Public Transport Authority

Northern Suburbs Railway Alignment Butler to Yanchep

Environmental Investigation

November 2012

Executive summary

The Public Transport Authority (PTA) is in the process of planning the early stages for an extension of the northern suburbs passenger railway from Romeo Road to Yanchep. The alignment extends from Romeo Road to the proposed Yanchep Railway station, a distance of 12.5 km, the rail reserve is 40 m wide, increasing at some station locations. The alignment covers approximately 50 ha.

GHD Pty Ltd (GHD) conducted both desktop and field surveys to identify and map the environmental values of the alignment. The desktop assessment identified any environmental constraints prior to the field survey in order to which may be in, or adjoining the study area.

A desktop search upon indigenous heritage revealed no registered heritage sites within 200m of the study area. However, a search of surrounding Native Title Claims indicated that the site is located within the external extent of both the Single Noongar Claim (Area 1) and Swan River People. The PTA will therefore need to consult the Native Title Claimants prior to undertaking works.

The registered National Parks of Neerabup National Park (1.4km east) and Yanchep National Park (500m east) are both within the local area, however, will be further separated from the rail extension by the proposed Mitchell freeway extension.

Two isolated pockets of ASS risk have been identified in association with the nearby Pipidinny Swamp and Beonaddy Swamp. Pipidinny Swamp is the closest area with associated ASS, being approximately 1km east of the mid-section of the proposed railway. These ASS risk areas are far enough to pose no significant threat to the proposed alignment construction.

Fauna and flora field surveys were conducted in spring 2010 and spring 2012 and a subterranean fauna survey was conducted in spring 2010. The fauna survey was undertaken in conjunction with the flora and vegetation survey, which consisted of a Level 1 survey in consideration of the requirements of the EPA's Guidance Statement No. 56. The conservation significant invertebrate species *Pachysaga munggai / strobila* was observed during the October 2012 field survey and is a Priority listed species under the DEC listing. The Graceful Sun-moth was recorded within the Northern study area in March 2011 (GHD, 2011). No Graceful Sun-moth were recorded within the southern study area. Approximately 9.3 ha of GSM habitat are recorded within both study areas

Carnaby Black Cockatoo feeding was observed during the field survey and they are known to frequent the area. The study area contains approximately 9.3 ha of potential Black Cockatoo feeding habitat. The potential feeding habitat was generally in good condition with similar habitat in similar condition occurring in remnant vegetation in the surrounding area. No potential breeding trees were recorded within the study area.

The study area has a high likelihood of subterranean fauna occurrence, however, the proposed project impacts are considered to pose a minimal threat to any such fauna, as no dewatering or groundwater contamination is anticipated. The implementation of a construction management plan that includes subterranean fauna will also further reduce any risk of potential impacts to any subterranean fauna inhabiting the area.

The flora assessment included desktop investigations and a field survey, conducted with regard to the EPA's Guidance Statement No. 51, where possible. No Threatened Ecological Communities or Priority Ecological Communities were identified as occurring within the study area. In addition, no Declared Rare species as listed under the WC Act or species of national conservation significance listed under the EPBC Act were recorded from the study area. No Weeds of National Significance (WONS) were recorded in the study area.

The vegetation condition within the northern and southern study area ranges from completely degraded to pristine / excellent. Vegetation within parts of the proposed alignment have been highly altered and show little to no resemblance to pre-European vegetation types. The areas that have been degraded have been exposed to a range of impacts including clearing, stock grazing, rabbits, fire and off-road vehicle tracks. Parts of the alignment contain plantations of either *Eucalyptus gomphocephala* and other eucalypt species or *Taxandra linearifolia.*

There are no wetlands located within the proposed project area. The nearest wetland is located approximately 1km east of the Eglinton section of the proposed northern suburbs railway alignment. The proposed rail alignment should pose no significant environmental impact upon the nearest wetland location.

The information from this study will be used to determine the environmental impacts, constraints and requirements of the railways extension to allow the PTA consideration in planning and designing.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.4 and the assumptions and qualifications contained throughout the Report.

Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Background

The Public Transport Authority (PTA) is in the early stages of planning the extension of the northern suburbs passenger railway from Romeo Road to Yanchep. Services are expected to commence in 2014.

As part of the planning process a desktop and field survey is required to identify and map the environmental values of the alignment. The information will be used to determine the environmental impacts, constraints and requirements of the railways extension to allow their consideration in planning and designing.

The alignment extends from Romeo Road to the proposed Yanchep Railway station, a distance of 12.5 km, the rail reserve is approximately 40 m wide, increasing at some station locations. The alignment covers approximately 50 ha.

The PTA have commissioned GHD Pty Ltd (GHD) to conduct the required environmental assessments of two sections within the alignment.

1.2 Study Area

The study area is broken up into two areas along the proposed rail alignment. The northern study area is 22.42 ha in size and extends from Yanchep Beach Road (approximately 2.5 km east of Welwyn Ave) south approximately 3.6 km. The southern study area is 4.94 ha in size and is approximately 1.2 km in length. It is located south of Pipidinny Road. The study area covered an approximate total of 27.36 ha across both study areas.

The study areas are shown in Figure 1, Appendix A.

1.3 Scope of Works

The environmental investigation is to be split into four components;

1. Spring Flora and Vegetation Survey (section 7)

- Description of the existing landform, vegetation complexes and vegetation conditions including weed status
- An assessment of the potential for declared rare or priority flora
- An assessment for the presence of Bush Forever, TEC or other significant vegetation
- Description of the floristic community types (as defined by Gibson *et al* 1994)
- Determine if Dieback is present on the alignment

2. Fauna Survey (section 5)

- An assessment of the potential for threatened fauna
- An assessment of fauna habitats

3. Subterranean Fauna Assessment (section 6)

- An assessment of the likelihood of Stygofauna, Stygofauna habitat or karst formations

4. Desktop Heritage Assessment (section 3)

- Determine if areas of Aboriginal and European significance will be impacted

The environmental investigation report will compile all information and provide an accurate and complete description of the environmental values of the alignment. The final report and associated mapping will identify the environmental impacts and constraints associated with the railways extension. All works will be in accordance with the following guidelines:

- EPA's Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia Guidance Statement No. 51
- EPA's Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia Guidance Statement No. 56
- EPA's Guidance for the Assessment of Environmental Factors; Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia

1.4 Limitations

This report: has been prepared by GHD for Public Transport Authority and may only be used and relied on by Public Transport Authority for the purpose agreed between GHD and the Public Transport Authority as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Public Transport Authority 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 Public Transport Authority 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.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) 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.

1.4.1 Desktop investigation limitations

Desktop investigations use a variety of online resources (such as the Western Australian Museum and DEC NatureMap database and the EPBC Act Protected Matters database) and the responsibility for the accuracy of such data remains with the issuing authority, not with GHD. The DSEWPaC Protected Matters 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 DSEWPaC search tool is broad-scale in its reporting and often the specific habitat requirements of the species do not occur within study area and are unlikely to occur within the study area. For this reason not all species reported by the search tool need to be considered in management decisions. The DEC 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.

1.4.2 Flora survey limitations

Complete flora and vegetation surveys can require multiple surveys, at different times of year, and over a period of a number of years, to enable observation of all species present. Flora and vegetation surveys are normally undertaken in spring, when many species are flowering and easier to identify. Some flora species, such as annuals, are only available for collection at certain times of the year. Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to above factors.

Flora composition changes over time, with flora species having specific growing periods, especially annuals and ephemerals (some plants lasting for a markedly brief time, some only a day or two). Therefore, the results of future botanical surveys in this location may differ from the results of this survey.

The flora survey followed generally the guidelines recommended in the EPA Guidance Statement No. 51, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004a). The scale and intensity of the field survey was considered sufficient to infer vegetation type boundaries although it is inherently difficult to demarcate vague transitions between vegetation types. This is especially important to consider when analysing the extents of potential conservation significant communities.

1.4.3 Fauna survey limitations

The fauna assessment undertaken was a reconnaissance survey only and thus 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 a reconnaissance survey and seasonal variation within species often requires targeted surveys at a particular time of the year.

The fauna assessment was aimed at identifying habitat types and terrestrial vertebrate fauna using the study area. No sampling for aquatic species occurred. The information available on the identification, distribution and conservation status of invertebrates is generally less extensive than that of vertebrate species.

This survey was carried out during only one season and in one year. Complete faunal surveys often require multiple surveys, at different times of year, and over a period of a number of years, to enable full survey of all species present.

The inclement weather of the survey may have impacted on fauna species identified.

2. Legislation

The key relevant State (WA) and Commonwealth Environmental Legislation are outlined in Table 1.

Table 1 Key relevant environmental Legislation

Legislation		Responsible Government agency	Aspect
State Legislation			
Agricultural and Related Resources Protection Act 1976	ARRP Act	Department of Agriculture, Western Australia	Weeds and feral animals
Environmental Protection Act 1986 (Part IV)	EP Act	Department of Environment and Conservation	Environmental impact assessment and management
Environmental Protection Act 1986 (Part V)	EP Act	Department of Environment and Conservation	Works Approvals and Licenses for Prescribed Premises
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	EP Act	Department of Environment and Conservation	Clearing of native vegetation
Wildlife Conservation Act 1950	WC Act	Department of Environment and Conservation	Protection of native wildlife
Rights in Irrigation and Water Act 1914	RIWI Act	Department of Water	Protection of water resources
Commonwealth Legislation			
Environment Protection and Biodiversity Conservation Act 1999	EPBC Act	Department of Sustainability, Environment, Water, Population and Communities	Threatened flora and fauna

3. Desktop Heritage Assessment

3.1 Indigenous Heritage

In Western Australia, the Aboriginal Heritage Act 1972 protects places and objects customarily used by, or traditional to, the original inhabitants of Australia. A register of such places and objects is maintained under the Act; however, all sites are protected under the Act regardless if they have been entered on the register.

A search of the Department of Indigenous Affairs (DIA) Aboriginal Heritage Register has revealed there are no registered heritage sites within 200m of the study area.

A search was conducted using the National Native Tribunal online mapping tool, which indicated that the site is located within the external extent of two active Native Title Claims as at 11 November 2010, these are detailed in Table 2.

Table 2 Native Title Claims as Filed in the Federal Court

Native Title Claim	NNTT No	Date Filed	Status of Claim
Single Noongar Claim (Area 1)	WC03/6	06/10/2003	Active
Swan River People	WC10/9	08/06/2010	Active

The PTA should consult the Native Title Claimants prior to undertaking works.

3.2 European Heritage

A desktop European heritage assessment includes a search of Commonwealth, State and municipal registers.

Commonwealth Lists

Records of the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) and the Australian Heritage databases were searched for known European heritage sites near the study area. There are no heritage sites listed on the National Heritage List, the Commonwealth Heritage List or the Register of the National Estate within or adjacent to the study area.

The proposed northern suburbs railway alignment does not intersect any Reserves or National Parks, however the alignment does pass two nearby National Parks.

The Neerabup National Park and Yanchep National Park are located in close proximity to the proposed railway alignment project. The Neerabup National park is located approximately 1.4km east from the Alkimos (Romeo Road) alignment section. The Yanchep National Park is located nearer the mid-section alignment within the suburb of Eglinton, approximately 500m east from the proposed railway. Both Neerabup National Park and Yanchep National Park are within the local area but will be further separated from the rail extension by the proposed Mitchell freeway extension.

State and Municipal Register

The Heritage Council of Western Australia holds details of local government municipal inventory in addition to State and Commonwealth heritage sites. A search of the Heritage Council of Western Australia database identified no registered heritage sites within the suburbs of Alkimos or Eglinton. The nearest European heritage sites are the Northwest Stock Route and Yanchep National Park both are more than 500 m from the alignment.

4. Acid Sulfate Soils Assessment

Acid Sulphate Soils (ASS) are naturally occurring soils containing iron sulphides. These soils are typically benign within the anaerobic environment of their formation. However, when they become oxidised through various disturbances, acidic soil, surface water and groundwater can result. The interaction between hydrogeology and soils is a key factor in determining the risk of ASS along the Site. ASS typically occurs in areas close to wetlands, where there is a combination of both organic soil deposits and water inundation. ASS poses a constraint to works where excavation or dewatering activities disturb these areas and expose them to air.

A desktop analysis of the ASS risk along the proposed railway alignment was undertaken using WA Atlas (2011) and CSIRO's Australian Soil Resource Information System (ASRIS) on 2 February 2011. The Swan coastal plain ASS risk map produced through the WA Atlas (2011) identifies two minor isolated parcels of ASS as having a Class 1 Risk. A Class 1 risk of ASS is a

high to moderate risk of ASS occurring within 3 m of natural soil surface that could be disturbed by most land development activities.

The ASRIS database highlighted the same two ASS locations as having a high probability of occurrence. These two isolated pockets are associated with the nearby Pipidinny Swamp and Beonaddy Swamp. Both these swamps are found within the suburb of Eglinton suburb, which is adjacent to Wanneroo Road. Pipidinny Swamp is the closest area with associated ASS, being approximately 1km east of the mid-section of the proposed railway. The location of these two minor ASS locations should pose no significant threat to the proposed construction of the northern suburbs railway alignment.

5. Fauna

5.1 Desktop Assessment of Fauna Values

5.1.1 Fauna of the general area

The Western Australian Museum *NatureMap* online search was conducted for a 5 km buffer of the study area. The search identifies terrestrial vertebrate and invertebrate species recorded in the collections of the Western Australian Museum and records from Department of Environment and Conservation. The search identified the potential presence of 127 bird, 25 reptile, 1 amphibian and 12 mammal species. A full list of species recorded from the *NatureMap* database is presented in Appendix E

It should be noted that some of the records of the database are historical and some of the recorded species may now be locally extinct. Additionally these records may include species (particularly bird species) that are vagrants or present in the general area but not present within the study area due to lack of suitable habitat.

5.1.2 Significant Fauna Species

The conservation of fauna species and their significance status is currently assessed under both State and Commonwealth Acts. The relevant Acts include the *Wildlife Conservation Act 1950* (WC Act); *Wildlife Conservation (Specially Protected Fauna) Notice 2003,* and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Commonwealth Legislation

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). A description of Conservation Categories delineated under the EPBC Act and the circumstances under which a project will trigger referral to SEWPAC are described in Appendix A. The EPBC Act also protects migratory species that are listed under International Agreements, and marine species on Commonwealth lands and waters.

State Legislation

The WC Act uses a set of Schedules but also classifies species using some of the IUCN categories. These Schedules are described in Appendix A.

In Western Australia, the DEC also produces a supplementary list of Priority Fauna, these being species that are not considered Threatened under the WC Act but for which the Department feels there is a cause for concern. These species have no special legislatory protection, but their presence would normally be considered. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. Levels of Priority are described in Appendix A.

Database Searches

SEWPAC maintains a database of matters of national environmental significance that are protected under the EPBC Act. An EPBC Act Protected Matters Report was generated (from the website of SEWPAC), for the matters of significance that may occur in, or may relate to, the survey area. The DEC and WAM's *NatureMap* and the SEWPAC databases, identified a number of protected fauna species as potentially occurring within the survey area, these are listed in Table 3.

It should be noted that some species that appear in the EPBC Act Protected Matters Search Tool are often not likely to occur within the specified area, as the search provides an approximate guidance to matters of national significance that require further investigation. The records from the DEC searches of threatened fauna provide more accurate information for the general area; however some records of sightings or trappings can be dated and often misrepresent the current range of threatened species.

Table 3 Table of potentially occurring Threatened and Priority Fauna Species within 5 km of the study area, with information source

Genus	Species	Common Name	Listing under EPBC Act	Listing under WC Act 1950 or DEC priority List	Source of Information	
					NatureMap	SEWPAC
Birds						
Anous	*tenuirostris melanops*	Australian Lesser Noddy	Vulnerable	Vulnerable	X	X
Botaurus	*poiciloptilus*	Australian Bittern	Endangered	Endangered		X
Calyptorhynchus	*latirostris*	Carnaby's Cockatoo	Endangered	Endangered	X	X
Diomedea	*exulans amsterdamensis*	Amsterdam Albatross	Endangered Ma, Mi	Critically Endangered		X
Diomedea	*exulans exulans*	Tristan Albatross	Endangered Ma, Mi	Endangered		X
Diomedea	*exulans gibsoni*	Gibson's Albatross	Vulnerable Ma, Mi	Vulnerable		
Diomedea	*exulans (sensu lato)*	Wandering Albatross	Vulnerable Ma, Mi	Vulnerable	X	X
Halobaena	*caerulea*	Blue Petrel	Vulnerable Ma, Mi			X
Ixobrychus	*minutus dubius*	Little Bittern		Priority 4	X	
Leiocarpa	*ocellata*	Malleefowl	Vulnerable, Mi	Vulnerable		X
Macronectes	*giganteus*	Southern Giant Petrel	Endangered Ma, Mi	Endangered	X	X
Macronectes	*halli*	Northern Giant Petrel	Vulnerable Ma, Mi			X
Pterdroma	*mollis*	Soft-plumaged Petrel	Vulnerable Ma, Mi			X
Rostrala	*australis*	Australian Painted Snipe	Vulnerable Ma, Mi	Vulnerable		X
Sternula	*nereis nereis*	Fairy Tern (Australian)	Vulnerable Ma	Vulnerable		X
Thalassarche	*cauta cauta*	Shy Albatross	Vulnerable Ma, Mi	Vulnerable		X
Thalassarche	*Melanophris*	Black-browed Albatross	Vulnerable Ma, Mi	Vulnerable		X
Tyto	*novaehollandiae novaehollandiae*	Masked Owl		Priority 3	X	
Reptiles						
Morelia	*spilota imbricata*	Carpet Python		Schedule 4; Priority 4	X	
Neelaps	*calonotos*	Black-striped Snake		Priority 3	X	
Mammals						
Bettongia	*penicillata ogilbyi*	Woylie	Endangered	Endangered	X	
Dasyurus	*geoffroii*	Chuditch	Vulnerable	Vulnerable	X	X
Isoodon	*obesulus fusciventer*	Southern Brown Bandicoot		Priority 5	X	

Genus	Species	Common Name	Listing under EPBC Act	Listing under WC Act 1950 or DEC priority List	Source of Information	
					NatureMap	SEWPAC
Insects						
Synemon	*gratiosa*	Graceful Sunmoth	Endangered	Endangered	X	X

N.B **Ma: Marine**

Mi: Migratory

5.2 Fauna Assessment Methodology

The fauna survey was undertaken in conjunction with the flora and vegetation survey. The survey consisted of a two phase Level 1 survey of the original (Old Alignment) and revised study area (Amended Alignment). The old alignment was surveyed in November 2010 and the amended alignment was surveyed in October 2012 (Figure 1) in consideration of the requirements of the EPA's Guidance Statement No. 56. Opportunistic area searches of major habitats within the study area were undertaken to search for the presence and signs of fauna species. Searches included but were not limited to investigating burrows; investigating scats, tracks and other traces; and turning rocks and fallen timber.

Habitat assessments were conducted and included specifically targeting the preferred habitats of threatened vertebrate species listed under the relevant Federal and State Acts that may potentially occur in the general area. The aim of the habitat assessment was to determine the likelihood of any threatened species utilising the areas that will be impacted upon as a consequence of the proposed works.

An analysis of the habitat types recorded at the site was conducted and comment as to the potential for the site to support fauna species of conservation significance was completed.

5.2.1 Graceful Sun-moth Survey and *Lomandra* spp. Density Assessment

GHD undertook a Graceful Sun-Moth (GSM) survey in accordance with the methodology developed by DEC (Bishop *et al*. 2010) during March 2011 (GHD, 2011). The survey included a habitat description of the site and assessment of both *Lomandra* spp. densities and Graceful Sun-moth walking surveys. These are described in further detail below.

Lomandra spp. Density Assessment

Graceful Sun-moth habitat within the proposed Northern Suburbs Railway Alignment from Romeo Road (Alkimos) to Yanchep is approximately 14.4 ha in area, therefore the mapping of *Lomandra maritima* and *Lomandra hermaphrodita* density over the site requires approximately 38 (2 x 2 m) quadrats. Two transect lines were established bisecting the bushland with 30 quadrats in the northern study area and 8 quadrats in the southern study area. Quadrats were undertaken on each line. *Lomandra* spp. density is measured according to the scale in Table 4.

Data collected for each quadrat was recorded on field sheets with all the information identified in the GSM survey kit (Bishop *et al*., 2010), which includes:

- Site name;
- Observers;
- Eastings, northings, elevation and aspect;
- Transect and quadrat number;
- Slope;
- Bare ground;
- Position in the landscape;
- Vegetation structure;
- Vegetation condition;
- Surface and sub-surface soil description;
- *Lomandra maritima* density using species cover due to its clumping habit (Table 1);

- *Lomandra hermaphrodita* density by counting each individual plant in each quadrat (Table 1);
- Dominant species cover (additional to the *Lomandra*) using the same cover scale as per *Lomandra maritima*; and
- Score of opportunistic sightings of *Lomandra maritima* and *Lomandra hermaphrodita* between quadrats using qualitative descriptions (abundant, common, uncommon).

Table 4 *Lomandra* spp. density scale (Bishop *et al*., 2010)

Lomandra hermaphrodita	*Lomandra maritima* and dominant species	
Count each individual plant in each 2 x 2 m quadrat.	Area Covered	Percentage Covered
	0	Absent
	0.25 m x 0.25 m	~12%
	0.50 m x 0.50 m	~25%
	1.0 m x 1.0 m	~50%
	1.5 m x 1.5 m	~75%
	2.0 m x 2.0 m	~100%

5.2.2 Walking GSM transect

The Graceful Sun-moth survey was undertaken in accordance with methodology from Bishop *et al*. 2010, as outlined below.

The two study areas are GSM habitat are approximately 14.4 ha in area and therefore approximately 2.8 km of walking transects were undertaken in order to provide adequate survey effort to detect GSM (Bishop *et al.* 2010). The transects were established within the lineal length of the Northern Study Area and existing tracks and dune tops were also walked where the study area intersected them (GHD, 2011). Transects were walked on six (6) separate days between the hours of 10 am and 3 pm. The days (local conditions) were required to be warm and sunny with wind speeds less than 18 km/h. Winds and temperature were measured using a Thermo – Anemometer. Two persons were used to sample the area with butterfly nets. Any specimens caught were photographed and released at the site of capture. Transects were undertaken by a suitably trained person in Graceful Sun-moth study methodology (Bishop *et al*. 2010).

5.3 Fauna Field Assessment Results

5.3.1 Fauna Species Recorded

During the two field survey's (November 2010 and October 2012), twenty-five bird, six reptile, four mammal and one invertebrate species were recorded in the study area. Of these, four species are introduced including the Laughing Kookaburra, Red Fox, Cat and European Rabbit. These are common species within the Perth region.

5.3.2 Significant Fauna Species

The conservation significant invertebrate species *Pachysaga munggai / strobila* was observed during the October 2012 field survey. *Pachysaga munggai* is listed as Priority 1 and *Pachysaga strobila* is listed as Priority 3 under the DEC listing. The identification was undertaken using photos by Dr David Rentz (CSIRO ret.) and was unable to the distinguished between the two species from the supplied images, however, both species are listed Priority species by the DEC.

Plate 1 *Pachysaga munggai / strobila* observed during October 2012 field survey

The Graceful Sun-moth (GSM) was recorded within the Northern study area in March 2011 (GHD, 2011). This species was recorded during on all survey days except for the final day. Five GSM were recorded / sighted in two vegetation types; Scattered emergent shrubs of *Acacia* spp. over Open Low Heath on low sand dune; and *Spyridium globulosum*, *Banksia sessilis* and *Acacia cyclops* Closed Tall Scrub in sandy swales with limestone outcrop (Table 9). No GSM were recorded within the Southern study area, however the Southern study area was only visited once and surveyed for Graceful Sun-moth. At the time of the survey of the Old Alignment, the vegetation condition in the Southern study area was in relatively poor condition and *Lomandra maritima* and *Lomandra hermaphrodita* were recorded in very low densities

Approximately 9.3 ha of GSM habitat are recorded within both study areas and all recorded locations and sightings of GSM are shown in Figure 5.

A complete list of fauna species observed is provided in Appendix E.

The desktop investigation indicated that a number of protected fauna may occur within the study area. The habitat requirements of these species and the likelihood of their occurrence in the site (with information from the field survey) are considered in Table 5.

Table 5 Conservation significant fauna identified by the desktop assessment

Species	Status	Habitat Requirements	Likelihood of Occurrence
Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)	Endangered Schedule 1	Carnaby's Black Cockatoo, also known as the Short-billed Black-Cockatoo, is distributed across the south-west of Western Australia in uncleared or remnant areas of Eucalyptus Woodland and Shrubland or Kwongan heath. Breeding usually occurs in the wheatbelt region of Western Australia, with flocks moving to the higher rainfall coastal areas to forage after the breeding season. These Cockatoos feed on the seeds of a variety of native plants, including Allocasuarina, Banksia, Dryandra, Eucalyptus, Grevillea and Hakea, and some introduced plants. They will also feed on the nectar from flowers of a number of species, and on insect larvae. Over the last 50 years most of the feeding habitat of Carnaby's Black Cockatoo has been destroyed by agricultural clearing. Any suitable habitat that remains is fragmented, and often degraded by soil salinity and weed invasion. Feeding habitat is often so far away from nests that the growth rate and survival of nestlings is significantly reduced. The original food sources for Carnaby's Black Cockatoo have been largely replaced by urban development and introduced pine plantations that are to be reduced significantly in the future.	Known This species was recorded in the area. Habitat is present in both study areas. The study areas contain pockets of feeding habitat for Carnaby's Black Cockatoo including Allocasuarina, Banksia and Eucalypt species. Signs of feeding were observed within the study area. No potential breeding trees were observed within either study area.
Southern Giant Petrel (*Macronectes giganteus*)	Endangered Schedule 1	The Southern Giant Petrel is a marine bird occurs in Antarctic to subtropical waters. They breed on Macquarie and Heard Islands and on other subantarctic islands. They are widespread in southern oceans, and have been recorded as far north as Shark Bay in WA.	Unlikely This is a marine species therefore the study areas are not necessary habitat for this species.
Woylie (*Bettongia penicillata ogilbyi*)	Endangered Schedule 1	Woylies historically occupied habitat in a variety of climatic zones including Mediterranean, semi-arid and arid. Habitat types ranged from forest to grassland, coastal and inland. The Woylie favours dry sclerophyll forest and woodlands with an overstorey of Jarrah and Wandoo. During the day the Woylie shelters under patches of dense undergrowth, logs and rock-cavities and occasionally in burrows.	Unlikely There is no significant habitat present in the study area for this species. There have been no recent records of Woylie in the surrounding area.
Graceful Sunmoth (*Synemon gratiosa*)	Endangered Schedule 1	The GSM is only active in autumn, unlike the majority of Lepidoptera that are most active during spring and summer months. Adults of the GSM are not active during spring but evidence of habitat use is assessed using known food plants (*Lomandra maritima*, and *L. hermaphrodita*) as a surrogate. The larvae of the GSM inhabit sandy soils and feed upon root mats formed by *L.*	Known GHD recorded the species in 2011.

		maritima and *L. hermaphrodita*. The GSM is currently only known from two general vegetation types (Bishop *et al*., 2010) including: Banksia woodland/woolly bush on deep sands, in the northern suburbs of Perth on the Swan Coastal Plain. In these sites the GSM breeds on *Lomandra hermaphrodita*, which often occurs in low numbers; and Open areas of herbland, heathland and shrubland on Quindalup soils (sand and limestone) close to the coast where it breeds on *Lomandra maritima*, which is often present in reasonable numbers and may even be a dominant understorey herb.	
Australian Lesser Noddy (*Anous tenuirostris melanops*)	Vulnerable Schedule 1	This Australian subspecies breeds only on three islands in the Houtman Abrolhos. Despite being a relatively abundant bird, the subspecies is dependant on less than 4.5 ha of mangroves for breeding, and hence is very susceptible to habitat destruction. This species remains at the Abrolhos all year round (Burbidge, 2004).	Unlikely The study areas are outside the known range for this species.
Gibson's Albatross (*Diomedea gibsoni*) Black-browed Albatross (*Diomedea melanophris melanophris*) Shy Albatross (*Thalassarche cauta cauta*)	Vulnerable Schedule 1	Thirteen species of albatrosses are listed as threatened in Western Australia. These species of Albatross are marine, pelagic and aerial. Albatrosses breed on subantarctic and other southern ocean islands and fly enormous distances in the southern oceans searching for food.	Unlikely Given the marine nature of Albatrosses the study areas are not considered significant habitat for these species.
Chuditch (*Dasyurus geoffroii*)	Vulnerable Schedule 1	Chuditch currently inhabit most kinds of wooded habitat within its current range including eucalypt forest (especially Jarrah), dry woodland and mallee shrubland. In Jarrah forest, Chuditch utilise hollow logs or earth burrows as dens or refuge. The species has been translocated to various conservation reserves in Western Australia and there is evidence of a return of the species the Walyunga National Park, outer metropolitan areas of Perth and the Swan Coastal Plain. In recent years it has been recorded from Byford, RAAF Pearce air field bushland and Paganoni Nature Reserve. These areas have large remnant patches of bushland sufficient to maintain a population of Chuditch.	Possible Potential habitat present. This species is known to occur in nearby nature reserves.
Northern Giant Petrel (*Macronectes halli*)	Vulnerable	The Northern Giant Petrel is a marine and oceanic species. It mainly occurs in sub-Antarctic waters, but regularly occurs in Antarctic waters of the southwestern Indian Ocean, the Drake passage and west of the Antarctic Peninsula (Marchant and Higgins, 1990). The range of the Petrel extends into subtropical waters mainly between winter and spring. It frequents both	Unlikely Given the marine nature of this species the study areas are not considered to contain significant habitat.

		oceanic and inshore waters near breeding islands and in the non-breeding range.	
Carpet Python (*Morelia spilota imbricata*)	Schedule 4 Priority 4	The Carpet Python occurs in a large range of habitats including woodlands, forests and dense coastal scrub, on granite and limestone outcrops and along watercourses. The distribution of the species is from Geraldton and Yalgoo in the North east to Pinjin, Kalgoorlie, Fraser Range and most of the remaining south west (Storr et al. 2002). It is often arboreal and preys on birds, other reptiles and small to medium size mammals.	Likely Potential habitat present. This species is known to occur in the Yanchep National Park.
Masked Owl (*Tyto novaehollandiae novaehollandiae*)	Priority 3	The Masked Owl inhabits forests, woodlands, timbered waterways and open country on the fringe of these areas. The main requirements for this species are tall trees with suitable hollows for nesting and roosting and adjacent areas for foraging. Masked Owls are territorial, and pairs remain in or near the territory all year round.	Possible Suitable habitat present in the northern study area. Has previously been recorded from the Yanchep area.
Black-striped Snake (*Neelaps calonotos*)	Priority 3	The Black-striped Snake is typically found in coastal dunes and sandplains in association with Banksias and heath. It has a very limited distribution exclusive to the Swan Coastal Plain. This taxa is particularly difficult to locate and is infrequently collected during biological surveys on the Swan Coastal Plain.	Likely Suitable habitat present in both areas. This species is known to occur in the surrounding area.
Little Bittern (*Ixobrychus minutus dubius*)	Priority 4	The Little Bittern inhabits freshwater swamps, lakes and rivers with dense reedbeds, tall sedges and well-vegetated margins, also in brackish-saline mangroves, salt marsh and coastal lagoons. They nest in dense vegetation over water.	Unlikely The study areas do not contain suitable habitat for this species.
Quenda (*Isoodon obesulus fusciventer*)	Priority 5	The Quenda or Southern Brown Bandicoot is an omnivorous marsupial that occurs in the southwest of Western Australia. This species prefers areas with dense understorey vegetation, particularly around swamps and along watercourses. However, it also occurs in woodlands, and may use less ideal habitat where this habitat occurs adjacent to the thicker, more desirable vegetation. Quenda populations on the Swan Coastal Plain are threatened by development in this region, which has resulted in loss of habitat. This species is relatively common in parts of the greater Perth and south west region.	Possible Suitable habitat present. This species is known to occur in the parks and reserves of Yanchep and Neerabup.

5.3.3 Marine and Migratory Species

Six marine and/or migratory listed bird species were observed within the study area, including Wedge-tailed eagle, Black-shouldered Kite, Whistling Kite, Nankeen Kestrel, Silvereye and Rainbow Bee-eater. These are common and widespread bird species. The study area is not deemed critical habitat for the survival of these species.

Desktop investigations resulted in 30 listed migratory and/or marine species (species listed under international agreements) recorded within 5 km of the study area. There is the potential for a number of terrestrial and marine migratory bird species to occur occasionally within the study area. However, the study area cannot be considered as significant habitat for these species.

5.4 Fauna Habitat

Five broad habitat types are present within the study areas; these are described below.

1. Eucalypt Woodland

The Eucalypt Woodland in the northern study area is dominated predominately by relatively young *Eucalyptus gomphocephala* (Tuart). A large proportion of the study area has previously been cleared and consists of a number of planted *Eucalyptus* species including Tuart. These areas contain little to no understorey and provides limited habitat for fauna, particularly reptiles and mammals. It is unknown as to the reason for an isolated area of planted Eucalypt woodland to be located within the study area.

The Eucalypt Woodland in the southern study area is dominated by *Eucalyptus decipiens* subsp. *decipiens* over Open Scrub of *Banksia sessilis.* The vegetation in this area is very dense and provides good habitat for a number of fauna species including feeding habitat for the conservation significant Carnabys Cockatoo.

2. Banksia Woodland

This habitat type is present within both study areas. It is the dominant vegetation type of the southern study area and present in patches along the northern study area.

Woodland habitats offer particularly high habitat value for fauna species due to the variety of microhabitats and various resource niches available in these areas. The woodlands would be expected to support a high diversity of bird species. Across these woodlands are areas of loose coastal sand that are suitable for burrowing reptiles, and in particular provide ideal habitat for the conservation significant Black-striped Snake. The presence of Banksia and other proteaceous species provides feeding habitat for the Carnabys Cockatoo.

3. Open Scrub and Shrublands

There are patches of this habitat type throughout the northern study area. The vegetation within this habitat type is variable however the upper storey is generally dominated by *Acacia saligna*, *Banksia sessilis*, *Spyridium globulosum*, *Melaleuca systena*, and *Acacia cyclops.*

These shrublands, particularly those that have been less disturbed, are important for the species that require dense vegetation, particularly nectarivorous bird species. These habitats can support species of conservation significance that have declined across the Swan Coastal Plain because of clearing of shrubland habitat. The presence of proteaceous species provides feeding habitat for the Carnabys Cockatoo. These areas also provides good habitat for the conservation significant Black-striped Snake.

4. Low heath on Sand Dune

This habitat type is present in small patches along the northern study area. It generally occurs on the slopes of the small sand dunal systems present in the area. The dominant plants include *Acacia cyclops*, *Melaleuca systena, Hemiandra pungens and Lomandra maritima.*

This habitat would be utilised by a number of coastal species such as skinks, burrowing reptiles, small birds, and mammal species. These areas also provides ideal habitat for the Black-striped Snake and Graceful Sunmoth.

5. Cleared-Disturbed Areas

These are areas where the native vegetation is no longer intact, either being cleared or subject to major disturbances that have considerably changed the vegetation structures. These areas are either completely cleared or mainly dominated by introduced species, particularly grassy species.

The disturbed habitat areas, including those containing introduced grasses, may be used by a number of species, such as some skink species, which have adapted to this new habitat. However, overall the habitat values of these areas are relatively low compared to the undisturbed areas of native vegetation.

5.4.1 Black Cockatoo Habitat

The *Eucalyptus*, *Banksia* and other proteaceous species within the study areas provide potential feeding habitat for the Endangered Carnabys Black Cockatoo. Signs of feeding were observed in the study areas and birds were observed during the field survey. Carnaby's Black Cockatoo are known to frequent the area. No potential breeding trees were recorded within the study areas.

The study area contains approximately 9.3 ha of potential Black Cockatoo feeding habitat. The potential feeding habitat was generally in good condition with similar habitat in similar condition occurring in remnant vegetation in the surrounding area.

5.4.2 Habitat Linkages

Habitat linkages are important to allow animals to move between areas of resource availability. Habitat linkage is important for ground and aerial fauna, providing cover, resources, and linking areas suitable for rest and reproduction.

Fragmentation of habitat limits the resources available to species, particularly sedentary species, which means they may be more vulnerable to natural disasters or habitat changes over time. Fragmentation of habitat can also lead to edge effects, leading to degradation of the habitat. Where the distance between habitat fragments is small, species may still be able to move between these habitat areas, but may be more exposed to predation pressures in the cleared areas.

The majority of the study areas is adjacent to native vegetation and has existing habitat linkages. Much of the area adjacent to the alignment however is proposed for future development. A bush forever site (Ningana Bushland) occurs over much of the northern study area which is linked to adjacent bushland to the north and south and to other bush forever sites to the east and west. A large area of native vegetation is currently being cleared around the southern study area for housing development and roads.

The bushland linkages from north-south that this study area is part of should not be significantly impacted by the proposed alignment. However, the rail alignment will cause a barrier to fauna movement east-west between these bushland linkages. It is recommended that fauna underpasses are provided along the alignment for fauna movement between these areas.

6. Preliminary Subterranean Fauna Assessment

GHD have conducted a desktop assessment for both the presence of subterranean fauna (stygofauna and troglofauna), and the risk of impact(s) to any such fauna by the project, for the portion of the study area between Romeo Road and the proposed Yanchep Railway Station. EPA Guidance Statement 54a (EPA, 2007) indicates that the general likelihood for the occurrence of subterranean fauna within the study area is high.

6.1 Assessment of subterranean fauna occurrence

A field assessment was conducted on 10th November by Dr Timothy Moulds (GHD) to assess the area for the presence of outcropping karstic features that may indicate the presence of subterranean voids suitable for supporting subterranean fauna communities. The stygofauna assessment was undertaken in the northern study area of the proposed railway alignment, from Yanchep Beach Road heading south towards the suburb of Eglinton. The stygofauna study area covered approximately the identical path of the Northern Fauna and Flora study area of the proposed northern suburbs railway alignment.This field assessment found several areas of outcropping karstic limestone, although it should be noted that many karstic voids show no human-sized connection with the surface.

Plate 2 Outcropping limestone within the proposed alignment.

While many subterranean fauna species are only known from caves, it is now recognised that numerous troglomorphic species occur within micro and meso-caverns or interstitial spaces not necessarily associated with caves. Hence the absence of caves or voids themselves can not be used as a surrogate for the absence of subterranean fauna. The complete absence of caves and voids can not be totally discounted due to the extreme variability of the Tamala Limestone.

The local geology and proximity to the Threatened Ecological Community (TEC) of aquatic root mat communities in the Yanchep National Park would indicate a very high likelihood of subterranean fauna in the area. Construction activities are not expected to have any substantial impact upon the subterranean environment and no dewatering is proposed. If this situation changes then it is suggested that a pilot study be undertaken to better determine the presence or otherwise of subterranean fauna. This study could comprise of sampling of existing monitoring bores or proposed construction bores.

6.2 Impacts to subterranean fauna

Reduction in groundwater levels and quality can adversely affect stygofauna, and to a lesser extent troglofauna, as they rely upon a saturated environment. The depth to groundwater within the study area is expected to be greater than the depth of construction activities thus the risk of any significant impact upon subterranean fauna is low. Contamination of groundwater during construction and subsequent use may also impact significantly upon subterranean fauna habitat, but risks of contamination can be minimised by measures included in a Construction Environment Management Plan (CEMP). The destruction of caves or large voids during construction works may also have potential impacts upon subterranean fauna especially if aquatic root mats are present within caves.

According to the Perth Groundwater Atlas (2011), the estimated groundwater depths along the proposed railway alignment are roughly a 1m depth from Alkimos to Eglinton, with increasing groundwater depths closer to Yanchep at approximately 2m.

6.3 Management recommendations for subterranean fauna

Impacts to subterranean fauna can be minimised through the following actions:

- A survey could be undertaken in conjunction with the geotechnical sampling program.
- Areas containing caves or significant karst should be avoided by the railway alignment, especially where such features will be destroyed by construction;
- If there is unavoidable destruction of caves or significant karst features then a survey for subterranean fauna (stygofauna and troglofauna) should be initiated to determine the presence of such fauna;
- If caves or voids are encountered during construction activities, work is suspended until their impact on subterranean fauna can be assessed;
- Groundwater levels are not altered during construction, or subsequently due to construction activities;
- Groundwater contamination risk is minimised during construction and subsequent operation;
- Subterranean fauna are specifically included within a Construction Environment Management Plan (CEMP) to ensure site personnel are aware of potential impacts that may be caused by construction works and have management measures in place.
- If significant impacts to the local groundwater, including but not limited to lowering or contamination occur, it is recommended that the following actions are taken:
- A pilot survey for subterranean fauna is undertaken on the site with regard to EPA Guidance Statement 54a (2007);
- Any water monitoring bores constructed are designed to be suitable for stygofauna sampling;
- Work suspended and the site is reassessed for impacts to potential subterranean fauna;

- Notify the DEC;
- Consult with relevantly qualified people.

6.4 Subterranean Fauna Conclusions

The study area has a high likelihood of subterranean fauna occurrence, however, the proposed project impacts are considered to pose a minimal threat to any such fauna, as no dewatering or groundwater contamination is anticipated. The implementation of a construction management plan that includes subterranean fauna will also further reduce any risk of potential impacts to any subterranean fauna inhabiting the area. Caves and significant karst features should be avoided within the railway alignment, although if their destruction is unavoidable, areas should be surveyed for stygofauna and troglofauna to determine the impact of proposed actions.

7. Flora and Vegetation

7.1 Desktop Assessment

7.1.1 Vegetation Types

In Western Australia, there are various floristic reports that detail a region's botanical values. A widely-used vegetation classification system that maps and describes vegetation communities in south-west Western Australia is *Vegetation of the Darling System* in the *Atlas of Natural Resources, Darling System, Western Australia* (Heddle *et al.* 1980). This document describes vegetation communities as vegetation complexes, and maps the distribution of each complex.

Vegetation complexes are defined as a combination of distinct site vegetation types usually associated with a particular geomorphic, climatic, floristic and vegetation structural association. Vegetation complexes are based on the pattern of vegetation at a regional scale, as it reflects the underlying key determining factors of landforms, climate and soils.

Heddle et al. (1980) mapped the study areas as containing three Swan Coastal Plain vegetation complexes. The northern study area is predominately composed of the Quindalup Complex, with a small area in the north composed of the Cottesloe Complex – North. The southern study area is composed of the Cottesloe Complex – Central and South.

The vegetation of these complexes is described as follows:

- Quindalup Complex: Coastal dune complex consisting mainly of two 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 shrub of *Acacia rostellifera*.
- Cottesloe Complex – North: Predominately low open forest and low woodland of *Banksia attenuata – B. menziesii – Eucalyptus todtiana*; closed heath on the limestone outcrops.
- 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 region through which the railway alignment passes is composed of Quindalup and Spearwood Dunes. The majority of the railway alignment is composed of the older dunes and plains of the Quindalup dunes which consist of Open Low Heaths of *Melaleuca systena*, *Acacia rostellifera*, *A lasiocarpa* and *Hibbertia racemosa* over Herblands dominated by *Lomandra maritima*; *Acacia rostellifera* Closed Tall Scrub to Closed Heath (Government of WA, 2000).

7.1.2 Vegetation Extent and Status

The mapped Heddle complexes can be used to determine vegetation extent and status on the Swan Coastal Plain. A vegetation type is considered to be underrepresented if there is less than 30 % of its original extent remaining. From a biodiversity perspective and taking no account of any other land degradation issues, there are several key criteria applied to vegetation clearing (EPA, 2000):

- The "threshold level", below which at an ecosystem level species loss appears to accelerate exponentially is regarded as being 30% of the pre-clearing extent for the vegetation type; and
- A level of 10% of the original vegetation extent is regarded as being a level representing "endangered"; and
- Clearing which would put the threat level into the class below should be avoided.

Such vegetation community status can be delineated into five (5) classes, where:

– Presumed extinct:	Probably no longer present in the bioregion
– Endangered*:	<10% of pre-European extent remains
– Vulnerable*:	10-30% of pre-European extent exists
– Depleted*:	>30% and up to 50% of pre-European extent exists
– Least concern:	>50% pre-European extent exists and subject to little or no degradation over a majority of this area.

* or a combination of depletion, loss of quality, current threats and rarity gives a comparable status.

The current extent of the complexes within the study area is presented in Table 6.

Table 6 Remnant Vegetation of the Swan Coastal Plain Bioregion within the System 6/part System 1

Vegetation Complex	Total pre-1750 extent (ha)	Present extent (1997/98) (ha)	% of each remaining (1997/98) (ha)	% of each remaining pre-1750 extent in secure tenure (2002) (ha)
Quindalup Complex	38,238	18,000	47.1	5.2
Cottesloe Complex - North	21,412	15,216	71.1	9.9
Cottesloe Complex – Central and South	44,995	18,474	41.1	8.8

(Source: EPA, 2006)

On the Swan Coastal Plain 47.1% of the Quindalup Complex and 41.1% of the Cottesloe Complex – Central and South are estimated to remain and are therefore considered "Depleted". It is estimated that 71.1% of the Cottesloe Complex – North remains and is therefore considered of "Least Concern".

These levels are above the 10% threshold level for which the EPA will formally assess a project.

7.1.3 Threatened Ecological Communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat' (English and Blythe, 1997). 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.

The DEC maintains a list of Threatened Ecological Communities (TECs). Some of these TECs are protected under the EPBC Act. DEC listed ecological communities are given special consideration in environmental impact assessments and have special status under the land clearing regulations of the *Environmental Protection Act 1986*. The EPAs position on TECs states that proposals that result in the direct loss of TECs are likely to require formal assessment.

Possible TECs that do not meet survey criteria are added to the DEC's Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, not 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.

A search of the DEC's Threatened Ecological Communities database indicates that there are a number of occurrences of different types of Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) within 5 km of the study areas. They include:

- The 'Endangered' threatened ecological community – '*Melaleuca huegelii – M. acerosa* (currently *M. systena*) shrubland on limestone ridges';
- The 'Critically Endangered' threatened ecological community – 'Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain';
- The 'Critically Endangered' threatened ecological community – 'Woodlands over sedgelands in Halocene dune swales of the Swan Coastal Plain'.
- The 'Priority 3' priority ecological community – 'Northern Spearwood shrublands and woodlands';
- The 'Priority 3' priority ecological community - Northern *Banksia attenuata - Banksia menziesii* woodlands; and
- The 'Priority 2' priority ecological community - *Banksia ilicifolia* woodlands

The southern study area is located within the 2 km boundary of the TEC '*Melaleuca huegelii – M. acerosa* (currently *M. systena*) shrubland on limestone ridges'.

7.1.4 Wetlands

A desktop analysis using The Western Australian Wetlands Database (2011) identified a swamp area consisting of two wetlands, with the nearest situated approximately 1km east of the proposed railway alignment. There are, however, no wetlands located within the boundaries of the study area.

7.1.5 Significant Flora

Species of significant flora are protected under both State and Commonwealth Acts.

Commonwealth

Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act and the WC Act can trigger referral to SEWPAC and/or the EPA.

A description of Conservation Categories delineated under the EPBC Act is detailed in Appendix A. These are applicable to threatened flora and fauna species.

A search of the EPBC Act Protected Matters Search Tool identified five Commonwealth protected flora species within 5 km of the study area. These are listed in Table 7.

State

In addition to the EPBC Act, significant flora in Western Australia is protected by the WC Act. This Act, which is administered by the DEC, protects DRF species. The DEC also maintains a list of Priority flora species. Conservation codes for flora species are assigned by the DEC to define the level of conservation significance. Priority flora are not currently protected under the WC Act. Priority flora may be rare or threatened, but cannot be considered for declaration as rare flora until adequate surveys have been undertaken of known sites and the degree of threat to these populations clarified. Special consideration is often given to sites that contain Priority flora, despite them not having formal legislatory protection. A description of the DEC's Conservation Codes that relate to flora species is provided in Appendix A.

A search of the current DEC Rare Flora Databases and Western Australian Herbarium (WAHERB) records was undertaken in May 2010. These results combined with the Western Australian Museums and DEC "NatureMap" search provide a list of conservation significant flora species that have been recorded within 5 km of the search area. These species are outlined in Table 7.

Known locations of Declared Rare and Priority flora species are not known to occur in either study areas but they do exist in close vicinity of the study area (as shown in **Error! Reference source not found.**). The closest record of DRF is *Eucalyptus argutifolia*, located approximately 1.3km west of the northern study area. The southern study area recorded Priority 3 *Stylidium maritimum* approximately 1.5km west of the study area. Both locations are not considered to be significantly impacted by the proposed railway alignment.

Table 7 Significant flora species previously recorded or potentially occurring within 5 km of the study area (DEC, WAHERB and NatureMap).

Family	Genus	Species	Details and Habitat	Commonwealth Conservation Code	DEC Conservation Code
Myrtaceae	*Darwinia*	*foetida Keighery*	No available information.	Critically Endangered	Threatened
Myrtaceae	*Eucalyptus*	*argutifolia*	Mallee, 1.5-4 m high, bark smooth. Flowers white March-April. Shallow soils over limestone on slopes or gullies of limestone ridges, outcrops.	Vulnerable	Threatened
Proteaceae	*Grevillea*	*curviloba* subsp. *incurva*	Prostrate to erect shrub, 0.1-2.5 m high. Flowers white, cream August-September. Sand, sandy loam in winter-wet heath.	Endangered	Threatened
Cyperaceae	*Lepidosperma*	*rostratum*	Rhizomatous, tufted perennial, grass-like or herb, 0.5 m high. Flowers brown. Peaty sand and clay.	Endangered	Threatened
Myrtaceae	Isopogon	uncinatus	Tufted spreading or prostrate, non-lignotuberous shrub, 0.05-0.4 m high. Fl. yellow/cream, Oct to Nov. Loam or sand on granite, peaty sand. Swampy depressions, hillslopes.	Endangered	Threatened
Centrolepidaceae	*Centrolopis*	*caespitosa*	Tufted annual, herb (forming a rounded cushion up to 25 mm across). Fl. Oct to Dec. White sand, clay. Salt flats, wet areas.	Endangered	Priority 4
Orchidaceae	*Caladenia*	*huegelii*	Tuberous, perennial, herb, 0.25-0.6 m high. Flowers green, cream and red Sept-Oct. Preferred habitat is grey or brown sand and clay loam.		Rare
Dasypogonaceae	*Calectasia*	*cyanea*	Rhizomatous, clump forming, woody perennial, herb, 0.1-0.6 m high, to 0.3 m wide. Flowers blue, purple in June-Oct. Prefers grey or yellow sand and gravel.		Rare

Family	Genus	Species	Details and Habitat	Commonwealth Conservation Code	DEC Conservation Code
Ericaceae	*Leucopogon*	sp. Perth coastal	No available information.		Priority 1
Ericaceae	*Leucopogon*	*maritimus*	No available information.		Priority 1
Myrtaceae	*Melaleuca*	sp. Wanneroo	No available information.		Priority 1
Bacidiaceae	*Lecania*	*sylvestris*	No available information.		Priority 2
Bacidiaceae	*Lecania*	*turicensis* var. *turicensis*	No available information.		Priority 2
Physciaceae	*Rinodina*	*bischoffii*	No available information.		Priority 2
Fabaceae	*Acacia*	*benthamii*	Shrub 1 m high. Flowers yellow Aug-Sept. Sand, typically on limestone breakaways.		Priority 2
Dilleniaceae	*Hibbertia*	*helianthemoides*	Spreading to erect, low or prostrate shrub, to 0.3 m high. Flowers yellowJul-Oct. Clayey sand over sandstone or loam over quartzite on hills and scree slopes.		Priority 3
Dilleniaceae	*Hibbertia*	*spicata subsp. leptotheca*	Erect or sreading shrub, 0.2-0.5 m high. Flowers yellow July-Oct. Sand, near coastal limestone ridges, outcrops and cliffs.		Priority 3
Elaeocarpaceae	*Tetratheca*	*pilifera*	Spreading shrub, 0.1-0.3 m high. Flowers purple Aug-Oct. Gravelly soils.		Priority 3
Placynthiaceae	*Placynthium*	*nigrum*	No available information.		Priority 3
Proteaceae	*Adenanthos*	*cygnorum* subsp. *chamaephyton*	Prostrate, mat-forming, non-lignotuberous shrub, to 0.3 m high. Flowers white, cream, pink, green, Jul–Jan. Grey sand, lateritic gravel		Priority 3
Malvaceae	*Lasiopetalum*	*membranaceum*	Multi-stemmed shrub, 0.2-1 m high. Flowers pink, purple Sept-Dec. Sand over limestone.		Priority 3
Ericaceae	*Leucopogon*	sp. Yanchep	Erect shrub, 0.15-1 m high, Flowers white, pink Apr-June/Sept. Light grey-yellow sand, brown loam, limestone, granite on coastal plains, breakaways, valley slopes and low hills.		Priority 3
Stylidiaceae	*Stylidium*	*maritimum*	Caespitose perennial, herb 0.3-0.7 m high. Flowers white, purple Sept-Nov. Sand over limestone, dune slopes and flats, coastal heath		Priority 3

Family	Genus	Species	Details and Habitat	Commonwealth Conservation Code	DEC Conservation Code
			and shrubland and open Banksia woodland.		
Haemodoraceae	*Conostylis*	*bracteata*	Rhizomatous, tufted or shortly proliferous perennial, grass-like or herb 0.2-0.45 m high. Flowers yellow Aug-Sept. Sand, limestone on consolidated sand dunes.		Priority 3
Fabaceae	*Sphaerolobium*	*calcicola*	Slender, multi-stemmed, scandent or erect shrub, to 1.5 m high. Fl. orange-red, Jun or Sep to Nov. White-grey-brown sand, sandy clay over limestone, black peaty sandy clay. Tall dunes, winter-wet flats, interdunal swamps, low-lying areas.		Priority 3
Haemodoraceae	*Conostylis*	*pauciflora* subsp. *euryrhipis*	Rhizomatous, stoloniferous perennial, grass-like, herb 0.06-0.18 m high. Flowers yellow Aug-Oct. White, grey or yellow sand on consolidated dunes.		Priority 4
Haemodoraceae	*Conostylis*	*pauciflora* subsp. *pauciflora*	Rhizomatous, stoloniferous perennial, grass-like, herb 0.1-0.35 m high. Flowers yellow Aug-Oct. Grey sand, limestone on hillslopes, consolidated dunes.		Priority 4
Brassicaceae	*Lepidium*	*pseudotasmanicum*	Erect annual or biennial, herb 0.2-0.4 m high. Flowers white, green Feb/Dec. Loam, sand.		Priority 4
Fabaceae	*Jacksonia*	*sericea*	Low spreading shrub, to 0.6 m high. Flowers orange Dec-Feb. Calcareous and sandy soils.		Priority 4

(Source: Florabase, 2010)

7.1.6 Bush Forever and Conservation Areas

The northern section of the proposed rail alignment traverses through Bush Forever site 289 known as Ningana Bushland (Yanchep/Eglington). Ningana Bushland consists of 551.5 ha of bushland (as shown in Figure 2). Ningana is a "site with some existing protection" due to its Existing Parks and Recreation reservation in the Metropolitan Region Scheme. However, it is "subject to further investigation". Ningana Bushland has linkages to adjacent bushland north, south and west (Bush Forever site 397) and east (Bush Forever site 228-Yanchep National Park). Ningana Bushland is also part of the regionally significant contiguous bushland/wetland linkage that Neerabup National Park, in the south, forms part of. This bushland linkage runs northward from Joondalup to Wilbinga, north to Yanchep, and links eastward into the Gingin region (Government of WA, 2000).

7.2 Field Assessment Methodology

The flora assessment included desktop investigations and a two phase Level 2 field survey. The Old Alignment was surveyed in November 2010 and the Amended alignment was surveyed in October 2012 (Figure 1). The survey was conducted with regard to the EPA's Guidance Statement No. 51, where possible.

The flora and vegetation survey was conducted using quadrats and relévés (i.e. unbounded search areas) within the study area. The relévés included recording a list of flora species visible at the time and mapping of vegetation types and conditions (including weed status). Aerial photography was used to assist in the delineation of vegetation types present in the study area. Detailed information was collected in seventeen 10 x 10 metre quadrats.

The information recorded at each quadrat is provided in Table 8. The quadrat data recorded during the survey is presented in Appendix D.

Table 8 Information recorded at each quadrat

Attribute	Information Recorded
Location	Coordinates recorded in GDA94 datum using a hand-held Global Positioning System (GPS), to an accuracy usually within 5m; reading taken for the north-east corner of the quadrat
Physical Features	Aspect, soil attributes Percentage surface cover by: rocks, logs and branches, leaf litter, bare open soil
Vegetation Classification	Broad vegetation description
Vegetation Condition	As per Bush Forever Vegetation Condition Rating Scale (Keighery, 1994)
Disturbance	Level and nature of disturbances (e.g. weed presence, fire – and time since last fire, grazing)
Flora	List of flora within quadrat; Measure of plant heights and percentage foliar cover. % Cover classed into ranges (<2%, 2-10%, 10-30%, 30-70%, 70-100%)

A list of flora species collated from the quadrats and relévés was generated for the study area. Where identification of flora species was uncertain, confirmation was made at the Western Australian State Herbarium.

The presence of DRF or Priority Flora was assessed. Suitable habitat for DRF and Priority flora species was searched. Vegetation was also assessed to determine the presence of TECs and PECs within the study area.

7.3 Field Assessment Results

7.3.1 Vegetation Type

Thirteen vegetation types were identified within the study area.

The proposed railway alignment passes through inland dunal areas that contain old stabilised sand dunes supporting predominately low woodlands and tall open scrub.

The vegetation types are described in Table 9.

Table 9 Vegetation types recorded in the study areas

No.	Broad Vegetation Type	Vegetation Description	Site Photo	Quadrat/Releve
1	*Banksia* spp. Low Woodland	*Banksia menziesii* and *Banksia attenuata* Low Woodland over *Hakea ruscifolia*, *Xanthorrhoea preissii* and *Macrozamia riedlei* Open Shrubland over *Gompholobium tomentosum*, *Hibbertia hypericoides* and *Jacksonia calcicola* Low Shrubland over *Conostylis aculeata*, *Mesomelaena pseudostygia* and *Desmocladus flexuosus* Very Open Herbland		Q2
2	*Eucalyptus* spp. Low Open Woodland over *Banksia* spp. Tall Open Scrub	*Eucalyptus decipiens* subsp. *decipiens* and *Eucalyptus foecunda* Low Open Woodland over *Banksia sessilis* and *Banksia attenuata* Tall Open Scrub over *Hibbertia hypericoides*, *Xanthorrhoea preissii* and *Calothamnus quadrifidus* subsp. *quadrifidus* Open Low Heath over *Conostylis aculeata*, *Mesomelaena pseudostygia* and *Desmocladus flexuosus* Very Open Herbland		Q1, Q20

No.	Broad Vegetation Type	Vegetation Description	Site Photo	Quadrat/Releve
3	*Acacia saligna, A. cyclops* and *Spyridium globulosum* Tall Open Scrub	*Acacia saligna, A. cyclops* and *Spyridium globulosum* Tall Open Scrub over *Acanthocarpus preissii*, **Euphorbia terracina* and *Conostylis pauciflora* subsp. *euryrhipis* Very Open Herbs **Bromus diandrus* and **Avena barabata* Closed Grassland		R1
4	*Eucalyptus gomphocephala* Woodland over Tall Open Scrub	*Eucalyptus gomphocephala* Woodland over *Spyridium globulosum* and *Acacia cyclops* Tall Open Scrub over **Bromus diandrus*, **Ehrharta longiflora* and **Avena barbata* Grassland		Q3
5	*Eucalyptus* sp. and *Taxandra linearifolia* Low Woodland	*Eucalyptus* sp. and *Taxandra linearifolia* Low Woodland over **Lagurus ovatus*, **Bromus diandrus* and **Avena barbata* Open Grassland over *Lomandra maritima*, **Euphorbia terracina* and *Desmocladus flexuosus* Very Open Herbland		Q4

No.	Broad Vegetation Type	Vegetation Description	Site Photo	Quadrat/Releve
6	Scattered emergent *E. gomphocephala* over Mixed Shrubland	Scattered Emergent *Eucalyptus gomphocephala* over *Melaleuca systena*, *Allocasuarina fraseriana* and *Acacia saligna* Shrubland over *Lomandra maritima*, *Desmocladus flexuosus* and Herbland.		Q5
7	*Spyridium globulosum*, *Banksia sessilis* and *Acacia cyclops* Closed Tall Scrub in sandy swales with limestone outcrop	*Spyridium globulosum*, *Banksia sessilis* and *Acacia cyclops* Closed Scrub over *Melaleuca systena*, *Calothamnus quadrifidus* subsp. *quadrifidus* and *Grevillea preissii* Low Shubland over *Lomandra maritima, Desmocladus flexuosus* and *Leucopogon parviflorus* Very Open Herbland over **Bromus diandrus*, **Briza maxima* and **Avena barbata* on Sandy Swales with Limestone Outcrop		Q6, Q7
8	Scattered emergent shrubs of *Acacia* spp. over Open Low Heath on low sand dune	*Acacia cyclops* and *A. cochlearis* Scattered Emergent Shrubs over *Melaleuca systena* and *Hemiandra pungens* Open Low heath over *Lomandra* spp., *Desmocladus flexuosus* and *Conostylis candicans* subsp. *candicans* Herbland on Low Sand Dune		Q8, Q18

No.	Broad Vegetation Type	Vegetation Description	Site Photo	Quadrat/Releve
9	*Acacia saligna, Spyridium globulosum* and *A. cyclops* Shrubland over *Lomandra maritima* and weed species	*Acacia saligna*, *Spyridium globulosum* and *Acacia cyclops* Shrubland over *Lomandra maritima*, **Euphorbia terracina* and **Pelargonium capitatum* Herbland		Q9, Q10, R5
10	*Banksia attenuata* Low Woodland over Tall Shrubland	*Banksia attenuata* Low Woodland over *Acacia saligna*, *Xanthorrhoea preissii* and *Melaleuca systena* Shrubland over *Lomandra maritima*, *Desmocladus flexuosus* and *Carpobrotus edulis* Herbland		Q11, Q12, Q13, Q14, Q15, Q16, Q17, R3
11	Planted *Taxandra linearifolia* over weeds	Planted *Taxandra linearifolia* over weeds		-

No.	Broad Vegetation Type	Vegetation Description	Site Photo	Quadrat/Releve
12	Planted *Eucalyptus* spp.	Planted *Eucalytpus* species over bare ground with some weed species		-
13	Cleared/Disturbed	Completely cleared or disturbed areas dominated by weed species.		-

7.3.2 Threatened Ecological Communities

No TECs were identified as occurring within the study area during the flora survey.

7.3.3 Statistical Analysis of Quadrat Data with PECs

A statistical analysis of all quadrat data used to map vegetation types within the study area was undertaken using PATN. PATN reports using the Bray Curtis dissimilarity, which is a statistic used to quantify the compositional dissimilarity between two different sites. It is equivalent to the total number of species that are unique to any one of the sites divided by the total number of species over the sites. It is the ratio between species between the sites and the total species richness over the sites. GHD quadrats were compared to the quadrat data of two known PECs within the vicinity of the study area. The 'Priority 3' PEC – 'Northern Spearwood shrublands and woodlands' and the 'Priority 3' PEC - Northern *Banksia attenuata* - *Banksia menziesii* woodlands were identified as sharing similar species composition with some GHD quadrats. A histogram of the results is included in Plate 3.

The results of the statisical analysis indicate GHD quadrats are dissimilar to the 'Priority 3' PEC – 'Northern Spearwood shrublands and woodlands' and the 'Priority 3' PEC - Northern *Banksia attenuata* - *Banksia menziesii* woodlands.

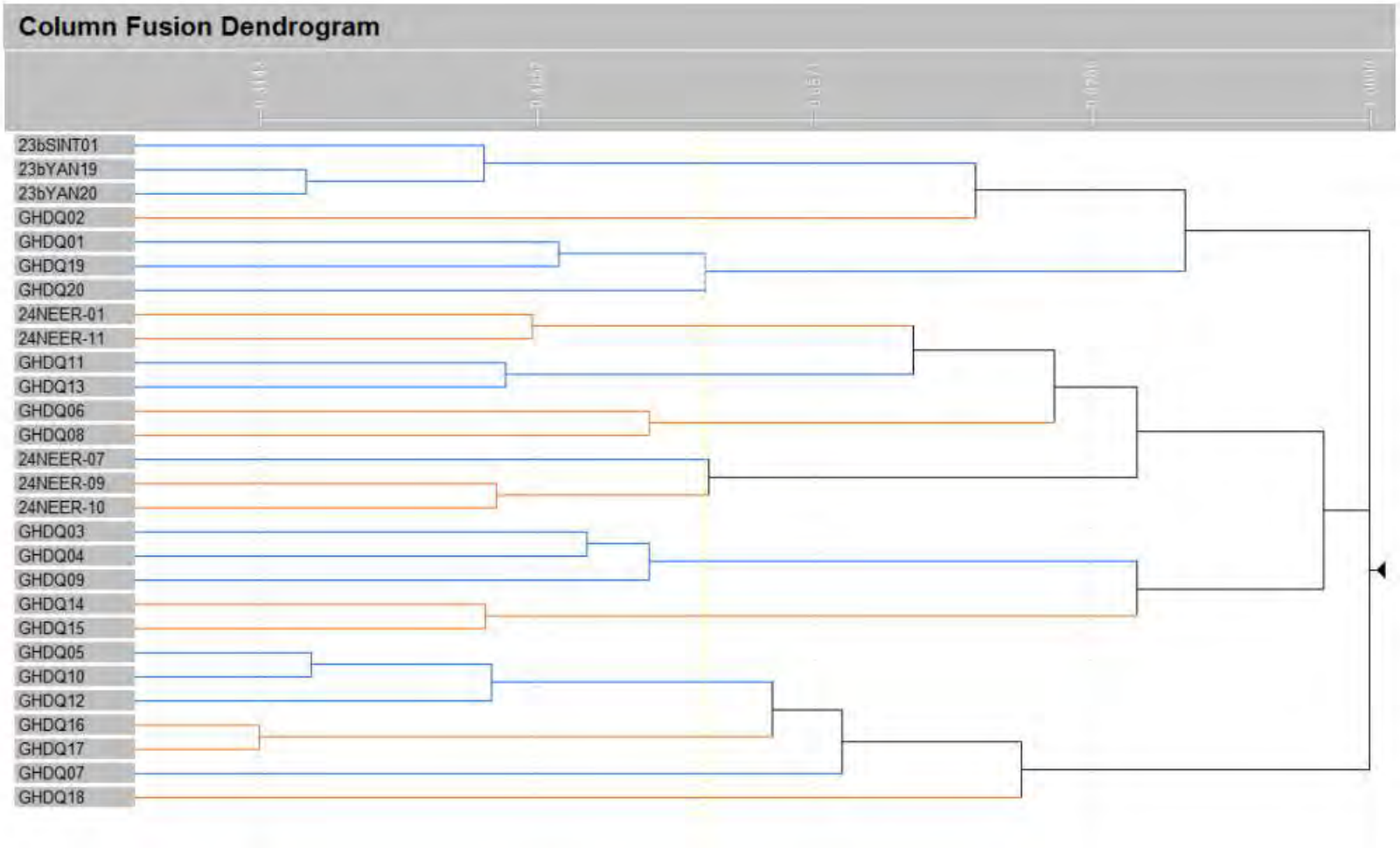


Plate 3 Dendogram comparing dissimilarity of GHD quadrat data with DEC, PEC quadrat data in the vicinity of the study area

7.3.4 Vegetation Condition

The vegetation condition of the site was rated using the vegetation condition rating scale developed by Keighery (1994) that 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 below in Table 10. The vegetation condition within the study area is mapped in Figure 4, Appendix A.

Table 10 Vegetation condition rating scale (Keighery, 1994)

Vegetation 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.

The vegetation condition within the northern study area ranges from completely degraded to excellent. Vegetation within parts of the proposed alignment has been highly altered and shows little to no resemblance to pre-European vegetation types. The areas that have been degraded have been exposed to a range of impacts including clearing, stock grazing, rabbits, fire and off-road vehicle tracks. Parts of the alignment contain plantations of either *Eucalyptus gomphocephala* and other eucalypt species or *Taxandra linearifolia.*

There are patches of native vegetation within the study area that range from good to excellent condition. These areas retain their basic vegetation structure and contain minimal (non-invasive) weed species.

A large proportion of the southern study area has recently been cleared as part of surrounding land development. The remaining vegetation shows signs of multiple disturbances with old and recent vehicle tracks throughout the site. The northern section of the southern study area rated pristine to excellent, as minimal signs of disturbance were evident. There was also evidence that a number of Grass Trees (*Xanthorrhoea preissii*) had been removed from the study area.

The PTA has advised that the removal of these Grass Trees has not been undertaken by or with the knowledge of the PTA.

7.3.5 Flora

A total of 194 plant taxa (including subspecies and varieties), representing 52 plant families and 125 genera, were recorded in the survey area. This total is comprised of 153 native species (some planted) and 40 introduced (exotic) species.

Dominant families recorded from the study area included:

Fabaceae	24 taxa.
Myrtaceae	18 taxa.
Poaceae	18 taxa.
Proteaceae	16 taxa.

Fifteen taxa in the collection could not be identified to species level due to the absence of adequate flowering parts and/or fruiting bodies.

A full list of flora species present in the study area is provided in Table 12, Appendix A

7.3.6 Significant Flora

No Declared Rare species as listed under the WC Act or species of national conservation significance listed under the EPBC Act were recorded from the study area.

Three Priority flora were recorded within the northern study area:

Conostylis pauciflora subsp. *euryrhipis* (Priority 4);

Conostylis pauciflora subsp. *pauciflora* (Priority 4); and

Beyeria cinerea subsp. *cinerea* (Priority 3).

Conostylis pauciflora subsp. *euryrhipis* was recorded at two sites in the northern study area. Approximately 10-20 plants were recorded at E 371454, N 6508913 and 2 plants at E 371639, N 6508655. This species is known to occur in white, grey or yellow sand on consolidated dunes.

Two populations of *Conostylis pauciflora* subsp. *pauciflora* were recorded within the northern study area at E 371497, N 6508857 with approximately 10+ plants and E 371731, N 6508503 with approximately 20 plants. A population of this species was also recorded adjacent to the northern study area at E 371692, N 6508641 with approximately 20 plants (approximately 35 metres from boundary). A single plant of *Conostylis pauciflora* subsp. *pauciflora* / *euryrhipis* was also recorded adjacent to the northern study area (approximately 3 metres from boundary). This plant species was not able to be determined to a definitive species as it was lacking in specific morphological characteristics. These species are known to occur in grey sand, limestone on hillslopes and consolidated dunes.

Beyeria cinerea subsp. *cinerea* was recorded in low densities in Quadrats 7 and 9 with covers of 3% and 1% respectively.

7.3.7 Introduced Flora

A total of 40 introduced (exotic) species were recorded during the survey. Introduced grasses and herb species were common throughout the understorey of the study area.

No Weeds of National Significance (WONS) were recorded in the study area.

One weed species recorded from the study area, One-leaf Cape Tulip (*Moraea flaccida*) is listed as a Declared Plant under the *Agriculture and Related Resources Protection Act 1976.* This species were recorded in its highest numbers towards the southern end of the northern study area. This species was recorded as covering approximately 60% of Quadrat 14. However the majority of these were dead.

One-leaf Cape Tulip is a serious pasture weed in Western Australia and is also declared as a P1 for the whole of the State. A P1 requirement prohibits the movement of plants or their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder (DAF, 2010).

7.3.8 Plant Pathogens

Introduced following European settlement, *Phytophthora cinnamomi* is a soil-borne pathogen that kills a wide range of native plant species in the south west of Western Australia by attacking their root system. *Phytophthora cinnamomi* threatens over 2300 (40%) of different plant species in Western Australia. Once the pathogen infects the roots, the plant may begin to show symptoms of 'dying back', hence the common name used for the pathogen: Dieback. However, for many species 'sudden death' is a better description. *Phytophthora cinnamomi* can also survive and reproduce on a wide range of native plant species without killing them. It has a widespread but discontinuous range in areas of the south west with an annual rainfall above 400 mm.

Indigenous species most affected by *Phytophthora cinnamomi* belong to four families: Proteaceae, Epacridaceae, Papilionaceae, and Myrtaceae. Not all genera within a family or all species within a genus are necessarily susceptible.

The survey area can be considered as in an area susceptible to the development of the pathogen. Preliminary observations, based on visual impacts on susceptible species and patterns of plant death, indicate that *Phytophthora cinnamomi* (dieback) may be present within the study area. A number of dead or dying Banksias were observed within the Banksia woodlands of the study area. A dieback assessment by an experienced dieback interpreter would need to be undertaken to confirm the presence of dieback in the area.

8. Assessment against the Ten Clearing Principles

Any clearing of native vegetation will require a permit under Part V Division 2 of the *Environmental Protection Act 1986* (EP Act), except where an exemption applies under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, and it is not in an Environmentally Sensitive Area (ESA).

To assist with the consideration of potential vegetation clearing an assessment against the "10 Clearing Principles" has been undertaken and is provided in Table 11. The proposed project may be considered to be at variance with Principle (g) and likely to be at variance to Principle (b) and (h) of the 10 Clearing Principles.

Table 11 Assessment against the ten clearing principles

Principle Number	Principle	Assessment	Outcome
(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity.	Vegetation within the study area is considered to be moderately diverse. A total of 194 plant taxa representing 52 plant families were recorded in the study area. Of these 40 taxa were introduced/weed species. Three Priority flora were recorded within the northern study area; *Conostylis pauciflora* subsp. *euryrhipis* (Priority 4), *Conostylis pauciflora* subsp. *pauciflora* (Priority 4) and *Beyeria cinerea* subsp. *cinerea* (Priority 3). *Conostylis pauciflora* subsp. *euryrhipis* was recorded at two sites in the northern study area with approximately 10-20 plants at one site and 2 plants at the other. *Conostylis pauciflora* subsp. *pauciflora* was recorded at two locations within the study area, with approximately 10+ plants at one site and 20 plants at the other site. *Beyeria cinerea* subsp. *cinerea* was recorded in low densities in Quadrats 7 and 9 with covers of 3% and 1% respectively. No Priority Ecological Communities (PECs) were identified as occurring within the study area. A total of 25 bird, 6 reptile, 4 mammal and 2 invertebrate species were recorded within the study area during the field surveys. Of these, 4 species are introduced. The biodiversity of the study area is typical of bushland in the surrounding area. There are significant areas of similar vegetation types in better condition to that in the study area in nearby areas reserved for conservation. The study area is not considered to be of higher biodiversity than the surrounding areas, and the proposed clearing is unlikely to have any significant impact on the biodiversity of the region.	The proposal is unlikely to be at variance with the Principle.
(b)	Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous Western Australia.	The conservation significant invertebrate species *Pachysaga munggai / strobila* was observed during the October 2012 field survey and is a DEC listed Priority species. Five Graceful Sun-moth (GSM) were recorded within the Northern study area (GHD, 2011). Approximately 9.3 ha of potential GSM habitat occur within both study areas.	The proposal is likely to be at variance with the Principle.

		Habitat for the threatened fauna species, Carnaby's Black Cockatoo is present within the study area. Approximately 9.3 ha of potential Cockatoo feeding habitat occur within the study area. Signs of feeding were observed and several birds observed. No potential breeding trees were recorded within the study area. Though not observed during the field survey it is considered likely that the Black-striped Snake and Carpet Python may also be present with the study area.	
(c)	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No DRF species have been recorded within the study area. The closest recorded DRF, is the Eucalyptus argutifolia (Rare) located approximately 1.3km west of the northern study area within a residential suburb.	The proposal is unlikely to be at variance with the Principle.
(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.	The southern study area is situated within the buffer of the threatened ecological community (TEC) 'Limestone Ridges (SCP 26a): Melaleuca huegelii – Melaleuca acerosa (now M. systena) shrublands on limestone ridges.' This TEC was not recorded within the study area. No additional TECs or PECs were identified within the study area.	The proposal is unlikely to be at variance with the 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.	On the Swan Coastal Plain 47.1% of the Quindalup Complex and 41.1% of the Cottesloe Complex – Central and South are estimated to remain and are therefore considered "Depleted". It is estimated that 71.1% of the Cottesloe Complex – North remains and is therefore considered of "Least Concern". These levels are above the 10% threshold level for which the EPA will formally assess a project. Under this principle clearing of vegetation complexes with greater then 30% of the pre-European extent remaining is not likely to be at variance with this principle.	The proposal is unlikely to be at variance with the Principle.
(f)	Native vegetation should not be cleared if it is growing in or in association with a watercourse or wetland.	There are no watercourses or wetlands within or associated with the application area.	The proposal is unlikely to be at variance with the Principle.
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The clearing of native vegetation within the study area may cause alterations to the health of adjacent lands. There is the potential for runoff, erosion and weed dispersal to increase, particularly on areas with a gradient. When cleared of vegetation the Quindalup dunes are very easily eroded by winds. Appropriate design and management measures need to be in place to	The proposal is may be at variance with the Principle.

		mitigate these impacts.	
(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 study area traverses through Bush Forever site 289 (Ningana Bushland). Ningana Bushland consists of 551.5 ha of bushland. Ningana is a “site with some existing protection” due to its Existing Parks and Recreation reservation in the Metropolitan Region Scheme. However, it is “subject to further investigation”. Ningana Bushland has linkages to adjacent bushland north, south and west (Bush Forever site 397) and east (Bush Forever site 228-Yanchep National Park). Ningana Bushland is also part of the regionally significant contiguous bushland/wetland linkage that Neerabup National Park, in the south, forms part of. This bushland linkage runs northward from Joondalup to Wilbinga, north to Yanchep, and links eastward into the Gingin region. The proposed alignment is likely to cause a barrier to the east-west link of these bushland reserves.	The proposal is likely to be at variance with the 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 clearing of native vegetation has a low potential to cause deterioration in the quality of surface and underground waters, as there are very limited areas of surface water in or adjoining the study area. Appropriate management plans may mitigate any potential impacts.	The proposal is unlikely to be at variance with the Principle
(j)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the intensity of flooding.	The clearing of native vegetation may cause, or exacerbate the incidence or intensity of flooding due to increased runoff in localised areas. However, this is considered to be a low risk due to the minimal amount of clearing required for the proposed railway. Appropriate management plans may mitigate any potential impacts.	The proposal is unlikely to be at variance with the Principle.

9. Summary of Environmental Issues

9.1 Heritage

- A search of the Department of Indigenous Affairs (DIA) Aboriginal Heritage Register has revealed there are no registered heritage sites within 200 m of the study area;
- A search was conducted using the National Native Tribunal online mapping tool, which indicated that the site is located within the external extent of two active Native Title Claims as at 11 November 2010, these are:
  - Single Noongar Claim (Area 1) (WC03/6); and
  - Swan River People (WC10/9).
- The PTA should consult the Native Title Claimants prior to undertaking works;
- There are no Eurpoean heritage sites listed on the National Heritage List, the Commonwealth Heritage List or the Register of the National Estate within or adjacent to the study area;
- A search of the Heritage Council of Western Australia database identified no registered heritage sites within the suburbs of Alkimos or Eglinton. The nearest European heritage sites are the Northwest Stock Route and Yanchep National Park both are more than 500m from the alignment.

9.2 Acid Sulphate Soils

- A search of the ASS risk along the proposed railway alignment was conducted using WA Atlas Map Viewer (2011) and CSIRO's ASRIS database.
- Two isolated parcels of ASS risk are identified with the associated Pipidinny Swamp and Beonaddy Swamp.
- The identified ASS in the area is considered as having a high probability of occurrence and is labelled as Class 1 risk (high to moderate risk of ASS occurring within 3 m of natural soil surface that could be disturbed by most land development activities).
- Pipidinny swamp is the closest area with associated ASS, being approximately 500m east of the proposed railway alignment

9.3 Vertebrate Fauna

A level 1 fauna survey utilising desktop and field survey methods was undertaken in November 2010 and October 2012. The main findings are summarised below:

- In total, utilising both opportunistic and trapping survey methods, 25 bird, 6 reptile, 4 mammal and one invertebrate species were recorded in the study area. Of these, four species are introduced including the Laughing Kookaburra, Red Fox, Cat and European Rabbit;
- The study area contains pockets of potential feeding habitat for the Endangered Carnaby's Black Cockatoo including *Allocasuarina*, *Banksia* and Eucalypt species. Approximately 9.3 ha of potential feeding habitat occur within the study area. Carnaby Black Cockatoo feeding was observed during the field survey and they are known to frequent the area;
- Potential habitat for the Endangered Graceful Sunmoth (GSM) is present within the study area. This species is only active in autumn however evidence of habitat use is assessed

using known food plants (*Lomandra maritima*, and *L. hermaphrodita*) as a surrogate. Given the presence of *Lomandra maritima* within the study area it is recommended a targeted GSM survey be undertaken in March 2011. The Graceful Sunmoth habitat may potentially cover nearly 12.5 km and approximately 50 ha (excluding the Eucalypt plantation).

- The Carpet Python (Schedule 4/Priority 4) is known to occur in the Yanchep National Park and surrounds. This species occurs in a large range of habitats and is likely to occur in remnant bushland in the area;
- The Priority 3 listed Black-striped Snake is typically found in coastal dunes and sandplains in associated with Banksias and heath on the Swan Coastal Plain. Suitable habitat for this species is present within the study area and is known to occur in the surrounding area;
- Six marine and/or migratory listed bird species were observed within the study area, including Wedge-tailed eagle, Black-shouldered Kite, Whistling Kite, Nankeen Kestrel, Silvereye and Rainbow Bee-eater. These are common and widespread bird species. The study area is not deemed critical habitat for the survival of these species;
- Five broad habitat types are present in the study area including:
  - Eucalypt Woodland;
  - Banksia Woodland;
  - Open Scrub and Shrublands;
  - Low Heath on Sand Dune; and
  - Cleared-Disturbed Areas.
- The habitat types present are common in the surrounding area and are not unique to the study area;
- The majority of the study area is adjacent to native vegetation and has existing habitat linkages. A bush forever site (Ningana Bushland) occurs over much of the northern study area which is linked to adjacent bushland to the north and south and to other bush forever sites to the east and west; and
- The bushland linkages from north-south that this study area is part of should not be significantly impacted by the proposed alignment. However, the rail alignment will cause a barrier to fauna movement east-west between these bushland linkages. It is recommended that fauna underpasses are provided along the alignment for fauna movement between these areas.

9.4 Invertebrate Fauna

- The Graceful Sun-moth (GSM) was recorded within the Northern study area in March 2011 (GHD, 2011). No GSM were recorded within the Southern study area;
- Approximately 9.3 ha of GSM habitat are recorded within both study areas; and
- *Pachysaga munggai / strobila* was observed during the October 2012 field survey and is a Priority listed species under the DEC listing.

9.5 Subterranean Fauna

GHD conducted a desktop and field assessment for both the presence of subterranean fauna (stygofauna and troglofauna), and the risk of impact(s) to any such fauna by the project for the portion of the study area between Romeo Road and the proposed Yanchep Railway Station. The main findings are summarised below:

- The field assessment found several areas of outcropping karstic limestone, although it should be noted that many karstic voids show no human-sized connection with the surface. The complete absence of caves and voids can not be totally discounted due to the extreme variability of the Tamala Limestone;
- The local geology and proximity to the Threatened Ecological Community (TEC) of aquatic root mat communities in the Yanchep National Park would indicate a very high likelihood of subterranean fauna in the area;
- The proposed project impacts are considered to pose a minimal threat to any such fauna, as no dewatering or groundwater contamination is anticipated. The implementation of a construction management plan that includes subterranean fauna will also further reduce any risk of potential impacts to any subterranean fauna inhabiting the area; and
- Caves and significant karst features should be avoided within the railway alignment, although if their destruction is unavoidable, areas should be surveyed for stygofauna and troglofauna to determine the impact of proposed actions.

9.6 Flora and Vegetation

The flora assessment included desktop investigations and a two phase Level 2 field survey (November 2010 and October 2012), conducted with regard to the EPA's Guidance Statement No. 51, where possible. The main findings of the field assessment are summarised below:

- Thirteen vegetation types were identified within the study area. The proposed railway alignment passes through inland dunal areas that contain old stabilised sand dunes supporting predominately low woodlands and tall open scrub;
- No TECs or PECs were identified as occurring within the study area;
- The vegetation condition within the northern study area ranges from completely degraded to excellent. The areas that have been degraded have been exposed to a range of impacts including clearing, stock grazing, rabbits, fire and off-road vehicle tracks. There are patches of native vegetation within the study area that range from good to excellent condition. These areas retain their basic vegetation structure and contain minimal (non-invasive) weed species;
- The vegetation condition within the southern study area ranges from completely degraded to pristine / excellent. A large proportion of the southern study area has recently been cleared as part of surrounding land development. The northern section of the southern study area rated pristine to excellent, as minimal signs of disturbance were evident;
- Plant taxa in the study area is considered to be moderately diverse. A total of 194 plant taxa representing 52 plant families were recorded in the study area;
- A total of 40 introduced (exotic) species were recorded during the survey. Introduced grasses and herb species were common throughout the understorey of the study area;
- One weed species recorded from the study area, One-leaf Cape Tulip (*Moraea flaccida*) is listed as a Declared Plant under the *Agriculture and Related Resources Protection Act 1976.*

- No Declared Rare species as listed under the WC Act or species of national conservation significance listed under the EPBC Act were recorded from the study area;
- Three Priority flora were recorded within the northern study area, including *Conostylis pauciflora* subsp. *euryrhipis* (Priority 4), *Conostylis pauciflora* subsp. *pauciflora* (Priority 4) and *Beyeria cinerea* subsp. *cinerea* (Priority 3); and
- Preliminary observations, based on visual impacts on susceptible species and patterns of plant death, indicate that *Phytophthora cinnamomi* (dieback) may be present within the study area. A number of dead or dying Banksias were observed within the Banksia woodlands of the study area. A dieback assessment by an experienced dieback interpreter would need to be undertaken to confirm the presence of dieback in the area.

9.7 Wetlands

The nearest wetland is located approximately 1km east of the Eglinton section of the proposed northern suburbs railway alignment. The nearest wetland was identified through a desktop search using The Western Australian Wetlands Database (2011). There are no wetlands located within the proposed project area. The proposed rail alignment should pose no significant environmental impact upon the nearest wetland location.

10. References

Bishop, C., Williams, M., Mitchell, D. and Gamblin, T. (2010) *Survey guidelines for the Graceful Sun-moth (Synemon gratiosa) and site habitat assessments*. Science Division and Swan Region, Department of Environment and Conservation.

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

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. Environmental Protection Authority, WA.

Environmental Protection Authority (2006) *Final Guidance No. 10 - Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 region.* Western Australia pp 54-56.

Department of Agriculture and Food (DAF) (2010) – *Declared Plants Database* Available Online: http://www.agric.wa.gov.au/PC_93088.html?s=696737977,Topic=PC_93079

Department of Sustainability, Environment, Water, Population and Communities (DEWPAC) (2010) Species Profile and Threats Database. Available Online: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

English, V and Blythe, J. (1997) *Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province*. Unpublished report for the Department of Conservation and Land Management to Environment Australia.

GHD (2011) *Northern Suburbs Railway Alignment from Romeo Rd (Alkimos) to Yanchep. Graceful Sun-moth Survey*. Unpublished report for the Public Transport Authority.

Gibson, N., Keighery, B.J., Keighery, G.J., Burbridge, A.H. & Lyons M.N. (1994) *A Floristic Survey of the Southern Swan Coastal Plain*. Unpublished Report for the Australian Heritage Commission prepared by Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc).

Government of WA (2000) *Bush Forever Volume 1. Policies, Principles, Processes*. Department of Environmental Protection, Perth, Western Australia.

Government of WA (2000) *Bush Forever Volume 2. Directory of Bush Forever Sites*. Department of Environmental Protection, Perth, Western Australia.

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

Johnstone, R. E. and Kirkby T. (1999) *Food of the Forest Red-tailed Black Cockatoo Calyptorhynchus banksii naso in south-west Western Australia*. Western Australian Naturalist 22: 167-177.

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

Marchant, S. and Higgins, P.J. (Eds) (1990) *Handbook of Australian, New Zealand and Antarctic Birds. Volume 1: Ratites to Ducks: Part A Ratites to Petrels*. Oxford University Press, Melbourne.

Storr, G.M., Smith, L.A. and Johnstone R.E. (2002) *Snakes of Western Australia. Revised Edition*, WA Museum, Perth

Appendices

Appendix A - Figures

LEGEND

- Roads
- Contours

Old Alignment
- Southern Study Area
- Northern Study Area

Amended Alignment
- Southern Study Area
- Northern Study Area

- National Parks
- Mainlands
- Seas

1:25,000 (at A3)

0 125 250 500 750 1,000 1,250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 50

N

Public Transport Authority
Butler to Yanchep
Environmental Investigations

Job Number 61-28717
Revision 0
Date 05 Nov 2012

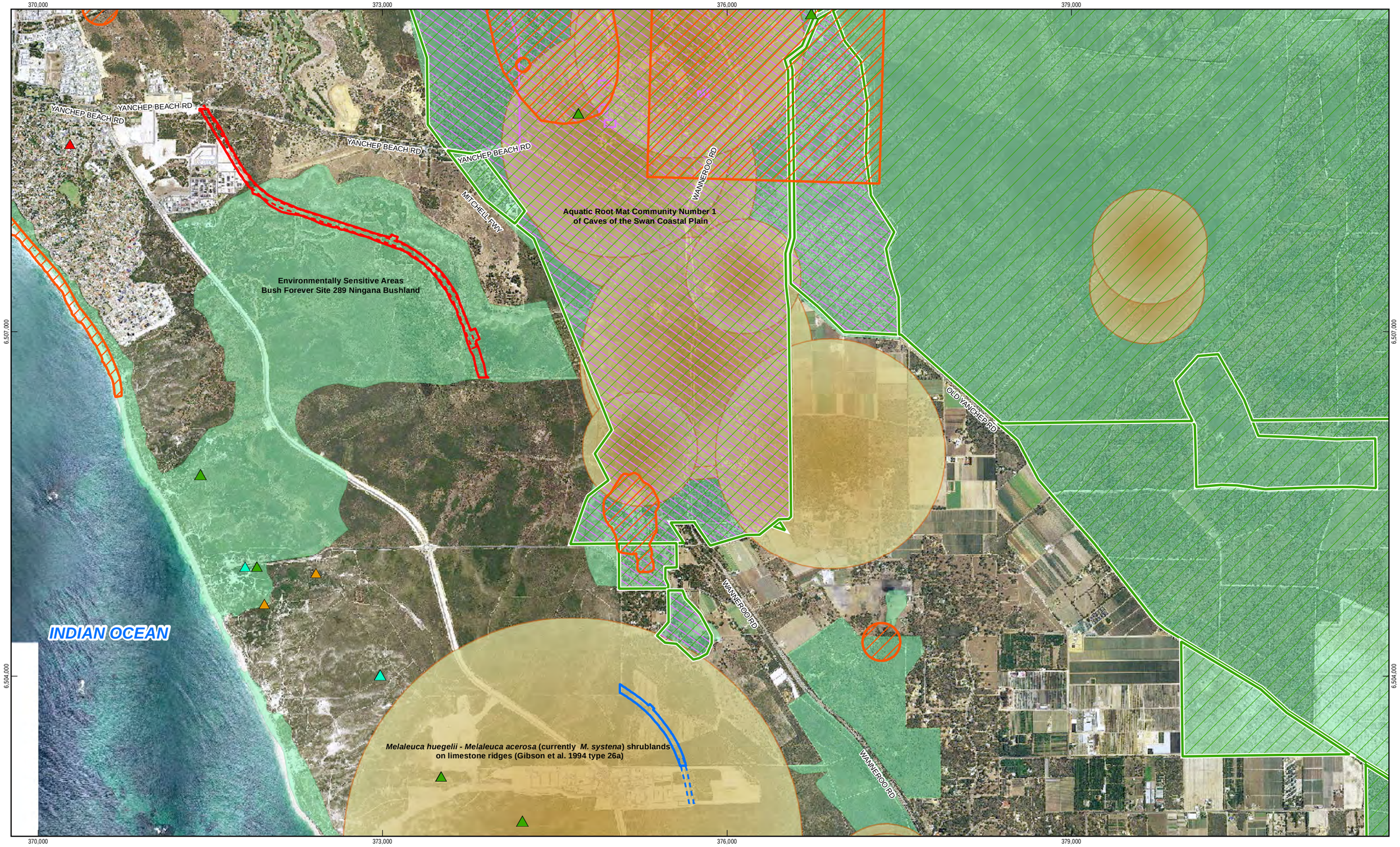
Site Location Map

Figure 1

G:\61\28717\GIS\Maps\MXD\6128717_G003_Fig1_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: GA: 250k Topo 250k Series 3 - 2006; Landgate: Roads - 20100624; DEC: National Parks - 20121025; GHD: Amended Alignment - 20121023; Old Alignment- 20121023. Created by: bflorczak



1:30,000 (at A3)

0 0.15 0.3 0.6 0.9 1.2 1.5

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Declared Rare & Priority Species
- (R) Declared Rare Flora - Extant Taxa
- Priority 1 - Poorly known taxa
- Priority 2 - Poorly known taxa
- Priority 3 - Poorly known taxa
- Priority 4 - Rare Taxa

Amended Alignment
- Southern Study Area
- Northern Study Area

Old Alignment
- Southern Study Area
- Northern Study Area
- Roads

- Aboriginal Heritage Sites
- DEC Estates
- Heritage Council Sites
- Environmentally Sensitive Areas

Threatened & Priority Ecological Communities
- Priority
- Threatened

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

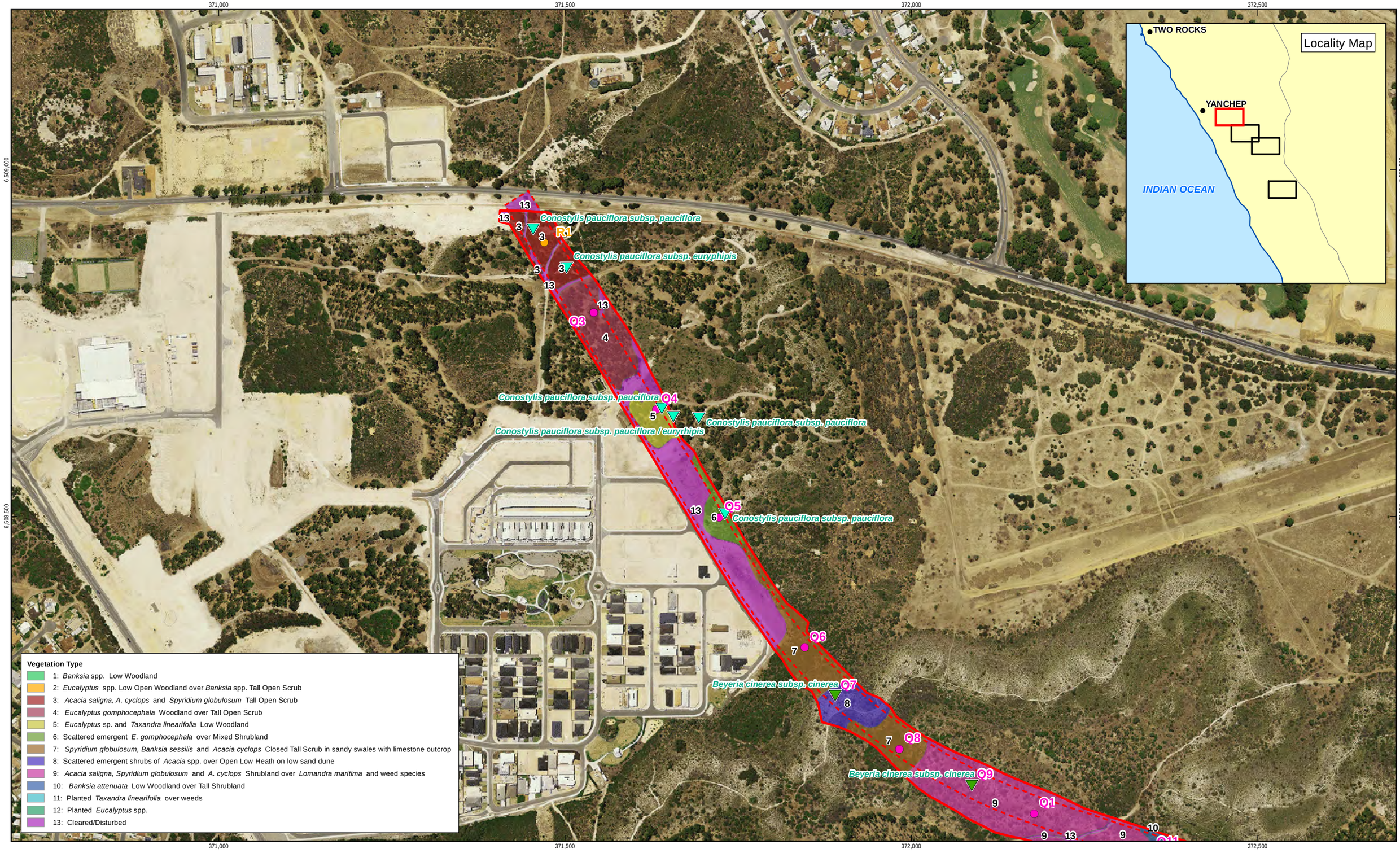
Environmental Constraints

Figure 2

Path: G:\61\28717\GIS\Maps\MXD\6128717_G004_Fig2_Rev0.mxd

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

Data Source: GHD: Amended Alignment - 20121023, Old Alignment - 20121023; Landgate: Metro North 2012 Mosaic - 20121026; DIA: Aboriginal Heritage Sites - 20101103; DEC: DEC Estate - 20121025, Threatened & Priority Ecological Communities - 20101006, Environmental Sensitive Areas - 20101103, Declared Rare & Priority Species - 20101006; DoP: Heritage Council Sites - 20101103. Created by: RLow, jhchen, slee2, bflorczak



1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Siginificant Flora
- Priority 3 - Poorly known taxa
- Priority 4 - Rare Taxa
- Quadrat
- Releve

Old Alignment
- Southern Study Area
- Northern Study Area

Amended Alignment
- Southern Study Area
- Northern Study Area

GHD

Public Transport Authority

powered by SLIP ENABLER

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Sheet 1 of 4

Vegetation Type & Significant Flora

Figure 3

G:\61\28717\GIS\Maps\MXD\6128717_G002_Fig3_Rev0.mxd

Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Quadrat - 20121023, Releve - 20121023, Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Type - 20121009, Significant Flora - 20121026. Created by: bflorczak

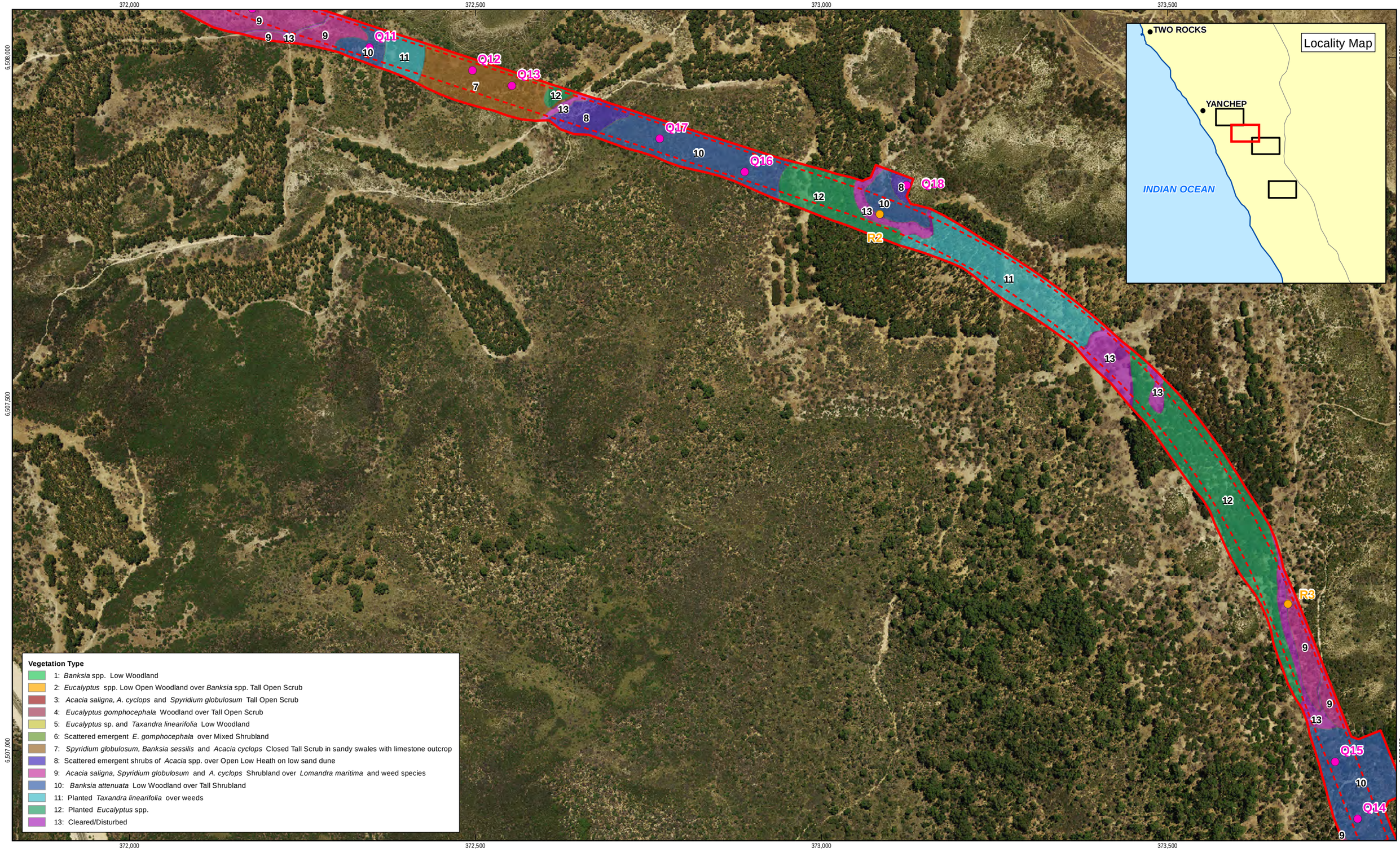
239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

372,000 372,500 373,000 373,500

6,508,000

6,507,500

6,507,000



Vegetation Type

1: *Banksia* spp. Low Woodland
2: *Eucalyptus* spp. Low Open Woodland over *Banksia* spp. Tall Open Scrub
3: *Acacia saligna, A. cyclops* and *Spyridium globulosum* Tall Open Scrub
4: *Eucalyptus gomphocephala* Woodland over Tall Open Scrub
5: *Eucalyptus* sp. and *Taxandra linearifolia* Low Woodland
6: Scattered emergent *E. gomphocephala* over Mixed Shrubland
7: *Spyridium globulosum, Banksia sessilis* and *Acacia cyclops* Closed Tall Scrub in sandy swales with limestone outcrop
8: Scattered emergent shrubs of *Acacia* spp. over Open Low Heath on low sand dune
9: *Acacia saligna, Spyridium globulosum* and *A. cyclops* Shrubland over *Lomandra maritima* and weed species
10: *Banksia attenuata* Low Woodland over Tall Shrubland
11: Planted *Taxandra linearifolia* over weeds
12: Planted *Eucalyptus* spp.
13: Cleared/Disturbed

1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Siginificant Flora
Priority 3 - Poorly known taxa
Priority 4 - Rare Taxa

Quadrat
Releve

Old Alignment
Southern Study Area
Northern Study Area

Amended Alignment
Southern Study Area
Northern Study Area

GHD

Public Transport Authority

powered by SLIP ENABLER

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Sheet 2 of 4

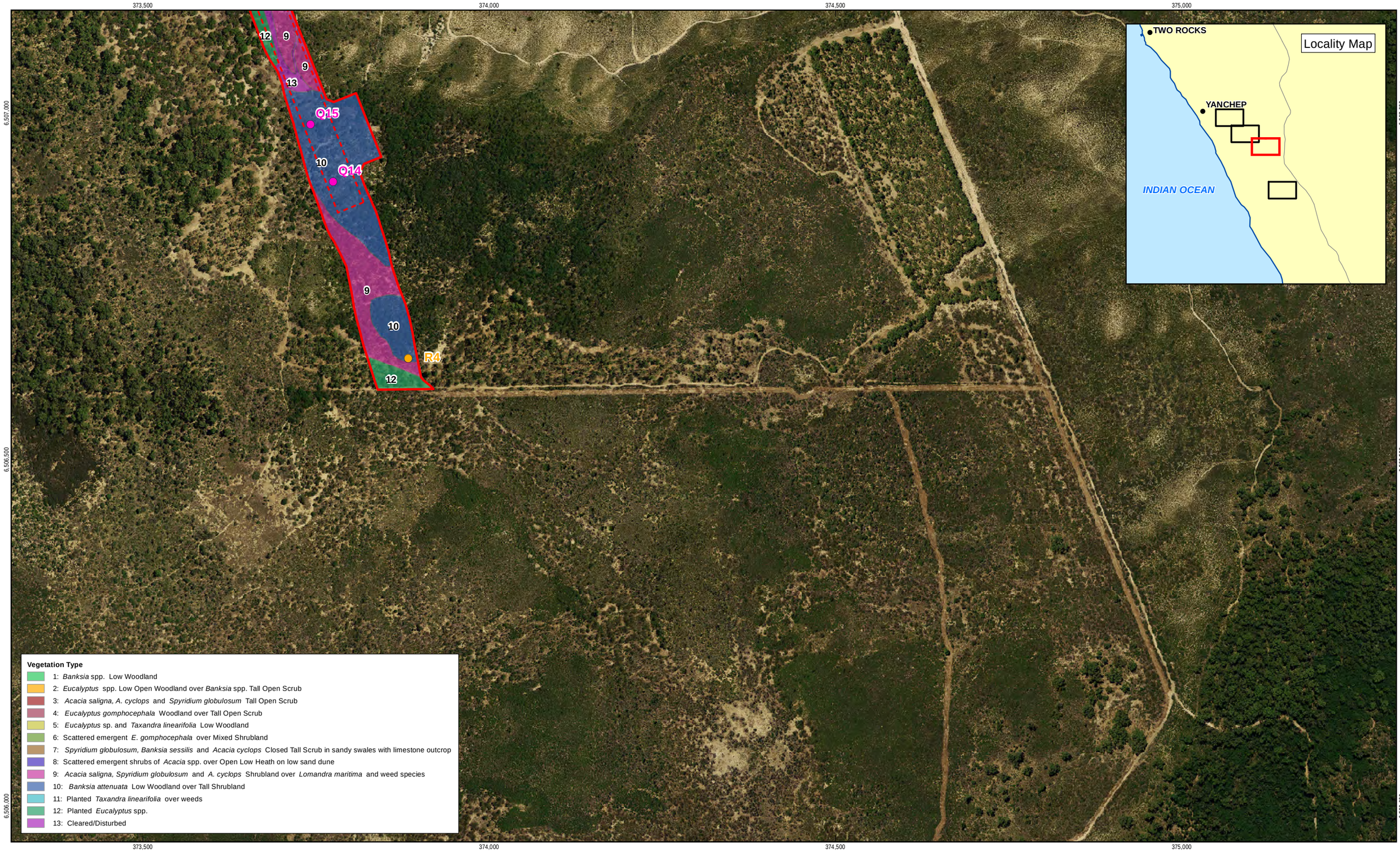
Vegetation Type & Significant Flora

Figure 3

G:\61\28717\GIS\Maps\MXD\6128717_G002_Fig3_Rev0.mxd

Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Quadrat - 20121023, Releve - 20121023, Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Type - 20121009, Significant Flora - 20121026. Created by: bflorczak

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



1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Siginificant Flora

- Priority 3 - Poorly known taxa
- Priority 4 - Rare Taxa
- Quadrat
- Releve

Old Alignment

- Southern Study Area
- Northern Study Area

Amended Alignment

- Southern Study Area
- Northern Study Area

GHD

Public Transport Authority

powered by SLIP ENABLER

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number 61-28717
Revision 0
Date 05 Nov 2012

Sheet 3 of 4

Vegetation Type & Significant Flora

Figure 3

G:\61\28717\GIS\Maps\MXD\6128717_G002_Fig3_Rev0.mxd

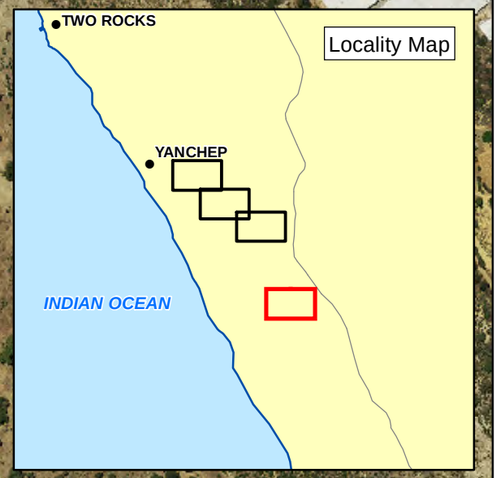
Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Quadrat - 20121023, Releve - 20121023, Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Type - 20121009, Significant Flora - 20121026. Created by: bflorczak

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

375,000 375,500 376,000 376,500

6,503,500

6,503,000



Q20 2 13 2 13 13 12 Q19 2 Q1 12 1 Q2 13

Vegetation Type

1: *Banksia* spp. Low Woodland
2: *Eucalyptus* spp. Low Open Woodland over *Banksia* spp. Tall Open Scrub
3: *Acacia saligna, A. cyclops* and *Spyridium globulosum* Tall Open Scrub
4: *Eucalyptus gomphocephala* Woodland over Tall Open Scrub
5: *Eucalyptus* sp. and *Taxandra linearifolia* Low Woodland
6: Scattered emergent *E. gomphocephala* over Mixed Shrubland
7: *Spyridium globulosum, Banksia sessilis* and *Acacia cyclops* Closed Tall Scrub in sandy swales with limestone outcrop
8: Scattered emergent shrubs of *Acacia* spp. over Open Low Heath on low sand dune
9: *Acacia saligna, Spyridium globulosum* and *A. cyclops* Shrubland over *Lomandra maritima* and weed species
10: *Banksia attenuata* Low Woodland over Tall Shrubland
11: Planted *Taxandra linearifolia* over weeds
12: Planted *Eucalyptus* spp.
13: Cleared/Disturbed

375,000 375,500 376,000 376,500

1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Siginificant Flora
Priority 3 - Poorly known taxa
Priority 4 - Rare Taxa

Quadrat
Releve

Old Alignment
Southern Study Area
Northern Study Area

Amended Alignment
Southern Study Area
Northern Study Area

GHD

Public Transport Authority

powered by SLIP ENABLER

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number 61-28717
Revision 0
Date 05 Nov 2012

Sheet 4 of 4

Vegetation Type & Significant Flora

Figure 3

G:\61\28717\GIS\Maps\MXD\6128717_G002_Fig3_Rev0.mxd

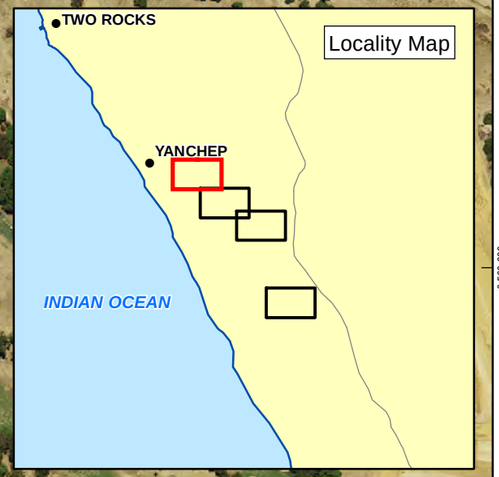
Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Quadrat - 20121023, Releve - 20121023, Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Type - 20121009, Significant Flora - 20121026. Created by: bflorczak

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

371,000 371,500 372,000 372,500

6,509,000

6,508,500



6 4-5 4-5 4-5 4-5 6 5 5 5 6 3 3-4 2-3 4 4-5 4-5 6 4-5 5

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

1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Amended Alignment	Old Alignment
Southern Study Area	Southern Study Area
Northern Study Area	Northern Study Area

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Sheet 1 of 4

Vegetation Condition

Figure 4

G:\61\28717\GIS\Maps\MXD\6128717_G005_Fig4_Rev0.mxd

Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Condition - 20121026. Created by: bflorczak

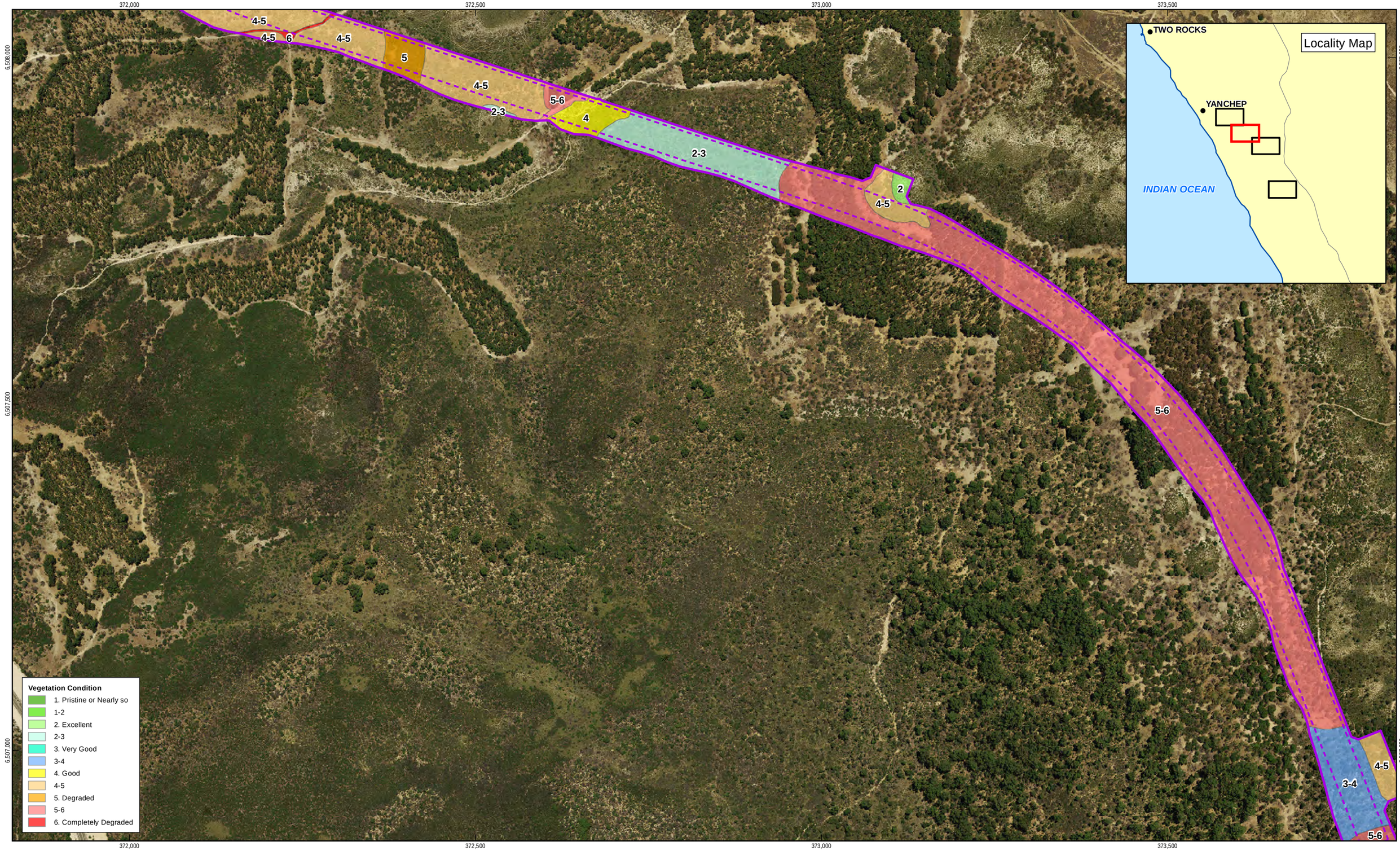
239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

372,000 372,500 373,000 373,500

6,508,000

6,507,500

6,507,000



1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Amended Alignment
- Southern Study Area
- Northern Study Area

Old Alignment
- Southern Study Area
- Northern Study Area

GHD

Public Transport Authority

powered by SLIP ENABLER

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Sheet 2 of 4

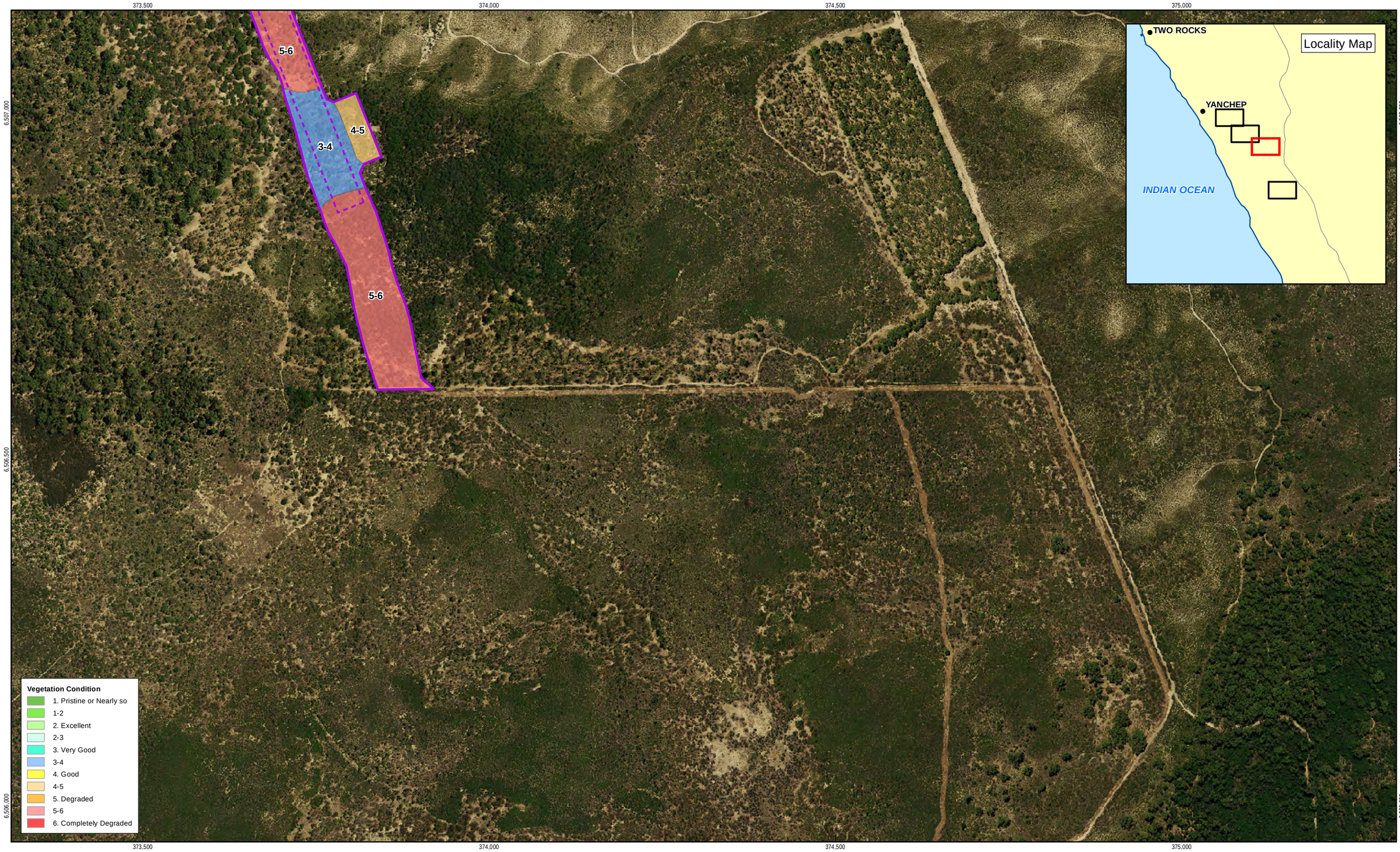
Vegetation Condition

Figure 4

G:\61\28717\GIS\Maps\MXD\6128717_G005_Fig4_Rev0.mxd

Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Condition - 20121026. Created by: bflorczak

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



1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Amended Alignment	Old Alignment
Southern Study Area	Southern Study Area
Northern Study Area	Northern Study Area

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number 61-28717
Revision 0
Date 05 Nov 2012

Sheet 3 of 4

Vegetation Condition

Figure 4

G:\61\28717\GIS\Maps\MXD\6128717_G005_Fig4_Rev0.mxd

Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Condition - 20121026. Created by: bflorczak

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

375,000 375,500 376,000 376,500

6,503,500

6,503,000

1-2
3-4
6
1-2
6
2-3
4-5
6
3
6
3-4

TWO ROCKS
YANCHEP
INDIAN OCEAN
Locality Map

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

1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Amended Alignment	Old Alignment
Southern Study Area	Southern Study Area
Northern Study Area	Northern Study Area

Public Transport Authority
Butler to Yanchep Environmental Investigations

Job Number 61-28717
Revision 0
Date 05 Nov 2012

Sheet 4 of 4

Vegetation Condition

Figure 4

G:\61\28717\GIS\Maps\MXD\6128717_G005_Fig4_Rev0.mxd

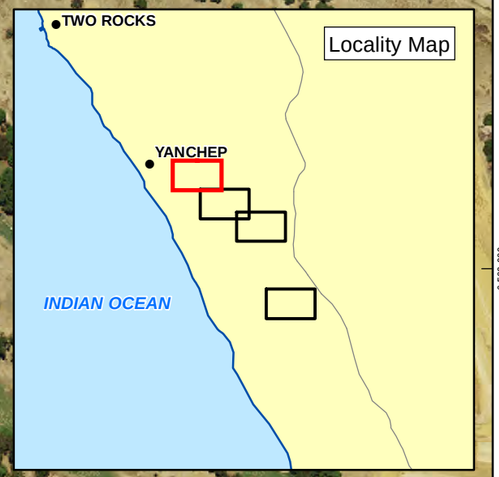
Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Vegetation Condition - 20121026. Created by: bflorczak

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

371,000 371,500 372,000 372,500

6,509,000

6,508,500



371,000 371,500 372,000 372,500

1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Pachysaga munggai / strobila Location

Graceful Sun-moth Recorded Locations and Sightings

Caught

Sighting

Graceful Sun-moth and Black Cockatoo Habitat

Old Alignment

Southern Study Area

Northern Study Area

Amended Alignment

Southern Study Area

Northern Study Area

Public Transport Authority

Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Graceful Sun-moth and Black Cockatoo Habitat and Significant Fauna Locations

Sheet 1 of 4

Figure 5

G:\61\28717\GIS\Maps\MXD\6128717_G001_Fig5_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

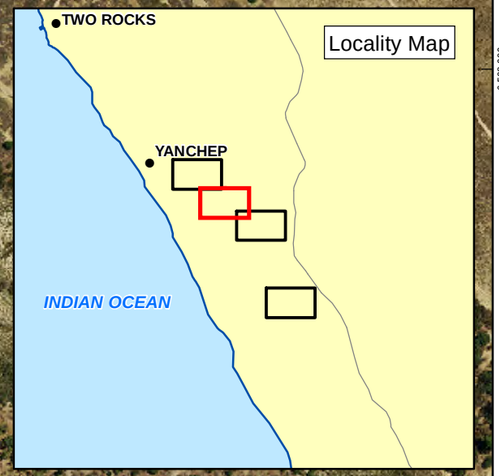
Data source: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Graceful Sun-moth and Black Cockatoo Habitat - 20121009, Graceful Sun-moth Recorded Locations and Sightings - 20110329, *Pachysaga munggai / strobila* Location - 20121105. Created by: bflorczak

372,000 372,500 373,000 373,500

6,508,000

6,507,500

6,507,000



1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Pachysaga munggai / strobila Location

Graceful Sun-moth Recorded Locations and Sightings

Caught

Sighting

Graceful Sun-moth and Black Cockatoo Habitat

Old Alignment

Southern Study Area

Northern Study Area

Amended Alignment

Southern Study Area

Northern Study Area

Public Transport Authority

Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Graceful Sun-moth and Black Cockatoo Habitat and Significant Fauna Locations

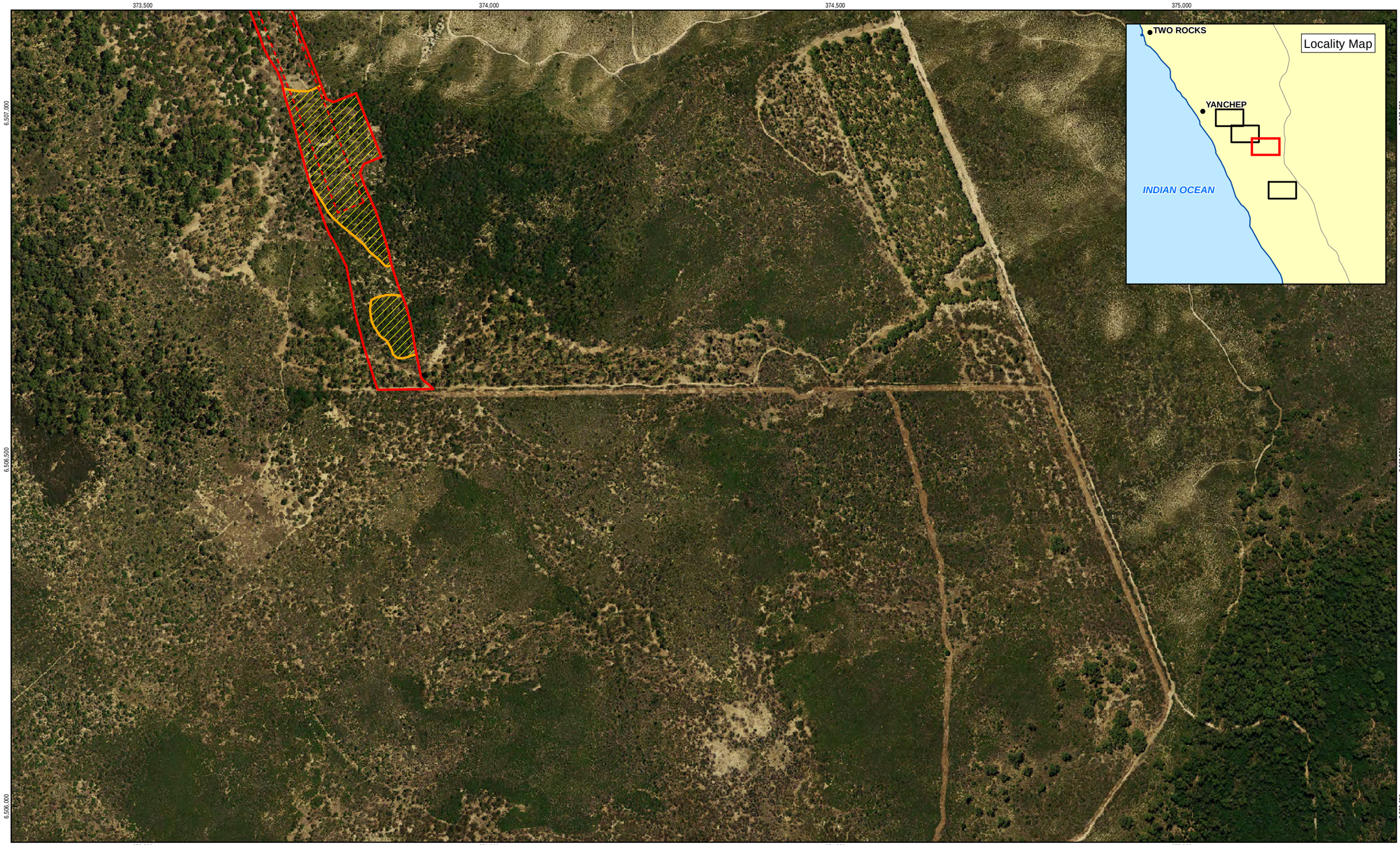
Sheet 2 of 4

Figure 5

G:\61\28717\GIS\Maps\MXD\6128717_G001_Fig5_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: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Graceful Sun-moth and Black Cockatoo Habitat - 20121009, Graceful Sun-moth Recorded Locations and Sightings - 20110329, *Pachysaga munggai / strobila* Location - 20121105. Created by: bfliorczak



1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Pachysaga munggai / strobila Location

Graceful Sun-moth Recorded Locations and Sightings

Caught

Sighting

Graceful Sun-moth and Black Cockatoo Habitat

Old Alignment

Southern Study Area

Northern Study Area

Amended Alignment

Southern Study Area

Northern Study Area

Public Transport Authority

Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Graceful Sun-moth and Black Cockatoo Habitat and Significant Fauna Locations

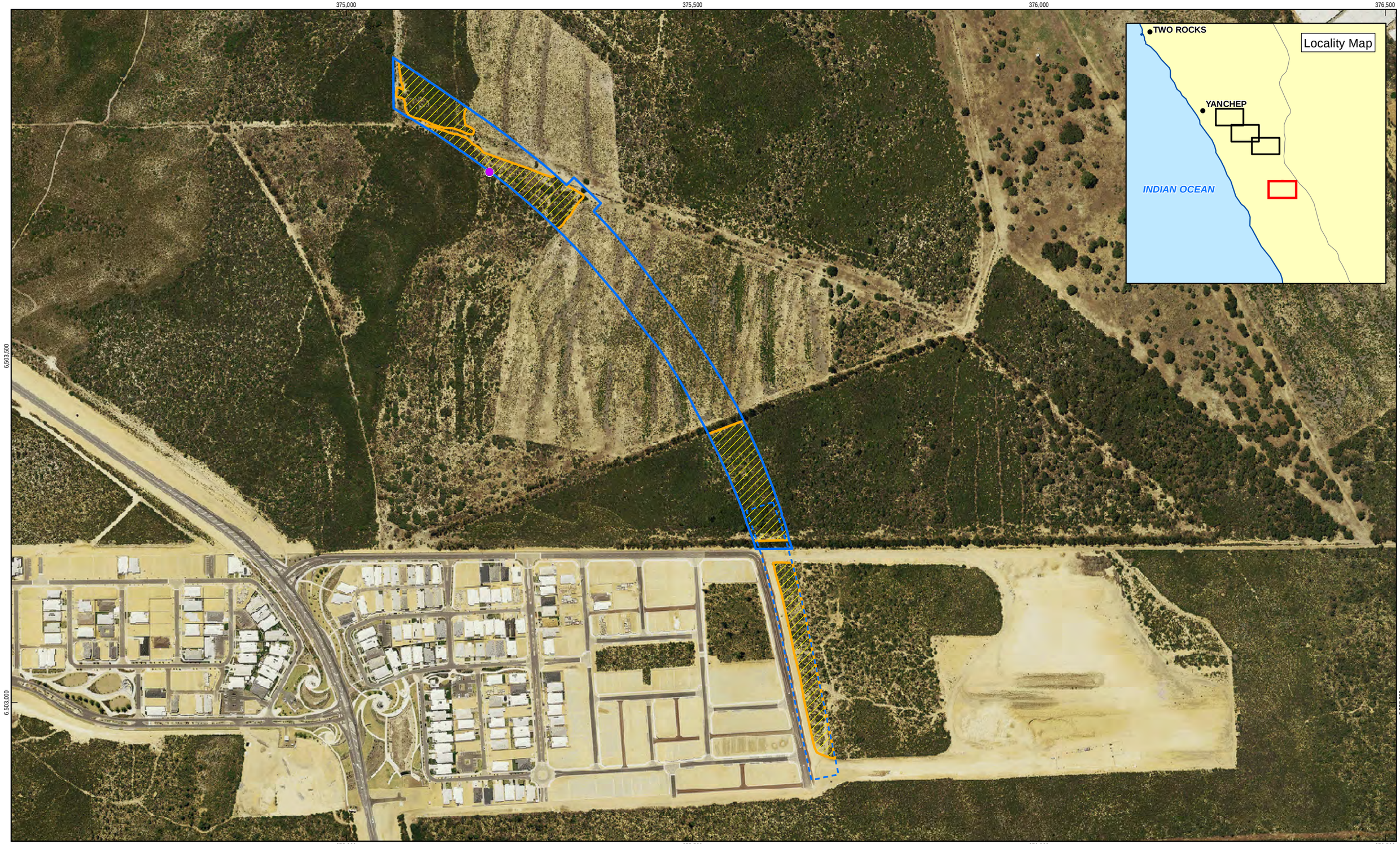
Sheet 3 of 4

Figure 5

G:\61\28717\GIS\Maps\MXD\6128717_G001_Fig5_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: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Graceful Sun-moth and Black Cockatoo Habitat - 20121009, Graceful Sun-moth Recorded Locations and Sightings - 20110329, *Pachysaga munggai / strobila* Location - 20121105. Created by: bflorczak



1:5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

LEGEND

Pachysaga munggai / strobila Location

Graceful Sun-moth Recorded Locations and Sightings

Caught

Sighting

Graceful Sun-moth and Black Cockatoo Habitat

Old Alignment

Southern Study Area

Northern Study Area

Amended Alignment

Southern Study Area

Northern Study Area

Public Transport Authority

Butler to Yanchep Environmental Investigations

Job Number	61-28717
Revision	0
Date	05 Nov 2012

Graceful Sun-moth and Black Cockatoo Habitat and Significant Fauna Locations

Sheet 4 of 4

Figure 5

G:\61\28717\GIS\Maps\MXD\6128717_G001_Fig5_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: GA: Topo 250k Series 3 - 2006; Landgate: Metro North 2012 Mosaic - 20121010; GHD: Old Alignment - 20121023, Amended Alignment - 20121023, Graceful Sun-moth and Black Cockatoo Habitat - 20121009, Graceful Sun-moth Recorded Locations and Sightings - 20110329, *Pachysaga munggai / strobila* Location - 20121105. Created by: bflorczak

Appendix B - Conservation Category Codes and Definitions

EPBC Act Fauna Conservation Categories

Listed threatened species and ecological communities

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- extinct in the wild,
- critically endangered,
- endangered, or
- vulnerable.

Critically endangered and endangered species

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interfere with the recovery of the species.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.*

Vulnerable species

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or
- interferes substantially with the recovery of the species.

An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.*

Listed migratory species

The EPBC Act protects lands and migratory species that are listed under International Agreements.

- Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a Range State under the Convention;
- The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA);
- The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and
- The Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA).
- other international agreements approved by the Commonwealth Environment Minister.

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed migratory species. Note that some migratory species are also listed as threatened species.

The criteria below are relevant to migratory species that are not threatened.

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.
- An area of important habitat is:
- habitat utilized by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
- habitat utilized by a migratory species which is at the limit of the species range, or
- habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an ecologically significant proportion of the population varies with the species (each circumstance will need to be evaluated).

**Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.*

Conservation categories and definitions for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed flora and 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 for Western Australian Flora and Fauna listed under the *Wildlife Conservation Act 1950* (WC Act) and the Department of Environment and Conservation

Code	Conservation Category	Description
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.
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.
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

Code	Conservation Category	Description
		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.

Conservation Codes for Threatened Ecological Communities (TECs) under the EPBC Act and Western Australia

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.		

Appendix C - Desktop searches

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

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: 26/10/12 17:02:49

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:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	34
Listed Migratory Species:	33

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 and the heritage values of a place on the Register of the National Estate.

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.

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:	53
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

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

Place on the RNE:	6
State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

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

Name	Status	Type of Presence
Aquatic Root Mat Community in Caves of the Swan Coastal Plain	Endangered	Community known to occur within area
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Community known to occur within area

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 likely to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding 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	Foraging, feeding or related behaviour may occur within area
Diomedea exulans gibsoni Gibson's Albatross [82271]	Vulnerable	Species or species habitat may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may 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
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Fairy Tern (Australian) [82950]	Vulnerable	Species or species habitat likely 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	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Insects		
Synemon gratiosa Graceful Sun Moth [66757]	Endangered	Species or species habitat known to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may 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	Species or species habitat known to occur within area
Neophoca cinerea Australian Sea-lion [22]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Plants		
Centrolepis caespitosa [6393]	Endangered	Species or species habitat may occur within area
Darwinia foetida Muchea Bell [83190]	Critically Endangered	Species or species habitat may occur within

Name	Status	Type of Presence
		area
[Eucalyptus argutifolia](#) Yanchep Mallee, Wabling Hill Mallee [24263]	Vulnerable	Species or species habitat likely to occur within area
[Isopogon uncinatus](#) Hook-leaf Isopogon [20871]	Endangered	Species or species habitat may occur within area
[Lepidosperma rostratum](#) Beaked Lepidosperma [14152]	Endangered	Species or species habitat 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	Species or species habitat likely to occur within area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Sharks		
[Carcharias taurus (west coast population)](#) Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat may occur within area
[Carcharodon carcharias](#) Great White Shark [64470]	Vulnerable	Species or species habitat may 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
[Ardea alba](#) Great Egret, White Egret [59541]		Species or species habitat may occur within area
[Ardea ibis](#) Cattle Egret [59542]		Species or species habitat may occur within area
[Diomedea amsterdamensis](#) Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
[Diomedea dabbenena](#) Tristan Albatross [66471]	Endangered*	Foraging, feeding or related behaviour may occur within area
[Diomedea exulans (sensu lato)](#) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
[Diomedea gibsoni](#) Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may occur within area

Name	Threatened	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
Sterna caspia Caspian Tern [59467]		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 (sensu stricto) Shy Albatross, Tasmanian Shy Albatross [64697]	Vulnerable*	Species or species habitat may occur within area
Thalassarche chlororhynchos Yellow-nosed Albatross, Atlantic Yellow-nosed Albatross, Indian Yellow-nosed Albatross [66481]	Vulnerable*	Foraging, feeding or related behaviour may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may 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 may 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 may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely 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
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area

Name	Threatened	Type of Presence
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		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may 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		
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]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Catharacta skua		
Great Skua [59472]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Diomedea amsterdamensis Amsterdam Albatross [64405]	Endangered*	Species or species habitat may occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered*	Foraging, feeding or related behaviour may occur within area
Diomedea exulans (sensu lato) Wandering Albatross [1073]	Vulnerable	Species or species habitat may occur within area
Diomedea gibsoni Gibson's Albatross [64466]	Vulnerable*	Species or species habitat may 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
Larus novaehollandiae Silver Gull [810]		Breeding known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour may 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
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
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Vulnerable*	Species or species habitat may 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*	Species or species habitat may occur within area
Thalassarche chlororhynchos Yellow-nosed Albatross, Atlantic Yellow-nosed	Vulnerable*	Foraging, feeding or

Name	Threatened	Type of Presence
Albatross, Indian Yellow-nosed Albatross [66481] Thalassarche melanophris		related behaviour may occur within area
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Fish		
Acentronura australe		
Southern Pygmy Pipehorse [66185] Campichthys galei		Species or species habitat may occur within area
Gale's Pipefish [66191] Choeroichthys suillus		Species or species habitat may occur within area
Pig-snouted Pipefish [66198] Halicampus brocki		Species or species habitat may occur within area
Brock's Pipefish [66219] Hippocampus angustus		Species or species habitat may occur within area
Western Spiny Seahorse, Narrow-bellied Seahorse [66234] Hippocampus breviceps		Species or species habitat may occur within area
Short-head Seahorse, Short-snouted Seahorse [66235] Hippocampus subelongatus		Species or species habitat may occur within area
West Australian Seahorse [66722] Lissocampus fatiloquus		Species or species habitat may occur within area
Prophet's Pipefish [66250] Maroubra perserrata		Species or species habitat may occur within area
Sawtooth Pipefish [66252] Mitotichthys meraculus		Species or species habitat may occur within area
Western Crested Pipefish [66259] Nannocampus subosseus		Species or species habitat may occur within area
Bonyhead Pipefish, Bony-headed Pipefish [66264] Phycodurus eques		Species or species habitat may occur within area
Leafy Seadragon [66267] Phyllopteryx taeniolatus		Species or species habitat may occur within area
Common Seadragon, Weedy Seadragon [66268] Pugnaso curtirostris		Species or species habitat may occur within area
Pugnose Pipefish, Pug-nosed Pipefish [66269] Solegnathus lettiensis		Species or species habitat may occur within area
Gunther's Pipehorse, Indonesian Pipefish [66273] Stigmatopora argus		Species or species habitat may occur within area
Spotted Pipefish, Gulf Pipefish [66276] Stigmatopora nigra		Species or species habitat may occur within area
Widebody Pipefish, Wide-bodied Pipefish, Black		Species or species

Name	Threatened	Type of Presence
Pipefish [66277]		habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		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
Mammals		
Arctocephalus forsteri 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		
Aipysurus pooleorum Shark Bay Seasnake [66061]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may 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 may 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

Name	Status	Type of Presence
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	Species or species habitat known to occur within area
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

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Yanchep National Park	WA	Registered
Indigenous		
Doogarch Site	WA	Indicative Place
Historic		
Administration Building Yanchep National Park	WA	Registered
Gloucester Lodge including Garden and Pool	WA	Registered
McNess House	WA	Registered
Yanchep Inn and Garden	WA	Registered

State and Territory Reserves [Resource Information]

Name	State
Yanchep	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
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
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 habitat may 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 may occur within area
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		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

Nationally Important Wetlands	[Resource Information]
Name	State
Loch McNess System	WA

Coordinates

-31.56998 115.66321

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 Heritage and Register of National Estate properties, Wetlands of International 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.

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:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA 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
-State Forests of 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 Sustainability, Environment, Water, Population and Communities
GPO Box 787
Canberra ACT 2601 Australia
+61 2 6274 1111

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 26/10/2012

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 115°40' 22" E,31°35' 17" S
Buffer 5km
Group By Family

Family	Species	Records
Acrotylaceae	2	2
Aizoaceae	1	1
Amaranthaceae	1	4
Apiaceae	3	8
Araceae	2	2
Araliaceae	4	9
Areschougiaceae	1	1
Asparagaceae	13	23
Asteraceae	29	41
Bonnemaisoniaceae	1	1
Brassicaceae	4	6
Bryaceae	1	2
Campanulaceae	2	6
Caprifoliaceae	1	1
Caryophyllaceae	6	10
Casuarinaceae	1	2
Caulerpaceae	3	3
Celastraceae	2	3
Centrolepidaceae	1	3
Ceramiaceae	6	7
Champiaceae	1	1
Chenopodiaceae	2	5
Codiaceae	1	1
Colchicaceae	1	2
Crassulaceae	2	3
Cucurbitaceae	1	2
Cyperaceae	24	51
Dasypogonaceae	1	3
Delesseriaceae	1	1
Dicranemataceae	1	1
Dilleniaceae	5	28
Droseraceae	3	7
Elaeocarpaceae	1	1
Ericaceae	14	47
Euphorbiaceae	1	1
Fabaceae	44	80
Geraniaceae	4	5
Gigaspermaceae	1	1
Goodeniaceae	10	14
Gracilariaceae	1	1
Gyrostemonaceae	1	2
Haemodoraceae	14	23
Haloragaceae	1	1
Halymeniaceae	1	1
Hemerocallidaceae	5	10
Hypneaceae	2	2
Iridaceae	2	4
Juncaceae	1	1
Juncaginaceae	2	3
Kallymeniaceae	1	1
Lamiaceae	6	6
Lauraceae	3	5
Lentibulariaceae	1	2
Loganiaceae	1	4
Loranthaceae	1	2
Malvaceae	2	2
Molluginaceae	1	1
Moraceae	1	1
Myrtaceae	36	53
Onagraceae	5	6
Orchidaceae	11	13
Orobanchaceae	1	1
Papaveraceae	2	2
Passifloraceae	1	1
Phyllanthaceae	2	4
Plantaginaceae	1	2
Plocamiaceae	2	2
Poaceae	17	25
Polygalaceae	2	4
Polygonaceae	3	3
Pottiaceae	1	1
Proteaceae	23	52
Pteridaceae	1	1
Racopilaceae	1	1
Ranunculaceae	3	4

Restionaceae	6	15
Rhamnaceae	6	18
Rhodomelaceae	11	15
Rhodymeniaceae	1	1
Rubiaceae	2	3
Rutaceae	2	3
Santalaceae	2	2
Scrophulariaceae	4	4
Solanaceae	5	8
Stylidiaceae	13	24
Thuidiaceae	1	1
Thymelaeaceae	4	5
Urticaceae	1	1
Violaceae	2	6
Vitaceae	1	1
Xanthorrhoeaceae	1	4
Zamiaceae	1	1
TOTAL	**424**	**748**

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 26/10/2012

Kingdom	Animalia
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115°40' 20" E,31°35' 19" S
Buffer	5km
Group By	Family

Family	Species	Records
Acanthizidae	7	83
Accipitridae	7	19
Anatidae	10	88
Apodidae	1	1
Ardeidae	3	8
Artamidae	3	3
Boidae	1	2
Burramyidae	1	1
Camelidae	1	1
Campephagidae	2	17
Canidae	1	1
Castniidae	1	446
Casuariidae	1	7
Cheluidae	1	1
Columbidae	6	39
Corvidae	1	35
Cracticidae	3	47
Cuculidae	1	13
Dasyuridae	2	5
Dicaeidae	1	4
Dicruridae	3	68
Diomedeidae	1	1
Elapidae	5	11
Falconidae	4	17
Fringillidae	1	1
Gekkonidae	1	2
Halcyonidae	3	33
Hirundinidae	2	28
Hylidae	1	6
Laridae	2	2
Limnodynastidae	1	7
Macropodidae	1	4
Maluridae	4	56
Meliphagidae	9	139
Meropidae	1	10
Motacillidae	1	1
Muridae	3	21
Neosittidae	1	2
Pachycephalidae	2	32
Pardalotidae	3	26
Pelecanidae	1	8
Peramelidae	2	5
Petroicidae	2	12
Phalacrocoracidae	3	10
Phasianidae	1	3
Podargidae	2	4
Podicipedidae	3	14
Potoroidae	1	1
Procellariidae	2	3
Psittacidae	7	52
Pygopodidae	3	5
Rallidae	4	26
Recurvirostridae	1	3
Scincidae	13	51
Scolopacidae	1	1
Strigidae	1	2
Sylviidae	3	14
Tachyglossidae	1	1
Tarsipedidae	1	9
Threskiornithidae	3	24
Turnicidae	1	2
Typhlopidae	1	1
Tytonidae	1	1
Vespertilionidae	2	2
Ziphiidae	1	1
Zosteropidae	2	48
TOTAL	**166**	**1591**

Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Acanthizidae					
1.	24260	*Acanthiza apicalis (Broad-tailed Thornbill)*			
2.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
3.	24262	*Acanthiza inornata (Western Thornbill)*			
4.	25530	*Gerygone fusca (Western Gerygone)*			
5.	24271	*Gerygone fusca subsp. fusca*			
6.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
7.	30948	*Smicrornis brevirostris (Weebill)*			
Accipitridae					
8.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
9.	25536	*Accipiter fasciatus (Brown Goshawk)*			
10.	24285	*Aquila audax (Wedge-tailed Eagle)*			
11.	24288	*Circus approximans (Swamp Harrier)*			
12.	24289	*Circus assimilis (Spotted Harrier)*			
13.	24290	*Elanus caeruleus subsp. axillaris (Australian Black-shouldered Kite)*			
14.	24295	*Haliastur sphenurus (Whistling Kite)*			
Anatidae					
15.	24312	*Anas gracilis (Grey Teal)*			
16.	24313	*Anas platyrhynchos (Mallard)*			
17.	24315	*Anas rhynchotis (Australasian Shoveler)*			
18.	24316	*Anas superciliosa (Pacific Black Duck)*			
19.	24318	*Aythya australis (Hardhead)*			
20.	24319	*Biziura lobata (Musk Duck)*			
21.	24321	*Chenonetta jubata (Australian Wood Duck)*			
22.	24322	*Cygnus atratus (Black Swan)*			
23.	24328	*Oxyura australis (Blue-billed Duck)*			
24.	24331	*Tadorna tadornoides (Australian Shelduck)*			
Apodidae					
25.	25554	*Apus pacificus (Fork-tailed Swift)*		IA	
Ardeidae					
26.	24341	*Ardea pacifica (White-necked Heron)*			
27.	24348	*Ixobrychus minutus subsp. dubius (Australian Little Bittern)*		P4	
28.	25564	*Nycticorax caledonicus (Rufous Night Heron)*			
Artamidae					
29.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
30.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
31.	24356	*Artamus personatus (Masked Woodswallow)*			
Boidae					
32.	25240	*Morelia spilota subsp. imbricata (Carpet Python)*		S	
Burramyidae					
33.	24086	*Cercartetus concinnus (Western Pygmy-possum)*			
Camelidae					
34.	24254	*Camelus dromedarius (Dromedary)*			
Campephagidae					
35.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
36.	24367	*Lalage tricolor (White-winged Triller)*			
Canidae					
37.	24040	*Vulpes vulpes (Red Fox)*			
Castniidae					
38.	33992	*Synemon gratiosa (Graceful Sunmoth)*		T	
Casuariidae					
39.	24470	*Dromaius novaehollandiae (Emu)*			
Cheluidae					
40.	25337	*Chelodina oblonga (Oblong Turtle)*			
Columbidae					
41.	24399	*Columba livia (Domestic Pigeon)*			
42.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
43.	24409	*Phaps chalcoptera (Common Bronzewing)*			
44.	25587	*Phaps elegans (Brush Bronzewing)*			
45.	25589	*Streptopelia chinensis (Spotted Turtle-Dove)*			
46.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*			
Corvidae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
47.	25592	*Corvus coronoides (Australian Raven)*			
Cracticidae					
48.	24420	*Cracticus nigrogularis (Pied Butcherbird)*			
49.	25595	*Cracticus tibicen (Australian Magpie)*			
50.	25596	*Cracticus torquatus (Grey Butcherbird)*			
Cuculidae					
51.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
Dasyuridae					
52.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
53.	24108	*Sminthopsis crassicaudata (Fat-tailed Dunnart)*			
Dicaeidae					
54.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
Dicruridae					
55.	24443	*Grallina cyanoleuca (Magpie-lark)*			
56.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
57.	24454	*Rhipidura leucophrys subsp. leucophrys*			
Diomedeidae					
58.	24469	*Diomedea melanophris subsp. melanophris (Black-browed Albatross)*		T	
Elapidae					
59.	25296	*Demansia psammophis subsp. reticulata*			
60.	25249	*Neelaps calonotos (Black-striped Snake)*		P3	
61.	25253	*Parasuta gouldii*			
62.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
63.	25266	*Simoselaps bertholdi (Jan's Banded Snake)*			
Falconidae					
64.	25621	*Falco berigora (Brown Falcon)*			
65.	24471	*Falco berigora subsp. berigora*			
66.	25622	*Falco cenchroides (Australian Kestrel)*			
67.	25623	*Falco longipennis (Australian Hobby)*			
Fringillidae					
68.	25625	*Carduelis carduelis (Goldfinch)*			
Gekkonidae					
69.	24980	*Christinus marmoratus (Marbled Gecko)*			
Halcyonidae					
70.	24305	*Dacelo novaeguinea (Laughing Kookaburra)*			
71.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*			
72.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
Hirundinidae					
73.	24488	*Cheramoeca leucosternus (White-backed Swallow)*			
74.	24491	*Hirundo neoxena (Welcome Swallow)*			
Hylidae					
75.	25388	*Litoria moorei (Motorbike Frog)*			
Laridae					
76.	24506	*Anous tenuirostris subsp. melanops (Australian Lesser Noddy)*		T	
77.	25637	*Larus novaehollandiae (Silver Gull)*			
Limnodynastidae					
78.	25410	*Heleioporus eyrei (Moaning Frog)*			
Macropodidae					
79.	24132	*Macropus fuliginosus (Western Grey Kangaroo)*			
Maluridae					
80.	25651	*Malurus lamberti (Variegated Fairy-wren)*			
81.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
82.	24549	*Malurus leucopterus subsp. leuconotus*			
83.	25654	*Malurus splendens (Splendid Fairy-wren)*			
Meliphagidae					
84.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
85.	24561	*Anthochaera carunculata (Red Wattlebird)*			
86.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
87.	24581	*Lichenostomus virescens (Singing Honeyeater)*			
88.	25661	*Lichmera indistincta (Brown Honeyeater)*			
89.	24582	*Lichmera indistincta subsp. indistincta*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
90.	24583	*Manorina flavigula (Yellow-throated Miner)*			
91.	24595	*Phylidonyris nigra subsp. gouldii*			
92.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
Meropidae					
93.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
Motacillidae					
94.	24599	*Anthus australis subsp. australis*			
Muridae					
95.	24223	*Mus musculus (House Mouse)*			
96.	24243	*Rattus fuscipes (Western Bush Rat)*			
97.	24245	*Rattus rattus (Black Rat)*			
Neosittidae					
98.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
Pachycephalidae					
99.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
100.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
Pardalotidae					
101.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
102.	25682	*Pardalotus striatus (Striated Pardalote)*			
103.	24630	*Pardalotus striatus subsp. westraliensis*			
Pelecanidae					
104.	24648	*Pelecanus conspicillatus (Australian Pelican)*			
Peramelidae					
105.	25478	*Isoodon obesulus (Southern Brown Bandicoot)*			
106.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
Petroicidae					
107.	24652	*Eopsaltria georgiana (White-breasted Robin)*			
108.	24658	*Petroica cucullata (Hooded Robin)*			
Phalacrocoracidae					
109.	25697	*Phalacrocorax carbo (Great Cormorant)*			
110.	24666	*Phalacrocorax melanoleucos subsp. melanoleucos*			
111.	24667	*Phalacrocorax sulcirostris (Little Black Cormorant)*			
Phasianidae					
112.	24671	*Coturnix pectoralis (Stubble Quail)*			
Podargidae					
113.	25703	*Podargus strigoides (Tawny Frogmouth)*			
114.	24679	*Podargus strigoides subsp. brachypterus*			
Podicipedidae					
115.	25704	*Podiceps cristatus (Great Crested Grebe)*			
116.	24681	*Poliocephalus poliocephalus (Hoary-headed Grebe)*			
117.	25705	*Tachybaptus novaehollandiae (Australasian Grebe)*			
Potoroidae					
118.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
Procellariidae					
119.	24689	*Halobaena caerulea (Blue Petrel)*			
120.	24702	*Pterodroma brevirostris (Kerguelen Petrel)*			
Psittacidae					
121.	25715	*Cacatua roseicapilla (Galah)*			
122.	25716	*Cacatua sanguinea (Little Corella)*			
123.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*			
124.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo))*		T	
125.	24738	*Neophema elegans (Elegant Parrot)*			
126.	25721	*Platycercus zonarius (Australian Ringneck)*			
127.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
Pygopodidae					
128.	24991	*Aprasia repens*			
129.	24999	*Delma grayii*			
130.	25005	*Lialis burtonis*			
Rallidae					
131.	25727	*Fulica atra (Eurasian Coot)*			
132.	25729	*Gallinula tenebrosa (Dusky Moorhen)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
133.	25731	*Porphyrio porphyrio (Purple Swamphen)*			
134.	24771	*Porzana tabuensis (Spotless Crake)*			
Recurvirostridae					
135.	25734	*Himantopus himantopus (Black-winged Stilt)*			
Scincidae					
136.	25011	*Acritoscincus trilineatum*			
137.	30893	*Cryptoblepharus buchananii*			
138.	25020	*Cryptoblepharus plagiocephalus*			
139.	25039	*Ctenotus fallens*			
140.	25119	*Hemiergis quadrilineata*			
141.	25133	*Lerista elegans*			
142.	25148	*Lerista lineopunctulata*			
143.	25165	*Lerista praepedita*			
144.	25184	*Menetia greyii*			
145.	25192	*Morethia obscura*			
146.	25203	*Tiliqua occipitalis (Western Bluetongue)*			
147.	25519	*Tiliqua rugosa*			
148.	25207	*Tiliqua rugosa subsp. rugosa*			
Scolopacidae					
149.	24788	*Calidris ruficollis (Red-necked Stint)*		IA	
Strigidae					
150.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
Sylviidae					
151.	25755	*Acrocephalus australis (Australian Reed Warbler)*			
152.	24831	*Acrocephalus australis subsp. gouldi*			
153.	24838	*Megalurus gramineus subsp. gramineus*			
Tachyglossidae					
154.	24207	*Tachyglossus aculeatus (Echidna)*			
Tarsipedidae					
155.	24167	*Tarsipes rostratus (Honey Possum)*			
Threskiornithidae					
156.	24841	*Platalea flavipes (Yellow-billed Spoonbill)*			
157.	24844	*Threskiornis molucca (Australian White Ibis)*			
158.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
Turnicidae					
159.	24851	*Turnix velox (Little Button-quail)*			
Typhlopidae					
160.	25285	*Ramphotyphlops pinguis*			
Tytonidae					
161.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southern subsp))*		P3	
Vespertilionidae					
162.	24186	*Chalinolobus gouldii (Gould's Wattled Bat)*			
163.	24187	*Chalinolobus morio (Chocolate Wattled Bat)*			
Ziphiidae					
164.	24076	*Mesoplodon bowdoini (Andrew's Beaked Whale)*			
Zosteropidae					
165.	25765	*Zosterops lateralis (Grey-breasted White-eye)*			
166.	24856	*Zosterops lateralis subsp. gouldi*			

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.

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Acrotylaceae					
1.	26665	*Claviclonium ovatum*			
2.	26915	*Hennedya crispa*			
Aizoaceae					
3.	2795	*Carpobrotus edulis (Hottentot Fig)*	Y		
Amaranthaceae					
4.	40841	*Ptilotus stirlingii subsp. stirlingii*			
Apiaceae					
5.	6218	*Daucus glochidiatus (Australian Carrot)*			
6.	6219	*Eryngium pinnatifidum (Blue Devils)*			
7.	6222	*Homalosciadium homalocarpum*			
Araceae					
8.	28342	*Landoltia punctata (Thin Duckweed)*			
9.	1051	*Lemna disperma (Duckweed)*			
Araliaceae					
10.	6224	*Hydrocotyle blepharocarpa*			
11.	6232	*Hydrocotyle hispidula*			
12.	19041	*Trachymene coerulea subsp. coerulea*			
13.	6280	*Trachymene pilosa (Native Parsnip)*			
Areschougiaceae					
14.	26503	*Betaphycus speciosum*			
Asparagaceae					
15.	1201	*Asparagus officinalis (Asparagus)*	Y		
16.	1287	*Dichopogon capillipes*			
17.	16091	*Lachenalia bulbifera*	Y		
18.	11464	*Laxmannia sessiliflora subsp. australis*			
19.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
20.	1228	*Lomandra hermaphrodita*			
21.	1231	*Lomandra maritima*			
22.	14542	*Lomandra micrantha subsp. micrantha*			
23.	1239	*Lomandra preissii*			
24.	1246	*Lomandra suaveolens*			
25.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
26.	1319	*Thysanotus arenarius*			
27.	1358	*Thysanotus triandrus*			
Asteraceae					
28.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
29.	7867	*Brachyscome bellidioides*			
30.	7878	*Brachyscome iberidifolia*			
31.	7909	*Carduus pycnocephalus (Slender Thistle)*	Y		
32.	20074	*Conyza sumatrensis*	Y		
33.	7943	*Cotula australis (Common Cotula)*			
34.	29594	*Helichrysum luteoalbum (Jersey Cudweed)*			
35.	8027	*Helichrysum macranthum*			
36.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
37.	9352	*Hypochaeris radicata (Flat Weed)*	Y		
38.	29046	*Lactuca serriola forma serriola*	Y		
39.	18585	*Lagenophora huegelii*			
40.	17852	*Leptorhynchos scaber (Lanky Buttons)*			
41.	8106	*Millotia tenuifolia (Soft Millotia)*			
42.	8149	*Olearia rudis (Rough Daisybush)*			
43.	8177	*Podolepis lessonii*			
44.	8183	*Podotheca chrysantha (Yellow Podotheca)*			
45.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
46.	15035	*Rhodanthe corymbosa*			
47.	25884	*Senecio pinnatifolius var. latilobus*			
48.	8218	*Senecio ramosissimus (Auricled Groundsel)*			
49.	8231	*Sonchus oleraceus (Common Sowthistle)*	Y		
50.	8245	*Taraxacum officinale (Dandelion)*	Y		
51.	8254	*Urospermum picroides (False Hawkbit)*	Y		
52.	8255	*Ursinia anthemoides (Ursinia)*	Y		
53.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
54.	13328	*Waitzia nitida*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
55.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
56.	19938	*Xerochrysum bracteatum*			
Bonnemaisoniaceae					
57.	26486	*Asparagopsis taxiformis*			
Brassicaceae					
58.	3016	*Heliophila pusilla*	Y		
59.	3042	*Lepidium pseudotasmanicum*		P4	
60.	3049	*Matthiola incana (Common Stock)*	Y		
61.	3080	*Stenopetalum robustum*			
Bryaceae					
62.	32380	*Gemmabryum pachythecum*			
Campanulaceae					
63.	7408	*Lobelia tenuior (Slender Lobelia)*			
64.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
Caprifoliaceae					
65.	7368	*Scabiosa atropurpurea (Purple Pincushion)*	Y		
Caryophyllaceae					
66.	2889	*Cerastium glomeratum (Mouse Ear Chickweed)*	Y		
67.	19825	*Petrorhagia dubia*	Y		
68.	2905	*Polycarpon tetraphyllum (Fourleaf Allseed)*	Y		
69.	2906	*Sagina apetala (Annual Pearlwort)*	Y		
70.	2909	*Silene gallica (French Catchfly)*	Y		
71.	2918	*Stellaria media (Chickweed)*	Y		
Casuarinaceae					
72.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
Caulerpaceae					
73.	26560	*Caulerpa distichophylla*			
74.	26562	*Caulerpa fergusonii*			
75.	26570	*Caulerpa obscura*			
Celastraceae					
76.	4733	*Stackhousia monogyna*			
77.	4737	*Tripterococcus brunonis (Winged Stackhousia)*			
Centrolepidaceae					
78.	1125	*Centrolepis drummondiana*			
Ceramiaceae					
79.	26471	*Antithamnion armatum*			
80.	26475	*Antithamnion hanovioides*			
81.	26511	*Bornetia binderiana*			
82.	26600	*Ceramium pusillum*			
83.	26884	*Griffithsia ovalis*			
84.	26942	*Hirsutithallia laricina*			
Champiaceae					
85.	26621	*Champia zostericola*			
Chenopodiaceae					
86.	2578	*Rhagodia baccata (Berry Saltbush)*			
87.	11341	*Rhagodia baccata subsp. baccata*			
Codiaceae					
88.	26672	*Codium galeatum*			
Colchicaceae					
89.	1398	*Wurmbea monantha*			
Crassulaceae					
90.	3137	*Crassula colorata (Dense Stonecrop)*			
91.	11709	*Crassula colorata var. acuminata*			
Cucurbitaceae					
92.	25825	*Cucurbita pepo*	Y		Y
Cyperaceae					
93.	743	*Baumea juncea (Bare Twigrush)*			
94.	755	*Carex fascicularis (Tassel Sedge)*			
95.	757	*Carex preissii*			
96.	760	*Caustis dioica*			
97.	816	*Cyperus tenuiflorus (Scaly Sedge)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
98.	907	*Gahnia trifida (Coast Saw-sedge)*			
99.	917	*Isolepis marginata (Coarse Club-rush)*	Y		
100.	925	*Lepidosperma angustatum*			
101.	932	*Lepidosperma effusum (Spreading Sword-sedge)*			
102.	933	*Lepidosperma gladiatum (Coast Sword-sedge)*			
103.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
104.	940	*Lepidosperma pubisquameum*			
105.	944	*Lepidosperma scabrum*			
106.	36060	*Lepidosperma sp. Coastal Dunes (R.J. Cranfield 9963)*			
107.	945	*Lepidosperma squamatum*			
108.	946	*Lepidosperma striatum*			
109.	955	*Mesomelaena pseudostygia*			
110.	969	*Schoenoplectus validus (Lake Club-rush)*			
111.	984	*Schoenus curvifolius*			
112.	992	*Schoenus grandiflorus (Large Flowered Bogrush)*			
113.	997	*Schoenus lanatus (Woolly Bog-rush)*			
114.	1002	*Schoenus nanus (Tiny Bog Rush)*			
115.	1026	*Schoenus unispiculatus*			
116.	12048	*Tricostularia neesii var. neesii*			
Dasypogonaceae					
117.	19309	*Calectasia narragara*			
Delesseriaceae					
118.	27149	*Platysiphonia mutabilis*			
Dicranemataceae					
119.	27347	*Tylotus obtusatus*			
Dilleniaceae					
120.	5112	*Hibbertia aurea*			
121.	5134	*Hibbertia huegelii*			
122.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			
123.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
124.	11461	*Hibbertia spicata subsp. leptotheca*		P3	
Droseraceae					
125.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
126.	13216	*Drosera menziesii subsp. penicillaris*			
127.	3118	*Drosera pallida (Pale Rainbow)*			
Elaeocarpaceae					
128.	4524	*Platytheca galioides*			
Ericaceae					
129.	11471	*Andersonia lehmanniana subsp. lehmanniana*			
130.	6331	*Astroloma microcalyx (Native Cranberry)*			
131.	6334	*Astroloma pallidum (Kick Bush)*			
132.	6347	*Conostephium minus (Pink-tipped Pearl flower)*			
133.	6348	*Conostephium pendulum (Pearl Flower)*			
134.	6349	*Conostephium preissii*			
135.	6405	*Leucopogon insularis*			
136.	40801	*Leucopogon maritimus*		P1	
137.	6427	*Leucopogon parviflorus (Coast Beard-heath)*			
138.	6434	*Leucopogon polymorphus*			
139.	6436	*Leucopogon propinquus*			
140.	6440	*Leucopogon racemulosus*			
141.	19460	*Leucopogon sp. Yanchep (M. Hislop 1986)*		P3	
142.	34736	*Lysinema pentapetalum*			
Euphorbiaceae					
143.	4638	*Euphorbia peplus (Petty Spurge)*	Y		
Fabaceae					
144.	3207	*Acacia alata (Winged Wattle)*			
145.	15430	*Acacia alata var. tetrantha*			
146.	15466	*Acacia applanata*			
147.	15470	*Acacia barbinervis subsp. borealis*			
148.	3237	*Acacia benthamii*		P2	
149.	3282	*Acacia cyclops (Coastal Wattle)*			
150.	3374	*Acacia huegelii*			
151.	3408	*Acacia lasiocalyx (Silver Wattle)*			
152.	3502	*Acacia pulchella (Prickly Moses)*			
153.	15481	*Acacia pulchella var. glaberrima*			
154.	3525	*Acacia rostellifera (Summer-scented Wattle)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
155.	3541	*Acacia sessilis*			
156.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
157.	3584	*Acacia truncata*			
158.	3604	*Acacia xanthina (White-stemmed Wattle)*			
159.	3692	*Aotus procumbens*			
160.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
161.	3805	*Daviesia decurrens (Prickly Bitter-pea)*			
162.	3807	*Daviesia divaricata (Marno)*			
163.	16585	*Daviesia nudiflora subsp. nudiflora*			
164.	3832	*Daviesia physodes*			
165.	3833	*Daviesia podophylla*			
166.	20483	*Gastrolobium linearifolium*			
167.	3945	*Gompholobium aristatum*			
168.	3950	*Gompholobium knightianum*			
169.	19295	*Gompholobium pungens*			
170.	11083	*Gompholobium scabrum*			
171.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
172.	3961	*Hardenbergia comptoniana (Native Wisteria)*			
173.	3967	*Hovea stricta*			
174.	3968	*Hovea trisperma (Common Hovea)*			
175.	3992	*Isotropis cuneifolia (Granny Bonnets)*			
176.	19700	*Isotropis cuneifolia subsp. cuneifolia*			
177.	14783	*Jacksonia calcicola*			
178.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
179.	4044	*Kennedia prostrata (Scarlet Runner)*			
180.	4066	*Lupinus cosentinii*	Y		
181.	4085	*Melilotus indicus*	Y		
182.	4181	*Pultenaea reticulata*			
183.	20348	*Sphaerolobium calcicola*		P3	
184.	4256	*Templetonia retusa (Cockies Tongues)*			
185.	4292	*Trifolium campestre (Hop Clover)*	Y		
186.	4310	*Trifolium spumosum (Bladder Clover)*	Y		
187.	4325	*Viminaria juncea (Swishbush)*			
Geraniaceae					
188.	4336	*Erodium moschatum (Musky Crowfoot)*	Y		
189.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
190.	4346	*Pelargonium littorale*			
191.	17149	*Pelargonium littorale subsp. littorale*			
Gigaspermaceae					
192.	32384	*Gigaspermum repens*			
Goodeniaceae					
193.	7454	*Dampiera linearis (Common Dampiera)*			
194.	7568	*Lechenaultia biloba (Blue Leschenaultia)*			
195.	7577	*Lechenaultia hirsuta (Hairy Leschenaultia)*			
196.	7580	*Lechenaultia linarioides (Yellow Leschenaultia)*			
197.	7586	*Lechenaultia stenosepala (Narrow-sepaled Leschenaultia)*			
198.	7603	*Scaevola canescens (Grey Scaevola)*			
199.	7626	*Scaevola nitida (Shining Fanflower)*			
200.	13181	*Scaevola repens var. angustifolia*			
201.	13182	*Scaevola repens var. repens*			
202.	13152	*Scaevola thesioides subsp. thesioides*			
Gracilariaceae					
203.	26876	*Gracilaria verrucosa*			
Gyrostemonaceae					
204.	2791	*Tersonia cyathiflora (Button Creeper)*			
Haemodoraceae					
205.	1409	*Anigozanthos humilis (Catspaw)*			
206.	11261	*Anigozanthos manglesii subsp. manglesii*			
207.	1418	*Conostylis aculeata (Prickly Conostylis)*			
208.	11826	*Conostylis aculeata subsp. aculeata*			
209.	1427	*Conostylis candicans (Grey Cottonhead)*			
210.	11438	*Conostylis candicans subsp. candicans*			
211.	11388	*Conostylis pauciflora subsp. euryrhipis*		P4	
212.	11657	*Conostylis pauciflora subsp. pauciflora*		P4	
213.	1454	*Conostylis setigera (Bristly Cottonhead)*			
214.	11597	*Conostylis setigera subsp. setigera*			
215.	1468	*Haemodorum laxum*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
216.	1475	*Haemodorum spicatum (Mardja)*			
217.	1477	*Macropidia fuliginosa (Black Kangaroo Paw)*			
218.	1478	*Phlebocarya ciliata*			
Haloragaceae					
219.	33620	*Glischrocaryon angustifolium*			
Halymeniaceae					
220.	26850	*Gelinaria ulvoidea*			
Hemerocallidaceae					
221.	1264	*Arnocrinum preissii*			
222.	11283	*Corynotheca micrantha var. micrantha*			
223.	1259	*Dianella revoluta (Blueberry Lily)*			
224.	1260	*Stypandra glauca (Blind Grass)*			
225.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
Hypneaceae					
226.	35898	*Hypnea musciformis*			
227.	26971	*Hypnea ramentacea*			
Iridaceae					
228.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
229.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
Juncaceae					
230.	1188	*Juncus pallidus (Pale Rush)*			
Juncaginaceae					
231.	18587	*Triglochin nana*			
232.	152	*Triglochin trichophora*			
Kallymeniaceae					
233.	27329	*Thamnophyllis lacerata*			
Lamiaceae					
234.	16934	*Hemiandra glabra subsp. glabra*			
235.	6839	*Hemiandra pungens (Snakebush)*			
236.	6871	*Hemigenia sericea (Silky Hemigenia)*			
237.	41020	*Hemiphora bartlingii (Woolly Dragon)*			
238.	15994	*Mentha x piperita var. citrata*	Y		
239.	6939	*Westringia dampieri*			
Lauraceae					
240.	2951	*Cassytha flava (Dodder Laurel)*			
241.	2957	*Cassytha racemosa (Dodder Laurel)*			
242.	11799	*Cassytha racemosa forma racemosa*			
Lentibulariaceae					
243.	7125	*Utricularia australis*			
Loganiaceae					
244.	6515	*Logania vaginalis (White Spray)*			
Loranthaceae					
245.	2401	*Nuytsia floribunda (Christmas Tree)*			
Malvaceae					
246.	4906	*Alyogyne huegelii (Lilac Hibiscus)*			
247.	5105	*Thomasia triphylla*			
Molluginaceae					
248.	2838	*Macarthuria apetala*			
Moraceae					
249.	1747	*Ficus carica (Common Fig)*	Y		
Myrtaceae					
250.	20283	*Astartea scoparia*			
251.	5426	*Calothamnus quadrifidus (One-sided Bottlebrush)*			
252.	35816	*Calothamnus quadrifidus subsp. quadrifidus*			
253.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower)*			
254.	5439	*Calytrix angulata (Yellow Starflower)*			
255.	5458	*Calytrix flavescens (Summer Starflower)*			
256.	5476	*Calytrix sapphirina*			
257.	5479	*Calytrix strigosa*			
258.	5498	*Chamelaucium uncinatum (Geraldton Wax)*			
259.	17104	*Corymbia calophylla (Marri)*			
260.	13950	*Eremaea asterocarpa subsp. asterocarpa*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
261.	5540	*Eremaea fimbriata*			
262.	5541	*Eremaea pauciflora*			
263.	5615	*Eucalyptus decipiens*			
264.	13536	*Eucalyptus decipiens subsp. decipiens*			
265.	5659	*Eucalyptus gomphocephala (Tuart)*			
266.	5708	*Eucalyptus marginata (Jarrah)*			
267.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			
268.	13511	*Eucalyptus rudis subsp. rudis*			
269.	5790	*Eucalyptus todtiana (Coastal Blackbutt)*			
270.	5857	*Leptospermum spinescens*			
271.	5887	*Melaleuca cardiophylla (Tangling Melaleuca)*			
272.	13271	*Melaleuca huegelii subsp. huegelii*			
273.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
274.	18598	*Melaleuca systena*			
275.	5983	*Melaleuca trichophylla*			
276.	6012	*Regelia ciliata*			
277.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
278.	12388	*Verticordia acerosa var. preissii*			
279.	12402	*Verticordia chrysanthella*			
280.	12411	*Verticordia densiflora var. cespitosa*			
281.	15433	*Verticordia huegelii var. huegelii*			
282.	6101	*Verticordia nitens (Morrison Featherflower)*			
283.	10822	*Verticordia nobilis*			
284.	6103	*Verticordia ovalifolia*			
285.	6109	*Verticordia picta (Painted Featherflower)*			
Onagraceae					
286.	11570	*Epilobium billardiereanum subsp. billardiereanum (Smooth Willow Herb)*			
287.	11992	*Epilobium billardiereanum subsp. intermedium*			
288.	6132	*Epilobium ciliatum*	Y		
289.	6133	*Epilobium hirtigerum (Hairy Willow Herb)*			
290.	14289	*Epilobium tetragonum subsp. tetragonum*	Y		
Orchidaceae					
291.	1592	*Caladenia flava (Cowslip Orchid)*			
292.	15348	*Caladenia flava subsp. flava*			
293.	1643	*Elythranthera brunonis (Purple Enamel Orchid)*			
294.	1644	*Elythranthera emarginata (Pink Enamel Orchid)*			
295.	1646	*Eriochilus dilatatus (White Bunny Orchid)*			
296.	20460	*Pheladenia deformis*			
297.	15426	*Pterostylis aspera*			
298.	1693	*Pterostylis recurva (Jug Orchid)*			
299.	18658	*Pterostylis sp. short sepals (W. Jackson BJ259)*			
300.	1698	*Pterostylis vittata (Banded Greenhood)*			
301.	1708	*Thelymitra fuscolutea (Leopard Orchid)*			
Orobanchaceae					
302.	7122	*Orobanche minor (Lesser Broomrape)*	Y		
Papaveraceae					
303.	2971	*Fumaria muralis (Wall Fumitory)*	Y		
304.	2967	*Romneya coulteri (California Tree Poppy)*	Y		
Passifloraceae					
305.	5225	*Passiflora filamentosa*	Y		
Phyllanthaceae					
306.	4675	*Phyllanthus calycinus (False Boronia)*			
307.	4691	*Poranthera microphylla (Small Poranthera)*			
Plantaginaceae					
308.	7110	*Veronica distans*			
Plocamiaceae					
309.	27155	*Plocamium cartilagineum*			
310.	27156	*Plocamium mertensii*			
Poaceae					
311.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
312.	185	*Aira cupaniana (Silvery Hairgrass)*	Y		
313.	226	*Arundo donax (Giant Reed)*	Y		
314.	17234	*Austrostipa compressa*			
315.	17240	*Austrostipa flavescens*			
316.	244	*Briza maxima (Blowfly Grass)*	Y		
317.	253	*Bromus rubens (Red Brome)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
			Y		
318.	13685	*Catapodium rigidum (Rigid Fescue)*	Y		
319.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
320.	476	*Lolium perenne (Perennial Ryegrass)*	Y		
321.	478	*Lolium rigidum (Wimmera Ryegrass)*	Y		
322.	485	*Microlaena stipoides (Weeping Grass)*			
323.	532	*Paspalum urvillei (Vasey Grass)*	Y		
324.	573	*Poa drummondiana (Knotted Poa)*			
325.	708	*Triticum aestivum (Wheat)*	Y		
326.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
327.	33101	*Vulpia myuros forma myuros*	Y		
Polygalaceae					
328.	4552	*Comesperma confertum*			
329.	4554	*Comesperma flavum*			
Polygonaceae					
330.	13911	*Persicaria decipiens*			
331.	2433	*Rumex crispus (Curled Dock)*	Y		
332.	2440	*Rumex pulcher (Fiddle Dock)*	Y		
Pottiaceae					
333.	32346	*Didymodon torquatus*			
Proteaceae					
334.	1800	*Banksia attenuata (Slender Banksia)*			
335.	1819	*Banksia grandis (Bull Banksia)*			
336.	1834	*Banksia menziesii (Firewood Banksia)*			
337.	32077	*Banksia sessilis var. cygnorum*			
338.	1859	*Conospermum brachyphyllum*			
339.	15516	*Conospermum canaliculatum subsp. canaliculatum*			
340.	1885	*Conospermum triplinervium (Tree Smokebush)*			
341.	15839	*Grevillea preissii subsp. preissii*			
342.	2119	*Grevillea vestita*			
343.	12824	*Grevillea vestita subsp. vestita*			
344.	2146	*Hakea costata (Ribbed Hakea)*			
345.	2175	*Hakea lissocarpha (Honey Bush)*			
346.	2197	*Hakea prostrata (Harsh Hakea)*			
347.	2203	*Hakea ruscifolia (Candle Hakea)*			
348.	2214	*Hakea trifurcata (Two-leaf Hakea)*			
349.	2258	*Persoonia comata*			
350.	20368	*Petrophile axillaris*			
351.	2286	*Petrophile brevifolia*			
352.	2299	*Petrophile linearis (Pixie Mops)*			
353.	2301	*Petrophile macrostachya*			
354.	2309	*Petrophile serruriae*			
355.	2316	*Stirlingia latifolia (Blueboy)*			
356.	15532	*Synaphea spinulosa subsp. spinulosa*			
Pteridaceae					
357.	45	*Pteris vittata (Chinese Brake)*			
Racopilaceae					
358.	32480	*Racopilum cuspidigerum var. convolutaceum*			
Ranunculaceae					
359.	10804	*Clematis linearifolia*			
360.	2932	*Ranunculus colonorum (Common Buttercup)*			
361.	2933	*Ranunculus muricatus (Sharp Buttercup)*	Y		
Restionaceae					
362.	1056	*Alexgeorgea nitens*			
363.	17663	*Desmocladus asper*			
364.	16595	*Desmocladus flexuosus*			
365.	1070	*Hypolaena exsulca*			
366.	17841	*Hypolaena pubescens*			
367.	18074	*Lepidobolus preissianus subsp. preissianus*			
Rhamnaceae					
368.	4802	*Cryptandra mutila*			
369.	4809	*Cryptandra pungens*			
370.	4828	*Spyridium globulosum (Basket Bush)*			
371.	15066	*Stenanthemum notiale subsp. chamelum*			
372.	11665	*Trymalium ledifolium var. ledifolium*			
373.	33418	*Trymalium odoratissimum subsp. odoratissimum*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rhodomelaceae					
374.	26752	*Dasyclonium incisum*			
375.	26761	*Dictyomenia harveyana*			
376.	26762	*Dictyomenia sonderi*			
377.	26763	*Dictyomenia tridens*			
378.	26919	*Herposiphonia rostrata*			
379.	26922	*Herposiphonia versicolor*			
380.	26998	*Laurencia brongniartii*			
381.	27011	*Lenormandia latifolia*			
382.	27108	*Osmundaria spiralis*			
383.	27173	*Polysiphonia decipiens*			
384.	27190	*Protokuetzingia australasica*			
Rhodymeniaceae					
385.	27015	*Leptosomia rosea*			
Rubiaceae					
386.	7348	*Opercularia hispidula (Hispid Stinkweed)*			
387.	18255	*Opercularia vaginata (Dog Weed)*			
Rutaceae					
388.	4453	*Diplolaena angustifolia (Yanchep Rose)*			
389.	18547	*Rhadinothamnus anceps*			
Santalaceae					
390.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
391.	2352	*Leptomeria preissiana*			
Scrophulariaceae					
392.	7054	*Dischisma arenarium*	Y		
393.	17175	*Eremophila glabra subsp. albicans*			
394.	7289	*Myoporum caprarioides (Slender Myoporum)*			
395.	7107	*Verbascum virgatum (Twiggy Mullein)*	Y		
Solanaceae					
396.	11725	*Anthocercis ilicifolia subsp. ilicifolia*			
397.	6949	*Anthocercis littorea (Yellow Tailflower)*			
398.	6988	*Solanum americanum (Glossy Nightshade)*	Y		
399.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
400.	7037	*Solanum symonii*			
Stylidiaceae					
401.	30278	*Stylidium androsaceum*			
402.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
403.	7694	*Stylidium bulbiferum (Circus Triggerplant)*			
404.	7696	*Stylidium calcaratum (Book Triggerplant)*			
405.	7709	*Stylidium crossocephalum (Posy Triggerplant)*			
406.	7710	*Stylidium cygnorum*			
407.	7713	*Stylidium dichotomum (Pins-and-needles)*			
408.	25801	*Stylidium hesperium*			
409.	13127	*Stylidium maritimum*		P3	
410.	7785	*Stylidium repens (Matted Triggerplant)*			
411.	20521	*Stylidium rigidulum*			
412.	7798	*Stylidium schoenoides (Cow Kicks)*			
413.	25830	*Stylidium sp. Darling Range (H. Bowler 371)*			
Thuidiaceae					
414.	32486	*Thuidium sparsum var. hastatum*			
Thymelaeaceae					
415.	5232	*Pimelea argentea (Silvery Leaved Pimelea)*			
416.	11402	*Pimelea imbricata var. piligera*			
417.	5254	*Pimelea leucantha*			
418.	5268	*Pimelea sulphurea (Yellow Banjine)*			
Urticaceae					
419.	1762	*Parietaria debilis (Pellitory)*			
Violaceae					
420.	5216	*Hybanthus calycinus (Wild Violet)*			
421.	12007	*Hybanthus floribundus subsp. floribundus*			
Vitaceae					
422.	17042	*Vitis vinifera*	Y		
Xanthorrhoeaceae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
423.	1256	*Xanthorrhoea preissii (Grass tree)*			

Zamiaceae

424.	85	*Macrozamia riedlei (Zamia)*			

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 Results

Table 12 Flora species recorded within the study area

Family	Name	Status
Aizoaceae	*Carpobrotus edulis*	*
Amaranthaceae	*Ptilotus drummondii* var. *drummondii*	
Amaranthaceae	*Ptilotus polystachyus*	
Anacardiaceae	*Schinus terebinthifolius*	*
Apiaceae	*Daucus glochidiatus*	
Apiaceae	*Eryngium pinnatifidum* subsp. *pinnatifidum*	
Apiaceae	*Trachymene pilosa*	
Asparagaceae	*Acanthocarpus preissii*	
Asparagaceae	*Lomandra caespitosa*	
Asparagaceae	*Lomandra hermaphrodita*	
Asparagaceae	*Lomandra maritima*	
Asparagaceae	*Thysanotus arbuscula*	
Asparagaceae	*Thysanotus sparteus*	
Asphodelaceae	*Asphodelus fistulosus*	*
Asphodelaceae	*Trachyandra divaricata*	*
Asteraceae	*Arctotheca calendula*	*
Asteraceae	*Hyalosperma cotula*	
Asteraceae	*Hypochaeris glabra*	*
Asteraceae	*Hypochaeris* sp.	
Asteraceae	*Leptorhynchos scaber*	
Asteraceae	*Olearia axillaris*	
Asteraceae	*Podolepis gracilis*	
Asteraceae	*Podotheca gnaphalioides*	
Asteraceae	*Rhodanthe* sp.	
Asteraceae	*Senecio pinnatifolius*	
Asteraceae	*Sonchus oleraceus*	*
Asteraceae	*Ursinia anthemoides*	*
Brassicaceae	*Brassica tournefortii*	*
Brassicaceae	*Heliophila pusilla*	*
Campanulaceae	*Wahlenbergia capensis*	*
Caryophyllaceae	*Petrorhagia dubia*	*
Caryophyllaceae	*Silene gallica*	*
Casuarinaceae	*Allocasuarina fraseriana*	
Casuarinaceae	*Allocasuarina humilis*	
Celastraceae	*Tripterococcus brunonis*	
Chenopodiaceae	*Rhagodia baccata*	
Colchicaceae	*Burchardia congesta*	
Crassulaceae	*Crassula decumbens* var. *decumbens*	
Crassulaceae	*Crassula* sp.	
Cyperaceae	*Lepidosperma pubisquameum*	

Family	Name	Status
Cyperaceae	*Lepidosperma scabrum*	
Cyperaceae	*Lepidosperma squamatum*	
Cyperaceae	*Mesomelaena pseudostygia*	
Cyperaceae	*Schoenus curvifolius*	
Cyperaceae	*Schoenus grandiflorus*	
Cyperaceae	*Schoenus lanatus*	
Dilleniaceae	*Hibbertia hypericoides*	
Dilleniaceae	*Hibbertia racemosa*	
Dipsacaceae	*Scabiosa atropurpurea*	*
Droseraceae	*Drosera intricata*	
Ericaceae	*Astroloma pallidum*	
Ericaceae	*Conostephium pendulum*	
Ericaceae	*Conostephium* sp.	
Ericaceae	*Leucopogon insularis*	
Ericaceae	*Leucopogon parviflorus*	
Ericaceae	*Leucopogon polymorphus*	
Ericaceae	*Leucopogon propinquus*	
Ericaceae	*Lysinema ciliatum*	
Euphorbiaceae	*Beyeria cinerea* subsp. *cinerea*	P3
Euphorbiaceae	*Euphorbia terracina*	*
Euphorbiaceae	*Phyllanthus calycinus*	
Euphorbiaceae	*Poranthera* sp.	
Fabaceae	*Acacia cochlearis*	
Fabaceae	*Acacia cyclops*	
Fabaceae	*Acacia huegelii*	
Fabaceae	*Acacia longifolia*	*
Fabaceae	*Acacia pulchella*	
Fabaceae	*Acacia pulchella* var. *goadbyi*	
Fabaceae	*Acacia rostellifera*	
Fabaceae	*Acacia saligna*	
Fabaceae	*Bossiaea eriocarpa*	
Fabaceae	*Daviesia divaricata subsp. divaricata ms*	
Fabaceae	*Gastrolobium nervosum*	
Fabaceae	*Gompholobium capitatum*	
Fabaceae	*Gompholobium tomentosum*	
Fabaceae	*Hardenbergia comptoniana*	
Fabaceae	*Jacksonia calcicola*	
Fabaceae	*Jacksonia furcellata*	
Fabaceae	*Jacksonia sternbergiana*	
Fabaceae	*Kennedia prostrata*	
Fabaceae	*Lupinus cosentinii*	*
Fabaceae	*Medicago polymorpha*	*
Fabaceae	*Medicago* sp.	
Fabaceae	*Templetonia retusa*	
Fabaceae	*Trifolium campestre*	*
Fabaceae	*Trifolium hirtum*	*
Geraniaceae	*Erodium cicutarium*	*
Geraniaceae	*Pelargonium capitatum*	*

Family	Name	Status
Goodeniaceae	*Lechenaultia linarioides*	
Goodeniaceae	*Scaevola canescens*	
Goodeniaceae	*Scaevola thesioides* subsp. *thesioides*	
Haemodoraceae	*Anigozanthos humilis*	
Haemodoraceae	*Conostylis aculeata*	
Haemodoraceae	*Conostylis candicans*	
Haemodoraceae	*Conostylis candicans* subsp. *candicans*	
Haemodoraceae	*Conostylis pauciflora* subsp. *euryrhipis*	P4
Haemodoraceae	*Conostylis pauciflora* subsp. *pauciflora*	P4
Haemodoraceae	*Conostylis setigera*	
Haemodoraceae	*Conostylis setigera* subsp. *setigera*	
Haemodoraceae	*Haemodorum paniculatum*	
Hemerocallidaceae	*Corynotheca micrantha*	
Hemerocallidaceae	*Tricoryne elatior*	
Iridaceae	*Gladiolus* sp.	
Iridaceae	*Moraea flaccida*	*
Iridaceae	*Orthrosanthus laxus*	
Iridaceae	*Romulea rosea*	*
Lamiaceae	*Hemiandra pungens*	
Lauraceae	*Cassytha glabella* forma *dispar*	
Lauraceae	*Cassytha* sp.	
Lobeliaceae	*Lobelia tenuior*	
Loranthaceae	*Nuytsia floribunda*	
Myrtaceae	*Calothamnus quadrifidus subsp. quadrifidus ms*	
Myrtaceae	*Calytrix flavescens*	
Myrtaceae	*Eucalyptus decipiens subsp. decipiens*	
Myrtaceae	*Eucalyptus gomphocephala*	
Myrtaceae	*Eucalyptus* sp. 1 (planted)	
Myrtaceae	*Eucalyptus* sp. 2 (planted)	
Myrtaceae	*Eucalyptus* sp. 3 (planted)	
Myrtaceae	*Eucalyptus* sp. 4 (planted)	
Myrtaceae	*Eucalyptus foecunda*	
Myrtaceae	*Eucalyptus todtiana*	
Myrtaceae	*Kunzea ericifolia*	
Myrtaceae	*Kunzea ericifolia* subsp. *ericifolia*	
Myrtaceae	*Leptospermum laevigatum*	*
Myrtaceae	*Leptospermum spinescens*	
Myrtaceae	*Melaleuca huegelii*	
Myrtaceae	*Melaleuca lanceolata*	
Myrtaceae	*Melaleuca systena*	
Myrtaceae	*Taxandria linearifolia*	
Orchidaceae	*Caladenia longicauda*	
Phormiaceae	*Dianella revoluta*	
Poaceae	*Austrodanthonia occidentalis*	

Family	Name	Status
Poaceae	*Austrostipa compressa*	
Poaceae	*Austrostipa flavescens*	
Poaceae	*Avena barbata*	*
Poaceae	*Briza maxima*	*
Poaceae	*Bromus diandrus*	*
Poaceae	*Bromus* sp.	
Poaceae	*Ehrharta calycina*	*
Poaceae	*Ehrharta longiflora*	*
Poaceae	*Eragrostis curvula*	*
Poaceae	*Lagurus ovatus*	*
Poaceae	*Lolium multiflorum*	*
Poaceae	*Lolium perenne*	*
Poaceae	*Pentameris* sp.	*
Poaceae	*Poa bulbosa*	*
Poaceae	*Poa porphyroclados*	
Poaceae	sp.	
Poaceae	*Vulpia myuros*	*
Polygonaceae	*Comesperma calymega*	
Polygonaceae	*Acetosella vulgaris*	*
Portulacaceae	*Calandrinia brevipedata*	
Primulaceae	*Anagallis arvensis*	*
Proteaceae	*Banksia attenuata*	
Proteaceae	*Banksia dallanneyi*	
Proteaceae	*Banksia menziesii*	
Proteaceae	*Banksia sessilis*	
Proteaceae	*Conospermum ? canaliculatum*	
Proteaceae	*Conospermum canaliculatum subsp. canaliculatum*	
Proteaceae	*Grevillea pilulifera*	
Proteaceae	*Grevillea preissii*	
Proteaceae	*Hakea lissocarpha*	
Proteaceae	*Hakea prostrata*	
Proteaceae	*Hakea ruscifolia*	
Proteaceae	*Hakea trifurcata*	
Proteaceae	*Petrophile axillaris*	
Proteaceae	*Petrophile brevifolia*	
Proteaceae	*Petrophile linearis*	
Proteaceae	*Petrophile macrostachya*	
Ranunculaceae	*Clematis linearifolia*	
Ranunculaceae	*Clematis pubescens*	
Restionaceae	*Alexgeorgea nitens*	
Restionaceae	*Desmocladus flexuosus*	
Rhamnaceae	*Cryptandra* sp.	
Rhamnaceae	*Spyridium globulosum*	
Rhamnaceae	*Trymalium ledifolium* var. *ledifolium*	
Rubiaceae	*Opercularia vaginata*	
Santalaceae	*Exocarpos sparteus*	
Santalaceae	*Leptomeria preissiana*	

Family	Name	Status
Santalaceae	*Santalum acuminatum*	
Scrophulariaceae	*Eremophila glabra* subsp. *albicans*	
Scrophulariaceae	*Veronica calycina*	
Solanaceae	*Anthocercis littorea*	
Solanaceae	*Solanum nigrum*	*
Stylidiaceae	*Stylidium androcaseum*	
Stylidiaceae	*Stylidium neurophyllum*	
Thymelaeaceae	*Pimelea ferruginea*	
Violaceae	*Hybanthus calycinus*	
Xanthorrhoeaceae	*Xanthorrhoea preissii*	
Xanthorrhoeaceae	*Xanthorrhoea* sp.	
Zamiaceae	*Macrozamia riedlei*	
Zygophyllaceae	*Tribulus forrestii*	

Quadrat Data

Yanchep PTA Site Q1

Described by **BS** **Date 4/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 **375608 mE, 6503269 mN**

Habitat

Soil **Light brown sand**

Vegetation **Open eucalypt woodland over tall shrubland of Banksia sessilis**

Veg Condition **Good - Very Good**

Fire Age **10+**

Species List:

Name	Cover	Height
Acacia pulchella	**1**	**1.2**
Anagallis arvensis	**0.5**	**0.2**
Austrostipa flavescens	**<1**	**0.5**
Banksia sessilis	**50**	**2.2**
Briza maxima	**2**	**0.2**
Burchardia congesta	**<1**	**0.6**
Calothamnus quadrifidus	**5.5**	**1.3**
Calothamnus quadrifidus	**5.5**	**1.3**
Conostylis aculeata	**1**	**0.4**
Desmocladus flexuosus	**5**	**0.05**
Ehrharta calycina	**<1**	**0.4**
Eucalyptus sp.	**10**	**5**
Gladiolus sp.	**<1**	**0.8**
Hakea trifurcata	**1**	**2.1**
Hibbertia hypericoides	**25**	**0.9**
Hypochaeris glabra	**<1**	**0.35**
Jacksonia calcicola	**<1**	**0.7**
Mesomelaena pseudostygia	**3**	**0.45**
Nuytsia floribunda	**1**	**0.5**

Trachymene pilosa	**<1**	**0.02**
Ursinia anthemoides	**<1**	**0.4**
Xanthorrhoea sp.	**5**	**1**

Yanchep PTA Site Q2

Described by **BS** **Date 4/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 375672 mE, 6503044 mN
Soil Dark grey sands
Vegetation: Open Banksia woodland
Veg Condition Good - Very Good
Fire Age 3-4 years

Species List:

Name	Cover	Height
Acacia huegelii	**<1**	**0.3**
Acacia pulchella	**1**	**1**
Alexgeorgea nitens	**<1**	**0.05**
Anagalis arvensis var. arvensis	**<1**	**0.2**
Anigozanthos humilis	**<1**	**0.2**
Astroloma pallidum	**<1**	**0.25**
Austrostipa flavescens	**<1**	**1.2**
Banksia attenuata	**5**	**5**
Banksia dallanneyi	**<1**	**0.2**
Banksia menziesii	**20**	**5.5**
Briza maxima	**<1**	**0.2**
Burchardia congesta	**<1**	**0.6**
Carpobrotus edulis	**2**	**0.1**
Conospermum canaliculatum	**<3**	**0.3**
Conostylis aculeata	**<1**	**0.4**
Conostylis setigera	**<1**	**0.1**
Corynotheca micrantha	**<1**	**0.4**
Desmocladus flexuosus	**1**	**0.05**
Dianella revoluta	**1**	**1.2**
Gompholobium tomentosum	**5**	**0.2**
Hakea prostrata	**<1**	**0.5**
Hakea ruscifolia	**1.5**	**1**
Hardenbergia comptoniana	**<1**	**creeping**

Hibbertia hypericoides	**14**	**0.5**
Hyalosperma cotula	**1.5**	**0.1**
Jacksonia calcicola	**1**	**0.3**
Kennedia prostrata	**<1**	**prostrate**
Leptospermum spinescens	**1**	**1**
Lomandra caespitosa	**<1**	**0.3**
Lomandra maritima	**<1**	**0.2**
Macrozamia riedlei	**2**	**1.5**
Mesomelaena pseudostygia	**8**	**0.45**
Moraea flaccida	**<1**	**0.3**
Orthrosanthus laxus	**1.5**	**0.3**
Petrophile brevifolia	**<1**	**0.15**
Petrophile linearis	**<1**	**0.25**
Petrorhagia dubia	**<1**	**0.2**
Podotheca gnaphalioides	**1**	**0.2**
Ptilotus drummondii var. drummondii	**0.5**	**0.4**
Ursinia anthemoides	**1**	**0.3**

Yanchep PTA Site Q3

Described by **BS** **Date 4/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 371540 mE, 6508788 mN
Soil Light to dark grey sand
Vegetation: Open woodland/tall open shrubland
Veg Condition Degraded
Fire Age 10+ years

Species List:

Name	Cover	Height
Acacia cyclops	**4**	**2.5**
Acanthocarpus preissii	**0.5**	**0.4**
Avena barbata	**1**	**0.4**
Bromus diandrus	**40**	**0.25**
Clematis pubescens	**15**	**creeper**
Ehrharta calycina	**<1**	**0.6**
Ehrharta longiflora	**5**	**0.2**
Eucalyptus gomphocephala	**60**	**10**
Euphorbia terracina	**2**	**0.25**
Lagurus ovatus	**<1**	**0.15**
Lomandra maritima	**1**	**0.25**
Spyridium globulosum	**10**	**2.5**
Trifolium campestre	**<1**	**0.1**

Yanchep PTA Site Q4

Described by **BS** **Date 4/11/2010** **Type: 10x10**

Location

MGA Zone: 50 371631 mE, 6508647 mN
Soil Dark grey
Vegetation: Taxandria linearis low woodland
Veg Condition Degraded - Completely Degraded
Fire Age 10+ years

Species List:

Name	Cover	Height
Acanthocarpus preissii	**<1**	**0.4**
Avena barbata	**12**	**0.3**
Brassica tournefortii	**<1**	**0.4**
Bromus diandrus	**10**	**0.2**
Desmocladus flexuosus	**2.5**	**0.2**
Eucalyptus sp. A Brooker & Kleinig 1990	**30.0**	**7.0**
Euphorbia terracina	**3**	**0.2**
Lagurus ovatus	**5**	**0.2**
Lomandra maritima	**2**	**0.4**
Medicago sp.	**5**	**0.05**
Phyllanthus calycinus	**<1**	**0.4**
Rhagodia baccata	**<1**	**0.5**
Spyridium globulosum	**1**	**1.5**
Taxandria linearifolia	**20**	**5**
Tricoryne elatior	**<1**	**0.2**
Trifolium hirtum	**<1**	**0.2**

Yanchep PTA Site Q5

Described by **BS** **Date 4/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 371722 mE, 6508500 mN
Soil **White/grey sand**
Vegetation **Low shrubland over Lomandra maritima herbland**
Veg Condition **Very Good**
Fire Age **5-10 years**

Species List:

Name	Cover	Height
Acacia saligna	**3**	**2.5**
Acanthocarpus preissii	**<1**	**0.3**
Acetosella vulgaris	**<1**	**0.2**
Allocasuarina fraseriana	**5**	**2.5**
Asphodelus fistulosus	**<1**	**0.4**
Austrodanthonia occidentalis	**4**	**0.3**
Austrostipa flavescens	**<1**	**1**
Avena barbata	**<1**	**0.4**
Brassica tournefortii	**<1**	**0.4**
Bromus diandrus	**<1**	**0.3**
Cassytha sp.	**1**	**creeping**
Conostylis candicans	**<1**	**0.2**
Desmocladus flexuosus	**5**	**0.05**
Eucalyptus gomphocephala	**3**	**3**
Euphorbia terracina	**1**	**0.45**
Gastrolobium nervosum	**<1**	**0.2**
Kennedia prostrata	**<1**	**prostrate**
Lagurus ovatus	**3**	**0.2**
Leucopogon insularis	**<1**	**0.4**
Leucopogon parviflorus	**1**	**0.7**
Lomandra maritima	**30**	**0.4**
Melaleuca systena	**8**	**0.6**
Opercularia vaginata	**<1**	**0.2**
Pelargonium capitatum	**1.5**	**0.2**

Petrorhagia dubia	**<1**	**0.3**
Phyllanthus calycinus	**1**	**0.4**
Romulea rosea	**<1**	**0.05**
Silene gallica	**<1**	**0.15**
Spyridium globulosum	**1**	**0.6**
Tricoryne elatior	**<1**	**0.3**
Trifolium campestre	**1**	**0.05**

Yanchep PTA Site Q6

Described by **Date 4/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 371842 mE, 6508308 mN
Soil Brown sand
Rock Type Limestone outcropping light - moderate
Vegetation: Medium/tall shrubland
Veg Condition Very Good
Fire Age 10+

Species List:

Name	Cover	Height
Acacia cyclops	**5**	**3**
Acacia pulchella	**1**	**1**
Allocasuarina fraseriana	**2.0**	**2.0**
Avena barbata	**<1**	**0.4**
Banksia dallanneyi	**<1**	**0.5**
Banksia sessilis	**25**	**2.1**
Briza maxima	**5**	**0.2**
Bromus diandrus	**1**	**0.3**
Calothamnus quadrifidus	**7**	**0.9**
Cryptandra sp.	**<1**	**0.2**
Daucus glochidiatus	**<1**	**0.2**
Desmocladus flexuosus	**2**	**0.1**
Gastrolobium nervosum	**1**	**0.4**
Grevillea preissii	**3**	**0.3**
Hakea lissocarpha	**<1**	**0.5**
Hardenbergia comptoniana	**<1**	**creeper**
Lagurus ovatus	**<1**	**0.2**
Leucopogon insularis	**1.5**	**0.3**
Leucopogon parviflorus	**2**	**0.4**
Lomandra maritima	**2**	**0.4**
Medicago polymorpha	**<1**	**0.05**
Melaleuca systena	**3**	**0.9**

Olearia axillaris	**<1**	**0.9**
Petrorhagia dubia	**<1**	**0.2**
Spyridium globulosum	**60**	**2.4**
Templetonia retusa	**<1**	**0.5**
Xanthorrhoea preissii	**<1**	**1**

Yanchep PTA Site Q7

Described by **BS** **Date 4/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 371889 mE, 6508240 mN
Soil White sand
Vegetation Low heath on low sand dunes
Veg Condition Excellent
Fire Age 5-10 years

Species List:

Name	Cover	Height
Acacia cochlearis	**<1**	**1.5**
Acacia cyclops	**1**	**2**
Austrodanthonia occidentalis	**<1**	**0.1**
Beyeria cinerea	**3**	**0.2**
Bromus diandrus	**<1**	**0.2**
Cassytha sp.	**<1**	**creeping**
Conostylis candicans subsp. candicans	**3**	**0.3**
Desmocladus flexuosus	**5**	**0.05**
Gompholobium tomentosum	**<1**	**0.2**
Hardenbergia comptoniana	**<1**	**creeper**
Hemiandra pungens	**5**	**0.6**
Kennedia prostrata	**<1**	**creeper**
Lechenaultia linarioides	**<1**	**0.3**
Lepidosperma pubisquameum	**2.5**	**0.2**
Lepidosperma scabrum	**<1**	**0.3**
Leucopogon insularis	**<1**	**0.4**
Lomandra maritima	**20**	**0.25**
Melaleuca systena	**10**	**0.9**
Opercularia vaginata	**1**	**0.2**
Pelargonium capitatum	**2**	**0.4**
Poa bulbosa	**<1**	**0.6**
Podolepis gracilis	**<1**	**0.1**
Romulea rosea	**<1**	**0.15**

Scaevola thesioides subsp. thesioides	**1**	**0.2**
Silene gallica	**<1**	**0.2**
Templetonia retusa	**<1**	**0.5**

Yanchep PTA Site Q8

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 **371981 mE, 6508164 mN**

Soil **Light brown sand**

Rock Type **Occasional limestone outcropping**

Vegetation **Tall shrubland/scrub**

Veg Condition **Good**

Fire Age **10+ years**

Notes **Same as Q6**

Species List:

Name	Cover	Height
Banksia dallanneyi	**<1**	**0.15**
Banksia sessilis	**10**	**2**
Briza maxima	**<1**	**0.25**
Bromus diandrus	**10**	**0.2**
Calothamnus quadrifidus	**3**	**1.1**
Carpobrotus edulis	**4**	**0.2**
Cassytha sp.	**1**	**creeping**
Comesperma calymega		**0.3**
Conostylis candicans	**<1**	**0.25**
Dianella revoluta	**1**	**0.7**
Ehrharta calycina	**<1**	**1.2**
Gladiolus sp.	**<1**	**1**
Gompholobium capitatum	**<1**	**0.2**
Hakea trifurcata	**3**	**1**
Hardenbergia comptoniana	**1**	**creeping**
Lomandra maritima	**3**	**0.3**
Medicago polymorpha		**0.2**
Melaleuca systena	**2.5**	**0.6**
Moraea flaccida	**<1**	**1.5**
Opercularia vaginata	**<1**	**0.2**
Petrorhagia dubia	**2**	**0.3**

Poa bulbosa	**<1**	**1.2**
Rhagodia baccata	**<1**	**1.6**
Spyridium globulosum	**55**	**2**
Templetonia retusa	**1**	**1.5**
Tripterococcus brunonis	**<1**	**0.45**
Ursinia anthemoides	**<1**	**0.2**

Yanchep PTA Site Q9

Described by **BS** **Date: 5/11/2010** **Type:** **10x10**

Location

MGA Zone: 50 **372088 mE, 6508111 mN**

Soil **Brown sand**

Vegetation **Shrubland over Lomandra maritima Herbland**

Veg Condition **Degraded**

Fire Age **10-15 years**

Species List:

Name	Cover	Height
Acacia cyclops	**6**	**2**
Acacia saligna	**30**	**3**
Avena barbata	**<1**	**0.6**
Beyeria cinerea	**1.0**	**0.2**
Brassica tournefortii	**<1**	**0.3**
Carpobrotus edulis	**<1**	**0.1**
Conostylis candicans subsp. candicans	**1**	**0.15**
Ehrharta calycina	**<1**	**0.7**
Euphorbia terracina	**15**	**0.4**
Lagurus ovatus	**2**	**0.25**
Lomandra maritima	**15**	**0.5**
Pelargonium capitatum	**20**	**0.4**
Phyllanthus calycinus	**<1**	**0.5**
Tricoryne elatior	**<1**	**0.2**

Yanchep PTA Site Q10

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone 50 **372176 mE, 6508072 mN**

Soil **Brown sand**

Vegetation **Shrubland**

Veg Condition **Degraded**

Fire Age **10-15 years**

Species List:

Name	Cover	Height
Acacia cyclops	**5**	**1.5**
Acacia saligna	**2**	**1.5**
Acanthocarpus preissii	**5**	**0.4**
Austrostipa flavescens	**<1**	**1**
Avena barbata	**1.5**	**0.4**
Conostylis candicans	**<1**	**0.2**
Desmocladus flexuosus	**5**	**0.1**
Euphorbia terracina	**15**	**0.3**
Lagurus ovatus	**1**	**0.3**
Lepidosperma pubisquameum	**<1**	**0.25**
Lomandra maritima	**7**	**0.25**
Melaleuca systena	**7**	**1.2**
Opercularia vaginata	**<1**	**0.15**
Pelargonium capitatum	**3**	**0.5**
Petrorhagia dubia	**<1**	**0.3**
Phyllanthus calycinus	**1.5**	**0.3**
Spyridium globulosum	**10**	**1.5**
Tricoryne elatior	**<1**	**0.2**

Yanchep PTA Site Q11

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone 50 372344 mE, 6508010 mN
Soil Light brown sand
Vegetation Open Banksia woodland
Veg Condition Degraded
Fire Age 10-20 years

Species List:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia cyclops	**1**	**1.5**		
	Acacia saligna	**<1**			
	Avena barbata	**1**	**0.4**		
	Banksia attenuata	**60**	**5**		
	Briza maxima	**10**	**0.2**		
	Bromus diandrus	**2**	**0.4**		
	Carpobrotus edulis	**7**	**prostrate**		
	Conostylis aculeata	**<1**	**0.3**		
	Desmocladus flexuosus	**<1**	**0.1**		
	Ehrharta longiflora	**8**	**2**		
	Eryngium pinnatifidum subsp. pinnatifidum		**<1**	**0.2**	
	Euphorbia terracina	**4**	**0.2**		
	Jacksonia sternbergiana	**3**	**2.6**		
	Lagurus ovatus	**<1**	**0.2**		
	Leucopogon propinquus	**1.5**	**0.4**		
	Lolium perenne	**<1**	**0.3**		
	Lomandra maritima	**2**	**1.5**		
	Pelargonium capitatum	**<1**	**0.2**		
	Petrorhagia dubia	**<1**	**0.3**		
	Phyllanthus calycinus	**1**	**0.4**		
	Ptilotus drummondii var. drummondii	**<1**	**0.2**		
	Spyridium globulosum	**1**	**1.4**		
	Trifolium campestre	**1.5**	**0.05**		

Ursinia anthemoides	**<1**	**0.2**
Xanthorrhoea preissii	**5**	**1.6**

Yanchep PTA Site Q12

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone 50 **372496 mE, 6507981 mN**

Soil **Brown sand**

Vegetation **Tall Open Shrubland over Open Low heath**

Veg Condition **Good - Degraded**

Fire Age **5-10 years**

Species List:

Name	Cover	Height
Acacia saligna	**6**	**2.6**
Austrostipa flavescens	**<1**	**0.6**
Avena barbata	**2**	**0.6**
Bromus diandrus	**1**	**0.5**
Clematis linearifolia	**<1**	**creeper**
Conostylis aculeata	**1.5**	**0.25**
Desmocladus flexuosus	**<1**	**0.15**
Euphorbia terracina	**5**	**0.4**
Kennedia prostrata	**<1**	**prostrate**
Lagurus ovatus	**1**	**0.1**
Lepidosperma pubisquameum	**4**	**0.25**
Leucopogon parviflorus	**3**	**0.4**
Lomandra maritima	**45**	**0.4**
Melaleuca systena	**15**	**1.1**
Romulea rosea	**<1**	**0.1**
Spyridium globulosum	**1**	**0.5**
Xanthorrhoea preissii	**5**	**3.5**

Yanchep PTA Site Q13

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone 50 **372561 mE, 6507958 mN**

Soil **Light brown, light yellow sands**

Vegetation **Open Banksia woodland**

Veg Condition **Completely degraded**

Fire Age **15-20+ years**

Species List:

Quad	Name	Cover	Height	Specimen	Notes
	Acacia saligna	**<1**	**1**		
	Arctotheca calendula	**<1**	**0.05**		
	Banksia attenuata	**30**	**5**		
	Banksia dallanneyi	**<1**	**0.1**		
	Bromus diandrus	**1.0**	**0.3**		
	Carpobrotus edulis	**2**	**0.1**		
	Conostylis aculeata	**<1**	**0.5**		
	Corynotheca micrantha	**<1**	**0.4**		
	Daucus glochidiatus	**<1**	**0.1**		
	Ehrharta longiflora	**<1**	**0.2**		
	Euphorbia terracina	**<1**	**0.2**		
	Hypochaeris glabra	**<1**			
	Jacksonia furcellata	**<1**	**0.1**		
	Lagurus ovatus	**<1**	**0.15**		
	Lomandra maritima	**2**	**0.5**		
	Moraea flaccida	**<1**	**0.4**		
	Petrorhagia dubia	**<1**	**0.2**		
	Rhagodia baccata	**<1**	**0.4**		
	Trifolium campestre	**<1**	**0.05**		
	Xanthorrhoea preissii	**15**	**2.5**		

Yanchep PTA Site Q14

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone 50 373774 mE, 6506900 mN
Soil Brown sand
Vegetation Banksia Low Open Woodland
Veg Condition Degraded - Completely Degraded
Fire Age 15+ years

Species List:

Name	Cover	Height	Notes
Acacia saligna	**1**	**1**	**mostly dead**
Arctotheca calendula	**<1**	**0.2**	
Avena barbata	**<1**	**0.4**	
Banksia attenuata	**10**	**8**	
Bromus diandrus	**<1**	**0.2**	
Carpobrotus edulis	**<1**	**0.1**	
Erodium cicutarium	**<1**	**0.3**	
Lolium perenne	**<1**	**0.3**	
Melaleuca systena	**1**	**0.8**	
Moraea flaccida	**60**		**dead**
Trachyandra divaricata	**<1**	**0.5**	
Xanthorrhoea preissii	**8**	**1.5**	

Yanchep PTA Site Q15

Described by **BS** **Date Type:** **Q** **10x10**
Season: **Uniformity:**

Location

MGA Zone 50 **373735 mE** **6506979 mN**
Habitat
Soil **Brown sand**
Rock Type
Vegetation **Banksia Low Open Woodland**
Veg Condition **Degraded - Completely Degraded**
Fire Age **15+ years**

Species List:

Name	Cover	Height
Acacia saligna	**6**	**7**
Avena barbata	**<1**	**0.7**
Banksia attenuata	**5**	**3**
Bromus diandrus	**3**	**0.25**
Bromus sp.	**10**	**0.6**
Clematis linearifolia	**6**	**0.6**
Erodium cicutarium	**1.5**	**0.2**
Leucopogon parviflorus	**<1**	**0.3**
Melaleuca systena	**<1**	**0.4**
Rhagodia baccata	**30**	**0.7**

Yanchep PTA Site Q16

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone 50 **372889 mE, 6507836 mN**

Soil **Brown sand**

Vegetation **Banksia Low Open Woodland**

Veg Condition **Excellent - Very Good**

Fire Age **10+ years**

Species List:

Name	Cover	Height
Acacia saligna	**8**	**3.5**
Austrostipa flavescens	**1**	**1**
Avena barbata	**<1**	**1**
Banksia attenuata	**5**	**2.3**
Banksia dallanneyi	**<1**	**0.1**
Bromus diandrus	**<1**	**0.5**
Conostylis candicans	**1**	**0.2**
Desmocladus flexuosus	**10**	**0.1**
Lepidosperma pubisquameum	**0.5**	**0.15**
Lomandra maritima	**40**	**0.3**
Melaleuca systena	**35**	**1**
Poa porphyroclados	**<1**	**1**
Rhagodia baccata	**2**	**0.4**
Romulea rosea	**<1**	**0.2**
Xanthorrhoea preissii	**4**	**1.6**

Yanchep PTA Site Q17

Described by **BS** **Date 5/11/2010** **Type:** **10x10**

Location

MGA Zone 50 **372778 mE, 6507883 mN**

Soil **Slight yellow to brown sand**

Vegetation

Veg Condition **Excellent - Very Good**

Fire Age **7-15 years**

Species List:

Name	Cover	Height
Acacia cochlocarpa subsp. cochlocarpa	**2.5**	**1.2**
Acacia saligna	**7**	**3**
Avena barbata	**<1**	**0.4**
Banksia attenuata	**3**	**1.6**
Banksia dallanneyi	**1**	**0.15**
Bromus diandrus	**1**	**0.35**
Carpobrotus edulis	**3**	**0.15**
Conostylis candicans subsp. candicans	**2**	**0.3**
Crassula decumbens var. decumbens	**<1**	**0.05**
Desmocladus flexuosus	**10**	**0.1**
Hardenbergia comptoniana	**<1**	**creeper**
Heliophila pusilla	**<1**	**0.15**
Leucopogon insularis	**<1**	**0.4**
Lobelia tenuior	**<1**	**0.1**
Lomandra maritima	**50**	**0.4**
Melaleuca systena	**9**	**0.9**
Opercularia vaginata	**<1**	**0.1**
Poa porphyroclados	**<1**	**0.3**
Romulea rosea	**<1**	**0.1**
Xanthorrhoea preissii	**17**	**2.2**

Yanchep PTA Site Q18

Described by **GO** **Date 4/10/2012** **Type:** **10x10**

Location

MGA Zone 50 **373123 mE, 6507815 mN**

Soil **White Sand**

Vegetation: Dune top

Veg Condition **Excellent**

Fire Age **7-15 years**

Species List:

Name	Cover	Height
Lomandra hermaphroidta	**30-70**	**0.3**
Melaleuca systena	**30-70**	**1.2**
Desmocladus flexuosus	**10-30**	**0.1**
Poaceae sp.	**30-70**	**0.15**
Romulea rosea	**2-10**	**0.15**
Lysimachia arvensis	**2-10**	**0.1**
Acacia cochlearis	**2-10**	**1**
Phyllanthus calycinus	**<2**	**0.3**
Tricoryne elatior	**<2**	**0.2**

Yanchep PTA Site Q19

Described by **GO** **Date 4/10/2012** **Type:** **10x10**

Location

MGA Zone 50 **375574 mE, 6503339 mN**
Soil **Slight yellow to brown sand**
Vegetation: Shrubland
Veg Condition **Very Good**
Fire Age **5-20 years**

Species List:

Name	Cover	Height
Banksia attenuata	**10-30**	**3**
Banksia menziesii	**2-10**	**2**
Acacia pulchella	**2-10**	**1**
Hibbertia hyperiocoides	**30-70**	**0.4**
Stylidium androsaceum	**2-10**	**0.15**
Xanthorrhoea preissii	**<2**	**1**
Burchadia congesta	**<2**	**0.3**
Brixa maxima	**10-30**	**0.15**
Watsonia meriana	**<2**	**0.7**
Hakea prostata	**30-70**	**2**
Lysimachia arvensis	**10-30**	**0.1**
Mesomelaena pseudostygia	**30-70**	**0.5**
Calothamnus quadrifidus	**1**	**2-10**
Grevillea pilulifera	**2-10**	**0.5**
Sowerbaea laxiflora	**<2**	**0.3**
Trachymene pilosa	**<2**	**0.1**
Ursinia anthemoides	**10-30**	**0.2**
Pimelea ?ferruginea	**<2**	**0.3**
Desmocladus flexuosus	**<2**	**0.2**

Yanchep PTA Site Q20

Described by **GO** **Date 4/10/2012** **Type:** **10x10**

Location

MGA Zone 50 **375108mE, 6503863mN**
Soil **White Sand**
Vegetation: Shrubland
Veg Condition **Pristine - Excellent**
Fire Age **5-20 years**

Species List:

Name	Cover	Height
Calothamnus quadrifidus	**2-10**	**0.8**
Banksia attenuata	**2-10**	
Hibbertia hyperiocoides	**30-70**	**0.4**
Watsonia meriana	**<2**	**0.5**
Banksia sessilis	**2-10**	**1**
Mesomelaena pseudostygia	**30-70**	**0.5**
Leucopogon sp. (being verified)	**<2**	**0.2**
Trachymene pilosa	**2-10**	**0.1**
Stylidium neurophyllum	**2-10**	**0.3**
Briza maxima	**2-10**	**0.2**
Opercularia vaginata	**<2**	**0.1**
Rhodanthe sp.	**<2**	**0.1**
Drosera intricate	**2-10**	**0.1**
Petrophile macrostachya	**2-10**	**1**
Allocasuarina humilis	**2-10**	**1**
Conostylis aculeata	**2-10**	**0.3**
Conostephium pendulum	**<2**	**0.3**
Burchadia congesta	**<2**	**0.3**
Eucalyptus foecunda	**Adjacent to quadrat**	

Eucalyptus decipiens subsp. *decipiens* Low Open Woodland over *Banksia sessilis* Tall Open Scrub over *Hibbertia hypericoides*, *Xanthorrhoea preissii* and *Calothamnus quadrifidus* subsp. *quadrifidus* Open Low Heath over *Conostylis aculeata*, *Mesomelaena pseudostygia* and *Desmocladus flexuosus* Very Open Herbland

Yanchep PTA Site R1

Described by **Date** **Type:** R
Season: **Uniformity:**

Location

MGA Zone 50 371470 **mE** 6508895 **mN**
Habitat
Soil
Rock Type
Vegetation
Veg Condition Degraded - Good
Fire Age
Notes

Species List:

Quad	Name	Cover C Class	Height	Specimen	Notes
	Acacia cyclops	5	5		
	Acacia saligna	3	2.5		
	Acacia saligna	35	1.5		
	Acanthocarpus preissii	2	0.5		
	Avena barbata	45	0.6		
	Bromus diandrus	45	0.35		
	Conostylis pauciflora subsp. euryrhipis	1.5	0.15		10+ plants @ 371497,
	Euphorbia terracina	2	0.3		
	Hardenbergia comptoniana	2	creeper		
	Leptomeria preissiana	1	0.8		
	Lolium multiflorum	<1	0.4		
	Melaleuca systena	0.5	1.2		
	Olearia axillaris	<1	2		
	Schinus molle	<1	2		
	Spyridium globulosum	4	2		

Yanchep PTA Site R2

Described by BS **Date** **Type:** R
Season: **Uniformity:**

Location

MGA Zone 50 373084 **mE** 6507774 **mN**
Habitat
Soil
Rock Type
Vegetation
Veg Condition
Fire Age
Notes Same vegetation as spot X

Species List:

Quad	Name	Cover C Class	Height	Specimen	Notes
	Acacia saligna	10	4		

Carpobrotus edulis	1	prosrate	
Hibbertia racemosa	<1	4	
Leptospermum laevigatum	60	4.5	
Leucopogon parviflorus	5	0.9	
Lomandra maritima	25	0.5	
Melaleuca systena	40	1	
Spyridium globulosum	1	0.5	
Veronica calycina	<1	prostrate	BS23
Xanthorrhoea preissii	15	1.5	

Yanchep PTA Site R3

Described by BS **Date** **Type:** R

Season: **Uniformity:**

Location

MGA Zone 50 373674 **mE** 6507211 **mN**

Habitat

Soil

Rock Type

Vegetation Over weed species

Veg Condition Completely Degraded

Fire Age

Notes

Species List:

Quad	Name	Cover	C Class	Height	Specimen	Notes
	Acacia saligna	5		2-4		
	Carpobrotus edulis	3		prostrate		
	Melaleuca systena	10		1.4		

Yanchep PTA Site R4

Described by GO **Date** **Type:** R

Season: **Uniformity:**

Location

MGA Zone 50 373883 **mE** 6506645 **mN**

Veg Condition Degraded - Completely Degraded

Fire Age

Notes

Species List:

Quad	Name
	Banksia attenuata
	Acacia saligna
	Melaleuca systena
	Xanthorrhoea preissii
	Banksia littoralis
	Sowerbaea laxiflora

Appendix E – Fauna Results

Table 13 Fauna species observed within the study area

Family	Genus	Species	Common Name	Status	2010	2012
Birds						
Acanthizidae	*Acanthiza*	*apicalis*	Inland Thornbill			X
Acanthizidae	*Acanthiza*	*chrysorrhoa*	Yellow-rumped Thornbill			X
Acanthizidae	*Gerygone*	*fusca*	Western Gerygone			X
Acanthizidae	*Smicrornis*	*brevirostris*	Weebill		X	
Accipitridae	*Aquila*	*audax*	Wedge-tailed Eagle	Mi	X	X
Accipitridae	*Accipiter*	*Fasciatus fasciatus*	Brown Goshark			X
Accipitridae	*Elanus*	*caeruleus*	Black-shouldered Kite	Mi	X	
Accipitridae	*Haliastur*	*sphenurus*	Whistling Kite	Mi, Ma	X	
Cacatuidae	*Calyptoryhynchus*	*latirostris*	Carnaby's Black Cockatoo	T, En		X
Cacatuidae	*Eolophus*	*roseicapilla*	Galah		X	X
Campephagidae	*Coracina*	*novaehollandae*	Black-faced Cuckoo-shrike			X
Campephagidae	*Lalage*	*sueurii*	White-winged Triller			X
Casuariidae	*Dromaius*	*novaehollandiae*	Emu		X	X
Columbidae	*Ocyphaps*	*lophotes*	Crested Pigeon		X	
Columbidae	*Phaps*	*chalcoptera*	Common Bronzewing		X	X
Corvidae	*Corvus*	*coronoides*	Australian Raven		X	X
Cracticidae	*Cracticus*	*tiibicen*	Australian Magpie		X	X
Cracticidae	*Cracticus*	*torquatus*	Grey Butcherbird		X	X
Cuculidae	*Chalcites*	*lucidus*	Shining Bronze Cuckoo			X
Falconidae	*Falco*	*cenchroides*	Nankeen Kestrel		X	
Halcyonidae	*Dacelo*	*novaequineae*	Laughing Kookaburra	int	X	X
Hirundinidae	*Hirundo*	*neoxena*	Welcome Swallow			X
Maluridae	*Malurus*	*leucopterus*	White-winged Fairy-wren			X
Maluridae	*Malurus*	*splendens*	Splendid Fairy-wren		X	X

Family	Genus	Species	Common Name	Status	2010	2012
Megaluridae	*Cincloramphus*	*mathewsi*	Rufous Songlark			X
Meliphagidae	*Anthochaera*	*carunculata*	Red Wattlebird		X	X
Meliphagidae	*Lichenostomus*	*ornatus*	Yellow-plumed Honeyeater		X	
Meliphagidae	*Lichenostomus*	*leucotis*	White-eared Honeyeater			X
Meliphagidae	*Phylidonyris*	*niger*	White-cheeked Honeyeater			X
Meliphagidae	*Lichenostomus*	*virescens*	Singing Honeyeater		X	X
Meliphagidae	*Lichmera*	*indistincta*	Brown Honeyeater		X	X
Meropidae	*Merops*	*ornatus*	Rainbow Bee-eater	Ma, Mi	X	
Monarchidae	*Grallina*	*cyanoleuca*	Magpie-lark		X	X
Pachycephalidae	*Pachycephala*	*pectoralis*	Golden Whistler			X
Pachycephalidae	*Pachycephala*	*rufiventris*	Rufous Whistler		X	X
Pardalotidae	*Pardalotus*	*striatus*	Striated Pardalote			X
Petroicidae	*Microeca*	*fascinans*	Jacky Winter			X
Petroicidae	*Petroica*	*goodenovii*	Red-capped Robin		X	
Psittacidae	*Platycercus*	*zonarius semitorquatus*	Twenty-eight Parrot		X	X
Rhipiduridae	*Rhipidura*	*fuliginosa*	Grey Fantail		X	X
Rhipiduridae	*Rhipidura*	*leucophrys*	Willie Wagtail		X	X
Timaliidae	*Zosterops*	*lateralis*	Silvereye		X	
Reptiles						
Elapidae	*Pseudonaja*	*affinis*	Dugite		X	
Gekkonidae	*Strophurus*	*spinigerus spinigerus*	Spiny-tailed gecko		X	
Pygopodidae	*Lialis*	*burtonis*	Burton's Legless Lizard			X
Scincidae	*Cryptoblephorus*	*buchananii*	Fence Skink		X	X
Scincidae	*Ctenotus*	*fallens*	West Coast Ctenotus		X	
Scincidae	*Hemiergis*	*quadrilineata*	Two-toed Mulch Skink			X
Scincidae	*Menetia*	*greyii*	Common Dwarf Skink			X
Scincidae	*Tiliqua*	*rugosa rugosa*	Western Bobtail		X	X
Varanidae	*Varanus*	*gouldii*	Gould's Monitor		X	
Mammals						

Family	Genus	Species	Common Name	Status	2010	2012
Canidae	*Vulpes*	*vulpes*	Red Fox	int	X	X
Felidae	*Felis*	*catus*	Feral Cat	int	X	
Leporidae	*Oryctolagus*	*cuniculus*	European Rabbit	int	X	X
Macropodidae	*Macropus*	*fuliginosus*	Western Grey Kangaroo		X	X
Muridae	*Mus*	*musculus*	House Mouse	int		X
Suidae	*Sus*	*scrofa*	Pig	int		
Tachyglossidae	*Tachyglossus*	*aculeatus*	Echidna			X
Invertebrates						
	Pachysaga	*munggai or strobila*	Cricket	P1 or P3		X
	Synemon	*gratiosa*	Graceful Sun-moth	T, Vu	X	

GHD

GHD House, 239 Adelaide Tce. Perth, WA 6004
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\28717\WP\127143.docx

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft	G Owen, G Gaikhorst	T Moulds		T Moulds		05/11/2012
0	G Owen, G Gaikhorst	T Moulds		T Moulds		06/11/2012

www.ghd.com