



CLIENTS | PEOPLE | PERFORMANCE

# **Main Roads Western Australia**

## **Bunbury Port Access Project Stage 2 Environmental Impact Assessment**

November 2010



# Contents

Acronyms	5
Executive Summary	7
1. Introduction and Planning Background	11
1.1 Introduction	11
1.2 Planning Background	11
2. Description of the Proposal	14
2.1 Project Scope	14
2.2 Study Area	15
3. Scope of EIA Report	16
3.1 Previous Studies	17
3.2 Environmental Factors	17
4. Existing Environment	19
4.1 Climate	19
4.2 Air Quality	19
4.3 Landform and Soils	20
4.4 Contaminated Sites	21
4.5 Hydrology and Hydrogeology	21
4.6 Terrestrial Flora and Vegetation	23
4.7 Topsoil Management	29
4.8 Revegetation and Landscaping	29
4.9 Fauna	29
4.10 Environmentally Sensitive Areas	32
4.11 Reserves and Conservation Areas	32
4.12 Landuse	32
4.13 Visual Amenity	33
4.14 Non-Indigenous Heritage	33
4.15 Indigenous Heritage	34
4.16 Traffic Noise	35



4.17	Construction Phase Impacts	35
5.	Clearing of Native Vegetation	37
6.	Stakeholder Consultation	38
7.	Summary of Recommendations	39
8.	Limitations	41
9.	References	42

## Table Index

Table 1	GBRS Ministerial Conditions relevant to the Project	13
Table 2	Landform Systems Traversed by the project	20
Table 3	Vegetation Complexes Traversed by the Project	23
Table 4	Regional Assessment of Vegetation Extent (Swan Coastal Plain)	24
Table 5	Government of Western Australia (2000) Vegetation Condition Scale	25
Table 6	Estimated Project Clearing Footprint	26
Table 7	Reserves Traversed by the Project	32
Table 8	European Heritage Sites within a 2km radius of the Study area.	33
Table 9	Aboriginal Heritage Sites Impacted by the Project	35

## Figure Index

Figure 1	Project Locality Plan
Figure 2	Bunbury Port Access Road Project Stage 2 Alignment, Alignment Options and GBRS Road Reservation
Figure 3	DoW Wetland Mapping
Figure 4	Environmentally Sensitive Areas and EPP Lakes
Figure 5	Site Vegetation Mapping and Vegetation Condition
Figure 6	Specially Protected Fauna Species Observations
Figure 7	Specially Protected Fauna Species Impacts



## Appendices

- A Ministerial Statement 000697
- B Site Photographs
- C Flora and Vegetation Survey
- D Assessment of the Project Against the Ten Clearing Principles
- E Fauna Survey





## Acronyms

ACMC	Aboriginal Cultural Materials Committee
ASS	Acid Sulphate Soil
BORR	Bunbury Outer Ring Road
CCW	Conservation Category Wetland
CEMP	Construction Environmental Management Plan
DEC	Department of Environment and Conservation
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
DIA	Department of Indigenous Affairs
DoW	Department of Water
DRF	Declared Rare Flora
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EPBC	Environmental Protection and Biodiversity Conservation
EPP	Environmental Protection Policy
ESA	Environmentally Sensitive Area
FMP	Flora / Fauna Management Plan
GBRS	Greater Bunbury Regional Scheme
IBRA	Interim Biogeographic Regionalisation of Australia
LRP	Landscape Remediation Plan
IUCN	International Union for Conservation of Nature MRWA
MRWA	MRWA Western Australia
NEPM	National Environmental Protection Measure
NES	National Environmental Significance
NNTT	National Native Title Tribunal
NPBH	New Perth to Bunbury Highway
NRM	Natural Resource Management



PAR	Port Access Road
PDWSA	Public Drinking Water Source Area
PEC	Priority Ecological Community
PF	Priority Flora
RIWI	Rights in Water and Irrigation Act
SWMP	Surface Water Management Plan
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TFD	Threatened Flora Database
TMP	Traffic Management Plan
WAHERB	Herbarium of Western Australia
WAPC	Western Australian Planning Commission.



## Executive Summary

Main Roads Western Australia (Main Roads) proposes to construct Stage 2 of the Bunbury Port Access Project (the Project) at Bunbury, Western Australia to provide improved access to the Bunbury Port. The Project comprises Stage 2 of the Bunbury Port Access Road (PAR) and Stage 1 of the Bunbury Outer Ring Road (BORR) projects as shown at Figure 1. Main Roads commissioned GHD Pty Ltd (GHD) to prepare an Environmental Impact Assessment (EIA) for the Project.

The Project will provide a high standard route for traffic to access Bunbury Port and the developing Preston industrial areas east of Bunbury, without having to travel through developed areas of Bunbury. Once completed, the BORR (Stages 2 and 3) will also provide a complete highway bypass of Bunbury for inter-regional traffic.

Main Roads propose to submit this EIA to the WA Environmental Protection Authority (EPA) for a determination under Section 38 of the *Environmental Protection Act, 1986* (EP Act) on the requirement of formal assessment. Should the project not be formally assessed Main Roads will then seek to conduct the clearing under its Statewide Purpose Clearing Permit (CPS 818/4) or seek a Purpose Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

The WA Minister for the Environment released Statement No. 000697 prescribing conditions for the implementation of the Greater Bunbury Region Scheme (GBRS) in October 2005. Conditions prescribed that may be relevant to the PAR Stage 2 Project relate to:

- ▶ Preparation of management plans including acid sulphate soils, drainage and foreshore
- ▶ Preparation of an offset strategy
- ▶ Site rehabilitation

The section of the PAR Stage 2 that forms part of this Project is not the ultimate alignment for the PAR as detailed in the GBRS. The re-alignment has been implemented to avoid impact on three areas of vegetation of concern noted by the EPA (EPA, 2003) - Areas 9, 10 and 11. The current BORR Stage 1 alignment impacts on two of the three vegetated areas (Area 6 and Area 8) raised as a concern by the EPA (2003) in their assessment of the GBRS. These areas are the Preston River crossing (Area 6) and the vegetation east of Moore Road. Re-alignment of the BORR Stage 1 to avoid these areas has not been possible.

Main Roads propose to submit this EIA to the Commonwealth Minister for the Environment through the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) for a decision on the requirement for formal assessment under the provisions of the Commonwealth *Environmental Protection and Biodiversity Conservation Act (EPBC Act) 1999*. Discussions with DSEWPC have included the requirement for an offset for impacts on fauna species protected under the EPBC Act.

Preliminary ASS site investigations conducted by Main Roads have confirmed the presence of ASS and PASS within the project site. Much of the road will be constructed above the existing ground level on imported fill and disturbance of ASS is likely to occur at the bridge crossings and where drainage



structure require excavation.

Lot 4 is traversed by the PAR Stage 2 and is located between Boyanup Picton Road and the Ferguson River. The lot has a Memorial (K539512) placed on the Certificate of Title for the property under the *Contaminated Sites Act 2003*. The Memorial issued by the Contaminated Sites Branch of DEC notes that the "Site has been classified as Possibly contaminated – investigation required".

Much of the project traverses 'Multiple Use' wetland, apart from where it traverses the Preston River which is recognised as a Conservation Category Wetland and an Environmental Sensitive Area. Another 'Multiple Use' wetland also protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* occurs immediately adjacent to the road reserve south west of the proposed Boyanup Picton Road intersection. This wetland is also defined as an ESA. The northern foreshore of this wetland will be impacted by roadworks.

Main Roads will be required to seek approval from the Department of Water to construct bridges at the Preston River and Ferguson River as both watercourses are 'declared' under the *Rights in Water and Irrigation (RIWI) Act 1914*.

The vegetation complexes in the study area comprise Swan, Guildford and Southern River. The Swan Complex is considered *Endangered* with only 5% of its pre-European extent remaining and the Southern River and Guildford are considered '*Vulnerable*' with less than 20 %. Clearing required for the project will have some impact on these vegetation types.

Much of the Project Area comprises cleared land, parkland cleared or Blue Gum plantation. The native vegetation within the project area was classified into three vegetation types:

- ▶ *Corymbia calophylla* , *Agonis flexuosa* open woodland
- ▶ *Melaleuca raphiophylla* over mixed pasture grasses
- ▶ *Eucalyptus rudis* woodland over mixed pasture grasses

Site vegetation is considered to have moderate species diversity with a total of 128 plant taxa from 34 families recorded during the site flora surveys. Of these 31 species are introduced or not endemic to the area – one of which is considered as a Declared Plant. The vegetation condition within the project site varied from Condition 3-4 (very good - good) to Condition 6 (completely degraded).

The expected clearing for the project, as detailed below, is approximately 16 ha of native vegetation and 27.5 ha of farmland/plantation based a 3m clearing from the edge of the earthworks, and a 5m clearing corridor for the construction of sections of new fencing required for the project.



## Estimated Bunbury Port Access Project Stage 2 Project Clearing Footprint

Vegetation Type	Vegetation Condition	Approximate Area (ha)
Corymbia calophylla/Agonis flexuosa open woodland	3-4	2.0
	4	0.5
	4-5	8.5
Eucalyptus rudis woodland	4-5	2.0
	5	1.5
Melaleuca raphiophylla wetland	4	1.5
Paddock/Cleared	6	27.5
Total Footprint of Road		43.5

An assessment of the proposed clearing against the Ten Clearing Principles and it is concluded that the project clearing may be at variance with Principles b), e) and f).

Construction of the PAR Stage 2 will not impact on any Declared Rare Flora, priority flora, Threatened Ecological Communities or priority Ecological Communities.

A dieback survey conducted for the Project noted that the site was dieback uninterpretable due to the lack of suitable indicator species with a high probability of *Phytophthora* occurrence.

A total of eight reptiles, four native mammals, seven non-native mammals, and 32 birds were recorded at the site. Of these five conservation significant fauna species were identified:

- ▶ Western Ring-tailed Possum
- ▶ Baudin's Black Cockatoo
- ▶ Carnaby's Black Cockatoo
- ▶ Red-tailed Black Cockatoo
- ▶ Rainbow Bee-eater

Project clearing will impact on approximately 5.5 ha of actual foraging habitat for Black cockatoo species and approximately 3.5 ha of active Western Ringtail Possum habitat. It is expected that the clearing impact will be revised as the project develops.

No conservation reserves of European heritage sites will be impacted by the project.

Aboriginal heritage surveys of the site have identified seven recorded Aboriginal heritage sites that will be impacted by the Project. Main Roads has sought approval to use the land at these sites for the



construction of the PAR Stage 2 under Section 18 of the *Aboriginal Heritage Act 1972*.

Main Roads has consulted with a number of stakeholders in respect to the project including:

- ▶ Office of the Environmental Protection Authority
- ▶ Department of Sustainability, Environment, Water, Population and Communities
- ▶ Office of the Environmental Protection Authority
- ▶ Department of Water Bunbury office
- ▶ Leschenault Catchment Council
- ▶ South West Environment Centre

A number of recommendations are detailed in this EIA to assist Main Roads in avoiding and managing the potential environmental impacts of constructing the PAR Stage 2 project.



# 1. Introduction and Planning Background

## 1.1 Introduction

Main Roads Western Australia (Main Roads) proposes to construct Stage 2 of the Bunbury Port Access Project (the Project) at Bunbury, Western Australia to provide improved access to the Bunbury Port. The Project comprises Stage 2 of the Bunbury Port Access Road (PAR) and Stage 1 of the Bunbury Outer Ring Road (BORR) projects as shown at Figure 1. Main Roads commissioned GHD Pty Ltd (GHD) to prepare an Environmental Impact Assessment (EIA) for the Project.

The Project will provide a high standard route for traffic to access Bunbury Port and the developing Preston industrial areas east of Bunbury, without having to travel through developed areas of Bunbury. Once completed, the BORR (Stages 2 and 3) will also provide a complete highway bypass of Bunbury for inter-regional traffic.

Main Roads propose to submit this EIA to the WA Environmental Protection Authority (EPA) for a determination under Section 38 of the *Environmental Protection Act, 1986* (EP Act) on the requirement of formal assessment. Should the project not be formally assessed Main Roads will then seek to conduct the clearing under its Statewide Purpose Clearing Permit (CPS 818/4) or seek a Purpose Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Similarly, Main Roads propose to submit this EIA to the Commonwealth Minister for the Environment through the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) for a decision on the requirement for formal assessment under the provisions of the Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999*.

## 1.2 Planning Background

The original route for the PAR is the result of a major road planning study completed by Main Roads in 1997 in conjunction with planning for the BORR. The route for the PAR was subsequently included in the Glen Iris Structure Plan and together with the route for the BORR included in the draft Greater Bunbury Region Scheme (GBRS). The routes for the PAR and the BORR were advertised to the broader community as part of the GBRS assessment commencing in about 2000. The GBRS was effected in November 2007 after being passed through parliament, and gazetted in January 2008.

### Port Access Road Stage 2

More detailed planning for the PAR has been underway since 2004 when the Western Australian State Government announced a commitment to construct PAR Stage 1. This resulted in changes to the configuration of the connecting roads and Stage 1 was constructed with minor adjustments to the ultimate route.

Detailed planning recently undertaken for PAR Stage 2 has resulted in major changes to the alignment from that shown in the GBRS due to environmental and planning constraints. PAR Stage 2 essentially traverses either cleared farmland and /or Blue Gum plantation compared to the GBRS alignment which traverses native vegetation. It should be noted that the alignment of the PAR Stage 2 that forms part of



this Project is not that as currently detailed as Primary Regional Road in the GBRS. Figure 2 shows the alignment options considered during these recent changes, the current PAR Stage 2 alignment and the PAR Stage 2 alignment detailed in the GBRS.

### **Bunbury Outer Ring Road**

The BORR forms a major component of the planned regional road network for the Greater Bunbury Area. The concept for the road was originally developed by Main Roads in the early 1970's in consultation with other State Government departments and local authorities, and in conjunction with the preparation of the Bunbury Region Plan. The concept alignment for the road linked the Perth Bunbury Highway north of Bunbury to the Bussell Highway south of Bunbury over a distance of some 19 km. It was planned as a controlled access four lane divide highway, with the ultimate capability of being upgraded to freeway status. The ultimate alignment was subsequently included in the GBRS.

The current Project includes BORR Stage 1 only. The remaining two stages to link Stage 1 to the Perth Bunbury Highway in the north, and Stage 3 to link to the Bussell Highway south of Bunbury are yet to be confirmed in respect to detailed alignment and construction timing.

The design for the BORR Stage 1 that forms part of this Project has recently been modified to meet current design standards and to provide for a future transit (rail) corridor in the median. The alignment has been slightly realigned outside of the reservation detailed as Primary Regional Road in the GBRS to avoid future impacts on major services. This re-alignment is also shown at Figure 2.

### **Environmental Assessment Background**

The Western Australian Planning Commission (WAPC) prepared the GBRS which was then referred to the EPA for assessment under Section 48 of the EP Act in August 2006. In their report (Bulletin 1108) the EPA provided specific recommendations in respect to the PAR and BORR. The EPA recommended some sections of these roads be re-aligned; and that the assessment of a number of environmental factors be deferred so that the EPA would have the opportunity to assess the projects in more detail at the appropriate stage in the planning process. Both PAR and BORR were identified as requiring more detailed consideration due to deferred factors – remnant vegetation, wetlands, fauna and noise.

As noted above the section of the PAR Stage 2 that form part of this Project is not the ultimate alignment for the PAR as detailed in the GBRS. This current alignment has avoided impact on the three areas of vegetation of concern to the EPA (EPA, 2003) - Areas 9, 10 and 11. The current BORR Stage 1 alignment impacts on two of the three vegetated areas (Area 6 and Area 8) raised as a concern by the EPA (2003) in their assessment of the GBRS. These areas are the Preston River crossing (Area 6) and the vegetation east of Moore Road (Area 8). Re-alignment of the BORR Stage 1 to avoid these areas has not been possible.

The WA Minister for the Environment released Statement No. 000697 prescribing conditions for the implementation of the GBRS in October 2005, a copy is included at Appendix A. Conditions prescribed that may be relevant to the current Project and their status are detailed in the Table 1 below:





**Table 1 GBRS Ministerial Conditions Relevant to the Bunbury PAR Stage 2 Project**

Condition	Requirement	Status
Condition 2	Re-alignment of sections of Bunbury Port Access Road and Bunbury Outer Ring Road	Not relevant to this project
Condition 3	Preparation of Management Plans: - Drainage, Nutrient and Water Management Plan - Acid Sulphate Soil Management Plan	To be prepared as part of project development
Condition 4	Completion of a Biological Survey	Completed as part of EIA preparation
Condition 5	Preparation of an offset strategy prior to construction of the Port Access Road and Bunbury Outer Ring Road	To be prepared as part of project development
Condition 5	Preparation of a foreshore management plan for the Ferguson River in the vicinity of the Port Access Road.  Rehabilitation of the strip of land adjacent to the road in the vicinity of lot 15 South Western Highway.	To be prepared as part of project development  To be conducted as part of project offset

This EIA provides recommendations to address the outstanding requirements of Ministerial Statement 000697 during the implementation of the Project in Section 3.



## 2. Description of the Proposal

### 2.1 Project Scope

The Bunbury Port Access Project Stage 2 will provide improved access to the Bunbury Inner harbour and the Picton industrial area from areas south of Bunbury serviced by South Western Highway. It will also provide an alternative route for freight vehicles seeking to bypass congested sections of South Western Highway and Robertson Drive (Inner Ring Road and the Eelup Rotary). It will improve travel times for traffic entering the port and Picton industrial area, as well as some inter-regional traffic wishing to bypass Bunbury.

The Project comprises the following:

- Construction of a 3 km extension of the existing PAR Stage 1 as a single carriageway from South Western Highway (north) in Picton to Stage 1 of the BORR including the construction of a two lane bridge over the Ferguson River
- Construction of a new Intersection at the connection to PAR Stage 1 with the Boyanup Picton Road at the northern extent of the Project
- Construction of 4 km section of BORR (including 3 km of 4 lane dual carriageway) from the Picton Boyanup Road to South Western Highway (south) including the construction of two dual lane bridges over the Preston River
- Construction of new Intersections at the junctions with South Western Highway, Boyanup Picton Road, Moore Road and Port Access Road Stage 1
- Upgrading an adjacent 1.6 km section of the Boyanup Picton Road
- Upgrading the Boyanup Picton Road intersection with Martin Pelusey Road
- Widening approximately 400m of the South Western Highway south of the BORR Stage 1 intersection
- Construction of drainage structures including basins and culverts
- Installation of fencing on the road reserve
- Construction of access roads to severed properties
- Construction of parking bays on the BORR Stage 1 section north east of PAR Stage 2 intersection
- Pre-construction activities including geotechnical investigations and service utilities re-locations, and
- Landscaping and rehabilitation works.

Pre-construction works are planned to commence in early 2011 with roadworks to commence in late 2011 with the road opened to traffic in 2013.



## **2.2 Study Area**

The Project study area included a nominal width of 50-100m either side of the proposed roadworks. Significant environmental aspects, including potential conservation significant fauna habitat outside of the Project Area, relevant to the project were also considered during preparation of this EIA. Appendix B. includes a number of photographs representative of the Project Area.



### 3. Scope of EIA Report

This EIA has been prepared to identify the primary environmental and social impacts associated with the proposed construction of the Project. Based on the environmental assessment recommendations are proposed for additional work and/or preparation and implementation of specific management plans to address relevant environmental factors through the development and construction of the Project.

In addition to information provided by Main Roads Project Manager (Mr G Zoetelief) investigations and activities conducted for the preparation of this EIA include:

- Site specific flora and vegetation surveys (spring 2009 and 2010)
- Site specific fauna surveys (spring 2009)
- Site specific Dieback Survey and Management Plan (2010)
- Site specific Aboriginal heritage survey comprising archival research, archaeological investigations and consultation with traditional owners who form part of the Gnaala Karla Booja Native Title Group conducted in 2010 (Goode, 2010)
- Consideration of Ministerial Statement 000697 in respect to PAR and BORR
- An assessment of all environmental aspects likely to require referral of the project to the WA EPA and/or the Commonwealth DSEWPC;
- A review of the Department of Environment and Conservations (DEC) Rare and Threatened Flora database;
- A review of DEC's Threatened Fauna database;
- A review of local and regional significance of plant communities;
- A review of the Western Australian Museum database for threatened and endangered fauna;
- A review of DEC's Environmentally Sensitive Areas database
- A review of the DSEWPC's database for areas listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC) Act 1999;
- A review of European and Aboriginal Heritage within the survey area, including information from:
  - The Western Australian Heritage Commission;
  - A review of the Australian Heritage Places Inventory;
  - The Department of Indigenous Affairs.

The EIA also considers (but does not apply for) additional clearances required under legislative requirements including those required under the following Acts:

- *Environmental Protection and Biodiversity Conservation Act 1999*;
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*;
- *Rights in Water and Irrigation Act 1914*;



- *Conservation and Land Management Act 1984;*
- *Wildlife Conservation Act 1950;*
- *Heritage of Western Australia Act 1990; and*
- *Aboriginal Heritage Act 1972.*

Also included in this EIA is a brief summary of consultation conducted by Main Roads with relevant environmental stakeholders in recent times.

### **3.1 Previous Studies**

A number of previously unpublished reports have been completed for the BORR and PAR projects on behalf of Main Roads. The information contained in them was examined during the preparation of the EIA and included where relevant. These previous studies include:

HGM Maunsell. (2002). Bunbury Outer Ring Road – Environmental Assessment and management Plan. Unpublished report prepared for Main Roads Western Australia. TH00570112.

Bennett Environmental Consulting. (2003). Vegetation and Flora of Selected Areas – Bunbury Outer Ring Road and Port Access Road. Unpublished Report prepared for Main Roads Bunbury.

Bennett Environmental Consulting. (2008). Significant Flora Along Proposed Bunbury Ring Road. Unpublished Report prepared for Main Roads Bunbury.

GHD. (2002). Bunbury Outer Ring Road and Port Access Road – Wetlands and Threatened Community Survey. Unpublished Report prepared for Main Roads WA.

### **3.2 Environmental Factors**

Based on an assessment of the project and a review of studies completed relevant environmental factors that require discussion to clearly define the impact of the project, and require consideration throughout project development and construction have been determined as follows:

- Air quality
- Acid sulphate soils
- Contaminated sites
- Hydrology and Hydrogeology – surface water, wetlands, drainage, groundwater and public drinking water sources
- Terrestrial flora and vegetation – vegetation type, vegetation extent and status, vegetation condition, clearing, significant flora and Threatened Ecological Communities
- Dieback
- Weeds and Declared Plants
- Fauna – threatened fauna, habitat values, habitat linkages
- Topsoil management



- Revegetation and landscaping
- Environmentally Sensitive Areas
- Reserves and conservation areas
- Landuse
- Visual amenity
- Aboriginal heritage
- European heritage
- Traffic noise, and
- Construction phase impacts.

These factors are addressed in the following sections of this report.



## 4. Existing Environment

The environmental and social issues considered relevant to this project area outlined in the following section. Each of the environmental factors includes a baseline environmental description, and where appropriate, is followed by an assessment of potential environmental impacts. Where relevant, recommendations are provided for additional investigations and/or management measures during the implementation of the project.

### 4.1 Climate

The project area has a climate that is broadly described as Mediterranean, experiencing warm dry summers and cool wet winters. The closest weather recording station to the project area is located at Bunbury. Recorded historical climate data for Bunbury has been summarised below:

- Mean Annual Maximum Temperature Range – 29.8°C (January) to 17.3°C (July)
- Mean Annual Minimum Temperature Range – 15.6°C (February) to 7.2°C (August)
- Mean Annual Rainfall – 743.3 mm
- Mean Annual Rain days per year – 88 days

*(Source: Bureau of Meteorology – Climate Averages for Australian Sites: Averages for Bunbury, 2009)*

### 4.2 Air Quality

Main Roads Guidelines on Air Quality (Reference) notes that Air Quality Impact Assessments are not required for projects where:

- A new road that is predicted to have traffic flow less than (or a major upgrade resulting in an increase of traffic flows less than) 10,000 vehicles per day in urban areas or 15,000 vehicles per day in rural areas
- Residential or other sensitive receptors are not within 200 metres of the road centre; and
- Where background air quality (measured by the nearest DoE fixed monitoring site) does not exceed 25% of the NEPM for ambient air quality and has remained below this level for the 12 months ending at the time of the assessment.

In respect to these criteria:

- The expected traffic volumes using the project are not expected to exceed 15 000 vehicles per day prior to 2021
- There are no residential or sensitive receptors within 200m of the Project, and
- DEC air monitoring in Bunbury is focused on particulate mater (PM10 and PM2.5) only. DEC monitoring data for 2009 (DEC, 2009) recorded one (1) exceedence for PM10 and seven (7) exceedences for PM2.5 of the relevant National Environmental Protection Measures NEPM) for



these air quality parameters. These exceedences were attributed to smoke haze.

There is likely to be some dust lift as a result of road construction activities and cartage operations. These are expected to be localised to the near vicinity of the project and transport routes, and be limited to the construction period. Consequently an Air Quality Impact Assessment is not likely to be required for the Project.

Overall, the Project is expected to marginally reduce vehicle emissions as a consequence of providing improved access to the Bunbury Port. Some reduction in vehicle emissions within the airshed could reasonably be expected through increased vehicle efficiency.

### 4.3 Landform and Soils

The project area occurs on the Swan Coastal Plain and traverses two landform systems – Bassendean and Pinjarra Dune Systems described in Table 2.

**Table 2 Landform Systems Traversed by the project**

Soil system	Description
Bassendean	Comprises of pale deep sand, semi-wet soil and wet soil of sand dunes and sand plains with flats and swamps on sandy alluvium over sedimentary rocks in the Swan Coastal Plain from Busselton to Jurien
Pinjarra	Poorly drained semi-wet grey deep sandy duplexes, brown loamy earths, pale sands and clays of the coastal plain on alluvium over sedimentary rocks in the Swan Coastal Plain from Perth to Capel

#### 4.3.1 Acid Sulphate Soils

The DEC (2006) describes Acid Sulphate Soils (ASS) as naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). In an undisturbed state below the watertable these soils are benign. If the soils are drained, excavated or exposed by lowering of the water table, the sulphides will react with oxygen to form sulphuric acid. Inappropriate disturbance of these soils can flush acidic leachate to groundwater and surface waters and cause off site environmental impacts.

Mapping of ASS by the Western Australian Planning Commission (WAPC) has been prepared for areas of the state, particularly where the impact of ASS has been assessed as being significant. The WAPC mapping identifies the Project site as having a moderate to low risk of ASS within 3m of the soil surface, apart from the section north of the Ferguson River and at the Preston River crossing where there is a high to moderate risk of acid sulphate soils within 3m of the surface.

Preliminary ASS site investigations conducted by Main Roads have confirmed the presence of ASS and PASS within the project site. Much of the road will be constructed above the existing ground level on imported fill and disturbance of ASS is likely to occur at the bridge crossings and where drainage structures require excavation.

#### Recommendation 1





It is recommended that Main Roads conduct detailed ASS investigations where site excavations are required for road and bridge construction, and that an Acid Sulphate Soil Management Plan be developed and implemented for the construction works.

#### **4.4 Contaminated Sites**

A search of the DEC's Contaminated Sites Database (2010) indicates that there is one listed contaminated site located at the northern extent of the Project Area. Lot 50 at the corner of the South Western Highway and the Boyanup Picton Road has been classified under the *Contaminated Sites Act 2003* as 'contaminated - remediation required'. The site forms part of the larger Western Power Picton Depot. An Intermediate Risk Assessment for hydrocarbon and pesticides present in soil and groundwater has indicated remediation of the site is required to mitigate potential risks to human health, the environment and/or any environmental value (DEC 2009).

The extent of the potentially contaminated surface site excludes the land required for this Project. In 2009 Main Roads conducted site investigation and clean up during the construction of the PAR Stage 1 of the road reservation in this section of the Project. No other impact from construction of the Project is expected on the land of Lot 50 not remediated for contamination.

Lot 4 located between Boyanup Picton Road and the Ferguson River has a Memorial (K539512) placed on the Certificate of Title for the property under the *Contaminated Sites Act 2003*. The Memorial issued by the Contaminated Sites Branch of DEC notes that the "Site has been classified as Possibly contaminated – investigation required".

Prior to Main Roads purchasing this portion of Lot 4 it is recommended that Phase 1 Contaminated Site Assessment be conducted to ensure that the land purchase does not include any contaminated land.

##### **Recommendation 2**

Main Roads conduct a Phase 1 Contaminated Site Assessment of the portion of Lot 4 to be purchased for the construction of the Project.

Lot 521 located north east of the BORR Stage 2 intersection with the Boyanup Picton Road has previously been used for a intensive piggery. Preliminary ground investigations conducted at this site by Main Roads have not revealed any indications of ground contamination on the road alignment.

#### **4.5 Hydrology and Hydrogeology**

##### **4.5.1 Surface Water, Drainage and Wetlands**

Most of the study area is situated in the low lying alluvial plains which are typically palusplain with several small seasonal damplands and sumplands.

As shown at Figure 3 the majority of the project traverses 'Multiple Use' wetland apart from where it crosses the Preston River which is defined as a 'Conservation' category wetland.

As shown at Figure 4 the Preston River is also recognised as an Environmentally Sensitive Area under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. The river foreshore and



its surrounds has been grazed for many years and essentially comprises an overstorey native trees with a weed and pasture understorey. The watercourse will be impacted by the construction of two bridges at the highway crossing.

A 'Multiple Use' wetland also protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* occurs immediately adjacent to the road reserve south west of the proposed Boyanup Picton Road intersection. This wetland is also defined as an ESA. The wetland has been grazed for a number of years and the roadworks embankment is expected to impact on the immediate fringe of this wetland.

Impact on these wetlands should be minimised as part of the final design process and appropriate construction management.

### **Recommendation 3**

It is recommended that Main Roads:

- minimise the impact of the project on the Preston and Ferguson Rivers through the preparation and implementation of a Foreshore Management Plan to minimise the impact and manage the impact through the construction process, and
- prepare and implement a Drainage, Nutrient and Water Management Plan for the Project to minimise the impact of off-road drainage on the environment with specific consideration of the EPP wetland (located south of the intersection of Moore Road and Boyanup Picton Road).

A search of the *EPBC Act* Protected Matters Search Tool indicates that there are no wetlands or watercourses of national or international significance in the vicinity of the proposed alignment.

### **Administrative Areas**

Both the Preston River and Ferguson River are declared under the *Rights in Water and Irrigation (RIWI) Act 1914*. Main Roads will be required to seek approval from the Department of Water to construct bridges at these crossings. The proposed bridge crossings and bridge concept designs were discussed with officers from the DoW in September 2010 who raised no concerns regarding the proposed bridge construction.

### **Recommendation 4**

Main Roads seek approval from the Department of Water under the *Rights in Water and Irrigation Act 1914* for the construction of the Preston and Ferguson River bridges.

#### **4.5.2 Groundwater**

The Project lies within the Dardanup sub-area of the Bunbury Groundwater Area, proclaimed under *RIWI Act 1914*. Any groundwater bores required for construction water will require approval from the DoW.

### **Recommendation 5**

Main Roads seek approval from the Department of Water under the *Rights in Water and Irrigation Act 1914* for the construction of groundwater bores for construction purposes.



#### 4.5.3 Public Drinking Water Source Protection Areas

The Project Area is not located within any gazetted Public Drinking Water Source Areas (PDWSA) protected under the *Country Areas Water Supply Act 1947*.

The Bunbury Water Reserve is approximately 3.3 km west from the study area and will not be impacted by the Project.

### 4.6 Terrestrial Flora and Vegetation

#### 4.6.1 Vegetation Type

Regional vegetation has been mapped by Heddle, *et al.* (1980) at a scale of 1:250,000 based on major geomorphic units on the Swan Coastal Plain. The Project traverses three vegetation complexes defined by Heddle as detailed in Table 3 below:

**Table 3 Vegetation Complexes Traversed by the Project**

Vegetation Complex	Vegetation Description
Swan	Woodland of <i>Eucalyptus rudis</i> and <i>Melaleuca raphiophylla</i> with localised occurrences of low open forest of <i>Casuarina obesa</i> and <i>Melaleuca cuticularis</i> .
Guildford	Mixture of Open Forest to Tall Open Forest of Wandoo ( <i>Eucalyptus wandoo</i> ) Jarrah and Marri, and Woodland of Wandoo (with rare occurrences of <i>Eucalyptus lane-poolei</i> ). Minor components include Flooded Gum.
Southern River	Open Woodland of Jarrah ( <i>Eucalyptus marginata</i> ), Marri ( <i>Corymbia calophylla</i> ) and Banksia species with Fringing Woodland of Flooded Gum ( <i>Eucalyptus rudis</i> ) and paperbark ( <i>Melaleuca raphiophylla</i> ) along creek beds.

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 under-represented 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):

#### 4.6.2 Vegetation Extent and Status

According to Heddle (1980) the pre-European vegetation extent remaining for the above vegetation types is as shown in Table 4.

**Table 4 Regional Assessment of Vegetation Extent (Swan Coastal Plain)**

Vegetation Complex	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining (of Pre-European Extent)	Status
Swan	92,497	4 662	5.0	Endangered
Guildford	15,783	2 454	15.6	Vulnerable
Southern River Complex	57,979	11 501	19.8	Vulnerable

The WA Environmental Protection Authority (EPA) recognises vegetation associations that are not well represented in reserves as being 'significant'. Vegetation complexes which have 10%-30% of their pre-European extent remaining may be considered regionally significant. Proposals that would impact on a vegetation complex with 10% or less remaining may be formally assessed by the EPA (EPA 2006).

As can be seen from the above table all of the vegetation complexes within and likely to be impacted by the project are beneath the EPA's 30% threshold. The Swan Complex is considered *Endangered* with only 5% of its pre-European extent remaining and the Southern River and Guildford are considered 'Vulnerable' with less than 20 %. Clearing required for the project will have some impact on these vegetation types.

#### 4.6.3 Site Vegetation

A Senior Ecologist and Environmental Scientist from GHD conducted flora and vegetation surveys of the Project Area in October 2008 and November 2009 congruent with EPA Guidance Statement No. 51. The vegetation within the project area was classified into three vegetation types:

- ▶ *Corymbia calophylla* , *Agonis flexuosa* open woodland
- ▶ *Melaleuca raphiophylla* over mixed pasture grasses
- ▶ *Eucalyptus rudis* woodland over mixed pasture grasses

The site vegetation mapping is shown at Figure 5. Much of the site comprises cleared land, parkland cleared or Blue Gum plantation.

#### 4.6.4 Vegetation Condition Assessment

The vegetation condition of the Project Area was assessed during the site survey based on the Bush Forever (Government of Western Australia, 2000) vegetation condition ratings scale. This scale recognises a level of 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;



- The potential for natural or assisted regeneration.

The ratings in this scale are described in Table 5

**Table 5 Government of Western Australia (2000) Vegetation Condition Scale**

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

The vegetation within the study area varied from vegetation Condition 2 to Condition 6 as shown at Figure 5. Large areas of the project area were completely degraded with no native vegetation present. Where native vegetation remained it has been degraded by past landuse activities such as services installation, drainage works, grazing, rubbish dumping and firewood cutting. Furthermore, all areas supporting native vegetation have been impacted to some extent by weeds. Regardless some clearing of native vegetation will be required for the development of the project.



#### 4.6.5 Clearing Area

Based on the site vegetation and the Concept Design (August 2010) provided by Main Roads the expected construction footprint and clearing area of the project has been estimated, based on a 3m clear zone for the safe construction of the road. The expected clearing areas are shown in Table 5 below:

**Table 6 Estimated Project Clearing Footprint**

<b>Vegetation Type</b>	<b>Vegetation Condition</b>	<b>Approximate Area (ha)</b>
Corymbia calophylla/Agonis flexuosa open woodland	3-4 (Very good to Good)	2.0
	4 (Good)	0.5
	4-5 (Good to degraded)	8.5
Eucalyptus rudis woodland	4-5 (Good to degraded)	2.0
	5 (Degraded)	1.5
Melaleuca raphiophylla wetland	4 (Good)	1.5
Paddock/Cleared	6 (Degraded)	27.5
Total Footprint of Road		43.5

Table 6 shows that the expected clearing for the project is approximately 16 ha of native vegetation and 27.5 ha of farmland/plantation based a 3m clearing from the edge of the earthworks, and a 5m clearing corridor for the construction of sections of new fencing required for the project.

The clearing of any native vegetation is regulated by the DEC and requires a permit under Part V of the *Environmental Protection Act (1998)*. Main Roads has been issued with a Statewide Purpose Clearing Permit (CPS 818/4) which provides for clearing for roadworks to occur under certain conditions and prescribes specific management and offset requirements.

CPS 818/4 requires an assessment to clear native vegetation for roadworks against the "Ten Clearing Principles". The clearing required for this project has been assessed against the "Ten Clearing Principles" as detailed at Appendix D

#### 4.6.6 Site Flora

Vegetation within the Project Area is considered to have moderate species diversity. A total of 128 plant taxa from 34 families were recorded during the site flora surveys. The dominant plant families recorded from the Project Area included:



Fabaceae	23 taxa
Myrtaceae	12 taxa
Proteaceae	10 taxa
Orchidaceae	8 taxa
Poaceae	8 taxa

A full list of the species noted during the site surveys is included at Appendix C.

Of the 128 flora species identified 31 are introduced species or species not endemic to the area.

#### 4.6.7 Significant Flora

Species of conservation significant flora are protected under both State and Commonwealth Acts. Any activities that are deemed to have a significant impact on species that are recognised by the EPBC Act 1999 and the *Wildlife Conservation Act 1950* can trigger referral to the DEWHA and/or the EPA.

In addition to the *EPBC Act*, significant flora in Western Australia is protected by the *Wildlife Conservation Act 1950*. This Act, which is administered by DEC, protects Declared Rare Flora (DRF) species. The DEC also maintains a list of priority listed flora species.

A search was undertaken through the DEC Threatened Flora Database (TFD) *Declared Rare and Priority Flora (DR&PF)* list and the *Western Australian Herbarium (WAHERB)* Specimen database for species of rare and priority flora located within approximately 5 km of the Project Area. The DEC search also includes results from their *Declared Rare and Priority Flora (DR&PF)* list. These species, as listed at Appendix C, are those known to exist in the general surrounds of the project Area and were searched for during the site survey.

Two plant species of conservation significance were located during the surveys undertaken by Bennett Environmental Consulting Pty Ltd (2007). These were:

- ▶ A number of *Diuris drummondii* (DRF) plants were recorded in Lot 5 north of Walrodt Road and east of PAR Stage 2. The closest of the identified plants is some 260m east of PAR Stage 2 and 400m north of BORR Stage 1
- ▶ The Priority 4 species, *Acacia flagelliformis* was identified in the power line corridor approximately 200 m north of Walrodt Road beyond the Project Area

The occurrence of these species was confirmed during the GHD 2008 and 2009 surveys. Neither of these plant populations will be impacted by the Project.

No other conservation significant species were identified during the GHD site surveys.

#### 4.6.8 Threatened Ecological Communities

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

Searches using the EPBC Act Protected Matters Search Tool and the DEC's TEC database indicated



that no TECs are listed or known to occur within the study area. This was confirmed by the site assessments conducted by GHD in June and July 2010.

A search for Threatened and Priority Ecological Communities (TEC/ PEC) was undertaken referencing the Department of Environment and Conservation's Threatened Ecological Communities database. No TECs are known to be located within the Project Area. This was confirmed during the site surveys conducted by GHD 2008 and 2009.

#### **4.6.9 Dieback**

*Phytophthora cinnamomi* threatens over 2300 (40%) 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. Dieback has a widespread but discontinuous range in areas of the south west with an annual rainfall above 400 mm (Dieback Working Group, 2005).

A site dieback assessment of the project area was conducted by Gleven Consulting on behalf of Main Roads in September 2010. This survey noted that

*"Phytophthora* occurrence information found no vegetation communities that were mappable for *Phytophthora* within the proposed construction area and easement. All seasonally inundated areas and water drainage systems within the development area have a high probability of previous epidemic disease activity."

In respect to management measures during construction of the project Gleven Consulting (2010) concluded that:

"Considering high levels of disturbance and the probability of pre-existing epidemic infestation, this report does not recommend the use of uninfested basic raw material on low priority sites within the study area."

#### **4.6.10 Weeds and Declared Plants**

Weeds that are, or may become, a problem to agriculture can be formally classified as Declared Plants under the *Agriculture and Related Resources Protection Act 1976*. A total of 31 weed species were identified as being present in the Project Area. These species are listed at Appendix C.

One weed species identified in the project area - Arum Lily (*Zantedeschia aethiopica*) is a Declared Weed Species prescribed by the *Agriculture and Related Resources Protection Act, 1976*. As such these weeds are required to be controlled as a part of the on-going road reserve management and during road construction activities.

#### **Recommendation 6**

Main Roads should manage the Declared Weed populations with the project area during road construction activities and on-going road reserve management.





#### **4.7 Topsoil Management**

The management of topsoil during roadworks is important to optimise the use of topsoil resources and to minimise the risk of transporting weeds within the project area.

##### **Recommendation 7**

Main Roads should prepare and implement a Topsoil Management Plan (TMP) for the Project to identify the use and movement of in-situ topsoil during road works.

#### **4.8 Revegetation and Landscaping**

Opportunities to enhance the areas visual amenity, floral diversity and potential for fauna habitat exist along the entire project length. This could be achieved through appropriate topsoil management and revegetating cleared areas within the corridor with local “provenance” native seed and / or seedlings. Main Roads Project Manager advised that there is scope for revegetation once the project is complete and proposes to develop and implement a Revegetation and Landscape Plan for the project.

##### **Recommendation 8**

Main Roads should prepare and implement a Revegetation and Landscape Plan for the project.

#### **4.9 Fauna**

A GHD Zoologist and Environmental Scientist conducted Level 1 rare fauna survey of the Project Area over four days and three nights between the period of 17<sup>th</sup> February and the 5<sup>th</sup> March 2009 and over four days and two nights between the 4<sup>th</sup> and 7<sup>th</sup> of August 2009. The fauna assessments were undertaken in accordance with *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia – Guidance Statement No. 56*, EPA, Perth.

A total of eight reptiles, four native mammals, seven non-native mammals, and 32 birds were recorded at the site. Of these five conservation significant fauna species were identified:

- Western Ring-tailed Possum
- Baudin’s Black Cockatoo
- Carnaby’s Black Cockatoo
- Red-tailed Black Cockatoo
- Rainbow Bee-eater

Domestic and pest species were also identified in the study area including European Cow (*Bos Taurus*), Horse (*Equus caballus*), Wild Pig (*Sus scrofa*), Cat (*Felis catus*), Domestic Dog (*Canis domesticus*), rabbit (*Oryctolagus cuniculus*) and Fox (*Vulpes vulpes*).

A discussion of the conservation significant species identified during the site surveys is included below.

##### **Western Ringtail Possum**

Western Ringtail Possum’s were observed at a number of locations within and adjacent to the project. Area with dreys, scats or animal signs recorded. The species was observed in a range of vegetation that



supported Peppermint (*Agonis flexuosa*), *Banksia spp*, *Melaleuca spp*, Marri Tree (*Corymbia calophylla*) and/or Jarrah (*Eucalyptus marginata*) in most native woodland areas along the alignment. The canopy of the woodland was generally dense and overlapping, suitable for arboreal activity.

Clearing for roadworks will impact habitat areas for this species.

#### **Forest Red-tailed Black Cockatoo**

Forrest Red-tailed Black Cockatoo's were observed along the alignment by either sightings or call identification. Several feeding areas were found particularly in Marri and Banksia woodlands. As there are three species of Black cockatoo in the area it is difficult to determine which species were using each area for food without actual sightings.

#### **Baudin's Black Cockatoo**

Baudin's Black Cockatoo was reported once during the assessment via calls and possible feathers but these can be easily confused with Carnaby's Black Cockatoo. Several feeding areas were found particularly where Marri or Banksia is present. As there was evidence of three species of Black cockatoo in the area it was difficult to determine which species were using each area for food without sightings.

#### **Carnaby's Black Cockatoo**

Carnaby's Black Cockatoo was not heard or observed over the assessment but foraging areas were found in Banksia woodland suggesting usage by the species. At one site feathers of one of the White tailed species were recorded and suspected to be Carnaby's Black Cockatoo. Several other feeding areas were also found particularly in Marri / Peppermint woodland. Again as there are three species of Black cockatoo in the area it is difficult to determine which species were using each area for food without actual sightings.

Observation of cockatoo foraging were concentrated in the remnant vegetation in the vicinity of Walrodt, Moore and Picton Boyanup Roads. Clearing for roadworks will impact cockatoo foraging habitat.

#### **Rainbow Bee-eater**

Rainbow bee-eaters were recorded at one site within the Project Area. Birds were observed on a sand ridge on Lot 5 north of Walrodt Road, where three pairs of birds were observed nesting at the site. This site is approximately 700m north of the PAR Stage 2.

Fauna observations of conservation significant species within the Project Area are as shown at Figure 6 while details of the Fauna Survey are included at Appendix E.

#### **4.9.1 Habitat Value**

The habitat between Walrodt Road and Boyanup-Picton Road provides confirmed habitat for Western Ringtail Possum and foraging habitat for Black Cockatoos. No confirmed cockatoo nesting trees were observed within the Project Area but significant large trees are present and are suitable for breeding. Rainbow Bee-eaters were observed breeding and utilising areas between Walrodt Road and Boyanup-Picton Road.

The potential impacts on these species in respect to habitat loss have been identified based on the



estimated project clearing area as shown at Figure 7 and are detailed below:

Potential loss of Western Ringtail Possum habitat	5.5 ha
Potential loss of Black Cockatoos habitat	3.5 ha

It is expected that the clearing impact will be revised as the project develops.

A number of other significant species may also be present between Walrodt Road and Boyanup-Picton Road namely *Lerista lineata*, *Morelia imbricata*, *Phascogale tapoatafa tapoatafa*, *Dasyurus geoffroii*, *Nyctophilus timoriensis major*, *Falsistrellus mackenziei*, *Macropus irma* and *Isoodon obesulus fusciventer*.

#### **4.9.2 Habitat Linkages**

The vegetation between Walrodt Road and Boyanup-Picton Road provides a significant habitat linkage to the large area of native vegetation in Lot 5 to the north, and the smaller remnants to the south and east.

The vegetation along both the Ferguson and Preston Rivers, although of poorer condition also provide a regional linkage along the watercourses.

#### **4.9.3 Environmental Offset and Impact Management**

##### **Environmental Offset**

Main Roads has had preliminary discussions with officers from the Office of the EPA and DSEWPC in respect to the preparation and implementation of an Environmental Offset Strategy for the Project. This strategy will address such matters as offset land purchases and rehabilitation of degraded areas of offset land. The Offset Strategy will be prepared in line with Condition 5 issued by the WA Minister for the Environment in Statement 000697.

Such an offset would place in secure tenure areas of remnant vegetation and rehabilitated areas to offset the project clearing impacts on conservation significant and other fauna species.

##### **Recommendation 9**

Main Roads should prepare and implement an Environmental Offset Strategy for the Project in consultation with DEC and DSEWPC.

##### **Impact Management Strategies**

In addition to minimising clearing as far as practicable to retain habitat for all fauna species Main Roads proposes to:

- ▶ Provide access for fauna along the river foreshore beneath the Preston and Ferguson River bridges, and provide fauna underpasses beneath the road to create strategic habitat linkages
- ▶ Fence the Project in a manner to reduce the potential for fauna roadkill

##### **Recommendation 10**

Main Roads should prepare and implement fauna management measures as part of the Project



development.

#### 4.10 Environmentally Sensitive Areas

The Project passes or traverses four areas identified as Environmentally Sensitive Area (ESA) (Department of Environment and Conservation, 2010) defined under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. These areas, as shown at Figure 4. Two of these ESA's will be impacted by the PAR Stage 2:

- ▶ The Preston River which is defined as an ESA will be impacted by the construction of twin bridges crossing the river.
- ▶ The wetland located south of the corner of Moore Road and the Boyanup Picton Road has been identified as ESA. This wetland has been grazed for many years and the BORR Stage 1 will impact on the cleared wetland fringe.

No other ESAs occur within 100m of the Project. Or will be impacted.

Impacts on these areas of the project area should be minimised through the detailed design stage of the project.

#### 4.11 Reserves and Conservation Areas

The Preston River at the proposed bridge crossing occurs within Reserve 31 866, Reserve 45 201, and Lot 11. Details of these reserve areas are shown in Table 7 below.

**Table 7 Reserves Traversed by the Project**

Reserve Number	Purpose	Location	Responsible Agency	Reserve Area
31 866	Public Recreation	Preston River	State Lands Department	40.1 ha
45 201	Drainage	Preston River	State Lands Department	4.4 ha

Lot 11 is owned by the City of Bunbury and occurs between these reserves and includes a portion of the river/river foreshore.

No other reserves or formal conservation area will be directly impact by the development of the Project.

#### 4.12 Landuse

As noted at Section 1 and shown at Figure 2, the section of PAR Stage 2 that forms this current Project is not that as detailed as Primary Regional Road under the GBRs. This section of the Project traverses land zoned as industrial (north of the Ferguson River from PAR Stage 1) and rural from the Ferguson River to the BORR Stage 1 intersection. The industrial land is currently a degraded Blue Gum plantation



that forms a buffer to the CSBP Wesfarmers Picton operations. The section traversing the rural land is used for grazing and Blue Gum plantation.

The BORR Stage 1 section of the Project is congruent with the GBRS Primary Regional Road apart from where it deviates north of the GBRS reservation into rural zoned land between Walrodt Road and the Preston River crossing. This rural land is currently used for grazing and Blue Gum plantation.

Apart from the reserve areas noted above, the project traverses freehold land. Main Roads will initiate the land acquisition process prior to the commencement of construction.

There are no private residences within 200m of the Project alignment.

### 4.13 Visual Amenity

Construction of the project will impact on the existing visual amenity of the project area which traverses cleared farmland and plantation areas, apart from the existing industrial development, north of the Ferguson River in Picton and the existing industry on Moore Road.

Construction and use of the roads will reduce the visual amenity from the uninhabited surrounding properties. Construction impacts are not likely to be significant and will be short term. Ongoing operation of the road will be offset to some extent by the proposed revegetation of the road verges and surplus land as a component of the project.

### 4.14 Non-Indigenous Heritage

A search of the EPBC Protected Matters Search Tool did not identify any Commonwealth listed heritage sites within, or within the vicinity of the Project Area.

A search of the Western Australian Heritage Council's Heritage Places Database identified three registered heritage places within 2 km of the Project Area. These are listed in Table 8 below.

**Table 8 European Heritage Sites within a 2km radius of the Study area.**

No.	Name	Location	Const. Date	Regn. Dates
<b>LGA: Bunbury</b>				
00382	Picton Inn Hotel	Kaeshagen St off Vittoria Rd Picton - now Wollaston	1850	11/03/1997 05/11/1996
00344	Leschenault Homestead	9 Estuary Drive Bunbury	1846 1874	19/05/1992
00381	Forrest Homestead	South Western Hwy, nr Vittoria Rd Intersect Picton - now Wollaston	1849 1960	29/09/1998 02/06/1998

None of these sites will be impacted by the construction of the Project.



#### **4.15 Indigenous Heritage**

Recent Aboriginal heritage investigations commenced in 2009 with the preparation of a Desktop Aboriginal Heritage Survey (Goode, 2009) of the Project Area. This assessment was based on archival research of records managed by the WA Department of Indigenous Affairs (DIA) and previous Aboriginal Heritage surveys conducted during the earlier planning for the project.

After finalisation of the project alignment additional Aboriginal Heritage investigations were conducted in 2010. These are described below.

##### **Archaeological Survey**

The field survey was conducted on the 4<sup>th</sup> and 5<sup>th</sup> of August 2010 by Jacqueline Harris, Archaeologist, accompanied by Stuart Johnston as Assistant Archaeologist. The sample survey of the proposed road corridor route to identify any archaeological sites comprised two persons walking abreast in transects, spaced 30m apart in the wider sections or a single person walking transects in the narrow sections. In addition, predictive intensive transects were conducted at firebreaks, cleared patches, along the river bank where the route crosses on two occasions and any other area of site potential. The overall sampling percentage of the project area is estimated to be around 40% with the addition of predictive sampling.

The survey included verifying the position of previously registered archaeological sites that were located within the project area.

##### **Ethnographic Survey**

Ethnographic consultations focused upon providing significance assessments of affected sites for any necessary Section 18 consents were conducted on the 5<sup>th</sup> of October 2010 by Mr Brad Goode (Anthropologist), Mr Colin (Floyd) Irvine (Ethnographer), Mrs Angela Tarbotton (Assistant) and nine representatives of the Gnaala Karla Booja WC 98/58 Native Title Claim Group. Mr Neil McCarthy (Senior Environmental Scientist from GHD Pty Ltd) and Mr Gerry Zoetelief (Project Manager from Main Roads) were also present to provide technical information.

During the survey the Nyungar community were consulted with regards to Main Roads wish to seek ministerial consent to affect a number of previously recorded archaeological and ethnographic sites that have been verified by the archaeological survey and archival research that would be directly affected by the Project. The Nyungar community were generally supportive of this wish to seek consent, apart from one of the nine persons consulted who objected to building more bridges over the rivers on cultural grounds

##### **Outcome of the Aboriginal heritage survey**

The survey identified seven registered Aboriginal heritage sites that will be impacted by the Project. These sites and recommended management measures are detailed in Table 9 below.

**Table 9 Aboriginal Heritage Sites Impacted by the Project**

Site ID	Name	Site Type	Extent of Impact	Proposed management
4870	Bunbury 19	Artefact Scatter	Whole	Salvage & Relocate
4875	Bunbury 14	Artefact Scatter	Whole	Salvage & Relocate
4876	Bunbury 15	Artefact Scatter	Whole	Salvage & Relocate
4877	Bunbury 16	Artefact Scatter	Whole	Salvage & Relocate
4880	Bunbury 20	Artefact Scatter	Whole	Salvage & Relocate
19 795	Preston River	Mythological	30m either side of the high water mark ie 60m wide, and two ephemeral drainage lines that flow to the Preston River	Proprietary ritual followed by ethnographic and archaeological monitoring.
17976	Ferguson River	Mythological	30m either side of the high water	Proprietary ritual followed by ethnographic and archaeological monitoring.

Main Roads has since submitted an application under Section 18 of the *Aboriginal Heritage Act 1972* to use the land for the construction of the project. The application is expected to be considered by the Aboriginal Cultural Materials Committee at their meeting of December 2010. Main Roads will be required to comply with any conditions issued under the Section 18 application.

#### 4.16 Traffic Noise

State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning (WAPC, 2009) prescribes noise level objectives for Main Roads to manage traffic noise on road new projects.

As there are no noise sensitive receptors within 100m of the Project, the current land use is rural and land is progressive being rezoned to industrial land use a Traffic Noise Study is not required for the project.

#### 4.17 Construction Phase Impacts

Additional minor potential impacts requiring consideration and management during the projects construction phase include the following:

- Aboriginal heritage salvage and monitoring
- construction noise and vibration
- dust
- materials transport to site



- ▶ traffic access and safety
- ▶ fire management
- ▶ hazardous chemicals storage and handling; and
- ▶ waste disposal.

These impacts are expected to be short term (approximately 12 – 18 months) and are likely to be limited to the construction site, or its near environs. Management of these issues should be clearly defined through the preparation and implementation of a Construction Environmental Management Plan specific for the project.

#### **Recommendation 11**

Main Roads should prepare and implement a Construction Environmental Management Plan for the construction of the Project. Alternatively, the construction contractor should prepare a CEMP for main Roads approval prior to implementation as part of the project delivery. The CEMP should be followed during any pre-construction works.





## 5. Clearing of Native Vegetation

### Ten Clearing Principles

The clearing of any native vegetation is regulated by the DEC and requires a permit under Part V of the *Environmental Protection Act (1998)*. Main Roads has been issued with a Statewide Purpose Clearing Permit (CPS 818/4) which provides for clearing for roadworks to occur under certain conditions and prescribes specific management and offset requirements.

CPS 818/4 requires an assessment to clear native vegetation for roadworks against the “Ten Clearing Principles”. The clearing required for this project has been assessed against the “Ten Clearing Principles” as detailed at Appendix D and it is concluded that the project clearing may be at variance with Principles b), e) and f). These principles relate to:

- b) The vegetation comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.
- e) The vegetation is significant as a remnant of native vegetation in an area that has been extensively cleared.
- f) The vegetation is growing in, or in association with, an environment associated with a watercourse or wetland.

If the Environmental Protection Authority do not formally assess the project under the provisions of the EP Act then the project clearing may be conducted under the provisions of Main Roads Clearing Permit CPS 818/4. These requirements may include stakeholder consultation, environmental offsets, landscaping and environmental management plans.

### Recommendation 12

If the project is not formally assessed by the EPA Main Roads should comply with the requirements detailed in CPS 818/4.



## 6. Stakeholder Consultation

Main Roads has consulted with a range of environmental stakeholders during the development of the project in recent years. Stakeholders that have been consulted to date are detailed in the table below.

	Agency	Date	Attendees
1	Office of the Environmental Protection Authority	July 23, 2009 July 3, 2010	Gary Williams
2	Department of Environment and Conservation Bunbury office	March 19, 2010	Peter Hanley, Andrew Webb and Aminya Ennis
		August 27, 2010	Peter Hanley, Kim Williams, Andrew Webb and Aminya Ennis
3	Department of Water Bunbury office	September 3, 2010	Mike McKenna and Carol Anderson
		September 16, 2010	Site meeting with Mike McKenna and Krish Seewraj
4	DSEWPC	June 16, 2009	Site tour with Dr Andrew Weavers
		August 17, 2010	Teleconference with Dr Andrew Weavers and Tim Wyndam
5	Leschenault Catchment Council	October 23, 2009	Mike McKenna, Ben Deeley, Mike Whitehead and other members of the LCC
6	South West Environment Centre	September 21, 2009	Brenden Kelly, Bernard Bischoff, John Sherwood

It is understood that Main Roads will continue to consult with these, and other relevant stakeholders through the development of the project.

### Recommendation 13

Main Roads should continue to consult with relevant stakeholders during the development and implementation of the project.



## 7. Summary of Recommendations

The following section lists the recommendations proposed throughout the EIA for additional work to be conducted during the development and implementation of the Project.

### **Recommendation 1**

It is recommended that Main Roads conduct detailed ASS investigations where site excavations are required for road and bridge construction, and that an Acid Sulphate Soil Management Plan be developed and implemented for the construction works.

### **Recommendation 2**

Main Roads conduct a Phase 1 Contaminated Site Assessment of the portion of Lot 4 to be purchased for the construction of the Project.

### **Recommendation 3**

It is recommended that Main Roads:

- ▶ minimise the impact of the project on the Preston and Ferguson Rivers through the preparation and implementation of a Foreshore Management Plan to minimise the impact and manage the impact through the construction process, and
- ▶ prepare and implement a Drainage, Nutrient and Water Management Plan for the Project to minimise the impact of off-road drainage on the environment with specific consideration of the EPP wetland (located south of the intersection of Moore Road and Boyanup Picton Road).

### **Recommendation 4**

Main Roads seek approval from the Department of Water under the *Rights in Water and Irrigation Act* 1914 for the construction of the Preston and Ferguson River bridges.

### **Recommendation 5**

Main Roads seek approval from the Department of Water under the *Rights in Water and Irrigation Act* 1914 for the construction of groundwater bores for construction purposes.

### **Recommendation 6**

Main Roads should manage the Declared Weed populations with the project area during road construction activities and on-going road reserve management.

### **Recommendation 7**

Main Roads should prepare and implement a Topsoil Management Plan (TMP) for the Project to identify the use and movement of in-situ topsoil during road works.

### **Recommendation 8**

Main Roads should prepare and implement a Revegetation and Landscape Plan for the project.

**Recommendation 9**

Main Roads should prepare and implement an Environmental Offset Strategy for the Project in consultation with DEC and DSEWPC.

**Recommendation 10**

Main Roads should prepare and implement fauna management measures as part of the Project development.

**Recommendation 11**

Main Roads should prepare and implement a Construction Environmental Management Plan for the construction of the Project. Alternatively, the construction contractor should prepare a CEMP for main Roads approval prior to implementation as part of the project delivery. The CEMP should be followed during any pre-construction works.

**Recommendation 12**

If the project is not formally assessed by the EPA Main Roads should comply with the requirements detailed in CPS 818/4.

**Recommendation 13**

Main Roads should continue to consult with relevant stakeholders during the development and implementation of the project.



## 8. Limitations

This report presents the results of desktop data searches for environmental aspects and site visits conducted in 2008, 2009 and 2010. The conclusions of this report were based on the information gathered during these investigations and thus reflect the environment of the site at the time of survey. GHD accepts no responsibility for any variation in the flora and fauna present at the site due to natural and seasonal variability.

The data and advice provided herein relate only to the project study area described herein and must be reviewed by a competent scientist before being used for any other purpose. GHD Pty Ltd accepts no responsibility for other use of the data or edits or alterations made to the report from the submitted final .pdf copy.

Where reports, searches, any third party information and similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.



## 9. References

Beard JS (1981). Vegetation Survey of Western Australia. 1:1 000000 Series. Sheet 7 - Swan. Map and Explanatory Notes. University of Western Australia Press, Nedlands

Bennett Environmental Consulting. (2003). Vegetation and Flora of Selected Areas – Bunbury Outer Ring Road and Port Access Road. Unpublished Report prepared for Main Roads Bunbury.

Bennett Environmental Consulting Pty Ltd (2008). Significant Flora along Proposed Bunbury Outer Ring Road. Perth. WA.

Birds Australia (2009). [Online] <http://www.birdsaustralia.com.au/>, accessed September 2009.

Brad Goode and Associates (2009). Desktop Aboriginal Heritage Survey of the Proposed Bunbury Outer Ring Road, Western Australia. A report prepared for GHD Pty Ltd on behalf of Main Roads Western Australia.

Bureau of Meteorology Australia (2008). Climatic Averages for Australian Sites, Bunbury. Bureau of Meteorology on-line database. [Online]  
[http://www.bom.gov.au/climate/averages/tables/ca\\_wa\\_names.shtml](http://www.bom.gov.au/climate/averages/tables/ca_wa_names.shtml), accessed June 2009.

Commonwealth Government of Australia (1999). Environmental Protection and Biodiversity Conservation Act, Canberra.

[Department of Agriculture and Food Western Australia \(2009\). Shared Land Information Platform. Natural Resource Management Information tool. \[Online\]  
<http://spatial.agric.wa.gov.au/slip/framesetup.asp>, accessed September 2010.](#)

Department of Conservation and Land Management (2001). *Phytophthora cinnamomi* and disease caused by it, Volume II: Interpreter guidelines for detection, diagnosis and mapping. Department of CALM (Forest Management Branch), Perth, Western Australia.

[Department of Environment and Conservation \(2010\). Native Vegetation Map Viewer. \[Online\]  
<http://maps.dec.wa.gov.au/idelve/nv/index.jsp>. Accessed October 2010.](#)

Department of Environment and Conservation (2009). West Australian Air Monitoring Report. Perth.

Department of Environment and Conservation (2008). Rare and Threatened Fauna Database. Data requested August 2008.

Department of Environment and Conservation (2008). Rare and Threatened Flora Database. Data requested August 2008.

[Department of Environment and Conservation \(2009\). Contaminated Sites Database. \[Online\]  
\[http://portal.environment.wa.gov.au/portal/page?\\\_pageid=53,34343&\\\_dad=portal&\\\_schema=PORTAL\]\(http://portal.environment.wa.gov.au/portal/page?\_pageid=53,34343&\_dad=portal&\_schema=PORTAL\), accessed October 2010.](#)

[Department of Environment and Conservation \(2009\). NatureMap. \[Online\]  
<http://naturemap.dec.wa.gov.au/default.aspx>, accessed](#)



Department of Environment and Conservation (2009b). Contaminated Sites Act 2003. Basic Summary of Records Search Response. Contaminated Sites database, accessed 19/10/10.

Department of Environment, Water, Heritage and the Arts (2008). Australian Heritage Places Inventory. [Online] <http://www.environment.gov.au/heritage/places/wa/list.html>, accessed October 2009.

Department of Environment, Water, Heritage and the Arts (2009). Environmental Protection and Biodiversity Conservation Act Protected Matters Search tool. [Online] <http://www.environment.gov.au/erin/ert/epbc/>, accessed September 2009.

Department of Indigenous Affairs (2010). Aboriginal Heritage Enquiry System. [Online] <http://www.dia.wa.gov.au/AHIS/>, accessed September 2009.

Department of Planning (2000). Final report; Bush Forever, VOLUME 1, Policies, Principles and Processes. Perth. WA.

Department of Planning Western Australia (2009). Greater Bunbury Region Scheme Maps. [Online] <http://www.planning.wa.gov.au/The+planning+system/Mapping/GBRS+maps/default.aspx>, accessed October 2009.

Department of Water (2008). Geographic Data Atlas of Western Australia. Accessed online at: <http://portal.water.wa.gov.au/portal/page/portal/MapsDataAtlases/GeographicDataAtlas>, accessed June 2009.

Department of Water (2009). Statewide River Water Quality Assessment. [Online] <http://www.water.wa.gov.au/idelve/srwqa/>, accessed October 2009.

English, V. and Blyth, J. (1997). Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province. Project N702, Final Report to Environment Australia. Department of Conservation and Land Management. Perth, Western Australia.

Environmental Protection Authority (2003). Greater Bunbury Region Scheme - Report and Recommendations of the Environmental Protection Authority, Environmental Protection Authority, Perth, Western Australia. Bulletin 1108.

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

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

GHD. (2002). Bunbury Outer Ring Road and Port Access Road – Wetlands and Threatened Community Survey. Unpublished Report prepared for Main Roads WA.

GHDa 2009. Report for Bunbury Outer Ring Road (Stage 1) and Port Access Road (Stage 2) – Flora and Vegetation Spring Survey. Unpublished report prepared for Main Roads WA.

GHDb 2009. Bunbury Outer Ring Road (Stage 1) and Port Access Road (Stage 2) - Significant Fauna Survey Report. Unpublished report prepared for Main Roads WA.

Government of Western Australia (1914). *Rights in Water and Irrigation Act*. State Law Publisher.



Perth, Western Australia

Government of Western Australia (1950). *Wildlife Conservation Act*. State Law Publisher. Perth, Western Australia.

Government of Western Australia (1972). *Aboriginal Heritage Act*. State Law Publisher. Perth, Western Australia.

Government of Western Australia (1976). *Agriculture and Related Resources Protection Act*. State Law Publisher. Perth, Western Australia.

Government of Western Australia (1984). *Conservation and Land Management Act*. State Law Publisher. Perth, Western Australia

Government of Western Australia (1986). *Environmental Protection Act*. State Law Publisher. Perth, Western Australia.

Government of Western Australia (1997). *Environmental Protection Noise Regulations*. State Law Publisher. Perth, Western Australia.

Government of Western Australia (1997). *Native Title Act*. State Law Publisher. Perth, Western Australia.

Government of Western Australia (2000). Final report; Bush Forever, VOLUME 1, Policies, Principles and Processes. Perth. WA.

Government of Western Australia (2003). *Contaminated Sites Act*. State Law Publisher. Perth, Western Australia.

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

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

Government of Western Australia (2004). *Environmental Protection (Clearing of Native Vegetation) Regulations*. State Law Publisher. Perth, Western Australia.

Hedde E M, Loneragan O W & 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. Perth.

[Heritage Council of Western Australia \(2009\) State register of Heritage Places. \[Online\] http://register.heritage.wa.gov.au/, accessed August 2009.](http://register.heritage.wa.gov.au/)

HGM Maunsell. (2002). Bunbury Outer Ring Road – Environmental Assessment and Management Plan. Unpublished report prepared for Main Roads Western Australia. TH00570112.

Keighery, B.J., (1994). Bushland Plant Survey: A Guide to Plant Community Survey for the Community,





Wildflower Society of WA (Inc.). Nedlands, Western Australia.

Main Roads Western Australia. (2004). Environmental Guideline – Air Quality. Unpublished Main Roads report. Document No. 6707/007.

Shepherd D.P, Beeston G.R and Hopkins A.J.M (2002). Native Vegetation in Western Australia: Extent, Type and Status. Natural Resource Management Technical Report No. 249: Department of Agriculture. Western Australia.

Shepherd D.P. (2005). Vegetation association data. Unpublished spreadsheets from the Department of Environment and Conservation.

Western Australian Minister for the Environment. (2005). Statement that a Scheme may be Implemented – Greater Bunbury Region Scheme. Ministerial Statement 000697.

[Western Australian Museum \(2009\). Faunabase. \[Online\] http://www.museum.wa.gov.au/faunabase/ accessed September 2009.](http://www.museum.wa.gov.au/faunabase/)

Western Australian Planning Commission (2009). State Planning Policy 5.4 - Road and Rail Transport Noise and Freight Considerations in Land Use Planning. Government of Western Australia. Perth WA.



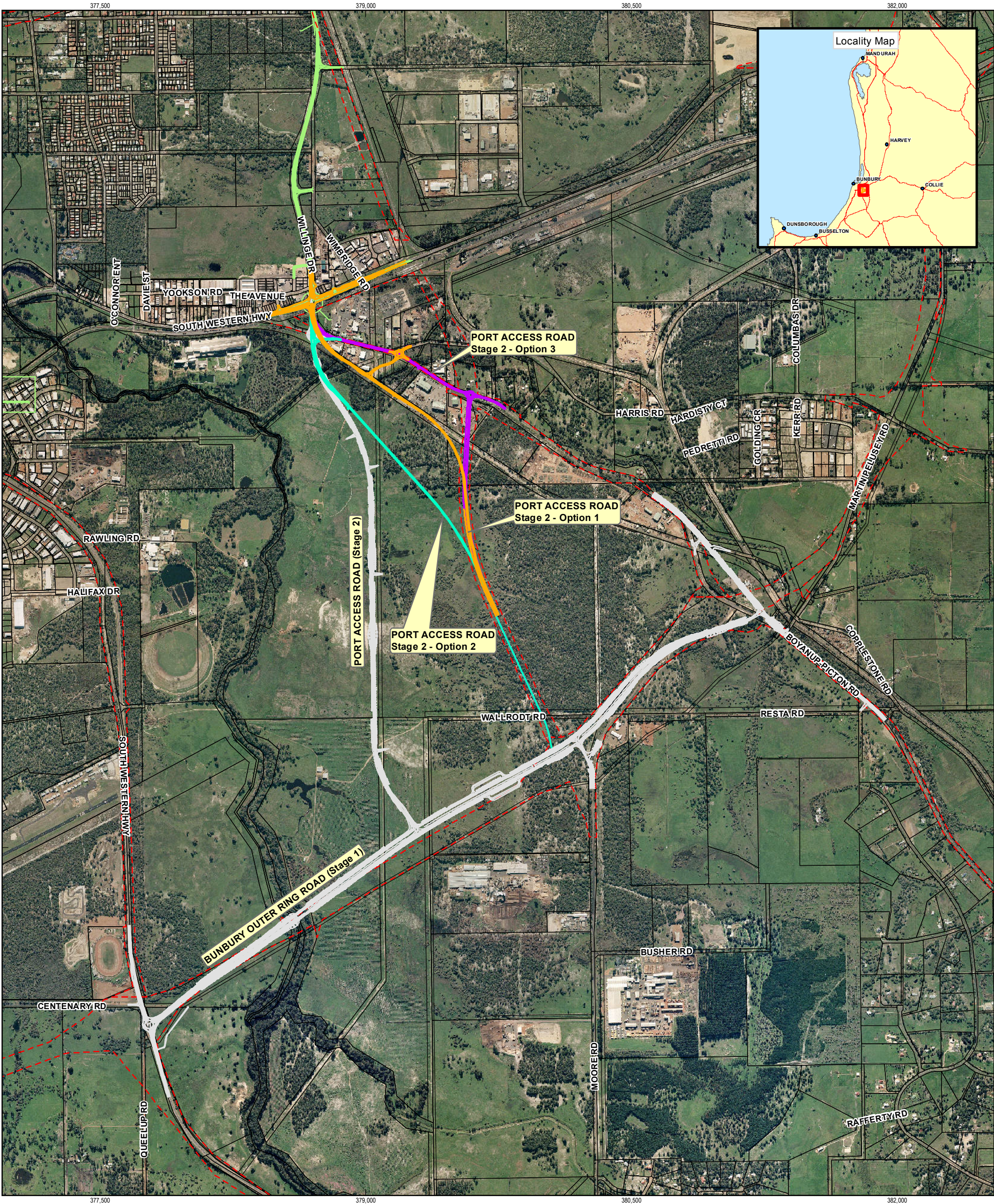
## **Figures**

- Figure 1     Project Locality Plan
- Figure 2     Bunbury Port Access Road Project Stage 2 Alignment, Alignment Options and GBRS Road Reservation
- Figure 3     DoW Wetland Mapping
- Figure 4     Environmentally Sensitive Areas and EPP Lakes
- Figure 5     Site Vegetation Mapping and Vegetation Condition
- Figure 6     Specially Protected Fauna Species Observations
- Figure 7     Specially Protected Fauna Species Impacts









**LEGEND**

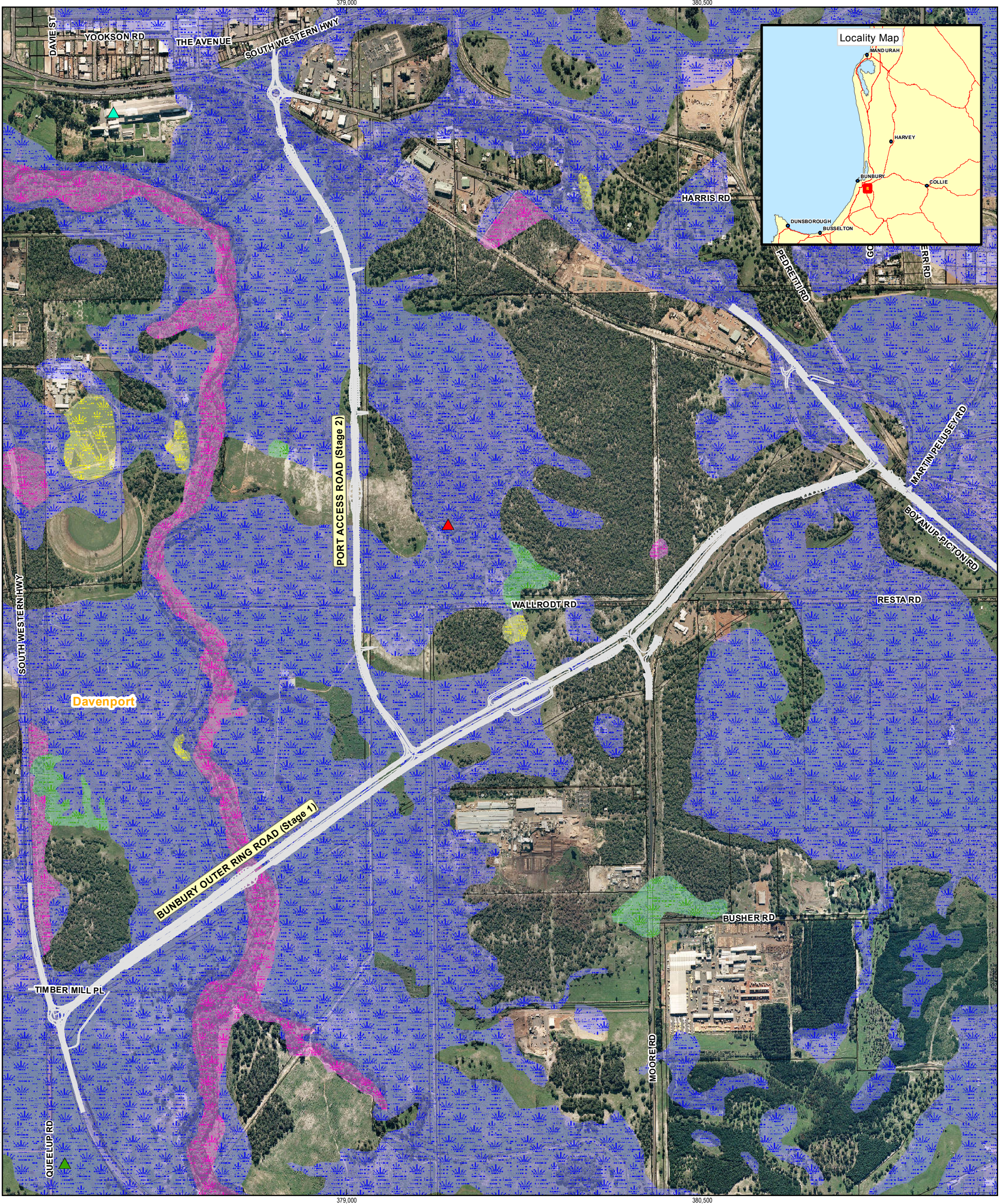
**Proposed Road Designs**

- Port Access Rd (Stage 2 - Option 1)
- Port Access Rd (Stage 2 - Option 2)
- Port Access Rd (Stage 2 - Option 3)

- Bunbury Port Access Project Stage 2
- Port Access Road - Stage 1 (Completed)
- Greater Bunbury Region Scheme Boundaries

- Cadastre





**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

- Bunbury Port Access Project Stage 2
- Cadastre
- Threatened Ecological Communities Buffers

**Geomorphic Wetlands**

- Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed





LEGEND

Bunbury Port Access Project Stage 2

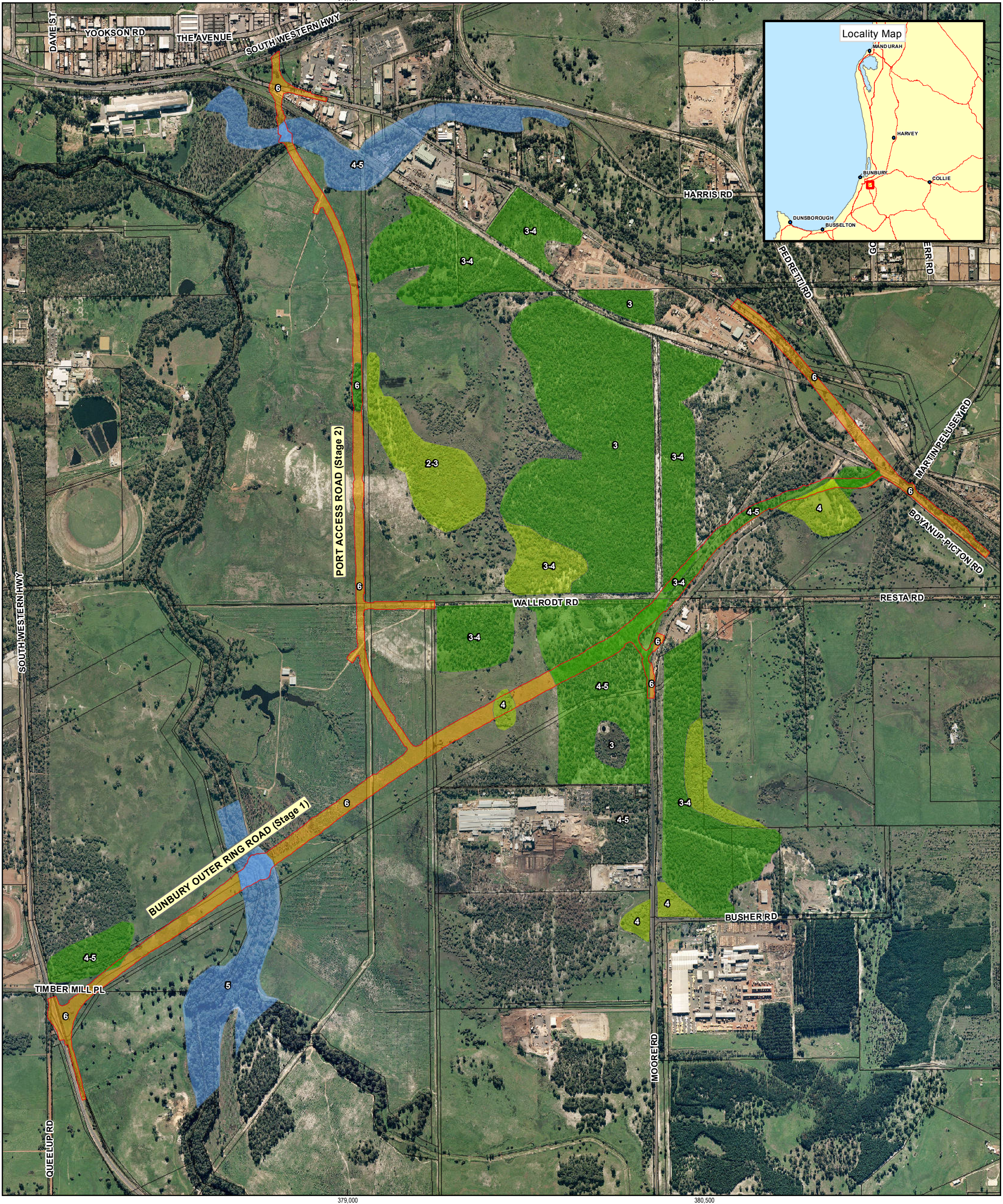
Cadastre

EPP Lakes Policy Area

Regional Parks

Clearing Regulations - Environmentally Sensitive Areas





**LEGEND**

3m Road Extents Buffer

Cadastral

**Vegetation Type**

- Corymbia calophylla / Agonis flexuosa open woodland
- Eucalyptus rudis woodland
- Melaleuca raphiophylla wetland
- Paddock/Cleared

**Vegetation Condition**

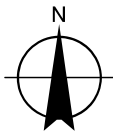
- Pristine
- Excellent
- Very Good
- Good
- Degraded
- Completely Degraded

1:15,000 (at A3)

0 75 150 300 450 600

Meters

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



**GHD**

CLIENTS | PEOPLE | PERFORMANCE



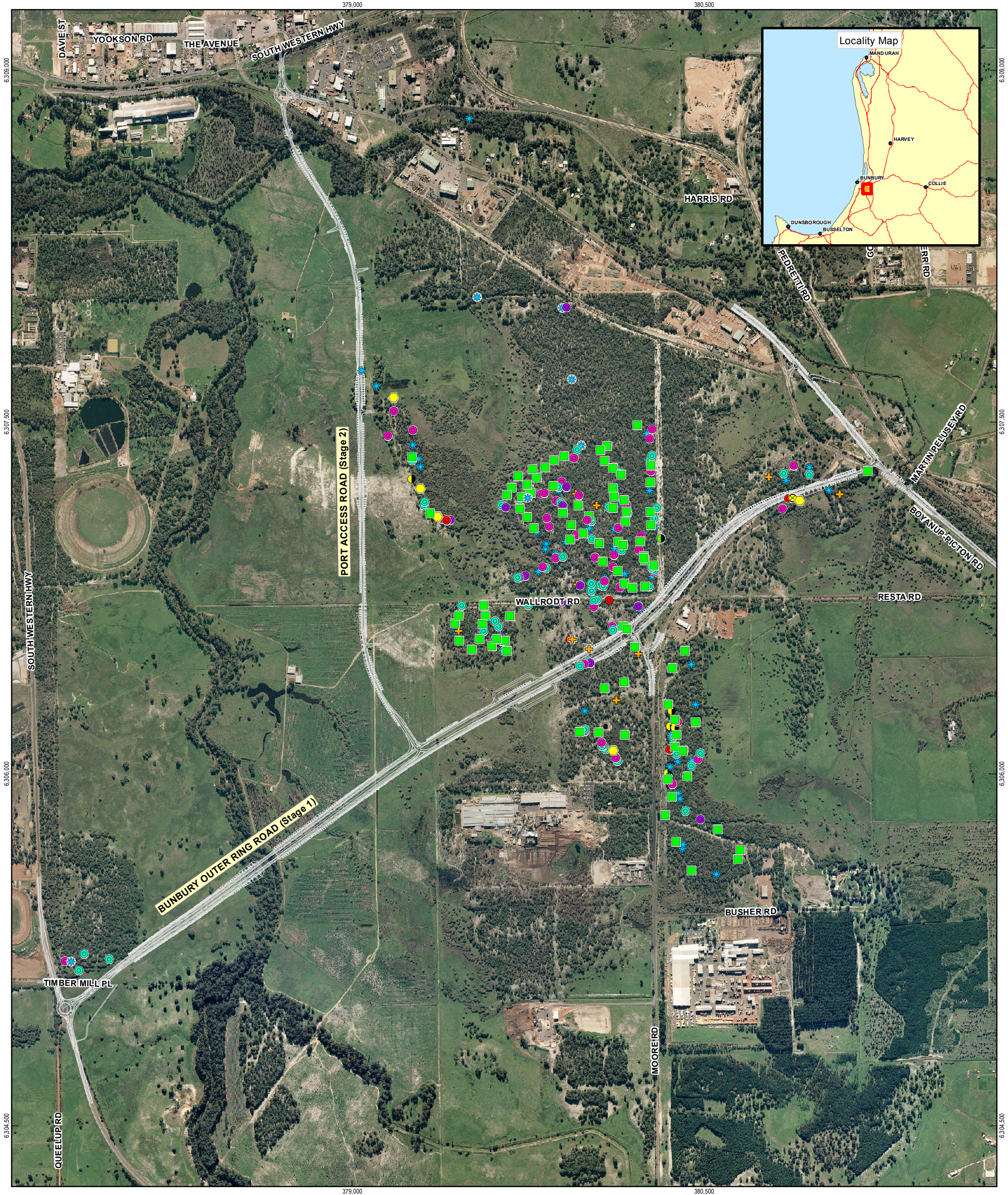
Main Roads WA  
Bunbury Port Access Project Stage 2

Job Number  
Revision  
Date

61-24038  
0  
22 NOV 2010

Vegetation Type and Condition **Figure 5**





LEGEND

Feeding Habitat

Cockatoo Feeding Areas

Cockatoos

- Live Baudin Black Cockatoo Sighting
- Live Carnaby Black Cockatoo Sighting

Western Ringtail Possum

- Live Western Ringtail Possum Sighting
- Possum Drey - Active
- Possum Drey - Old
- Possum Drey - Undetermined

Native Fish Sample Points

Habitat Areas

Cockatoo Habitat Area

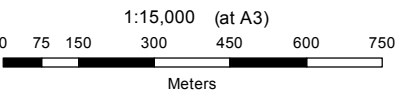
Western Ringtail Possum Droppings

Droppings

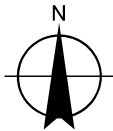
Animal Sighting

- Live Brushtail Possum
- Bandicoot
- Bee Eater

Bunbury Port Access Project Stage 2



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



CLIENTS | PEOPLE | PERFORMANCE



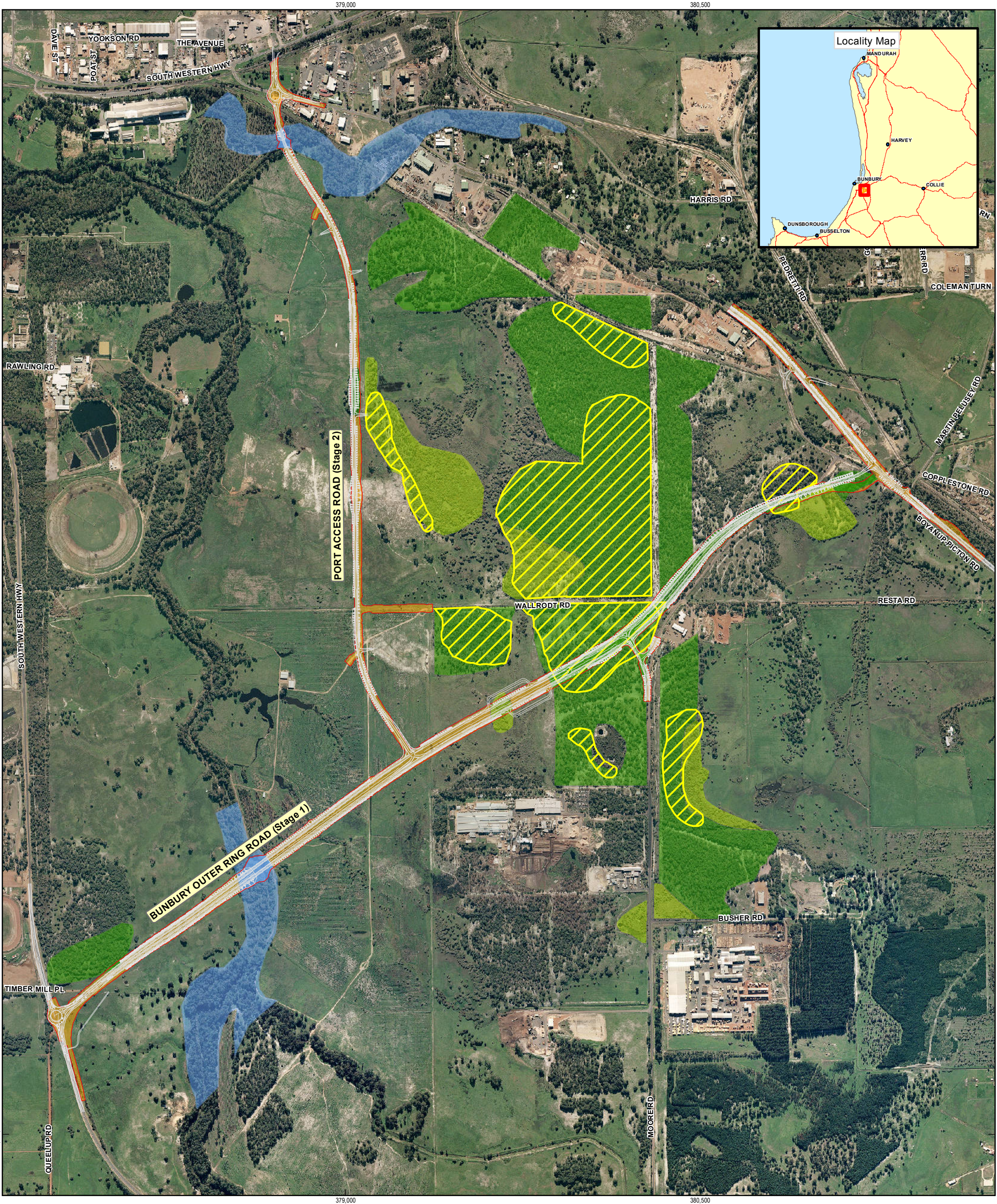
Main Roads WA  
Bunbury Port Access Project Stage 2

Job Number 61-24038  
Revision 0  
Date 22 NOV 2010

Fauna Survey  
Observations

Figure 6

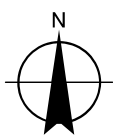




- LEGEND**
- Bunbury Port Access Project Stage 2
  - 3m Road Extents Buffer
  - Known Western Ringtail Possum Habitat

- Vegetation Type**
- Corymbia calophylla/ Agonis flexuosa open woodland
  - Eucalyptus rudis woodland
  - Melaleuca raphiophylla wetland
  - Paddock/Cleared

1:15,000 (at A3)  
0 75 150 300 450 600 750  
Meters  
Map Projection: Transverse Mercator  
Horizontal Datum: Geocentric Datum of Australia  
Grid: Map Grid of Australia 1994, Zone 50



CLIENTS | PEOPLE | PERFORMANCE



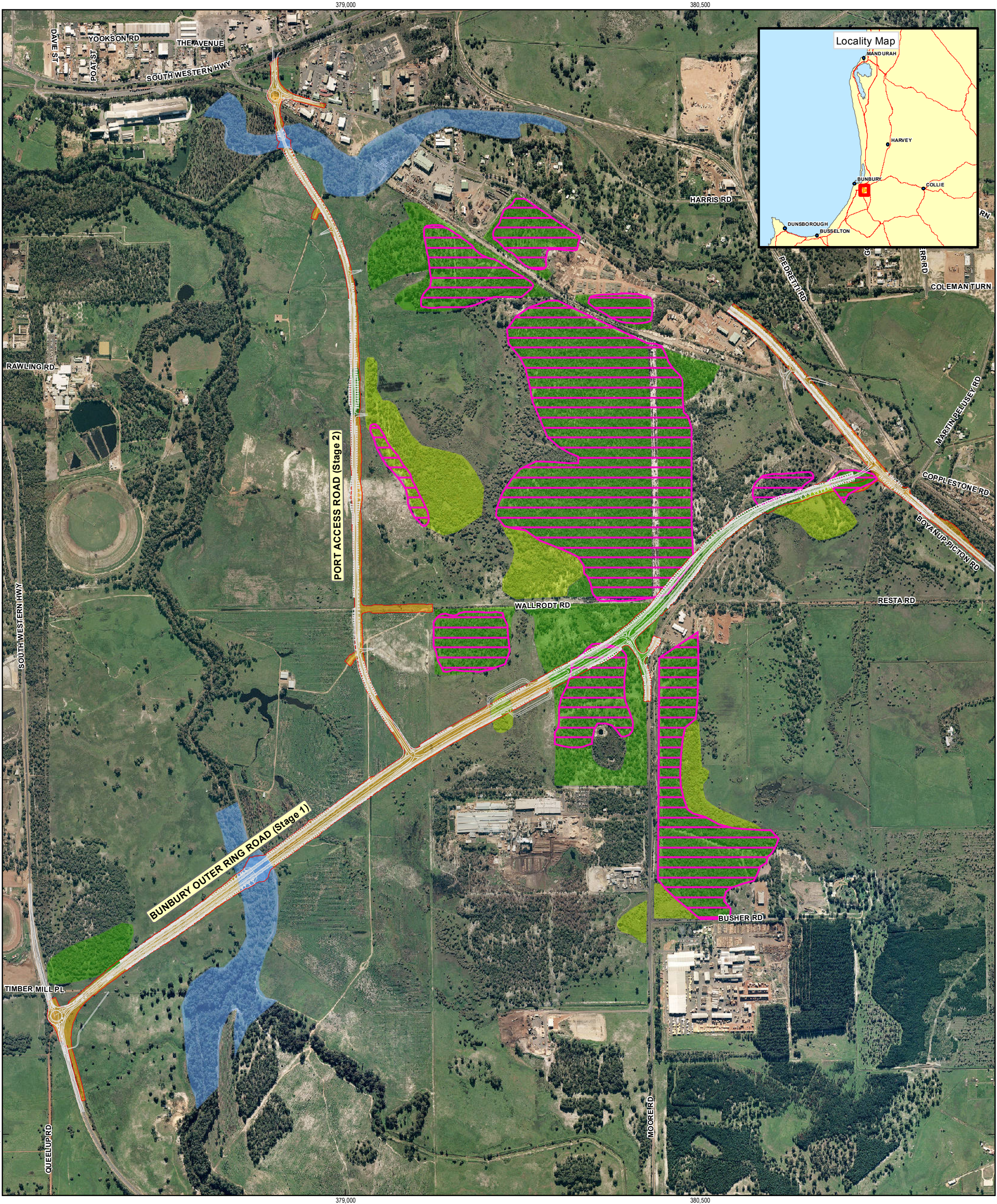
Main Roads WA  
Bunbury Port Access Project Stage 2

Job Number 61-24038  
Revision 0  
Date 22 NOV 2010

Known Possum  
Habitat and Impact

Figure 7a





**LEGEND**

- Bunbury Port Access Project Stage 2
- 3m Road Extents Buffer
- Known Cockatoo Feeding Habitat

**Vegetation Type**

- Corymbia calophylla/ Agonis flexuosa open woodland
- Eucalyptus rudis woodland
- Melaleuca raphiophylla wetland
- Paddock/Cleared

1:15,000 (at A3)

0 75 150 300 450 600 750

Meters

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

CLIENTS | PEOPLE | PERFORMANCE

Main Roads WA  
Bunbury Port Access Project Stage 2

Cockatoo Foraging Habitat  
and Impact

Job Number 61-24038  
Revision 0  
Date 22 NOV 2010

**Figure 7b**





Appendix A

# Ministerial Statement 000697



Statement No.

GOVERNMENT OF WESTERN AUSTRALIA

000697

**MINISTER FOR THE ENVIRONMENT; SCIENCE**

**STATEMENT THAT A SCHEME MAY BE IMPLEMENTED  
(PURSUANT TO THE PROVISIONS OF DIVISION 3 OF PART IV OF THE  
ENVIRONMENTAL PROTECTION ACT 1986)**

**GREATER BUNBURY REGION SCHEME**

**Scheme Purpose:** To guide and regulate the use and development of land and to make provisions for regional infrastructure and regional open space within the Greater Bunbury Region.

**Responsible Authority:** Western Australian Planning Commission

**Responsible Authority Address:** 469 Wellington Street, PERTH WA 6000

**Assessment Number:** 1048

**Report of the Environmental Protection Authority:** Bulletin 1108

Subject to the following conditions, there is no known environmental reason why the Greater Bunbury Region Scheme to which the above report of the Environmental Protection Authority relates should not be implemented:

**1 Additional Land to be Reserved**

1-1 All or portions of the following sites shall be reserved for conservation, in accordance with the requirements set out in Attachment 1 of the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (date):

- 1) Reserve 35061 Paris Road, Australind - Decommissioned Wastewater Treatment Plant
- 2) Reserve 31012 Harewoods Road, Dalyellup
- 3) Foreshore adjoining Port Installations Reserve
- 4) Twin Rivers - Pt Lot 211 Barnes Avenue, Australind
- 5) College Grove - Lot 1000 Bussell Highway
- 6) Pt Loc 632 Parade Road, Glen Padden
- 7) Reserve 670 North Boyanup Road, Davenport
- 8) Picton Waters - Environmental Protection Policy Lake on portion of Lots 40-44 Jeffery Road, Picton
- 9) Pt Lot 1 North Boyanup Road, Davenport
- 10) Lot 317 Harewoods Road, Dalyellup
- 11) Lot 1, Dalyellup Boulevard, Dalyellup

Published on

31 OCT 2005

## **2 Realignment of Primary Regional Roads Reserves**

- 2-1 Portions of the following Primary Regional Roads Reserves shall be realigned, in accordance with the requirements set out in Attachment 1 of the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (date):

- 1) Port Access Road
- 2) Bunbury Outer Ring Road

## **CONDITIONS TO BE INCORPORATED INTO THE SCHEME BY INSERTION OF PROVISIONS IN SCHEME TEXT**

### **3 Management Plans**

- 3-1 The following Environmental Management Plans may be required in accordance with the specifications set out in Attachment 1 in the Minister for the Environment's "Statement that a Scheme may be Implemented" No. 000697 published on (insert date), and shall be subsequently implemented in accordance with the provisions of the Management Plans, to the satisfaction of the Western Australian Planning Commission:

- 1) Environmental Management Plans for schemes, subdivisions and developments which impact on Regional Open Space in the scheme, Crown conservation or nature reserves, a National Park or bushland, waterways, wetlands or other land that may be part of an ecological linkage;
- 2) Environmental Management Plans for industrial development within the Kemerton Industrial Area and Special Control Area No. 2;
- 3) Drainage, Nutrient and Water Management Plans in areas where the Average Maximum Groundwater Level is less than 1.2 metres below the natural ground surface or where any proposed off-site drainage could lead to degradation of wetlands or waterways; and
- 4) Acid Sulfate Soil Management Plans where the presence of acid sulphate soils is confirmed or there is likely to be a significant risk of disturbing acid sulphate soils.

### **4 Biological Survey**

- 4-1 As part of a scheme amendment or application to subdivide or develop land which has the potential to impact on regionally significant native remnant vegetation or native fauna, the Western Australian Planning Commission or local government, as the case requires, may require a biological survey, including a search for Declared Rare Flora and Fauna, Priority Flora, Threatened Flora Communities and Threatened Fauna, to be undertaken.

The biological survey shall be undertaken to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies, and shall be taken into account when considering the rezoning and subsequent subdivision and development applications.

**5 Provision of Environmental Offsets**

- 5-1 Prior to construction of the Port Access Road and Bunbury Outer Ring Road, an environmental offset strategy shall be prepared to mitigate unavoidable impacts on wetlands and native vegetation associated with the Port Access Road and Bunbury Outer Ring Road to the satisfaction of the Western Australian Planning Commission on advice of the Environmental Protection Authority. With respect to the Port Access Road, the strategy shall include a foreshore management plan for the Ferguson River in the vicinity of the road. With respect to the Bunbury Outer Ring Road, the strategy shall include rehabilitation of the strip of land adjacent to the road in the vicinity of Lot 15 North Boyanup Road (South Western Highway) and design of the intersection with the Australind Bypass to minimize impacts on environmental values of the area.

Dr Judy Edwards MLA  
MINISTER FOR THE ENVIRONMENT; SCIENCE

31 OCT 2005

**STATEMENT THAT A SCHEME MAY BE IMPLEMENTED –  
GREATER BUNBURY REGION SCHEME**

**SPECIFICATIONS FOR ENVIRONMENTAL MANAGEMENT PLANS,  
ADDITIONAL LAND TO BE RESERVED AND REALIGNMENT OF PRIMARY  
REGIONAL ROAD RESERVES**

**1 Environmental Management Plans for Schemes, Subdivisions and Developments**

1-1 Prior to amending local town planning schemes, or finally approving subdivisions or developments (whichever is sooner), the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed subdivision or development on the following:

- 1) land which is reserved as Regional Open Space in the Scheme;
- 2) a Crown conservation or nature reserve;
- 3) a National Park; or
- 4) bushland, waterway, wetland or land that may be part of an ecological linkage.

The Environmental Management Plan shall include:

- i) a description of existing environmental values, and the identification of the environmental outcome to be achieved through the implementation of the Plan;
- ii) clear delineation of boundaries of significant areas to be protected;
- iii) fire management;
- iv) drainage and nutrient management;
- v) management of access and rehabilitation;
- vi) vegetation and/or wetland mitigation strategies;
- vii) a program for implementation;
- viii) allocation of responsibilities and identification of timing and duration of implementation;
- ix) provision for routine monitoring of environmental values; and
- x) provision of details of contingency plans in the event that the monitoring surveys indicate that the development is having or has had an adverse impact upon environmental values.

- 1-2 Environmental Management Plans required by condition 1-1 shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.

**2 Environmental Management Plans for Industrial Development within the Kemerton Industrial Area and Special Control Area No. 2**

- 2-1 Prior to approving subdivision or development within the Kemerton Industrial Area and the Special Control Area No. 2, the Western Australian Planning Commission or local government, as the case requires, may require an Environmental Management Plan to be prepared and implemented to achieve the objective of managing the potential impacts of the proposed development.

The Environmental Management Plan shall include:

- 1) a description of existing environmental values (including vegetation, fauna and wetlands) and the identification of the environmental outcome to be achieved through the implementation of this Plan;
- 2) management of potential impacts on visual amenity;
- 3) clear delineation of significant areas to be protected;
- 4) a program for implementation;
- 5) allocation of responsibilities and identification of timing and duration of implementation;
- 6) provision for routine monitoring of environmental values; and
- 7) provision of details of contingency plans in the event that the monitoring surveys indicate that the subdivision or development is having or has had an adverse impact upon environmental values.

- 2-2 An Environmental Management Plan required by condition 2-1 shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and shall be implemented in accordance with a program defined in the Environmental Management Plan.

**3 Drainage, Nutrient and Water Management Plans**

- 3-1 Prior to amending local town planning schemes, or finally approving subdivision or developments (including those for intensive horticulture), whichever is sooner, in areas where the Average Maximum Groundwater Level is less than 1.2 metres below the natural ground surface, or where any proposed off-site drainage could lead to degradation of wetlands or waterways, the Western Australian Planning Commission or local government, as the case requires, may require a Drainage, Nutrient and Water Management Plan to be prepared and implemented.



- 3-2 A Drainage, Nutrient and Water Management Plan, if required, shall ensure that there is no net increase in nitrogen export to the Leschenault Estuary as a result of development within the Greater Bunbury Region.
- 3-3 The Drainage, Nutrient and Water Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies, and shall be implemented in accordance with a program defined in the Drainage, Nutrient and Water Management Plan.

#### **4 Acid Sulfate Soil Management Plans**

- 4-1 Prior to amending local town planning schemes, or finally approving subdivisions or development, the Western Australian Planning Commission or local government, as the case requires, may require a Preliminary Acid Sulfate Soils Assessment to be prepared where there is likely to be a significant risk of disturbing acid sulfate soils.
- 4-2 Where the presence of acid sulfate soils is confirmed, an Acid Sulphate Soil Management Plan shall be prepared to the satisfaction of the Western Australian Planning Commission or local government, as the case requires, having due regard for advice from relevant government agencies and implemented in accordance with a program defined in the Acid Sulphate Soil Management Plan.

#### **5 Additional Land to be Reserved**

##### **5-1 Reserve 35061 Paris Road, Australind - Decommissioned Wastewater Treatment Plant**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the northern and western portions of Reserve 35061 Paris Road, Australind, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

##### **5-2 Reserve 31012 Harewoods Road, Dalyellup**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the northern portion of Reserve 31012 Harewoods Road, Dalyellup to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority and shall only be used for conservation, landscape and recreational purposes.

##### **5-3 Foreshore adjoining Port Installations Reserve**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the foreshore adjacent to the Port Installations Reserve to the requirements of the Western Australian Planning Commission on advice of the

Environmental Protection Authority and shall only be used for conservation and complementary purposes.

**5-4 Twin Rivers - Pt Lot 211 Barnes Avenue, Australind**

A portion of Pt Lot 211 Barnes Avenue as detailed in the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004, shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

**5-5 Picton Waters – Environmental Protection Policy Lake on Portion of Lots 40-44 Jeffery Road, Picton**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the wetland on Lots 40-44 Jeffery Road, Picton, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes. The land requirements shall include an appropriate buffer to protect the core wetland.

**5-6 College Grove – Lot 1000 Bussell Highway**

A portion of Lot 1000, Bussell Highway, as detailed in the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004, shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

**5-7 Pt Loc 632 Parade Road, Glen Padden**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on Pt Loc 632 Parade Road, Glen Padden, to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

**5-8 Reserve 670 North Boyanup Road, Davenport**

Land shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on Reserve 670 North Boyanup Road, Davenport to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

**5-9 Pt Lot 1 North Boyanup Road, Davenport**

Land shall be reserved for conservation purposes to provide an appropriate buffer to the Preston River on Pt Lot 1, North Boyanup Road, Davenport to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

**5-10 Lot 317 Harewoods Road, Dalyellup**

Lot 317 Harewoods Road, Dalyellup shall be reserved for conservation purposes to protect the integrity, function and environmental value of the bushland on the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority, and shall only be used for conservation and complementary purposes.

**5-11 Lot 1 Dalyellup Boulevard, Dalyellup**

Lot 1 Dalyellup Boulevard, Dalyellup shall be reserved for conservation purposes to protect the integrity, function and environmental values of the land to the requirements of the Western Australian Planning Commission on advice of the Environmental Protection Authority and shall only be used for conservation and complementary purposes.

**6 Realignment of Primary Regional Roads Reserves**

**6-1 Port Access Road**

The Port Access Road Primary Regional Roads Reserve shall be realigned in accordance with the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004.

**6-2 Bunbury Outer Ring Road**

The Bunbury Outer Ring Road Primary Regional Roads Reserve shall be realigned in accordance with the Minister for the Environment's determination of appeals relating to the Environmental Protection Authority's report and recommendations on the Scheme, dated 30 November 2004.



## Appendix B

# Site Photographs



Photo 1 looking north to PAR Stage 1



Photo 2 Lot 4 looking south along PAR Stage 2 north of Ferguson River



Photo 3 Northern approach to Ferguson River crossing looking south



Photo 4 Looking north to Ferguson River (in distance) along PAR Stage 2 alignment on Lot 5



Photo 5 Looking south along PAR Stage 2 alignment on Lot 5



Photo 6 Looking south along PAR Stage 2 towards BORR Stage 1 intersection





Photo 7 Looking NW along proposed Boyanup Picton Road re-alignment



Photo 8 Looking SE along proposed Boyanup Picton Road re-alignment



Photo 9 Looking NW to proposed BORR Stage 1 / Boyanup Picton Road intersection



Photo 10 Looking SW to EPP wetland located south of Moore Road adjacent to BORR Stage 1



Photo 11 Vegetation north of Moore Road on BORR Stage 1



Photo 12 Vegetation north of Moore Road on BORR Stage 1





Photo 13 Vegetation north of Moore Road on BORR Stage 1



Photo 14 Vegetation south of Walrodt Rd on BORR Stage 1



Photo 15 Vegetation south of Walrodt Rd on BORR Stage 1 looking SW



Photo 16 Preston River crossing from east



Photo 17 BORR Stage 1 looking NE to Preston River crossing



Photo 18 SW Highway looking NE along BORR Stage 1 alignment



Appendix C

# Flora and Vegetation Survey



CLIENTS | PEOPLE | PERFORMANCE

## **Main Roads Western Australia**

**Bunbury Port Access Road  
Project Stage 2**

**Flora and Vegetation Survey**

**November 2010**



# Contents

1.	Background	1
2.	Methodology	2
2.1	Desktop assessment	2
2.2	Site Survey	2
3.	Desktop Assessment and Field Survey	3
3.1	Vegetation Types	3
3.2	Vegetation Extent and Status	3
3.3	Site Vegetation	4
3.4	Vegetation Condition Assessment	4
3.5	Site Flora	5
3.6	Significant Flora	5
3.7	Threatened Ecological Communities	9
3.8	Weeds and Declared Plants	9
3.9	Environmentally Sensitive Areas	9
4.	Conclusion	10
5.	Limitations	11
6.	References	12

## Appendices

- A Site Flora Species List



## 1. Background

Main Roads Western Australia (Main Roads) commissioned GHD to undertake a Level 2 flora and vegetation survey of the proposed alignment of the Bunbury Outer Ring Road (BORR) and the Bunbury Port Access Road (Stage 2).

The initial study area included the entire BORR alignment and a number of alignment options for the Port Access Road Stage 2. An assessment of the significance of the biological aspects outside the immediate Project Area (which may be affected by roadworks within the Project Area) was also undertaken. The survey results have been used to produce this report for the proposed PAR Stage 2 Project and are to be incorporated into an Environmental Impact Assessment (EIA) report prepared for the project.

The PAR Stage 2 Project is shown at Figure 1 of the EIA report.





## 2. Methodology

### 2.1 Desktop assessment

The desktop assessment included a database and literature review of the following factors:

- A search of the Department of Environment and Conservation's (DEC) Declared Rare and Priority Flora database and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool was undertaken to identify expected significant flora for the area
- Broad vegetation types shown in existing mapping
- Remnant vegetation clearing in relation to statutory requirements
- Threatened Ecological Communities
- Declared Rare and Priority Flora; and
- Environmentally Sensitive Areas.

### 2.2 Site Survey

Senior Ecologist, Georgina Nielssen, and Environmental Scientist, Tegan Ridgeway undertook flora and vegetation field surveys on the 13<sup>th</sup>, 14<sup>th</sup> and 17<sup>th</sup> of October 2008 and on the 4<sup>th</sup> and 5<sup>th</sup> of November 2009. The surveys were conducted congruent with Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia – Guidance Statement No. 51, EPA, Perth. The survey was undertaken according to the following process:

- Meandering walking transects and *relevés*<sup>1</sup> within the entire Project Area were undertaken to ensure that all vegetation types were covered during the survey
- The vegetation types and their boundaries were delineated, recording vegetation composition, condition rating, weed species and evidence of disturbance
- Vegetation was rated according to the Bush Forever vegetation condition scale (Government of Western Australia, 2000)
- The presence of potential Threatened Ecological Communities (TECs) in the area was assessed; and
- Suitable habitat for Declared Rare and Priority Flora species was searched to determine the presence of previously unrecorded threatened flora.

---

<sup>1</sup> For the purposes of this flora and vegetation assessment, a *relevé* is defined as an unconfined survey area in which a general statement about the floristic composition of the location can be made.

### 3. Desktop Assessment and Field Survey

#### 3.1 Vegetation Types

The composition of remnant native vegetation in the Project Area was interpreted from mapping conducted by Heddle (1980). According to this mapping, the Project Area is likely to contain the following vegetation complexes as detailed in Table 1.

**Table 1 Vegetation Complexes Traversed by the Project**

Vegetation Complex	Vegetation Description
Swan	Woodland of <i>Eucalyptus rudis</i> and <i>Melaleuca raphiophylla</i> with localised occurrences of low open forest of <i>Casuarina obesa</i> and <i>Melaleuca cuticularis</i> .
Guildford	Mixture of Open Forest to Tall Open Forest of Wandoo ( <i>Eucalyptus wandoo</i> ) Jarrah and Marri, and Woodland of Wandoo (with rare occurrences of <i>Eucalyptus lane-poolei</i> ). Minor components include Flooded Gum.
Southern River	Open Woodland of Jarrah ( <i>Eucalyptus marginata</i> ), Marri ( <i>Corymbia calophylla</i> ) and Banksia species with Fringing Woodland of Flooded Gum ( <i>Eucalyptus rudis</i> ) and paperbark ( <i>Melaleuca raphiophylla</i> ) along creek beds.

#### 3.2 Vegetation Extent and Status

A vegetation type is considered under-represented if there is less than 30 percent of its original distribution remaining. From a purely biodiversity perspective, and not taking into account any other land degradation issues, there are several key criteria now being applied to vegetation in States where clearing is still occurring (EPA, 2000). These criteria are:

- ▶ The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-European/pre-1750 extent of the vegetation type;
- ▶ A level of 10% of the original 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 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 give a comparable status.





Native vegetation types represented in the study area, their regional extent and reservation status are generally drawn from *Shephard et al. (2002)*, and Shephard pers. comm. (2005), which are based on broad scale mapping undertaken by Beard (1975).

As shown at Table 2 the vegetation associations found within the Project Area are considered *Endangered* to *Vulnerable*, with the Swan Complex located at the Preston River considered to be endangered, and the Southern River and Guildford considered as vulnerable with less than 20% of their original area remaining in the Swan Coastal Plain IBRA region.

**Table 2 Regional Assessment of Vegetation Extent (Swan Coastal Plain) (EPA , 2006)**

Association Description	Pre-European Extent (Ha)	Current Extent (Ha)	% Remaining (of Pre-European Extent)	Status
Guildford Complex	92,497	4,662	5.0	Endangered
Swan Complex	15,783	2,454	15.6	Vulnerable
Southern River Complex	57,979	11,501	19.8	Vulnerable

### 3.3 Site Vegetation

The vegetation within the Project Area was classified into three main vegetation types, namely:

- *Corymbia calophylla* , *Agonis flexuosa* open woodland
- *Melaleuca raphiophylla* over mixed pasture grasses
- *Eucalyptus rudis* woodland over mixed pasture grasses

Much of the site comprises cleared land, parkland cleared or Blue Gum plantation. The site vegetation mapping is shown at Figure 5 of the EIA report.

### 3.4 Vegetation Condition Assessment

The vegetation condition of the Project Area was assessed during the site surveys based on the Bush Forever (Government of Western Australia, 2000) vegetation condition ratings scale. This scale recognises a level of 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 therefore consists of six rating levels as outlined in Table 3 below.



**Table 3 Government of Western Australia (2000) Vegetation Condition Scale**

<b>Vegetation Condition Rating</b>	<b>Vegetation Condition</b>	<b>Description</b>
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 within the study area varied from vegetation Condition 3 to Condition 6 as shown at Figure 5 of the EIA report. Large areas of the Project Area were completely degraded with no native vegetation present. Where native vegetation remained it has been degraded by past landuse activities such as services installation, drainage works, grazing, rubbish dumping and firewood cutting. Furthermore, all areas supporting native vegetation have been impacted to some extent by weeds.

### **3.5 Site Flora**

Vegetation within the Project Area is considered to have moderate species diversity. A total of 128 plant taxa from 34 families were recorded during the site flora surveys. The dominant plant families recorded included:

Fabaceae	23 taxa
Myrtaceae	12 taxa
Proteaceae	10 taxa
Orchidaceae	8 taxa
Poaceae	8 taxa

Of the 128 flora species identified 31 are introduced species or species not endemic to the area. A full list of the species recorded during the site surveys is included at Appendix A

### **3.6 Significant Flora**

Species of significant flora are protected under both State and Commonwealth Acts. Any activities that are deemed to have a significant impact on species that are recognised by the Commonwealth



*Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), and the *Western Australian Wildlife Conservation Act 1950* can trigger referral to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) and/or the WA Environmental Protection Authority.

### 3.6.1 Commonwealth

A description of Conservation Categories delineated under the EPBC Act is detailed at Table 4. An EPBC Act Protected Matters Search was undertaken for the Project Area including a 1 km buffer. This search identified *Drakaea micrantha* as potentially occurring within the Project Area. Searches during the field survey did not identify this plant within, or in the vicinity of the Project Area.

**Table 4 Conservation categories of listed Species defined under the EPBC Act**

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

### 3.6.2 West Australian

Significant flora in Western Australia is protected by the *Wildlife Conservation Act 1950*. This Act, which is administered by the Department of Environment and Conservation (DEC), protects Declared Rare Flora (DRF) species.

The DEC also maintains a list of priority listed flora species. Conservation codes for flora species are assigned by the DEC to define the level of conservation significance. Priority listed flora are not specifically protected under the *Wildlife Conservation Act 1950*. Priority listed 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 listed flora, despite them not having specific legal protection. A description of the DEC's Conservation Codes that relate to flora species is provided in Table 5.

**Table 5 Conservation Codes & Descriptions for DEC Declared Rare and Priority Flora**

Conservation Code	Description
R: Declared Rare Flora – Extant Taxa	Taxa which 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.
P1: Priority One – Poorly Known Taxa	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2: Priority Two – Poorly Known Taxa	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3: Priority Three – Poorly Known Taxa	Taxa which are known from several populations, and the taxa are believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further survey.
P4: Priority Four – Taxa in need of monitoring	Taxa which are considered to have been adequately surveyed and which whilst being rare (in Australia) are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.

A search was undertaken through the Department of Environment and Conservation (DEC) Threatened (*Declared Rare*) Flora Database (TFD) and the *Western Australian Herbarium Specimen* (WAHERB) database for species of rare and priority flora located within approximately 5 km of the Project Area.

The DEC search also included results from their *Declared Rare and Priority Flora (DR&PF)* list. The species in this list are those known to exist in the general surrounds and not the Project Area specifically. The result of these searches is provided in Table 6.

**Table 6 Significant flora potentially occurring within the Project Area study area and its surrounds.**

Species	Status	Distribution
<i>Acacia flagelliformis</i>	Priority 4	Harvey, Eaton, Bunbury, Capel, Busselton, Donnybrook
<i>Acacia semitrullata</i>	Priority 3	
<i>Aponogeton hexatepalus</i>	Priority 4	Perth, Pinjarra, Capel, Bunbury, Boyanup, Dunsborough
<i>Boronia humifusa</i>	Priority 1	
<i>Caladenia huegelii</i>	Declared Rare	
<i>Caladenia longicauda subsp. clivicola</i>	Priority 4	Harvey, Dardanup, Dunsborough, Pinjarra, Lesmurdie, Cape Naturaliste



<i>Caladenia speciosa</i>	Priority 4	Myalup, Eaton, Yarloop, Ludlow, Gingin, Capel
<i>Carex tereticaulis</i>	Priority 1	Dardanup, Bridgetown, Blackwood River, Guildford, Mungali
<i>Chamaescilla gibsonii</i>	Priority 3	
<i>Diuris drummondii</i>	Declared Rare	
<i>Drakaea micrantha</i>	Declared Rare	
<i>Eucalyptus mundijongensis</i>	Priority 1	Wilbinga, Matilda Bay, Dardanup,
<i>Eucalyptus rudis subsp cratyantha</i>	Priority 4	
<i>Gastrolobium sp. Yoongarillup</i>	Priority 1	Dardanup, Yoongarillup
<i>Gastrolobium whicherense</i>	Priority 2	Whicher Range, Dardanup
<i>Lasiopetalum membranaceum</i>	Priority 3	
<i>Logania wendyae</i>	Priority 1	Capel, Dardanup
<i>Pultenaea skinneri</i>	Priority 4	Collie, Binningup, Boyanup, Which Range, Jalbarragup, Nannup, Bunbury
<i>Rhodanthe pyrethrum</i>	Priority 3	Bullsbrook, Boyanup, Kenwick, Waterloo, Harvey, Eaton, Denmark, Pinjarra, Waroona, West Cape Howe NP, Young Siding, Mt Roe NP, Lake Muir, Ludlow, Capel, Forrestdale, Tone Perup, NR, Barrabup Pool, Muja, Wandoo NP, Lake Pinjar
<i>Schoenus benthamii</i>	Priority 3	Mogumber, Kenwick, Busselton, Elgin, Pinjarra, Kodjupin NR, Bunbury, Condingup, Bremer Bay
<i>Schoenus capillifolius</i>	Priority 2	
<i>Stylidium longitubum</i>	Priority 3	Upper Swan, Bullsbrook, Bunbury, Midland, Busselton, Arthur River, Jandakot
<i>Stylidium sp. Dardanup</i>	Priority 1	Dardanup
<i>Synaphea polypodioides</i>	Priority 3	Dardanup, Boyanup, Donnybrook,
<i>Synaphea sp. Fairbridge Farm</i>	Declared Rare	Pinjarra, Dardanup
<i>Trichocline sp. Treeton</i>	Priority 2	
<i>Verticordia attenuata</i>	Priority 3	Ruabon Tutanup, Bunbury, Capel
<i>Villarsia submera</i>	Priority 4	

Previous surveys unrelated to this project conducted by GHD have identified the DRF *Diuris drummondii* in the wetland area west of the road alignment, and the Priority 4 species, *Acacia flagelliformis* in the CCW wetland situated in the powerline corridor approximately 200 m north of Walrodt Rd. Neither of these populations are expected to be impacted by the Project.



### 3.7 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, Endangered and Vulnerable.

Some TECs are protected under the EPBC Act. Although TECs are not formally protected under the WA *Wildlife Conservation Act 1950*, the loss of, or disturbance to, some TECs trigger the EPBC Act. The EPA's 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 for TECs and PECs was undertaken referencing the DEC's, TEC and PEC database. No TECs or PECs are known to be located within the boundaries of this area. The field survey completed for this project has confirmed that no TEC or PEC vegetation will be impacted by the Project.

### 3.8 Weeds and Declared Plants

Weeds that are, or may become, a problem to agriculture can be formally classified as Declared Plants under the *Agriculture and Related Resources Protection Act 1976*. The Department of Agriculture and Food and the Agriculture Protection Board maintains a list of Declared Plants for Western Australia. If a plant is declared for the whole of the State or for particular Local Government Areas, all land holders are obliged to comply with the specific category control.

A total of 31 introduced or weed species were identified as being present in the Project Area. Of these, Arum Lily (*Zantedeschia aethiopica*) was identified at a number of locations within the PAR Stage 2 Project Area. This plant is considered a Declared Weed Species (P1 and P4) prescribed by the *Agriculture and Related Resources Protection Act, 1976*. Consequently management of this plant is required.

### 3.9 Environmentally Sensitive Areas

The PAR Stage 2 passes or traverses four areas identified as Environmentally Sensitive Area (ESA) (Department of Environment and Conservation, 2010) defined under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. These areas, as shown at Figure 4 of the EIA report. Two of these four ESAs will be impacted by the proposed road alignment:

- 1 The Preston River which is defined as an ESA will be impacted by the construction of twin bridges crossing the river.
- 2 The wetland located south of the corner of Moore Road and the Boyanup Picton Road has been identified as ESA. This wetland has been grazed for many years and the Project will impact the cleared wetland fringe.



## 4. Conclusion

The vegetation complexes in the study area comprise Swan, Guildford and Southern River. The Swan Complex is considered *Endangered* with only 5% of its pre-European extent remaining and the Southern River and Guildford are considered '*Vulnerable*' with less than 20 %. Clearing required for the project will have some impact on these vegetation types.

Although much of the Project Area is cleared farmland and plantation, the site assessment identified three vegetation types:

- *Corymbia calophylla* , *Agonis flexuosa* open woodland
- *Melaleuca raphiophylla* over mixed pasture grasses
- *Eucalyptus rudis* woodland over mixed pasture grasses

The vegetation condition ranges from Completely Degraded (6) in areas of cleared farmland and highly disturbed road verges to Good - Very Good (3 - 4) in areas of relatively intact vegetation that have been impacted by disturbances that include logging, grazing, fire and weed encroachment.

No DRF or priority species occur within the project site.

No TEC or PEC communities occur within the project site.

One species of declared weed, Arum Lily (*Zantedeschia aethiopica*). This plant requires management as prescribed under the *Agriculture and Related Resources Protection Act*.

Two areas identified as ESA – Preston River and a wetland at the intersection of Moore and Picton Boyanup roads will be impacted by the proposed roadworks.



## 5. Limitations

An outline of the limitations of the survey is provided in Table 7. The flora survey was restricted to predominantly flowering plants, with consideration of some other vascular plants such as cycads. Non-vascular plants were not systematically searched for, as the information available on these plants is generally limited.

**Table 7 Limitations and constraints associated with the Flora and Vegetation Survey**

Variable	Impact on Survey Outcomes
<b>Access Problems</b>	Minimal access problems were encountered.
<b>Experience levels</b>	<p>The ecologist and environmental scientist who executed this survey are practitioners suitably qualified in their respective fields.</p> <p>Coordinating Botanist: Georgina Nielssen (Senior Ecologist)</p> <p>Field Staff: Georgina Nielssen (Senior Ecologist) and Tegan Ridgeway (Environmental Scientist)</p> <p>Taxonomy: Georgina Nielssen (Senior Ecologist)</p> <p>Data Interpretation: Tegan Ridgeway (Environmental Scientist)</p>
<b>Timing, weather, season</b>	The survey was undertaken in October 2008. The area had received 567.5 millimetres of rainfall in the 6 months prior to the survey (April to September) (Bureau of Meteorology 2008).
<b>Completeness</b>	<p>As the survey was conducted only once rather than several times over the course of a year some annual, ephemeral condition specific species may be present that were not recorded in the survey.</p> <p>Species that were insufficiently mature or dead were identified in the field to Genus or Family level only (where possible).</p> <p>A comprehensive species list has not been prepared for areas that do not constitute a natural vegetation area, such as gardens or areas that have been totally cleared.</p>
<b>Determination</b>	The taxonomy and conservation status of the Western Australian flora are dynamic. This report was prepared in reliance on taxonomy and conservation current at the time, but it should be noted this may change.





## 6. References

- Commonwealth Government of Australia (1999). *Environmental Protection and Biodiversity Conservation Act*, Canberra.
- Department of Water (2008). *Geographic Data Atlas of Western Australia*. Accessed online at: <http://portal.water.wa.gov.au/portal/page/portal/MapsDataAtlases/GeographicDataAtlas> on 23/01/2009.
- Department of Environment and Conservation (2008a). DEC Estate Database. Extracted 23/01/09.
- Department of Environment and Conservation (2008b). Native Vegetation Map Viewer. Accessed online at: [http://portal.environment.wa.gov.au/portal/page?\\_pageid=119,50334&\\_dad=portal&\\_schema=PORTAL](http://portal.environment.wa.gov.au/portal/page?_pageid=119,50334&_dad=portal&_schema=PORTAL) on 23/01/09.
- English V and Blyth J (1997). Identifying and Conserving Threatened Ecological Communities in the South West Botanical Province. Project N702, Final Report to Environment Australia. Department of Conservation and Land Management. Perth, Western Australia.
- Environmental Protection Authority (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. Perth, Western Australia.
- Environmental Protection Authority (2004). Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia – Guidance Statement No. 51, EPA. Perth, Western Australia.
- Government of Western Australia (1950), *Wildlife Conservation Act*. State Law Publisher. Perth, Western Australia.
- Government of Western Australia (1976). *Agriculture and Related Resources Protection Act*. State Law Publisher. Perth, Western Australia.
- Government of Western Australia (2000). *Bush Forever Volume 2- Directory of Bush Forever Sites*. Western Australia Planning Commission. Western Australia.
- Government of Western Australia (2004). Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia. Environmental Protection Authority. Perth, Western Australia.
- Government of Western Australia (2004). *Environmental Protection (Clearing of Native Vegetation) Regulations*. State Law Publisher. Perth, Western Australia.
- Heddl E M, Loneragan O W & 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. Perth.
- Shepherd D.P, Beeston G.R and Hopkins A.J.M (2002). Native Vegetation in Western Australia: Extent, Type and Status. Natural Resource Management Technical Report No. 249: Department of Agriculture.



## Appendix A

# Site Flora Species List



**Table 8 Flora Species Identified within the Project Area**

Family	Genus	Species	Common Name	Corymbia calophylla	E. rudis	M. raphiophylla
Araceae	*	<i>Zantedeschia</i>	<i>Aethiopica</i>	Arum lily	x	
Araliaceae		<i>Trachymene</i>	<i>Pilosa</i>	Native Parsnip	x	
Asparagaceae		<i>Dasypogon</i>	<i>bromeliifolius</i>	Pineapple Bush		x
		<i>Lomandra</i>	<i>caespitosa</i>	Tufted Mat Rush	x	
		<i>Lomandra</i>	<i>purpurea</i>	Purple Mat Rush	x	
		<i>Sowerbaea</i>	<i>laxiflora</i>	Purple Tassels	x	
		<i>Thysanotus</i>	<i>manglesianus</i>	Fringed Lily	x	
		<i>Thysanotus</i>	<i>multiflorus</i>	Many-flowered Fringe Lily	x	
Asteraceae	*	<i>Arctotheca</i>	<i>calendula</i>	Cape Weed	x	x
	*	<i>Sonchus</i>	<i>asper</i>	Rough Sowthistle	x	x
		<i>Trichocline</i>	<i>spathulata</i>	Native Gerbera	x	
	*	<i>Ursinia</i>	<i>anthemoides</i>	Ursinia	x	x
Caryophyllaceae		<i>Petrorhagia</i>	<i>dubia</i>	Velvet pink	x	
Casuarinaceae		<i>Allocasuarina</i>	<i>humilis</i>	Dwarf Sheoak	x	
Colchicaceae		<i>Burchardia</i>	<i>congesta</i>	Milkmaids	x	
Cyperaceae		<i>Lepidosperma</i>	<i>costale</i>		x	
		<i>Lepidosperma</i>	<i>longitudinale</i>	Pithy Sword-sedge		x
		<i>Mesomelaena</i>	<i>tetragona</i>	Semaphore Sedge	x	
Dennstaedtiaceae		<i>Pteridium</i>	<i>esculentum</i>	Bracken	x	x
Dilleniaceae		<i>Hibbertia</i>	<i>racemosa</i>	Stalked Guinea Flower	x	
		<i>Hibbertia</i>	<i>hypericoides</i>	Yellow Buttercups	x	
Droseraceae		<i>Drosera</i>	<i>macrantha</i>	Bridal Rainbow	x	
Elaeocarpaceae		<i>Tetratheca</i>	<i>hirsuta</i>	Black Eyed Susan	x	
Epacridaceae		<i>Leucopogon</i>	<i>parviflorus</i>	Coast Beard-heath	x	



	<i>Leucopogon</i>	<i>propinquus</i>		x	
Euphorbiaceae	<i>Phyllanthus</i>	<i>calycinus</i>	False Boronia	x	
Fabaceae	<i>Acacia</i>	<i>pulchella</i>	Prickly Moses	x	x
	<i>Acacia</i>	<i>saligna</i>	Orange Wattle	x	
	<i>Acacia</i>	<i>stenoptera</i>	Narrow Winged Wattle	x	
	* <i>Acacia</i>	<i>podalyriifolia</i>	Sydney Wattle		x
	<i>Acacia</i>	<i>willdenowiana</i>	Grass Wattle	x	
	<i>Aotus</i>	<i>gracillima</i>			x
	<i>Bossiaea</i>	<i>eriocarpa</i>	Common Brown Pea	x	
	<i>Chorizema</i>	<i>cordatum</i>		x	
	<i>Daviesia</i>	<i>angulata</i>	Stick Daveisia	x	
	<i>Daviesia</i>	<i>physodes</i>		x	
	<i>Gastrolobium</i>	<i>capitatum</i>		x	
	<i>Gompholobium</i>	<i>tomentosum</i>	Hairy Yellow Pea	x	
	<i>Hardenbergia</i>	<i>comptoniana</i>	Native Wisteria	x	
	<i>Jacksonia</i>	<i>sternbergiana</i>	Stinkwood;	x	
	<i>Jacksonia</i>	<i>furcellata</i>	Grey Stinkwood	x	
	<i>Kennedia</i>	<i>prostrata</i>	Scarlet Runner	x	
	* <i>Lathyrus</i>	<i>odoratus</i>	Sweet Pea		x
	* <i>Lupinus</i>	<i>angustifolius</i>	Narrowleaf Lupin	x	x
	* <i>Lupinus</i>	<i>luteus</i>	Yellow Lupins		x
	<i>Medicago</i>	<i>polymorpha</i>	Burr Medic		x
	* <i>Trifolium</i>	<i>hirtum</i>	Rose Clover		x
	* <i>Trifolium</i>	<i>pratense</i>	Red Clover	x	
	<i>Viminaria</i>	<i>junceae</i>	Swishbush		x
Geraniaceae	* <i>Pelargonium</i>	<i>capitatum</i>	Rose Pelargonium		x
Goodeniaceae	<i>Dampiera</i>	<i>linearis</i>	Common Dampiera	x	x
Haemodoraceae	<i>Conostylis</i>	<i>setigera</i>	Bristly Cottonhead	x	
	<i>Conostylis</i>	<i>aculeata</i>		x	
	<i>Haemodorum</i>	<i>simplex</i>		x	
	<i>Phlebocarya</i>	<i>ciliata</i>		x	



		<i>Orthrosanthus</i>	<i>laxus</i>		x	
		<i>Anigozanthos</i>	<i>manglesii</i>	Mangles Kangaroo Paw	x	
Hemerocallidaceae		<i>Dianella</i>	<i>revoluta</i>	Blueberry Lily	x	
Iridaceae	*	<i>Romulea</i>	<i>rosea</i>	Guildford Grass	x	
	*	<i>Ixia</i>	<i>maculata</i>	Yellow Ixia		x
		<i>Patersonia</i>	<i>occidentalis</i>	Purple Flag	x	
	*	<i>Watsonia</i>	<i>meriana</i>	Pink Watsonia		x
Juncaceae	*	<i>Juncus</i>	<i>microcephalus</i>			x
		<i>Juncus</i>	<i>pallidus</i>	Pale Rush	x	x
	*	<i>Juncus</i>	<i>capitatus</i>	Capitate Rush		x
Lamiaceae		<i>Hemiandra</i>	<i>pungens</i>	Snakebush	x	
Loranthaceae		<i>Nuytsia</i>	<i>floribunda</i>	Christmas tree	x	
Myrtaceae		<i>Astartea</i>	<i>scorparia</i>		x	
		<i>Corymbia</i>	<i>calophylla</i>	Marri	x	
		<i>Eucalyptus</i>	<i>marginata</i>	Jarrah	x	
		<i>Eucalyptus</i>	<i>rudis</i>	Flooded Gum		x
		<i>Hypocalymma</i>	<i>angustifolium</i>	White Myrtle	x	x
		<i>Kunzea</i>	<i>recurva</i>		x	
		<i>Kunzea</i>	<i>micrantha</i> subsp <i>micrantha</i>		x	
		<i>Kunzea</i>	<i>ericifolia</i>	Spearwood	x	x
		<i>Melaleuca</i>	<i>preissiana</i>	Moonah		x
		<i>Melaleuca</i>	<i>rhopiophylla</i>	Swamp Paperbark		x
		<i>Pericalymma</i>	<i>ellipticum</i>	Swamp Teatree		x
		<i>Agonis</i>	<i>flexuosa</i>	Peppermint	x	x
Orchidaceae		<i>Caladenia</i>	<i>latifolia</i>	Pink Fairy Orchids	x	
		<i>Elythranthera</i>	<i>brunonis</i>	Enamel Orchid	x	
		<i>Microtis</i>	<i>alba</i>	White Mignonette Orchid	x	
		<i>Prasophyllum</i>	<i>sp</i>	Leek Orchid	x	
		<i>Pyrorchis</i>	<i>nigricans</i>	Red Beaks	x	
		<i>Thelymitra</i>	<i>macrophylla</i>	Scented Sun Orchid	x	



	*	<i>Disa</i>	<i>bracteata</i>	South African Orchid	x	
		<i>Caladenia</i>	<i>flava</i>	Cowslip Orchid	x	
Orobanchaceae		<i>Orobanche</i>	<i>minor</i>	Lesser Broomrape	x	x
Oxalidaceae	*	<i>Oxalis</i>	<i>pes-caprae</i>	Soursob		x x
Papaveraceae	*	<i>Fumaria</i>	<i>capreolata</i>	Whiteflower Fumitory		x
Phytolaccaceae	*	<i>Phytolacca</i>	<i>octandra</i>	Inkweed		x
Plantaginaceae	*	<i>Plantago</i>	<i>lanceolata</i>	Ribwort Plantain		x
Poaceae	*	<i>Avena</i>	<i>fatua</i>	Wild Oats	x	x
	*	<i>Bromus</i>	<i>diandrus</i>	Great Brome	x	
	*	<i>Cynodon</i>	<i>dactylon</i>	Couch		x
	*	<i>Ehrharta</i>	<i>calycina</i>	Perennial Veldt Grass	x	
	*	<i>Eragrostis</i>	<i>curvula</i>	African Love Grass	x	
	*	<i>Lolium</i>	<i>perenne</i>	Parennial Rye Grass	x	
	*	<i>Aira</i>	<i>caryophyllea</i>	Silvery Hairgrass	x	
	*	<i>Briza</i>	<i>maxima</i>	Blowfly Grass	x	
		<i>Austrostipa</i>	<i>elegantissima</i>		x	
Proteaceae		<i>Banksia</i>	<i>grandis</i>	Bull Banksia	x	
		<i>Banksia</i>	<i>littoralis</i>	Swamp Banksia	x	x
		<i>Banksia</i>	<i>ilicifolia</i>	Holly-leaved Banksia;	x	
		<i>Banksia</i>	<i>attenuata</i>	Slender Banksia	x	
		<i>Conospermum</i>	<i>flexuosum</i>	Tangled Smokebush	x	
		<i>Grevillea</i>	<i>manglesioides</i>		x	
		<i>Stirlingia</i>	<i>latifolia</i>	Blueboy	x	
		<i>Xylomelum</i>	<i>occidentale</i>	Woody Pear	x	
		<i>Synaphea</i>	<i>petiolaris</i>		x	
		<i>Adenanthos</i>	<i>meisneri</i>			x
Restionaceae		<i>Desmocladus</i>	<i>flexuosus</i>		x	x
		<i>Hypolaena</i>	<i>exsulca</i>			x
		<i>Hypolaena</i>	<i>pubescens</i>		x	



		<i>Lyginia</i>	<i>imberbis</i>		x	
		<i>Meeboldina</i>	<i>scariosa</i>			x
		<i>Desmocladius</i>	<i>fasciculatus</i>		x	x
Rubiaceae		<i>Opercularia</i>	<i>hispidula</i>	Hispid Stinkweed	x	
Rutaceae		<i>Philotheca</i>	<i>spicata</i>	Pepper and Salt	x	
		<i>Boronia</i>	<i>alata</i>	Winged Boronia	x	
Solanaceae	*	<i>Solanum</i>	<i>nigrum</i>	Blackberry Nightshade		x
Stylidiaceae		<i>Stylidium</i>	<i>schoenoides</i>	Cowkicks	x	
		<i>Sylidium</i>	<i>violaceum</i>	Violet Triggerplant	x	
		<i>Stylidium</i>	<i>calcaratum</i>	Book Triggerplant	x	
Xanthorrhoeaceae		<i>Xanthorrhoea</i>	<i>preissii</i>	Grass tree	x	
		<i>Xanthorrhoea</i>	<i>gracilis</i>	Graceful Grass Tree	x	
Zamiaceae		<i>Macrozamia</i>	<i>riedlei</i>	Zamia Palm	x	

\* denotes introduced species

+ denotes planted species (not endemic to the region)

**GHD**

1st Floor 10 Victoria Street

Bunbury WA 6230

T: 08 9721 0700 F: 08 9721 0777 E: bunmail@ghd.com.au

**© GHD 2010**

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

**Document Status**

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	T Ridgeway/N McCarthy	G Nielsen	<i>G Nielsen</i>	F Hannon	<i>Fionnuala Hannon</i>	22/11/10





## Appendix D

# Assessment of the Project Against the Ten Clearing Principles



## MRWA Vegetation Clearing Impact Assessment Report

This guideline has been prepared to assist MRWA in addressing condition 7 "Assessment of Clearing Impacts" under Clearing Permit CPS 818.

### Area Under Assessment Details

#### Proponent details

Proponent's name:

MRWA

Contacts:

Name: Gerry Zoetelief

Phone: 9725 5640

Fax:

Email: gerry.zoetelief@mrwa.wa.gov.au

#### Property details

Property:

Port Access Road and Bunbury Outer Ring Road road reserves

Colloquial name:

Bunbury Port Access project (Bunbury Port Access Road Stage 2 and Bunbury Outer Ring Road Stage 1)

#### Area under assessment

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:	Site Plan Attached
12.9 ha		Machinery	Road and bridge construction	<input type="checkbox"/> Yes <input type="checkbox"/> No

#### Avoidance/Minimise clearing

##### How have the clearing impacts been minimised?

Road alignment has been modified to avoid areas of vegetation where possible. Clearing will be minimised during construction to the minimum necessary for the safe construction and operation of the road.

#### Background

#### Existing environment and information

##### Description of the native vegetation under application

(suggestion: To determine Vegetation Condition use - Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.)

Site Visit Undertaken	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Fauna / Flora Survey Undertaken	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Site Report Attached	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Fauna / Flora Survey Report Attached	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Site Photos Attached	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Other Relevant References Attached	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Vegetation Complex Swan	Clearing Description Clearing for road and bridge construction and Preston River bridge	Vegetation Condition 5 and 6	Comment



<b>Guildford</b>	<b>Road construction</b>	<b>3-4 and 6</b>
<b>Southern River</b>	<b>Majority of the project area, mainly cleared farmland and plantation</b>	<b>4-5 and 6</b>

### **Assessment of application against Clearing Principles**

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

**Comments** Proposal is not likely to be variance to this Principle

The native vegetation in the area comprises a moderate level of biological diversity as it is primarily a remnant of the pre-existing vegetation. There are however large areas of cleared farmland which show a very low level of biodiversity.

**Methodology** Database searches, aerial photography, site assessment

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

**Comments** Proposal may be at variance to this Principle

The vegetation areas of the Project Area comprise habitat for a number of fauna species, including Western Ringtail Possum (foraging and nest habitat), Forest Red-tailed Cockatoo (foraging habitat), Carnaby's Black Cockatoo (foraging habitat), Baudin's Black Cockatoo (foraging habitat) and the Rainbow Bee-eater (nest habitat). No active cockatoo habitat trees were observed.

These species are known to occur outside of the proposed clearing area.

Revegetation of the cleared sections of the project site will be implemented.

**Methodology** Database searches, aerial photography, site survey and habitat assessment

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

**Comments** Proposal is not at variance to this Principle

No DRF or priority flora species will be impacted by clearing for the project.

**Methodology** Database searches, aerial photography, site survey and habitat assessment



(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.

Comments Proposal is not at variance to this Principle

No Threatened or Priority Ecological Communities were identified as being present within the Project Area.

Methodology Database searches, aerial photography, site survey and habitat assessment

(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.

Comments Proposal may be at variance to this Principle

The mapped vegetation complexes (Heddl) for the Project Area are:

Southern River (Vulnerable) with 15.6% remaining

Swan (Endangered) with 5.0% remaining

Guildford (Vulnerable) with 19.8% per cent respectively

It should be recognised that the vegetation within the project is good to completely degraded condition. Refer vegetation condition mapping in EIA. Revegetation of the cleared sections of the project site will be implemented.

Management of impacts on these attributes will be implemented during roadworks.

Methodology Database searches, aerial photography, site survey and habitat assessment

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

Comments Proposal may be at variance to this Principle

The project traverses the Preston River identified as a 'Conservation' category wetland and ESA. The project also impacts on the fringe of a degraded EPP wetland also defined as an ESA at the Moore Rd/ Boyanup Picton Road intersection. Vegetation at these sites is degraded (Condition 5)

Revegetation of the cleared sections of the project site will be implemented.

Management of impacts on these attributes will be implemented during roadworks.

Methodology Database searches, aerial photography, site survey and habitat assessment



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

Comments Proposal is not at variance to this Principle

Clearing of native vegetation will not cause appreciable land degradation. Management of impacts on drainage, ASS and clearing will be implemented during roadworks. Revegetation of the cleared sections of the project site will be implemented.

Methodology Database searches, aerial photography, site survey and habitat assessment.

**(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.**

Comments Proposal is not at variance to this Principle

There are no conservation areas in close proximity to the Project Area

Methodology Database searches, aerial photography, site survey and habitat assessment.

**(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.**

Comments Proposal is not at variance to this Principle

Clearing of native vegetation for the project is considered unlikely to impact on surface or groundwater. Management of off road drainage and river foreshores will be implemented during the design and construction of the project.

Methodology Database searches, aerial photography, site survey and habitat assessment

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

Comments Proposal is not at variance to this Principle

The clearing of native vegetation is not considered to cause any alteration to flood duration or flood height.

Road will be designed to maintain existing surface water movements. Drainage and ASS management plans to be prepared and implemented.

Methodology Aerial photography, site survey and road design concept





## Planning instrument, Native Title, RIWI Act Licence, EP Act Licence, Works Approval, Previous EPA decision or other matter.

### Comments

Sections of the project are as defined under the Greater Bunbury Region Scheme.  
Project will be referred to EPA under S38 of the WA Environmental Protection Act for a decision on the need for formal assessment.  
Approval under RIWI Act will be required for the Ferguson and Preston River crossings  
Approval under S18 of Aboriginal heritage Act is currently being sought

### Methodology

### Assessor's recommendations

May be at variance with Principles (b), (e), and (f)

Main Roads will prepare and implement Environment Offset, Revegetation Management Plan, ASS management Plan, Foreshore Management plan, Drainage Management Plan and Construction Management Plan

### References

Refer to Environmental Impact Assessment for the Bunbury Port Access Project (GHD, 2010)

### OFFICER PREPARING REPORT

Neil McCarthy

Position: Principle Environmental Consultant GHD Bunbury

Date: 26/10/10



## Appendix E

# Fauna Survey



CLIENTS | PEOPLE | PERFORMANCE

## **Main Roads Western Australia**

**Bunbury Port Access Road  
Project Stage 2**

**Rare Fauna Survey**

**November 2010**



# Contents

1.	Introduction	1
1.1	Background	1
1.2	Methodology	1
1.3	Desktop Assessment	2
2.	Field Assessment	6
2.1	Survey Methods	6
2.2	Habitat Assessment	6
2.3	Significant Fauna Species	6
2.4	Introduced Fauna Species	7
2.5	Fauna Habitat Types	7
2.6	Habitat Value	8
2.7	Habitat Linkages	8
3.	Consultation with DEC	9
4.	Conclusions	11
5.	Report Limitations	12
6.	References	13

## Appendices

- A Results of Fauna Database Searches
- B Fauna Conservation Classifications
- C Field Survey Fauna Observations



# 1. Introduction

## 1.1 Background

Main Roads commissioned GHD Pty Ltd (GHD) to undertake a survey of significant fauna for the proposed Bunbury Outer Ring Road and Port Access Road Stage 2.

The fauna assessment completed for the project included both desktop searches and site surveys. A Level 1 rare fauna survey was conducted over four days and three nights between the period of 17<sup>th</sup> February and the 5<sup>th</sup> March 2009 and over four days and two nights between the 4<sup>th</sup> and 7<sup>th</sup> of August 2009. The fauna assessments were undertaken in accordance with *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia – Guidance Statement No. 56*, EPA, Perth.

The initial significant fauna survey included the entire Bunbury Outer Ring Road alignment, and a number of alignment options for the Port Access Road Stage 2. The results of the wider survey have been used to produce this report which focuses on the Bunbury Port Access Road Stage 2 Project (PAR Stage 2), which comprises Stage 2 of the Bunbury Port Access Road and Stage 1 of the Bunbury Outer Ring Road.

## 1.2 Methodology

This Level 1 Fauna assessment included both desktop and field assessments. The desktop assessment included:

- ▶ A review of the Department of Environment and Conservation's (DEC) Rare and Threatened Fauna database
- ▶ A review of the Western Australian Museum and Birds Australia database for fauna
- ▶ A review of the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) database for areas listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); and
- ▶ Review all available reports and literature of possible fauna in the area and consult with relevant experts on the fauna of the area, specifically Paul De-Tores of DEC.

The field survey verified the desktop study and provided a detailed assessment of the existing environment in the survey area and its relationship to adjoining areas. The field survey included the following actions and details:

- ▶ An inventory of the vertebrate fauna species in the study area through targeted searches and opportunistic recording of species
- ▶ Review of the fauna species considered to be rare or in need of special protection
- ▶ Review of the presence and abundance of pest, declared or feral animals
- ▶ Identification of any habitats of significance
- ▶ Conduct day and night surveys to determine the presence of significant fauna
- ▶ Netting of ephemeral wetlands in the vicinity of the Project Area to identify the occurrence of two significant fish species





- ▶ Other opportunistic searches through microhabitats including turning of logs, rocks, leaf litter and looking in hollow logs
- ▶ Opportunistic visual and aural surveys, particularly for birds utilizing the sites; and
- ▶ The site was also searched for tracks, scats, bones, diggings and feeding areas for both native and feral fauna.

The report notes any difficulties, qualifications or limitations encountered during any aspect of the project, and includes an inventory of vertebrate fauna observations.

Nomenclature used in the report is that used by the Western Australian Museum *FaunaBase* program, as it is deemed to contain the most up-to-date species information for Western Australia.

### **1.3 Desktop Assessment**

The Western Australian Museum *FaunaBase* online search was conducted for a 10 km buffer of the study area. The search identifies terrestrial vertebrate species recorded in the collections of the Western Australian Museum. The search identified the potential presence of 38 bird, 51 reptile, 12 amphibians, 41 mammal species, and 15 fish species. A list of these species is presented at Appendix A.

Several fauna species of conservation significance were identified as potentially occurring in the Project Area through this search. Due to the close proximity to the ocean, several marine and migratory species were identified in these database searches – these species will not be impacted by the project.

It should be noted that some of the records of the Museum 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 Project Area due to lack of suitable habitat.

#### **1.3.1 Significant Fauna Species Databases**

The conservation of fauna species and their significance status is currently assessed under both State and Commonwealth legislation. This legislation includes the *Western Australian Wildlife Conservation Act 1950*; *Wildlife Conservation (Specially Protected Fauna) Notice 2010*, and the Commonwealth *EPBC Act*.

The significance levels for fauna used in the *EPBC Act* are those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN). The EPBC Act also protects migratory species that are listed under the following 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); and
- ▶ 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).

Listed migratory species also include species identified in other international agreements approved by the Commonwealth Environment Minister.



DSEWPC 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 the DEWHA), for the matters of significance that may occur in, or may relate to, the survey area. A description of the EPBC conservation categories is included at Appendix B.

Species considered threatened under Western Australian *Wildlife Conservation Act 1950* are listed under scheduled levels of protection by the state. The levels of scheduled fauna are described at Appendix B. The DEC also produces a supplementary list of Priority Fauna, these being species that are not considered threatened under the Western Australian *Wildlife Conservation Act 1950* but for which the Department feels there is a cause for concern. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. Levels of Priority are also included at Appendix B.

A number of protected fauna species were identified from the FaunaBase, DEC and DEWHA databases, as potentially occurring within the survey area, however most of these species however are marine species and will not be impacted by the Project.

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.

The desktop surveys 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 surveys) are considered below.

### 1.3.2 Significant Fauna Species

#### **Forest Red-tailed Black-Cockatoo (*Calyptrorhynchus banksii naso*) Schedule 1 Vulnerable**

The Forest Red-tailed Black-Cockatoo species is essentially a cockatoo of the Jarrah forest (*Eucalyptus marginata*) but also uses Marri (*Corymbia calophylla*) and woodlands for foraging, with Marri seeds (along with jarrah) being its principal food source (Johnstone and Kirkby, 1999). This species is currently classified as Vulnerable on the February 2009 DEC Threatened Fauna list.

The Forest Red-tailed Black Cockatoo has reduced in range on the Swan Coast Plain due to habitat loss and now persists in the Jarrah forest of the South West. In the Bunbury area the species is known to utilise Marri trees as feeding sites and possibly Tuart's to breed in.

**Assessment:** This species is known to occur in the general area and contains significant habitat for Forest Red-tailed Black-cockatoo for both feeding and breeding.

#### **Baudin's Black Cockatoo (*Calyptrorhynchus baudinii*) Vulnerable, Schedule 1**

Baudin's Black cockatoo is found in the south-west of Western Australia in the Forest and Woodlands of Jarrah (*Eucalyptus marginata*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*). It also occurs in Wandoo (*E. wandoo*) woodland, and in orchards, and is occasionally recorded in farmland and grasslands (DEC, 2007). This species mainly feeds on the seeds and flowers of Marri in the forested regions of the south-west, and the seeds of the Proteaceous *Banksia grandis*, *B. littoralis*, *B. ilicifolia*, *Hakea undulata*, *H. prostrata*, *H. trifurcata*, as well as *Erodium botrys*, Jarrah and insect larvae. They



also feed on apple and pear seeds in orchards. Baudin's Cockatoo nests in mature trees such as Marri, Karri, Jarrah and Wandoo in the lower south-west of Western Australia (DEC, 2007). The northern-most breeding record for Baudin's Black Cockatoo is for Lowden, near Donnybrook (DEC, 2007).

The principal cause of the decline in range was clearing of the eastern margins of the forests for agriculture. Other threatening processes are killing by illegal shooting, feral honeybees (*Apis mellifera*), habitat loss, nest shortage and competition for available nest hollows (DEC, 2007). Baudin's Cockatoo is currently listed as Endangered in Western Australia and listed as Vulnerable under the Commonwealth *EPBC Act 1999*. Baudin's Cockatoo fits the criteria for Endangered because of a projected or suspected decline in the population of 50 per cent or more within the next ten years or three generations, whichever is the longer (up to a maximum of 100 years) (DEC, 2007).

**Assessment:** The study area contains significant habitat for Baudin's Black Cockatoo for both feeding and breeding.

#### **Carnaby's Black Cockatoo (*Calyptrorhynchus latirostris*) Schedule 1, Endangered**

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.

**Assessment:** The study area contains significant habitat for Carnaby's Black Cockatoo for both feeding and breeding.

#### **Cape Barron Goose (*Cereopsis novaehollandiae grisea*) Schedule 2.**

This subspecies of the Cape Barren Goose occurs on the islands of the Recherche Archipelago and is occasionally recorded on the mainland. It is not expected that this species will utilise the study area for forage or refuge, with many species preferring offshore islands as such habitat.

**Assessment:** This species is known to occur very rarely in the general area and there is an extremely low likelihood of it occurring in the project area. There was a recorded road death specimen south of Bunbury (Hume pers. comm. 2007) several years ago (no specific date) but the occurrence of the species in the region is very rarely reported.

#### **Australasian Bittern (*Botaurus poiciloptilus*) Schedule 1, Vulnerable**

The Australasian Bittern is a large powerfully built wetland dwelling bird that stands 65-75 cm tall (Morcombe 2004). This species is cryptic by nature and prefers heavily vegetated freshwater or estuarine wetlands shallow or deep in which it hunts from vegetation platforms on the waters edge (Morcombe 2004). The species is distributed in the south west of Western Australia, southern portions



of South Australia, Victoria, New South Wales and Tasmania. It occasionally is found in the Ord River Drainage of Western Australia (Morcombe 2004).

**Assessment:** This species is likely to migrate to optimal wetlands at different times of the year. The riparian vegetation on the Preston and Ferguson Rivers although heavily weed infested may provide for temporarily use by this species but no permanent use areas exist.

#### **Little Bittern (*Ixobrychus minutus dubius*) Priority 3**

The Little Bittern is approximately half of the size of the Australasian Bittern and has a similar distribution and habitat requirement (Morcombe 2004).

**Assessment:** Very similar to the Australasian Bittern in that the species may temporarily use the area as required.

#### **Hooded Plover (*Charadrius rubricollis*) Priority 4**

The Hooded Plover is a wader that is endemic to Australia with most of the remaining birds occurring in southern Western Australia. Hooded Plovers live on ocean beaches and on coastal and inland salt lakes. This species is known to occur on coastal areas and inland lakes in the Esperance region. They are mainly found on the coast during the dry season, but some birds move inland during the wet season. They feed on invertebrates such as worms, shellfish, crustaceans, insects and seeds. Hooded Plovers are particularly vulnerable in the first stages of their lives. They take approximately four weeks to hatch and are flightless for five to six weeks after that. The eggs and flightless chicks can easily be hunted and eaten by foxes, dogs and cats. Being highly camouflaged they are also accidentally crushed by pedestrians, 4WD vehicles and trail bikes (Birds Australia, 2007).

**Assessment:** It is unlikely that this species would occur within the alignment as no suitable habitat occurs for this species within the Project Area. Temporary inundated areas may be used by this species opportunistically.

#### **Peregrine Falcon (*Falco peregrinus*) Schedule 4**

The Peregrine Falcon is an iconic species that went through a population decline in 1960's and 1970's. The species is distributed world wide and declined due to the over use of pesticides such as DDT. Since the dramatic worldwide reduction in DDT use the Peregrine Falcon has stabilised and in Australia is considered the largest population.

**Assessment:** This species is known to occur in the general area and it is likely to occur in the project area. No animals were observed during the field assessment and it is likely that the PAR Stage 2 will not impact this species. The alignment does not traverse any cliff or potential breeding areas for this species.

#### **Rainbow Bee-eater (*Merops ornatus*) Migratory, Marine**

The Rainbow Bee-eater is a brightly coloured species that migrates to Australia in the warmer drier months of southern Australia. In the northern parts of Australia it can live all year round without migration. The species prefers woodlands, open forests, semi-arid scrub, grasslands or farmlands. They prefer to breed in open cleared areas in heavily forested woodlands or in farmlands (Morcombe 2004). Its breeding season is from November to February and it nests by constructing a burrow on the ground or by tunnelling in sandy or clay soils.



**Assessment:** Rainbow Bee-eater is the only Migratory and Marine listed species known to occur within the locality of the PAR Stage 2. Breeding sites were observed in native habitat between Walrodt Road and Boyanup-Picton Road.

#### **Western Ring-tail Possum (*Pseudocheirus occidentalis*) Schedule 1, Vulnerable**

Western Ring-tail Possums occur only in the south west region of Western Australia where they feed upon Peppermint (*Agonis flexuosa*) and *Eucalyptus* trees (Menkhorst 2004). The species is now restricted to wetter coastal areas of the south west; with smaller populations occurring inland in Jarrah, Wandoo and Marri forests (Menkhorst 2004).

**Assessment:** The study area contains significant habitat for the Western Ring-tail Possum. The project is likely to impact local populations mainly by habitat loss, population fragmentation and increased mortality caused by highway traffic.

#### **Western Brush Wallaby (*Macropus irma*) Priority 4**

The Western Brush Wallaby is a medium sized macropod, is a grazer found primarily in open forest and woodland. This species was once very common in the south-west of Western Australia but has undergone a reduction in range and a significant decline in abundance in its current habitat. The decline in populations of this species has resulted from extensive clearing within its original distribution and from predation of juvenile Western Brush Wallabies by foxes (DEC, 2008).

The Western Brush Wallaby occurs on the Swan Coastal Plain only in a select number of large vegetation remnants, peripheral to urban areas (Government of Western Australia, 2000).

**Assessment:** The Western Brush wallaby is known to occur in the general area in large vegetated areas. This species was not identified during the fauna surveys, and it would be unlikely to occur on the project area due to the lack of large vegetated areas. Potential habitat occurs north of the section between Walrodt Road and Boyanup-Picton Road and within the PAR Stage 2 alignment.

#### **Chuditch (*Dasyurus geoffroii*) Schedule 1, Vulnerable**

The Chuditch or Western Quoll formerly ranged over nearly 70 % of Australia but now retains only a patchy distribution through the Jarrah forest and mixed Karri/Marri/Jarrah forest of south-western WA. This reduction in range and decline in population numbers have been caused by habitat alteration, impacts from the introduction of foxes and cats, hunting and poisoning (Orell and Morris, 1994). This species tends to now be restricted to the more open Jarrah forests and woodlands to the north of Manjimup (Orell and Morris, 1994) and northern Jarrah forest (Orell and Morris, 1994). The reduction in range and decline in population numbers have been caused by habitat loss and predation from foxes and cats (Orell and Morris, 1994). This species is currently listed as Vulnerable on the EPBC Act.

It currently occurs in sclerophyll forests, heath and mallee shrublands of the southwest region of Western Australia, and the southern Wheatbelt. The Chuditch occurs at low densities, even in quality habitats of coastal areas.

**Assessment:** The Chuditch are known to occur in the Collie and adjoining areas of the Darling Range. Due to habitat loss surrounding Bunbury it is unlikely that the species still occurs in the area. Potential habitat occurs north of the section between Walrodt Road and Boyanup-Picton Road and within the PAR Stage 2 alignment.





### **Southern Brush-tailed Phascogale (*Phascogale tapoatafa tapoatafa*) Schedule 1, Vulnerable**

The Southern Brush-tailed Phascogale is observed in dry sclerophyll forests and open woodlands with a generally spare understorey. This species' habitat requirements also include hollow-bearing trees, rotted stumps or tree cavities which they use as nest sites (Van Dyck and Strahan, 2008). Tree hollows that have a small and secure entrance with a large internal cavity are highly favoured by breeding SBTPs. Southern Brush-tailed Phascogale will also use existing bird's nests as their small size and weight allows them to use such existing nests successfully (Van Dyck and Strahan, 2008).

Habitat clearing and fragmentation as a result of agriculture and land development; and habitat alteration from logging and mining have reduced the availability of trees with hollows required for this species to nest and breed. Another cause for decline of this species is predation by foxes and cats. What suitable habitat remains is often fragmented, isolating populations and impeding genetic exchange.

**Assessment:** This species was recorded in remnant vegetation east of Moore Road south of the PAR Stage 2 alignment. There is potential for this species to occur in the Marri / Peppermint Woodland between Walrodt Road and Boyanup-Picton Road.

### **Southern Brown Bandicoot (*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.

The Quenda is a Priority 5 species, which means that it is not considered threatened but is subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years. 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.

**Assessment:** The PAR Stage 2 Project Area assessment did not sight or record any diggings of Southern Brown Bandicoot however some habitat of thick sedges is present between Walrodt Road and Boyanup-Picton Road that maybe suitable.

### **Mainland Quokka (*Setonix brachyurus*) Vulnerable, Schedule 1**

The Quokka is a small macropod that inhabits low lying scrub or dense heath and swamps with dense vegetation (Maxwell *et al.*, 1996). This species is a browser, with peppermint (*Agonis flexuosa*) and *Thomasia* species being dominant in their diet (DEC, 2008). The range of the Quokka once extended across the south west of Western Australia; however, with the impact of colonization and the introduction of predators such as the fox this range has been highly reduced.

**Assessment:** This species is known to occur in the general region particularly in the Collie area however there is a low likelihood of it occurring in the project area due to unsuitable habitat.

### **Numbat (*Myrmecobius fasciatus*) Vulnerable, Schedule 1**

The numbat is a small, banded, diurnal marsupial that feeds solely on termites. This species once ranged widely in southern semi-arid and arid Australia, distributed within a number of vegetation types. However, the numbat's current distribution is limited to Dryandra and Perup/Kingston area east of Manjimup and a number of nature reserves into which it has been reintroduced. This species occupies a



number of habitat types including Jarrah forest, open eucalypt woodland, *Banksia* woodland and tall closed shrubland (Van Dyck and Strahan, 2008).

The numbat has been threatened by a number of factors since European colonization of Western Australia, these factors include predation by foxes, clearing of native vegetation and changed fire regimes. This species is now listed as Threatened on both the *Wildlife Conservation Act 1950* and the *EPBC Act*.

**Assessment:** This species is believed to be locally extinct and would not be expected to occur in the Project Area.

#### **Woylie (*Bettongia penicillata ogilbyi*) Endangered, Schedule 1**

The Woylie is a small marsupial that historically ranged across much of Australia, but is now restricted to small populations in Western Australia. Contraction in range has been attributed to the presence of feral cats and foxes and climatic factors. As the result of a fox baiting and recovery program, the Woylie was removed from state and commonwealth endangered fauna lists. However, populations have declined rapidly in recent times, with the species having its endangered status reapplied.

**Assessment:** This species is known to occur in the general region and due to the lack of suitable habitat there is a low likelihood of it occurring in the Project Area.

#### **Water Rat (*Hydromys chrysogaster*) Priority 4**

Water rats are widely distributed across coastal and much of eastern inland Australia, although they are patchily distributed within their range. The species always lives in the vicinity of water bodies, where they make dens at the end of tunnels in banks or occasionally in logs.

**Assessment:** This species is known to occur in the general region in freshwater courses and estuarine areas. The PAR Stage 2 crosses the Preston and Ferguson Rivers and is possible that the species occurs in these areas. There is a low likelihood of it occurring in the remainder of the project area due to the lack of permanent water.

#### **Western False Pipistrelle (*Falsistrellus mackenziei*) Priority 4**

This species of insectivorous bat is endemic to the south west coast of Western Australia. Most records of this species are from mature Karri forest but they are also known to occur in woodlands on the Swan Coastal Plain. The Western False Pipistrelle roosts in tree hollows.

**Assessment:** This species is known to occur in the general area. There is a low likelihood of it occurring in the project area, although a number of trees within the proposed alignment support hollows that may be used by this species.

#### **Greater Long-eared Bat (*Nyctophilus timoriensis major*) Priority 4**

The Greater Long-eared Bat is the largest member of the *Nyctophilus* group. *N. t. major* is the south west of Western Australia subspecies and roosts in tree hollows in wet sclerophyll forest (Menkhorst *et al.* 2004). The species requires woodland canopy and shrub layers for hunting of arthropods from foliage and on the ground (Menkhorst *et al.* 2004).

**Assessment:** This species is known to occur in the general area and there is a low likelihood of it occurring in the project area. There is a low likelihood of it occurring in the project area, although a number of trees within the proposed alignment support hollows that may be used by this species.



#### **South West Carpet Python (*Morelia imbricata*) Schedule 4, Priority 4**

The South West Carpet Python is the only python species in the extreme south west of Western Australia (Wilson et al 2008). The species occurs in a large range of habitats from wet sclerophyll forest to arid woodlands, granite exfoliation and coastal heath. 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). The species is known to be in the area in particular Leschenault Peninsula Conservation Park.

**Assessment:** This species is known to occur in the general area and there is a low likelihood of it occurring in the project area. No signs of the species were recorded, There is potential for a small population to occur in the Marri / Peppermint Woodland between Walrodt Road and Boyanup-Picton Road.

#### **Darling Range Heath Ctenotus (*Ctenotus delli*) Priority 4**

*Ctenotus delli* is a small ground dwelling striped skink endemic to Western Australia found in the Darling Range, from Darlington south to near Collie (Storr et al, 1999). The species is mainly found in Jarrah and Marri Woodlands (Wilson et al 2008) in humid areas on lateritic and clay soils (Storr et al, 1999). The species is rarely observed active due to its secretive nature.

**Assessment:** This species is not known to occur in the general area and is very unlikely to occur in the Project Area.

#### ***Lerista lineata* Priority 3**

The Lined Skink is a small, slender lizard with prominent black stripes along its back and sides. This skink is found in the southern areas of the Swan Coastal Plain, restricted to pale sands that support heathlands and shrublands. This species is particularly associated with Banksia woodland. (Bush et al., 1995).

The Lined Skink is locally restricted in range, being found within the southern suburbs of Perth, and at Rottnest and Garden Islands, Busselton, and east of Shark Bay (Storr, *et al.*, 1999). This species has been threatened by the extensive urban development in the southern suburbs. The primary habitat of the lined skink is now within urban backyards (Bush *et al.*, 1995). It was removed from the gazetted, threatened fauna list in 1990, and is now listed on the DEC database of threatened and priority fauna as a Priority Three species, indicating it is a “taxa with several, poorly known populations, some on conservation lands”.

**Assessment:** This species is known to occur in the general area and there is a high likelihood of it occurring in the project area particularly in the sandy soils. No signs of the species were recorded, however, there is potential that the Marri / Peppermint Woodland between Walrodt Road and Boyanup-Picton Road may support a small population.

#### **Balston's Pigmy Perch (*Nannatherina balstoni*) Vulnerable, Schedule 1**

Balston's Pigmy Perch is a small species of native freshwater fish restricted to the south west corner of Western Australia from Two Peoples Bay to Margaret River (Allan et al 2002). Historically the species range extended to just north of Perth but has contracted due to habitat degradation. Habitat of this species consists of pools, streams and lakes which are acidic and tannin-stained. Shallow water areas with sedge vegetation are preferred (Allan *et al.* 2002).



**Assessment:** This species is not known to occur in the general area and there is a low likelihood of it occurring in the project area. No signs of the species were recorded, however, the alignment crosses the Preston and Ferguson Rivers which may potentially support populations of these species.

#### **Western Mud Minnow (*Galaxiella munda*) Vulnerable, Schedule 1**

The Mud Minnow is a small native freshwater fish restricted to the south west of Western Australia. In the south west corner from Albany to Margaret River the species is considered common (Allan *et al.* 2002). An isolated population exists in the Gingin area north of Perth that is restricted in range and considered vulnerable. There is little habitat available in this area and its population has contracted due to habitat degradation (Allan *et al.* 2002). This species has similar habitat requirement to that of the Balston's Pigmy Perch.

**Assessment:** This species is not known to occur in the general area and there is a low likelihood of it occurring in the project area. No signs of the species were recorded, however, the alignment crosses the Preston and Ferguson Rivers which may support populations of this species.

#### **Black-strip Minnow (*Galaxiella nigrostriata*) Priority 3**

Black Stripe Minnow has a restricted distribution to freshwater areas within 100 km of the coast in the south west of Western Australia. The main population of this species exists on the south coast between Albany and Augusta (Allan *et al.* 2002). Small populations have been recorded at Ellenbrook, Kemerton and Bunbury. This species is able to aestivate in damp areas over the dry period and tend to be associated with swamps and ephemeral ponds with acidic tannin stained water (Allan *et al.* 2002).

**Assessment:** This species is known to occur in the general area and there is a likelihood of it occurring in the project area. The ephemeral wetlands in the vicinity of the Project has the potential to support populations of this species. A targeted survey conducted at these sites when they held water did not identify this species.

#### **Pouched Lamprey (*Geotria australis*) Priority 1**

Lampreys are a primitive jawless fish which are considered the group where all jawed vertebrates evolved (Allan *et al.* 2002). The Pouched Lamprey has a broad distribution throughout the southern hemisphere including Australia, New Zealand, Chile and Argentina. In Western Australia the species utilises freshwater streams in the south west (Perth to Albany) to breed and grow before migrating to the ocean to mature (Allan *et al.* 2002). The species is regarded as secure but has declined due to modifications to breeding streams. Dams and weirs are the main obstacles for the species (Allan *et al.* 2002).

**Assessment:** This species is known to occur in the general area and there is a likelihood of it occurring in the project area. No signs of the species were recorded, the alignment crosses the Preston and Ferguson Rivers which may support populations of this species.

#### **Migratory Bird Species**

A number of the species included in the list of significant fauna species that could potentially occur in the project area were migratory terrestrial, marine and wetland species. There is the potential for terrestrial and marine migratory bird species, such as the White-bellied Sea-Eagle, to occur occasionally within the study areas. However, the study area cannot be considered as significant habitat for migratory species.



### **Other Species**

In addition to the above species, the DEC and *EPBC Act* Protected Matters Search also recorded a number of marine mammals, reptiles, shark species, and ray-finned fishes, listed under the *Wildlife Conservation Act 1950* and/or the *EPBC Act 1999*, to occur within the search area. Sections of the study area are situated very near Vittoria and Koombana Bays near the Bunbury Port facility; therefore, the marine environment was included in the 10 km buffer search of the study area. Given that the PAR Stage 2 will not impact on the marine environment, these species have not been considered in this report.





## 2. Field Assessment

### 2.1 Survey Methods

Field surveys consisted of ground truthing of native vegetation within, and surrounding, the proposed PAR Stage 2 and Bunbury Outer ring Road alignments. Searches were conducted over eight days and five nights with species present identified and recorded. Signs of animals were also recorded as a guide to their presence such as tracks, scats, nests and burrows.

Three nocturnal inspections were undertaken to specifically target Western Ringtail Possums in February and March 2009.

The survey also included an assessment and targeted netting of ephemeral wetlands in the vicinity of the Project Area to identify the occurrence of two significant fish species - *Nannatherina balstoni* and *Galaxiella nigrostriata* that could potentially be present. Methodology for these searches was discussed with David Moragan and Kim Williams from DEC and consisted of one human hours of netting within the selected water body. Nets used were 50cm triangular fine netting. The specific searches did not identify these species within, or in proximity to the Project Area.

### 2.2 Habitat Assessment

The alignment was assessed by aerial photography with areas selected based on native vegetation present. Cleared land which comprises much of the Project Area were not targeted for these surveys, although all observations were recorded while traverses these areas. Eight reptiles, four native mammals, five non native mammals and thirty two birds were recorded during the site survey. These species are listed at Appendix C.

### 2.3 Significant Fauna Species

During the field investigation five significant fauna species were identified along the alignment. These species were:

- ▶ Western Ringtail Possum
- ▶ Forrest Red-tailed Black Cockatoo
- ▶ Baudin's Black Cockatoo
- ▶ Carnaby's Black Cockatoo and
- ▶ Rainbow bee-eater.

A brief description of the occurrence and other observations in respect to these species is noted below. Observations and or evidence of these species detailed at Appendix C below and Figure 6 of the EIA report.

#### Western Ringtail Possum

Western Ringtail Possum's were observed at a number of locations within and adjacent to the project Area with dreys, scats or animal signs recorded. The species was observed in a range of woodlands that consisted of Peppermint (*Agonis flexuosa*), *Banksia spp*, *Melaleuca spp*, Marri Tree (*Corymbia*



*calophylla*) and/or Jarrah (*Eucalyptus marginata*) in most native woodland areas along the alignment. The canopy of the woodland was generally dense and overlapping, suitable for arboreal activity.

Clearing for roadworks will impact habitat areas for this species.

#### **Forrest Red-tailed Black Cockatoo**

Forrest Red-tailed Black Cockatoo's were observed along the alignment by either sightings or call identification. Several feeding areas were found particularly in Marri and Banksia woodlands. As there are three species of Black cockatoo in the area it is difficult to determine which species were using each area for food without actual sightings.

#### **Baudin's Black Cockatoo**

Baudin's Black Cockatoo was reported once during the assessment via calls and possible feathers but these can be easily confused with Carnaby's Black Cockatoo. Several feeding areas were found particularly where Marri or Banksia is present. As there was evidence of three species of Black cockatoo in the area it was difficult to determine which species were using each area for food without sightings.

#### **Carnaby's Black Cockatoo**

Carnaby's Black Cockatoo was not heard or observed over the assessment but foraging areas were found in Banksia woodland suggesting usage by the species. At one site feathers of one of the White tailed species were recorded and suspected to be Carnaby's Black Cockatoo. Several other feeding areas were also found particularly in Marri / Peppermint woodland. Again as there are three species of Black cockatoo in the area it is difficult to determine which species were using each area for food without actual sightings.

Observation of cockatoo foraging were concentrated in the remnant vegetation in the vicinity of Walrodt, Moore and Picton Boyanup Roads. Clearing for roadworks will impact cockatoo foraging habitat.

#### **Rainbow Bee-eater**

Rainbow bee-eaters were recorded at one site within the project Area. Birds were observed on a sand ridge on Lot 5 north of Walrodt Road, where three pairs of birds were observed nesting at the site. This site is approximately 700m north of the PAR Stage 2.

## **2.4 Introduced Fauna Species**

Six introduced or domestic species were observed along the alignment these being the European Cow (*Bos Taurus*), Horse (*Equus caballus*), Cat (*Felis catus*), Domestic Dog (*Canis domesticus*), rabbit (*Oryctolagus cuniculus*) and the Fox (*Vulpes vulpes*).

## **2.5 Fauna Habitat Types**

Much of the PAR Stage 2 alignment is cleared pasture or plantation with isolated scattered trees. Several sites provide suitable fauna habitat, these being:

- ▶ *Corymbia calophylla* / *Agonis flexuosa* open woodland
- ▶ *Melaleuca raphiophylla* over mixed pasture grasses
- ▶ *Eucalyptus rudis* woodland over mixed pasture grasses



## 2.6 Habitat Value

The cleared agricultural areas and plantation along the alignment have little habitat value based on the lack of native vegetation present. Well vegetated sites have a high habitat value based on its usage by significant fauna, such as Western Ringtail Possum, Forrest Red-tailed Black Cockatoo, Baudin's Black Cockatoo, Carnaby's Black Cockatoo and the Rainbow bee-eater.

The habitat between Walrodt Road and Boyanup-Picton Road provides confirmed habitat for Western Ringtail Possum and foraging habitat for Black Cockatoos. No confirmed cockatoo nesting trees were observed within the Project Area but significant large trees are present and are suitable for breeding. Rainbow Bee-eaters were observed breeding and utilising areas between Walrodt Road and Boyanup-Picton Road.

A number of other significant species may also be present between Walrodt Road and Boyanup-Picton Road namely *Lerista lineata*, *Morelia imbricata*, *Phascogale tapoatafa tapoatafa*, *Dasyurus geoffroii*, *Nyctophilus timoriensis major*, *Falsistrellus mackenziei*, *Macropus irma* and *Isoodon obesulus fusciventer*.

## 2.7 Habitat Linkages

The vegetation between Walrodt Road and Boyanup-Picton Road provides a significant habitat linkage to the large area of native vegetation in Lot 5 to the north, and the smaller remnants to the south and east.

The vegetation along both the Ferguson and Preston Rivers, although of poorer condition also provide a regional linkage along the watercourses.



### 3. Consultation with DEC

GHD's Glen Gaikhorst met with Paul De-Tores from DEC at the Woodvale Science facility on Tuesday 10<sup>th</sup> March 2009 to discuss the project and work being undertaken by DEC in the vicinity of the project Area. Paul is the principal research scientist working on Western Ringtail Possums in the Bunbury/Busselton area and has significant experience with the species.

Glen presented the data on the Western Ringtail Possums to obtain Paul's comments on the distribution on the species in the region.

DEC's database on the species showed possums were historically present in most of the areas studied within the Project Area. Paul noted that in his experience areas where 3-4 animals can be spotted in one night often a larger population of 15-20 individuals may be present. He was particularly interested in the populations north and south of Walrodt Road within the current Project Area.

#### **Interesting points made;**

- The non presence of dreys doesn't necessarily mean a population isn't present and it isn't an indication of population size.
- Western Ringtail Possums are known to use many hides including houses, hollows, forks in trees, on the ground in hollows, rabbit warrens, reed beds and dense vegetation.
- Genetics have shown the historical population to be continuous and not fragmented. It is unknown how the current fragmentation of the species will impact on their long term survival.
- Paul is currently preparing the current distribution data on the species and would like to include this project's information with permission from Main Roads and GHD.

#### **Potential Fauna Impacts**

The main potential impacts on fauna are:

- ▮ *Vegetation Clearing:* This project will require the clearing of some native vegetation. Several significant species were identified over the fauna assessment utilising the native vegetation for feeding, breeding areas or required habitat. The Western Ringtail Possum requires specific native vegetation to survive.
- ▮ *Weed introduction and invasion:* Each of the study areas have had some degree of disturbance and contain weeds that are relatively widespread through the South West. Disturbance from the proposed activities has the potential to introduce and/or spread weeds to the area directly impacted by, and adjacent to, the clearing.
- ▮ *Soil degradation and erosion:* Native vegetation serves an important role in the stabilisation of soil within the landscape. Removal of vegetation can cause land degradation, including erosion. However, as the amount of clearing required for this project is relatively minimal and is predominantly in or adjacent to previously disturbed areas the potential impacts of soil degradation should be minimal.
- ▮ *Hydrological Changes:* Changes to natural drainage from clearing or other activities may impact on both vegetation structure and fauna habitat in adjoining areas.
- ▮ *Habitat loss and damage:* Significant species identified in the fauna assessment require specific habitat to survive. The bird species identified may be able to move into nearby similar habitat



areas. The Western Ringtail Possum requires more specific habitat, and may be impacted by a reduction and/or fragmentation in habitat.

► *Death or harm to fauna species:* Any construction works have the potential to cause death or harm to fauna species. Vegetation clearing and vehicle movements are likely to result in an increased incidence of animal death or injury. Slower moving land animals (including mammals, reptiles and amphibians) are most at risk, as they are often unable to vacate disturbed areas of vegetation quickly enough to avoid harm. Animals may become disorientated following destruction of their current habitat ranges.



## 4. Conclusions

Main Roads has commissioned GHD Pty Ltd (GHD) to undertake a survey of significant fauna for the proposed Bunbury Port Access Road Stage 2 and Bunbury Outer Ring Road. The results of the assessment are summarised below:

- ▶ The dominant land use of the Project Area is agricultural used for cattle grazing and plantation, although there are several areas of remnant vegetation present.
- ▶ The field assessments identified five conservation significant fauna species, these being Western Ringtail Possum, Carnaby's Black Cockatoo, Baudin's Black Cockatoo, Red-tail Black Cockatoo, Rainbow bee-eater.
- ▶ The bird species identified during this study have the ability to move into adjacent areas and are unlikely to be impacted by the PAR Stage 2 project. The mammal species, however, have limited escape options there is some risk of habitat loss. Species such as the Western Ringtail Possum require specific habitats to survive and due to this species already restricted range, it will be impacted by additional clearing.
- ▶ Appropriate management measures should be put in place to minimise direct impacts on the significant fauna species and to assist in mitigating potential impacts, such as road death, habitat loss, population fragmentation and fauna mortality during clearing and earthworks.





## 5. Report Limitations

This report presents the results of a Fauna Assessment prepared for the purpose of this commission. The data and advice provided herein relate only to the project and structures described herein and must be reviewed by a competent scientist/zoologist before being used for any other purpose. GHD accepts no responsibility for other use of the data.

Where previous reports, fauna surveys and similar work have been performed and recorded by others the data is included and used in the form provided by others. The responsibility for the accuracy of such data remains with the issuing authority, not with GHD.

An understanding of site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experience based. Hence, this report should not be altered, amended or abbreviated, issued in part or incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances that arise from the issue of the report that has been modified in any way as outlined above.



## 6. References

- Allen GR, Midgley SH, and Allen M (2002). *Field Guide to the Freshwater Fishes of Australia*. Quality Press. Perth, Western Australia.
- Birds Australia, Conservation through Knowledge (2007). Bird species profile: Accessed online: [www.birdsaustralia.com.au/our-projects/west-australian-hooded-plover.html](http://www.birdsaustralia.com.au/our-projects/west-australian-hooded-plover.html)
- Bush B, Maryan B, Brown-Cooper, R and Robertson, D (1995). *A Guide to Reptiles and Frogs of the Perth Region*. University of Western Australia Press, Perth.
- Bureau of Meteorology (2009). Climate statistics for Australian locations – Bunbury. [http://www.bom.gov.au/climate/averages/tables/cw\\_009965.shtml](http://www.bom.gov.au/climate/averages/tables/cw_009965.shtml). Accessed 23 February 2009.
- Commonwealth Government of Australia (1999). *Environmental Protection and Biodiversity Conservation Act*. Canberra.
- Department of Environment and Conservation (2008). Fauna Species Profiles: Access online: <http://www.dec.wa.gov.au/animals/fauna-management/fauna-species-profiles/marsupials-and-monotremes.html>
- Department of Environment and Conservation (2007). Fauna Note No. 5: Carnaby's Cockatoo, Accessed online: [http://www.agric.wa.gov.au/content/pw/vp/bird/5\\_carnabys\\_cockatoo.pdf](http://www.agric.wa.gov.au/content/pw/vp/bird/5_carnabys_cockatoo.pdf)
- Department of Environment and Conservation (2009). Geographic data atlas. <http://maps.dec.wa.gov.au/idelve/doedataext/> Accessed 23 February 2009.
- Department of Environment and Conservation (2009). *Threatened and Priority Fauna Database*. Department of Environment and Conservation, Perth.
- Environmental Protection Authority (2004b). *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. Guidance Statement No. 56*. Environmental Protection Authority, Perth, Western Australia.
- Government of Western Australia (1950). *Wildlife Conservation Act*. State Law Publisher, Perth, Western Australia.
- Government of Western Australia (1986). *Environmental Protection Act*. State Law Publisher, Perth, Western Australia.
- Government of Western Australia (2000). *Bush Forever Volume 2: Directory of Bush Forever Sites*. Department of Environmental Protection, Perth.
- Government of Western Australia (2010). *Wildlife Conservation (Specially Protected Fauna) Notice 2010*. State law Publisher. Perth, Western Australia.
- 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.
- Orell P. and K Morris (1994). Chuditch Recovery Plan 1992-2001. [Online]. Wanneroo: WA DEC. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/recovery/chuditch/index.html>.



Maxwell S., Burbidge A. and Morris K. (1996). The 1996 Action Plan for Australian Marsupials and Monotremes. Environment Australia. Canberra.

Menkhorst P and Knight F (2004). A Field Guide to the Mammals of Australia. Second Edition. Oxford University Press. Melbourne Australia.

Morcombe M. (2004). Field Guide to Australian Birds. Complete Compact Edition. Steve Parish Publishing, Queensland, Australia.

Storr G.M, Smith LA and Johnstone R.E (1999). Lizards of Western Australia.1; Skinks. Revised Edition. Western Australian Museum. Perth, Western Australia.

Storr G.M Smith LA and Johnstone RE (2002). Snakes of Western Australia. Revised Edition. Western Australian Museum.

Van Dyck V. and Strahan R. (2008). The Mammals of Australia. Third Edition. Reed New Holland, Australia.

Western Australian Museum (2008) *Faunabase Fauna Records*. Accessed at:  
<http://www.museum.wa.gov.au/faunabase/prod/index.htm>

Wilson S., and Swan G. (2008). A Complete Guide to Reptiles of Australia. Second Edition. New Holland Publishers, Australia.



Appendix A

## Results of Fauna Database Searches



WA Museum FaunaBase Records and EPBC Protected Matters Search Results Within approx. 10 km of the Study Area

Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Birds						
Acanthizidae	<i>Acanthiza</i>	<i>apicalis</i>	Inland Thornbill			
Acanthizidae	<i>Acanthiza</i>	<i>Chrysorrhoa</i>	Yellow-rumped Thornbill			
Acanthizidae	<i>Acanthiza</i>	<i>inornatus</i>	Western Thornbill			
Acanthizidae	<i>Gergone</i>	<i>fusca</i>	Western Gerygone			
Acanthizidae	<i>Sericornis</i>	<i>frontalis maculatus</i>	White-browed Scrubwren			
Accipitridae	<i>Accipiter</i>	<i>cirrocephalus cirrocephalus</i>	Collared Sparrowhawk	Mi		
Accipitridae	<i>Accipiter</i>	<i>fasciatus fasciatus</i>	Brown Goshawk	Mi, Ma		
Accipitridae	<i>Aquila</i>	<i>audax</i>	Wedge-tailed Eagle	Mi		
Accipitridae	<i>Elanus</i>	<i>axillaris</i>	Black-shouldered Kite	Mi		
Accipitridae	<i>Haliastur</i>	<i>sphenurus</i>	Whistling Kite	Mi, Ma		
Accipitridae	<i>Hamirostra</i>	<i>isura</i>	Square-tailed Kite	Mi		
Aegothelidae	<i>Aegotheles</i>	<i>cristatus cristatus</i>	Australian Owlet-nightjar			
Anatidae	<i>Cereopsis</i>	<i>Novaehollandiae grisea</i>	Cape Barren Goose	Mi, Ma	S2	
Anatidae	<i>Chenonetta</i>	<i>jubata</i>	Australian Wood Duck	Mi		
Anatidae	<i>Malacorhynchus</i>	<i>membranaceus</i>	Pink-eared Duck	Mi		
Anatidae	<i>Oxyura</i>	<i>australis</i>	Blue-billed Duck	Mi		
Anatidae	<i>Stictonetta</i>	<i>naevosa</i>	Freckled Duck	Mi		
Apodidae	<i>Apus</i>	<i>pacificus</i>	Fork-tailed Swift	Ma		
Ardeidae	<i>Ardea</i>	<i>alba</i>	Great Egret, White Egret	Ma, Mi		
Ardeidae	<i>Ardea</i>	<i>alba modesta</i>	Great Egret	Mi, Ma		
Ardeidae	<i>Ardea</i>	<i>ibis</i>	Cattle Egret	Ma, Mi		
Ardeidae	<i>Ardea</i>	<i>novaehollandiae</i>	White-faced Heron			
Ardeidae	<i>Botaurus</i>	<i>poeciloptilus</i>	Australasian Bittern		S1	Vu
Ardeidae	<i>Ixobrychus</i>	<i>minutus dubius</i>	Little Bittern			P3
Ardeidae	<i>Nycticorax</i>	<i>caledonicus hilli</i>	Nankeen Night Heron			
Artamidae	<i>Artamus</i>	<i>cyanopterus perthi</i>	Dusky Woodswallow			
Campephagidae	<i>Coracina</i>	<i>novaehollandiae</i>	Black-faced Cuckoo Shrike	Ma		



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Caprimulgidae	<i>Eurostopodus</i>	<i>argus</i>	Spotted Nightjar	Ma		
Charadriidae	<i>Charadrius</i>	<i>rubricollis</i>	Hooded Plover	Mi		P4
Charadriidae	<i>Charadrius</i>	<i>ruficapillus</i>	Red Capped Plover	Mi, Ma		
Charadriidae	<i>Vanellus</i>	<i>tricolor</i>	Banded Lapwing	Mi		
Climacteridae	<i>Climacteris</i>	<i>rufa</i>	Rufous Treecreeper			
Columbidae	<i>Phaps</i>	<i>chalcoptera</i>	Common Bronzewing			
Columbidae	<i>Phaps</i>	<i>elegans</i>	Brush Bronzewing			
Corvidae	<i>Corvus</i>	<i>coronoides perplexus</i>	Australian Raven			
Corvidae	<i>Corvus</i>	<i>spendens protegatus</i>	House Crow			
Cracticidae	<i>Cracticus</i>	<i>nigrogularis</i>	Pied Butcherbird			
Cracticidae	<i>Cracticus</i>	<i>tiibicen dorsalis</i>	Australian Magpie			
Cracticidae	<i>Cracticus</i>	<i>torquatus</i>	Grey Butcherbird			
Cuculidae	<i>Chrysococcyx</i>	<i>lucidus plagosus</i>	Shining-bronze Cuckoo	Ma		
Diomedidae	<i>Diomedea</i>	<i>amsterdamensis</i>	Amsterdam Albatross	En, Ma	S1	Cr
Diomedidae	<i>Diomedea</i>	<i>dabbenena</i>	Tristan Albatross	En, Ma	S1	En
Diomedidae	<i>Diomedea</i>	<i>exulans</i>	Wandering Albatross	Vu, Ma	S1	Vu
Diomedidae	<i>Diomedea</i>	<i>gibsoni</i>	Gibson's Albatross	Vu, Ma	S1	Vu
Diomedidae	<i>Thalassarche</i>	<i>carteri</i>	Indian Yellow-nosed Albatross	Vu, Ma	S1	Vu
Diomedidae	<i>Thalassarche</i>	<i>cauta cauta</i>	Shy Albatross	Vu, Ma	S1	Vu
Diomedidae	<i>Thalassarche</i>	<i>chlororhynchus</i>	Yellow-nosed Albatross	Ma	S1	Vu
Diomedidae	<i>Thalassarche</i>	<i>melanophris</i>	Black-browed Albatross	Vu, Ma	S1	Vu
Dricuridae	<i>Grallina</i>	<i>cyanoleuca</i>	Magpie-lark			
Dricuridae	<i>Rhipidura</i>	<i>leucophrys</i>	Willie Wagtail			
Falconidae	<i>Falco</i>	<i>peregrinus</i>	Peregrine Falcon		S4	
Falconidae	<i>Haliaeetus</i>	<i>leucogaster</i>	White-bellied Sea-Eagle	Mi		
Halcyonidae	<i>Dacelo</i>	<i>novaeaguineae</i>	Laughing Kookaburra			
Halcyonidae	<i>Todiramphus</i>	<i>sanctus sanctus</i>	Sacred Kingfisher			
Hirundinidae	<i>Hirundo</i>	<i>neoxena</i>	Welcome Swallow			
Maluridae	<i>Malurus</i>	<i>elegans</i>	Red-winged Fairy-wren			
Maluridae	<i>Stipiturus</i>	<i>Malachurus westernensis</i>	Southern Emu-wren			
Meliphagidae	<i>Anthochaera</i>	<i>carunculata</i>	Red Wattlebird			
Meliphagidae	<i>Anthochaera</i>	<i>lunulata</i>	Western Wattlebird			





Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Meliphagidae	<i>Epthianura</i>	<i>albifrons</i>	White-fronted Honeyeater			
Meliphagidae	<i>Lichenostomus</i>	<i>virescens</i>	Singing Honeyeater			
Meliphagidae	<i>Lichmera</i>	<i>indistincta indistincta</i>	Brown Honeyeater			
Meliphagidae	<i>Melithreptus</i>	<i>chloropsis</i>	White-naped Honeyeater			
Meliphagidae	<i>Phylidonyris</i>	<i>nigra</i>	White-cheeked Honeyeater			
Meliphagidae	<i>Phylidonyris</i>	<i>novaeollandiae</i>	New Holland Honeyeater			
Meropidae	<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater	Mi, Ma		
Pachycephalidae	<i>Pachycephala</i>	<i>pectoralis fuliginosa</i>	Golden Whistler			
Pardalotidae	<i>Pardalotus</i>	<i>striatus</i>	Striated Pardalote			
Passeridae	<i>Stagonopleura</i>	<i>oculata</i>	Red-eared Firetail			
Petroicidae	<i>Eopsaltria</i>	<i>georgiana</i>	White-breasted Robin			
Petroicidae	<i>Petroica</i>	<i>multicolor campbelli</i>	Scarlet Robin			
Phasianidae	<i>Coturnix</i>	<i>Ypsilophora</i>	Brown Quail			
Podargidae	<i>Podargus</i>	<i>strigoides</i>	Tawny Frogmouth			
Podicipedidae	<i>Tachybaptus</i>	<i>novaeollandiae</i>	Australasian Grebe			
Procellariidae	<i>Halobaena</i>	<i>caerulea</i>	Blue Petrel	Vu		
Procellariidae	<i>Macronectes</i>	<i>giganteus</i>	Southern Giant-Petrel	En, Ma	S1	En
Procellariidae	<i>Macronectes</i>	<i>halli</i>	Northern Giant-Petrel	Vu, Ma		
Procellariidae	<i>Pterodroma</i>	<i>mollis</i>	Soft-plumaged Petrel	Vu		
Psittacidae	<i>Calyptorhynchus</i>	<i>Banksii naso</i>	Red Tailed Black Cockatoo		S1	Vu
Psittacidae	<i>Calyptorhynchus</i>	<i>baudinii</i>	Baudin's Black Cockatoo	Vu	S1	En
Psittacidae	<i>Calyptorhynchus</i>	<i>latirostris</i>	Carnaby's black Cockatoo	En	S1	En
Psittacidae	<i>Neophema</i>	<i>elegans</i>	Elegant Parrot			
Psittacidae	<i>Platycercus</i>	<i>icterotis icterotis</i>	Western Rosella			
Psittacidae	<i>Platycercus</i>	<i>zonarius semitorquatus</i>	Twenty-eight Parrot			
Psittacidae	<i>Polytelis</i>	<i>anthopeplus anthopeplus</i>	Regent Parrot			
Rallidae	<i>Fulica</i>	<i>atra australis</i>	Eurasian Coot			
Rallidae	<i>Gallinula</i>	<i>tenebrosa tenebrosa</i>	Dusky Moorhen			
Rallidae	<i>Gallirallus</i>	<i>philippensis mellori</i>	Buff-banded Rail			
Rallidae	<i>Porphyrio</i>	<i>porphyrio bellus</i>	Purple Swampphen	Ma		
Rallidae	<i>Porzana</i>	<i>tabuensis</i>	Spotless Crane	Ma		
Recurvirostridae	<i>Cladorhynchus</i>	<i>leucocephalus</i>	Banded Stilt	Mi		



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Recurvirostridae	<i>Himantopus</i>	<i>himantopus leucocephalus</i>	Black-winged Stilt	Mi, Ma		
Recurvirostridae	<i>Recurvirostra</i>	<i>novaeollandiae</i>	Red-necked Avocet	Mi, Ma		
Scolopacidae	<i>Calidris</i>	<i>acuminata</i>	Sharp-tailed Sandpiper	Mi, Ma		
Scolopacidae	<i>Calidris</i>	<i>ruficollis</i>	Red-necked Stint	Mi, Ma		
Scolopacidae	<i>Calidris</i>	<i>subminuta</i>	Long-toed Stint	Mi, Ma		
Scolopacidae	<i>Tringa</i>	<i>hypoleucos</i>	Common Sandpiper	Mi		
Scolopacidae	<i>Tringa</i>	<i>stagnatilis</i>	Marsh Sandpiper	Mi, Ma		
Sternidae	<i>Anous</i>	<i>Tenuirostris melanops</i>	Australian Lesser Noddy	Vu, Ma	S1	Vu
Strigidae	<i>Ninox</i>	<i>novaeeseelandiae</i>	Boobook Owl			
Sylviidae	<i>Acrocephalus</i>	<i>australis gouldi</i>	Australian Reed Warbler			
Sylviidae	<i>Cincloramphus</i>	<i>mathewsi</i>	Rufous Songlark			
Turnicidae	<i>Turnix</i>	<i>varia varia</i>	Painted Button-quail			
Tytonidae	<i>Tyto</i>	<i>alba delicatula</i>	Barn Owl			
Zosteropidae	<i>Zosterops</i>	<i>lateralis gouldi</i>	Silvereye			
Reptiles						
Agamidae	<i>Pogona</i>	<i>Minor minor</i>	South-west Bearded Dragon			
Boidae	<i>Morelia</i>	<i>imbricata</i>	South West Carpet Python		S4	P4
Chelonidae	<i>Caretta</i>	<i>caretta</i>	Loggerhead Turtle	En, Ma	S1	
Cheluidae	<i>Chelodina</i>	<i>oblonga</i>	Oblong Turtle			
Elapidae	<i>Echiopsis</i>	<i>curta</i>	Bardick			
Elapidae	<i>Elapognathus</i>	<i>coronatus</i>	Crowned Snake			
Elapidae	<i>Neelaps</i>	<i>bimaculatus</i>	Black-napped Snake			
Elapidae	<i>Notechis</i>	<i>scutatus</i>	Tiger Snake			
Elapidae	<i>Parasuta</i>	<i>gouldii</i>	Goulds Snake			
Elapidae	<i>Parasuta</i>	<i>nigriceps</i>	Black-backed Snake			
Elapidae	<i>Pseudonaja</i>	<i>affinis affinis</i>	Dugite			
Elapidae	<i>Rhinoplocephalus</i>	<i>bicolor</i>	Blunt-nosed Snake			
Elapidae	<i>Sminthopsis</i>	<i>bertheldi</i>	Bandy Bandy Snake			
Gekkonidae	<i>Christinus</i>	<i>marmoratus</i>	Marbled Gecko			
Gekkonidae	<i>Diplodactylus</i>	<i>granarensis granarensis</i>	Western Stone Gecko			
Gekkonidae	<i>Diplodactylus</i>	<i>polyophthalmus</i>	Speckled Stone Gecko			
Gekkonidae	<i>Underwoodisaurus</i>	<i>milli</i>	Barking Gecko			



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Pygopodidae	<i>Aprasia</i>	<i>pulchella</i>	Granite Worm Lizard			
Pygopodidae	<i>Aprasia</i>	<i>repens</i>	Sand-plain Worm Lizard			
Pygopodidae	<i>Lialis</i>	<i>burtonis</i>	Burtens Snake Lizard			
Scincidae	<i>Acritoscincus</i>	<i>trilineatus</i>	Western Swamp Skink			
Scincidae	<i>Cryptoblepharus</i>	<i>buchananii</i>	Common Fence Skink			
Scincidae	<i>Ctenotus</i>	<i>australis</i>	Australis Ctenotus			
Scincidae	<i>Ctenotus</i>	<i>catenifer</i>				
Scincidae	<i>Ctenotus</i>	<i>delli</i>				P4
Scincidae	<i>Ctenotus</i>	<i>fallens</i>				
Scincidae	<i>Ctenotus</i>	<i>impar</i>				
Scincidae	<i>Ctenotus</i>	<i>labillardieri</i>	Red-legged Skink			
Scincidae	<i>Egernia</i>	<i>kingii</i>	King Skink			
Scincidae	<i>Egernia</i>	<i>luctuosa</i>	Swamp Skink			
Scincidae	<i>Egernia</i>	<i>napoleonis</i>	Napoleon Skink			
Scincidae	<i>Glaphyromorphus</i>	<i>gracilipes</i>				
Scincidae	<i>Hemiergus</i>	<i>Initialis initialis</i>				
Scincidae	<i>Hemiergus</i>	<i>peronii peronii</i>				
Scincidae	<i>Hemiergus</i>	<i>peronii tridactyla</i>				
Scincidae	<i>Hemiergus</i>	<i>quadrilineata</i>				
Scincidae	<i>Lerista</i>	<i>lineata</i>				P3
Scincidae	<i>Lerista</i>	<i>microtis microtis</i>				
Scincidae	<i>Lerista</i>	<i>distinguenda</i>				
Scincidae	<i>Lerista</i>	<i>elegans</i>				
Scincidae	<i>Menetia</i>	<i>greyii</i>				
Scincidae	<i>Morethia</i>	<i>lineoocellata</i>				
Scincidae	<i>Morethia</i>	<i>obscura</i>				
Scincidae	<i>Tiliqua</i>	<i>rugosa rugosa</i>	Bobtail			
Typhlopidae	<i>Ramphotyphlops</i>	<i>australis</i>	Southwest Blind Snake			
Typhlopidae	<i>Ramphotyphlops</i>	<i>pinguis</i>				
Varanidae	<i>Varanus</i>	<i>gouldii</i>	Goulds Monitor			
Varanidae	<i>Varanus</i>	<i>rosenbergi</i>	Heath Monitor			



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Amphibia						
Hylidae	<i>Litoria</i>	<i>adelaidensis</i>	Slender Tree Frog			
Hylidae	<i>Litoria</i>	<i>moorei</i>	Motorbike Frog			
Myobatrachidae	<i>Crinia</i>	<i>georgiana</i>	Quacking Frog			
Myobatrachidae	<i>Crinia</i>	<i>glauerti</i>	Glauert's Frog			
Myobatrachidae	<i>Crinia</i>	<i>insignifera</i>	Common Froglet			
Myobatrachidae	<i>Crinia</i>	<i>pseudinsignifera</i>	Granite Froglet			
Myobatrachidae	<i>Geocrinia</i>	<i>leai</i>				
Myobatrachidae	<i>Heleioporus</i>	<i>eyrei</i>	Moaning Frog			
Myobatrachidae	<i>Heleioporus</i>	<i>inornatus</i>				
Myobatrachidae	<i>Lymnodynastes</i>	<i>dorsalis</i>	Pobblebonk			
Myobatrachidae	<i>Metacrinia</i>	<i>nichollsi</i>	Karri Frog			
Myobatrachidae	<i>Pseudophryne</i>	<i>guentheri</i>	Guenther's Toadlet			
Mammals						
Balaenidae	<i>Eubalaena</i>	<i>australis</i>	Southern Right Whale	En, Ma, Ce	S1	
Balaenopteridae	<i>Balaenoptera</i>	<i>acutorostrata</i>	Minke Whale	Ce		
Balaenopteridae	<i>Balaenoptera</i>	<i>edeni</i>	Bryde's Whale	Ma, Ce		
Balaenopteridae	<i>Balaenoptera</i>	<i>musculus</i>	Blue Whale	En, Ma, Ce	S1	
Balaenopteridae	<i>Megaptera</i>	<i>novaeangliae</i>	Humpback Whale	Vu, Ma, Ce	S1	
Bovidae	<i>Bos</i>	<i>taurus</i>	*Domestic Cattle			
Burramyidae	<i>Cercartetus</i>	<i>concinnus</i>	Pigmy Possum			
Cervidae	<i>Cervus</i>	<i>dama</i>	*Fallow Deer			
Dasyuridae	<i>Antechinus</i>	<i>Flavipes leucogaster</i>	Yellow-footed Antechinus			
Dasyuridae	<i>Dasyurus</i>	<i>geoffroi</i>	Chuditch	Vu	S1	Vu
Dasyuridae	<i>Phascogale</i>	<i>tapoatafa tapoatafa</i>	Brush-tailed Phascogale		S1	Vu
Dasyuridae	<i>Sminthopsis</i>	<i>gilberti</i>	Gilbert's Dunnart			
Dasyuridae	<i>Sminthopsis</i>	<i>griseoventer griseoventer</i>	Grey-bellied Dunnart			
Delphinidae	<i>Delphinus</i>	<i>delphis</i>	Common Dolphin	Ce		
Delphinidae	<i>Grampus</i>	<i>griseus</i>	Risso's Dolphin, Grampus	Ce		
Delphinidae	<i>Lagenorhynchus</i>	<i>obscurus</i>	Dusky Dolphin	Ma, Ce		
Delphinidae	<i>Orcinus</i>	<i>orca</i>	Killer Whale, Orca	Ma, Ce		



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Delphinidae	<i>Stenella</i>	<i>attenuata</i>	Spotted Dolphin	Ce		
Delphinidae	<i>Tursiops</i>	<i>aduncus</i>	Indian Ocean Bottlenose Dolphin	Ce		
Delphinidae	<i>Tursiops</i>	<i>truncatus</i>	Bottlenose Dolphin	Ce		
Macropodidae	<i>Macropus</i>	<i>fuliginosus</i>	Western Grey Kangaroo			
Macropodidae	<i>Macropus</i>	<i>irma</i>	Western Brush wallaby			P4
Macropodidae	<i>Setonix</i>	<i>brachyurus</i>	Mainland Quokka	Vu	S1	Vu
Muridae	<i>Hydromys</i>	<i>chrysogaster</i>	Water Rat			P4
Muridae	<i>Mus</i>	<i>musculus</i>	*House Mouse			
Muridae	<i>Rattus</i>	<i>fuscipes</i>	Bush Rat			
Muridae	<i>Rattus</i>	<i>rattus</i>	*Black Rat			
Mustelidae	<i>Mustela</i>	<i>putorius</i>	*Feret			
Myrmecobiidae	<i>Myrmecobius</i>	<i>fasciatus</i>	Numbat		S1	Vu
Neobalaenidae	<i>Caperea</i>	<i>marginata</i>	Pygmy Right Whale	Ma, Ce		
Otariidae	<i>Arctocephalus</i>	<i>forsteri</i>	New Zealand Fur-seal	Ma	S4	
Otariidae	<i>Neophoca</i>	<i>cinerea</i>	Australian Sea-lion	Vu, Ma	S4	
Peramelidae	<i>Isodon</i>	<i>obesulus fusciventer</i>	Southern Brown Bandicoot			P5
Phalangeridae	<i>Trichosurus</i>	<i>vulpecula vulpecula</i>	Brush-tailed Possum			
Potoroidae	<i>Bettongia</i>	<i>penicillata ogilbyi</i>	Woylie		S1	En
Pseudocheiridae	<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ring-tail Possum	Vu	S1	Vu
Suidae	<i>sus</i>	<i>scrofa</i>	*Wild Pig			
Tarsipedidae	<i>Tarsipes</i>	<i>rostratus</i>	Honey Possum			
Vespertilionidae	<i>Chalinolobus</i>	<i>gouldii</i>	Gould's Wattled Bat			
Vespertilionidae	<i>Chalinolobus</i>	<i>morio</i>	Chocolate Wattle Bat			
Vespertilionidae	<i>Falsistrellus</i>	<i>mackenziei</i>	Western False Pipistrelle			P4
Vespertilionidae	<i>Nyctophilus</i>	<i>geoffroyi</i>	Lesser Long-eared Bat			
Vespertilionidae	<i>Nyctophilus</i>	<i>gouldi</i>	Gould's Long-eared Bat			
Vespertilionidae	<i>Nyctophilus</i>	<i>timoriensis timoriensis</i>	Greater Long-eared Bat			P4
Vespertilionidae	<i>Vespadelus</i>	<i>regulus</i>	Southern Forest Bat			
FISHES						
Antennariidae	<i>Histiophryne</i>	<i>cryptacanthus</i>				
Apogonidae	<i>Dinolestes</i>	<i>lewini</i>				
Galaxiidae	<i>Galaxias</i>	<i>occidentalis</i>	Western Minnow			
Galaxiidae	<i>Galaxiella</i>	<i>munda</i>	Western Mud Minnow	Vu		Vu
Galaxiidae	<i>Galaxiella</i>	<i>nigrostriata</i>	Black-strip Minnow			P3
Labridae	<i>Bodianus</i>	<i>vulpinus</i>				
Lamnidae	<i>Carcharodon</i>	<i>carcharias</i>	Great White Shark	Vu, Ma	S1	Vu



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Lepidogalaxiidae	<i>Lepidogalaxias</i>	<i>salamandroides</i>	Salamanderfish			
Monacanthidae	<i>Meuschenia</i>	<i>flavolineata</i>				
Nannopercidae	<i>Edelia</i>	<i>vitatta</i>	Western Pygmy Perch			
Odontaspidae	<i>Carcharias</i>	<i>taurus</i>	Grey Nurse Shark	Vu	S1	Vu
Percichthyidae	<i>Bostockia</i>	<i>porosa</i>	Nightfish			
Percichthyidae	<i>Nannatherina</i>	<i>balstoni</i>	Balston's Pygmy Perch	Vu	S1	Vu
Petromyzontidae	<i>Geotria</i>	<i>australis</i>	Pouched Lamprey			P1
Plesiopidae	<i>Paraplesiops</i>	<i>meleagris</i>				
Plesiopidae	<i>Trachinops</i>	<i>brauni</i>				
Plesiopidae	<i>Trachinops</i>	<i>noarlungae</i>				
Rhincodontidae	<i>Rhincodon</i>	<i>typus</i>	Whale Shark	Vu, Ma		
Serranidae	<i>Epinephelides</i>	<i>armatus</i>				
Syngnathidae	<i>Acentronura</i>	<i>australe</i>	Southern Pygmy Pipehorse	Ma		
Syngnathidae	<i>Campichthys</i>	<i>galei</i>	Gale's Pipefish	Ma		
Syngnathidae	<i>Heraldia</i>	<i>nocturna</i>	Upside-down Pipefish	Ma		
Syngnathidae	<i>Hippocampus</i>	<i>angustus</i>	Western Spiny Seahorse, Narrow-bellied Seahorse	Ma		
Syngnathidae	<i>Hippocampus</i>	<i>breviceps</i>	Short-head Seahorse, Short-snouted Seahorse	Ma		
Syngnathidae	<i>Hippocampus</i>	<i>subelongatus</i>	West Australian Seahorse	Ma		
Syngnathidae	<i>Histiogamphelus</i>	<i>cristatus</i>	Rhino Pipefish, Macleay's Crested Pipefish	Ma		
Syngnathidae	<i>Lissocampus</i>	<i>caudalis</i>	Australian Smooth Pipefish,			
Syngnathidae	<i>Lissocampus</i>	<i>fatiloquus</i>	Smooth Pipefish	Ma		
Syngnathidae	<i>Lissocampus</i>	<i>runa</i>	Prophet's Pipefish	Ma		
Syngnathidae	<i>Maroubra</i>	<i>perserrata</i>	Javelin Pipefish	Ma		
Syngnathidae	<i>Mitotichthys</i>	<i>meraculus</i>	Sawtooth Pipefish	Ma		
Syngnathidae	<i>Nannocampus</i>	<i>subosseus</i>	Western Crested Pipefish	Ma		
Syngnathidae	<i>Phycodurus</i>	<i>eques</i>	Bony-headed Pipefish	Ma		
Syngnathidae	<i>Phyllopteryx</i>	<i>taeniolatus</i>	Leafy Seadragon	Ma		
Syngnathidae	<i>Pugnaso</i>	<i>curtirostris</i>	Weedy Seadragon, Common Seadragon	Ma		
Syngnathidae	<i>Solegnathus</i>	<i>lettiensis</i>	Pug-nosed Pipefish	Ma		
Syngnathidae	<i>Stigmatopora</i>	<i>argus</i>	Indonesian Pipefish, Gunther's Pipehorse	Ma		
Syngnathidae			Spotted Pipefish	Ma		





Family	Genus	Species	Common Name	EPBC Listing	Wildlife Conservation Act 1950	DEC Priority Listing
Syngnathidae	<i>Stigmatopora</i>	<i>nigra</i>	Wide-bodied Pipefish, Black Pipefish	Ma		
Syngnathidae	<i>Urocampus</i>	<i>carinirostris</i>	Hairy Pipefish	Ma		
Syngnathidae	<i>Vanacampus</i>	<i>margaritifer</i>	Mother-of-pearl Pipefish	Ma		
Syngnathidae	<i>Vanacampus</i>	<i>phillipi</i>	Port Phillip Pipefish	Ma		
Syngnathidae	<i>Vanacampus</i>	<i>poecilolaemus</i>	Australian Long-snout Pipefish	Ma		
Triakidae	<i>Galeorhinus</i>	<i>galeus</i>	School Shark	CD		

\* introduced species

En Endangered (EPBC Act)

Vu Vulnerable (EPBC Act)

CD Conservation Dependant (EPBC Act)

Ma Marine Species (EPBC Act)

Mi Migratory species (EPBC Act)

Ce Cetacean (EPBC Act)

P Priority fauna rating (DEC)

S Schedules species (WA Environment Act)

#### Significant, Rare and Priority Fauna Species Potentially Occurring within the Study Area, with Information Source

Family	Genus	Species	Common Name	EPBC Listing	Wildlife Con. Act 1950	DEC Priority Listing
Birds						
Accipitridae	<i>Accipiter</i>	<i>cirrocephalus</i>	Collared Sparrowhawk	Mi		
Accipitridae	<i>Accipiter</i>	<i>fasciatus fasciatus</i>	Brown Goshawk	Mi, Ma		
Accipitridae	<i>Aquila</i>	<i>audax</i>	Wedge-tailed Eagle	Mi		



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Con. Act 1950	DEC Priority Listing
Accipitridae	<i>Elanus</i>	<i>axillaris</i>	Black-shouldered Kite	Mi		
Accipitridae	<i>Haliastur</i>	<i>sphenurus</i>	Whistling Kite	Mi, Ma		
Accipitridae	<i>Hamirostra</i>	<i>isura</i>	Square-tailed Kite	Mi		
Anatidae	<i>Cereopsis</i>	<i>Novaehollandiae grisea</i>	Cape Barren Goose		S2	
Anatidae	<i>Chenonetta</i>	<i>jubata</i>	Australian Wood Duck	Mi		
Anatidae	<i>Malacorhynchus</i>	<i>membranaceus</i>	Pink-eared Duck	Mi		
Anatidae	<i>Oxyura</i>	<i>australis</i>	Blue-billed Duck	Mi		
Anatidae	<i>Stictonetta</i>	<i>naevosa</i>	Freckled Duck	Mi		
Apodidae	<i>Apus</i>	<i>pacificus</i>	Fork-tailed Swift	Ma		
Ardeidae	<i>Ardea</i>	<i>alba</i>	Great Egret, White Egret	Ma, Mi		
Ardeidae	<i>Ardea</i>	<i>ibis</i>	Cattle Egret	Ma, Mi		
Ardeidae	<i>Botaurus</i>	<i>poiciloptilus</i>	Australasian Bittern		S1	Vu
Ardeidae	<i>Ixobrychus</i>	<i>minutus dubius</i>	Little Bittern			P3
Campephagidae	<i>Coracina</i>	<i>novaehollandiae</i>	Black-faced Cuckoo Shrike	Ma		
Caprimulgidae	<i>Eurostopodus</i>	<i>argus</i>	Spotted Nightjar	Ma		
Charadriidae	<i>Charadrius</i>	<i>rubricollis</i>	Hooded Plover	Mi		P4
Charadriidae	<i>Charadrius</i>	<i>ruficapillus</i>	Red Capped Plover	Mi, Ma		
Charadriidae	<i>Vanellus</i>	<i>tricolor</i>	Banded Lapwing	Mi		
Cuculidae	<i>Chrysococcyx</i>	<i>lucidus plagosus</i>	Shining-bronze Cuckoo	Ma		
Falconidae	<i>Falco</i>	<i>peregrinus</i>	Peregrine Falcon		S4	
Falconidae	<i>Haliaeetus</i>	<i>leucogaster</i>	White-bellied Sea-Eagle	Mi		
Meropidae	<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater	Mi, Ma		
Psittacidae	<i>Calyptorhynchus</i>	<i>Banksii naso</i>	Red Tailed Black Cockatoo		S1	Vu
Psittacidae	<i>Calyptorhynchus</i>	<i>baudinii</i>	Baudin's Black Cockatoo	Vu	S1	En
Psittacidae	<i>Calyptorhynchus</i>	<i>latirostris</i>	Carnaby's black Cockatoo	En	S1	En
Rallidae	<i>Porphyrio</i>	<i>porphyrio bellus</i>	Purple Swamphen	Ma		
Rallidae	<i>Porzana</i>	<i>tabuensis</i>	Spotless Crake	Ma		
Recurvirostridae	<i>Cladorhynchus</i>	<i>leucocephalus</i>	Banded Stilt	Mi		
Recurvirostridae	<i>Himantopus</i>	<i>himantopus leucocephalus</i>	Black-winged Stilt	Mi, Ma		
Recurvirostridae	<i>Recurvirostra</i>	<i>novaehollandiae</i>	Red-necked Avocet	Mi, Ma		
Scolopacidae	<i>Calidris</i>	<i>acuminata</i>	Sharp-tailed Sandpiper	Mi, Ma		
Scolopacidae	<i>Calidris</i>	<i>ruficollis</i>	Red-necked Stint	Mi, Ma		



Family	Genus	Species	Common Name	EPBC Listing	Wildlife Con. Act 1950	DEC Priority Listing
<b>Scolopacidae</b>	<b><i>Calidris</i></b>	<b><i>subminuta</i></b>	<b>Long-toed Stint</b>	<b>Mi, Ma</b>		
<b>Scolopacidae</b>	<b><i>Tringa</i></b>	<b><i>hypoleucos</i></b>	<b>Common Sandpiper</b>	<b>Mi</b>		
<b>Scolopacidae</b>	<b><i>Tringa</i></b>	<b><i>stagnatilis</i></b>	<b>Marsh Sandpiper</b>	<b>Mi, Ma</b>		
Reptiles						
<b>Boidae</b>	<b><i>Morelia</i></b>	<b><i>imbricata</i></b>	<b>South West Carpet Python</b>		<b>S4</b>	<b>P4</b>
<b>Scincidae</b>	<b><i>Ctenotus</i></b>	<b><i>delli</i></b>				<b>P4</b>
<b>Scincidae</b>	<b><i>Lerista</i></b>	<b><i>lineata</i></b>				<b>P3</b>
Mammals						
<b>Dasyuridae</b>	<b><i>Dasyurus</i></b>	<b><i>geoffroii</i></b>	<b>Chuditch</b>	<b>Vu</b>	<b>S1</b>	<b>Vu</b>
<b>Dasyuridae</b>	<b><i>Phascogale</i></b>	<b><i>tapoatafa tapoatafa</i></b>	<b>Brush-tailed Phascogale</b>		<b>S1</b>	<b>Vu</b>
<b>Macropodidae</b>	<b><i>Macropus</i></b>	<b><i>irma</i></b>	<b>Western Brush wallaby</b>			<b>P4</b>
<b>Macropodidae</b>	<b><i>Setonix</i></b>	<b><i>brachyurus</i></b>	<b>Mainland Quokka</b>	<b>Vu</b>	<b>S1</b>	<b>Vu</b>
<b>Muridae</b>	<b><i>Hydromys</i></b>	<b><i>chrysogaster</i></b>	<b>Water Rat</b>			<b>P4</b>
<b>Myrmecobiidae</b>	<b><i>Myrmecobius</i></b>	<b><i>fasciatus</i></b>	<b>Numbat</b>	<b>Vu</b>	<b>S1</b>	<b>Vu</b>
<b>Peramelidae</b>	<b><i>Isoodon</i></b>	<b><i>obesulus fusciventer</i></b>	<b>Southern Brown Bandicoot</b>			<b>P5</b>
<b>Potoroidae</b>	<b><i>Bettongia</i></b>	<b><i>penicillata ogilbyi</i></b>	<b>Woylie</b>		<b>S1</b>	<b>En</b>
<b>Pseudocheiridae</b>	<b><i>Pseudocheirus</i></b>	<b><i>occidentalis</i></b>	<b>Western Ring-tail Possum</b>	<b>Vu</b>	<b>S1</b>	<b>Vu</b>
<b>Vespertilionidae</b>	<b><i>Falsistrellus</i></b>	<b><i>mackenziei</i></b>	<b>Western False Pipistrelle</b>			<b>P4</b>
<b>Vespertilionidae</b>	<b><i>Nyctophilus</i></b>	<b><i>timoriensis timoriensis</i></b>	<b>Greater Long-eared Bat</b>			<b>P4</b>
FISHES						
<b>Percichthyidae</b>	<b><i>Nannatherina</i></b>	<b><i>balstoni</i></b>	<b>Balston's Pygmy Perch</b>	<b>Vu</b>	<b>S1</b>	<b>Vu</b>
<b>Petromyzontidae</b>	<b><i>Geotria</i></b>	<b><i>australis</i></b>	<b>Pouched Lamprey</b>			<b>P1</b>
<b>Galaxiidae</b>	<b><i>Galaxiella</i></b>	<b><i>munda</i></b>	<b>Western Mud Minnow</b>	<b>Vu</b>	<b>S1</b>	<b>Vu</b>
<b>Galaxiidae</b>	<b><i>Galaxiella</i></b>	<b><i>nigrostriata</i></b>	<b>Black-strip Minnow</b>			<b>P3</b>

- En Endangered (EPBC Act)  
Vu Vulnerable (EPBC Act)  
CD Conservation Dependant (EPBC Act)  
Ma Marine Species (EPBC Act)  
Mi Migratory species (EPBC Act)  
Ce Cetacean (EPBC Act)  
P Priority fauna rating (DEC)  
S Schedules species (WA Environment Act)







## Appendix B

# Fauna Conservation Classifications



## Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* Fauna Conservation Categories

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

## Western Australian *Wildlife Conservation Act 1950* Conservation Codes

Conservation Code	Description
Schedule 1	"...fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection."
Schedule 2	"...fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection."
Schedule 3	"...birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is in need of special protection."
Schedule 4	"...fauna that is in need of special protection, otherwise than for the reasons mentioned [in Schedule 1 – 3]"





## DEC Priority Fauna Codes

Conservation Code	Description
Priority 1	Taxa with few, poorly known populations on threatened lands.
Priority 2	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc.
Priority 3	Taxa which are known from few specimens or sight records, some of which are on lands not under immediate threat of habitat destruction or degradation.
Priority 4	Rare taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.
Priority 5	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.



## Appendix C

# Field Survey Fauna Observations



## Native Fauna Observations Within the Study Area – February 2009

Genus	Species	Common name	Observation	Location (Easting, Northings)	Comment
<b>Reptiles</b>					
<i>Pogona</i>	<i>minor minor</i>	Western Bearded Dragon	Sighting	Wallrodt Rd intersection	Dead on road
<i>Tiliqua</i>	<i>rugosa rugosa</i>	Bobtail	Sighting		A pair
<i>Christinus</i>	<i>marmoratus</i>	Marbled Gecko	Sighting	Wallrodt Rd intersection	Active in a <i>Melaleuca</i> spp.
<i>Morethia</i>	<i>obscura</i>	Obscured Snake-eyed Skink	Sighting	Wallrodt Rd North	
<i>Menetia</i>	<i>greyi</i>	Grey's Menetia	Sighting	Wallrodt Rd North	
<i>Egernia</i>	<i>kingii</i>	King Skink	tracks	Wallrodt Rd North	Active in the alignment
<i>Varanus</i>	<i>Sp.(Gouldi or rosenbergi)</i>	Goulds or Rosenbergs Monitor	tracks	Recorded over most of the alignment	Very common
<b>Mammals</b>					
<i>Macropus</i>	<i>fuliginosus</i>	Western Grey Kangaroo	Sighting/scats	Wallrodt Rd North	8 animals
<i>Macropus</i>	<i>fuliginosus</i>	Western Grey Kangaroo	Sighting/scats	Wallrodt Rd South	Several animals
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Sighting	380095.689758, 6306741.62327	Male active in <i>Melaleuca</i> spp.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Sighting	379865.470169, 6306736.10969	Mother and young active 15m in flowering Marri.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Sighting	379929.473107, 6306574.46049	Active in Jarrah about 15m.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379898.759901, 6306926.16030	Active
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379838.864707, 6307057.00551	Old nest 3m in <i>Melaleuca</i> spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379828.524957, 6307091.67981	Old nest 4m in <i>Banksia</i> spp.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379959.964010, 6307384.02000	Active 3m in <i>Melaleuca</i> spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379944.927279, 6307347.18297	Old nest in <i>Banksias</i> spp.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail	Drey	379911.976657,	Active in <i>Banksias</i>





Genus	Species	Common name	Observation	Location (Eastings, Northings)	Comment
s		Possum		6307222.886610	pp.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	380002.762912, 6307082.620410	Old nest in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	380117.350170, 6306934.922300	Old nest in Banksias spp.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	380008.253654, 6306479.05042	Active 3m in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	380015.522562, 6306471.85836	Active 5m in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379990.147293, 6306468.54986	Old nest in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379972.370953, 6306461.45413	Active 6m in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	377776.659026, 6305202.71926	Old nest in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	377857.915513, 6305234.00077	2 dreys in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	377964.798103, 6305210.30436	Active 4m in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	377833.807547, 6305163.72113	Active 4m in Melaleuca spp
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	380045.18233, 6306742.8093	Active 5m in Melaleuca spp On road verge.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	380028.85338, 6306740.25983	Active 5m in Melaleuca spp On road verge.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Drey	379891.862497, 6306733.73849	Possibly active 7m Melaleuca spp On road verge.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Droppings	379748.122123, 6307177.3282	Fresh droppings on log and Agonis stump.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Droppings	379532.041075, 6308033.45191	Old droppings on log.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Droppings	379896.025524, 6307988.15895	Old droppings on log in dense woodland.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Droppings	379935.485224, 6307682.43042	Droppings on Banksia log.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Droppings	379975.627207, 6307399.866	Droppings on Banksia log.



Genus	Species	Common name	Observation	Location (Easting, Northings)	Comment
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Droppings	380009.770846, 6306545.60619	At the base of a Large Jarrah where live WRTP was observed.
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Droppings	377802.612000, 6305200.496200	Old and fresh droppings on Agonis log.
<i>Oryctolagus</i>	<i>cuniculus</i>	Rabbit	Tracks and scats	Recorded over most of the alignment	Very common
<i>Vulpes</i>	<i>vulpes</i>	Fox	tracks	Recorded over most of the alignment	Very common
<i>Felis</i>	<i>catus</i>	Cat	tracks	Recorded over most of the alignment	Very common
<i>Equus</i>	<i>caballus</i>	Horse	Sighted	Recorded over much of the alignment	Very common
<i>Bos</i>	<i>taurus</i>	Domestic Cow	Sighted	Recorded over much of the alignment	Very common
<b>Birds</b>					
<i>Cracticus</i>	<i>tibicen</i>	Australian Magpie	Sighting	Recorded over most of the alignment	Very common
<i>Coracina</i>	<i>novaehollandiae</i>	Black-faced Cuckoo-shrike	Sighting	Recorded over most of the alignment	Very common
<i>Calyptorhynchus</i>	<i>Baudinii or latirostris</i>	Black Cockatoos	Feeding area	379908.973269, 6306909.663660	Marri feeder trees, lots of chewed nuts, White tail black feathers at the site.
<i>Calyptorhynchus</i>	<i>unk</i>	Black Cockatoos	Breeding/habitat tree	379937.334200, 6306574.460490	Group large habitat trees together, Marri and Jarrah.
<i>Calyptorhynchus</i>	<i>unk</i>	Black Cockatoos	Breeding/habitat tree	380009.770846, 6306533.25304	Group large habitat trees together, Marri and Jarrah.
<i>Rhipidura</i>	<i>fuliginosa</i>	Grey Fantail	Sighting	Sighted at several locations, common	Active in the alignment
<i>Rhipidura</i>	<i>leucophrys</i>	Willy Wagtail	Sighting	Sighted at several locations, common	Active in the alignment
<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater	Sighting and breeding	379748.562987, 6307201.78601	Several birds observed and at least 3 breeding pairs present.



Genus	Species	Common name	Observation	Location (Eastings, Northings)	Comment
Merops	<i>ornatus</i>	Rainbow Bee-eater	Calls	Corner Wallrodt Road and Boyanup Picton Road	Active in the alignment
<i>Pardalotus</i>	<i>striatus</i>	Striated Pardalote	Sighting	380433.925602, 6306824.557340	Active in flowering Marri.
<i>Lichmera</i>	<i>indistincta</i>	Brown Honeyeater	Sighting	Sighted at several locations, common	Active in the alignment
<i>Lichenostomus</i>	<i>virescens</i>	Singing Honeyeater	Sighting	Sighted at several locations, common	Active in the alignment
<i>Petroica</i>	<i>multicolor</i>	Scarlet Robin	Sighted	379748.562987, 6307201.78601	Active in the alignment
<i>Artamus</i>	<i>cyanopterus</i>	Dusky Woodswallow	Sighted	379748.562987, 6307201.78601	At least 6 bird sighted
<i>Pachycephala</i>	<i>rufiventris</i>	Rufous Whistler	Sightings/calls	Sighted and heard at several locations, common	Active in the alignment
<i>Barnardius</i>	<i>zonarius</i>	Australian Ringneck (28)	Sightings/calls	Sighted and heard at several locations, common	Active in the alignment
<i>Corvus</i>	<i>coronoides</i>	Australian Raven	Sightings/calls	Sighted and heard at several locations, common	Active in the alignment
<i>Smicronis</i>	<i>brevirostris</i>	Weebill	Sightings/calls	Sighted and heard at several locations, common	Active in the alignment
<i>Purpureicephalus</i>	<i>spurius</i>	Red Capped Parrot	Sighting	Wallrodt Road North	Active in the alignment
<i>Anthus</i>	<i>novaeeseelandiae</i>	Richard's Pipit	Sighting	Bluegum Plantation Preston River east	Active in the alignment
<i>Ninox</i>	<i>novaeeseelandiae</i>	Boobook Owl	Sighting	Bluegum Plantation Preston River east	Pair disturbed, active in the alignment
<i>Falco</i>	<i>cenchrus</i>	Kestrel	Sighting	Bluegum Plantation Preston River east	Active in the alignment

**GHD**

1st Floor 10 Victoria Street

Bunbury WA 6230

T: 08 9721 0700 F: 08 9721 0777 E: bunmail@ghd.com.au

**© GHD 2010**

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission.

Unauthorised use of this document in any form whatsoever is prohibited.

**Document Status**

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	T Ridgeway/N McCarthy	G Gaikhorst	<i>G Gaikhorst</i>	F Hannon	<i>Fiona Hannon</i>	22/11/10



**GHD**

1st Floor 10 Victoria Street

Bunbury WA 6230

T: 08 9721 0700 F: 08 9721 0777 E: bunmail@ghd.com.au

**© GHD 2010**

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

**Document Status**

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	N McCarthy	F Hannon		F Hannon	<i>Fionnuala Hannon</i>	22/11/10