. icterotis (Western Rosella)*			
129.	24747	*Platycercus spurius (Red-capped Parrot)*			
130.	24750	*Platycercus zonarius subsp. semitorquatus (Twenty-eight Parrot)*			
131.	25703	*Podargus strigoides (Tawny Frogmouth)*			
132.	25722	*Polytelis anthopeplus (Regent Parrot)*			
133.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
134.	24771	*Porzana tabuensis (Spotless Crake)*			
135.	25579	*Psophodes nigrogularis (Western Whipbird)*		T	
136.	24388	*Psophodes nigrogularis subsp. nigrogularis (Western Whipbird (western heath))*		T	
137.	24711	*Puffinus assimilis subsp. assimilis (Little Shearwater)*			
138.		*Purpureicephalus spurius*			
139.	48096	*Rhipidura albiscapa (Grey Fantail)*			
140.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
141.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
142.	24279	*Sericornis frontalis subsp. maculatus (White-browed Scrubwren)*			
143.	30948	*Smicrornis brevirostris (Weebill)*			
144.	24645	*Stagonopleura oculata (Red-eared Firetail)*			
145.	24522	*Sterna bergii (Crested Tern)*			
146.	25655	*Stipiturus malachurus (Southern Emu-wren)*			
147.	24554	*Stipiturus malachurus subsp. westernensis (Southern Emu-wren)*			
148.	25597	*Strepera versicolor (Grey Currawong)*			
149.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
150.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
151.	34135	*Thalassarche cauta (Shy Albatross)*		T	
152.	34007	*Thalassarche chlororhynchos (Atlantic Yellow-nosed Albatross)*		T	
153.	44607	*Thalassarche melanophris (Black-browed Albatross)*		T	
154.	48597	*Thalasseus bergii (Crested Tern)*		IA	
155.	48135	*Thinornis rubricollis (Hooded Plover, Hooded Dotterel)*		P4	
156.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
157.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
158.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
159.	48147	*Turnix varius (Painted Button-quail)*			
160.	25764	*Tyto novaehollandiae (Masked Owl)*			
161.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
162.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			

□ish

163.		*? ?*
164.		*Acanthaluteres vittiger*
165.		*Acanthistius pardalotus*
166.		*Aetapcus maculatus*
167.		*Afurcagobius suppositus*
168.		*Alabes brevis*
169.		*Aracana aurita*
170.		*Arripis georgiana*
171.		*Arripis truttacea*
172.		*Atherinosoma wallacei*
173.		*Carassius auratus*
174.		*Coris auricularis*
175.		*Cristiceps australis*
176.		*Dactylophora nigricans*

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
177.		*Edelia vittata*			
178.	34028	*Galaxias occidentalis (Western Minnow)*			
179.	34026	*Galaxiella munda (mud minnow, western dwarf galaxias)*		T	
180.	34030	*Geotria australis (Pouched Lamprey)*		P3	
181.		*Halichoeres brownfieldi*			
182.		*Helcogramma decurrens*			
183.		*Heteroclinus sp.*			
184.		*Heterodontus portusjacksoni*			
185.		*Hippocampus sp.*			
186.		*Histiophryne cryptacanthus*			
187.		*Lepidoblennius marmoratus*			
188.		*Lepidoperca occidentalis*			
189.		*Lissocampus runa*			
190.		*Meuschenia flavolineata*			
191.		*Meuschenia galii*			
192.		*Meuschenia hippocrepis*			
193.	34033	*Nannatherina balstoni (Balston's Pygmy Perch)*		T	
194.		*Nannoperca vittata*			
195.		*Naucrates ductor*			
196.		*Neopataecus waterhousii*			
197.		*Odax acroptilus*			
198.		*Oplegnathus woodwardi*			
199.		*Pelsartia humeralis*			
200.		*Pictilabrus laticlavius*			
201.		*Platycephalus sp.*			
202.		*Plectranthias alleni*			
203.		*Pseudogobius olorum*			
204.		*Pseudolabrus sp.*			
205.		*Pterygotrigla polyommata*			
206.		*Schuettea woodwardi*			
207.		*Scobinichthys granulatus*			
208.		*Siphonognathus beddomei*			
Invertebrate					
209.		*Acariformes sp.*			
210.		*Acritoptila globosa*			
211.		*Aeshnidae sp.*			
212.		*Akamptogonus novarae*			
213.		*Akamptogonus novarae?*			Y
214.		*Allothereua maculata*			
215.		*Alotanypus dalyupensis*			
216.		*Amphisopodidae sp.*			
217.		*Aname mainae*			
218.		*Aname tepperi*			
219.		*Ancylidae sp.*			
220.		*Arachnura higginsi*			
221.		*Araneus cyphoxis*			
222.		*Araneus eburneiventris*			
223.		*Araneus eburnus*			
224.		*Araneus senicaudatus*			
225.		*Archaeosynthemis leachii*			
226.		*Archaeosynthemis occidentalis*			
227.		*Archaeosynthemis spiniger*			
228.		*Archichauliodes sp.*			
229.		*Argiope trifasciata*			
230.		*Arkys walckenaeri*			
231.		*Arrenuridae sp.*			
232.		*Artoria cingulipes*			
233.		*Artoria flavimana*			
234.		*Artoria linnaei*			
235.		*Artoria taeniifera*			
236.		*Asadipus kunderang*			
237.		*Athericidae sp.*			
238.		*Aturidae sp.*			
239.		*Austracantha minax*			
240.		*Australomimetus diabolicus*			
241.		*Australomimetus tasmaniensis*			
242.		*Austroaeschna anacantha*			
243.	34110	*Austroassiminea letha (Cape Leeuwin Freshwater Snail)*		T	
244.		*Austrochiltonia sp.*			
245.		*Badumna microps*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
246.		*Baetidae sp.*			
247.		*Baiami tegenarioides*			
248.		*Baiami volucripes*			
249.		*Ballarra longipalpus*			
250.	47873	*Bertmainius opimus (western pygmy trapdoor spider)*		P3	
251.		*Bibulmena kadjina*			
252.		*Bithyniidae sp.*			
253.		*Botryocladius freemani*			
254.		*Caenidae sp.*			
255.		*Calymmachernes angulatus*			
256.		*Carabidae sp.*			
257.		*Ceratopogonidae sp.*			
258.		*Cercophonius granulosus*			
259.		*Cercophonius sulcatus*			
260.		*Chaussieria warregense*			
261.	33939	*Cherax cainii (Marron)*			
262.		*Cherax crassimanus*			
263.		*Cherax destructor*			
264.		*Cherax quinquecarinatus*			
265.	33940	*Cherax tenuimanus (Margaret River hairy marron, Margaret River Marron)*		T	
266.		*Chironominae sp.*			
267.		*Chironomus aff. alternans (V24) (CB)*			
268.		*Chironomus tepperi*			
269.		*Cladocera (non-daphniidae)*			
270.		*Cladocera (unident.)*			
271.		*Coenagrionidae sp.*			
272.		*Conicochernes crassus*			
273.		*Copepoda sp.*			
274.		*Corduliidae sp.*			
275.		*Corixidae sp.*			
276.		*Cormocephalus aurantiipes*			
277.		*Cormocephalus hartmeyeri*			
278.		*Cormocephalus strigosus*			
279.		*Corydalidae sp.*			
280.		*Cricotopus 'parbicinctus'*			
281.		*Crustulina bicruciata*			
282.		*Culicidae sp.*			
283.		*Curculionidae sp.*			
284.		*Cyclosa trilobata*			
285.		*Dicrotendipes sp. A (V47) (SAP)*			
286.		*Dugesiidae sp.*			
287.		*Dytiscidae sp.*			
288.		*Emertonella maga*			
289.		*Empididae sp.*			
290.		*Enchytraeidae sp.*			
291.	33945	*Engaewa pseudoreducta (Margaret River Burrowing Crayfish)*		T	
292.		*Eodelena lapidicola*			
293.		*Ephydridae sp.*			
294.		*Eriophora biapicata*			
295.		*Geogarypus taylori*			
296.		*Glossiphoniidae sp.*			
297.		*Gripopterygidae sp.*			
298.		*Gyrinidae sp.*			
299.		*Harrisius sp. B (SFM)*			
300.		*Hemicorduliidae sp.*			
301.		*Henicops dentatus*			
302.		*Holasteron aspinosum*			
303.		*Hydraenidae sp.*			
304.		*Hydrobiosidae sp.*			
305.		*Hydrometridae sp.*			
306.		*Hydrophilidae sp.*			
307.		*Hydropsychidae sp.*			
308.		*Hydroptilidae sp.*			
309.		*Hyriidae sp.*			
310.		*Isopeda leishmanni*			
311.		*Ixodes australiensis*			
312.		*Karaops ellenae*			
313.	33980	*Kawaniphila pachomai (Grey Vernal Katydid (southwest), cricket)*		P1	
314.		*Kiefferulus intertinctus*			
315.		*Lagynochthonius australicus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
316.		*Lampona brevipes*			
317.		*Lampona cylindrata*			
318.		*Lamponella ainslie*			
319.		*Latrodectus hasseltii*			
320.		*Lectrides parilis*			
321.		*Lepidoptera (non-pyralid)*			
322.		*Leptoceridae sp.*			
323.		*Leptoperla australica*			
324.		*Leptophlebiid genus S sp. AV1*			
325.		*Leptophlebiidae sp.*			
326.		*Libellulidae sp.*			
327.		*Lycosa gilberta*			
328.		*Lymnaeidae sp.*			
329.		*Maratus pavonis*			
330.		*Megaloptera sp.*			
331.		*Megapodagrionidae sp.*			
332.		*Mesoveliidae sp.*			
333.		*Microvelia (Austromicrovelia) australiensis*			
334.		*Microvelia sp.*			
335.		*Missulena granulosa*			
336.		*Mituliodon tarantulinus*			
337.		*Naididae sp.*			
338.		*Neboissophlebia occidentalis*			
339.		*Nematoda sp.*			
340.		*Newmanoperla exigua*			
341.		*Notalina sp.*			
342.		*Notalina sp. AV15 (PSW)*			
343.		*Notonectidae sp.*			
344.		*Notoperata tenax*			
345.		*Nousia sp. AV16*			
346.		*Nunciella aspera*			
347.		*Nyungara bunni*			
348.		*Ochthebius sp.*			
349.		*Oligochaeta sp.*			
350.		*Oniscidae sp.*			
351.		*Orthocladiinae 'woodminer' (SAP)*			
352.		*Orthocladiinae sp.*			
353.		*Ostracoda (unident.)*			
354.		*Oxidae sp.*			
355.		*Oxyopes gracilipes*			
356.		*Palaemonidae sp.*			
357.		*Paralimnophyes pullulus (V42)*			
358.		*Paramerina levidensis*			
359.		*Parastacidae sp.*			
360.		*Pentasteron intermedium*			
361.		*Perthiidae sp.*			
362.		*Pholcus phalangioides*			
363.		*Phreatoicidae sp.*			
364.		*Phreodrilidae sp.*			
365.		*Physidae sp.*			
366.		*Pinkfloydia harveii*			
367.		*Planorbidae sp.*			
368.		*Polypedilum nr. convexum (SAP)*			
369.		*Polypedilum watsoni*			
370.		*Prionosternum nitidiceps*			
371.		*Protochelifer cavernarum*			
372.		*Pseudotyrannochthonius giganteus*			
373.		*Pyralidae sp.*			
374.		*Raveniella peckorum*			
375.		*Rheotanytarsus sp. (SFM)*			
376.		*Rheotanytarsus trivittatus*			
377.		*Rheotanytarsus underwoodi*			
378.		*Richardsonianidae sp.*			
379.		*Riekoperla occidentalis*			
380.		*Riethia v4*			
381.		*Sciomyzidae sp.*			
382.		*Scirtidae sp.*			
383.		*Scolopendra laeta*			
384.		*Servaea spinibarbis*			
385.		*Simaetha tenuior*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
386.		*Simuliidae sp.*			
387.		*Siphonotus flavomarginatus*			
388.		*Skusella/"V12 ex-WA" (Cranston)*			
389.		*Sphaeriidae sp.*			
390.		*Spinicrus minimus*			
391.		*Spinicrus porongorupensis*			
392.		*Staphylinidae sp.*			
393.		*Steatoda grossa*			
394.		*Sternopriscus sp.*			
395.		*Storena formosa*			
396.		*Storosa tetrica*			
397.		*Stratiomyidae sp.*			
398.		*Styloniscidae sp.*			
399.		*Supunna picta*			
400.		*Synthemistidae sp.*			
401.		*Tabanidae sp.*			
402.		*Talitridae sp.*			
403.		*Tamopsis perthensis*			
404.		*Tanypodinae sp.*			
405.		*Tanytarsus aff manleyensis*			
406.		*Tanytarsus nr K5*			
407.		*Tanytarsus palmatus*			
408.		*Taphiassa robertsi*			
409.		*Tasmanicosa leuckartii*			
410.		*Tasmanocoenis tillyardi*			
411.		*Telephlebiidae sp.*			
412.		*Temnocephalidea sp.*			
413.		*Thaumaleidae sp.*			
414.		*Thienemanniella sp. (V19) (SAP)*			
415.		*Tipulidae sp.*			
416.		*Trachytrema castaneum*			
417.	33995	*Trichosternus relictus (a ground beetle (Margaret River), beetle)*		P3	Y
418.		*Triplectides sp. AV1 (SFM)*			
419.		*Triplectides sp. AV21 (SFM)*			
420.		*Urodacus novaehollandiae*			
421.		*Veliidae sp.*			
422.		*Venator immansueta*			
423.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
Mammal					
424.	24088	*Antechinus flavipes subsp. leucogaster (Yellow-footed Antechinus, Mardo)*			
425.	24209	*Arctocephalus tropicalis (Subantarctic fur-seal)*		T	
426.	24049	*Balaenoptera musculus subsp. intermedia (Antarctic Blue Whale)*		T	
427.	24161	*Bettongia lesueur subsp. graii (Boodie (inland), Burrowing Bettong (inland))*		□	
428.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
429.		*Capreolus capreolus*			Y
430.	24086	*Cercartetus concinnus (Western Pygmy-possum, Mundarda)*			
431.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
432.	24187	*Chalinolobus morio (Chocolate Wattled Bat)*			
433.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
434.	24258	*Equus caballus (Horse)*	Y		
435.	24189	*Falsistrellus mackenziei (Western False Pipistrelle, Western Falsistrelle)*		P4	
436.	24041	*Felis catus (Cat)*	Y		
437.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
438.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
439.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
440.	24168	*Macrotis lagotis (Bilby, Dalgyte, Ninu)*		T	
441.	24078	*Mesoplodon grayi (Gray's Beaked Whale)*			
442.	24213	*Mirounga leonina (Southern Elephant Seal)*			
443.	24146	*Myrmecobius fasciatus (Numbat, Walpurti)*		T	
444.	48024	*Notamacropus eugenii subsp. derbianus (Tammar Wallaby, Tammar)*		P4	
445.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
446.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
447.	24142	*Petrogale lateralis subsp. lateralis (Black-flanked Rock-wallaby, Black-footed Rock-wallaby)*		T	
448.	48401	*Petrogale sp. (rock wallaby)*		T	
449.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	
450.	24073	*Physeter macrocephalus (Sperm Whale)*		T	
451.	24163	*Potorous gilbertii (Gilbert's Potoroo)*		T	
452.	24164	*Potorous platyops (Broad-faced Potoroo)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
				□	
453.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
454.	24236	*Pseudomys fieldi (Shark Bay Mouse, Djoongari)*		T	
455.	24241	*Pseudomys shortridgei (Heath Mouse, Heath Rat, Dayang)*		T	
456.	24243	*Rattus fuscipes (Western Bush Rat)*			
457.	24245	*Rattus rattus (Black Rat)*	Y		
458.	24145	*Setonix brachyurus (Quokka)*		T	
459.	24109	*Sminthopsis dolichura (Little long-tailed Dunnart)*			
460.	24111	*Sminthopsis gilberti (Gilbert's Dunnart)*			
461.	24259	*Sus scrofa (Pig)*	Y		
462.	24167	*Tarsipes rostratus (Honey Possum, Noolbenger)*			
463.	25521	*Trichosurus vulpecula (Common Brushtail Possum)*			
464.	24158	*Trichosurus vulpecula subsp. vulpecula (Common Brushtail Possum)*			
465.	24069	*Tursiops truncatus (Bottlenose Dolphin)*			
466.	24206	*Vespadelus regulus (Southern Forest Bat)*			
467.	24040	*Vulpes vulpes (Red Fox)*	Y		
Reptile					
468.	42368	*Acritoscincus trilineatus (Western Three-lined Skink)*			
469.	24990	*Aprasia pulchella (Granite Worm-lizard)*			
470.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
471.	43380	*Chelodina colliei (South-western Snake-necked Turtle)*			
472.	24980	*Christinus marmoratus (Marbled Gecko)*			
473.	30893	*Cryptoblepharus buchananii*			
474.	25031	*Ctenotus catenifer*			
475.	25047	*Ctenotus impar*			
476.	25049	*Ctenotus labillardieri*			
477.	25251	*Echiopsis curta (Bardick)*			
478.	25096	*Egernia kingii (King's Skink)*			
479.	25100	*Egernia napoleonis*			
480.	25250	*Elapognathus coronatus (Crowned Snake)*			
481.	30919	*Hemiergis gracilipes (skink)*			
482.	25118	*Hemiergis peronii subsp. tridactyla*			
483.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
484.	25131	*Lerista distinguenda*			
485.	25133	*Lerista elegans*			
486.	25154	*Lerista microtis subsp. microtis*			
487.	25155	*Lerista muelleri*			
488.	25005	*Lialis burtonis*			
489.	41416	*Liopholis pulchra subsp. pulchra (South-western Rock Skink, Spectacled Rock Skink)*			
490.	42413	*Lissolepis luctuosa (Western Swamp Skink)*			
491.	25184	*Menetia greyii*			
492.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*			
493.	25191	*Morethia lineoocellata*			
494.	25192	*Morethia obscura*			
495.	25252	*Notechis scutatus (Tiger Snake)*			
496.	25253	*Parasuta gouldii*			
497.	25255	*Parasuta nigriceps*			
498.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
499.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
500.	25008	*Pygopus lepidopodus (Common Scaly Foot)*			
501.	30818	*Rhinoplocephalus bicolor (Square-nosed Snake)*			
502.	25519	*Tiliqua rugosa*			
503.	25207	*Tiliqua rugosa subsp. rugosa*			
504.	25225	*Varanus rosenbergi (Heath Monitor)*			

Conservation Codes
T □Rare or likely to become e□tinct
□ □Presumed e□tinct
IA □Protected under international agreement
S □□ther specially protected fauna
1 □Priority 1
2 □Priority 2
3 □Priority 3
4 □Priority 4
5 □Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those □hose records are □holely contained □ithin the search area. Note that only those records complying □ith the search criterion are included in the calculation. For e□ample, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the □uery area.

EPBC Act Protected Matters Report

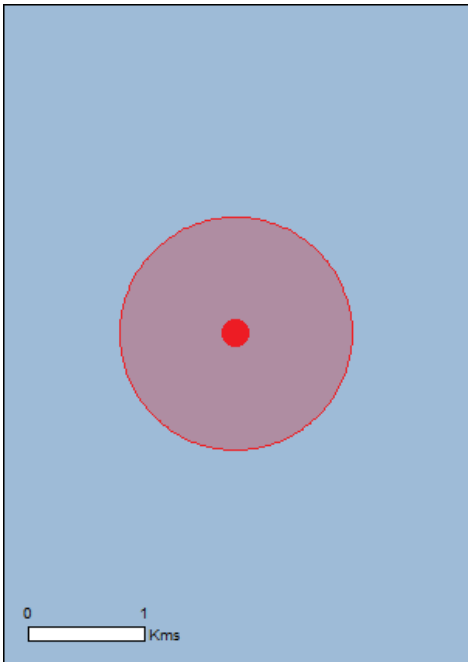
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and □ualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

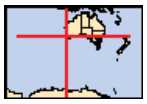
Report created□15□04□19 13□03□16

Summary
Details
Matters of NES
□ther Matters Protected by the EPBC Act
E□ta Information
Caveat
Ackno□ledgements



This map may contain data □hich are □Common□ealth of Australia □Geoscience Australia□, □PSMA 2010

Coordinates
Buffer□1.0□m



Summary

Matters of National Environmental 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, □hich can be accessed by scrolling or follo□ing the links belo□. 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 □eritage Properties□	None
National □eritage Places□	None
Wetlands of International Importance□	None
Great Barrier Reef Marine Park□	None
Common□ealth Marine Area□	None
□isted Threatened Ecological Communities□	None
□isted Threatened Species□	39
□isted Migratory Species□	39

□ther 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 re□uired for a proposed activity that significantly affects the environment on Common□ealth land, □hen the action is outside the Common□ealth land, or the environment any□here □hen the action is taken on Common□ealth land. Approval may also be re□uired for the Common□ealth or Common□ealth agencies proposing to take an action that is likely to have a significant impact on the environment any□here.

The EPBC Act protects the environment on Common□ealth land, the environment from the actions taken on Common□ealth land, and the environment from actions taken by Common□ealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Common□ealth □eritage values of a Common□ealth □eritage place. Information on the ne□ heritage la□s can be found at http□□□□□.environment.gov.au□heritage

A permit may be re□uired for activities in or on a Common□ealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, □hales and other cetaceans, or a member of a listed marine species.

Common□ealth □and□	None
Common□ealth □eritage Places□	None
□isted Marine Species□	60
Whales and □ther Cetaceans□	13
Critical □abitats□	None
Common□ealth Reserves Terrestrial□	None
Australian Marine Parks□	None

E□ta Information

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

State and Territory Reserves□	1
Regional Forest Agreements□	1
Invasive Species□	23
Nationally Important Wetlands□	None
□ey Ecological Features □Marine□	None

Details

Matters of National Environmental Significance

□isted Threatened Species		□Resource Information □
Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops Australian □esser Noddy □26000□	□ulnerable	Species or species habitat may occur □ithin area
Botaurus poiciloptilus Australasian Bittern □1001□	Endangered	Species or species habitat may occur □ithin area
Calidris canutus Red □not, □not □855□	Endangered	Species or species habitat may occur □ithin area
Calidris ferruginea Curle□ Sandpiper □856□	Critically Endangered	Species or species habitat may occur □ithin area
Calyptorhynchus banksii naso Forest Red□tailed Black□Cockatoo, □arrak □67034□	□ulnerable	Species or species habitat likely to occur □ithin area
Calyptorhynchus baudinii Baudin's Cockatoo, □ong□billed Black□Cockatoo □769□	Endangered	Breeding kno□n to occur □ithin area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short□billed Black□Cockatoo □59523□	Endangered	Species or species habitat kno□n to occur □ithin area
Diomedea amsterdamensis Amsterdam Albatross □64405□	Endangered	Species or species habitat may occur □ithin area
Diomedea dabbenena Tristan Albatross □66471□	Endangered	Species or species habitat may occur □ithin area
Diomedea epomophora Southern Royal Albatross □89221□	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Diomedea e□ulans Wandering Albatross □89223□	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Diomedea sanfordi Northern Royal Albatross □64456□	Endangered	Foraging, feeding or related behaviour likely to occur □ithin area
□imosa lapponica baueri Bar□tailed God□it □baueri□, Western Alaskan Bar□tailed God□it □86380□	□ulnerable	Species or species habitat may occur □ithin

Name	Status	Type of Presence
		area
□imosa lapponica men□bieri Northern Siberian Bar□tailed God□it, Bar□tailed God□it □me□bieri□[86432□]	Critically Endangered	Species or species habitat may occur □ithin area
Macronectes giganteus Southern Giant□Petrel, Southern Giant Petrel [1060□]	Endangered	Species or species habitat may occur □ithin area
Macronectes halli Northern Giant Petrel [1061□]	□ulnerable	Species or species habitat may occur □ithin area
Numenius madagascariensis Eastern Curle□, Far Eastern Curle□ [847□]	Critically Endangered	Species or species habitat may occur □ithin area
Pachyptila turtur subantarctica Fairy Prion □southern□[64445□]	□ulnerable	Species or species habitat kno□n to occur □ithin area
Sternula nereis nereis Australian Fairy Tern [82950□]	□ulnerable	Breeding likely to occur □ithin area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345□]	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Thalassarche cauta steadi White□capped Albatross [82344□]	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Thalassarche impavida Campbell Albatross, Campbell Black□bro□ed Albatross [64459□]	□ulnerable	Species or species habitat may occur □ithin area
Thalassarche melanophris Black□bro□ed Albatross [66472□]	□ulnerable	Species or species habitat may occur □ithin area
Mammals		
Balaenoptera musculus Blue Whale [36□]	Endangered	Species or species habitat likely to occur □ithin area
Bettongia penicillata ogilbyi Woylie [66844□]	Endangered	Species or species habitat may occur □ithin area
Dasyurus geoffroii Chuditch, Western □uoll [330□]	□ulnerable	Species or species habitat likely to occur □ithin area
Eubalaena australis Southern Right Whale [40□]	Endangered	Breeding kno□n to occur □ithin area
Megaptera novaeangliae □umpback Whale [38□]	□ulnerable	Congregation or aggregation kno□n to occur □ithin area
Neophoca cinerea Australian Sea□lion, Australian Sea □ion [22□]	□ulnerable	Species or species habitat may occur □ithin area
Pseudocheirus occidentalis Western Ringtail Possum, Ng□ayir, Womp, Woder, Ngoor, Ngoolangit [25911□]	Critically Endangered	Species or species habitat may occur □ithin area
Plants		
Drakaea micrantha D□arf □ammer□orchid [56755□]	□ulnerable	Species or species habitat may occur □ithin area

Name	Status	Type of Presence
Sphenotoma drummondii		
Mountain Paper□heath □21160□	Endangered	Species or species habitat may occur □ithin area
Reptiles		
Caretta caretta		
□oggerhead Turtle □1763□	Endangered	Breeding likely to occur □ithin area
Chelonia mydas		
Green Turtle □1765□	□ulnerable	Breeding likely to occur □ithin area
Dermochelys coriacea		
□eatherback Turtle, □eathery Turtle, □uth □1768□	Endangered	Breeding likely to occur □ithin area
Natator depressus		
Flatback Turtle □59257□	□ulnerable	Breeding likely to occur □ithin area
Sharks		
Carcharias taurus □□est coast population□		
Grey Nurse Shark □□est coast population□□68752□	□ulnerable	Species or species habitat kno□n to occur □ithin area
Carcharodon carcharias		
White Shark, Great White Shark □64470□	□ulnerable	Species or species habitat kno□n to occur □ithin area
Rhincodon typus		
Whale Shark □66680□	□ulnerable	Species or species habitat may occur □ithin area

□isted Migratory Species □Resource Information □

□Species is listed under a different scientific name on the EPBC Act □Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork□tailed S□ift □678□		Species or species habitat likely to occur □ithin area
Ardenna carneipes		
Flesh□footed Shear□ater, Fleshy□footed Shear□ater □82404□		Species or species habitat likely to occur □ithin area
Diomedea amsterdamensis		
Amsterdam Albatross □64405□	Endangered	Species or species habitat may occur □ithin area
Diomedea dabbenena		
Tristan Albatross □66471□	Endangered	Species or species habitat may occur □ithin area
Diomedea epomophora		
Southern Royal Albatross □89221□	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Diomedea e□ulans		
Wandering Albatross □89223□	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Diomedea sanfordi		
Northern Royal Albatross □64456□	Endangered	Foraging, feeding or related behaviour likely to occur □ithin area
□ydroprogne caspia		
Caspian Tern □808□		Foraging, feeding or related behaviour kno□n to occur □ithin area
Macronectes giganteus		
Southern Giant□Petrel, Southern Giant Petrel □1060□	Endangered	Species or species habitat may occur □ithin area

Name	Threatened	Type of Presence
Macronectes halli Northern Giant Petrel [1061]	[ulnerable	Species or species habitat may occur [ithin area
[nychoprion anaethetus Bridled Tern [82845]		Foraging, feeding or related behaviour likely to occur [ithin area
Thalassarche cauta Tasmanian Shy Albatross [89224]	[ulnerable[	Foraging, feeding or related behaviour likely to occur [ithin area
Thalassarche impavida Campbell Albatross, Campbell Black[bro[ed Albatross [64459]	[ulnerable	Species or species habitat may occur [ithin area
Thalassarche melanophris Black[bro[ed Albatross [66472]	[ulnerable	Species or species habitat may occur [ithin area
Thalassarche steadi White[capped Albatross [64462]	[ulnerable[	Foraging, feeding or related behaviour likely to occur [ithin area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered[	Breeding kno[n to occur [ithin area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur [ithin area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur [ithin area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur [ithin area
Carcharodon carcharias White Shark, Great White Shark [64470]	[ulnerable	Species or species habitat kno[n to occur [ithin area
Caretta caretta [oggerhead Turtle [1763]	Endangered	Breeding likely to occur [ithin area
Chelonia mydas Green Turtle [1765]	[ulnerable	Breeding likely to occur [ithin area
Dermochelys coriacea [eatherback Turtle, [eathery Turtle, [uth [1768]	Endangered	Breeding likely to occur [ithin area
[agenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur [ithin area
[amna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur [ithin area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur [ithin area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, [ceanic Manta Ray [84995]		Species or species habitat may occur [ithin area
Megaptera novaeangliae [umpback Whale [38]	[ulnerable	Congregation or aggregation kno[n to occur [ithin area

Name	Threatened	Type of Presence
Natator depressus		
Flatback Turtle [59257]	□ulnerable	Breeding likely to occur □ithin area
□rcinus orca		
□iller Whale, □rca [46]		Species or species habitat may occur □ithin area
Rhincodon typus		
Whale Shark [66680]	□ulnerable	Species or species habitat may occur □ithin area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat likely to occur □ithin area
Calidris acuminata		
Sharp□tailed Sandpiper [874]		Species or species habitat may occur □ithin area
Calidris canutus		
Red □not, □not [855]	Endangered	Species or species habitat may occur □ithin area
Calidris ferruginea		
Curle□ Sandpiper [856]	Critically Endangered	Species or species habitat may occur □ithin area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur □ithin area
□imosa lapponica		
Bar□tailed God□it [844]		Species or species habitat may occur □ithin area
Numenius madagascariensis		
Eastern Curle□, Far Eastern Curle□ [847]	Critically Endangered	Species or species habitat may occur □ithin area
Pandion haliaetus		
□sprey [952]		Breeding kno□n to occur □ithin area

□ther Matters Protected by the EPBC Act

□isted Marine Species — □Resource Information □

□Species is listed under a different scientific name on the EPBC Act □Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat likely to occur □ithin area
Anous tenuirostris melanops		
Australian □esser Noddy [26000]	□ulnerable	Species or species habitat may occur □ithin area
Apus pacificus		
Fork□tailed S□ift [678]		Species or species habitat likely to occur □ithin area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur □ithin area
Ardea ibis		
Cattle Egret [59542]		Species or species

Name	Threatened	Type of Presence
		habitat may occur □ithin area
Calidris acuminata Sharp□tailed Sandpiper □874□		Species or species habitat may occur □ithin area
Calidris canutus Red □not, □not □855□	Endangered	Species or species habitat may occur □ithin area
Calidris ferruginea Curle□ Sandpiper □856□	Critically Endangered	Species or species habitat may occur □ithin area
Calidris melanotos Pectoral Sandpiper □858□		Species or species habitat may occur □ithin area
Diomedea amsterdamensis Amsterdam Albatross □64405□	Endangered	Species or species habitat may occur □ithin area
Diomedea dabbenena Tristan Albatross □66471□	Endangered	Species or species habitat may occur □ithin area
Diomedea epomophora Southern Royal Albatross □89221□	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Diomedea e□ulans Wandering Albatross □89223□	□ulnerable	Foraging, feeding or related behaviour likely to occur □ithin area
Diomedea sanfordi Northern Royal Albatross □64456□	Endangered	Foraging, feeding or related behaviour likely to occur □ithin area
□aliaeetus leucogaster White□bellied Sea□Eagle □943□		Species or species habitat likely to occur □ithin area
□imosa lapponica Bar□tailed God□it □844□		Species or species habitat may occur □ithin area
Macronectes giganteus Southern Giant□Petrel, Southern Giant Petrel □1060□	Endangered	Species or species habitat may occur □ithin area
Macronectes halli Northern Giant Petrel □1061□	□ulnerable	Species or species habitat may occur □ithin area
Merops ornatus Rainbo□ Bee□eater □670□		Species or species habitat may occur □ithin area
Numenius madagascariensis Eastern Curle□, Far Eastern Curle□ □847□	Critically Endangered	Species or species habitat may occur □ithin area
Pachyptila turtur Fairy Prion □1066□		Species or species habitat kno□n to occur □ithin area
Pandion haliaetus □sprey □952□		Breeding kno□n to occur □ithin area
Puffinus assimilis □ittle Shear□ater □59363□		Foraging, feeding or related behaviour kno□n to occur □ithin area

Name	Threatened	Type of Presence
Puffinus carneipes Flesh□footed Shear□ater, Fleshy□footed Shear□ater □1043□		Species or species habitat likely to occur □ithin area
Sterna anaethetus Bridled Tern □814□		Foraging, feeding or related behaviour likely to occur □ithin area
Sterna caspia Caspian Tern □59467□		Foraging, feeding or related behaviour kno□n to occur □ithin area
Thalassarche cauta Tasmanian Shy Albatross □89224□	□ulnerable□	Foraging, feeding or related behaviour likely to occur □ithin area
Thalassarche impavida Campbell Albatross, Campbell Black□bro□ed Albatross □64459□	□ulnerable	Species or species habitat may occur □ithin area
Thalassarche melanophris Black□bro□ed Albatross □66472□	□ulnerable	Species or species habitat may occur □ithin area
Thalassarche steadi White□capped Albatross □64462□	□ulnerable□	Foraging, feeding or related behaviour likely to occur □ithin area
Thinornis rubricollis □ooded Plover □59510□		Species or species habitat kno□n to occur □ithin area
Fish		
Acentronura australe Southern Pygmy Pipehorse □66185□		Species or species habitat may occur □ithin area
Campichthys galei Gale's Pipefish □66191□		Species or species habitat may occur □ithin area
□eraldia nocturna □pside□do□n Pipefish, Eastern □pside□do□n Pipefish, Eastern □pside□do□n Pipefish □66227□		Species or species habitat may occur □ithin area
□ippocampus angustus Western Spiny Seahorse, Narro□□bellied Seahorse □66234□		Species or species habitat may occur □ithin area
□ippocampus breviceps Short□head Seahorse, Short□snouted Seahorse □66235□		Species or species habitat may occur □ithin area
□ippocampus subelongatus West Australian Seahorse □66722□		Species or species habitat may occur □ithin area
□istiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring□back Pipefish □66243□		Species or species habitat may occur □ithin area
□issocampus caudalis Australian Smooth Pipefish, Smooth Pipefish □66249□		Species or species habitat may occur □ithin area
□issocampus fatilo□uus Prophet's Pipefish □66250□		Species or species habitat may occur □ithin area
□issocampus runa □avelin Pipefish □66251□		Species or species habitat may occur □ithin area

Name	Threatened	Type of Presence
Maroubra perserrata Sa□tooth Pipefish [66252]		Species or species habitat may occur □ithin area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur □ithin area
Nannocampus subosseus Bonyhead Pipefish, Bony□headed Pipefish [66264]		Species or species habitat may occur □ithin area
Phycodurus e□ues □eafy Seadragon [66267]		Species or species habitat may occur □ithin area
Phylloptery□taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur □ithin area
Pugnaso curtirostris Pugnose Pipefish, Pug□nosed Pipefish [66269]		Species or species habitat may occur □ithin area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur □ithin area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur □ithin area
Stigmatopora nigra Widebody Pipefish, Wide□bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur □ithin area
□rocampus carinirostris □airy Pipefish [66282]		Species or species habitat may occur □ithin area
□anacampus margaritifer Mother□of□pearl Pipefish [66283]		Species or species habitat may occur □ithin area
□anacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur □ithin area
□anacampus poecilolaemus □ongsnout Pipefish, Australian □ong□snout Pipefish, □ong□snouted Pipefish [66285]		Species or species habitat may occur □ithin area
Mammals		
Arctocephalus forsteri □ong□nosed Fur□seal, Ne□ □ealand Fur□seal [20]		Species or species habitat may occur □ithin area
Neophoca cinerea Australian Sea□ion, Australian Sea □ion [22]	□ulnerable	Species or species habitat may occur □ithin area
Reptiles		
Caretta caretta □oggerhead Turtle [1763]	Endangered	Breeding likely to occur □ithin area
Chelonia mydas Green Turtle [1765]	□ulnerable	Breeding likely to occur □ithin area
Dermochelys coriacea □eatherback Turtle, □eathery Turtle, □uth [1768]	Endangered	Breeding likely to occur □ithin area
Natator depressus Flatback Turtle [59257]	□ulnerable	Breeding likely to occur

Name	Threatened	Type of Presence
		□ithin area

Whales and other Cetaceans — □Resource Information □

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale □33□		Species or species habitat may occur □ithin area
Balaenoptera edeni Bryde's Whale □35□		Species or species habitat may occur □ithin area
Balaenoptera musculus Blue Whale □36□	Endangered	Species or species habitat likely to occur □ithin area
Caperea marginata Pygmy Right Whale □39□		Species or species habitat may occur □ithin area
Delphinus delphis Common Dophin, Short□beaked Common Dolphin □60□		Species or species habitat may occur □ithin area
Eubalaena australis Southern Right Whale □40□	Endangered	Breeding kno□n to occur □ithin area
Grampus griseus Risso's Dolphin, Grampus □64□		Species or species habitat may occur □ithin area
□agenorhynchus obscurus Dusky Dolphin □43□		Species or species habitat may occur □ithin area
Megaptera novaeangliae □umpback Whale □38□	□ulnerable	Congregation or aggregation kno□n to occur □ithin area
□rcinus orca □iller Whale, □rca □46□		Species or species habitat may occur □ithin area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin □51□		Species or species habitat may occur □ithin area
Tursiops aduncus Indian □cean Bottlenose Dolphin, Spotted Bottlenose Dolphin □68418□		Species or species habitat likely to occur □ithin area
Tursiops truncatus s. str. Bottlenose Dolphin □68417□		Species or species habitat may occur □ithin area

E□ta Information

State and Territory Reserves — □Resource Information □

Name	State
□eeu□in□Naturaliste	WA

Regional Forest Agreements — □Resource Information □

Note that all areas □ith completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species

Resource Information

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtledove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffelgrass, Black Buffelgrass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur

Name	Status	Type of Presence
		□ithin area
Genista linifolia Fla□leaved Broom, Mediterranean Broom, Fla□Broom □2800□		Species or species habitat likely to occur □ithin area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom □20126□		Species or species habitat likely to occur □ithin area
Genista sp. □ Genista monspessulana Broom □67538□		Species or species habitat may occur □ithin area
□ycium ferocissimum African Bo□thorn, Bo□thorn □19235□		Species or species habitat likely to occur □ithin area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine □20780□		Species or species habitat may occur □ithin area
Rubus fruticosus aggregate Blackberry, European Blackberry □68406□		Species or species habitat likely to occur □ithin area
Tamari□aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamari□, Desert Tamarisk, Flo□ering Cypress, Salt Cedar □16018□		Species or species habitat likely to occur □ithin area

Caveat

The information presented in this report has been provided by a range of data sources as ackno□ledged at the end of the report.

This report is designed to assist in identifying the locations of places □hich may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National □eritage properties, Wetlands of International and National Importance, Common□ealth and State□Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Common□ealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped □see belo□□and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the □ualifications belo□ and may need to seek and consider other information sources.

For threatened ecological communities □here the distribution is □ell kno□n, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less □ell kno□n, e□isting vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are □ell kno□n and if time permits, maps are derived using either thematic spatial data □i.e. vegetation, soils, geology, elevation, aspect, terrain, etc□together □ith point locations and described habitat□or environmental modelling □MA□ENT or BI□C□IM habitat modelling□using point locations and environmental data layers.

Where very little information is available for species or large number of maps are re□uired 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 techni□ues □static t□o kilometre grid cells, alpha□hull and conve□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 □ere defined by degree blocks, 100□ or 250□ map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

□nly selected species covered by the follo□ing provisions of the EPBC Act have been mapped□

- □migratory and
- □marine

The follo□ing species and ecological communities have not been mapped and do not appear in reports produced from this database□

- □threatened species listed as e□tinct or considered as vagrants
- □some species and ecological communities that have only recently been listed
- □some terrestrial species that overfly the Common□ealth marine area
- □migratory species that are very □idespread, vagrant, or only occur in small numbers

The follo□ing groups have been mapped, but may not cover the complete distribution of the species□

- □non□threatened seabirds □hich have only been mapped for recorded breeding sites
- □seals □hich have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Common□ealth Marine environment.

Coordinates

□33.97104 114.99517

Ackno□ledgements

This database has been compiled from a range of data sources. The department ackno□ledges the follo□ing custodians □ho have contributed valuable data and advice□

- □□ffice of Environment and □eritage, Ne□ South Wales
- □Department of Environment and Primary Industries, □ictoria
- □Department of Primary Industries, Parks, Water and Environment, Tasmania
- □Department of Environment, Water and Natural Resources, South Australia
- □Department of □and and Resource Management, Northern Territory
- □Department of Environmental and □eritage Protection, □ueensland
- □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 □ictoria
- □Australian Museum
- □South Australian Museum
- □□ueensland Museum
- □□nline □oological Collections of Australian Museums
- □□ueensland □erbarium
- □National □erbarium of NSW
- □Royal Botanic Gardens and National □erbarium of □ictoria
- □Tasmanian □erbarium
- □State □erbarium of South Australia
- □Northern Territory □erbarium
- □Western Australian □erbarium
- □Australian National □erbarium, Canberra
- □□niversity of Ne□ England
- □□cean Biogeographic Information System
- □Australian Government, Department of Defence
- Forestry Corporation, NSW
- □Geoscience Australia
- □CSIR□
- □Australian Tropical □erbarium, 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 □ife Survey Australia
- □American Museum of Natural □istory
- □□ueen □ictoria Museum and Art Gallery, Inveresk, Tasmania
- □Tasmanian Museum and Art Gallery, □obart, Tasmania
- □□ther groups and individuals

The Department is e□tremely grateful to the many organisations and individuals □ho provided e□pert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact □s page.

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Department of the Environment
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Canberra ACT 2601 Australia
□61 2 6274 1111

APPENDIX D

BLACK COCKATOO HABITAT TREE DETAILS

Habitat Trees
DBH >50cm
Datum - GDA94
Entrance Size Ranges - Small = >5cm, Medium = 5 - 10cm, Large = >10cm

Waypoint Number	Zone	mE	mN	Tree Species	Tree Height (m)	DBH (cm)	Number of Hollows	Estimated Hollow Entrance Size	Occupancy	Chew Marks	Potential Cockatoo Nest Hollow	Comments
wpt005	50H	314908	6239457	Marri	15-20	>50	2+	Small	No Signs	No Signs	No	
wpt010	50H	314881	6239453	Marri	15-20	>50	0					
wpt011	50H	314871	6239423	Marri	15-20	>50	0					

DISCLAIMER

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The conclusions are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

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