City of Cockburn

Coogee Beach Surf Life Saving Club Carpark Development
Flora and Fauna Assessment

November 2015

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Executive summary

The City of Cockburn (CoC), in response to the Coogee Beach Master Plan, is seeking to provide additional car parking at the Coogee Beach Surf Life Saving Club (SLSC). Due to the complex tenure arrangements across the site, the area available to be developed for the purposes of the carpark currently supports vegetation including a State Threatened Ecological Community (TEC) SCP 30a *Callitris preissii* (*Melaleuca lancelolata*) and has been used as an offset site for the original SLSC development.

GHD Pty Ltd (GHD) was commissioned by the CoC to undertake a spring Level 1 flora and fauna assessment of the Project area. The purpose of the assessment was to delineate key flora, vegetation and fauna values within the Project area. The outcomes of the assessment will provide information to support an application for clearing under Part V of the *Environmental Protection Act 1986* (EP Act).

The survey methodology and reporting was undertaken with reference to the Environmental Protection Authority (EPA) Guidance Statement No. 51 (EPA 2004a), Guidance Statement No. 56 (EPA 2004b) and Position Statement No. 3 (EPA 2002).

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.6 and the assumptions and qualifications contained throughout the Report

Key Results:

- The Project area is situated within the Woodman Point Regional Park (R 49220) and Bush Forever Site 341.
- The entire Project area is within an Environmentally Sensitive Area (ESA). The ESA aligns with the presence of a Bush Forever site and TEC.
- The Project area is located within an area that has a long history of disturbances, including clearing which have resulted in the colonisation of grassy weeds and annuals. The Project area would receive a high level of traffic from people moving through the area due to its proximity to cycle paths and walkways, a caravan park, the Coogee Beach SLSC, adjacent carpark and beach which in turn increases the amount of littering and weed invasion.
- The Project area comprises of three vegetation associations, *Agonis flexuosa* Low Open Forest, *Callitris preissii* Low Open Forest and Revegetation. The Low Open Forest vegetation types ranged from Very Good to degraded condition and the Revegetation ranged from Good to degraded condition. *Agonis flexuosa* is not known to naturally occur within the Woodman Point area and was planted in the area in the late 1980's and therefore all occurrences of this species are considered to be a result of these planting. Therefore the *Agonis flexuosa* Low Open Forest would be considered to be an altered remnant of the *Callitris preisii* Low Open Forest.
- The two vegetation types comprising of *Callitris preissii* forest have been identified as a Threatened Ecological Community (TEC). An analysis of information provided by Gibson et al. (1994) in Floristic Survey of the Southern Swan Coastal Plain, indicated that the Floristic Community Type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands is present within the Project area which is listed as Vulnerable. Given that the Project area has suffered a long history of disturbances, the vegetation types present within the Project area have underdone considerable changes and are considered as degraded remnants of this TEC. There is approximately 0.35 ha of remnant vegetation in the Project area which is considered to represent this TEC.

- A total of 52 flora taxa (including subspecies and varieties) representing 26 families and 44 genera were recorded from the Project area during the field survey. This total comprised 31 native taxa and 21 introduced taxa. Overall, the Project area is considered to have a relatively low floral diversity which is considered typical of the vegetation associations associated with the Project area. No flora taxa listed as Threatened under the EPBC Act or WC Act or as Priority by the DPaW were recorded or are expected to occur within the Project area.
- One weed species recorded from the Project area, Bridal creeper (*Asparagus asparagoides*), is listed as a Declared pest under the *Biosecurity and Management Act 2007* (BAM Act) and Weed of National Significance (WoNS). A number of young shoots of bridal creeper were recorded throughout the Project area.
- The Project area comprises of two broad habitat types consisting of low open forest and an open shrubland (revegetation). The trees and shrubs provide good value fauna habitat, particularly for bird species, providing shelter and food resources. However given the open and degraded nature of the understorey, the Project area is considered to provide very low value habitat for small native mammal and reptile species.
- A total of 13 native fauna species, including 12 birds and one reptile, were recorded in the Project area during the survey. Three introduced species were also recorded during the survey, including the Laughing Turtle-dove (*Streptopelia senegalensis*), European Rabbit (*Oryctolagus cuniculus*) and Cat (*Felis catus*).
- No fauna of conservation significance were recorded within the Project area during the survey. However evidence of foraging by black cockatoo's, likely to be the Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) has previously been recorded in the area (Regen4 Environmental Services and Western Wildlife 2015).
- A likelihood of occurrence assessment was conducted for all conservation significant fauna species identified in the desktop assessment. This identified an additional six conservation significant fauna as likely to, or possibly to occur, within the Project area, including the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), Peregrine Falcon (*Falco peregrinus*), Rainbow Bee-eater (*Merops ornatus),* Quenda / Southern Brown Bandicoot (*Isoodon obesulus fusciventer*), Perth Lined Skink (*Lerista lineata*) and Black-striped Snake (*Neelaps calonotos*).
- No species of conservation significance are likely to be solely dependent on the remnant vegetation remaining within the Project area. Given the small size and fragmented nature of the Project area and history of disturbances, clearing of the Project area is unlikely to have a significant impact on these conservation significant fauna species.

Key Outcomes:

- The City of Cockburn will be required to submit a clearing permit application to the Department of Environment Regulation (DER) for the proposed clearing of the Project area. The assessment against the Ten Clearing Principles determined that the proposed clearing of the Project area (0.5 ha) is at variance with Principles d and h and may be at variance to Principles a, e and g.
- The Project area currently supports 0.35 ha of vegetation which is considered to be the TEC SCP 30a *Callitris preissii* (*Melaleuca lanceolata*) which has previously been used as part of the offset site for the original SLSC development.
- The City of Cockburn will be required to provide the DER an offset package to offset the loss of 0.35 ha of TEC as well as 0.5 ha of Bush Forever Site 341.

Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Project background

The City of Cockburn (CoC), in response to the Coogee Beach Master Plan, is seeking to provide additional car parking at the Coogee Beach Surf Life Saving Club (SLSC). Due to the complex tenure arrangements across the site, the area available to be developed for the purposes of the carpark currently supports vegetation including a State Threatened Ecological Community (TEC) SCP 30a *Callitris preissii* (*Melaleuca lancelolata*) and has been used as an offset site for the original SLSC development.

1.2 Purpose of this report

GHD Pty Ltd (GHD) was commissioned by the CoC to undertake a spring Level 1 flora and fauna assessment of the Project area. The purpose of the assessment was to delineate key flora, vegetation and fauna values within the Project area. The outcomes of the assessment will provide information to support an application for clearing under Part V of the *Environmental Protection Act 1986* (EP Act).

1.3 Location

The Project area consists of two small areas of vegetation separated by a footpath located adjacent to the existing carpark at the Coogee Beach SLSC, off Poore Grove, in the City of Cockburn. The Project area is situated within the Woodman Point Regional Park (Bush Forever Site 341) and is approximately 0.5 ha in size.

The Project area is shown in Figure 1, Appendix A.

1.4 Scope of works

The scope of works, as detailed in the CoC request for quote and GHD proposal, was to undertake a Level 1 spring flora and fauna survey of the Project area to provide:

- An inventory of the vascular plant species
- A review of, and search for, native plant species considered to be rare or potentially endangered. A discussion on other species of interest, including those of limited distribution or outliers from their known range, has also been provided
- An inventory and location of dominant exotic plants and Declared Plants and environmental weed species
- A description of and the location of threatened and priority ecological communities
- A description and location, including mapping, of vegetation types
- A rating of condition of the vegetation types or areas using a published rating scale such as Keighery (1994)
- An assessment of the local and regional significance of the vegetation types in terms of their intrinsic value, extent, rarity and condition against Government of Western Australia (GoWA) (2013)
- The occurrence of Environmentally Sensitive Areas
- Fauna species observed, including any signs of fauna occurrence and/or usage

- Discussion of presence and potential occurrence of threatened species listed under the *Wildlife Conservation Act 1950* (WC Act), *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) and Department of Parks and Wildlife (DPaW) protected species
- Location of fauna habitats for conservation significant species
- Discussion of habitat significance and linkages
- An assessment of the Project against the 10 clearing principles
- A discussion considering the impacts based ion the 10 clearing principles, to give an indication of impacts including mitigation and minimisation as per the environmental impact hierarchy.

1.5 Relevant legislation, conservation codes and background information

In Western Australia significant communities, flora and fauna are protected under both Commonwealth and State Government legislation. In addition regulatory authorities also provide a range of guidance and information on expected standards and protocols for environmental surveys.

An overview of key legislation and guidelines, conservation codes and background information relevant to this Project is provided in Appendix B.

1.6 Report limitations and assumptions

This report has been prepared by GHD for the City of Cockburn (CoC) and may only be used and relied on by the CoC for the purpose agreed between GHD and the CoC as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than the CoC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by the CoC and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Site conditions may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

This report has assessed the flora and fauna within the Project area (Figure 1, Appendix A). Should the Project area change or be refined, further assessment may be required.

2. Methodology

2.1 Desktop assessment

Prior to the commencement of the field survey a desktop assessment was undertaken to identity relevant environmental information pertaining to the Project area and to assist in survey design.

This included a review of:

- Existing flora and vegetation survey data and relevant reports provided by the CoC, including.
- The Department of the Environment's (DotE) Protected Matters Search Tool (PMST) to identify communities and species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) potentially occurring within the Project area (DotE 2015a) (Appendix C).
- The Department of Parks and Wildlife (DPaW) Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC) databases to determine the potential for TECs or PECs to be present within the Project area.
- The DPaW's NatureMap database for flora and fauna species previously recorded within the Project area (DPaW 2007–) (Appendix C).
- The DPaW Threatened and Priority Flora database (TPFL) and Western Australian Herbarium database (WAHERB) for Threatened and Priority flora species listed under *Wildlife Conservation Act 1950* (WC Act) and listed as priority by DPaW, previously recorded within the Project area.
- Existing datasets including: previous vegetation mapping of the Project area (Beard 1979, Heddle et al. 1980), aerial photography, geology/soils and hydrology information to provide background information on the variability of the environment, likely vegetation units and fauna habitats and to identify areas with potential to contain TECs and/or PECs (Gibson et al.1994), and Threatened and Priority listed flora and fauna species.

2.2 Field Survey

2.2.1 Vegetation and flora

GHD ecologist (Erin Lynch – SL011313) conducted a single season Level 1 vegetation and flora assessment of the Project area on the 30 September 2015. The field survey was undertaken to verify the results of the desktop assessment, identify and describe the dominant vegetation units, assess vegetation condition and identify and record vascular flora taxa present at the time of survey. Additionally, opportunistic searching for conservation significant or other significant ecological communities and flora taxa was undertaken.

The survey methodology employed by GHD was undertaken with reference to the Environmental Protection Authority (EPA) Guidance Statement No. 51 Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004a) and Terrestrial Biological Surveys as an Element of Biodiversity Protection, Position Statement No. 3 (EPA 2002).

Vegetation units

Vegetation units were identified and boundaries delineated using a combination of aerial photography, topographical features and field data/observations. The units were described

based on structure, dominant taxa and cover characteristics as defined by quadrat and rapid assessment data, and general field observations.

Vegetation condition

The vegetation condition of the Survey Area was assessed and mapped in accordance with the Keighery (1994) vegetation condition rating scale. This scale recognises the intactness of vegetation, which is defined by the following:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping; and
- The potential for natural or assisted regeneration.

The scale consists of six rating levels as outlined in Table 1.

Table 1 Vegetation condition rating scale (Keighery 1994)

Condition Rating	Vegetation Condition	Description
1	*Pristine or Nearly So*	No obvious signs of disturbance.
2	*Excellent*	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3	*Very Good*	Vegetation structure altered, obvious signs of disturbance.
4	*Good*	Vegetation structure significantly altered by very obvious signs of multiple disturbances retains basic vegetation structure or ability to regenerate it.
5	*Degraded*	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not in a state approaching good condition without intensive management.
6	*Completely Degraded*	The structure of the vegetation is no longer intact and the area is completely or almost without native species.

Flora identification and nomenclature

Species that were well known to the survey botanist were identified in the field; all other species were collected and assigned a unique collection number to facilitate tracking. Plant species were identified by the use of local and regional flora keys and by comparison with the named species held at the Western Australian Herbarium.

The conservation status of all recorded flora was compared against the current lists available on *FloraBase* (WA Herbarium 1998–) and the EPBC Act Threatened species database provided by DotE (2015b).

Nomenclature used in this report follows that used by the Western Australian Herbarium as reported on *FloraBase*.

2.2.2 Fauna

GHD ecologist (Erin Lynch) undertook a Level 1 fauna assessment of the Project area on the 30 September 2015, concurrently with the vegetation and flora assessment. The field survey was undertaken to identify fauna habitat types, assess habitat value and connectivity, identify and record fauna taxa present at the time of survey, and identify fauna habitats for conservation significant species.

The survey methodology employed by GHD was undertaken with reference to the EPA Guidance Statement No. 56 Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b) and Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment (EPA 2010).

Habitat assessment

A fauna habitat assessment was undertaken to document the type, condition and extent of habitats within the Project area, this included:

- Habitat structure (e.g. vegetation type, presence/absence of overstorey, midstorey, understorey and ground cover)
- Presence/absence of refuge including: fallen timber (coarse woody debris), hollow-bearing trees and stags and rocks/boulder piles, and the type and extent of each refuge
- Presence/absence of waterways including type, extent and habitat quality within waterways
- Identification of wildlife corridors within and immediately adjacent to the Project area

Opportunistic fauna searches

The fauna survey was an opportunistic survey and did not involve any fauna trapping. The survey involved visual and aural surveys for any fauna species utilising the Project area. The Project area was also searched for any fauna signs, such as tracks, scats, bones, diggings and feeding signs.

Surveys also included systematic searching across all habitat types, which is an effective method of surveying for many wildlife species. This involved searching through microhabitats where wildlife is known to frequent, including turning over logs or rocks, turning over leaf litter and examining hollow logs. Reptiles were also sighted as they basked during the day.

During the field survey, targeted searches for conservation significant fauna species and their habitats were conducted. Species – specific search strategies were used to identify any conservation protected species in the area or evidence that they utilise the Project area.

Fauna nomenclature

Nomenclature used in this report follows that used by the Western Australian Museum and the DPaW NatureMap database with the exception of birds where Christidis and Boles (2008) was used.

2.3 Limitations

2.3.1 Desktop limitations

Desktop investigations use a variety of online resources such as the DPaW NatureMap database and the EPBC Act PMST. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD. The PMST database is used to identify species listed under the EPBC Act. This database draws on various sources to report on the potential of the

species occurrence within the area. The EPBC Act search tool is broad-scale in its reporting and often the specific habitat requirements of the species do not occur within the Project area. For this reason not all species reported by the search tool need to be considered in management decisions. The NatureMap database reports on actual records of the species within the designated area and can provide more accurate information of the likelihood of species presence.

2.3.2 Field survey limitations

Guidance Statement No. 51 and 56 (EPA 2004a, 2004b) states that flora and fauna survey reports for environmental impact assessment in Western Australia should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 2.

Table 2 Survey limitations

Aspect	Constraint	Comment
Sources of information and availability of contextual information.	Minor	Adequate information is available for the Project area, this includes: • Broad scale mapping by Beard (1979) and digitised by Shepherd et al. (2002) • Vegetation mapping by Heddle et al. (1980) • Regional biogeography (Mitchell et al. 2002) • Previous survey data (Coffey 2008, Regen4 Environmental Services 2015). • Gibson et al. (1994) FCTs
Scope (what life forms were sampled etc.)	Nil	Vascular flora were sampled during the survey. Non-vascular flora, invertebrate and aquatic fauna were not assessed as part of survey.
Proportion of flora collected and identified (based on sampling, timing and intensity) Proportion of fauna identified, recorded and/or collected	Minor	The vegetation and flora survey was a single season survey only and was undertaken in late September. This was considered an optimal time for surveying due to rainfall amount received in the three months prior to the survey (see Timing/weather/ season/cycle). The flora recorded from the field survey is detailed in Section 4.2 and a full flora species list provided in Appendix D. The flora present within the Project area was considered to be well sampled given the small size of the area. The fauna survey was undertaken in late September and was a reconnaissance survey only. The fauna assessment only sampled those species that can be easily seen, heard or have distinctive signs, such as tracks, scats, diggings etc. Many cryptic and nocturnal species would not have been identified during the survey and seasonal variation within species often requires multiple targeted surveys at a particular time of the year. Of the fauna species recorded during the survey, all species were identified to species level. The fauna assessment was aimed at identifying habitat types and terrestrial vertebrate fauna utilising the Project area. No sampling for invertebrates or aquatic species occurred. The information available on the identification, distribution and conservation status of invertebrates is generally less extensive than that of vertebrate species.
Flora determination	Nil	Flora determination was undertaken by GHD ecologists in the field and at the Western Australian Herbarium. One flora collection could only be identified to genus only due to lack of flowering and fruiting material required for identification. The taxonomy and conservation status of the Western

Aspect	Constraint	Comment
		Australian flora is dynamic. This report was prepared with reliance on taxonomy and conservation current at the time issuing, but it should be noted this may change.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Nil	The Project area was fully surveyed during the vegetation, flora and fauna assessment.
Mapping reliability	Nil	The vegetation was mapped at a scale of 1:500 using high resolution ESRI aerial imagery, topographical features, previous mapping and field data. Data was recorded in the field using a hand-held GPS tool. Certain atmospheric factors and other sources of error can affect the accuracy of such GPS receivers. On average, the GPS units used during this field survey (Garmin GPS, Trimble Nomad or Trimble Juno units) have an accuracy to approximately ± 5 m. Therefore the data points consisting of coordinates recorded from the GPS may contain inaccuracies.
Timing/weather/ season/cycle	Minor	The survey was conducted on 30 September 2015 (spring). In the three months prior to the survey (July-September), Perth Airport weather recording station (No. 009021: BoM 2015) recorded a total of 243 mm of rainfall. This rainfall total is approximately 30 per cent less than the long term average for the same period (July-September; 346 mm) (BoM 2015). Due to less rainfall in this period than the average of previous years, the number of herbs and annual species may be lower than years with greater rainfall. The weather conditions recorded during the field survey included (BoM 2015): Daily maximum temperature: 24.5 °C Daily minimum temperature: 9.2 °C Daily rainfall 0 mm The weather conditions recorded during the survey period were considered unlikely to have impacted upon the vegetation, flora and fauna survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Minor	There were no disturbances observed that impacted the survey. Revegetation has been undertaken along much of the boundary of the Project area due to historical clearing/disturbances.
Intensity (in retrospect, was the intensity adequate)	Nil	The vascular flora of the Project area was sampled in accordance with EPA (2004a) and terrestrial fauna sampled in accordance with EPA (2004b). The Project area was sufficiently covered by GHD ecologists during the survey.
Resources	Nil	Adequate resources were employed during the field survey.
Access restrictions	Minor	No access problems were encountered during the survey.
Experience levels	Nil	The survey ecologist is a practitioner suitably qualified and experienced in their respective fields. Erin Lynch is a Senior Ecologist with over 8 years' experience.

3. Desktop assessment

3.1 Climate

The Project area experiences a temperate climate with dry, hot summers and cool, wet winters. The closest Bureau of Meteorology (BoM) weather station to the Project is located at Perth airport (site number: 009021). Climatic data from this station indicates the mean maximum temperature of the area ranges from 32 °C in February to 17.9 °C in July, and the mean minimum temperature of the area ranges from 17.5 °C in February to 8.0 °C in July. The mean annual rainfall is 770.8 mm (BoM 2015).

Climatic data for the region is summarised in Plate 1.

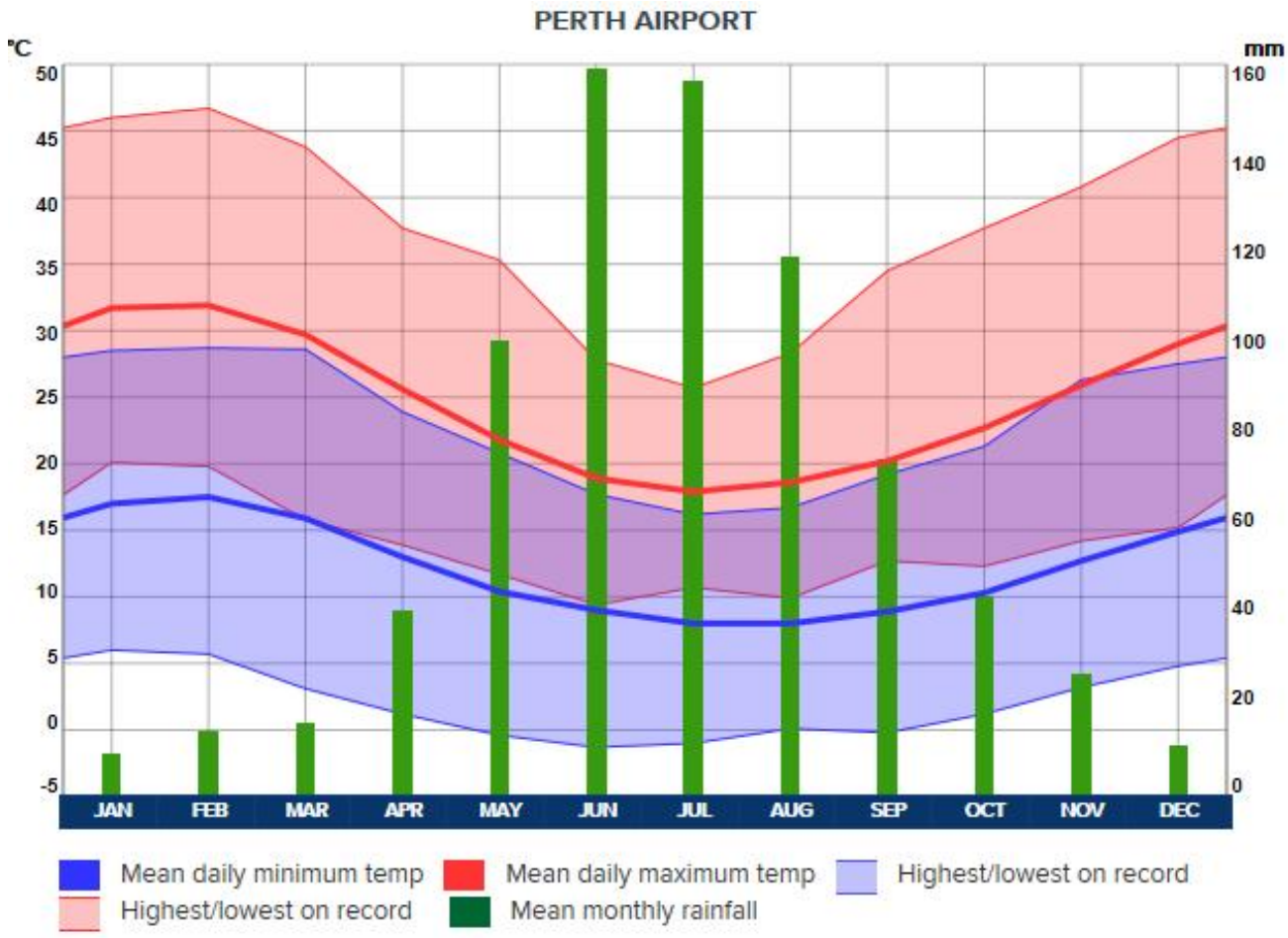


Plate 1 Perth long term mean temperature and rainfall (Weatherzone 2015)

3.2 Geology, landform and soils

The Project area lies within the Spearwood Dune System which consists of Pleistocene Aeolian sands overlying Tamala Limestone. The soils within the Project area are mapped as the Quindalup South 13 Subsystem (211Qu13), which is described as having limestone outcrops; shallow calcareous sands and remnants of parabolic dunes with limestone dominant.

3.3 Conservation reserves and estate

The Project area is situated within the Woodman Point Regional Park (R 49220). Woodman Point Regional Park covers a total area of 251.8 ha and is an important component of a series of regionally significant bushland reserves in the southern metropolitan area (DPaW 2010). The western chain of wetlands of Beeliar Regional Park and Henderson Foreshore are located to the east and south. Woodman Point provides a vegetated east-west corridor link to the wetland chain from the coast. Such corridors are not common in the Perth metropolitan area (DPaW 2010). The Project area also lies entirely within Bush Forever site 341, which covers a total area of 91.7 ha.

3.4 Environmentally Sensitive Areas

A search of the Department of Environment Regulation's (DER) Clearing Permit System Viewer (DER 2015) identified the entire Project area within an Environmentally Sensitive Area (ESA). The ESA aligns with the presence of a Bush Forever site and Threatened Ecological Community (TEC) (Figure 1, Appendix A).

3.5 Regional biogeography

The Project area is situated in the South West Botanical Province of Western Australia (Beard 1990) within the Swan Coastal Plain bioregion and Perth sub-region described by the Interim Biogeographic Region of Western Australia (IBRA; DotE 2015c).

The Swan Coastal Plain bioregion is a low lying coastal plain, mainly covered with woodlands. The Perth sub-region is characterised by colluvial and aeolian sands, alluvial river flats and coastal limestone. Heath and/or Tuart woodlands on occur on limestone, *Banksia* and Jarrah-*Banksia* woodlands on Quaternary marine dunes of various ages, and Marri on colluvial and alluvials. The region also includes a complex series of seasonal wetlands (Mitchell et al. 2002).

3.6 Vegetation and flora

3.6.1 Broad vegetation associations

Broad scale pre-European vegetation mapping of the area was completed by Beard (1979) at an association level. The mapping indicates one vegetation association present within the Project area:

- Medium woodland; Tuart (association 998)

Regional vegetation has been mapped by Heddle et al. (1980) at a scale of 1:250,000 based on major geomorphic units on the Swan Coastal Plain. The Heddle et al. (1980) mapping indicates one vegetation complex on Aeolian deposits of the Swan Coastal Plain present within the Project area:

- Cottesloe complex – central and south: Mosaic of woodland of *Eucalyptus gomphocephala* and open forest of *E. gomphocephala – E. marginata – E. calophylla*; closed heath on the limestone outcrops.

3.6.2 Broad vegetation extent and status

The Beard (1979) pre-European mapping has been adapted and digitised by Shepherd et al. (2002). The extent of the vegetation associations have been determined by the state-wide vegetation remaining extent calculations maintained by the DPaW (latest update June 2014 – Government of Australia (GoWA) 2015). As shown in Table 3, the current extent of vegetation association 998 is more than 30 percent of its pre-European extent remaining at all levels (State, IBRA bioregion, IBRA subregion) except the Local Government Area (LGA), which has less than 30 percent remaining.

The Local Biodiversity Program (2013) has assessed the vegetation complex described and mapped by Heddle et al. (1980) against presumed pre-European extents within the Swan Coastal Plain IBRA bioregion, and the City of Cockburn. As shown in Table 4 and Table 5, the current extent of the Cottesloe complex – central and south vegetation complex within the Swan Coastal Plain IBRA bioregion is more than 30 percent of the calculated pre-European extent. However, within the City of Cockburn there is less than 30 percent remaining.

Table 3 Extent of vegetation associations within the Project area (Beard 1979, GoWA 2015)

Vegetation association	Scale	Pre-European extent (ha)	Current extent (ha)	Remaining (%)	% Current extent remaining in all DPaW managed lands
Swan Coast Plain IBRA bioregion		1,501,221.93	580,697.31	38.68	37.35
Perth IBRA subregion		1,117,757.03	467,145.63	41.79	38.06
998	State: Western Australia	51,015.33	18,885.83	36.98	42.07
	IBRA bioregion: Swan Coastal Plain	50,867.50	18,865.52	37.09	42.07
	IBRA sub-region: Perth	50,867.50	18,865.52	37.09	42.07
	LGA: City of Cockburn	4,464.34	869.03	19.47	33.42

Table 4 Extent of vegetation complexes within the Project area on the Swan Coastal Plain (Heddle et al. 1980, Local Biodiversity Program 2013)

Vegetation Complex	Pre-European extent (ha)	2013 extent (ha)	% of pre-European extent	% of pre-European extent with formal protection
Cottesloe Complex – Central and South	44,899.92	15,815.73	35.22	18.32

Table 5 Extent of vegetation complex within the Project area in the City of Cockburn (Heddle et al. 1980, 3 WALGA 2010)

Vegetation complex	Pre-European total (ha)	2010 Remaining extent total (ha)	Remaining extent (%)	% of pre-European extent protected and on Bush Forever
Cottesloe Complex – Central and South	4839	1035.17	21.39	10.87

3.6.3 Conservation significant ecological communities

A search of the EPBC Act PMST identified no Commonwealth listed TECs within 5 km of the Project area.

Searches of the DPaW TEC and PEC databases identified one TEC within and surrounding the Project area (Figure 1, Appendix A). The TEC is identified as *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands (Swan Coastal Plain community type 30a). The community was endorsed as a TEC with a threat ranking of Vulnerable by the WA Minister for Environment in November 2011.

This TEC is described as a woodland and forest community located on calcareous sandy soils of the Quindalup Dunes between Trigg and Point Peron and on the Swan River in Peppermint Grove. The community is also present on Garden Island and Rottnest Island. Typical and common native taxa in the community are: *Callitris preissii*, *Melaleuca lanceolata*, *Spyridium globulosum*, *Acanthocarpus preissii*, *Rhagodia baccata*, *Austrostipa flavescens* and *Trachymene pilosa* (Gibson et al. 1994). The introduced herbs *Galium murale* (small bedstraw), *Asparagus asparagoides* (bridal creeper) and *Trachyandra divaricata* (dune onion weed) are common in the community (DPaW 2014).

The coastal occurrences of this TEC occur on calcareous sandy soils associated with the Quindalup dunes and the Swan River occurrence is on the Aeolian deposits of the Cottesloe complex – central and south. Species richness is naturally quite low in the community. There have not been any detailed groundwater studies completed for this community but it is believed that this community is at least a partially groundwater dependent ecosystem (DPaW 2014).

3.6.4 Flora diversity

A search of the *NatureMap* database identified 223 flora taxa, representing 71 families and 167 genera previously recorded within 5 km of the Project area (Appendix C). This total comprised 137 native flora taxa and 86 naturalised (introduced) flora taxa. Dominant families recorded included Poaceae (26 taxa), Fabaceae (25 taxa) and Asteraceae (18 taxa).

3.6.5 Conservation significant flora

Searches of the EPBC Act PMST, DPaW NatureMap database and DPaW TPFL and WAHERB databases identified the presence/potential presence of eight conservation significant flora taxa within a 5 km buffer of the Project area (Appendix C). The desktop searches recorded:

- Five EPBC Act and WC Act listed taxa
- One Priority 3 taxa
- Two Priority 4 taxa

No conservation significant flora has previously been recorded from the Project area or in the immediate vicinity.

3.7 Fauna

3.7.1 Fauna diversity

A search of the NatureMap database identified 182 terrestrial vertebrate fauna species previously recorded within 5 km of the Project area. This total comprised of 137 birds, 30 reptiles, 13 mammals and two amphibians. Of the 182 fauna species previously recorded 173 were native species and nine were naturalised (introduced) species.

3.7.2 Conservation significant fauna

Searches of the EPBC Act PMST and DPaW NatureMap database identified the presence/ potential presence of 74 conservation significance fauna taxa within a 5 km buffer of the Project area (Appendix C). Of these, 36 migratory marine and migratory wetland bird species have been excluded from the search results as the Project area is entirely terrestrial / does not contain wetlands or watercourses and is not considered to contain significant habitat for any of these species.

The remaining 38 species included:

- 29 species listed as Threatened under the EPBC Act and/or as Schedule 1 (Threatened) under the WC Act
- Two bird species listed as migratory (terrestrial) under the EPBC Act and/or under Schedule 3 (Migratory birds protected under an international agreement) of the WC Act
- One species listed as Schedule 4 (Specially Protected) under the WC Act
- Six species listed as Priority by DPaW

Marine mammals and reptiles, sharks and fish have been excluded from the search results as the Project area is entirely terrestrial and is not considered suitable habitat for these species.

4. Field survey results

4.1 Vegetation

4.1.1 Vegetation associations

A total of three vegetation types were described from the Project area during the field survey, including areas of revegetation. The vegetation types are described as follows:

- ***Agonis flexuosa* Low Open Forest (0.153 ha)**

  Agonis flexuosa and *Callitris preissii* Low Open Forest over *Spyridium globulosum*, *Rhagodia baccata* and *Acacia* spp. Shrubland over **Euphorbia terracina*, **Lysimachia arvensis*, **Galium murale* and **Crassula glomerata* Open Herbland on grey sand. This vegetation type ranged from Very Good to Degraded condition.

  Agonis flexuosa is not known to naturally occur within the Woodman Point area and was planted in the area when Poore Grove and Poore Grove carpark were installed in the late 1980's (Regen4 Environmental Services and Western Wildlife 2015). All occurrences of this species are considered to be a result of these planting.

- ***Callitris preissii* Low Open Forest (0.198 ha)**

  Callitris preissii and *Melaleuca huegelii* Low Open Forest over *Spyridium globulosum*, *Rhagodia baccata* and *Enchylaena tomentosa* Tall Shrubland over **Euphorbia terracina*, **Lysimachia arvensis* and **Crassula glomerata* Open Herbland on grey sand. This vegetation type ranged from Very Good to Degraded condition.

- **Revegetation (0.16 ha)**

  Revegetation has occurred in scattered locations throughout the Project area, mostly concentrated around the boundaries of the Project area in areas which have previously been cleared or highly disturbed. In these areas, a mixture of species naturally occurring to the local area as well as those from the broader region are present. Planted species include (but not limited to) *Callitris preissii*, *Spyridium globulosum*, *Melaleuca lanceolata*, *Melaleuca huegelii*, *Lepidosperma gladiatum*, *Eucalyptus gomphocephala*, *Acacia rostellifera*, *Acacia cochlearis* and *Acacia cyclops*. The revegetated areas were generally considered to be in Good to Degraded condition due to a higher density of weed species.

The vegetation types within the Project area are not considered to be consistent with the Beard (1979) vegetation associations and Heddle et al. (1980) vegetation complexes mapped for the Project area. The vegetation types are considered to be more characteristic of the Quindalup Complex (Heddle et al 1980) which has been mapped nearby. The Quindalup Complex is described as coastal dune complex consisting mainly of alliances – the strand and fore dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of *Melaleuca lanceolata – Callitris preissii* and the closed scrub of *Acacia rostellifera* (Heddle et al. 1980).

The vegetation types within the Project area are mapped for the Project area in Figure 2, Appendix A.

4.1.2 Conservation significant ecological communities

An analysis of information provided by Gibson et al. (1994) in Floristic Survey of the Southern Swan Coastal Plain, indicated there is one Floristic Community Type occurring within the Project area; FCT 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands. This floristic community type is recognised as a threatened ecological community and is known to be

present in the Woodman Point Regional Park. This TEC is classed as 'Vulnerable' and is poorly reserved (Gibson et al. 1994). Forty-five occurrences of this community are recorded on the DPaW TEC database and total approximately 627 ha. The largest occurrence covers 196 ha, but 35 occurrences are less than 10 ha in size (DPaW 2014).

Callitris preissii is considered to be a definitive indicator of this TEC when it is present in appropriate vegetation and coastal habitat on the southern Swan Coastal Plain. An assessment of the vegetation types described within the Project area at a broad level, based on dominant species and general field observations determined that the GHD vegetation types consisting of *Callitris preissii* low open forest (including the area dominated by *Agonis flexuosa*) (0.35 ha) showed affinities to floristic community type 30a (Gibson et al. 1994).

The Project area has suffered a long history of disturbances including clearing and revegetation, therefore the vegetation types present within the Project area have underdone considerable changes and are considered as degraded remnants of this TEC. The *Agonis flexuosa* trees which dominate the southern portion of the Project area were originally planted and are not native to the Woodman Point area. There is approximately 0.35 ha of remnant vegetation (excluding the areas of revegetation) in the Project area which represent this TEC. The vegetation condition ranges from Very Good to Degraded.

4.1.3 Other significant vegetation

There are no other significant vegetation types present within the Project area.

4.1.4 Vegetation condition

The vegetation condition throughout the Project area ranged from *Very Good* to *Completely Degraded*. The Project area is located within an area that has a long history of disturbances, including clearing which have resulted in the colonisation of grassy weeds and annuals. The Project area would receive a high level of traffic from people moving through the area due to its proximity to cycle paths and walkways, a caravan park, the Coogee Beach SLSC, adjacent carpark and beach which in turn increases the amount of littering and weed invasion.

The vegetation condition of the Project Area is mapped in Figure 3, Appendix A.

4.2 Flora

4.2.1 Flora diversity

A total of 52 flora taxa (including subspecies and varieties) representing 26 families and 44 genera were recorded from the Project area during the field survey. This total comprised 31 native taxa and 21 introduced taxa.

Dominant families recorded from the Project area included:

- Fabaceae (7 taxa)
- Asteraceae (6 taxa)
- Poaceae (6 taxa)

Overall, the Project area is considered to have a low floral diversity which is considered typical of the vegetation associations associated with the Project area (DPaW 2014).

The flora taxa list for the Project area is provided in Appendix D.

4.2.2 Conservation significant flora

No flora taxa listed as Threatened under the EPBC Act or WC Act or as Priority by the DPaW were recorded within the Project area.

Likelihood of occurrence assessment

A likelihood of occurrence assessment was conducted post-field survey for all conservation significant flora taxa identified in the desktop assessment (Appendix D). This assessment took into account previous records, habitat requirements, efficacy of the survey, intensity of the survey, flowering times and cryptic nature of species.

The likelihood of occurrence assessment post-field survey concluded no conservation significant taxa identified in the desktop assessment are likely to occur within the Project area.

4.2.3 Other significant flora

No flora taxa considered 'significant flora' as defined by the EPA (2004a) was identified within the Project area during the field survey.

4.2.4 Introduced flora

The Project area ranged from very good to degraded condition with extensive weed (introduced species) invasion that has replaced much of the ground layers, particularly around the boundaries of the project area. A total of 21 introduced species were recorded during the field survey. The most dominant weed species recorded through the Project area were **Crassula glomerata*, **Fumaria capreolata*, **Lysimachia arvensis*, **Ehrharta longiflora*, **Euphorbia terracina*, **Galium murale* and **Arctotheca calendula*.

One weed species recorded from the Project area, Bridal creeper (*Asparagus asparagoides*), is listed as a Declared Pest under the *Biosecurity and Management Act 2007* (BAM Act) and Weed of National Significance (WoNS).

Bridal creeper is a climbing vine with sharply pointed, shiny green leaves. A mass of scented white flowers appear in late winter, followed by small green berries in spring. This species was introduced to Australia as a garden plant in the 1870s, and has since spread throughout many parts of Australia. Bridal creeper invades bushland, smothers native plants and reduces the health and diversity of our natural and agricultural resources (Weeds Organisation 2012). A number of young shoots of bridal creeper were recorded throughout the Project area.

4.3 Fauna

4.3.1 Fauna habitats

The Project area comprises of two broad habitat types consisting of low open forest and an open shrubland (revegetation). The understorey of this habitat type is generally sparse, mostly dominated by introduced grasses and herbs. The majority of the outer edges of the Project area consist of a mixture of remnant coastal shrubs and planted native species in a varying degree of establishment, including patches of *Lepidosperma gladiatum, Acacia rostellifera, A. cochlearis, Scaevola crassifolia* and *Melaleuca spp.*

The trees and shrubs provide good value fauna habitat, particularly for bird species, providing shelter and food resources. However given the open and degraded nature of the understorey, the Project area is considered to provide very low value habitat for small native mammal and reptile species.

4.3.2 Habitat value

Native vegetation within the south west of Western Australia has been significantly altered since European settlement and as local development of the land continues to grow, the significance of any remnant vegetation increases.

The Project area is divided into two small pockets of remnant vegetation separated by a pedestrian walkway/cycleway. The existing carpark lies immediately adjacent to the western boundary, a caravan park lies to the north and another walkway/cycleway lies along the eastern boundary. The remnant vegetation remaining is significantly altered from a long history of disturbances, including clearing. The Project area and surrounding remnant vegetation are currently subject to weed invasion, introduced fauna (cats, rabbits and foxes) and littering.

The trees and shrubs within the site provide good value fauna habitat, particularly for bird species, providing shelter and food resources. However given the open and degraded nature of the understorey, the Project area is considered to provide very low value habitat for small native mammal and reptile species.

No species of conservation significance are likely to be solely dependent on the remnant vegetation remaining within the Project area.

4.3.3 Fauna diversity

A total of 13 native fauna species, including 12 birds and one reptile, were recorded in the Project area during the survey. Three introduced species were also recorded during the survey, including the Laughing Turtle-dove (*Streptopelia senegalensis*), European Rabbit (*Oryctolagus cuniculus*) and Cat (*Felis catus*).

The list of fauna species recorded during the survey is provided in Appendix D.

4.3.4 Conservation significant fauna

No fauna of conservation significance were recorded within the Project area during the survey.

Likelihood of occurrence valuation

A likelihood of occurrence assessment was conducted for all conservation significant fauna species identified in the desktop assessment. This assessment was based on species biology, habitat requirements, the likely quality and availability of suitable habitat (based on vegetation associations present within the Project area) and records of the species in the vicinity of the Project area. The assessment is provided in Appendix D.

Of the 38 conservation significant fauna identified in the desktop searches seven are considered to may/ likely to occur, including:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – Schedule 1 (WC Act) and Endangered (EPBC Act). This species may frequent the area on occasions. The Rottnest Island Pine provides suitable foraging habitat for the species however there is no suitable breeding or roosting habitat present. Previous surveys undertaken in the area have recorded evidence of foraging by black-cockatoos, probably Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) on the Rottnest Island Pines (Coffey Environments 2008, Regen4 Environmental Services and Western Wildlife 2015).
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – Schedule 1 (WC Act) and Vulnerable (EPBC Act). This species may frequent the area on occasions. The Rottnest Island Pine provides suitable foraging habitat for the species however there is no suitable breeding or roosting habitat present.

- Peregrine Falcon (*Falco peregrinus*) – Schedule 4 (WC Act). This species may occur in the general area however there are no suitable nest sites in the Project area. It is likely to only occur as an occasional flyover.
- Rainbow Bee-eater (*Merops ornatus*) – Schedule 3 (WC Act) and Migratory (EPBC Act). Common seasonal visitor to the south west of Western Australia. May occasionally forage and roost within the Project area.
- Quenda / Southern Brown Bandicoot (*Isoodon obesulus fusciventer*) – Priority 4 (DPaW). This species is known to be present in the Woodman Point Regional Park (Department of Environment and Conservation 2010). There was no evidence (scats or diggings) of this species present within the Project area during the survey. The Quenda generally favours vegetation with a dense understorey whilst the Project area is predominantly sparse at ground level. Given the size and highly fragmented nature of the project area the Project area isn't considered optimal habitat for this species.
- Perth Lined Skink (*Lerista lineata*) – Priority 3 (DPaW)*. Suitable habitat is present within the Project area. This species has previously been recorded from the Woodman Park Regional Park, with numerous records in 1994 and 1995 (Naturemap 2007-).
- Black-striped Snake (*Neelaps calonotos*) – Priority 3 (DPaW). Suitable habitat is present within the Project area. There are two records of this species in the Woodman Point area, the most recent record in 1965 (Naturemap 2007-).

No evidence of these species was recorded in the project area during the survey. Given the small size and fragmented nature of the Project area and history of disturbances, clearing of the Project area is unlikely to have a significant impact on the above conservation significant fauna species.

*Note: The Perth Lined Skink (*Lerista lineata*) is currently listed Priority 3, however is likely to be listed via DoTE as either Vulnerable or Endangered. This will likely take effect in early 2016.

5. Assessment against the 10 clearing principles

The clearing of native vegetation in Western Australia requires a clearing permit under Part V of the *Environment Protection Act 1999* (EP Act), except when a project is assessed under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing Native Vegetation) Regulations 2004*.

Table 6 provides an indicative assessment of the proposed clearing of the entire Project area against the “Ten Clearing Principles”, as outlined in the EP Act, to determine whether it is at variance to the Principles. These Principles aim to ensure that all potential impacts resulting from removal of native vegetation can be assessed in an integrated way. The assessment against the Ten Clearing Principles determined that the proposed clearing of the Project area (0.5 ha) is at variance with Principles d and h and may be at variance to Principles a, e and g.

Table 6 Assessment of the Project area against the Ten Clearing Principles

Principle	Assessment	Outcome1	Data sources
a) – Native vegetation should not be cleared if it comprises a high level of biological diversity.	The Project area is situated in the South West Botanical Province of Western Australia (Beard 1990), within the Swan Coastal Plain IBRA bioregion and Perth IBRA sub-region. The flora of the Perth sub-region is diverse with 3,255 native vascular flora taxa recorded. The Project area consists of remnant coastal vegetation with patches of revegetation and planted trees (*Agonis flexuosa*). The remnant coastal vegetation consists predominantly of a *Callitris preissii* low open forest, dominated by *Agonis flexuosa* in the southern portion of the Project area. The understorey of this vegetation type is generally sparse, mostly dominated by introduced grasses and herbs. The majority of the outer edges of the Project area consist of a mixture of remnant coastal shrubs and planted native species (revegetation) in a varying degree of establishment, including patches of *Lepidosperma gladiatum, Acacia rostellifera, A. cochlearis, Scaevola crassifolia* and *Melaleuca spp.* The remnant vegetation remaining within the Project area has been subject to a long history of disturbances and as a result is highly modified. Disturbances to the Project area include previous clearing, planting of non-local plant species, weed invasion, soil disturbance/erosion by rabbits, and small amounts of rubbish dumping. The vegetation within the Project area ranges from Very Good to Degraded. The Project area does not contain areas of native vegetation that are in better condition, or offer a higher floristic value than the surrounding environment. The majority of the remnant vegetation in the Project area shows affinities to floristic community type 30a '*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands' (Gibson et al. 1994). This community type is a TEC classed as 'Vulnerable' under Western Australian threat criteria. The majority of this community type in the Project area has undergone a long history of disturbances and ranged in condition from Very Good to Degraded. Species richness is naturally quite low in this community (DPaW 2014). A total of 223 native flora taxa have been previously recorded within 5 km of the Project area (DPaW 2007–). The survey of the Project area recorded 52 flora taxa representing 26 families and 44 genera. This total comprised 31 native flora taxa and 21 introduced and/or naturalised flora taxa. The Project area is considered to have low floral diversity which is considered typical of the vegetation associations associated with the area. Desktop searches identified the presence/potential presence of eight conservation significant flora taxa within 5 km of the Project area. No EPBC Act or WC Act listed	The Project may be at variance to this Principle	Beard (1979) Beard (1990) DotE (2015a) DPaW (2007–) DPaW TEC and PEC databases DPaW TPFL and WAHERB WA Herbarium (1998–)

Principle	Assessment	Outcome1	Data sources
	flora taxa or Priority listed flora listed by DPaW were recorded within the Project area or are considered likely to occur. The trees and shrubs within the Project area provide good value fauna habitat, particularly for bird species, providing shelter and food resources. However given the open and degraded nature of the understorey, the Project area is considered to provide very low value habitat for small native mammal and reptile species. A total of 182 native fauna species have been previously recorded within 5 km of the Project area (DPaW 2007–). The survey of the Project area recorded 16 fauna species, including 13 birds, one reptile and two mammals. Of these, 13 are native species and three are introduced species. No fauna of conservation significance were sighted or evidence of their presence recorded in the Project area during the survey. Previous surveys undertaken in the area have recorded evidence of foraging by black-cockatoos, probably Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) on the Rottnest Island Pines (Coffee Environments 2008, Regen4 Environmental Services and Western Wildlife 2015). A likelihood of occurrence post-site assessment concluded that an additional six conservation significant fauna species are likely to or may occur in the Project area and surrounding vegetation, including Forest Red-tailed Black Cockatoo, Peregrine Falcon, Rainbow Bee-eater, Quenda, Perth Lined Skink and Black-striped Snake. Given the fragmented nature, small size of the site, proximity to existing infrastructure and the presence of introduced species, the Project area is likely to have a lower level of biodiversity than similar vegetation in the surrounding area. However given the vegetation within the Project area is representative of a TEC which is poorly reserved, the vegetation may be considered significant.		
b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	A total of 173 native fauna species have been previously recorded within 5 km of the Project area (DPaW 2007–). A survey of the Project area recorded 16 fauna species, including 13 birds, two mammals and one reptile. Of these, 13 are native species and three are introduced species. No fauna of conservation significance were recorded in the Project area during the field survey. Seven conservation significant and terrestrial migratory fauna species were assessed as known to, likely to, or may occur within the Project area, including: • Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) – listed as Endangered under the EPBC Act and under Schedule 1 of the WC Act • Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) – listed as Vulnerable under the EPBC Act and under Schedule 1 of the WC Act • Peregrine Falcon (*Falco peregrinus*) – listed under Schedule 4 of the WC Act	The Project is unlikely to be at variance to this Principle.	DotE (2015a) DPaW (2007–)

Principle	Assessment	Outcome1	Data sources
	• Rainbow Bee-eater (*Merops ornatus*) – listed as Migratory under the EPBC Act and under Schedule 3 of the WC Act • Quenda (*Isoodon obesulus fusciventer*) – listed as Priority 4 by DPaW • Perth Lined Skink (*Lerista lineata*) – listed as Priority 3 by DPaW • Black-striped Snake (Neelaps calonotos) – listed as Priority 3 by DPaW The Rottnest Island Pine provides suitable feeding habitat for the Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo however there is no suitable breeding or roosting habitat present in the Project area. Given the fragmented nature, small size of the site, proximity to existing infrastructure and the presence of introduced species, the Project area is unlikely to contain rich species assemblages and is not considered to comprise of significant habitat for native fauna species. Additionally, no species of conservation significance are likely to be solely dependent on the remnant vegetation remaining within the Project area.		
(c) – Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No Threatened flora taxa were recorded from the Project area during the field survey. Desktop searches identified the presence/potential presence of five EPBC Act and/or WC Act listed flora taxa within 5 km of the Project area. A likelihood of occurrence assessment, which takes into account the habitats present, known species distribution and previous records and intensity of field surveys and season, was completed for the Threatened flora taxa identified in desktop searches. This assessment determined that no Threatened taxa are likely to occur within the Project area. Given the largely degraded condition of the Project area, the survey effort and season (spring survey) if populations of Threatened flora taxa were present it is expected they would have been identified in the field.	The Project is unlikely to be at variance to this Principle.	DotE (2015a) DPaW (2007–) DPaW TPFL and WAHERB WA Herbarium (1998–)
d) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	A search of the EPBC Act PMST identified no Commonwealth listed TECs within 5 km of the Project area. Searches of the DPaW TEC and PEC databases identified one TEC within and surrounding the Project area. The TEC is identified as *Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands (Swan Coastal Plain community type 30a). The community was endorsed as a TEC with a threat ranking of vulnerable by the WA Minister for Environment in November 2011. An assessment of the vegetation types described within the Project area at a broad level, based on dominant species and general field observations determined that the GHD vegetation types consisting of *Callitris preissii* low open forest (including the area dominated by *Agonis flexuosa*) (0.35 ha) showed affinities to floristic community type 30a. The Project area has suffered a long history of disturbances including clearing and revegetation, therefore the vegetation types present within the Project area have underdone considerable changes and are considered as degraded remnants of this	The Project is at variance to this Principle.	DotE (2015a) DPaW TEC and PEC databases Gibson et al. (1994) DPaW (2014)

Principle	Assessment	Outcome1	Data sources
	TEC. The vegetation types ranged from Very Good to Degraded condition. Given that the proposed clearing will result in the loss of approximately 0.35 ha of vegetation representing a TEC the Project is considered to be at variance to this principle.		
(e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	The national objectives and targets for biodiversity in Australia has a target to prevent clearance of ecological communities with an extent below 30 per cent of that present pre-1970, below which species loss appears to accelerate exponentially at an ecosystem level. Within constrained areas (i.e. areas of urban development in cities and major towns) on the Swan Coastal Plain, the target for representation of the pre-clearing extent of a particular native vegetation complex is 10% (Commonwealth of Australia 2001). The Project area is located within the Swan Coastal Plain IBRA Bioregion, which has approximately 39.10 percent of its pre-European extent remaining. Broad scale pre-European vegetation mapping of the area was completed by Beard (1979) at an association level. The mapping indicates one vegetation association present within the Project area: Medium woodland; Tuart (association 998). The current extent of vegetation association 998 is more than 30 percent of its pre-European extent remaining at all levels (State, IBRA bioregion, IBRA subregion) except the Local Government Area (LGA), which it has less than 30 percent remaining(19.47) and may be considered as significant by the EPA. Regional vegetation has been mapped by Heddle et al. (1980) at a scale of 1:250,000 based on major geomorphic units on the Swan Coastal Plain. The Heddle et al. (1980) mapping indicates one vegetation complex on Aeolian deposits of the Swan Coastal Plain present within the Project area: Cottesloe complex – central and south: Mosaic of woodland of *Eucalyptus gomphocephala* and open forest of *E. gomphocephala – E. marginata – E. calophylla*; closed heath on the limestone outcrops. The Local Biodiversity Program (2013) has assessed the vegetation complex described and mapped by Heddle et al. (1980) against presumed pre-European extents within the Swan Coastal Plain IBRA bioregion, and the City of Cockburn. The current extent of the Cottesloe complex – central and south vegetation complex within the Swan Coastal Plain IBRA bioregion is more than 30 percent of the calculated pre-European extent however the City of Cockburn has less than 30 percent remaining, and is therefore below than the 30 percent threshold level (21.39%) and may be considered significant by the EPA. However the vegetation types within the Project area are not considered to be consistent with the Beard (1979) vegetation associations and Heddle et al. (1980) vegetation complexes mapped for the Project area. The vegetation types are	The Project may be at variance to this Principle.	Beard (1979) Commonwealth of Australia (2015) Government of Western Australia (2000) Heddle et al. (1980) Shepherd (2007)

Principle	Assessment	Outcome1	Data sources
	considered to be more characteristic of the Quindalup Complex (Heddle et al 1980) which has been mapped nearby. The Quindalup Complex has more than 30% remaining within both the Swan Coastal Plain IBRA bioregion and the City of Cockburn. The vegetation within the Project area also closely resembles floristic community type 30a –'Callitris preissii' (or Melaleuca lanceolate) forests and woodlands, Swan Coastal Plain. This community type is a TEC classed as Vulnerable. The vegetation remaining within the Project area may be considered a significant remnant of native vegetation in an area that has been extensively cleared.		
(f) – Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	There are no watercourses or wetlands within or in close proximity to the Project area. The vegetation within the Project area is not considered to be growing in, or in association with, an environment associated with a watercourse or wetland.	The Project is not at variance to this Principle.	DotE (2015a) DoW (2015)
(g) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The Project area lies within the Spearwood Dune System which consists of Pleistocene Aeolian sands overlying Tamala Limestone. Within the Project area the soils are mapped as the Quindalup South 13 Subsystem (211Qu13) which is described as having limestone outcrop; shallow calcareous sands and remnants of parabolic dunes, limestone dominant. The Project area is mapped as having a low salinity risk. The groundwater salinity ranges between 500-1000 mg/L total dissolved solids (TDS) (DoW 2015). Coastal environments are highly susceptible to degradation and destabilisation through wind and water erosion and human and vehicle disturbance. Given the high likelihood of wind erosion being exacerbated within the Project area as a result of clearing, without proper management, the clearing may cause appreciable land degradation.	The Project may be at variance to this Principle.	DAFWA (2007) DER (2015) DoW (2015)
(h) – Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The Project area is situated within the Woodman Point Regional Park (R 49220). Woodman Point Regional Park covers a total area of 251.8 ha and is an important component of a series of regionally significant bushland reserves in the southern metropolitan area (DEC 2010). The western chain of wetlands of Beeliar Regional Park and Henderson Foreshore are located to the east and south. Woodman Point provides a vegetated east-west corridor link to the wetland chain from the coast. Such corridors are not common in the Perth metropolitan area (DEC 2010). The Project area is managed by the City of Cockburn.	The Project is at variance to this Principle.	DPaW Estate spatial dataset DPaW (2010) Government of Western Australia (2000)

Principle	Assessment	Outcome1	Data sources
	The Project area also lies entirely within Bush Forever site 341 which covers a total area of 91.7 ha. Bush Forever Site 341 has been included for special protection due to its representation of ecological communities, rarity, general criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation (Government of Western Australia 2000). The removal of the vegetation within the Project area will result in the clearing of a small portion of a TEC (SCP 30a). Given the proposed Project will result the clearing of up to 0.5 ha of vegetation within Bush Forever Site 341 and Woodman Point Regional Park, it is considered to be at variance to this principle.		
(i) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The Project area is situated within the Coastal Hydrographic Catchment within the Murray River Basin. There are no watercourses or wetlands located within or in close proximity to the Project area. The closest wetlands are approximately 1 km from the Project area, which are separated from the Project area by residential development. Within the Project area the soils are mapped as the Quindalup South 13 Subsystem (211Qu13) which is described as having limestone outcrop; shallow calcareous sands and remnants of parabolic dunes, limestone dominant. These soils have a high permeability and groundwater flows towards the ocean. The Project area is mapped as having a low salinity risk. The groundwater salinity ranges between 500-1000 mg/L total dissolved solids (TDS). Given the relatively small scale of clearing required in an already highly modified landscape, the proposed clearing is unlikely to significantly increase salinity, groundwater recharge, surface water runoff or nutrient export. The Project is considered unlikely to be at variance to this principle.	The Project is unlikely to be at variance to this Principle.	DoW (2015)
(j) – Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	There are no watercourses or wetlands within or in close proximity to the Project area. Given the small amount of clearing required for the Project (0.5 ha), clearing within the Project area is not expected to increase the existing risk of waterlogging. The proposed clearing is not likely to cause, or exacerbate, the incidence or intensity of flooding.	The Project is unlikely to be at variance to this Principle.	DoW (2015)

[1]Outcome definitions

Not at variance: the data indicates without a doubt that the proposal is not at variance e.g. there are no wetlands or watercourses in the area

Not likely to be at variance: there is very limited likelihood or potential for impact e.g. the area is considered completely degraded and does not support the vegetation or soil type preferred by a nearby record of a declared rare flora species

May be at variance: a decision cannot be made based on current data or available knowledge e.g. vegetation is in good condition, rare flora are known to occur in the local area and the area supports the soil and vegetation type preferred by declared rare flora species

Likely to be at variance: there will be an effect from the proposal, e.g. there is declared rare flora within the vegetation proposed to be cleared or there is a watercourse and riparian vegetation will be impacted by the project

Likely to be seriously at variance: there is certainty that there will be substantial damage from the proposal e.g. proposal will remove an entire population of declared rare flora.

6. Conclusion and recommendations

6.1 Key findings

6.1.1 Vegetation and flora

- The Project area consists of remnant coastal vegetation with patches of revegetation and planted trees. The Project area is located within an area that has a long history of disturbances, including clearing which have resulted in the colonisation of grassy weeds and annuals. The Project area would receive a high level of traffic from people moving through the area due to its proximity to cycle paths and walkways, a caravan park, the Coogee Beach SLSC, adjacent carpark and beach which in turn increases the amount of littering and weed invasion.
- Three vegetation types were described from the Project area, *Agonis flexuosa* (Peppermint) Low Open Forest, *Callitris preissii* (Rottnest Island Pine) Low Open Forest and Revegetation. The two low open forest vegetation types only differed by the absence/presence of *Agonis flexuosa* and essentially comprised of an understorey of the same dominant species. These vegetation types comprised of a dense canopy cover and a very sparse understorey. Revegetation has occurred in scattered locations throughout the Project area, mostly concentrated around the boundaries in areas which have previously been cleared or highly disturbed.
- The two vegetation types comprising of *Callitris preissii* forest have been identified as a Threatened Ecological Community (TEC). An analysis of information provided by Gibson et al. (1994) in Floristic Survey of the Southern Swan Coastal Plain, indicated that the Floristic Community Type (FCT) 30a – *Callitris preissii* (or *Melaleuca lanceolata*) forest and woodlands is present within the Project area which is listed as Vulnerable. There is approximately 0.35 ha of remnant vegetation in the Project area which is considered to represent this TEC.
- No conservation significant flora species listed under the EPBC Act or WC Act or Priority flora listed by DPaW were recorded within the Project area during the survey or are considered likely to occur.
- One weed species recorded from the Project area, Bridal creeper (*Asparagus asparagoides*), is listed as a Declared pest under the BAM Act and WoNS. A number of young shoots of bridal creeper were recorded throughout the Project area.

6.1.2 Fauna

- The Project area comprises of two broad habitat types consisting of low open forest and an open shrubland (revegetation). The trees and shrubs within the site provide good value fauna habitat, particularly for bird species, providing shelter and food resources. However given the open and degraded nature of the understorey, the Project area is considered to provide very low value habitat for small native terrestrial species.
- No fauna of conservation significance were recorded within the Project area during the survey.
- A likelihood of occurrence assessment was conducted for all conservation significant fauna species identified in the desktop assessment. This identified seven conservation significant fauna as likely to, or may occur, within the Project area, including the Carnaby's Black Cockatoo (Calyptorhynchus latirostris), Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*), Peregrine Falcon (*Falco peregrinus*), Rainbow

Bee-eater (*Merops ornatus),* Quenda / Southern Brown Bandicoot (*Isoodon obesulus fusciventer*), Perth Lined Skink (*Lerista lineata*) and Black-striped Snake (*Neelaps calonotos*).

- Evidence of foraging by black cockatoo's, likely to be the Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) has previously been recorded in the area (Regen4 Environmental Services and Western Wildlife 2015).
- The Perth Lined Skink is currently listed as Priority 3 (DPaW) however the species is currently under federal review and initial assessment places the species as either vulnerable or endangered listing. This listing is likely to take effect in early 2016. Woodman Point is a well-known Perth Lined Skink locality and the species is likely to be within the Project area. The Perth Lined Skink is only found between Perth and Bunbury along the western edge of the coastal strip and much of its habitat has been destroyed through urban creep (Maryan et al 2015). When the Perth Lined Skink is listed additional assessments may be required to ascertain its presence and the extent of impact to this species.
- No species of conservation significance are likely to be solely dependent on the remnant vegetation remaining within the Project area. Given the small size and fragmented nature of the Project area and history of disturbances, clearing of the Project area is unlikely to have a significant impact on these conservation significant fauna species.

6.2 Recommendations

The City of Cockburn will be required to submit a clearing permit application to the Department of Environment Regulation (DER) for the proposed clearing of the Project area. The assessment against the Ten Clearing Principles determined that the proposed clearing of the Project area (0.5 ha) is at variance with Principles d and h and may be at variance to Principles a, e and g.

The Project area currently supports 0.35 ha of vegetation which is considered to be the TEC SCP 30a *Callitris preissii* (*Melaleuca lanceolata*) and has previously been used as part of the offset site for the original SLSC development.

Based on the results of the flora and fauna survey and assessment of the Ten Clearing Principles, GHD propose the following recommendations:

- Provide an offset package to the DER to offset the loss of 0.35 ha of a TEC as well as 0.5 ha of a Bush Forever Site.
- Clearing of vegetation will be restricted to the minimum required for the Project.
- Rehabilitation works to be carried out in adjacent areas of degraded remnant vegetation using local native species.
- Avoid clearing during late winter and spring to avoid mortality of native birds - eggs and nestlings.
- Avoid clearing during summer, when Rainbow Bee-eaters are breeding, or ensure there are no Rainbow Bee-eater burrows within the clearing area.
- Use local native plant species in any verge and median strip plantings.

7. References

Beard, JS 1979, *Vegetation Survey of Western Australia: Perth Map and Explanatory Memoir 1:250,000 series*, Perth, Vegmap Publications.

Beard, JS 1990, *Plant Life of Western Australia*, Perth, Kangaroo Press.

Bell, PJ and Mooney, N 2002, *Distribution, Habitat and Abundance of Masked Owls (Tyto novaehollandiae) in Tasmania*, In; Ecology and Conservation of Owls, Eds. Newton I., Kavanagh R., Olsen J., and Taylor I., CSIRO Publishing, Australia.

Burbidge, AA 2004, *Threatened Animals of Western Australia*. Department of Conservation and Land Management, Perth.

Bush, B, Maryan, B, Browne-Cooper, R, and Robinson, D 2010, *Field Guide to the Reptiles and Frogs of the Perth Region,* Western Australian Museum, Western Australia.

Bureau of Meteorology (BoM) 2015*, Climate Data Online*, retrieved October 2015, from http://www.bom.gov.au/climate/data/

Christidis, L and Boles, WE 2008, *Systematics and Taxonomy of Australian Birds*, Melbourne, CSIRO Publishing.

Coffey Environments Pty Ltd (Coffey) 2008, *Proposed Coogee Beach Surf Life Saving Club and Community Facilities at Poore Grove, Coogee Environmental Management Plan*, Prepared for City of Cockburn August 2008.

Commonwealth of Australia 2012, *EPBC Act Referral Guidelines for Three Threatened Black Cockatoo Species: Carnaby's Black Cockatoo, Baudin's Black Cockatoo and Forest red-tailed Black Cockatoo*, Canberra, Department of Sustainability, Environment, Water, Population and Communities.

Department of Environment and Conservation (DEC) 2010, *Woodman Point Regional Park Management Plan 2010*, Prepared by the Department of Environment and Conservation on behalf of the Conservation Commission of Western Australia.

Department of Agriculture and Food Western Australia (DAFWA) 2007, *Soil-landscape mapping in South-western Australia*, Perth, Department of Agriculture and Food

Department of Environment Regulation (DER) 2015, *Native Vegetation Map Viewer*, retrieved October 2015, from http://maps.dec.wa.gov.au/idelve/nv/.

Department of Parks and Wildlife (DPaW) 2007–, N*atureMap: Mapping Western Australia's Biodiversity,* Department of Parks and Wildlife, retrieved October 2015, from http://NatureMap.dec.wa.gov.au/default.aspx.

Department of Parks and Wildlife (DPaW) 2014, *Callitris preissii (or Melaleuca lanceolate) forests and woodlands (Swan Coastal Plain community type 30a – Gibson et al. 1994),* Interim Recovery Plan No. 340, Department of Parks and Wildlife, Perth.

Department of the Environment (DotE) 2015a, *EPBC Act Protected Matters Report*, retrieved October 2015, from http://www.environment.gov.au/arcgisframework/apps/pmst/pmst.jsf.

Department of the Environment (DotE) 2015b, *Species Profile and Threats Database (SPRAT)*, retrieved October 2015, from http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

Department of the Environment (DotE) 2015c, *Interim Biogeographic Regionalisation of Australia, Version 7,* retrieved October 2015, from http://www.environment.gov.au/topics/land/nrs/science-maps-and-data/australiasbioregions-ibra.

Department of Water 2015, *Perth Groundwater Atlas*, retrieved October 2015, from http://www.water.wa.gov.au/maps-and-data/maps/perth-groundwater-atlas

Environmental Protection Authority (EPA) 2002, *Terrestrial Biological Surveys as an Element of Biodiversity Protection: Position Statement No. 3*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2004a, *Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2004b, *Guidance Statement No. 56: Terrestrial Fauna Surveys for Impact Assessment in Western Australia*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2010, *Technical Guide – Terrestrial Vertebrate fauna Surveys for Environmental Impact,* Perth, Environmental Protection Authority and the Department of Environment and Conservation.

Garnett, ST and Crowley, GM 2000, *The Action Plan for Australian Birds 2000,* Environment Australia, Canberra.

Gibson, N, Keighery, BJ, Keighery, GJ, Burbidge, AH and Lyons, MN 1994, *A Floristic Survey of the Southern Swan Coastal Plain*, unpublished report prepared for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and The Conservation Council of Western Australia (Inc.).

Government of Western Australia (GoWA) 2000, *Bush Forever Volumes 1 and 2.* Western Australian Planning Commission, Perth, WA.

Government of Western Australia (GoWA) 2015, *Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full report),* Current as of June 2014, Perth Western Australia, Department of Environment and Conservation, retrieved October 2015, from https://www2.landgate.wa.gov.au/web/guest/downloader.

Heddle, EM, Loneragan, OW and Havel, JJ 1980, *Vegetation of the Darling System, In Atlas of Natural Resources, Darling System, Western Australia*, Department of Environment, Perth, Western Australia.

Keighery, B 1994, *Bushland Plant Survey: a Guide to Plant Community Survey for the Community*, Nedlands, Wildflower Society of WA (Inc.).

Local Biodiversity Program 2013, 2013 *Native vegetation by vegetation complex dataset for the South West of Western Australia*, retrieved October, 2015, from http://pbp.walga.asn.au/Publications.aspx.

Marchant, S and Higgins, PJ eds. 1990, *Handbook of Australian, New Zealand and Antarctic Birds, Volume One - Ratites to Ducks*, Melbourne, Victoria: Oxford University Press.

Maryan, B, Gaikhorst, G, O'Connell, M and Callan, S 2015. *Notes on the distribution and conservation status of the Perth Lined skink (Lerista Lineata); A small lizard in a big city*. The Western Australian Naturalist. Vol 30 No.1 June 2, 2015.

Mitchell, D, Williams, K and Desmond, A 2002, *Swan Coastal Plain 2 (SWA2 — Swan Coastal Plain subregion), In: A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (pages 606—623), Perth, Department of Conservation and Land Management.

Morcombe, M 2004, *Field Guide to Australian Birds,* Steve Parish Publishing Archer Field, Queensland Australia.

Nevill, S 2013, *Birds of Western Australia Field Guide*, Simon Nevill Publications, Perth Australia Floraurvey

Regen4 Environmental Services and Western Wildlife 2015, *Flora and Fauna Survey for Coogee Surf Life Saving Club Overflow Carpark*, Unpublished report for the City of Cockburn, June 2015.

Shepherd, DP, Beeston, GR, and Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status, Resource Management Technical Report 249*, Perth, Department of Agriculture, Western Australia.

Sinclair, EA, and Hyder, BM 2009, *Surviving quokka (Setonix brachyurus) population on the Swan Coastal Plain, Western Australia*, *Australian Mammalogy* 31 (1): 67-69.

Van Dyke, S and Strahan, R 2008, *The Mammals of Australia*. Third Edition, New Holland Publishing, Sydney Australia.

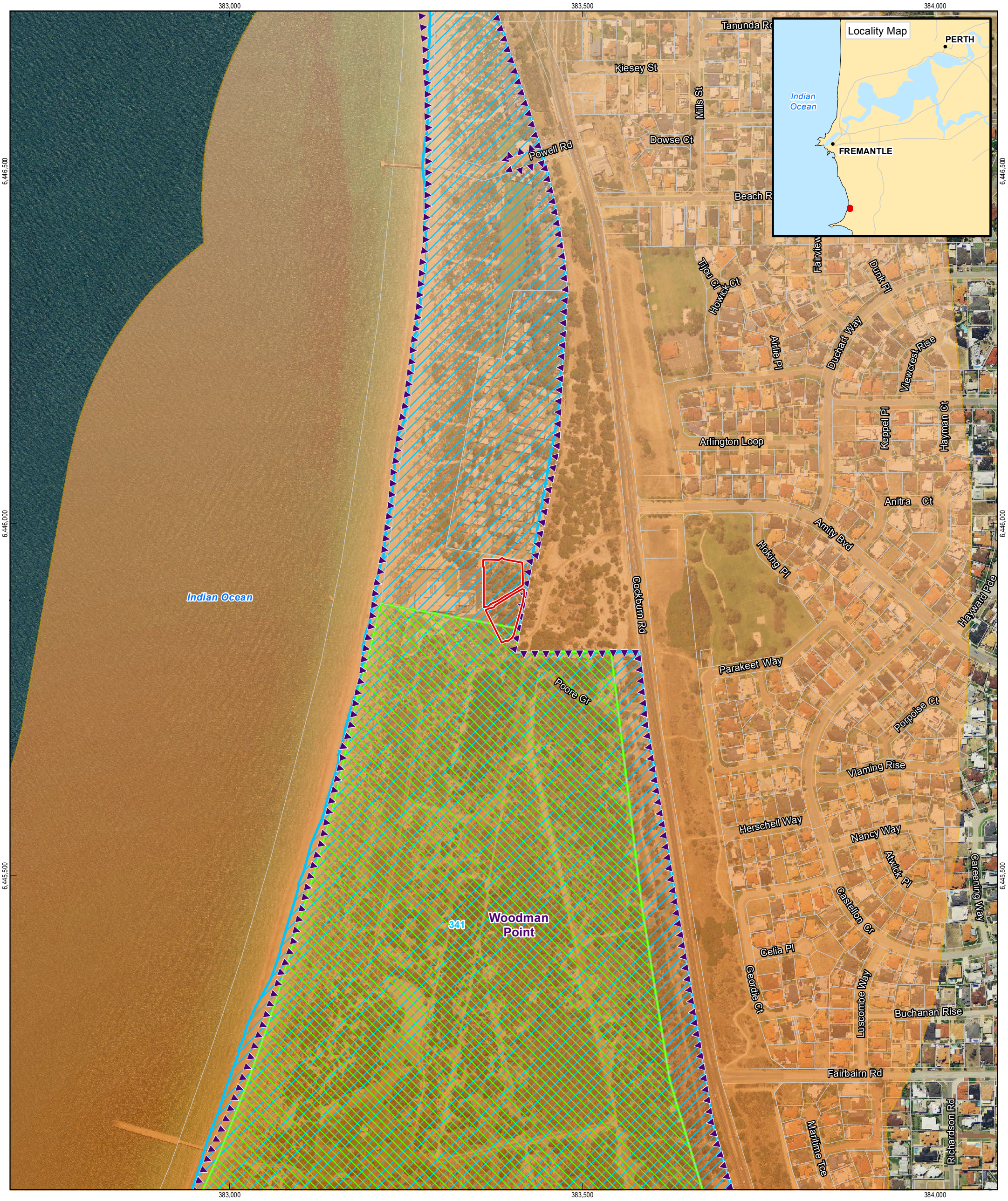
Weatherzone 2015, *Perth Climate*, retrieved October 2015, from http://www.weatherzone.com.au/climate/station.jsp?lt=site&lc=9225.

Western Australian Herbarium 1998–, *FloraBase—the Western Australian Flora*, Department of Parks and Wildlife, retrieved October 2015, from http://florabase.dpaw.wa.gov.au/.

Wilson, S, and Swan, G 2010, *A Complete Guide to Reptiles of Australia*, Thirds Edition, New Holland Publishing, Sydney, Australia.

Appendices

Appendix A – Figures



LEGEND

- DPaW Estate
- Bush Forever Area 2000
- Threatened Ecological Communities
- Regional Park
- Cadastre
- Project Area

1:5,000 at A3

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

City of Cockburn
Coogee Beach SLSC Carpark Development

Job Number	61-32654
Revision	0
Date	25 Nov 2015

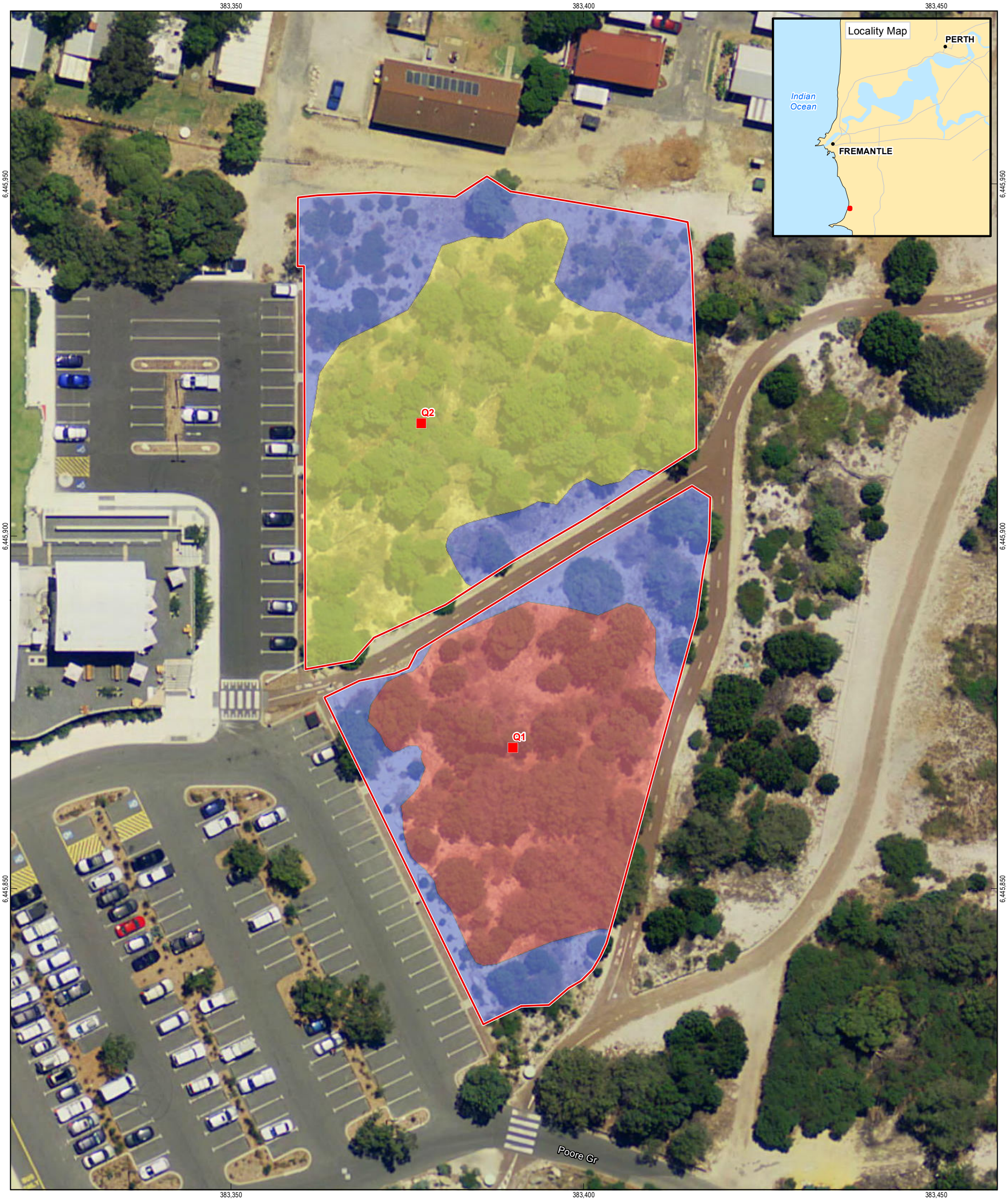
Locality and Environmental Constraints

Figure 1

G:\61\32654\GIS\Maps\Working\6132654_G001_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: Landgate: Virtual Mosaic - 20151026, Road Names - 20151026, Cadastre - 20151027; City of Cockburn: Project Area - 20150807; DPaW: Regional Park - 20151027, DPaW Estate - 20151027, Threatened Ecological Communities - 20151027; DoP: Bush Forever Area 2000 - 20151028; GA: Geodata Topo 250k Series III - 2006. Created by: mczekaj



LEGEND

- Quadrat
- Project Area

Vegetation Type

- *Agonis flexuosa* Low Open Forest
- *Callitris preissii* Low Open Forest
- Revegetation

1:500 at A3

0 2.5 5 10 15 20 25

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

City of Cockburn
Coogee Beach SLSC Carpark Development

Job Number 61-32654
Revision 0
Date 25 Nov 2015

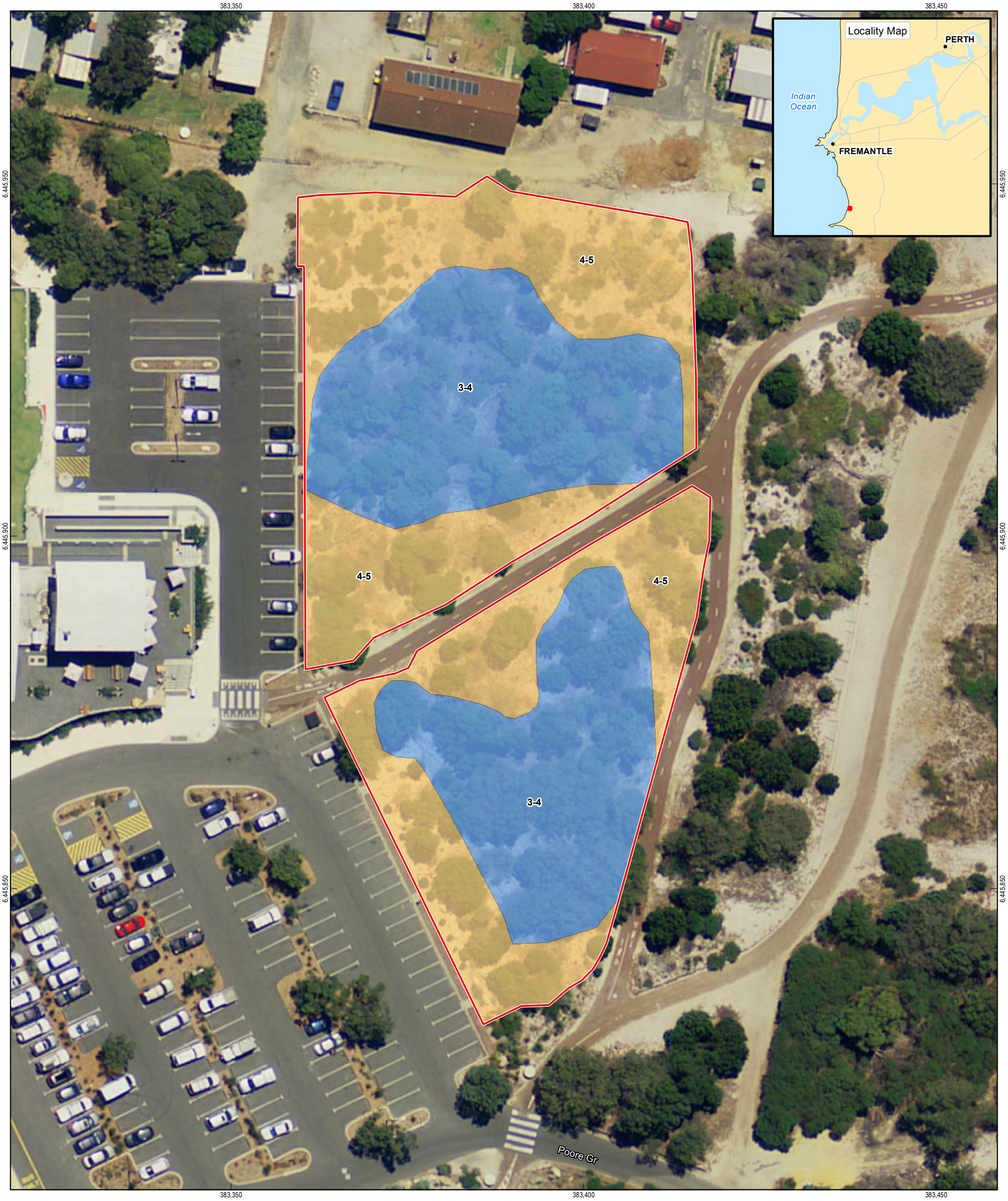
Vegetation Type

Figure 2

G:\61\32654\GIS\Maps\Working\6132654_G002_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: Landgate: Virtual Mosaic - 20151026, Road Names - 20151026; City of Cockburn: Project Area - 20150807; GHD: Vegetation Type - 20151027, Quadrat - 20151027; GA: Geodata Topo 250k Series III - 2006. Created by: mczekaj



LEGEND

Vegetation Condition			
1. Pristine or Nearly so	2-3	4-5	Project Area
1-2	3. Very Good	5. Degraded	
2. Excellent	3-4	5-6	
	4. Good	6. Completely Degraded	

1:500 at A3

0 2.5 5 10 15 20 25

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

City of Cockburn
Coogee Beach SLSC Carpark Development

Job Number 61-32654
Revision 0
Date 25 Nov 2015

Vegetation Condition

Figure 3

G:\61\32654\GIS\Maps\Working\6132654_G003_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: Landgate: Virtual Mosaic - 20151026, Road Names - 20151026; City of Cockburn: Project Area - 20150807; GHD: Vegetation Condition - 20151027; GA: Geodata Topo 250k Series III - 2006. Created by: mczekaj

Appendix B – Relevant legislation, conservation codes and background information

Legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not take an action that has, will have, or is likely to have a significant impact MNES, without approval from the Federal Minister for the Environment.

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Australian Government Minister for the Environment.

State *Environmental Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the above.

Clearing of native vegetation in Western Australia requires a permit from the Department of Environment Regulation (DER) (formerly the Department of Environment and Conservation – DEC), unless exemptions apply. Native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native, but not vegetation planted in a plantation or planted with commercial intent.

In the EP Act Section 51A, clearing is defined as the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage of some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above.

When making a decision to grant or refuse a permit to clear native vegetation the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

a) Native vegetation should not be cleared if it comprises a high level of biodiversity.

b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.

c) Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.

d) Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.

e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

g) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

h) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

There are a number of Environmentally Sensitive Areas (ESAs) within Western Australia where exemptions in regulations do not apply. ESAs include locations of threatened communities and species.

State *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*

ESAs are declared by a notice under Section 51B of the EP Act. The Table below outlines the aspects of areas declared as ESA (under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 – Reg 6).

Aspects of Environmentally Sensitive Areas

Aspects of Environmentally Sensitive Areas
A declared World Heritage property as defined in Section 13 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
An area that is registered on the Register of the National Estate (RNE), because of its natural values, under the *Australian Heritage Commission Act 1975* of the Commonwealth (the RNE was closed in 2007 and is no longer a statutory list – all references to the RNE were removed from the EPBC Act on 19 February 2012).
A defined wetland and the area within 50 m of the wetland.
The area covered by vegetation within 50 m of rare flora, to the extent to which the vegetation is continuous with the vegetation in which the rare flora is located.
The area covered by a TEC.
A Bush Forever Site.
The areas covered by the following policies:
a) The *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.
b) The *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (SCPL) (EPP Lakes) applies.
Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.
Areas of fringing native vegetation in the policy area as defined in the *Environmental Protection (Swan and Canning Rivers) Policy 1997*.

State *Wildlife Conservation Act 1950*

The *Wildlife Conservation Act 1950* (WC Act) provides for the conservation and protection of wildlife. It is administered by the Department of Parks and Wildlife (DPaW) (formerly the DEC) and applies to both flora and fauna. Any person wanting to capture, collect, disturb or study fauna requires a permit to do so. A permit is required under the WC Act if removal of threatened species is required.

State *Biosecurity and Agriculture Management Act 2007*

Under the *Biosecurity and Agriculture Management Act 2007* (BAM Act), a Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) is in force. The Department of Agriculture and Food Western Australia (DAFWA) maintains a list of Declared Pests for Western Australia. If a Pest is declared for the whole of the State or for particular Local Government Areas, all landholders are obliged to comply with the specific category of control. Declared plants are gazetted under categories, which define the action required. The category may apply to the whole of the State, districts, individual properties or even paddocks. Categories of control are defined below. Among the factors considered in categorising Declared Pests are:

- The impact of the plant on individuals, agricultural production and the community in general
- Whether it is already established in the area
- The feasibility and cost of possible control measures

The BAM Act replaces the repealed *Agriculture and Related Resources Protection Act 1976* (ARRP Act).

Department of Agriculture and Food (Western Australia) Categories for Declared Pests under the *Biosecurity and Agriculture Management Act 2007*

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are 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)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are 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.

Background information and conservation codes

Reserves and conservation areas

Bush Forever

Bush Forever, which was released in December 2000 and proclaimed in 2010, is a Government initiate aimed to retain and protect regionally significant bushland on the Swan Coastal Plain within the Perth Metropolitan Region. Bush Forever aims to protect more than 51,000 hectares of regionally significant bushland within 287 sites across the metropolitan portion of the Swan Coastal Plain (Government of Western Australia 2000). Bush Forever sites constitute ESAs as declared by a notice under Section 51B of the EP Act.

Department of Parks and Wildlife managed lands and waters

DPaW manages lands and waters throughout Western Australia to conserve ecosystems and species, and to provide for recreation and appreciation of the natural environment. DPaW managed lands and waters include national parks, conservation parks and reserves, marine parks and reserves, regional parks, nature reserves, State forest and timber reserves. DPaW managed conservation estate, is vested with the Conservation Commission of Western Australia. Access to, or through, some areas of DPaW managed lands may require a permit or could be restricted due to management activities. Proposed land use changes and development proposals that abut DPaW managed lands will generally be referred to DPaW throughout the assessment process.

Wetlands

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil. Approximately 25 percent of the Swan Coastal Plain between Moore River and Mandurah is classified as wetland (Hill et al. 1996).

Though extensive in area, not all wetlands retain significant ecological values due to the concentration of urban and agricultural development in the region. Most wetlands have been cleared, filled or developed over, leaving only 20 percent of all the wetlands that were present on the Swan Coastal Plain prior to European settlement. Of these, an estimated 15 percent of the wetland area has retained high ecological values (Hill et al. 1996).

Ramsar Listed Wetlands

The Convention of Wetlands of International Importance was signed in 1971 at the Iranian town of Ramsar. The Convention has since been referred to as the Ramsar Convention. Ramsar Listed wetlands are “sites containing representative, rare or unique wetlands, or wetlands that are important for conserving biological diversity … because of their ecological, botanical, zoological, limnological or hydrological importance” (DotE 2015b). Once a Ramsar Listed Wetland is designated, the country agrees to manage its conservation and ensure its wise use. Under the Convention, wise use is broadly defined as “maintaining the ecological character of a wetland” (DotE 2015b).

Nationally important wetlands

Wetlands of national significance are listed under the Directory of Important Wetlands in Australia. Nationally important wetlands are wetlands which meet at least one of the following criteria (DoE 2015a):

- It is a good example of a wetland type occurring within a biogeographic region in Australia
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex

- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail
- The wetland supports one percent or more of the national populations of any native plant or animal taxa
- The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level
- The wetland is of outstanding historical or cultural significance

Lakes covered under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*

The *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP Lakes) protects the environmental values of selected lakes/wetlands on the Swan Coastal Plain.

Geomorphic wetlands

Categorisation of wetlands has been conducted by Hill et al. (1996), delineating Swan Coastal Plain wetlands into levels of protection and management categories. Conservation Category Wetlands are wetlands that support high levels of attributes and functions. Resource Enhancement Wetlands are those that have been partly modified but still support substantial functions and attributes. Multiple Use Wetlands are classified as those wetlands with few attributes that still provide important wetland functions. Multiple Use wetlands have few important ecological attributes and functions remaining.

The Geomorphic Wetlands Swan Coastal Plain dataset displays the location, boundary, geomorphic classification (wetland type) and management category of wetlands on the Swan Coastal Plain.

Vegetation extent and status

The National Objectives and Targets for Biodiversity Conservation 2001–2005 (Commonwealth of Australia 2001) recognise that the retention of 30 percent or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. This is the threshold level below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the National Strategy for the Conservation of Australia's Biological Diversity (ANZECC 2000) and in Environmental Protection Authority (EPA) Position Statement No. 2 on environmental protection of native vegetation in Western Australia (EPA 2000).

From a purely biodiversity perspective and taking no account of any other land degradation issues, there are a number of key criteria now being applied to the clearing of native vegetation in Western Australia (EPA 2000).

- The "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30 percent of the pre-European extent of the vegetation type.
- A level of 10 percent of the original extent is regarded as being a level representing Endangered.
- Clearing which would put the threat level into the class below should be avoided.
- From a biodiversity perspective, stream reserves should generally be in the order of at least 200 metres (m) wide.

Within the Swan Coastal Plain, EPA Position Statement No. 9 (EPA 2006a) identifies vegetation complexes with 30 percent or less or their pre-clearing extent remaining in a bioregion, or 10 percent or less of their pre-clearing extent remaining in constrained areas (i.e. areas of urban development in cities and major town) on the Swan Coastal Plain, to be critical assets.

The extent of remnant native vegetation has been assessed by Shepherd et al. (2002) and the Government of Western Australia (2013), based on broadscale vegetation association mapping by Beard (1979).

The Local Biodiversity Program (2013) has assessed the extent of Heddle et al. (1980) vegetation complexes currently present against presumed pre-European extents.

It is important to note that the “remnant native vegetation mapping used in the Region is derived from dated aerial photography (in this case 1998) with limited ground-truthing. As a consequence, the percentages of ecological communities remaining are generally an overestimate of the native vegetation remaining at present and at the date of this Guidance (2006). The principal factors contributing to this overestimation are:

- The preferential mapping of treed landscapes, leading to some mapping of areas that are parkland cleared or completely degraded
- The inclusion of areas that are approved for clearing through development approvals and/or clearing permits
- Some areas that have been cleared since the time of the aerial photography

It is therefore important to bear these issues in mind when the percentage of the vegetation complexes remaining is approaching 30 percent” (EPA 2006b). Furthermore, as a result of the clearing of the Swan Coastal Plain since 1998, it is likely that the actual percentage remaining of each vegetation type is less.

Conservation codes

Species of significant flora, fauna and communities are protected under both Federal and State Acts. The Federal EPBC Act provides a legal framework to protect and manage nationally important flora and communities. The State WC Act is the primary wildlife conservation legislation in Western Australia. Information on the conservation codes is summarised in the following sections.

Conservation significant communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English and Blyth 1997). Federally listed Threatened Ecological Communities (TECs) are protected under the EPBC Act administered by the Department of the Environment (DotE) (formerly Department of Sustainability, Environment, Water, Population and Communities – DSEWPaC). The DPaW also maintains a list of TECs for Western Australia; some of which are also protected under the EPBC Act. TECs are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

Possible TEC that do not meet survey criteria are added to the DPaW Priority Ecological Community (PEC) List under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs 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. PECs are not listed under any formal Federal or State legislation.

Conservation codes and definitions for Threatened Ecological Communities endorsed by the Western Australian Minister for the Environment and listed under the *Environment Protection and Biodiversity Conservation Act 1999*

Western Australia conservation categories		Federal Government Conservation Categories (EPBC Act)	
Presumed Totally Destroyed (PD)	The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.	Critically Endangered (CR)	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated	Endangered (EN)	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.	Vulnerable (VU)	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.		

Conservation categories and definitions for Priority Ecological Communities as listed by the Department of Parks and Wildlife

Category	Description
Priority 1	**Poorly known ecological communities.** Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority 2	**Poorly known ecological communities.** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200 ha). At least some occurrences are not believed to be under immediate threat 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.
Priority 3	**Poorly known ecological communities.** (i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, 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.
Priority 4	**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.** (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.

Category	Description
Priority 5	**Conservation Dependent ecological communities.** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Other significant vegetation

Vegetation may be significant for a range of reasons, other than a statutory listing as TEC or because the extent is below a threshold level. The EPA (2004) states that significant vegetation may include vegetation that includes the following:

- Scarcity
- Unusual species
- Novel combinations of species
- A role as a refuge
- A role as a key habitat for Threatened species or large population representing a significant proportion of the local to regional total population of a species
- Being representative of the range of a unit (particularly, a good local and/or regional example of a unit in 'prime' habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- A restricted distribution

This may apply at a number of levels, so the unit may be significant when considered at the fine-scale (intra-locality), intermediate-scale (locality or inter-locality) or broad-scale (local to region).

Conservation significant flora and fauna

Species of significant flora are protected under both Federal and State legislation. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act, and/or the WC Act can warrant referral to the DotE and/or the EPA. According to the DPaW (WA Herbarium, 1998–): "Threatened flora are plants which have been assessed as being at risk of extinction. In Western Australia the term Declared Rare Flora (DRF) is applied to Threatened flora due to the laws regarding threatened flora conservation. The WC Act is the primary wildlife conservation legislation in the State and the Minster for the Environment can declare taxa (species, subspecies or variety) as "Rare Flora" if they are considered to be in danger of extinction, rare or otherwise in need of special protection." For the purposes of this report, flora listed by the WC Act as DRF is described as Threatened.

The Federal conservation level of flora and fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN).

The State conservation level of fauna species and their significance status is assessed under the State WC Act (*Wildlife Conservation (Specially Protected Fauna) Notice 2010(2)*). This Act uses a set of Schedules, but also classifies species using some of the IUCN categories. Schedule 3 fauna species are those which are "subject to an agreement between the Government of Australia and the Governments of Japan, China and the Republic of Korea relating to the protection of migratory birds, are declared to be fauna that is in need of special protection".

In Western Australia, the DPaW also maintains a list of Priority listed flora species. Conservation codes for Priority species are assigned by the DPaW to define the level of conservation significance. Priority species are not currently protected under the WC Act.

For the purposes of this assessment, all species listed under the EPBC Act, WC Act and DPaW Priority species are considered conservation significant.

Conservation categories and definitions for *Environment Protection and Biodiversity Conservation Act 1999* listed flora & fauna species

Conservation category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years
Extinct in the Wild	Taxa known to survive only in captivity
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Taxa facing a very high risk of extinction in the wild in the near future
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term
Near Threatened	Taxa that risk becoming Vulnerable in the wild
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not considered Threatened

Conservation codes and descriptions for Western Australian flora and fauna

Code	Conservation category	Description
Wildlife Conservation Act 1950		
T	Schedule 1 under the WC Act	**Threatened Fauna (Fauna that is rare or is likely to become extinct)** **Threatened Flora (Declared Rare Flora – Extant)** Taxa that have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such. ***CR: Critically Endangered –*** considered to be facing an extremely high risk of extinction in the wild. ***EN: Endangered –*** considered to be facing a very high risk of extinction in the wild. ***VU: Vulnerable –*** considered to be facing a high risk of extinction in the wild.
X	Schedule 2 under the WC Act	**Presumed Extinct Fauna** **Presumed Extinct Flora (Declared Rare Flora – Extinct)** Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	Schedule 3 under the WC Act	**Birds protected under an international agreement.** Birds that are subject to an agreement between governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction.
S	Schedule 4 under the WC Act	**Other specially protected fauna.** Fauna that is in need of special protection, otherwise than for the reasons mentioned in the above schedules.
DPaW Priority Listed		
1	Priority One: Poorly-known taxa	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.

Code	Conservation category	Description
2	Priority Two: Poorly-known taxa	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3	Priority Three: Poorly-known taxa	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4	Priority Four: Rare, Near Threatened and other taxa in need of monitoring	(a) Rare. Taxa 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 taxa are usually represented on conservation lands. (b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5	Priority 5: Conservation Dependent taxa	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.

Migratory species listed under the EPBC Act

The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

Other significant flora and fauna

Flora species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than as Threatened (Declared Rare) Flora or Priority Flora. The EPA (2004) states that significant flora may include taxa that have:

- A keystone role in a particular habitat for threatened species or supporting large populations representing a significant proportion of the local regional population of a species
- Relic status
- Anomalous features that indicate a potential new discovery
- Being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range)
- The presence of restricted subspecies, varieties, or naturally occurring hybrids
- Local endemism/a restricted distribution
- Being poorly reserved

The application of the degree of significance may apply at a range of scales.

Introduced plants (weeds)

Declared Pests

Information on species considered to be Declared Pests is provided under *State Biosecurity and Agriculture Management Act 2007.*

Weeds of National Significance

The spread of weeds across a range of land uses or ecosystems is important in the context of socio-economic and environmental values. The assessment of Weeds of National Significance (WoNS) is based on four major criteria:

- Invasiveness
- Impacts
- Potential for spread
- Socio-economic and environmental values

Australian state and territory governments have identified thirty two Weeds of National Significance (WoNS); a list of 20 WoNS was endorsed in 1999 and a further 12 were added in 2012 (Australian Government 2014).

Environmental weeds

“Environmental weeds are plants that establish themselves in natural ecosystems (marine, aquatic and terrestrial) and proceed to modify natural processes, usually adversely, resulting in the decline of the communities they invade” (CALM 1999). The Environmental Weed Strategy for Western Australia (EWSWA) was published in 1999. This document provides direction and an approach to tackling environmental weeds in Western Australia (CALM 1999). Following on from this strategy (in 2008), in an effort to address invasive weeds and implement an integrated approach to weed management on DPaW-managed lands in WA, the Weed Prioritisation Process was developed. A series of workshops were held in each of the nine DPaW regions with the purpose of scoring all weeds which occurred in each of the DPaW regions according to the following key attributes (DPaW 2013):

- Potential distribution and impact
- Invasiveness

- Current distribution
- Feasibility of control
- Weed management ability
- Weed risk

This process resulted in the following five ratings for each weed species (DPaW 2013):

- Very high (VH)
- High (H)
- Medium (M)
- Low (L)
- Negligible (N)

The suggested management actions for each species ranged from no action required (the weed species ranking is as low as to not warrant any investment in regional strategic management actions), through targeted control to reduce infestation or spread, to species requiring state-wide eradication (DPaW 2013).

The prioritisation for individual weeds within a DPaW region should be treated as a guide and does not diminish any other requirements of land managers or developers e.g. Declared Pest requirements of the BAM Act or Ministerial requirements under Part IV of the EP Act (DPaW 2013).

References

Australia New Zealand Environment and Conservation Council (ANZECC) 2000, *Core Environmental Indicators for Reporting on the State of Environment*, ANZECC State of the Environment Reporting Task Force.

Australian Government 2014, *Weeds in Australia*, retrieved 2015, from http://www.environment.gov.au/biodiversity/invasive/weeds/index.html.

Beard, JS 1979, *Vegetation Survey of Western Australia: Perth Map and Explanatory Memoir 1:250,000 series*, Perth, Vegmap Publications.

Commonwealth of Australia 2001, *National Targets and Objectives for Biodiversity Conservation 2001–2005*, Canberra, AGPS.

Department of Conservation and Land Management (CALM) 1999, *Environmental Weed Strategy for Western Australia*, Como, Western Australia, Department of Conservation and Land Management.

Department of Parks and Wildlife (DPaW) 2013, *Weed Prioritisation Process*, retrieved 2015, from http://www.dpaw.wa.gov.au/plants-and-animals/plants/weeds/156-how-does-dpaw-manage-weeds.

Department of the Environment (DotE) 2015a, *Criteria for determining nationally important wetlands*, retrieved 2015, from http://www.environment.gov.au/topics/water/water-our-environment/wetlands/australian-wetlands-database/directory-important.

Department of the Environment (DotE) 2015b, *The Ramsar Convention on Wetlands*, retrieved 2015, from http://www.environment.gov.au/topics/water/water-our-environment/wetlands/ramsar-convention-wetlands.

English, V and Blyth, J 1997, *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*, Perth, Department of Conservation and Land Management.

Environmental Protection Authority (EPA) 2000, *Environmental Protection of Native Vegetation in Western Australia. Clearing of native vegetation, with particular reference to the agricultural area. Position Statement No. 2*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2004, *Guidance Statement No. 51, Guidance for the Assessment of Environmental Factors: Vegetation and Flora Surveys for Environmental Impact Assessment in Western Australia*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2006a, *Position Statement No. 9: Environmental Offsets*, Perth, Environmental Protection Authority.

Environmental Protection Authority (EPA) 2006b, *Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986): Level of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region (No. 10)*, Perth, Environmental Protection Authority.

Government of Western Australia 2000, *Bush Forever – Keeping the Bush in the City. Volumes 1 (Policies, Principals and Processes) & 2 (Directory of Bush Forever Sites)*, Perth, Government of Western Australia.

Government of Western Australia 2013, *2012 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report): current as of October 2012*, retrieved 2015, from https://www2.landgate.wa.gov.au/web/guest/downloader.

Heddle, EM, Loneragan, OW and Havel, JJ 1980, *Vegetation of the Darling System, In Atlas of Natural Resources, Darling System, Western Australia*, Department of Environment, Perth, Western Australia.

Hill, AL, Semeniuk, CA, Semeniuk, V and del Marco, A 1996, *Wetlands of the Swan Coastal Plain. Volume 2: Wetland Mapping, Classification and Evaluation – Wetland Atlas*, Prepared for the Water and Rivers Commission and the Department of Environmental Protection, Perth, Western Australia.

Local Biodiversity Program 2013, *2013 Native vegetation by vegetation complex dataset for the South West of Western Australia*, retrieved 2015, from http://pbp.walga.asn.au/Publications.aspx.

Shepherd, DP, Beeston, GR & Hopkins, AJM 2002, *Native Vegetation in Western Australia – Extent, Type and Status, Resource Management Technical Report 249*, Perth, Department of Agriculture.

Western Australian Herbarium 1998–, *FloraBase—the Western Australian Flora*. Department of Parks and Wildlife, retrieved 2015, from http://florabase.dpaw.wa.gov.au/.

Appendix C – Desktop searches

EPBC Act Protected Matters Search Tool (5 km buffer)

Naturemap Flora Report (5 km buffer)

Naturemap Fauna Report (5 km buffer)

Australian Government

Department of the Environment

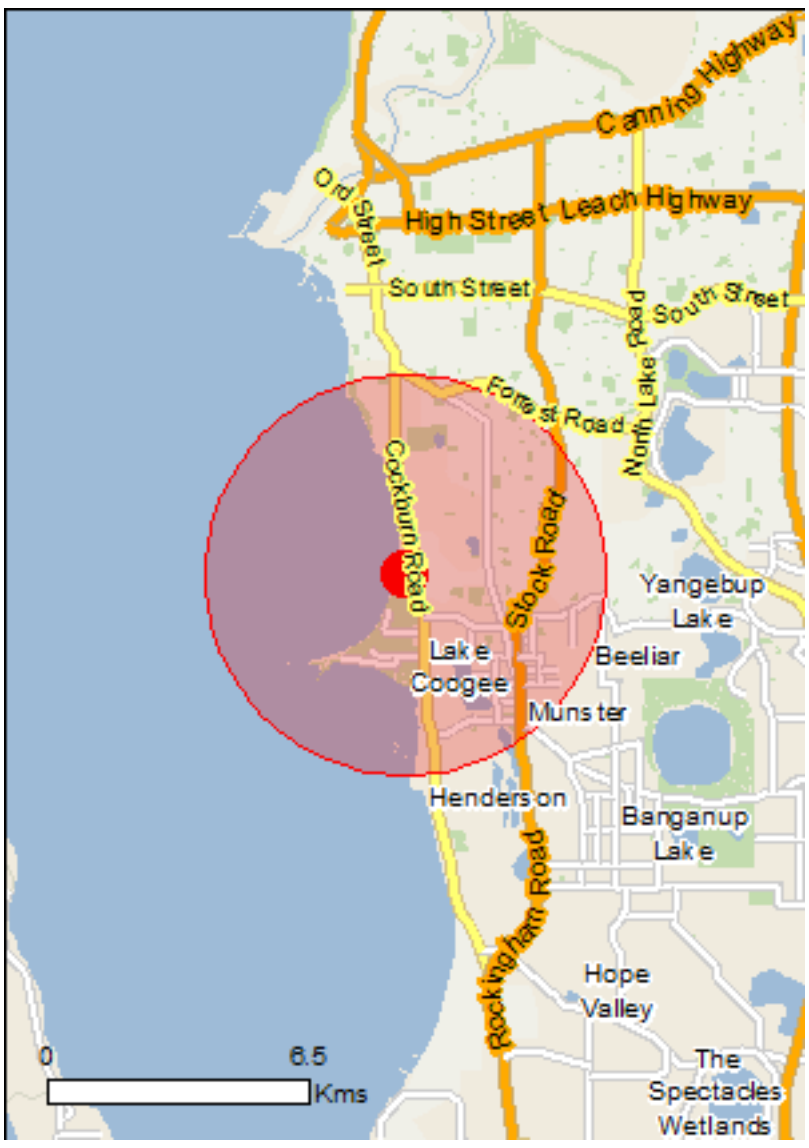
EPBC Act Protected Matters Report

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

Information on the coverage of this report and qualifications 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.

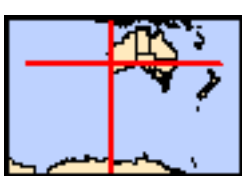
Report created: 22/09/15 14:01:16



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates

Buffer: 5.0Km



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, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	42
Listed Migratory Species:	53

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	81
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	42
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Forrestdale and thomsons lakes	Within 10km of Ramsar

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anous tenuirostris melanops		
Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus banksii naso		
Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus latirostris		
Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Diomedea epomophora epomophora		
Southern Royal Albatross [25996]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora sanfordi		
Northern Royal Albatross [82331]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans amsterdamensis		
Amsterdam Albatross [82330]	Endangered	Species or species habitat may occur within area
Diomedea exulans exulans		
Tristan Albatross [82337]	Endangered	Species or species habitat may occur within area
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Halobaena caerulea		
Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Macronectes giganteus Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris impavida Campbell Albatross [82449]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Neophoca cinerea Australian Sea-lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir [25911]	Vulnerable	Species or species habitat likely to occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat may occur within area
Plants		

Name	Status	Type of Presence
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Diuris micrantha Dwarf Bee-orchid [55082]	Vulnerable	Species or species habitat likely to occur within area
Diuris purdiei Purdie's Donkey-orchid [12950]	Endangered	Species or species habitat may occur within area
Drakaea elastica Glossy-leafed Hammer-orchid, Praying Virgin [16753]	Endangered	Species or species habitat likely to occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat may occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Sharks		
Carcharias taurus (west coast population) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat known to occur within area
Carcharodon carcharias Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed 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 Swift [678]		Species or species habitat likely to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Diomedea exulans (sensu lato)		
Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus		
Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Sterna anaethetus		
Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia		
Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii		
Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta (sensu stricto)		
Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida		
Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias		
Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Chelonia mydas Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Species or species habitat known to occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

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

Name
Commonwealth Land -

Listed 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

Name	Threatened	Type of Presence
		habitat known to occur within area
Anous tenuirostris melanops Australian Lesser Noddy [26000]	Vulnerable	Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]		Species or species habitat known to occur within area
Charadrius mongolus Lesser Sand Plover, Mongolian Plover [879]		Species or species habitat known to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Species or species habitat may occur within area
Diomedea epomophora (sensu stricto) Southern Royal Albatross [1072]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area

Name	Threatened	Type of Presence
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered*	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Heteroscelus brevipes Grey-tailed Tattler [59311]		Species or species habitat known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may occur within area
Limicola falcinellus Broad-billed Sandpiper [842]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Pluvialis squatarola Grey Plover [865]		Species or species habitat known to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area

Name	Threatened	Type of Presence
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat likely to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Sterna dougallii Roseate Tern [817]		Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross [64459]	Vulnerable*	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Xenus cinereus Terek Sandpiper [59300]		Species or species habitat known to occur within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Hippocampus subelongatus West Australian Seahorse [66722]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys meraculus Western Crested Pipefish [66259]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Vanacampus poecilolaemus		
Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Neophoca cinerea		
Australian Sea-lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area
Disteira kingii		
Spectacled Seasnake [1123]		Species or species habitat may occur within area
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Foraging, feeding or related behaviour known to occur within area

Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata		
Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus		
Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus		
Dusky Dolphin [43]		Species or species habitat may occur within area
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Congregation or aggregation known to occur within area

Name	Status	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Unnamed WA42469	WA
Unnamed WA49220	WA

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		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis European Goldfinch [403]		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
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Passer montanus Eurasian Tree Sparrow [406]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		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
Funambulus pennantii Northern Palm Squirrel, Five-striped Palm Squirrel [129]		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 norvegicus Brown Rat, Norway Rat [83]		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
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643]		Species or species habitat likely to occur within area
Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425]		Species or species habitat likely to occur within area
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species

Name	Status	Type of Presence
		habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Protasparagus densiflorus Asparagus Fern, Plume Asparagus [5015]		Species or species habitat likely to occur within area
Protasparagus plumosus Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth 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 below) 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 qualifications below and may need to seek and consider other information sources.

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

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-32.11796 115.76373

Acknowledgements

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

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

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

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

Department of the Environment
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report_Flora

Created By Guest user on 22/09/2015

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115°45' 49" E,32°07' 04" S
Buffer 5km
Group By Family

Family	Species	Records
Aizoaceae	2	2
Amaranthaceae	3	5
Anacardiaceae	1	1
Apiaceae	2	7
Araliaceae	1	1
Asparagaceae	7	9
Asphodelaceae	2	3
Asteraceae	18	26
Brassicaceae	2	2
Bryaceae	1	2
Campanulaceae	1	1
Caprifoliaceae	1	4
Caryophyllaceae	2	3
Casuarinaceae	1	1
Chenopodiaceae	4	4
Convolvulaceae	3	4
Crassulaceae	2	2
Cupressaceae	1	9
Cymodoceaceae	2	2
Cyperaceae	8	10
Dilleniaceae	2	6
Ericaceae	2	3
Euphorbiaceae	4	9
Fabaceae	25	45
Fissidentaceae	1	2
Gentianaceae	1	1
Geraniaceae	3	5
Goodeniaceae	2	2
Gyrostemonaceae	1	2
Haemodoraceae	2	2
Haloragaceae	2	3
Hemerocallidaceae	2	2
Juncaceae	1	1
Juncaginaceae	1	1
Lamiaceae	2	2
Lauraceae	2	2
Linaceae	1	1
Loganiaceae	1	1
Malvaceae	4	4
Myrtaceae	12	21
Onagraceae	2	4
Ophioglossaceae	1	1
Orchidaceae	5	5
Papaveraceae	2	3
Phyllanthaceae	1	1
Pinaceae	2	2
Plantaginaceae	2	2
Poaceae	26	33
Polygalaceae	2	5
Polyphysaceae	1	2
Portulacaceae	2	3
Pottiaceae	5	11
Primulaceae	2	2
Proteaceae	7	12
Racopilaceae	1	1
Ranunculaceae	2	5
Restionaceae	1	1
Rhamnaceae	3	9
Rhodomelaceae	1	1
Rubiaceae	2	4
Rutaceae	1	2
Santalaceae	2	2
Sapindaceae	1	5
Scrophulariaceae	1	1
Simaroubaceae	1	1
Solanaceae	5	9
Stylidiaceae	2	2
Thymelaeaceae	2	2
Urticaceae	1	1
Xanthorrhoeaceae	1	1
Zygophyllaceae	1	4
TOTAL	**223**	**350**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Aizoaceae					
1.	2795	*Carpobrotus edulis (Hottentot Fig)*	Y		
2.	2813	*Mesembryanthemum crystallinum (Iceplant)*	Y		
Amaranthaceae					
3.	2668	*Amaranthus powellii (Powell's Amaranth)*	Y		
4.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
5.	15856	*Ptilotus sericostachyus subsp. sericostachyus*			
Anacardiaceae					
6.	11027	*Schinus terebinthifolius*	Y		
Apiaceae					
7.	6221	*Foeniculum vulgare (Fennel)*	Y		
8.	6289	*Xanthosia huegelii*			
Araliaceae					
9.	6280	*Trachymene pilosa (Native Parsnip)*			
Asparagaceae					
10.	1208	*Acanthocarpus preissii*			
11.	1370	*Lachenalia reflexa*	Y		
12.	1231	*Lomandra maritima*			
13.	1239	*Lomandra preissii*			
14.	1372	*Ornithogalum arabicum (Lesser Cape Lily)*	Y		
15.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
16.	1319	*Thysanotus arenarius*			
Asphodelaceae					
17.	1364	*Asphodelus fistulosus (Onion Weed)*	Y		
18.	1368	*Trachyandra divaricata*	Y		
Asteraceae					
19.	7838	*Arctotheca calendula (Cape Weed)*	Y		
20.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
21.	7911	*Carthamus lanatus (Saffron Thistle)*	Y		
22.	7915	*Centaurea calcitrapa (Star Thistle)*	Y		
23.	7916	*Centaurea melitensis (Maltese Cockspur)*	Y		
24.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
25.	20074	*Conyza sumatrensis*	Y		
26.	7976	*Galinsoga parviflora (Potato Weed)*	Y		
27.	12624	*Gnephosis angianthoides*			
28.	8008	*Helianthus annuus (Sunflower)*	Y		
29.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
30.	8149	*Olearia rudis (Rough Daisybush)*			
31.	42281	*Pithocarpa cordata*			
32.	20161	*Senecio pinnatifolius*			
33.	25884	*Senecio pinnatifolius var. latilobus*			
34.	8220	*Senecio vulgaris (Common Groundsel)*	Y		
35.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
36.	8287	*Xanthium spinosum (Bathurst Burr)*	Y		
Brassicaceae					
37.	2995	*Brassica x napus*	Y		
38.	3011	*Diplotaxis muralis (Wall Rocket)*	Y		
Bryaceae					
39.	44608	*Rosulabryum billarderii*			
Campanulaceae					
40.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
Caprifoliaceae					
41.	7368	*Scabiosa atropurpurea (Purple Pincushion)*	Y		
Caryophyllaceae					
42.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
43.	19825	*Petrorhagia dubia*	Y		
Casuarinaceae					
44.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
Chenopodiaceae					
45.	2483	*Chenopodium album (Fat Hen)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
46.	2578	*Rhagodia baccata (Berry Saltbush)*			
47.	2593	*Sarcocornia quinqueflora (Beaded Samphire)*			
48.	2639	*Suaeda australis (Seablite)*			
Convolvulaceae					
49.	6611	*Convolvulus arvensis (Field Bindweed)*	Y		
50.	6658	*Wilsonia backhousei (Narrow-leaf Wilsonia)*			
51.	6659	*Wilsonia humilis (Silky Wilsonia)*			
Crassulaceae					
52.	3140	*Crassula glomerata*	Y		
53.	3142	*Crassula natans*	Y		
Cupressaceae					
54.	96	*Callitris preissii (Rottnest Island Pine, Maro)*			
Cymodoceaceae					
55.	126	*Amphibolis antarctica (Sea Nymph)*			
56.	127	*Amphibolis griffithii*			
Cyperaceae					
57.	743	*Baumea juncea (Bare Twigrush)*			
58.	907	*Gahnia trifida (Coast Saw-sedge)*			
59.	910	*Isolepis cernua (Nodding Club-rush)*			
60.	925	*Lepidosperma angustatum*			
61.	940	*Lepidosperma pubisquameum*			
62.	29150	*Lepidosperma sp. Margaret River (B.J. Lepschi 1841)*			
63.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
64.	1036	*Tetraria octandra*			
Dilleniaceae					
65.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
66.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
Ericaceae					
67.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
68.	6436	*Leucopogon propinquus*			
Euphorbiaceae					
69.	4582	*Adriana quadripartita (Bitter Bush)*			
70.	29940	*Euphorbia maculata*	Y		
71.	4638	*Euphorbia peplus (Petty Spurge)*	Y		
72.	4648	*Euphorbia terracina (Geraldton Carnation Weed)*	Y		
Fabaceae					
73.	3282	*Acacia cyclops (Coastal Wattle)*			
74.	15481	*Acacia pulchella var. glaberrima*			
75.	3525	*Acacia rostellifera (Summer-scented Wattle)*			
76.	3527	*Acacia saligna (Orange Wattle, Kudjong)*			
77.	30032	*Acacia saligna subsp. saligna*			
78.	3584	*Acacia truncata*			
79.	18560	*Daviesia divaricata subsp. divaricata*			
80.	16585	*Daviesia nudiflora subsp. nudiflora*			
81.	20475	*Gastrolobium capitatum*			
82.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
83.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
84.	4037	*Kennedia coccinea (Coral Vine)*			
85.	4065	*Lupinus angustifolius (Narrowleaf Lupin)*	Y		
86.	4075	*Medicago littoralis (Strand Medic)*	Y		
87.	4085	*Melilotus indicus*	Y		
88.	4256	*Templetonia retusa (Cockies Tongues)*			
89.	4289	*Trifolium angustifolium (Narrowleaf Clover)*	Y		
90.	17145	*Trifolium angustifolium var. angustifolium*	Y		
91.	17763	*Trifolium campestre var. campestre (Hop Clover)*	Y		
92.	4298	*Trifolium hirtum (Rose Clover)*	Y		
93.	14738	*Trifolium resupinatum var. resupinatum*	Y		
94.	4315	*Trifolium tomentosum (Woolly Clover)*	Y		
95.	15509	*Trifolium tomentosum var. tomentosum*	Y		
96.	4319	*Vicia benghalensis (Purple Vetch)*	Y		
97.	11474	*Vicia sativa subsp. nigra*	Y		
Fissidentaceae					
98.	32369	*Fissidens tenellus*			
Gentianaceae					
99.	6539	*Centaurium erythraea (Common Centaury)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
			Y		
Geraniaceae					
100.	4332	*Erodium botrys (Long Storksbill)*	Y		
101.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
102.	4346	*Pelargonium littorale*			
Goodeniaceae					
103.	7626	*Scaevola nitida (Shining Fanflower)*			
104.	13152	*Scaevola thesioides subsp. thesioides*			
Gyrostemonaceae					
105.	2791	*Tersonia cyathiflora (Button Creeper)*			
Haemodoraceae					
106.	1427	*Conostylis candicans (Grey Cottonhead)*			
107.	11438	*Conostylis candicans subsp. candicans*			
Haloragaceae					
108.	6161	*Gonocarpus pithyoides*			
109.	6198	*Myriophyllum salsugineum*			
Hemerocallidaceae					
110.	1259	*Dianella revoluta (Blueberry Lily)*			
111.	1260	*Stypandra glauca (Blind Grass)*			
Juncaceae					
112.	11922	*Juncus kraussii subsp. australiensis*			
Juncaginaceae					
113.	147	*Triglochin mucronata*			
Lamiaceae					
114.	6881	*Marrubium vulgare (Horehound)*	Y		
115.	6929	*Salvia verbenaca (Wild Sage)*	Y		
Lauraceae					
116.	2951	*Cassytha flava (Dodder Laurel)*			
117.	2957	*Cassytha racemosa (Dodder Laurel)*			
Linaceae					
118.	4362	*Linum marginale (Wild Flax)*			
Loganiaceae					
119.	6515	*Logania vaginalis (White Spray)*			
Malvaceae					
120.	4906	*Alyogyne huegelii (Lilac Hibiscus)*			
121.	14646	*Lagunaria patersonia*	Y		
122.	4958	*Lawrencia spicata*			
123.	5092	*Thomasia pauciflora (Few Flowered Thomasia)*			
Myrtaceae					
124.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			
125.	17104	*Corymbia calophylla (Marri)*			
126.	5615	*Eucalyptus decipiens (Limestone Marlock, Moit)*			
127.	5659	*Eucalyptus gomphocephala (Tuart, Duart)*			
128.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
129.	5850	*Leptospermum laevigatum (Coast Teatree)*	Y		
130.	5900	*Melaleuca cuticularis (Saltwater Paperbark)*			
131.	13271	*Melaleuca huegelii subsp. huegelii*			
132.	5922	*Melaleuca lanceolata (Rottnest Teatree, Moonah)*			
133.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
134.	18598	*Melaleuca systena*			
135.	5978	*Melaleuca teretifolia (Banbar)*			
Onagraceae					
136.	6138	*Oenothera drummondii (Beach Evening Primrose)*	Y		
137.	14292	*Oenothera stricta subsp. stricta*	Y		
Ophioglossaceae					
138.	12782	*Ophioglossum gramineum*			
Orchidaceae					
139.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
140.	17760	*Caladenia nobilis*			
141.	10916	*Cyrtostylis huegelii*			
142.	15418	*Leptoceras menziesii*			
143.	1698	*Pterostylis vittata (Banded Greenhood)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Papaveraceae					
144.	17797	*Argemone ochroleuca subsp. ochroleuca*	Y		
145.	2969	*Fumaria capreolata (Whiteflower Fumitory)*	Y		
Phyllanthaceae					
146.	4675	*Phyllanthus calycinus (False Boronia)*			
Pinaceae					
147.	17671	*Pinus halepensis*	Y		
148.	88	*Pinus radiata (Radiata Pine)*	Y		
Plantaginaceae					
149.	7304	*Plantago major (Greater Plantain)*	Y		
150.	7108	*Veronica arvensis (Wall Speedwell)*	Y		
Poaceae					
151.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
152.	17240	*Austrostipa flavescens*			
153.	231	*Avellinia michelii*	Y		
154.	244	*Briza maxima (Blowfly Grass)*	Y		
155.	249	*Bromus diandrus (Great Brome)*	Y		
156.	41566	*Cenchrus longisetus (Feathertop)*	Y		
157.	41563	*Cenchrus purpureus (Elephant Grass)*	Y		
158.	41568	*Cenchrus setaceus (Fountain Grass)*	Y		
159.	349	*Ehrharta longiflora (Annual Veldt Grass)*	Y		
160.	351	*Ehrharta villosa (Pyp Grass)*	Y		
161.	20019	*Lachnagrostis filiformis*			
162.	467	*Lagurus ovatus (Hare's Tail Grass)*	Y		
163.	485	*Microlaena stipoides (Weeping Grass)*			
164.	507	*Panicum miliaceum (Millet Panic)*	Y		
165.	11494	*Phalaris arundinacea var. arundinacea*	Y		
166.	573	*Poa drummondiana (Knotted Poa)*			
167.	578	*Poa porphyroclados*			
168.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
169.	10970	*Rostraria cristata*	Y		
170.	603	*Secale cereale (Rye)*	Y		
171.	624	*Spinifex hirsutus (Hairy Spinifex)*			
172.	625	*Spinifex longifolius (Beach Spinifex)*			
173.	627	*Spinifex x alterniflorus*			
174.	635	*Sporobolus virginicus (Marine Couch)*			
175.	636	*Stenotaphrum secundatum (Buffalo Grass)*	Y		
176.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
Polygalaceae					
177.	4552	*Comesperma confertum*			
178.	4555	*Comesperma integerrimum*			
Polyphysaceae					
179.	26442	*Acetabularia calyculus*			
Portulacaceae					
180.	2845	*Calandrinia brevipedata (Short-stalked Purslane)*			
181.	2846	*Calandrinia calyptrata (Pink Purslane)*			
Pottiaceae					
182.	32390	*Gymnostomum calcareum*			
183.	32437	*Syntrichia antarctica*			
184.	32438	*Syntrichia pagorum*			
185.	32439	*Syntrichia papillosa*			
186.	32450	*Trichostomum eckelianum*			
Primulaceae					
187.	6483	*Samolus junceus*			
188.	6484	*Samolus repens (Creeping Brookweed)*			
Proteaceae					
189.	1819	*Banksia grandis (Bull Banksia, Pulgarla)*			
190.	32077	*Banksia sessilis var. cygnorum*			
191.	2054	*Grevillea olivacea (Olive Grevillea)*		P4	
192.	15839	*Grevillea preissii subsp. preissii*			
193.	2197	*Hakea prostrata (Harsh Hakea)*			
194.	2273	*Persoonia saccata (Snottygobble)*			
195.	20368	*Petrophile axillaris*			
Racopilaceae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
196.	32480	*Racopilum cuspidigerum var. convolutaceum*			
Ranunculaceae					
197.	10804	*Clematis linearifolia*			
198.	2932	*Ranunculus colonorum (Common Buttercup)*			
Restionaceae					
199.	16595	*Desmocladus flexuosus*			
Rhamnaceae					
200.	4802	*Cryptandra mutila*			
201.	4828	*Spyridium globulosum (Basket Bush)*			
202.	11665	*Trymalium ledifolium var. ledifolium*			
Rhodomelaceae					
203.	27002	*Laurencia forsteri*			
Rubiaceae					
204.	7323	*Galium murale (Small Goosegrass)*	Y		
205.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
Rutaceae					
206.	4454	*Diplolaena dampieri (Southern Diplolaena)*			
Santalaceae					
207.	10765	*Exocarpos sparteus (Broom Ballart, Djuk)*			
208.	2356	*Santalum acuminatum (Quandong, Warnga)*			
Sapindaceae					
209.	4763	*Dodonaea hackettiana (Hackett's Hopbush)*		P4	
Scrophulariaceae					
210.	17175	*Eremophila glabra subsp. albicans*			
Simaroubaceae					
211.	17028	*Ailanthus altissima*	Y		
Solanaceae					
212.	6968	*Lycium ferocissimum (African Boxthorn)*	Y		
213.	6974	*Nicotiana glauca (Tree Tobacco)*	Y		
214.	18281	*Petunia x hybrida*	Y		
215.	6984	*Physalis philadelphica (Tomatillo)*	Y		Y
216.	7025	*Solanum oldfieldii*			
Stylidiaceae					
217.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
218.	7785	*Stylidium repens (Matted Triggerplant)*			
Thymelaeaceae					
219.	5237	*Pimelea calcicola*		P3	
220.	18117	*Pimelea rosea subsp. rosea*			
Urticaceae					
221.	1767	*Urtica urens (Small Nettle)*	Y		
Xanthorrhoeaceae					
222.	1256	*Xanthorrhoea preissii (Grass tree, Palga)*			
Zygophyllaceae					
223.	4383	*Tribulus terrestris (Caltrop)*	Y		

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

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

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report_Fauna

Created By Guest user on 22/09/2015

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115°45' 48" E,32°07' 04" S
Buffer 5km
Group By Species Group

Species Group	Species	Records
Amphibian	2	8
Bird	137	2768
Fish	73	122
Invertebrate	48	178
Mammal	13	136
Reptile	30	355
TOTAL	**303**	**3567**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amphibian					
1.	25410	*Heleioporus eyrei (Moaning Frog)*			
2.	25415	*Limnodynastes dorsalis (Western Banjo Frog)*			
Bird					
3.	24260	*Acanthiza apicalis (Broad-tailed Thornbill, Inland Thornbill)*			
4.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
5.	24262	*Acanthiza inornata (Western Thornbill)*			
6.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
7.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
8.	25536	*Accipiter fasciatus (Brown Goshawk)*			
9.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
10.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
11.	24312	*Anas gracilis (Grey Teal)*			
12.	24313	*Anas platyrhynchos (Mallard)*			
13.	24315	*Anas rhynchotis (Australasian Shoveler)*			
14.	24316	*Anas superciliosa (Pacific Black Duck)*			
15.	24561	*Anthochaera carunculata (Red Wattlebird)*			
16.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
17.	24285	*Aquila audax (Wedge-tailed Eagle)*			
18.	24286	*Aquila morphnoides subsp. morphnoides (Little Eagle)*			
19.	41324	*Ardea modesta (Eastern Great Egret)*		IA	
20.	24341	*Ardea pacifica (White-necked Heron)*			
21.	25736	*Arenaria interpres (Ruddy Turnstone)*		IA	
22.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
23.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
24.	24318	*Aythya australis (Hardhead)*			
25.	24319	*Biziura lobata (Musk Duck)*			
26.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
27.	25715	*Cacatua roseicapilla (Galah)*			
28.	25716	*Cacatua sanguinea (Little Corella)*			
29.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*	Y		
30.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
31.	42307	*Cacomantis pallidus (Pallid Cuckoo)*			
32.	24780	*Calidris alba (Sanderling)*		IA	
33.	25738	*Calidris canutus (Red Knot)*		IA	
34.	24784	*Calidris ferruginea (Curlew Sandpiper)*		T	
35.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
36.	24790	*Calidris tenuirostris (Great Knot)*		T	
37.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
38.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black-Cockatoo)*		T	
39.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo),*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
		Carnaby's Cockatoo)		T	
40.		*Catharacta skua*			Y
41.	25575	*Charadrius leschenaultii (Greater Sand Plover)*		IA	
42.	25576	*Charadrius mongolus (Lesser Sand Plover)*		T	
43.	24376	*Charadrius rubricollis (Hooded Plover)*		P4	
44.	24377	*Charadrius ruficapillus (Red-capped Plover)*			
45.	24321	*Chenonetta jubata (Australian Wood Duck, Wood Duck)*			
46.	24432	*Chrysococcyx lucidus subsp. plagosus (Shining Bronze Cuckoo)*			
47.	24288	*Circus approximans (Swamp Harrier)*			
48.	24774	*Cladorhynchus leucocephalus (Banded Stilt)*			
49.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
50.	24399	*Columba livia (Domestic Pigeon)*	Y		
51.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
52.	24416	*Corvus bennetti (Little Crow)*			
53.	25592	*Corvus coronoides (Australian Raven)*			
54.	24671	*Coturnix pectoralis (Stubble Quail)*			
55.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
56.	25595	*Cracticus tibicen (Australian Magpie)*			
57.	24422	*Cracticus tibicen subsp. dorsalis (White-backed Magpie)*			
58.	25596	*Cracticus torquatus (Grey Butcherbird)*			
59.	24322	*Cygnus atratus (Black Swan)*			
60.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*	Y		
61.	24687	*Daption capense (Cape Petrel)*			
62.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
63.	24379	*Erythrogonys cinctus (Red-kneed Dotterel)*			
64.	25746	*Eudyptula minor (Little Penguin)*			
65.	24818	*Eudyptula minor subsp. novaehollandiae (Little Penguin)*			
66.	25621	*Falco berigora (Brown Falcon)*			
67.	25622	*Falco cenchroides (Australian Kestrel)*			
68.	25623	*Falco longipennis (Australian Hobby)*			
69.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
70.	25727	*Fulica atra (Eurasian Coot)*			
71.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			
72.	25530	*Gerygone fusca (Western Gerygone)*			
73.	24443	*Grallina cyanoleuca (Magpie-lark)*			
74.	24487	*Haematopus longirostris (Pied Oystercatcher)*			
75.	24295	*Haliastur sphenurus (Whistling Kite)*			
76.	25734	*Himantopus himantopus (Black-winged Stilt)*			
77.	24491	*Hirundo neoxena (Welcome Swallow)*			
78.	25637	*Larus novaehollandiae (Silver Gull)*			
79.	25638	*Larus pacificus (Pacific Gull)*			
80.	25661	*Lichmera indistincta (Brown Honeyeater)*			
81.	30932	*Limosa lapponica (Bar-tailed Godwit)*		IA	
82.	24690	*Macronectes giganteus (Southern Giant Petrel)*			
83.	24326	*Malacorhynchus membranaceus (Pink-eared Duck)*			
84.	25654	*Malurus splendens (Splendid Fairy-wren)*			
85.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
86.	24739	*Neophema petrophila (Rock Parrot)*			
87.	24798	*Numenius madagascariensis (Eastern Curlew)*		T	
88.	25742	*Numenius phaeopus (Whimbrel)*		IA	
89.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
90.	24497	*Oceanites oceanicus (Wilson's Storm Petrel)*		IA	
91.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
92.	24328	*Oxyura australis (Blue-billed Duck)*		P4	
93.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
94.	25707	*Pachyptila salvini (Salvin's Prion)*			
95.	24696	*Pachyptila turtur (Fairy Prion)*			
96.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
97.	25682	*Pardalotus striatus (Striated Pardalote)*			
98.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
99.	25697	*Phalacrocorax carbo (Great Cormorant)*			
100.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
101.	25699	*Phalacrocorax varius (Pied Cormorant)*			
102.	24409	*Phaps chalcoptera (Common Bronzewing)*			
103.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
104.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
105.	25720	*Platycercus icterotis (Western Rosella)*			
106.	25721	*Platycercus zonarius (Australian Ringneck, Ring-necked Parrot)*			
107.	24382	*Pluvialis fulva (Pacific Golden Plover)*		IA	
108.	24383	*Pluvialis squatarola (Grey Plover)*		IA	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
109.	25704	*Podiceps cristatus (Great Crested Grebe)*			
110.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
111.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
112.	24771	*Porzana tabuensis (Spotless Crake)*			
113.	25711	*Pterodroma mollis (Soft-plumaged Petrel)*			
114.	24711	*Puffinus assimilis subsp. assimilis (Little Shearwater)*			
115.	24776	*Recurvirostra novaehollandiae (Red-necked Avocet)*			
116.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
117.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
118.	24279	*Sericornis frontalis subsp. maculatus (White-browed Scrubwren)*			
119.	30948	*Smicrornis brevirostris (Weebill)*			
120.	24517	*Stercorarius parasiticus (Arctic Skua)*		IA	
121.	24518	*Stercorarius pomarinus (Pomarine Skua)*		IA	
122.	25640	*Sterna dougallii (Roseate Tern)*		IA	
123.	24525	*Sterna fuscata subsp. nubilosa (Sooty Tern)*			
124.	24526	*Sterna hirundo subsp. hirundo (Common Tern)*		IA	
125.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*	Y		
126.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*	Y		
127.	25705	*Tachybaptus novaehollandiae (Australasian Grebe, Black-throated Grebe)*			
128.	24331	*Tadorna tadornoides (Australian Shelduck, Mountain Duck)*			
129.	24844	*Threskiornis molucca (Australian White Ibis)*			
130.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
131.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
132.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
133.	24754	*Trichoglossus haematodus subsp. rubritorquis (Red-collared Lorikeet)*			
134.	24808	*Tringa nebularia (Common Greenshank)*		IA	
135.	24849	*Turnix varia subsp. varia (Painted Button-quail)*			
136.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southern subsp))*		P3	
137.	24386	*Vanellus tricolor (Banded Lapwing)*			
138.	25765	*Zosterops lateralis (Grey-breasted White-eye, Silvereye)*			
139.	24856	*Zosterops lateralis subsp. gouldi (Grey-breasted White-eye)*			

Fish

140.		*? ?*			
141.		*Acanthaluteres brownii*			
142.		*Acanthaluteres spilomelanurus*			
143.		*Acanthaluteres vittiger*			
144.		*Afurcagobius suppositus*			
145.		*Anoplocapros lenticularis*			
146.		*Anoplocapros robustus*			
147.		*Aploactisoma milesii*			
148.		*Apogon rueppellii*			
149.		*Apogon victoriae*			
150.		*Aracana aurita*			
151.		*Aracana ornata*			
152.		*Arripis georgiana*			
153.		*Aulohalaelurus labiosus*			
154.		*Callogobius mucosus*			
155.	34031	*Carcharodon carcharias (Great White Shark)*		T	
156.		*Cleidopus gloriamaris*			
157.		*Cochleoceps spatula*			
158.		*Colurodontis paxmani*			
159.		*Contusus brevicaudus*			
160.		*Cristiceps australis*			
161.		*Cristiceps sp.*			
162.		*Dactylopus dactylopus*			
163.		*Diodon nicthemerus*			
164.		*Elops hawaiensis*			
165.		*Epinephelus sp.*			
166.		*Fistularia petimba*			
167.		*Girella zebra*			
168.		*Gonorynchus greyi*			
169.		*Gymnapistes marmoratus*			
170.		*Haletta semifasciata*			
171.		*Heteroclinus adelaidae*			
172.		*Hippocampus elongatus*			
173.		*Histiogamphelus cristatus*			
174.		*Histrio histrio*			
175.		*Hypnos monopterygium*			
176.		*Ichthyscopus barbatus*			
177.		*Idiotropiscis australe?*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
178.		*Lagocephalus sceleratus*			
179.		*Maxillicosta scabriceps*			
180.		*Megalaspis cordyla*			
181.		*Meuschenia flavolineata*			
182.		*Meuschenia freycineti*			
183.		*Meuschenia hippocrepis*			
184.		*Microcanthus strigatus*			
185.		*Neosebastes pandus*			
186.		*Ophisurus serpens*			
187.		*Paraploactis intonsa*			
188.		*Parequula melbournensis*			
189.		*Perryena leucometopon*			
190.		*Petroscirtes breviceps*			
191.	34039	*Phycodurus eques (Leafy Sea Dragon)*		P2	
192.		*Phyllophryne sp.*			
193.		*Platax teira*			
194.		*Platycephalus sp.*			
195.		*Plotosus lineatus*			
196.		*Pomatomus saltatrix*			
197.		*Pterois antennata*			
198.		*Pterygotrigla polyommata*			
199.		*Rachycentron canadum*			
200.		*Rhycherus gloveri*			
201.		*Scobinichthys granulatus*			
202.		*Scorpaena papillosa*			
203.		*Scorpis georgianus*			
204.		*Siganus fuscescens*			
205.		*Sillago sp.*			
206.		*Siphamia cuneiceps*			
207.		*Solegnathus lettiensis*			
208.		*Sphyrna zygaena*			
209.		*Stigmatopora argus*			
210.		*Strongylura leiura*			
211.		*Torquigener pleurogramma*			
212.		*Trygonorrhina fasciata*			
Invertebrate					
213.		*Aname mainae*			
214.		*Anoplodactylus pycnosoma*			Y
215.		*Antichiropus variabilis*			
216.		*Araneus senicaudatus*			
217.		*Argiope trifasciata*			
218.		*Artema atlanta*			
219.		*Artoria linnaei*			
220.		*Artoria taeniifera*			
221.		*Austracantha minax*			
222.		*Cercophonius sulcatus*			
223.		*Cormocephalus aurantiipes*			
224.		*Cryptoerithus quobba*			
225.		*Cyclosa trilobata*			
226.		*Delena cancerides*			
227.		*Dingosa serrata*			
228.		*Eriophora biapicata*			
229.		*Ero aphana*			
230.		*Erythracarus decoris*			
231.		*Ethmostigmus rubripes*			
232.		*Geogarypus taylori*			
233.		*Holasteron aspinosum*			
234.		*Idiommata blackwalli*			
235.		*Idiosoma sigillatum*			
236.		*Isopeda leishmanni*			
237.		*Lampona brevipes*			
238.		*Lampona cylindrata*			
239.		*Latrodectus hasseltii*			
240.		*Longepi woodman*			
241.		*Lycosa australicola*			
242.		*Lycosa lacertosa*			
243.		*Mituliodon tarantulinus*			
244.		*Molycria vokes*			
245.		*Myandra bicincta*			
246.		*Oecobius navus*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
247.		*Phenasteron longiconductor*			
248.		*Pinkfloydia harveii*			
249.		*Pseudolampona woodman*			
250.		*Pycnothea flynni*			
251.		*Raveniella arenacea*			
252.		*Raveniella peckorum*			
253.		*Raveniella subcirrata*			
254.		*Smeringopus natalensis*			
255.		*Supunna funerea*			
256.		*Synothele michaelseni*			
257.		*Tasmanicosa leuckartii*			
258.		*Urodacus novaehollandiae*			
259.		*Venator immansueta*			
260.		*Westrarchaea sinuosa*			
Mammal					
261.	24072	*Caperea marginata (Pygmy Right Whale)*			
262.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
263.	24041	*Felis catus (Cat)*	Y		
264.	25478	*Isoodon obesulus (Southern Brown Bandicoot)*		P5	
265.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
266.	24223	*Mus musculus (House Mouse)*	Y		
267.	24042	*Mustela putorius (European Polecat, Ferret)*	Y		
268.	24210	*Neophoca cinerea (Australian Sea Lion)*		S	
269.	24194	*Nyctophilus geoffroyi (Lesser Long-eared Bat)*			
270.	24245	*Rattus rattus (Black Rat)*	Y		
271.	24145	*Setonix brachyurus (Quokka)*		T	
272.	24185	*Tadarida australis (White-striped Freetail-bat)*			
273.	24206	*Vespadelus regulus (Southern Forest Bat)*			
Reptile					
274.	24991	*Aprasia repens (Sand-plain Worm-lizard)*			
275.	42381	*Brachyurophis semifasciatus (Southern Shovel-nosed Snake)*			
276.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
277.	24980	*Christinus marmoratus (Marbled Gecko)*			
278.	30893	*Cryptoblepharus buchananii*			
279.	25027	*Ctenotus australis*			
280.	25039	*Ctenotus fallens*			
281.	25766	*Delma fraseri (Fraser's Legless Lizard)*			
282.	25346	*Dermochelys coriacea (Leatherback Turtle)*		T	
283.	25119	*Hemiergis quadrilineata*			
284.	24961	*Heteronotia binoei (Bynoe's Gecko)*			
285.	25366	*Hydrophis elegans (Elegant Seasnake, Bar-bellied Seasnake)*			
286.	43384	*Hydrophis platurus (Yellow-bellied Seasnake)*			
287.	25128	*Lerista christinae*			
288.	25131	*Lerista distinguenda*			
289.	25133	*Lerista elegans*			
290.	25147	*Lerista lineata (Perth Slider, Lined Skink)*		P3	
291.	25005	*Lialis burtonis*			
292.	25184	*Menetia greyii*			
293.	25191	*Morethia lineoocellata*			
294.	25192	*Morethia obscura*			
295.	25249	*Neelaps calonotos (Black-striped Snake)*		P3	
296.	24907	*Pogona minor subsp. minor (Dwarf Bearded Dragon)*			
297.	25511	*Pseudonaja affinis (Dugite)*			
298.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
299.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
300.	24942	*Strophurus spinigerus subsp. spinigerus*			
301.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
302.	25519	*Tiliqua rugosa*			
303.	25207	*Tiliqua rugosa subsp. rugosa*			

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

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

Appendix D – Flora Data

Flora species list

Flora likelihood of occurrence guidelines

Flora likelihood of occurrence assessment

Quadrat data

Flora species recorded during the field survey

Family	Genus	Species	Status	Quadrat 1	Quadrat 2	Opportunistic
Aizoaceae	*Tetragonia*	*decumbens*	*			X
Aizoaceae	*Carpobrotus*	*virescens*				X
Apocynaceae	*Alyxia*	*buxifolia*		X		
Asparagaceae	*Asparagus*	*asparagoides*	*DP	X	X	
Asparagaceae	*Acanthocarpus*	*preissii*				X
Asphodelaceae	*Asphodelus*	*fistulosus*	*			X
Asteraceae	*Arctotheca*	*calendula*	*			X
Asteraceae	*Hypochaeris*	*glabra*	*			X
Asteraceae	*Senecio*	*vulgaris*	*			X
Asteraceae	*Sonchus*	*asper*	*			X
Asteraceae	*Sonchus*	*oleraceus*	*		X	
Asteraceae	*Olearia*	*axillaris*				X
Brassicaceae	*Raphanus*	*raphanistrum*	*	X	X	
Casuarinaceae	*Allocasuarina*	*lehmanniana*				X
Chenopodiaceae	*Atriplex*	*cinerea*				X
Chenopodiaceae	*Atriplex*	*sp.*			X	
Chenopodiaceae	*Enchylaena*	*tomentosa*			X	
Chenopodiaceae	*Rhagodia*	*baccata*		X	X	
Crassulaceae	*Crassula*	*glomerata*	*	X	X	
Cupressaceae	*Callitris*	*preissii*		X	X	
Cyperaceae	*Ficinia*	*nodosa*				X
Cyperaceae	*Lepidosperma*	*gladiatum*				X
Euphorbiaceae	*Euphorbia*	*terracina*	*	X	X	
Fabaceae	*Acacia*	*cochlearis*			X	
Fabaceae	*Acacia*	*cyclops*		X		

Family	Genus	Species	Status	Quadrat 1	Quadrat 2	Opportunistic
Fabaceae	*Acacia*	*lasiocarpa*				X
Fabaceae	*Acacia*	*rostellifera*		X		
Fabaceae	*Acacia*	*saligna*				X
Fabaceae	*Hardenbergia*	*comptoniana*		X	X	
Fabaceae	*Scaevola*	*crassifolia*			X	
Geraniaceae	*Pelargonium*	*capitatum*	*			X
Haemodoraceae	*Conostylis*	*candicans subsp. calcicola*				X
Hemerocallidaceae	*Dianella*	*revoluta*				X
Myrtaceae	*Agonis*	*flexuosa*		X		
Myrtaceae	*Eucalyptus*	*?gomphocephala*				X
Myrtaceae	*Eucalyptus*	*erythrocorys*				X
Myrtaceae	*Melaleuca*	*huegelii*			X	
Myrtaceae	*Melaleuca*	*lanceolata*				X
Oxalidaceae	*Oxalis*	*pes-caprae*	*			X
Papaveraceae	*Fumaria*	*capreolata*	*		X	
Poaceae	*Bromus*	*diandrus*	*		X	
Poaceae	*Ehrharta*	*longiflora*	*	X	X	
Poaceae	*Lagurus*	*ovatus*	*			X
Poaceae	*Lolium*	*multiflorum*	*			X
Poaceae	*Austrostipa*	*flavescens*				X
Poaceae	*Spinifex*	*longifolia*				X
Primulaceae	*Lysimachia*	*arvensis*	*	X	X	
Proteaceae	*Grevillea*	*crithmifolia*				X
Ranunculaceae	*Clematis*	*linearifolia*				X
Rhamnaceae	*Spyridium*	*globulosum*		X	X	
Rubiaceae	*Galium*	*murale*	*	X	X	
Solanaceae	*Solanum*	*nigrum*	*			X

Quadrat Data

Quadrat:	1				
Location:	Coogee Beach Carpark	**Date:**	30/09/2015		
MGA Zone:	50 383390mE; 6445870mN				
Vegetation Type:	*Agonis flexuosa* and *Callitris preisii* Low Open Forest over *Spyridium globulosum*, *Rhagodia baccata* and *Acacia* spp. Shrubland over **Euphorbia terracina*, **Lysimachia arvensis*, **Galium murale* and **Crassula glomerata* Open Herbland				
Vegetation Condition:	Very Good (3) to Good (4)				
Disturbances:	Previous clearing, rabbits, weeds				
Soil:	Grey sand				
Soil cover:	10-30%	**Leaf litter:**	Plentiful	Wood litter:	Moderate
Landform:	Plain/gentle undulating dune				
Fire:	>5 yrs, no obvious signs				

Family	Genus	Species	Stratum	% Cover	Height (m)
Cupressaceae	*Callitris*	*preissii*	U1	30-70%	6
Myrtaceae	*Agonis*	*flexuosa*	U1	30-70%	9
Chenopodiaceae	*Rhagodia*	*baccata*	M1	10-30%	2
Fabaceae	*Acacia*	*rostellifera*	M1	<2% T	3.5
Fabaceae	*Acacia*	*cyclops*	M1	<2% T	3.4
Rhamnaceae	*Spyridium*	*globulosum*	M1	10-30%	3
Apocynaceae	*Alyxia*	*buxifolia*	G1	<2% T	0.5
Asparagaceae	**Asparagus*	*asparagoides*	G1	<2% T	0.1
Brassicaceae	**Raphanus*	*raphanistrum*	G1	<2% T	0.3
Crassulaceae	**Crassula*	*glomerata*	G1	<2% N	0.1
Euphorbiaceae	**Euphorbia*	*terracina*	G1	<2% N	0.2
Fabaceae	*Hardenbergia*	*comptoniana*	G1	<2% T	Creeper
Poaceae	**Ehrharta*	*longiflora*	G1	<2% T	0.4
Primulaceae	**Lysimachia*	*arvensis*	G1	<2% N	0.15
Rubiaceae	**Galium*	*murale*	G1	<2% N	0.1

Quadrat:	2				
Location:	Coogee Beach Carpark	**Date:**	30/09/2015		
MGA Zone:	50 383377mE; 6445916mN				
Vegetation Type:	*Callitris preissii* and *Melaleuca huegelii* Low Open Forest over *Spyridium globulosum*, *Rhagodia baccata* and *Enchylaena tomentosa* Tall Shrubland over **Euphorbia terracina*, **Lysimachia arvensis* and **Crassula glomerata* Open Herbland				
Vegetation Condition:	Very Good (3) to Good (4)				
Disturbances:	Previous clearing, rabbits, weeds, rehabilitation				
Soil:	Grey sand				
Soil cover:	10-30%	**Leaf litter:**	Moderate	**Wood litter:**	Moderate
Landform:	Gentle undulating dune				
Fire:	>5 yrs, minor impact, scars on some trees				

Family	Genus	Species	Stratum	% Cover	Height (m)
Cupressaceae	*Callitris*	*preissii*	U1	30-70%	10
Myrtaceae	*Melaleuca*	*huegelii*	U1	10-30%	5
Fabaceae	*Acacia*	*cochlearis*	M2	<2% T	2
Chenopodiaceae	*Enchylaena*	*tomentosa*	M1	10-30%	1.3
Chenopodiaceae	*Rhagodia*	*baccata*	M1	10-30%	1.5
Rhamnaceae	*Spyridium*	*globulosum*	M1	10-30%	2.2
Asparagaceae	**Asparagus*	*asparagoides*	G1	<2% T	0.1
Asteraceae	**Sonchus*	*oleraceus*	G1	<2% N	0.5
Brassicaceae	**Raphanus*	*raphanistrum*	G1	<2% T	0.3
Chenopodiaceae	*Atriplex*	*sp.*	G1	<2% T	0.2
Crassulaceae	**Crassula*	*glomerata*	G1	<2% N	0.1
Euphorbiaceae	**Euphorbia*	*terracina*	G1	<2% N	0.15
Fabaceae	*Hardenbergia*	*comptoniana*	G1	<2% T	Creeper
Fabaceae	*Scaevola*	*crassifolia*	G1	<2% T	0.2
Papaveraceae	**Fumaria*	*capreolata*	G1	<2% T	0.2

Family	Genus	Species	Stratum	% Cover	Height (m)
Poaceae	**Bromus*	*diandrus*	G1	<2% T	0.5
Poaceae	**Ehrharta*	*longiflora*	G1	<2% N	0.2
Primulaceae	**Lysimachia*	*arvensis*	G1	<2% N	0.15
Rubiaceae	**Galium*	*murale*	G1	<2% T	0.01

Flora likelihood of occurrence assessment guidelines

Likelihood of occurrence	Guideline
Known	Species definitely recorded within the Project area either from previous records or field survey results.
Likely	Species previously recorded within the Project area and large areas of suitable habitat occurs in the Project Area. Also takes into account other considerations.
Possible	Species previously recorded within the Project area with marginally suitable habitat occurring in the Project Area.
Unlikely	Species previously recorded within the Project area, but suitable habitat does not occur in the Project Area.
Highly unlikely	Species not previously recorded within Project area, suitable habitat does not occur in the Project Area and/or Project Area is outside the natural distribution of the species.
Other considerations	Intensity of survey, availability of access, growth form type, recorded flowering times, cryptic nature of species

Flora likelihood of occurrence assessment for conservation significant flora identified in the Project area

Family	Taxon	Status		Description (Western Australian Herbarium 1998–)	Efficacy of survey	Likelihood of occurrence	Source
		EPBC Act	WC Act/ DPaW				
Orchidaceae	*Caladenia huegelii*	E	T	Tuberous, perennial, herb, 0.25-0.6 m high. Flowers green and cream and red, September-October. Occurs in grey or brown sand, clay loam.	High	Unlikely – the Project area does not contain optimum habitat for this species. There are no known records in close proximity to the Project area.	PMST

Family	Taxon	Status		Description (Western Australian Herbarium 1998–)	Efficacy of survey	Likelihood of occurrence	Source
		EPBC Act	WC Act/ DPaW				
Orchidaceae	*Diuris micrantha*	V	T	Tuberous, perennial, herb, 0.3-0.6 m high. Flowers yellow and brown, September to October. Occurs in brown loamy clay, winter-wet swamps, in shallow water.	High	Unlikely – the Project area does not contain optimum habitat for this species. There are no known records in close proximity to the Project area.	PMST
Orchidaceae	*Diuris purdiei*	E	T	Tuberous, perennial, herb, 0.15-0.35 m high. Flowers yellow, September to October. Occurs in grey-black sand, moist. Winter-wet swamps.	High	Unlikely – the Project area does not contain optimum habitat for this species. There are no known records in close proximity to the Project area.	PMST
Orchidaceae	*Drakaea elastica*	E	T	Tuberous, perennial, herb, 0.12-0.3 m high. Flowers red and green and yellow, October to November. Occurs in white or grey sand in low-lying situations adjoining winter-wet swamps.	High	Unlikely – the Project area does not contain optimum habitat for this species. There are no known records in close proximity to the Project area.	PMST

Family	Taxon	Status		Description (Western Australian Herbarium 1998–)	Efficacy of survey	Likelihood of occurrence	Source
		EPBC Act	WC Act/ DPaW				
Orchidaceae	*Drakaea micrantha*	V	T	Tuberous, perennial, 0.15-0.3 m high, flowers red and yellow in September to October. Occurs in white-grey sand.	High	Unlikely – there are no known records in close proximity to the Project area. The GHD field survey was undertaken during the reported flowering period. Given survey intensity, it is expected that the species would have been recorded if present.	PMST
Proteaceae	*Grevillea olivacea*		P4	Erect, non-lignotuberous shrub, 1-4.5 m high. Flowers red/red-pink from June to September. Occurs in white or grey sand on coastal dunes, limestone rocks.	High	Unlikely – the study contains suitable habitat for this species. The GHD field survey was undertaken during the reported flowering period and the taxon is not considered cryptic. Given survey intensity, it is expected that the species would have been recorded if present.	NP

Family	Taxon	Status		Description (Western Australian Herbarium 1998–)	Efficacy of survey	Likelihood of occurrence	Source
		EPBC Act	WC Act/ DPaW				
Sapindaceae	*Dodonaea hackettiana*		P4	Erect shrub or tree, 1-5 m high. Flowers yellow-green/red, mainly July to October. Occurs on sand and outcropping limestone.	High	Unlikely – the study contains suitable habitat for this species. The GHD field survey was undertaken during the reported flowering period and the taxon is not considered cryptic. Given survey intensity, it is expected that the species would have been recorded if present.	NP
Thymelaeaceae	*Pimelea calcicola*		P3	Erect to spreading shrub, 0.2-1 m high. Flowers pink, September to November. Occurs on sand and coastal limestone ridges.	High	Unlikely – the study contains suitable habitat for this species. The GHD field survey was undertaken during the reported flowering period and the taxon is not considered cryptic. Given survey intensity, it is expected that the species would have been recorded if present.	NP

Appendix E – Fauna Data

Fauna species list

Fauna likelihood of occurrence guidelines

Fauna likelihood of occurrence assessment

Fauna species recorded during the field survey

Family	Species	Common Name	Status
Birds			
Acanthizidae	*Acanthiza inornata*	Western Thornbill	
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	
Artamidae	*Cracticus tibicen*	Australian Magpie	
Cacatuidae	*Eolophus roseicapillus*	Galah	
Columbidae	*Streptopelia senegalensis*	Laughing Turtle-dove	Introduced
Corvidae	*Corvus coronoides*	Australian Raven	
Falconidae	*Falco cenchroides*	Nankeen Kestrel	
Maluridae	*Malurus splendens*	Splendid Fairy-wren	
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater	
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	
Timaliidae	*Zosterops lateralis*	Silvereye	
Mammals			
Felidae	*Felis catus*	Cat	Introduced
Leporidae	*Oryctolagus cuniculus*	Rabbit	Introduced
Reptiles			
Scincidae	*Cryptoblepharus buchananii*	Common Fence Skink	

Fauna likelihood of occurrence assessment guidelines

Assessment outcome	Description
Present	Species recorded during the field survey or from recent, reliable records from within the Project Area.
Likely	Species are likely to occur in the Project Area where there is suitable habitat within the Project Area and there are recent records of occurrence of the species in close proximity to the Project Area OR Species known distribution overlaps with the Project Area and there is suitable habitat within the Project Area.
Unlikely	Species assessed as unlikely include: those species previously recorded within the Project Area however: • There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the Project Area. The suitable habitat within the Project Area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the Project area. OR • Those species that have a known distribution overlapping with the Project Area however: there is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the Project Area the suitable habitat within the Project Area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the Project Area.
Highly unlikely	Species that are considered highly unlikely to occur in the Project Area include those species: • That have no suitable habitat within the Project Area • That have become locally extinct, or are not known to have ever been present in the region of the Project Area.

Fauna likelihood of occurrence assessment for conservation significant fauna identified in the Project area

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
Birds						
Australian Lesser Noddy (*Anous tenuirostris melanops*)	V	T (S1)	In Australia the preferred habitat includes low, flat coral-limestone isles in Abrolhos Group; reefs and lagoons with dense, low fringing mangroves. Forages around islands, reefs and lagoons, and further out to sea (Morcombe 2003).	Highly unlikely The Project area does not contain suitable habitat for this species.		x
Australian Bittern (*Botaurus poiciloptilus*)	E	T (S1)	The Australasian Bittern occurs mainly in densely vegetated freshwater wetlands and, rarely, in estuaries or tidal wetlands. The species favours foraging in tall, dense vegetation in shallow permanent or seasonal fresh water. In the southwest of Western Australia the Bittern is now largely confined to coastal areas especially along the south coast where it is found in beds of tall rush mixed with or near short fine sedge or open pools (Burbidge 2004). It also occurs around swamps, lakes, pools, rivers and channels fringed with lignum Muehlenbeckia, canegrass, Eragrostis or other dense vegetation (Marchant and Higgins 1990). It occasionally ventures into areas of open water or onto banks.	Highly unlikely The Project area does not contain suitable habitat for this species.		x
Curlew Sandpiper (*Calidris ferruginea*)	CE	T (S1)	This species is a widespread and common migrant to Australian coastal sites; some scattered across suitable interior sites. Preferred habitat types	Highly unlikely The Project area does not contain	x	x

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
			include inter-tidal mudflats of estuaries, lagoons, mangrove channels; and lakes, dams, floodwaters, and flooded saltbush surrounds of inland lakes (Morcombe 2003).	suitable habitat for this species.		
Forest red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	V	T (S1)	The Forest Red-tailed Black Cockatoo is endemic to the south-west humid and subhumid zones of Western Australia. Within their range they forage in jarrah and marri woodlands and forest and edges of karri forests including wandoo and blackbutt. They are thought to breed in October/November (or in March/April in years with good autumn rainfall) in woodland or forest, or isolated trees that were part of a forest, nesting in hollows in live or dead trees of marri, karri, wandoo, bullich, *Eucalyptus megacarpa*, blackbutt, *E. patens*, tuart and jarrah (Commonwealth of Australia 2012).	Likely This species more commonly occurs in the Darling Range however some birds move out onto the coastal plain to forage. This species may occasionally occur within the Project area where it may forage on the Rottnest Island Pine. The Project area does not provide any breeding or roosting habitat for this species.	x	x
Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)	E	T (S1)	The Carnaby's Black Cockatoo breeds from July/August to January/February generally in woodland or forest, but also in former woodland or forest now present as isolated trees. They nest in hollows in live or dead trees of salmon gum, wandoo, tuart, jarrah, flooded gum, York gum, powderbark, karri and marri. They forage on native shrubland, kwongan heathland and woodland dominated by proteaceous plant species such as *Banksia* spp., *Hakea* spp. and *Grevillea* spp. Also forages in pine plantations, eucalypt woodland and	Known to occur This species has previously been recorded in the general area (Regen4 Environmental Services and Western Wildlife 2015). The Rottnest Island Pine is considered to be a suitable foraging species of black cockatoos. The Project area does not provide any breeding or roosting habitat for this species.	x	x

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
			forest that contain foraging species. Also individual trees and small stands of these species (Commonwealth of Australia 2012).			
Albatrosses and Petrels Southern Royal Albatross (*Diomedea epomophora epomophora*) Northern Royal Albatross (*Diomedea epomophora sanfordi*)	V, Mi E, Mi	T (S1) T (S1)	Albatrosses and Petrels are large seabirds which range widely in the Southern Ocean and the North Pacific. They are pelagic in distribution returning to land only to breed. They feed on squid, fish and krill by either scavenging, surface seizing or diving. Albatrosses are colonial, nesting for the most part on remote oceanic islands (Morcombe 2003).	Unlikely The Project area does not contain suitable breeding habitat for any of these species. These species are only likely to occur as a flyover, if at all.		x
Amsterdam Albatross (*Diomedea exulans amsterdamensis*)	E, Mi	T (S1)				
Tristan Albatross (*Diomedea exulans exulans*)	E, Mi	T (S1)				
Wandering Albatross (*Diomedea exulans)* (sensu lato)	V, Mi	T (S1)				
Blue Petrel (*Halobaena caerulea*)	V					
Southern Giant Petrel (*Macronectes giganteus*)	E, Mi					
Northern Giant Petrel (*Macronectes halli)*	V, Mi					
Soft-plumaged Petrel (*Pterodroma mollis*)	V					
Indian Yellow-nosed Albatross	V, Mi	T (S1)				

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
(*Thalassarche carteri*) Shy Albatross (*Thalassarche cauta cauta*)	V, Mi	T (S1)				
White-capped Albatross (*Thalassarche cauta steadi*)	V, Mi	T (S1)				
Black-browed Albatross (*Thalassarche melanophris*)	V, Mi	T (S1)				
Campbell Albatross (*Thalassarche melanophris impavida*)	V, Mi	T (S1)				
Malleefowl (*Leipoa ocellata*)	V	T (S1)	The Malleefowl is a quiet, shy and wary bird. This species occurs in unburned mallee and woodland with abundant litter and low scrub (Morcombe 2003).	Highly unlikely There are no known records of Malleefowl occurring on the Swan Coastal Plain in the Perth subregion (Naturemap 2007-). The project area does not contain suitable habitat for this species.		x
Fairy Prion (southern) (*Pachyptila turtur subantarctica*)	V		Habitat includes sub-Antarctic seas and islands while breeding, then wanders to subtropical seas; rarely close inshore except when sheltering from storms (Morcombe 2003).	Highly unlikely The Project area is not considered suitable habitat for this species.		x
Australian Painted Snipe (*Rostratula australis*)	E	T (S1)	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and	Highly unlikely The Project area does not contain suitable habitat for this species.		x

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
			permanent lakes, swamps and claypans. Australian Painted Snipe breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby (Morcombe 2003).			
Australian Fairy Tern (*Sternula nereis nereis*)	V	T (S1)	Within Australia, the Fairy Tern occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia; occurring as far north as the Dampier Archipelago near Karratha. The Fairy Tern (Australian) nests on sheltered sandy beaches, spits and banks above the high tide line and below vegetation. The subspecies has been found in embayments of a variety of habitats including offshore, estuarine or lacustrine (lake) islands, wetlands and mainland coastline. The bird roosts on beaches at night (Garnett and Crowley 2000)	Unlikely The Project area does not contain optimal habitat for this species.		x
Great Knot (*Calidris tenuirostris*)	Mi	T (S1)	The Great Knot is more abundant in the northern parts of Australia and less common in the south. Preferred habitat includes sheltered coastal mudflats of estuaries, inlets, harbours, lagoons, and mangrove swamps. Also on sandy bars and beaches near mudflats. Occasionally seen in salt lakes, lagoons and saltworks ponds, but only rarely on inland lakes r swamps (Morcombe 2003).	Highly unlikely The Project area does not contain suitable habitat for this species.	x	
Lesser Sand Plover (*Charadrius mongolus*)	Mi	T (S1)	Habitat incudes inter-tidal sandflats and mudflats, beaches, estuary mudflats and sandbars; reef flats (Morcombe 2003).	Highly unlikely The Project area does not contain suitable habitat for this species.	x	

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
Hooded Plover (*Charadrius rubricollis*)		P4	Occurs usually in pairs or small parties; dashes about near the water's edge, pecking, bobbing, often darting down the beach as waves recede. Habitat includes sandy beaches of ocean, estuaries, coastal lakes and inland salt lakes (Morcombe 2003).	Highly unlikely The Project area does not contain suitable habitat for this species.	x	
Peregrine Falcon (*Falco peregrinus*)		S4	The Peregrine Falcon is seen occasionally anywhere in the south-west of Western Australia. It is found everywhere from woodlands to open grasslands and coastal cliffs - though less frequently in desert regions. The species nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2003).	Likely The Peregrine Falcon is a widespread species and although this species may occur in the area, it is likely to occur as an occasional flyover. The Project area provides limited foraging habitat and is not considered to contain suitable breeding habitat.		
Eastern Curlew (*Numenius madagascariensis*)	CE, Mi	T (S1)	This is the largest wader in Australia, over 0.5 m in length including long downcurved bill. Habitatsconsists of tidal mudflats, sand spits of estuaries, mangroves, lake shores, and ocean beaches.	Unlikely The Project area is not considered significant habitat for this species.	x	
Blue-billed Duck (*Oxyura australis*)		P4	This species is almost totally reliant on a life in water and does not like to venture far on land. An uncommon duck, although locally common in the Perth region, and coastal belt down to Capel, mostly in small numbers (Nevill 2013).	Highly unlikely There are no wetlands or waterways present within the Project area. The Project area does not contain	x	

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
				suitable habitat for this species.		
Masked Owl (southern subsp.) (*Tyto novae-hollandiae subsp. novae-hollandiae*)		P3	The Masked Owl is found across a range of habitats from wet sclerophyll forest, dry sclerophyll forest, non-eucalypt dominated forest, scrub and cleared land with remnant old growth trees. There are however several aspects of habitat preference which appear to be common: the Masked Owl requires large hollows in old growth eucalypts for nesting; it often favours areas with dense understorey or ecotones comprising dense and sparse ground cover, they are often recorded foraging within 100-300 m of the boundary of two vegetation types (Bell & Mooney, 2002).	Unlikely The Project area does not contain suitable habitat for this species.	x	
Migratory Terrestrial Birds						
Rainbow Bee-eater (*Merops ornatus*)	Mi	S3	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It also inhabits sand dune systems in coastal areas and at inland sites that are in close proximity to water (Morcombe 2003). The Rainbow Bee-eater is also common in cleared and semi-cleared habitats, orchards and is regularly recorded in other disturbed habitats including roadside vegetation (DotE 2015b).	Likely The Project area contains suitable habitat for this species which has the potential to breed where there are sandy soils in which to burrow. However the Rainbow Bee-eater is a common and widespread migrant with a large habitat range and the Project area is not considered to be representative of significant habitat for this species.		x

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
Grey Wagtail (*Motacilla cinerea*)	Mi	S3	European and Asian species that migrates in winter south to Indonesia and New Guinea, rarely reaching Australia. Has been recorded on widely separated parts of the Australian coast, including NE Qld, the NT and near Adelaide, SA. Usually found near fresh streams, but also on mown grass, ploughed land or new sewage ponds (Morcombe 2003).	Highly unlikely There are no known records of this species in the south-west of Western Australia. The Project area is considered to be outside of its currently known distribution.		x
Mammals						
Chuditch / Western Quoll (*Dasyurus geoffroii*)	V	T (S1)	The Chuditch inhabits eucalypt forest (especially jarrah), dry woodland and mallee shrublands. In jarrah forest, Chuditch populations occur in both moist, densely vegetated, steeply sloping forest and drier, open, gently sloping forest. Most diurnal resting sites in sclerophyll forest consist of hollow logs or earth burrows (Van Dyke & Strahan, 2008). This species can travel large distances, has a large home range and is sparsely populated through a large portion of its range.	Highly unlikely There is no suitable habitat for this species within the Project area. The Project area is located outside of the currently known distribution of this species.		x
Western Ringtail Possum (*Pseudocheirus occidentalis*)	V	T (S1)	The Western Ringtail Possum occurs in and near coastal peppermint tree (*Agonis flexuosa*) forest and tuart dominated forest with a peppermint tree understorey from Bunbury to Albany. Also occurs in jarrah forest and jarrah-marri forest associated with peppermint tree (Van Dyck and Strahan,	Highly unlikely The Project area is located outside of the currently known distribution of this species.		x

Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
			2008).			
Quokka (*Setonix brachyurus*)	V	T (S1)	Dense forests and thickets, streamside vegetation, heaths and shrublands *Agonis linearifolia*-dominated swamps in the jarrah forest. The northern extent of the current distribution on the mainland is in the jarrah forest immediately south-east of the Perth metropolitan area, from where it extends southward through the southern jarrah, marri and karri forests to the south coast, but largely confined throughout to areas receiving an annual rainfall of 1,000 millimetres or more (Van Dyck and Strahan, 2008).	Highly unlikely There is no suitable habitat for this species within the Project area. The only known population from the Swan Coastal Plain (Perth Sub-region) is at Muddy Lakes, south of Bunbury (Sinclair and Hyder 2009), with unconfirmed reports from Thompsons Lake, and in the Yallingup area of the southern Swan Coastal Plain.	x	x
Southern Brown Bandicoot / Quenda (*Isoodon obesulus* subsp. *fusciventer*)		P5	The Quenda prefers dense scrubby, often swampy, vegetation with dense cover up to one metre high. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. The species often feeds in adjacent forest and woodland that is burnt on a regular basis and in areas of pasture and cropland lying close to dense cover (Van Dyck and Strahan 2008).	Likely This species is known to be present in the Woodman Point Regional Park (Department of Environment and Conservation 2010). There was no evidence (scats or diggings) of this species present within the Project area during the survey. The Quenda generally favours vegetation with a dense understorey whilst the Project area is predominantly sparse at ground level. Given the size and highly fragmented nature of the project area the Project area isn't	x	

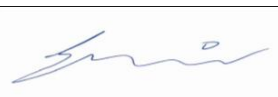
Species	EPBC listing	WC Act/ DPaW listing	Habitat and ecology	Likelihood of occurrence assessment	NM	PMST
				considered optimal habitat for this species.		
Reptiles						
Perth Slider / Perth Lined Skink (*Lerista lineata*)		P3	*Lerista lineata* has a restricted distribution, found only on the coastal plain between Mandurah and the southern suburbs of Perth, as well as Rottnest and Garden Islands (Bush et al. 2007). The preferred habitat consists of sandy coastal heath, banksia woodland and shrubland, and shelters in leaf litter and upper layers of loose sand at bases of shrubs, spoil heaps and stick ant nests.	Likely Suitable habitat is present within the Project area. This species has previously been recorded from the Woodman Park Regional Park, with numerous records in 1994 and 1995 (Naturemap 2007-).	x	
Black-striped Snake (*Neelaps calonotos*)		P3	The Black-striped snake is restricted to the sandy coastal strip of the Swan Coastal Plain between Manadurah and Lancelin, with some records existing inland at Gingin, Bullsbrook and Caversham. This species primarily occurs on dunes and sand-plains vegetated with heaths and eucalypt/banksia woodlands (Wilson and Swan 2010).	Likely Suitable habitat is present within the Project area. There are two records of this species in the Woodman Point area, the most recent record in 1965 (Naturemap 2007-).	X	

GHD

GHD, 999 Hay Street, Perth, WA 6000
P.O. Box 3106, Perth WA 6832
T: 61 8 6222 8222 F: 61 8 6222 8555 E: permail@ghd.com.au

\\ghdnet\ghd\AU\perth\Projects\61\32654\WP\152561.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	E Lynch	M Toner / G Gaikhorst		M Toner		25/11/2015

www.ghd.com