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Main Roads WA

Coalfields Highway Upgrade
(27.92- 35.45 SLK)

Environmental Impact
Assessment and Environmental
Management Plan

September 2010



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Executive Summary

The Coalfields Highway provides the primary highway link between the Bunbury and the town of Collie. Main Roads Western Australia (Main Roads) has commissioned GHD to provide environmental services to determine the environmental impacts and management measures for the proposed upgrade of the highway between Allanson and Collie (27.92 – 35.45 SLK). This Environmental Impact Assessment and Environmental Management Plan (EIA and EMP) has been prepared as requested by Main Roads.

The proposed works involve widening of the existing highway, mainly on the existing formation, with one minor re-alignment to improve an existing curve and the improvement of two vertical curves (crests). The aim of the works is to improve the road geometry and provide 2.5m wide shoulders (1.5m of which will be sealed) and provide a safety clear zone over the 7 km section.

This combined EIA and EMP report details the results from both the desktop and field investigations and will be used to manage the environmental impacts of the project. A number of additional studies have also been undertaken for Main Roads over the project area and reference to these has been included.

The key outcomes of the EIA:

- Referral of the project to the West Australia Environmental Protection Authority under Part IV of the *Environmental Protection Act 1986* is not considered warranted
- The estimated 2.63 ha of clearing required for roadworks has been assessed against the Ten Clearing Principles and it is concluded that the project clearing is not likely to be at variance with these principles and can therefore be conducted under the provisions of Main Roads Clearing Permit CPS 818/4
- Main Roads should continue liaison with officers from the Commonwealth Department of Environment, Heritage, Water and the Arts to define the requirement for DEWHA involvement in the development of the project
- Main Roads has been issued with a Bed and Banks Permit under the *Rights in Water and Irrigation Act 1914* to conduct drainage works at two watercourses crossed by the highway
- Vegetation to be impacted by the roadworks is regionally well represented with 60% of its pre-European extent remaining
- Two species of Declared Weeds are present within the project area and require management intervention
- Topsoil management is an important aspect of road construction activities
- No contaminated sites of acid sulphate soils are expected to be impacted by roadworks
- One registered Aboriginal heritage site (Site ID 16713 Collie River Waugal) will be impacted by roadworks. Main Roads is seeking approval under Section 18 of the Western Australian *Aboriginal Heritage Act (1972)* to conduct works at this site, and
- Main Roads should adopt the environmental management measures detailed in this report during the implementation of the project to mitigate and manage impacts of construction activities.



1. Introduction

1.1 Background

The Coalfields Highway provides the primary highway link between the Bunbury and the town of Collie. Main Roads Western Australia (Main Roads) has commissioned GHD to provide environmental services to determine the environmental impacts and management measures for the proposed upgrade of the highway between Allanson and Collie (27.92 – 35.45 SLK). This Environmental Impact Assessment and Environmental Management Plan (EIA and EMP) has been prepared as requested by Main Roads.

The proposed works involve widening of the existing highway, mainly on the existing formation, with one minor re-alignment to improve an existing curve and the improvement of two vertical curves (crests). The aim of the works is to improve the road geometry and provide 2.5m wide shoulders (1.5m of which will be sealed) and provide a safety clear zone over the 7 km section.

Apart from the curve re-alignment the works will be located within the existing road reserve.

A Preliminary Environmental Impact Assessment (PEIA) was conducted by GHD in February 2009, for the section of the highway (16 - 35 SLK) to identify any issues which may require further investigation. The PEIA and additional site investigations were used to identify the impacts and management requirements on the Allanson to Collie section.

1.2 Scope of the Report

This report assesses the primary environmental impacts of the proposed Coalfields Highway (27.92 – 35.45 SLK) upgrade based on site assessments, existing database records, information provided by Main Roads and literature available in the public domain. This combined EIA and EMP report was prepared according to Main Roads requirements and scope, and included the following:

- ▶ A review of any relevant environmental reports
- ▶ Assessment of the project against the Environmental Protection Act's Ten Clearing Principles (Schedule 5) shown at Appendix A
- ▶ Assessment of environmental aspects likely to require referral of the project and advise whether the project should be referred to the Environmental Protection Authority (EPA)
- ▶ Assessment of Matters of National Environmental Significance likely to require referral of the project and advise whether the project should be referred to the Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA)
- ▶ Consultation with relevant government agencies
- ▶ Determining (but not applying for) clearances required under other legislative provisions, including (but not limited to) those required under the following Acts:
 - *Rights in Water and Irrigation Act 1914*
 - *Country Areas Water Supply Act 1947*
 - *Wildlife Conservation Act 1950*



- *Aboriginal Heritage Act 1972*
- *Conservation and Land Management Act 1984*
- *Environmental Protection Act 1986*
- *Heritage of Western Australia Act 1990*
- Searches of the Department of Environment and Conservation's (DEC's) Declared Rare and Priority Flora database, Threatened Ecological Communities (TECs) database and Threatened Fauna database.
- Search of the DEC's Contaminated Sites Register
- A Black Cockatoo Habitat Assessment conducted for Main Roads by G Harewood (Harewood, 2010) in May 2010
- A Dieback survey completed by Glevan Consulting (Glevan Consulting, 2010) for Main Roads in July 2010
- A site assessment by GHD Environmental Scientist on June 2010
- A rare flora survey of the project area conducted by GHD ecologists on July 20, 2010
- An Aboriginal Heritage Survey conduct by Brad Goode and Associates in July 2010

Based on an assessment of the project and a review of previous studies, the relevant environmental and social factors that require consideration for the project were identified as follows:

- Geology, landform and soils
- Acid sulphate soils
- Hydrology and drainage
- Terrestrial flora and vegetation – Vegetation clearing, types and extent, site vegetation, vegetation condition, Declared Rare and Priority flora, Threatened Ecological Communities
- Weeds and introduced species
- Topsoil Management
- Revegetation and landscaping
- Dieback
- Fauna
- Environmentally sensitive areas
- Reserves and conservation areas
- Existing land use
- Contaminated sites
- Visual amenity
- European heritage
- Aboriginal heritage
- Pre-construction works, and
- Construction phase impacts



1.3 Study Area

The study area includes a nominal width of 10m either side of the existing highway road reserve. The significance of the environmental aspects outside of the project study area that may be impacted by the proposed roadwork was also considered as part of this assessment.

This assessment did not include any basic raw material (BRM) source areas nor construction water sources. It is understood that Main Roads will source BRM from existing quarries or other locations.



2. Existing Environment

This chapter describes the existing project environment, details the expected primary impacts of the proposed works on the environment and details management actions to reduce or manage those impacts. The information included in this section was sourced from database records, literature review, previous studies in the project area, and site surveys conducted in 2010.

2.1 Physical Environment

2.1.1 Climate

The climate of the project area is best described as Mediterranean with warm dry summers and cool wet winters. The closest Bureau of Meteorology weather recording station to the project site is located at Collie. The recorded climate data for Collie is summarised in Table 1 below.

Table 1 Climate Data for Collie

Mean Annual Maximum Temperature Range	30.5°C (January) & 15.5°C (July)
Mean Annual Minimum Temperature Range	13.2°C (February) & 4.2°C (July)
Mean Annual Rainfall	939.6 mm
Mean Annual Days of Rain per year	90.2

(Bureau of Meteorology, 2010)

2.1.2 Geology, Landform and Soils

The project area is located within the Yilgarn Plateau Province. The Australian Soil Resource Information System (ASRIS, 2010) describes the landforms as '*sand plains, low hills and ridges, breakaways, salt lakes and dune fields*'.

Seven soil subsystems underlie the study area; all of which are subsystems of the Coalfields System, which are described by the Department of Agriculture and Food Western Australia's (DAFWA) NRM Information tool as, '*Gently undulating plain over coal basins, in the south of the Western Darling Range. Sandy gravel, deep sand and non-saline wet soils*' (DAFWA, 2010).

The project area traverses a gently undulating terrain varying in height by approximately 30m over the 7 km section.

The potential risk of water and wind erosion as a consequence of the proposed works is not expected to be significant. Proposed drainage management measures and dust during control roadworks will manage these issues in the short term.



2.1.3 Acid Sulphate Soils

The Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Australian Soil Resource Information System (ASRIS) indicated Coalfields Highway between 27.92 SLK and 35.45 SLK has extremely low probability of Acid Sulfate Soil (ASS) occurring within 3m of the natural soil surface.

The project site is greater than 60m above sea level with no wetlands, saline waterlogged areas or site characteristics commonly associated with the presence of ASS. As the upgrade involves raising the road above the existing ground level, proposed roadworks are considered unlikely to disturb ASS.

2.1.4 Hydrology and Drainage

The Department of Water (DoW) Geographic Data Atlas notes groundwater salinity within the project area to range between 1000 mg/L and 5000 mg/L total dissolved salts (TDS) (DoW, 2008), classifying it as brackish. Issues associated with increased salinity are unlikely to result from implementing the project due to the narrow width of clearing within the broader landscape.

The works will include extending 15 existing cross road culverts and installing two new culverts over the length of the project. Existing roadside table drains will be replicated as part of the widening works.

Protected Catchment Areas

The project area occurs within a proclaimed surface water area where the Collie River and its tributaries are protected under the *Rights in Water and Irrigation Act 1914*. As such, a Bed and Banks Permit is required under this Act prior to disturbance of any watercourses crossed by the highway. Discussions with the Department of Water have noted the requirement for a license to construct culvert works at two ephemeral water courses within the project area – Ironstone Gully (28 075 SLK) and an un-named watercourse 80m east of Ferguson Road (30 886 SLK). A Bed and Banks Permit has since been issued to Main Roads for the works by the Department of Water.

The Allanson to Collie section also occurs with the Harvey Irrigation Area and Zone D of the Wellington Dam Catchment Area protected under the *Country Areas Water Supply Act 1947* (CAWS Act). Discussion with officers from DoW Manjimup office noted that a licence under the CAWS Act is not required for the roadworks clearing.

The site also traverses the Not Assigned portion of the Wellington Dam Public Drinking Water Source Area (PDWSA) which overlies the whole of the project area. DoW has advised that roadworks are permitted within this portion of the catchment subject to appropriate management practices. The Environmental Management Plan prepared for the project includes relevant management practises detailed in the Western Australian Planning Commission's Statement of Planning Policy No 2.7 – Public Drinking Water Source Policy, and the DoW's *Water Quality Protection Note – Land use Compatibility in Public Drinking Water Source Areas*.

The proposed works are not expected to significantly alter existing surface water drainage movements (including groundwater recharge) which can be managed through the project drainage design and appropriate erosion control measures.



Wetlands

No Wetlands of International Significance or State wetlands of significance are within the project area.

A low lying ephemeral sumpland occurs at approximately 30 785 – 31 000 SLK LHS (north of the highway). This wetland area occurs on private property and has been impacted by past landuse activities including clearing and possibly grazing.

Another ephemeral wetland area, mapped as *Melaleuca preissiana* on Figure 2 occurs at approximately 32 050 – 34 000 SLK RHS. This wetland area has been impacted by previous land use including excavations and track construction and the vegetation condition was noted as being degraded comprising a weedy understorey beneath paperbarks. Roadworks are not expected to directly impact this wetland.

A minor risk to water quality in nearby watercourses is the potential for accidental hydrocarbon spills during construction activities. This risk can be minimised and managed during construction through appropriate management measures.

As noted above, existing cross road drainage patterns will be maintained and the existing roadside table drains will be maintained as part of the works.

Management Actions

- ▶ Main Roads should comply with the requirements of the Bed and Banks Permit issued by DoW prior to conducting works at watercourses – Ironstone Gully and un-named watercourse 80m east of Ferguson Road
- ▶ The road design should be such to maintain existing surface water flows and incorporate appropriate erosion control measures
- ▶ No on-site storage of fuel, oils and other contaminant materials should be permitted within 100m of a watercourse or wetland during road construction
- ▶ Spill clean-up kits should be kept on site for the clean up of any accidental spillages
- ▶ Major vehicle and plant servicing should not be conducted on the project site
- ▶ Any minor servicing to be undertaken should be in a cleared area at least 100m from any watercourse or wetland

2.2 Biological Environment

2.2.1 Vegetation Types and Extent

For a development proposal to be assessed in terms of the flora and vegetation values that may be impacted upon, an understanding of the extent and status of vegetation communities at the site in question at a regional scale, is required. A widely-used broad scale vegetation classification system that maps and describes vegetation communities in WA is described in Beard (1990). Beard mapping has been adapted by Shepherd (2005) and each vegetation complex is presented as a percentage of the pre-European settlement extent which is estimated to be remaining today in each Interim Biogeographic



Regionalisation of Australia (IBRA) region. From data generated by Shepherd (2005), the site vegetation complexes can be categorised as being regionally significant or not.

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).

The project area is situated within the Southern Jarrah Forest Bioregion. Broad scale vegetation mapping by Beard (1990) described the vegetation of the study area as an Open forest of *Eucalyptus marginata* (Jarrah) and *Corymbia calophylla* (Marri). The native vegetation type represented in the study area, its regional extent and reservation status from Shepherd *et al* (2005) is shown in Table 2.

Table 2 Vegetation Types and Extent

Vegetation Association	Vegetation Community	Pre-European Extent (ha)	Current Extent (ha)	% Remaining	% in IUCN Class I-IV Reserves
Southern Jarrah Forest					
3 (Medium Forest, Jarrah & Marri)	Open Forest of <i>Eucalyptus marginata</i> subsp <i>marginata</i> & <i>Corymbia calophylla</i>	1,482,495.07	9,133,31.84	61%	30%

The vegetation of the project area as mapped by Shepherd (2005) is considered to be well represented with 60% of its pre-European extent remaining intact and exceeding the EPA threshold of 30%.

2.2.2 Site Vegetation

An assessment of the project site in June 2010 by GHD identified five vegetation types over the length of the project:

- ▶ Jarrah / Marri open forest
- ▶ Jarrah / Casuarina woodland
- ▶ *Melaleuca preissiana* wetland
- ▶ Flooded gum at creek crossings
- ▶ Verge plantings with a grass weed understorey

The distribution of these vegetation types over the project area is shown at Figure 2.

Within the site vegetation 76 plant species were identified from 64 Genera and 30 Families. The most dominant Families were the Poaceae, and the Myrtaceae with a total of 8 and 12 species respectively.



Twenty five of the species recorded are considered as weeds. A list of the species recorded is included at Appendix B.

Collie Townsite Entry Statement

The roadsides on the approach to the Collie townsite (33.60 – 35.45 SLK) has been planted with Spotted Gum (*Eucalyptus maculate*), Yellow Gum (*E. leucoxylon*), Peppermint (*Agonis flexuosa*), Red Flowering Gum (*Corymbia ficifolia*) and Queensland Brush Box (*Lophostemon confertus*). These trees form a landscape entry statement to the town and any removal has the potential reduce the effectiveness and character of this entry statement.

Management Action

Main Roads should avoid the removal of trees that form the entry statement to Collie where possible, or where impact is unavoidable minimise and replace trees removed to replicate the entry statement in the longer term.

2.2.3 Vegetation Condition

Roadside vegetation condition was assessed in June 2010 over the length of the project area congruent with the Government of Western Australia (2000) Vegetation Condition Rating Scale, as detailed in the table below.

Vegetation Condition Rating Scale

Rating	Description	
1	Pristine	Pristine or nearly so.
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 disturbance, retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to 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 survey noted that the vegetation condition along the project area ranged from 'Completely Degraded' to 'Excellent' as shown at Figure 3 and described below.

The creek crossing at Ch. 30 800 was in a 'Degraded' condition dominated by pasture grasses and a large patch of Blackberry (*Rubus ulmifolius*).



The majority of the Jarrah Marri Woodland was in 'Very Good' condition with some sections nearing 'Excellent'.

The wetland vegetation (approximately 32 050 – 34 000 SLK RHS) was in a 'Degraded' condition with clear evidence of past disturbance including ground excavations, stockpiles of soil and tracks traversing the area. The shoulders of the highway were 'Completely Degraded' for the most part, particularly through Allanson and on the approach to Collie, however there are sections of native vegetation in the road verge in 'Very Good' to 'Excellent' condition.

2.2.4 Declared Rare and Priority Flora

A search of the EPBC Act Protected Matters Search Tool listed no known rare flora species within the study area. However, searches of the DEC flora database revealed that a total of 18 threatened flora species possibly occur in the vicinity of the project area (Appendix B).

It should be noted that the DEC and EPBC Protected Matters flora database does not necessarily represent a comprehensive listing of rare flora in the area. Its comprehensiveness is dependent on the extent of survey carried out within the specified area and the databases are subject to updating and amendment.

A rare flora survey of the project area was conducted by a botanist from GHD on July 20, 2010. Prior to the site survey, an assessment of the species with the potential to occur within the project site noted that the listed species were able to be adequately identified during July, negating the need to conduct a spring rare flora survey. No DRF or Priority Flora were recorded within the project area during the July 2010 site survey.

2.2.5 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.

2.2.6 Vegetation Clearing

Vegetation clearing of the road verges is required to provide for the proposed roadworks and to create a safety clear zone for traffic. The project clearing area is estimated to be 2.63 ha based on the clearing line marked on-site in August 2010 as detailed in the table below.



Table 3 Clearing Area According to Vegetation Type

Vegetation Type	Area (ha)
Jarrah / Marri open forest	1.64
Jarrah / Casuarina woodland	0.70
<i>Melaleuca preissiana</i> wetland	0.01
Creek crossings - Flooded gum	0.28
Total Clearing Area (excl verge plantings)	2.63

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 A and it is concluded that the project clearing is not likely to be at variance with the clearing principles. Therefore proposed clearing can be conducted under the provisions of Main Roads Clearing Permit CPS 818/4.

Management Actions

- ▮ Clearing should be kept to the minimum required for construction activities and to provide a safe clear zone
- ▮ The limits of clearing should be clearly marked with works conducted to minimise clearing and avoid disturbance to native vegetation and potential fauna habitat outside of the clearing limits
- ▮ Significant trees to be retained shall be clearly marked prior to the start of clearing operations
- ▮ The project design be reviewed and adjusted to retain the two trees containing potential nest hollows that occur at 32 320 SLK LHS and 33 020 SLK RHS
- ▮ Trees to be removed should be felled in a manner that ensures they fall within the approved clearing envelope
- ▮ Cleared trees suitable for timber or firewood should be salvaged for re-use
- ▮ The remainder of cleared vegetation should be chipped on-site for use in site rehabilitation and soil stabilisation
- ▮ Existing cleared areas should be utilised for locating site access, site offices and infrastructure, and lay-down areas
- ▮ No burning of cleared vegetation should be permitted on site



2.2.7 Weeds and Introduced Species

The WA Department of Agriculture and Food website noted that 83 species of 'Declared Plants' (weeds) occur within the Collie district. These species are declared as environmental weeds under the *Agriculture and Related Resources Protection Act 1976*.

Two Declared Weeds Bridal creeper (*Asparagus asparagoides*) and Blackberry (*Rubus ulmifolius*) were identified within the project area during site surveys. The listing of these weeds species as declared plants mean that their populations require management to eliminate the infestation and potential spread of the species. The locations of these plants / infestations are listed at Appendix C.

The survey identified an additional 27 weed species within the project area as listed at Appendix C. Management of topsoil movement in line with the Topsoil Management Plan will minimise the risk of spreading weeds throughout the project area.

In discussions, officers from DEC Collie raised the issue of weed spread into the Westralia Conservation Park through the movement of construction machinery and plant into access tracks and firebreaks outside of the road reserve. Apart from any movements required for the construction of tie-ins for access tracks to the highway all other plant movement shall be avoided within the Westralia Conservation Park through education of construction staff, signage and / or physical barriers.

Management Actions

- ▶ Declared weed infestations should be treated with herbicide prior to the commencement of roadworks. Alternatively, Blackberry plants should be removed and either burnt on-site or buried at a landfill site
- ▶ Apart from any movements required for the construction of tie-ins of access tracks to the highway all other plant and machinery movement should be avoided within the Westralia Conservation Park through education of construction staff, signage and / or physical barriers

2.2.8 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 and / or dieback along the project area. A Topsoil Management Plan (TMP) has been prepared for the project area to identify the use and movement of in-situ topsoil during road works. A summary of topsoil use throughout the project area is detailed in the table below.

The table below details topsoil management requirements during roadworks based on its conservation significance.

Table 4 Recommended Topsoil Treatment

Start SLK	End SLK	Section (km)	Topsoil Management LHS	Topsoil Management RHS
27.920	28.860	0.940	Spoil Topsoil	Spoil Topsoil
28.860	29.810	0.950	Conserve and respread topsoil	Conserve and respread topsoil



Start SLK	End SLK	Section (km)	Topsoil Management LHS	Topsoil Management RHS
Start Chainage	End Chainage	Section (km)	Topsoil Management LHS	Topsoil Management RHS
29.810	31.300	1.490	Spoil Topsoil	Spoil Topsoil
31.300	34.130	2.830	Spoil Topsoil	Conserve and respread topsoil
34.130	34.550	0.420	Conserve and respread topsoil	Conserve and respread topsoil
34.550	35.450	0.900	Conserve and respread topsoil	Conserve and respread topsoil

Management Action

All works should be conducted in line with Topsoil Management Plan prepared for the project.

2.2.9 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 by 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.

Management Action

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

2.2.10 Dieback

Main Roads commissioned Glevan Consulting (Glevan, 2010) to conduct a dieback survey for the project. The mapping identified areas of dieback, free, infected and uninterpretable along the project site, in addition to areas that were unmappable due to lack of indicator species.

The results of the dieback assessment formed the basis of discussions with officers from DEC in Collie in defining the dieback status of the site and defining appropriate dieback management requirements. Based on the results of the survey and status of the adjacent land use for the purposes of road construction the project site is considered to be dieback infected and unprotectable. Management measures as detailed below should be implemented during the construction of the project.

Management Actions

- ▶ Earth-moving machinery should be cleaned of soil and vegetation prior to entering and leaving the area to be cleared.
- ▶ Clearing and topsoil movement during wet soil conditions should be avoided.



- ▶ The movement of plant, machinery and other vehicles should be restricted to the limits of the areas to be cleared.

Employing the above hygiene practises will also assist in minimising the introduction and spread of weeds.

2.2.11 Fauna

A list of significant fauna species potentially occurring in the project area as defined by the EPBC Act Protected Matters Search Tool and the DEC Threatened Fauna database search is provided at Appendix D. Fauna species observed onsite are also detailed at Appendix D.

Rare Fauna Assessment

Main Roads commissioned Mr G Harewood to conduct a Black Cockatoo Habitat Assessment of the project area. The survey report is included at Appendix E, while a summary of the report findings is detailed below.

The scope of the survey was focused to:

- ▶ Assess all trees within the proposed clearing area for the potential to contain suitable hollows for black cockatoos
- ▶ Recording of the potential cockatoo habitat present based on vegetation type and flora species present
- ▶ Recording of direct or indirect evidence of cockatoo foraging and / or roosting within the project area.

The survey also included an assessment of evidence of other conservation significant fauna species and recording of opportunistic observation of fauna within the survey area. In summary the survey concluded the following:

- ▶ Two trees containing hollows were identified in the potential clearing area. Only one of these trees had a hollow considered large enough for use by black cockatoo species and neither trees showed signs of usage for nesting by these species. Both trees were at the extremity of the expected clearing area and may potentially be retained
- ▶ No evidence of trees being used for overnight roosting was observed
- ▶ Almost all of the native vegetation within the project area represents potential foraging habitat for cockatoo species
- ▶ It is suggested that Western Ringtail Possums are absent from the survey area and may be used by occasional transient individuals
- ▶ The area expected to be cleared is 'very unlikely to have what could be considered as a high level of biological diversity or constitute the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia'

It is considered that:



- The proposed clearing is the minimum necessary for the safe operation and upgrade of the highway
- The proposed clearing is linear in nature following an established highway corridor
- Sections of the proposed clearing occur adjacent to equivalent vegetation; and
- It is expected that some fauna will have adequate adjacent areas to find habitat/refuge if disturbed

Harewood (2010) concluded that no fauna species, including those of conservation significance, will have their local populations threatened by the planned roadworks. Management recommendations proposed by Harewood (2010) have been incorporated into this report.

The Coalfields Highway project and potential impacts on Commonwealth protected fauna species was the subject of discussions with officers from the Commonwealth Department of Environment Water Heritage and Arts (DEWHA) by telephone on August 17, 2010. Based on the outcome of these discussions Main Roads should continue liaison with DEWHA to define the requirement for DEWHA involvement in the development of the project.

Management Actions

- ▮ Site inductions and 'toolbox meetings' should discuss the issue of fauna and fauna management
- ▮ Main Roads should continue liaison with DEWHA to define the requirement for DEWHA involvement in the development of the project
- ▮ The project design should be reviewed and adjusted to retain the two trees containing potential nest hollows that occur at 32 320 SLK LHS and 33 020 SLK RHS
- ▮ Hollows in trees should be inspected for fauna and eggs prior to clearing
- ▮ If any native fauna is disturbed during clearing it should be allowed to make its own way to adjacent vegetated areas, and if injured DEC or a registered fauna carer should be contacted for advice
- ▮ Excavations and trenches should kept open for the minimum period necessary, with escape ramps installed when left open for extended periods. Trenches should be inspected regularly for fauna present and prior to backfilling. Any trapped fauna should be safely removed to adjacent habitats

2.2.12 Environmentally Sensitive Areas (ESAs)

A search of the DEC's online Native Vegetation Viewer confirmed that there are no Environmentally Sensitive Areas (ESAs) within the vicinity of the project area, as declared by a notice under Section 51B of the *Environmental Protection Act 1986*. (Department of Environment and Conservation, 2008b).



2.3 Social Environment

2.3.1 Reserves and Conservation Areas

A number of reserves areas occur adjacent to the road reserve over the length of the project. Table 5 lists the reserves that occur adjacent to the Coalfields Highway Road reserve. None of these areas will be directly impacted by roadwork, which will be limited to within the road reserve where it passes adjacent to these areas.

Table 5 Reserves and Conservation Areas Adjacent to the Project Area.

Reserve Number	Land Use	Location	Responsible Agency
23 032	Mining	28 860 – 29 780 SLK RHS (south)	Dept. Minerals and Energy
16 403	Recreation	35 665 – 30 600 SLK LHS (north)	Dept. Planning and Infrastructure
45 961	Conservation Park (Class A) – Westralia Conservation park	31 300-33 360 SLK RHS and 33 860 – 34 480 SLK	Dept. Environment and Conservation
6 738	Cemetery	33 360- 33 860 SLK RHS	Dept. Planning and Infrastructure
10 014	Rifle Range	34 480 – 34 710 SLK RHS	Dept. Planning and Infrastructure
36 584	Railway	33 760 - 37 720 SLK	Public Transport Authority WA
47 127	Miniature Railway	34 720 – 35.000 SLK LHS (north)	Dept. Planning and Infrastructure

2.3.2 Existing Land Use

Land use adjacent to the project area includes private properties (rural and rural residential) and reserve areas as listed in Section 2.3.1. Proposed roadworks are not expected to alter these existing uses.

The Bilbumen Track crosses Coalfields Highway north to south at 31 300 SLK. Construction works may disrupt access for walker using the track. Safe access to the track should be maintained during roadworks and track users should be advised by appropriate warning signs of the presence of construction machinery operating on Coalfields Highway.

Management Action

Safe access to the Bilbumen Track should be maintained during roadworks and track users should be advised by appropriate warning signs of the presence of construction machinery operating on Coalfields Highway.

2.3.3 Contaminated Sites

The DEC Contaminated Sites database was reviewed to determine the occurrence of any contaminated sites within, or in close proximity to the project area. The database revealed that there are no known



contaminated sites within, or in proximity to, the proposed project area (Department of Environment and Conservation, 2010).

Advice from the DoW raised the issue of two possibly contaminated sites on the outskirts of the Collie town site. These sites are distant from the highway and will not be expected to be impacted by roadworks.

2.3.4 Visual Amenity

The proposed clearing will have some impact on the visual amenity from the highway by opening up the aspect to adjacent land use, particularly existing farming operations. As noted above the impact of project clearing on the avenue of trees at the approach to Collie should be avoided where possible and managed by the replacement of any trees removed.

Potential clearing and roadwork may marginally impact on the landscape character; however any impact should be offset by planned revegetation works in the medium to long term.

Management Action

Implement the Revegetation and Landscape Plan to maintain the visual amenity to and from the highway.

2.3.5 European Heritage

Searches of the Australian Heritage Places Inventory and the Heritage Council of WA Places Database were conducted to identify any European Heritage Sites within the project area. No sites were listed on either of these databases. Additionally, no World Heritage Properties or National Heritage Places were identified from using the EPBC Act Protected Matters Search Tool.

There is, however, a European Heritage Site within close proximity to the project area which is listed on the Shire of Collie Municipal Register of Heritage Places. This site Road House with Turntable (Site 00541) is located approximately 100m north of Coalfields Highway and is not expected to be impacted by roadworks.

2.3.6 Aboriginal Heritage

Main Roads initiated an Aboriginal heritage survey of the project area, which was completed by Brad Goode and Associates Consulting Anthropologists and Archaeologists in July 2010. The survey assessed both the archaeological and ethnographic status of the project site and impact of the proposed roadworks on identified heritage sites.

Archaeological Survey

A search of the Department of Indigenous Affairs online site register was undertaken on June 1, 2010 to determine proposed works would impact on any previously recorded sites. The search revealed seven ethnographic Aboriginal Heritage sites and one archaeological site that lay within or in the vicinity of the project area.

The archaeological field survey was undertaken on June 8 and 10, 2010 and was conducted via a systematic total survey of the project area. Transects were conducted within the re-vegetated road



reserve, disturbed forest, fields of pasture and industrial lands. In addition, predictive intensive transects were conducted at firebreaks, cleared areas and any other area of site potential.

The buffer zone of archaeological site DIA 4578 intersected the proposed works area. DIA 4578 Collie Burial was reported to be located within a public cemetery. However the project corridor extending from roadway to fence line does not impact on the actual site boundary nor the fenced cemetery.

The survey concluded that no archaeological sites were located within or in close proximity to the project area.

Ethnographic Survey

A search of the DIA Sites Register was conducted on June 1, 2010, to determine any previously recorded Aboriginal Heritage sites that would be affected by the proposed roadworks. The search revealed that seven previously recorded ethnographic Aboriginal Heritage sites located within the search area corridor.

Of these sites only Site ID 16713 Collie River Waugal will be directly affected by the project where Main Roads plans to widen the highway and replace the existing culvert at Ironstone Gully and the unnamed creek east of Ferguson Road. Approval from the WA Minister for Indigenous Affairs issued under Section of the WA *Aboriginal Heritage Act (1972)* will be required before works commence at these watercourses.

The survey included consultation with nine members of the Gnaala Karla Booja WC98/058 Native Title Claim group. The consultation noted that no new ethnographic sites (as defined by Section 5 of the WA *Aboriginal Heritage Act (1972)*) were identified within the project area.

As a consequence of the Aboriginal Heritage Survey a number of management measures are recommended, as detailed below.

Management Actions

- ▶ Main Roads should seek approval under section 18 of the Western Australian *Aboriginal Heritage Act (1972)* for consent to use the land that contains an Aboriginal site, where the road works and associated infrastructure will affect two tributaries of Site ID 16713 Collie River Waugal - Ironstone Gully and un-named watercourse 80m east of Ferguson Road.
- ▶ Main Roads should ensure all site personnel are aware of their obligations under the *Aboriginal Heritage Act 1972*, prior to commencing site work
- ▶ If during construction, materials likely to be significant to Aboriginal people are uncovered, works should cease in the vicinity of the area and Main Roads Environmental Officer and Department of Indigenous Affairs should be notified immediately. If skeletal material is uncovered, the Western Australian Police Service shall be advised immediately
- ▶ Main Roads should consider the following requests from the Nyungar consultants
 - ▶ That Nyungar monitors are engaged to supervise ground disturbing works at the Rose Road and the un-named watercourse 80m east of Ferguson Road
 - ▶ That all work at the Coalfields Road creek crossing avoids affecting a number of springs north of the road reserve on the Coalfields Highway



2.3.7 Roadside Memorials

During site investigations two roadside memorials, dedicated to a person who lost their life in a road crashes, were identified in the project area. These memorials should be managed in accordance with Main Roads policy.

Management Action

Main Roads should ensure that management of roadside memorials complies with the Roadside Memorials Policy and Guidelines (Main Roads, 2008).

2.4 Pre-construction Works

A number of utility services occur within the project area including Telstra cables and pits. The pre-construction services re-locations will be required prior to the commencement of roadwork. The management measures detailed in this EMP should be followed during service relocations by other agents. A copy of the EMP should be given to all relevant service providers and contractors responsible for service re-locations with a requirement to fulfil the EMP measures.

Management Action

Main Roads should ensure that all of the agencies and contractors involved with service re-locations are provided a copy of the EMP and comply with its management requirements.

2.5 Construction Phase Impacts

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

- construction noise and vibration
- damage to public/private property
- dust lift
- traffic access and safety
- fire management
- chemicals storage and handling
- waste disposal

These issues are specific to each section of project development and detailed measures to manage them are given in the Environmental Management Plan (EMP) at Appendix B.

Construction work should be managed by implementing the EMP and ensuring management measures are included in relevant contractual documents.

Management Action

Main Roads should incorporate relevant EMP measures and requirements into the projects tender documentation and site induction material for all personnel and service providers involved.



3. Environmental Management

The Environmental Management Plan (EMP) prepared for the project is included at Appendix B which collates the management actions detailed in Section 2. The EMP details the environmental management measures to be implemented during roadworks to provide for Main Roads to deliver the project in an environmentally acceptable manner. This information is presented to be used as a 'stand alone' Construction EMP during the implementation of the project.

The EMP outlines responsibility for each commitment at the applicable design, construction or operational phase. The commitments outlined in the EMP aim to provide a basis for which performance and compliance can be measured during development of the project.

3.1 Environmental Management and Quality Plan

The Construction Contractor should prepare a Quality Plan for the Project, which will address the Construction Contractor's management responsibility, authority and communication requirements and clearly detail the Contractor's 'Quality Management Representative' (QMR) role with respect to the Contract in accordance with AS/NZS ISO 9001.

The Quality Plan should be submitted to Main Roads Construction Manager for approval.

3.2 Environmental Monitoring and Compliance

Environmental management commitments detailed in the EMP should be included in relevant contract documents and the Technical Specification prepared for the project. All Main Roads WA employees, service authorities, contractors and other personnel employed on the project should be made aware of the EMP through the site induction and tool box meeting processes.

During the construction phase, compliance with environmental management measures should be regularly monitored. Any non-conformances should be addressed at the first opportunity, while the non-conformance and any improvement actions implemented should be detailed in appropriate construction documentation.



4. Consultation

During the development of this EIA and EMP Main Roads and GHD were involved in a number of consultations with officers from government stakeholders and regulators. These meetings are summarised below:

Commonwealth Department of Environment, Heritage and the Arts

The Coalfields Highway project was discussed with Dr A Weavers and Mr T Wyndam from DEWHA via telephone on August 17, 2010. The discussions were focused on the scope of the project, environmental impacts on issues of national Environmental Significance and the formal involvement of DEWHA in the development of the project.

It is strongly recommended that Main Roads continue to liaise with DEWHA officers regarding this matter.

Department of Water (DoW)

Ms C Anderson from the DoW Bunbury office provided preliminary advice to Main Roads in respect to regulatory issues managed by DoW during the initial stages of preparing this EIA. GHD subsequently consulted with Ms Anderson who provide location information in respect to the contaminated sites recorded in the vicinity of the project site.

GHD consulted with Mr K Alan from DoW's Manjimup office in respect to the requirement for Main Roads to obtain a Clearing Permit under the provisions of the *Country Areas Water Supply Act (1947)*. DoW subsequently advised that such a clearing permit was not required if the clearing was conducted under Main Roads Clearing Permit CPS 818/4.

Both Main Roads and GHD met with Ms M Subotic and Mr H Sieradzki on July 30, 2010 to discuss the requirement for a Bed and Banks Permit to be obtained by Main Roads to upgrade the culverts at Ironstone Gully and the creek east of Ferguson Road. Main Roads has since been issued with the required permit.

Department of Environment and Conservation

Main Roads and GHD met with Mr T Keneally from DEC's Collie office on August 6, 2010. The meeting included a briefing for DEC on the project, discussed the dieback management requirements and other management issues to be considered by main Roads during the implementation of the project.

Management issues raised by DEC have been incorporated into the EMP for the project.



5. Limitations

This report presents the results of desktop data searches for environmental aspects and site visits during June to August 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.



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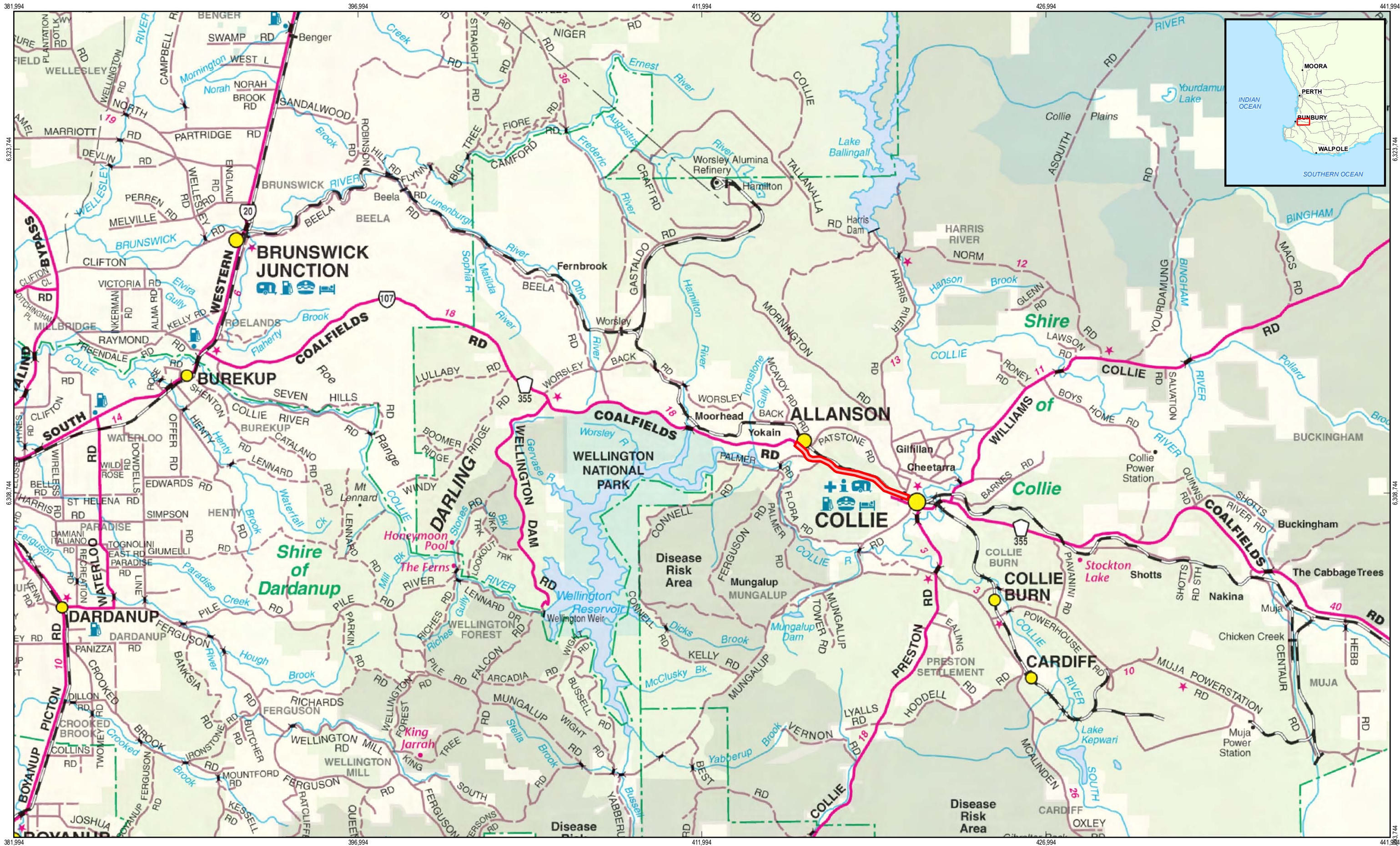
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Figure 1
Project Locality Plan

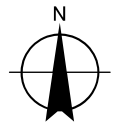


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0 0.75 1.5 3 4.5 6 7.5

Kilometres

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



LEGEND

Study Area



Main Roads Western Australia
Coalfields Highway 28-35
SLK EIA & EMP

Job Number 61-25572
Revision 0
Date 22 SEP 2010

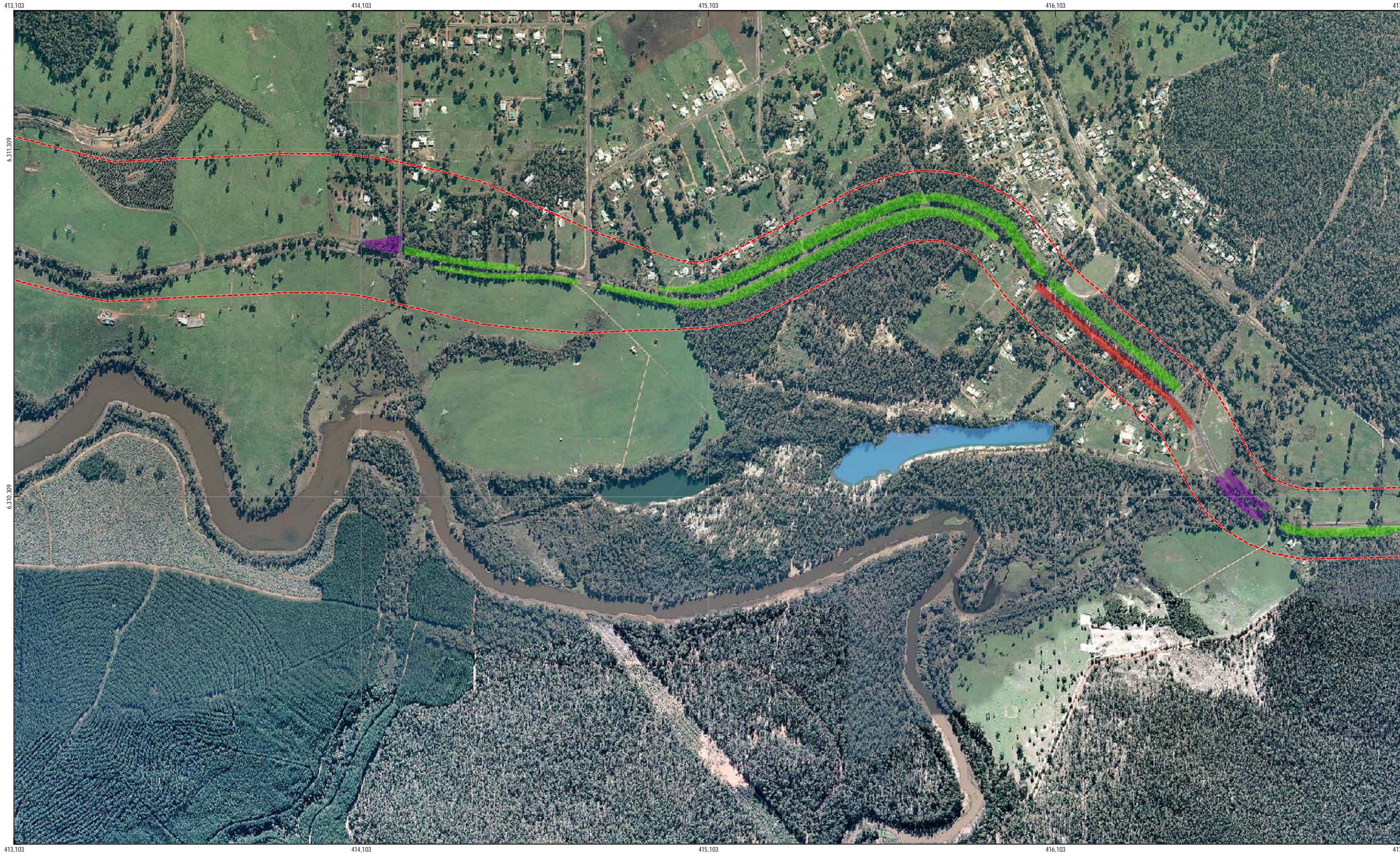
Location Map

Figure 1



Figure 2

Site Vegetation Types



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Metres

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

N

LEGEND

	Study Area
	Jarrah/Marri open forest
	Melaleuca/peppercorn wetland
	Jarrah/Casuarina Woodland
	Creek crossing (Eucalyptus rudis & Blackberry)
	Verge plantings

CLIENTS | PEOPLE | PERFORMANCE

WESTERN AUSTRALIA

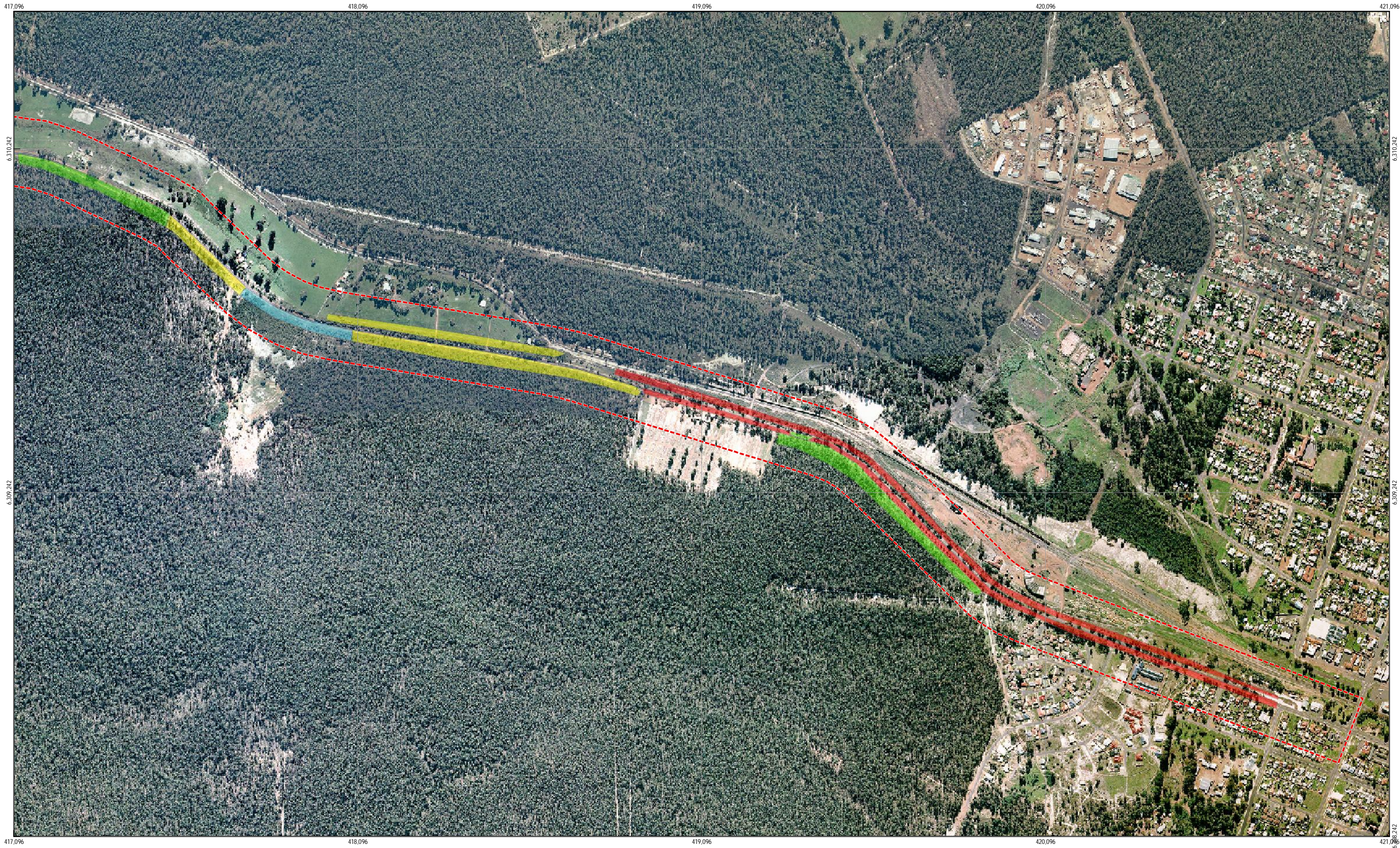
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Coalfields Highway 28-35
SLK EIA & EMP

Job Number	61-255572
Revision	A
Date	02 JUL 2010

Vegetation Type

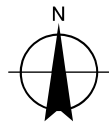
Figure 2 Sheet 1

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Data Source: MRWA: Study Area - 20081205; Landgate: Collie 2131 Mosaic - Feb 2008; GHD: Vegetation Type - 20100701. Created by: sismail



1:10,000 (at A3)
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Metres

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



LEGEND



Study Area



Vegetation Type

Jarrah/Marri open forest

Melaleuca preissiana



Jarrah/Casuarina Woodland

Roadside plantings



CLIENTS | PEOPLE | PERFORMANCE



Main Roads Western Australia
Coalfields Highway 28-35
SLK EIA & EMP

Job Number	61-255572
Revision	A
Date	02 JUL 2010

Vegetation Type

Figure 2 Sheet 2

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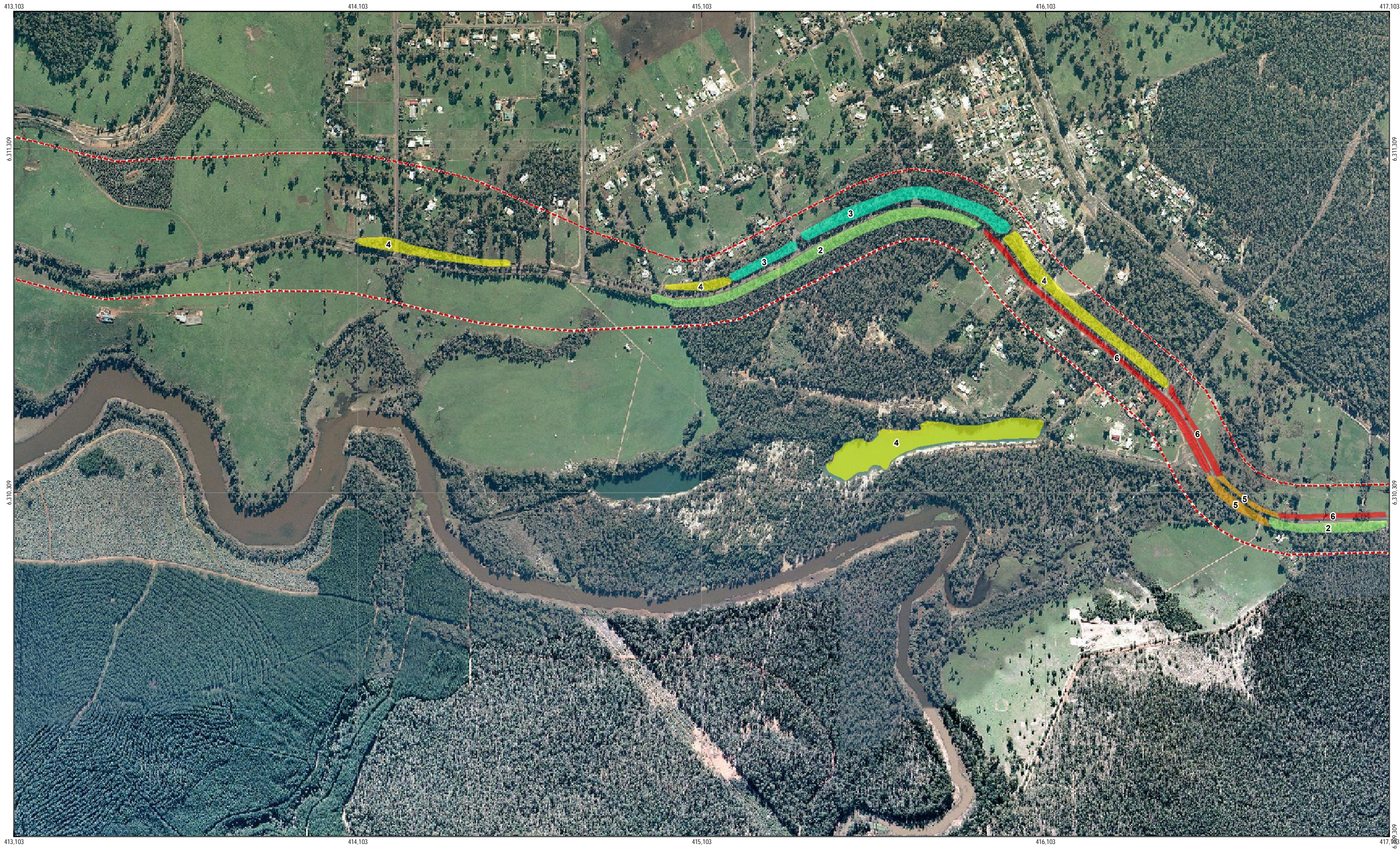
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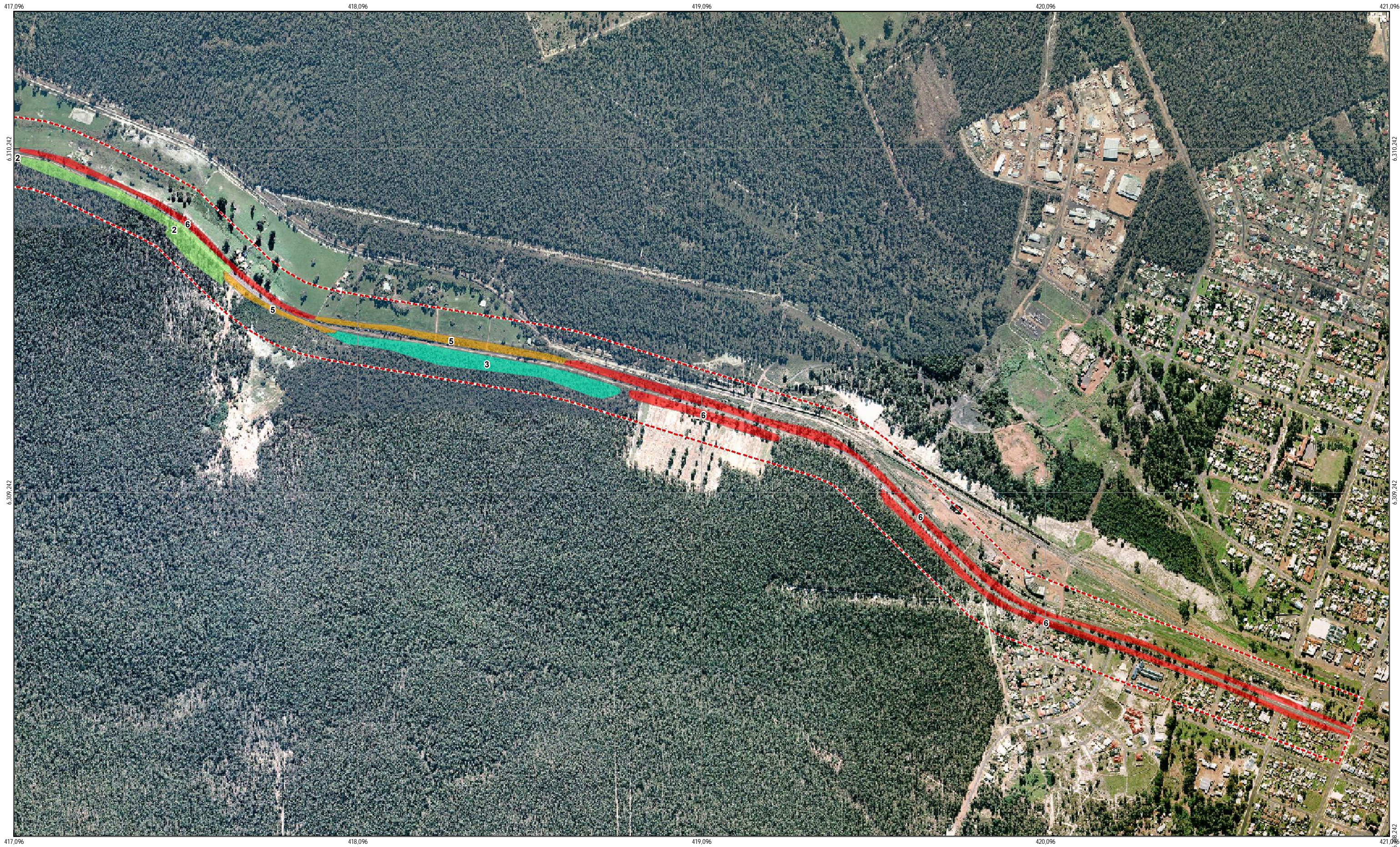
GHD House, 239 Adelaide Terrace Perth WA 6004 T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au



Figure 3

Site Vegetation Condition Assessment







Appendix A

Project Clearing Impact Assessment Against the Ten Clearing Principles



The clearing of any native vegetation is regulated by the Environmental Protection Authority (EPA) and requires a permit under Part V of the *Environmental Protection Act (1998)*, except where exemptions apply under Schedule 6 of the Act or when the clearing is for exempt purposes, as prescribed in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, and not in an Environmentally Sensitive Area (ESA).

Applications to clear native vegetation are assessed against the “Ten Clearing Principles” outlined in Schedule 5 of the *Environmental Protection Amendment Act 2003*. The clearing required for roadworks has been assessed against the “Ten Clearing Principles” as detailed below. It is concluded that the project clearing is not likely to be at variance with the clearing principles and can therefore be conducted under the provisions of Main Roads Clearing Permit CPS 818/4.

The principles address three main environmental areas:

- ▶ Biodiversity significance
- ▶ Land degradation; and
- ▶ Ground and surface water quality.

Main Roads has been granted a State-wide vegetation clearing permit (Purpose Permit CPS 818/4), under section 51E of the *Environmental Protection Act 1986*, from the DEC. The Purpose Permit allows Main Roads to clear native vegetation for road realignment projects and associated construction activities. The permit requires any proposed clearing of native vegetation to be assessed against the “Ten Clearing Principles” as outlined in the permit. The Permit does not authorise the clearance of native vegetation for project activities where:

The clearing may be seriously at variance with the clearing principles;

- ▶ Those project activities are incorporated in any proposal that is referred to and assessed under Part IV of the *Environmental Protection Act 1986* by the EPA; or
- ▶ Clearing occurs in an Environmentally Sensitive Area

The Purpose Permit requires that Main Roads adhere to its internal environmental process of *Environmental Assessment and Approval* to ensure compliance with the Permit. Where clearing is or is likely to be at variance with one or more of the “Ten Clearing Principles”, then the permit holder must implement an offset in accordance with Part V of the Permit with respect to that native vegetation.

The assessment detailed below concludes **that project clearing is not likely to be at variance with the clearing principles.**



Table 6 Assessment Against the “Ten Clearing Principles”

Principle Number	Principle	Assessment	Outcome	Methodology
(a)	Native vegetation should not be cleared if it comprises a high level of biological diversity.	The native vegetation in the study area does not comprise a high level of biological diversity. The width of the clearing will be limited to roadside vegetation with clearing generally not exceeding 8m beyond the current road edge line.	The proposal is not likely to be at variance with the Principle.	Desktop assessment (GIS and aerial mapping) of extent of DEC estate in the vicinity of the project area and site assessment by GHD ecologists.
(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.	<p>The vegetation comprises habitat for the Carnaby's, Baudin's and Forest Red-tailed, Black Cockatoos. However the study area is surrounded by areas of State Forest and Conservation Parks, which support similar or better condition vegetation.</p> <p>The Black Cockatoo Habitat Assessment concluded that the proposed clearing area is very unlikely to have a high level of biological diversity, or constitute significant habitat necessary for the maintenance of significant indigenous fauna species.</p>	The proposal is not likely to be at variance with the Principle.	<p>Cockatoo and Possum survey (Harewood 2010).</p> <p>EPBC Protected Matters Search Tool</p>
(c)	Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No Declared Rare or Priority Flora species were recorded during the field survey.	The proposal is not at variance with the Principle.	Rare Flora survey by GHD ecologists. GIS - assessment of DEC Declared Rare and priority Flora list and EPBC Protected Matters Search Tool
(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.	No TECs were identified as being present within the Project Area.	The proposal is not at variance with the Principle.	Rare Flora survey (by GHD ecologists and GIS EPBC Act Protected Matters Search Tool and the DEC's TEC database



Principle Number	Principle	Assessment	Outcome	Methodology
(e)	Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	The vegetation mapping for the project area (Hedde) has 61% of its pre-European extent remaining intact.	The proposal is not at variance with the Principle.	Site assessment by GHD ecologists. Database information Shepherd et al (2002)
(f)	Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The project area traverses two tributaries of the Collie River. Vegetation associated with these watercourses is degraded with a high occurrence of weed species. A Bed and Banks Permit has been issued to conduct roadworks at these watercourses. A degraded ephemeral wetland occurs at 32 050 – 34 000 SLK RHS. Roadworks impacts are not expected to threaten the viability of this area.	The proposal is not likely to be at variance with the Principle.	Desktop assessment (GIS and aerial mapping) of extent of DEC estate in the vicinity of the project area. Site assessment by GHD staff
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The project clearing and implementation of the EMP will provide the management of any land degradation impacts.	The proposal is not likely to be at variance with the Principle.	Site assessment by GHD staff
(h)	Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The project area occurs adjacent to the Westralia Conservation Park. Project impacts are implementation of the EMP mean it is unlikely that the clearing will have a significant impact on the environmental values of the Park.	The proposal is not likely to be at variance with the Principle.	Site assessment by GHD staff



Principle Number	Principle	Assessment	Outcome	Methodology
(i)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The small area of clearing of native vegetation for the project is considered unlikely to impact on groundwater.	The proposal is not likely to be at variance with the Principle.	Site assessment by GHD staff. Discussions with DoW officers.
(j)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The clearing of native vegetation is not considered to cause any alteration to flood duration or flood height due to the small area to be cleared.	The proposal is not likely to be at variance with the Principle.	Site assessment by GHD staff. Discussions with DoW officers.



Appendix B

Construction Environmental Management Plan



Environmental Management Plan (EMP)

	Management Measure	Expected Outcome	Responsibility
1.0	Overall Project		
	Environmental Management		
1.1	Main Roads South West Region is responsible for the Coalfields Highway upgrade in line with the environmental management measures detailed in this EMP.	Implement the project on the Coalfields Highway in accordance with this EMP.	Main Roads Project Manager
1.2	Compliance with this EMP should be monitored throughout the design and development of the project.	Monitor compliance with the EMP and provide for feedback for continuous improvement.	Main Roads Project Manager / Environmental Officer
1.3	Main Roads should incorporate relevant EMP measures and requirements into the projects tender documentation and site induction material for all personnel and service providers involved.	Environmental management measures included in relevant project documentation and site inductions.	Main Roads Project Manager
2.0	Pre-construction \ Design Phase		
2.1	Main Roads should continue liaison with DEWHA to define the requirement for DEWHA involvement in the development of the project.	Compliance with DEWHA approval requirements	Main Roads Project Manager / Environmental Officer
2.2	Main Roads should comply with the requirements of the Bed and Banks Permit issued by DoW prior to conducting works at watercourses – Ironstone Gully and un-named watercourse 80m east of Ferguson Road.	Approval to conduct drainage works under the Rights in Irrigation and Water Act	Main Roads Project Manager
2.3	The road design should be such to maintain existing surface water flows and incorporate appropriate erosion control measures.	Maintain existing surface water drainage flows and stabilise soil surface at watercourses.	Main Roads Project Manager



	Management Measure	Expected Outcome	Responsibility
2.4	The project design be reviewed and adjusted to retain the two trees containing potential nest hollows that occur at 32 320 SLK LHS and 33 020 SLK RHS.	Retain potential fauna habitat trees	Main Roads Project Manager
2.5	Main Roads should Section 18 of the Western Australian <i>Aboriginal Heritage Act (1972)</i> for roadworks and associated infrastructure will affect two tributaries of Site ID 16713 Collie River Waugal - Ironstone Gully and un-named watercourse 80m east of Ferguson Road.	Secure necessary approval under the provisions of the WA Aboriginal Heritage Act (1972).	Main Roads Project Manager
2.6	Main Roads should avoid the removal of trees that form the entry statement to Collie where possible, or where impact is unavoidable minimise and replace trees removed to replicate the entry statement in the longer term.	Minimise impacts on the avenue of trees at the approach to the Collie townsite.	Main Roads Project Manager
2.7	Main Roads should prepare a Topsoil Management Plan for the proposed works	Plan to manage topsoil movement during roadworks	Main Roads Project Manager
2.8	Declared weed infestations should be treated with herbicide prior to the commencement of roadworks. Alternatively, Blackberry plants should be removed and either burnt on-site or buried at a landfill site	Eradicate Declared Weeds	Main Roads Project Manager
2.9	Main Roads should prepare a Revegetation and Landscape Plan for the project.	Plan for the rehabilitation of the project site and stabilisation of disturbed soil surfaces.	Main Roads Project Manager
2.10	Main Roads should ensure that management of roadside memorials complies with the Roadside Memorials Policy and Guidelines.	Correct management of the roadside memorial	Main Roads Project Manager
2.11	Main Roads should ensure that all of the agencies and contractors involved with service re-locations are provided a copy of the EMP and comply with its management requirements.	Management of potential environmental impacts during pre-construction works.	Main Roads Project Manager / Services Re-locators



Management Measure		Expected Outcome	Responsibility
Environmental Management and Quality Plan			
2.11	The Construction Contractor should prepare an Environmental Management and Quality Plan for the Project, which will address the Construction Contractor's management responsibility, authority and communication requirements and clearly detail the Contractor's 'Quality Management Representative' (QMR) role with respect to the Contract in accordance with AS/NZS ISO 9001.	Environmental issues are adequately understood and managed throughout the project, and environmental impacts are minimised.	Main Roads Project Manager / Construction Contractor
2.12	The road design should be such to maintain existing surface water flows, culverts and incorporate appropriate erosion control measures.	Main existing surface water flows	Main Roads Project Manager
3.0 Construction Phase Management			
Workforce Inductions and Education			
3.1	Site inductions and tool box meetings for construction staff and contractors should include details of environmental management requirements for the project.	Ensure that all site personnel and contractors are aware of site environmental management requirements	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
Wetlands and Watercourses			
3.2	Impacts on wetlands and water courses should be managed by: <ul style="list-style-type: none"> Complying with the requirements of the Bed and Banks Permit issued by DoW prior to conducting works at – Ironstone Gully and un-named watercourse 80m east of Ferguson Road Design the road to maintain existing surface water flows and incorporate appropriate erosion control measures No on-site storage of fuel, oils and other contaminant 	Comply with the requirements of the Bed and Banks permit, and minimise potential impacts on wetlands and watercourses	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor



Management Measure	Expected Outcome	Responsibility
<p>materials should be permitted within 100m of a watercourse or wetland during road construction</p> <ul style="list-style-type: none"> Spill clean-up kits should be kept on site for the clean up of any accidental spillages Major vehicle and plant servicing should not be conducted on the project site Any minor servicing to be undertaken should be in a cleared area at least 100m from any watercourse or wetland 		
Vegetation Clearing and Fauna Management		
<p>3.3 Clearing operations should be managed in the following manner:</p> <ul style="list-style-type: none"> Clearing should be conducted in line with the Topsoil Management Plan Clearing should be kept to the minimum required for construction activities and to provide a safe clear zone The limits of clearing should be clearly marked with works conducted to minimise clearing and avoid disturbance to native vegetation and potential fauna habitat outside of the clearing limits Significant trees to be retained shall be clearly marked prior to the start of clearing operations Trees to be removed should be felled in a manner that ensures they fall within the approved clearing envelope Cleared trees suitable for timber or firewood should be 	<p>Minimise clearing impact, manage any fauna impacts and re-use cleared vegetation.</p>	<p>Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor</p>



Management Measure	Expected Outcome	Responsibility
salvaged for re-use		
<ul style="list-style-type: none">▶ The remainder of cleared vegetation should be chipped on-site for use in site rehabilitation and soil stabilisation▶ Existing cleared areas should be utilised for locating site access, site offices and infrastructure, and lay-down areas▶ The clearing area should be searched for fauna prior to the commencement of clearing operations by a suitably experienced and licensed zoologist / environmental scientist▶ Hollows in trees should be inspected for fauna and eggs prior to clearing▶ If any native fauna is disturbed during clearing it should be allowed to make its own way to adjacent vegetated areas, and if injured DEC or a registered fauna carer should be contacted for advice▶ Excavations and trenches should kept open for the minimum period necessary, with escape ramps installed when left open for extended periods. Trenches should be regularly inspected for fauna present and prior to backfilling. Any trapped fauna should be safely removed to adjacent habitats▶ No burning of cleared vegetation will be permitted on site▶ No pets, firearms or traps should be allowed on the construction site		



Management Measure		Expected Outcome	Responsibility
Topsoil and Weed Management			
3.4	Apart from any movements required for the construction of tie-ins of access tracks to the highway all other plant and machinery movement should be avoided within the Westralia Conservation Park through education of construction staff, signage and / or physical barriers.	Minimise the introduction and spread of weeds within and adjacent to the project area.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
3.5	All works should be conducted in line with Topsoil Management Plan prepared for the project.	Minimise the introduction and spread of weeds within and adjacent to the project area.	Main Roads Construction Manager / Construction Contractor
Dieback Management			
3.6	Dieback should be managed during road by ensuring that: <ul style="list-style-type: none"> Earth-moving machinery should be cleaned of soil and vegetation prior to entering and leaving the area to be cleared. Clearing and topsoil movement during wet soil conditions should be avoided. The movement of plant, machinery and other vehicles should be restricted to the limits of the areas to be cleared. 	Minimise the risk of introducing and spreading <i>Phytophthora</i> dieback as a result of project activities.	Main Roads Project Manager / Main Roads Construction Manager / Construction Contractor
Land use – Bilbumen Track			
3.7	Safe access to the Bilbumen Track should be maintained during roadworks and track users should be advised by appropriate warning signs of the presence of construction machinery operating on Coalfields Highway.	Maintain safe movement for walkers using the Bilbumen Track during construction works.	Main Roads Construction Manager / Construction Contractor
Aboriginal Heritage			



	Management Measure	Expected Outcome	Responsibility
3.8	<p>Main Roads should comply with the conditions of any Section 18 approvals issued under the Western Australian <i>Aboriginal Heritage Act (1972)</i> for the project.</p> <ul style="list-style-type: none">▸ Main Roads should ensure all site personnel are aware of their obligations under the <i>Aboriginal Heritage Act 1972</i>, prior to commencing site work▸ If during construction, materials likely to be significant to Aboriginal people are uncovered, works should cease in the vicinity of the area and Main Roads Environmental Officer and Department of Indigenous Affairs should be notified immediately. If skeletal material is uncovered, the Western Australian Police Service shall be advised immediately	Comply with the requirements of the Aboriginal Heritage Act 1972	Main Roads Project Manager / Construction Contractor
3.9	<p>Main Roads should consider the following requests from the Nyungar consultants</p> <ul style="list-style-type: none">▸ That Nyungar monitors are engaged to supervise ground disturbing works at the Rose Road and the un-named watercourse 80m east of Ferguson Road▸ That all work at the Coalfields Road creek crossing avoids affecting a number of springs north of the road reserve on the Coalfields Highway	Manage the expectation of the local Nyungar community.	Main Roads Project Manager

Damage to Public Property, Noise and Vibration



	Management Measure	Expected Outcome	Responsibility
3.10	The Construction Contractor should nominate a person responsible for reviewing and monitoring all operations in order to prevent or minimise the impact of vibration, noise, dust and other forms of pollution on property and the public.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
3.11	The Construction Contractor should write to the owners/occupants of properties within 200 m of the limits of the work site, informing them of the nature and timing of the works and providing contact details for complaints. Main Roads Superintendent will approve a copy of the letter, mailing list and delivery dates prior to the commencement of road works.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
3.12	The Construction Contractor should provide occupants of adjacent properties with at least 24 hours warning when construction work is planned outside the hours of 7:00 am and 7:00 pm or on Sundays or public holidays.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
3.13	The Construction Contractor should detail in the Quality Plan, procedures for dealing with complaints regarding public nuisance or property damage. These procedures must ensure that the Superintendent is informed in a timely manner of any such complaint, the progress made in dealing with it, and of the reinstatement or repairs to damage carried out.	Minimise impacts of road works on property and the public.	Main Roads Construction Manager / Construction Contractor
Construction Noise			
3.14	The Construction Contractor should observe its obligations under the <i>Environmental Protection Act 1986</i> , the Environmental Protection (Noise) Regulations 1997 and section 6 of AS 2436 – 1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites.	Minimise and manage construction noise.	Main Roads Construction Manager / Construction Contractor
3.15	For construction work between 7:00 am and 7:00 pm (excluding Sunday and public holidays), the construction contractor should minimise the effects of noise on the occupants of adjacent	Minimise and manage construction noise.	Main Roads Construction Manager / Construction Contractor



	Management Measure	Expected Outcome	Responsibility
	properties. This may include using silenced plant, operating plant as far away as practicable from occupied properties, or by limiting working hours on those construction activities which generate significant noise.		
3.16	<p>At least seven days prior to any after-hours construction work commencing, the Construction Contractor should submit an approved Noise Management Plan to Main Roads Superintendent for approval. The Noise Management Plan will be approved by the Chief Executive Officer of the Shire of Collie and will include, but not be limited to, the following requirements:</p> <ul style="list-style-type: none"> Details of, and reasons for, construction work which is outside the normal daytime operating hours; Details of activities likely to result in noise emissions above the assigned noise levels; Predictions of construction noise levels; Details of noise control measures to be implemented; Procedures for on-site monitoring; Plans for notifying the occupiers of adjacent properties; and Plans for complaint response. 	Minimise and manage construction noise.	Main Roads Construction Manager / Construction Contractor
Vibration			
3.17	The Construction Contractor should take all necessary precautions during its operations to limit ground particle velocities from vibratory compaction or percussion equipment so that they do not become a public nuisance or result in property damage.	Minimise and manage vibration impacts.	Main Roads Construction Manager / Construction Contractor
3.18	The use of vibrating rollers in vibratory mode will not be permitted	Minimise and manage vibration	Main Roads Construction Manager / Construction



	Management Measure	Expected Outcome	Responsibility
	within the nominated distances of any building as detailed below: All residential buildings – 50 m Old / historic buildings or where residents show concern – 100 m	impacts.	Contractor
3.19	Prior to the start of any operation that may cause vibration or result in damage, the Construction Contractor should conduct property inspections to establish their pre-works condition.	Minimise and manage vibration impacts.	Main Roads Construction Manager / Construction Contractor
3.20	The Construction Contractor is liable for any vibration damage caused to buildings and property adjacent to the works, and will take all necessary precautions to prevent such damage. If damage is caused due to the Construction Contractor's operations, they are responsible to take all necessary action to rectify the damage.	Rectify vibration impacts caused by construction activities.	Main Roads Construction Manager / Construction Contractor
Dust Management			
3.22	The Construction Contractor should employ construction methods that will keep dust lift to a minimum, and as required provide for the management of dust such as by watering of the works area and of roads, streets and other areas immediately adjacent to the works.	Minimise dust lift and impacts of dust and safety on the public.	Main Roads Construction Manager / Construction Contractor
3.23	Where it is found that vehicles leaving the site have dropped excessive soil material onto the road these sections should be swept on an as needs basis to reduce the potential for dust generation and maintain traffic safety.	Minimise dust lift and impacts of dust and safety on the public.	Main Roads Construction Manager / Construction Contractor
Traffic Access and Safety			
3.24	Access to private properties should be maintained at all times during roadworks	Maintain access to adjacent private properties.	Main Roads Construction Manager / Construction Contractor



Management Measure		Expected Outcome	Responsibility
Fire Management			
3.25	No burning will be permitted on the project site.	Reduce fire risk throughout site activities.	Main Roads Construction Manager / Construction Contractor
3.26	Machines and vehicles should be restricted and parked within designated cleared areas.	Reduce the fire risk during construction phase.	Main Roads Construction Manager / Construction Contractor
3.27	The Construction Contractor should confirm and adhere to any specific requirements for fire prevention requested by the Shire Collie, Department of Environment and Conservation and the Fire and Emergency Services Authority of WA.	Comply with stakeholder agency requirements.	Main Roads Construction Manager / Construction Contractor
Fuel and Chemical Storage			
3.28	No on-site storage of fuel, oils and other contaminant materials should be permitted. Materials required for the clean up of any accidental spillages should be maintained on-site and personnel shall be trained/experienced in their use.	Avoid hazardous chemical storage on the site. Adequate resources maintained onsite to manage any accidental spillage.	Main Roads Construction Manager / Construction Contractor
3.29	Major vehicle and plant servicing should not be conducted on the project site. Any minor servicing to be undertaken should be in a cleared area at least 100m from any watercourse.	Avoid impacts from accidental spills when servicing vehicles.	Main Roads Construction Manager / Construction Contractor
Waste Disposal			
3.30	Domestic and site generated waste will not be disposed of by burning. All waste associated with the project shall be collected daily and disposed of at an authorised waste site, or site agreed with the Shire of Collie.	Waste managed and disposed of appropriately, to leave site clean.	Main Roads Construction Manager / Construction Contractor.



Management Measure		Expected Outcome	Responsibility
Environmental Monitoring			
3.31	During the projects construction phase compliance with environmental management measures will be regularly monitored. Any non-conformances will be addressed at the first opportunity, while the non-conformance and any improvement actions implemented will be detailed in appropriate construction superintendent documentation.	Monitor compliance with environmental management measures.	Main Roads Project Manager / Main Roads Construction Manager
4.0 Post Construction			
Revegetation			
4.1	Main Roads should Implement the Revegetation and Landscape Plan to maintain the visual amenity to and from the highway.	Address ant visual impacts from project clearing	Main Roads Project Manager
Weed Management			
4.2	Longer-term management of weeds within the project area will be conducted during the annual herbicide and weed management program conducted by Main Roads Term Network Contractor.	On-going weed monitoring and management within the project area.	Main Roads Term Network Contractor



Appendix C

Flora Database Searches, Site Flora List, Declared Plant Locations and Definitions of Flora Conservation Status



Rare and Priority Flora – Results of EPBC Protected Matters Search and DEC Database Searches

Taxon (species or subspecies)	Conservation Code	Description	Preferred Habitat	Known Localities
<i>Acacia cuneifolia</i>	Priority 4	Erect or straggly shrub, 1–3 m high. Fl. yellow, Jul–Oct	Sand, clay or loam over granite. Granite outcrops & hills, rocky watercourses	Pony Hill, Boyagin Rock, Wandoo CP, Collie, Kojonup.
<i>Acacia semitrullata</i>	Priority 3	Slender, erect, pungent shrub, (0.1–)0.2–0.7(–1.5) m high. Fl. cream, white, May–Oct	White/grey sand, sometimes over laterite, clay. Sandplains, swampy areas	Yallingup, Harvey, Donnybrook, Yarloop Collie.
<i>Adenanthos cygnorum</i> subsp. <i>chamaephyton</i>	Priority 3	Prostrate, mat-forming, non-lignotuberos shrub, to 0.3 m high. Fl. white, cream, pink, green, Jul–Jan.	Grey sand, lateritic gravel	Chidlow, Mundaring, Collie, Bindoon, Muchea, Sawyers Valley.
<i>Calytrix pulchella</i>	Priority 3	Shrub, 0.3–0.7(–1) m high. Fl. pink, Aug–Nov	Grey or white sand over laterite. Ridges, flats	Collie, Manjimup, Cranbrook, Pingrup, Tambellup, Hassell NP.
<i>Eryngium ferox</i>	Priority 3	Erect, open tuberous, herb, 0.1–0.3 m high. Fl. green, Nov	Grey to brown loamy to sandy clay, brown cracking clay. Winter-wet flats, swamps, dried claypans, ridges	Collie, Pinjarra, Capel, Kulunilup NR.
<i>Grevillea prominens</i>	Priority 3	Spreading shrub, 0.5–1.7 m high, 0.3–1 m wide. Fl. cream, white, Sep–Oct	Gravelly loam. Along creeklines	East of Harvey, My William, Collie
<i>Grevillea rara</i>	Rare	Dense, prickly shrub, to 2 m high. Fl. white, pink, Oct	Lateritic loam. Creeklines	Collie
<i>Grevillea ripicola</i>	Priority 4	Spreading, much-branched, non-lignotuberos shrub, 0.6–2(–3) m high, to 4 m wide. Fl. red, orange, Jan–Apr/Nov–Dec	Sandy clay, clay or gravelly loam. Swampy flats, granite outcrops, along watercourses.	Collie, Kirup, Muirillup
<i>Jacksonia velveta</i>	Rare	Open, upright, sometimes sprawling shrub, to 1.9 m high. Fl. yellow, orange, Dec	Brown gravelly loam, dry grey sand, ironstone. Slight hillslopes, ridges.	Collie Basin, Woodanilling, Narrogin
<i>Lasiopetalum cardiophyllum</i>	Priority 4	Erect, multi-stemmed shrub, 0.2–0.5 m high. Fl. pink, Aug–Jan	Lateritic gravelly soils, sandy clay. Flats, hillslopes	Mt Saddleback, Bannister, Wandering, Collie



Taxon (species or subspecies)	Conservation Code	Description	Preferred Habitat	Known Localities
<i>Leucopogon</i> sp. <i>Collie</i>	Priority 2	Unavailable	Unavailable	Collie
<i>Meeboldina thysanantha</i>	Priority 3	Rhizomatous, perennial, herb (rush-like), 0.4–1 m high. Fl. brown, Dec	Sand. Swamps	Busseton, Scott River, Collie, Bow river, Witchcliff, Rocky Gully, Glenoran, Kent Tiver
<i>Millotia tenuifolia</i> var. <i>laevis</i>	Priority 2	Ascending to erect annual, herb, 0.02–0.1 m high. Fl. yellow, Sep–Oct	Granite or laterite soils	Dunsborough, Cape Naturalist, Collie, Red Hill.
<i>Pultenaea skinneri</i>	Priority 4	Slender shrub, 1–2 m high. Fl. yellow, orange, red, Jul–Sep.	Sandy or clayey soils. Winter-wet depressions	Collie, Binningup, Boyanup, Whicher Range, Jalbarragup, Nannup, Bunbury
<i>Sphaerolobium benetectum</i>	Priority 1	Slender, caespitose shrub, 0.2–1 m high, to 0.45 m wide. Fl. pink, red, yellow, Oct–Nov.	White gravelly sandy clay, sandy loam, granite, laterite. Ridges, swamps, undulating rises	Collie, Scott River, Mt Lindesay, Lake Surprise
<i>Stylidium rhipidium</i>	Priority 3	Slender annual, herb, ca 0.05 m high. Fl. white, Oct–Nov. Sandy soils.	Wet creek flats, swamps, granite outcrops.	Rocky Gully, Williams, Collie, Lake Muir, Hyden, Cranbrook, Glenelg Hills
<i>Synaphea hians</i>	Priority 3	Prostrate or decumbent shrub, 0.15–0.6 m high, to 1 m wide. Fl. yellow, Jul–Nov.	Sandy soils. Rises.	Busseton, Collie, Ludlow, Capel, Crooked Brook.
<i>Tetradlea parvifolia</i>	Priority 3	Small shrub, 0.2–0.3 m high. Fl. pink, Oct	Unavailable	Capel, East of Donnybrook, Collie



Site Flora List

Family	Genus	Species	Status
Asparagaceae	<i>Asparagus</i>	<i>asparagoides</i>	*DW
Anarthriaceae	<i>Lyginia</i>	<i>imberbis</i>	*
Asteraceae	<i>Hypochaeris</i>	<i>radicata</i>	*
	<i>Arctotheca</i>	<i>calendula</i>	*
	<i>Conyza</i>	<i>bonariensis</i>	*
	<i>Cotula</i>	<i>turbinata</i>	*
	<i>Helichrysum</i>	<i>luteoalbum</i>	*
	<i>Lactuca sp.</i>		*
	<i>Sonchus</i>	<i>oleraceus</i>	*
Casuarinaceae	<i>Casuarina</i>	<i>obesa</i>	
Cucurbitaceae	<i>Citrullus</i>	<i>lanatus</i>	*
	<i>Cucumis</i>	<i>myriocarpus</i>	*
Cyperaceae	<i>Baumea</i>	<i>junceae</i>	
	<i>Lepidosperma</i>	<i>squamatum</i>	
	<i>Mesomelaena</i>	<i>tetragona</i>	
Dasypogonaceae	<i>Dasypogon</i>	<i>bromeliifolius</i>	
Dennstaedtiaceae	<i>Pteridium</i>	<i>esculentum</i>	
Dilleniaceae	<i>Hibbertia</i>	<i>hypericoides</i>	
Droseraceae	<i>Drosera</i>	<i>erythrorhiza</i>	
	<i>Drosera</i>	<i>pallida</i>	
Ericaceae	<i>Leucopogon</i>	<i>propinquus</i>	
	<i>Leucopogon</i>	<i>sp</i>	
Fabaceae	<i>Acacia</i>	<i>extensa</i>	
	<i>Acacia</i>	<i>baileyana</i>	*
	<i>Bossiea</i>	<i>eriocarpa</i>	
	<i>Chamaecytisus</i>	<i>palmensis</i>	*
	<i>Daviesia</i>	<i>inflata</i>	
	<i>Daviesia</i>	<i>decurrens</i>	
	<i>Hovea</i>	<i>chorizemifolia</i>	
	<i>Hovea</i>	<i>sp</i>	
	<i>Jacksonia</i>	<i>furcellata</i>	
Goodeniaceae	<i>Dampiera</i>	<i>linearis</i>	
Haemodoraceae	<i>Anigozanthos</i>	<i>manglesii</i>	
	<i>Conostylis</i>	<i>setigera</i>	
	<i>Haemodorum</i>	<i>laxum</i>	
Iridaceae	<i>Romulea</i>	<i>rosea</i>	*
	<i>Patersonia</i>	<i>umbellata</i>	
	<i>Watsonia</i>	<i>meriana var. bulbillifera</i>	*
Juncaceae	<i>Juncus</i>	<i>bufonius</i>	*
Loranthaceae	<i>Nuytsia</i>	<i>floribunda</i>	
Myrtaceae	<i>Astartea</i>	<i>juniperina</i>	
	<i>Agonis</i>	<i>flexuosa</i>	



Myrtaceae	<i>Corymbia</i>	<i>calophylla</i>	
	<i>Corymbia</i>	<i>ficifolia</i>	
	<i>Eucalyptus</i>	<i>maculata</i>	
	<i>Eucalyptus</i>	<i>marginata</i>	
	<i>Eucalyptus</i>	<i>locoxylon</i>	
	<i>Eucalyptus</i>	<i>rudis</i>	
	<i>Hypocalymma</i>	<i>angustifolium</i>	
	<i>Kunzea</i>	<i>sp</i>	
	<i>Lophostemon</i>	<i>confertus</i>	
	<i>Melaleuca</i>	<i>preissiana</i>	
Oxalidaceae	<i>Oxalis</i>	<i>purpurea</i>	*
Plantaginaceae	<i>Plantago</i>	<i>lanceolata</i>	*
Pinaceae	<i>Pinus sp.</i>		*
Poaceae	<i>Briza</i>	<i>maxima</i>	*
	<i>Chloris</i>	<i>sp</i>	*
	<i>Cynodon</i>	<i>dactylon</i>	*
	<i>Ehrharta</i>	<i>calycina</i>	*
	<i>Eragrostis</i>	<i>curvula</i>	*
	<i>Holcus</i>	<i>lanatus</i>	*
	<i>Pennisetum</i>	<i>clandestinum</i>	*
	<i>Pennisetum</i>	<i>macrourum</i>	*
Proteaceae	<i>Banksia</i>	<i>grandis</i>	
	<i>Banksia</i>	<i>illicifolia</i>	
	<i>Hakea</i>	<i>ruscifolia</i>	
	<i>Petrophile</i>	<i>linearis</i>	
Polygonaceae	<i>Rumex sp</i>		
Restionaceae	<i>Desmocladius</i>	<i>fasciculatus</i>	
	<i>Hypolaena</i>	<i>exsulca</i>	
Rosaceae	<i>Rubus</i>	<i>ulmifolius</i>	* DW
Solanaceae	<i>Solanum</i>	<i>nigrum</i>	*
Stylidiaceae	<i>Stylidium</i>	<i>piliferum</i>	
Xanthorrhoeaceae	<i>Xanthorrhoea</i>	<i>preissii</i>	
	<i>Xanthorrhoea</i>	<i>gracilis</i>	
Zamiaceae	<i>Macrozamia</i>	<i>reidlei</i>	



Declared Plants Identified in the Project Area

Species	Easting	Northing	Number of Plants	Chainage
<i>Rubus ulmifolius</i> (Blackberry)	414263.1154	6311016.965	1	28 080 LHS
<i>Asparagus asparagoides</i> (Bridal creeper)	416571.7313	6310351.301	1	30 800 RHS
<i>Rubus ulmifolius</i>	416571.4004	6310353.701	1	30 800 RHS
<i>Rubus ulmifolius</i>	416587.7967	6310340.906	1	30 840 RHS
<i>Rubus ulmifolius</i>	416601.6183	6310320.881	2	30 860 RHS
<i>Rubus ulmifolius</i>	416637.5512	6310326.919	infestation	30 880 LHS
<i>Rubus ulmifolius</i>	416649.7741	6310312.425	infestation	30 900 LHS
<i>Rubus ulmifolius</i>	416688.3222	6310284.851	infestation	30 950 LHS
<i>Rubus ulmifolius</i>	416731.5893	6310267.667	1	31 000 LHS
<i>Rubus ulmifolius</i>	416740.7716	6310264.05	1	31 010 LHS
<i>Rubus ulmifolius</i>	416750.5869	6310258.96	3	31 020 LHS
<i>Rubus ulmifolius</i>	417995.0334	6309741.036	4	32 420 LHS

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.



Conservation Categories and Definitions (EPBC Act (1999) and DEC)

Source	Conservation Category	Definition
EPBC Act	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.
DEC	Least Concern	Taxa that are not considered Threatened
	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]"
	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.



Source	Conservation Category	Definition
	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.

(source: Commonwealth Government of Australia, EPBC Act)



Appendix D

Fauna Database Searches, Site Fauna List and Conservation Definitions

Significant Fauna Results - EPBC Protected Matters and DEC Database Searches

Genus	Species	Common Name	EPBC Act Status	DEC Status
<i>Calyptorhynchus</i>	<i>latirostris</i>	Carnaby's Black-Cockatoo	Endangered	Schedule 1
<i>Calyptorhynchus</i>	<i>banksii naso</i>	Forest Red-tailed Black-Cockatoo		Schedule 1
<i>Isoodon</i>	<i>obesulus fusciventer</i>	Quenda	Priority 5	Schedule 1
<i>Pachysaga</i>	<i>munggai</i>	Cricket	Priority 3	
<i>Dasyurus</i>	<i>geoffroii</i>	Chuditch/Western Quoll	Vulnerable	Schedule 1
<i>Setonix</i>	<i>brachyurus</i>	Quokka	Vulnerable	
<i>Burhinus</i>	<i>grallarius</i>	Bush Stonecurlew	Priority 4	Priority 2
<i>Macropus</i>	<i>irma</i>	Western Brush Wallaby	Priority 1	Priority 4
<i>Haliaeetus</i>	<i>leucogaster</i>	White-bellied Sea-Eagle	Migratory	
<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater	Migratory	
<i>Ardea</i>	<i>alba</i>	Great Egret	Migratory	
<i>Ardea</i>	<i>ibis</i>	Cattle Egret	Migratory	
<i>Apus</i>	<i>pacificus</i>	Fork-tailed Swift	Migratory	
<i>Pseudocheirus</i>	<i>occidentalis</i>	Western Ringtail Possum	Vulnerable	Schedule 1
<i>Phascogale</i>	<i>tapoatafa</i>	Brush-tailed Phascogale	Vulnerable	Schedule 1
<i>Macrotis</i>	<i>lagotis</i>	Bilby, Dalgyte, Ninu	Vulnerable	Schedule 1
<i>Myrmecobius</i>	<i>fasciatus</i>	Numbat, Walpurti	Vulnerable	Schedule 1
<i>Bettongia</i>	<i>penicillata ogilbyi</i>	Woylie	Endangered	Schedule 1
<i>Hydromys</i>	<i>chrysogaster</i>	Water-rat, Rakali	Priority 4	
<i>Nannatherina</i>	<i>balstoni</i>	Balston's Pygmy Perch	Vulnerable	Schedule 1

Site Fauna Observation List

Genus	Species	Common Name	EPBC Act Status	DEC Status
Amphibians				
<i>Crinia</i>	<i>glauerti</i>	Glauert's Froglet	-	-
	<i>pseudinsignifera</i>	Bleating Froglet	-	-
<i>Geocrinia</i>	<i>leai</i>	Lea's Frog	-	-
Birds				
<i>Calyptorhynchus</i>	<i>banksii naso</i>	Forest Red-tailed Black Cockatoo	Vulnerable	Schedule 1
<i>Calyptorhynchus</i>	<i>baudinii</i>	Baudin's Cockatoo	Endangered	Schedule 1
<i>Calyptorhynchus</i>	<i>latirostris</i>	Carnaby's Cockatoo	Endangered	Schedule 1
<i>Platycercus</i>	<i>icterotis icterotis</i>	Western Rosella (Western ssp)	-	-
	<i>zonarius</i>	Australian Ringneck	-	-
<i>Acanthiza</i>	<i>apicalis</i>	Broad-tailed Thornbill	-	-
<i>Gerygone</i>	<i>fusca</i>	Western Gerygone	-	-
<i>Anthochaera</i>	<i>carunculata</i>	Red Wattlebird	-	-
<i>Grallina</i>	<i>cyanoleuca</i>	Magpie-lark	-	-
<i>Rhipidura</i>	<i>fuliginosa</i>	Grey Fantail	-	-
<i>Cracticus</i>	<i>tibicen</i>	Australian Magpie	-	-
<i>Corvus</i>	<i>coronoides</i>	Australian Raven	-	-
<i>Hirundo</i>	<i>neoxena</i> +	Welcome Swallow	-	-
<i>Zosterops</i>	<i>lateralis</i>	Grey -breasted White-eye	-	-
Mammals				
<i>Macropus</i>	<i>fuliginosus</i>	Western Grey Kangaroo	-	-

From GHD observations and Harewood (2010)

Appendix E

Black Cockatoo Habitat Assessment Report

Black Cockatoo

Habitat Assessment

Coalfields Highway
(~SLK 28 to 35.3)

Allanson/Collie

June 2010

Version 1

On behalf of:
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TABLE 1: Listed Threatened, Migratory and Priority Fauna Species Potentially Occurring in Study Area.

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FIGURE 1: Study Area

FIGURE 2: Habitat Trees

PLATES

PLATE 1: Example of Habitat Tree Tag

APPENDICES

APPENDIX A: Details of Habitat Trees

APPENDIX B Details of Foraging Evidence

APPENDIX C: Opportunistic Fauna Observations

DISCLAIMER

This fauna assessment report (“the report”) has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the Client and Greg Harewood (“the Author”). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints. In accordance with the scope of services, the Author has relied upon the data and has conducted environmental field monitoring and/or testing in the preparation of the report. The nature and extent of monitoring and/or testing conducted is described in the report.

The conclusions are based upon field data and the environmental monitoring and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of preparing the report. Also it should be recognised that site conditions, can change with time.

Within the limitations imposed by the scope of services, the field assessment and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

In preparing the report, the Author has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations, most of which are referred to in the report (“the data”). Except as otherwise stated in the report, the Author has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (“conclusions”) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. The Author will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to the Author.

The report has been prepared for the benefit of the Client and no other party. The Author assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of the Author or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Other parties should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

The Author will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.



EXECUTIVE SUMMARY

This report details the results of a black cockatoo habitat assessment of remnant native vegetation bordering a section of the Coalfields Highway just west of Collie. The assessment has been carried out on behalf of Main Roads Western Australia (MRWA).

The study area comprises a 7 km section of the Coalfields Highway between Rose Road, Allanson (~SLK 28) and Atkinson Road, Collie (~SLK 35.3) and includes all vegetation within 11 metres of the existing road on both sides (Figure 1).

The scope of works was to carry out/provide a:

1. Potential/existing black cockatoo nest hollow survey;
2. Black cockatoo foraging habitat survey;
3. Observations for evidence of other conservation significant fauna species and their habitat; and
4. Report summarising results with management recommendations.

The study area was surveyed by the Author on the 29th May 2010 over a period of about 6 hours.

All trees within the proposed clearing areas were assessed for the potential to contain suitable hollows for black cockatoos. Characteristics of each tree recorded include tree species, number, type and size of hollows observed.

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

Generally any tree which is alive or dead that contains one or more visible hollows (cavities within the trunk or branches) suitable for occupation by any of the three black cockatoo species for the purpose of nesting/breeding. Hollows that had an entrance greater than about 12cm in diameter and would allow the entry of a cockatoo (white tailed or red-tailed) into a suitably sized branch/trunk were recorded as a “potential nest hollow”.

Details of habitat trees (i.e. any tree with a hollow) that appeared not suitable for black cockatoos were also recorded.

The extent of potential cockatoo foraging habitat present on site, based on the vegetation units/species present, was noted. During field work direct or indirect evidence of foraging by cockatoos was recorded (location, evidence type and species responsible).

Any other observations made that would aid in determining the likelihood of other species of conservation significance being present were also recorded.



The survey identified only two trees containing hollows within the proposed/potential clearing footprint (i.e. within an area 11 metres either side of the existing road, between SLK 28 and 35.3). Both these trees were located at the extreme limit of the study area boundary (i.e. ~11 metres from existing road boundary) and may therefore not actually require removal under any potential road widening scenario. Both habitat trees were Jarrah.

Of these two trees, only one appeared to contain hollows with entrances large enough for a black cockatoo to enter. No evidence of any hollow actually having been used, or being in use by black cockatoos was seen.

The location of habitat trees including the tree determined to contain a potential cockatoo nest hollow are shown in Figure 2. Additional details on each tree are provided in Appendix A.

No evidence of trees being used for overnight roosting by black cockatoos was observed within the study area.

Evidence of black cockatoos foraging on vegetation within the study area was uncommon but widespread. Evidence attributed to Carnaby's Black Cockatoo was found in the form of chewed Pine cones (introduced tree species). Evidence of Baudin's Black Cockatoo and the Forest Red-tailed Black Cockatoo foraging was observed in the form of chewed marri nuts.

Details of the opportunistic observations made of black cockatoos foraging is provided in Appendix B. It should be noted that these observations do not represent all of the foraging evidence seen or likely to be present.

Irrespective of the amount of foraging evidence seen almost all of the remnant native vegetation within the study areas represents potential foraging habitat. It is not possible to determine the area of vegetation that will require removal at this stage as the exact areas requiring clearing are yet to be defined.

A total of 18 fauna species were observed during the site assessment (Appendix C). Forest Red-tailed Black Cockatoos were heard on several occasions but not actually seen. Besides the foraging evidence of Carnaby's and Baudin's Black Cockatoo no evidence of any other species of conservation significance was seen during the survey of the study area.

In particular evidence of the Western Ringtail Possum was searched for during the site survey. In general terms the vegetation within the potential clearing footprint appears largely unsuitable or at best marginal for WRPs to utilise. This is primarily based on the fact that the majority of the vegetation is dominated by young, relatively tall trees with an overall structure that lacks a significant density of midstorey vegetation/canopy and therefore connectivity between trees is compromised. This would make it difficult



for WRPs to move through the vegetation without coming to ground. The distinct lack of relatively dense midstorey vegetation also means that WRPs, if present, would have to rely on older trees and in particular tree hollows for daytime refuge. As indicated by the habitat tree survey trees with hollows are almost totally absent from the study area. Balga bushes, another option for daytime refuge used by WRPs are totally absent from all sections of the study area. Areas of Melaleuca are often used by WRPs for daytime refuge but areas of paperbark within the study area lack associated foraging species which lessens these areas suitability as WRP habitat.

The observations made in the field suggest that WRPs, while known to be present in some areas around Collie where areas of suitable habitat exist (e.g. dense vegetation along the Collie River), are absent from the study area itself and would only ever occur as occasional transient individuals.

It was beyond the scope of this report to carry out a full assessment of all the conservation significance species likely to be present within the study area. It is however understood that an assessment of this nature has previously been carried out. The Author was supplied by the MRWA with a listing of species previously recorded or likely to occur with the study area based on DEC and EPBC database searches carried out as part of this previous assessment.

While some of the vegetation along the road possibly represents potential habitat for some of these threatened species, its generally degraded nature and proximity to the existing road makes it marginal at best for most species concerned. Table 1 provides a summary of conservation significant species potentially present in the area (based on data provided by the MRWA) in addition to providing an assessment of the likely impact of the proposed road works on their habitat.

It is understood that the MRWA have a state-wide purpose permit issued under the Native Vegetation Clearing Regulations 2004. The use of this permit is only appropriate if the proposed clearing is not at variance to any of the 10 clearing principles as defined under the regulations.

One purpose of the assessment reported on here is to provide information relevant to principle (a) & (b) of the clearing regulations. Based on the assessment results and despite the fact that the area is or is possibly being utilised by some species of conservation significance it is the Author's opinion that the area requiring clearing is very unlikely to have what would be considered a high level of biological diversity or constitute the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

This opinion is based on the fact that fauna habitats present within the proposed clearing footprint are generally degraded, are common and widespread in the general area and the faunal assemblage potentially present is unlikely to be of a high diversity or different to that found in similar habitats located elsewhere in the region. It can therefore be concluded that the area to be cleared does not contain habitats of high



ecological significance from a faunal perspective or contain faunal assemblages that are ecologically significant. Also the total area to be cleared is relatively small and is spread along a ~7km section of road verge. The impact of clearing on fauna or fauna habitat will therefore be very small/negligible at any one location. Existing fauna populations (including those of conservation significant species) are very unlikely to be affected by the loss of small areas of habitat spread out over such a distance.

A number of fauna species known to or potentially present within the study area are listed under the federal *Environment Protection and Biodiversity Conservation Act* (*EPBC Act*, 1999). Development proposals (“actions”) that are likely to have a significant impact on any listed species should be referred to the Department of Environment, Water, Heritage and Arts (DEWHA) for assessment. The aim of a referral is to provide certainty about whether a proposal does or doesn’t need approval under the *EPBC Act*. The proposed action should be considered at its broadest possible scope. This includes all stages and components of the action, all related activities, and all related infrastructure such as roads and powerlines, if applicable.

It is the proponent’s responsibility to determine if their proposed action (e.g. clearing and development of an area of native bushland) requires referral. To aid in determining if a proposal is likely to have a significant impact DEWHA provide a series of Significant Impact Guidelines (DEH 2006). These guidelines outline a ‘self-assessment’ process, including detailed criteria, to assist persons in deciding whether or not referral may be required.

An assessment of the likelihood of significant impact on *EPBC Act* listed species present suggests that it is highly unlikely that the impact caused by the proposed road works would trigger any of the significant impact criteria. This is primary because of the relatively small area of clearing required, the fact that it is spread over a wide area and the existence of substantial areas of habitat areas nearby.

The most likely impact of the proposed clearing is the potential for fauna to be killed or injured during site works. The following recommendations are provided for guidance and aim to reduce the potential impact on fauna and fauna habitat and should be implemented if considered reasonable and practicable for the project in question. It is recommended that:

- During clearing operations a suitably experienced “fauna spotter” should be employed to inspect logs, trees and hollows (where possible) before clearing to reduce likelihood of injury to fauna. Trees observed to contain hollows should be felled in a manner that reduces the likelihood that fauna present will be injured. Hollows in fallen trees should be inspected for fauna prior to removal from the site. If feasible any fauna encountered should be relocated to suitable retained habitat nearby.



- During site works, areas requiring clearing should be clearly marked and access to other areas restricted to prevent accidental clearing of areas to be retained.
- No dead, standing or fallen timber should be removed unnecessarily. Logs (hollow or not) and other debris resulting from land clearing should be used to enhance fauna habitat in untouched and rehabilitated areas if possible. Where possible, logs are to be retained either by pushing the logs into the surrounding forest, when significant disturbance to the forest can be avoided, or the logs cut so that the length of log outside the clearing area remains insitu.
- All staff working on site should be made aware that native fauna is protected. Personnel working on the project should not be allowed to bring firearms, other weapons or pets onsite.
- Native fauna injured during clearing or normal site operations should be taken to a designated veterinary clinic or a DEC nominated wildlife carer.
- Any trenching required for services should be kept open for only as long as necessary and suitable escape ramps and bridging provided if the site is to be left unattended for extended periods. Significant sized trenches should be inspected for fauna immediately prior to filling.
- While the probability that any of the black cockatoo species breed within trees in the clearing footprint can be considered to be low, the documented breeding and fledging times of the respective species (see below) suggests that the best time to carry out clearing at the site would be in the months of April, May or June so as to avoid the peak breeding times for all species in question. It would also be possible to carry out observations of potential nest hollows to establish if they were in use if clearing needed to be undertaken at other times.

Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*

J	F	M	A	M	J	J	A	S	O	N	D

Baudin's Black- Cockatoo *Calyptorhynchus baudinii*

J	F	M	A	M	J	J	A	S	O	N	D

Carnaby's Black- Cockatoo *Calyptorhynchus latirostris*

J	F	M	A	M	J	J	A	S	O	N	D



Period in which breeding is most likely to commence

Period in which fledging could extend through



1. INTRODUCTION

This report details the results of a black cockatoo habitat assessment of remnant native vegetation bordering a section of the Coalfields Highway just west of Collie. The assessment has been carried out on behalf of Main Roads Western Australia (MRWA).

It is understood that this section of the Coalfields Highway is to be widened/realigned and the clearing of vegetation is required at some locations to achieve the required width. The extent of clearing from the existing road boundary varies from one side to the other depending on the location. In some locations little or no clearing is required. It is not possible to determine the area of vegetation that will require removal at this stage as the exact areas requiring clearing are yet to be defined.

The study area comprises a 7 km section of the Coalfields Highway between Rose Road, Allanson (~SLK 28) and Atkinson Road, Collie (~SLK 35.3) and includes all vegetation within 11 metres of the existing road on both sides (Figure 1).

2. SCOPE OF WORKS

The scope of works was to carry out/provide a:

1. Potential/existing black cockatoo nest hollow survey;
2. Black cockatoo foraging habitat survey;
3. Observations for evidence of other conservation significant fauna species and their habitat; and
4. Report summarising results with management recommendations.

Note: For the purposes of this proposal the term Black Cockatoo is in reference to Baudin's Black Cockatoo *Calyptorhynchus baudinii*, Carnaby's Black Cockatoo *Calyptorhynchus latirostris* and the Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*.

3. METHODOLOGY

Cockatoo nest hollow survey

All trees within the proposed clearing areas were assessed for the potential to contain suitable hollows for black cockatoos. Characteristics of each tree recorded include tree species, number, type and size of hollows observed.



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

Generally any tree which is alive or dead that contains one or more visible hollows (cavities within the trunk or branches) suitable for occupation by any of the three black cockatoo species for the purpose of nesting/breeding. Hollows that had an entrance greater than about 12cm in diameter and would allow the entry of a cockatoo (white tailed or red-tailed) into a suitably sized branch/trunk were recorded as a “potential nest hollow”.

Details of habitat trees (i.e. any tree with a hollow) that appeared not suitable for black cockatoos were also recorded.

Identification of black cockatoo foraging habitat

The extent of potential cockatoo foraging habitat present on site, based on the vegetation units/species present, was noted. During field work direct or indirect evidence of foraging by cockatoos was recorded.

Observations on other fauna species of conservation significance

Any other observations made that would aid in determining the likelihood of other species of conservation significance being present were also recorded.

Report

A report summarising all results with potential management measures aimed at minimising any impacts has been prepared.

4. SURVEY CONSTRAINTS

The assessment reported on here has included a single daytime reconnaissance survey.

It is generally not reasonable or practicable to examine every tree within the potential clearing footprint from every angle to determine if hollows are present. Some trees, in particular smaller trees with smaller hollows have the potential not to have been recorded as a habitat tree. It is far less likely that larger hollows would be missed except those not visible from ground level. Significantly more effort was expended examining larger/older trees as these are more likely to contain larger hollows.

The assessment of habitat trees from ground level, in particular those possibly suitable for black cockatoos, is likely to result in an over estimation of the number that would be suitable for use by respective fauna species as the full characteristic of the hollow cannot be made. For example it is not possible to



determine other characteristics of hollows such as hollow depth and internal width from a ground based survey.

The location of habitat trees and other observations were recorded using a handheld gps. The accuracy of the GPS cannot be guaranteed above a level of about 5 to 10 metres, though it should be noted that in some circumstance the accuracy can be worse (or better) than this.

The study area was survey by the Author on the 29th May 2010 over a period of about 6 hours.

5. RESULTS

5.1 HABITAT TREE ASSESSMENT

The majority of the study area is either cleared or only contains trees that are too young/small to contain hollows of any substantial size and the results reflect this fact. The survey identified only two trees containing hollows within the proposed/potential clearing footprint (i.e. within an area 11 metres either side of the existing road, between SLK 28 and 35.3). Both these trees were located at the extreme limit of the study area boundary (i.e. ~11 metres from existing road boundary) and may therefore not actually require removal under any potential road widening scenario. Both habitat trees were Jarrah.

Of these two trees, only one appeared to contain hollows with entrances large enough for a black cockatoo to enter. No evidence of any hollow actually having been used, or being in use by black cockatoos was seen.

The location of habitat trees including the tree determined to contain a potential cockatoo nest hollow are shown in Figure 2. Additional details on each tree are provided in Appendix A.

The identified habitat trees were marked with a numbered aluminium tag and red flagging tape to enable re-identification (see Plate 1 for an example). The numbers used correspond to the waypoint number given for each tree as listed in Appendix A.

No evidence of trees being used for overnight roosting by black cockatoos was observed within the study area.

5.2 BLACK COCKATOO FORAGING HABITAT

Vegetation within the study area varies considerably. The eastern end of the study is characterised by highly degraded/cleared areas containing planted endemic and non endemic tree species (including some scattered Marri). A Jarrah open woodland (with associated Sheoak trees) dominates the southern, central section of the study area. The northern side of the road in this central



section contains a low woodland of *Melaleuca* (with some scattered Jarrah and *Nuytsia floribunda*) along with some totally cleared areas with wide spaced endemic plantings. A small, low lying area just east of Allanson contains Flooded Gum and Blackbutt. The balance of the study area from this point westwards, is either cleared or contains an open woodland of Jarrah and Marri in various densities.

Evidence of black cockatoos foraging on vegetation within the study area was uncommon but widespread. Evidence attributed to Carnaby's Black Cockatoo was found in the form of chewed Pine cones (introduced tree species). Evidence of Baudin's Black Cockatoo and the Forest Red-tailed Black Cockatoo foraging was observed in the form of chewed marri nuts.

Details of the opportunistic observations made of black cockatoos foraging is provided in Appendix B. It should be noted that these observations do not represent all of the foraging evidence seen or likely to be present. Irrespective of the amount of foraging evidence seen almost all of the remnant native vegetation within the study areas represents potential foraging habitat.

The following represents a list of the observed plant species present within the study area known to be used by one or more of the black cockatoo species as a food source (i.e. foraging habitat).

- Jarrah – *Eucalyptus marginata* – seeds.
- Flooded Gum - *Eucalyptus rudis* – flowers, nectar.
- Blackbutt - *Eucalyptus patens* - seeds
- Marri – *Corymbia calophylla* - flowers, seeds, nectar.
- Sheoak – *Allocasuarina* sp. - seeds
- Pine – *Pinus* sp. (introduced) – seeds.

It is not possible to determine the area of vegetation that will require removal at this stage as the exact areas requiring clearing are yet to be defined.

5.3 OPPORTUNISTIC FAUNA OBSERVATIONS

A total of 18 fauna species were observed during the site assessment (Appendix C). Forest Red-tailed Black Cockatoos were heard on several occasions but not actually seen. Besides the foraging evidence of Carnaby's and Baudin's Black Cockatoo no evidence of any other species of conservation significance was seen during the survey of the study area.



In particular evidence of the Western Ringtail Possum was searched for during the site survey. In general terms the vegetation within the potential clearing footprint appears largely unsuitable or at best marginal for WRPs to utilise. This is primarily based on the fact that the majority of the vegetation is dominated by young, relatively tall trees with an overall structure that lacks a significant density of midstorey vegetation/canopy and therefore connectivity between trees is compromised. This would make it difficult for WRPs to move through the vegetation without coming to ground. The distinct lack of relatively dense midstorey vegetation also means that WRPs, if present, would have to rely on older trees and in particular tree hollows for daytime refuge. As indicated by the habitat tree survey trees with hollows are almost totally absent from the study area. Balga bushes, another option for daytime refuge used by WRPs are totally absent from all sections of the study area. Areas of Melaleuca are often used by WRPs for daytime refuge but areas of paperbark within the study area lack associated foraging species, which lessens these areas suitability as WRP habitat.

The observations made in the field suggest that WRPs, while known to be present in some areas around Collie where areas of suitable habitat exist (e.g. dense vegetation along the Collie River), are absent from the study area itself and would only ever occur as occasional transient individuals.

It was beyond the scope of this report to carry out a full assessment of all the conservation significance species likely to be present within the study area. It is however understood that an assessment of this nature has previously been carried out. The Author was supplied by the MRWA with a listing of species previously recorded or likely to occur with the study area based on DEC and EPBC database searches carried out as part of this previous assessment.

While some of the vegetation along the road possibly represents potential habitat for some of these threatened species, its generally degraded nature and proximity to the existing road makes it marginal at best for most species concerned. Table 1 provides a summary of conservation significant species potentially present in the area (based on data provided by the MRWA) in addition to providing an assessment of the likely impact of the proposed road works on their habitat.

6. LEGISLATIVE OBLIGATIONS

6.1 WILDLIFE CONSERVATION ACT 1950

The objective of the *Wildlife Conservation Act 1950* is to provide for the protection of wildlife. The Act is administered by the Executive Director of the Department of Environment and Conservation, under the direction and control of the Minister for the Environment. Under section 14, "Protection of Fauna", of this Act, all fauna is wholly protected throughout the State at all times, unless



Table 1: Listed Threatened, Migratory and Priority Fauna Species Potentially Occurring in Study Area.

Common Name/Species	Conservation Code				Actual Records or Listed as Potentially in General Area			Threatening Processes	Habitat Requirements	Habitat in Project Area/Quality	Potential Impact on Habitat
	EPBC Act Status	WC Act Status	ICUN Status	DEC Priority Status	EPBC Act Database	DEC Database	Birds Aust. Database				
Unnamed Cricket <i>Pachysaga munggai</i>	-	-	VU	P3	-	Yes	-	Land clearing/degradation	Not documented	Unlikely	None Likely
Balston's Pygmy Perch <i>Nannatherina balstoni</i>	VU	S1	DD	-	Yes	-	-	Land clearing, introduced predators and declines in water quality	Acidic, tannin stained freshwater pools, streams and lakes within 30km of the coast, typically situated amongst peat flats. Prefers shallow water and is commonly found in association with tall sedge thickets.	No	None
Great Egret <i>Ardea alba</i>	Migratory (CAMBA, JAMBA)	S3	LC	-	Yes	-	-	Loss of breeding habitat and declines in water quality.	Wetlands, flooded pasture, dams, estuarine mudflats, mangroves and reefs	No/ Very Marginal	Loss of a very small area of marginal habitat
Cattle Egret <i>Ardea ibis</i>	Migratory (CAMBA, JAMBA)	S3	LC	-	Yes	-	-	Loss of breeding habitat and declines in water quality	Moist pastures with tall grasses, shallow open wetlands and margins, mudflats.	No/ Very Marginal	Loss of a very small area of marginal habitat
White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>	Migratory (CAMBA)	S3	LC	-	Yes	-	-	Loss of breeding habitat and declines in water quality	Nests and forages near the coast over islands, reefs, headlands, beaches, bays, estuaries, mangroves, but will also live near seasonally flooded inland swamps, lagoons and floodplains, often far inland on large pools of major rivers. Established pairs usually sedentary, immatures dispersive. Builds a large stick nest, which is used for many seasons in succession.	No	None
Bush Stone Curlew <i>Burhinus grallarius</i>	-	-	NT	P4	-	Yes	-	Land clearing	Lightly wooded country (including partly cleared forests) near daytime shelter e.g. thickets or long grass.	No, Species Locally Extinct	None
Forest Red-tailed Black Cockatoo <i>Calyptrorhynchus banksii naso</i>	VU	S1	LC	-	Yes	Yes	Yes	Land clearing and logging.	This subspecies of the Red-tailed Black Cockatoo is restricted to the forests of the south-west. It requires tree hollows to nest and breed and is totally dependent on jarrah-marri forest	Yes	Loss of a small area of foraging and breeding habitat
Baudin's Black-Cockatoo <i>Calyptrorhynchus baudinii</i>	VU	S1	EN	-	Yes	Yes	Yes	Land clearing and illegal shooting	Heavily forested areas of the south-west, where it feeds on the seeds of eucalypts and various proteaceous species. It is a nomadic species. Breeding on the coastal plain mostly occurs in areas south of Mandurah during spring/summer, nesting in tree hollows (primarily Marri).	Yes	Loss of a small area of foraging and breeding habitat
Carnaby's Black-Cockatoo <i>Calyptrorhynchus latirostris</i>	EN	S1	EN	-	Yes	Yes	Yes	Land clearing and illegal shooting	This species moves around in seasonal flocks to feeding areas in proteaceous scrubs and heaths and eucalypt woodlands as well as pine plantations. Breeding occurs in winter/spring mainly in eastern forest and wheatbelt where they can find mature hollow bearing trees to nest in though it appears this species is currently expanding its breeding range westward and south into the Jarrah – Marri forest of the Darling Scarp and into the Tuart forests of the Swan Coastal Plain including the region between Mandurah and Bunbury.	Yes	Loss of a small area of foraging and breeding habitat
Fork-tailed Swift <i>Apus pacificus</i>	Migratory (CAMBA, JAMBA)	S3	LC	-	Yes	-	-	None identified	Low to very high airspace over varied habitat from rainforest to semi desert.	Yes	None
Rainbow Bee-eater <i>Merops ornatus</i>	Migratory (JAMBA)	S3	LC	-	Yes	-	-	Loss of roosting and breeding sites	Open Country, of woodlands, open forest, semi arid scrub, grasslands, clearings in heavier forest, farmlands. Common as a regular summer migrant to southern Australia (September to April) and breeds underground during this period in areas of suitable soft soil firm enough to support tunnel building.	Yes	Loss of small area of foraging habitat
Western Ringtail Possum <i>Pseudocheirus occidentalis</i>	VU	S1	VU	-	Yes	-	-	Fox predation. Habitat loss and/or modification, changing fire regimes, damming	Western Ringtail Possums feed, rest and socialise in the canopy, primarily coastal peppermint woodlands and peppermint/tuart associations. Inland, the largest known populations occur in the Upper Warren area east of Manjimup. In this area the Peppermint tree is naturally absent and Jarrah and Marri foliage constitutes the species staple diet. They require tree hollows and/or dense canopy for refuge and nesting.	Yes/Marginal	Loss of a small area of foraging, refuge and dispersal habitat

Common Name/Species	Conservation Code				Actual Records or Listed as Potentially in General Area			Threatening Processes	Habitat Requirements	Habitat in Project Area/Quality	Potential Impact on Habitat
	EPBC Act Status	WC Act Status	ICUN Status	DEC Priority Status	EPBC Act Database	DEC Database	Birds Aust. Database				
Chuditch <i>Dasyurus geoffroyi</i>	VU	S1	VU	-	Yes	-	-	Competition from and predation by foxes and cats, land clearing, habitat alteration through removal of suitable den logs, poisoning, illegal shooting and road traffic.	This carnivorous marsupial occupies large home ranges, is highly mobile and appears to utilise bush remnant and corridors. Requires a medium sized hollow at or near ground level or will dig burrow under log or stump. Chuditch occur in a wide range of habitats but are more commonly found in woodland, forest and riparian vegetation.	Yes/Marginal	Loss of a small area of foraging and dispersal habitat
Bilby <i>Macrotis lagotis</i>	VU	S1	VU	-	-	Yes	-	Habitat loss and change, and competition with and predation by introduced animals.	Current habitat included Acacia shrublands, spinifex and hummock grassland	No, Species Locally Extinct	None
Numbat <i>Myrmecobius fasciatus</i>	VU	S1	VU	-	-	Yes	-	Fox and cat predation, land clearing, habitat alteration through removal of suitable den logs.	This diurnal marsupial feeds almost exclusively on termites and is very vulnerable to predation by foxes and cats. It occurs in a variety of habitats including woodland and shrubland where it shelters in hollow logs, tree hollows and burrows.	No, Species Locally Extinct	None
Southern Bush-tailed Phascogale <i>Phascogale tapoatafa</i> ssp	-	S1	NT	-	-	Yes	-	Fox and cat predation, reduction in trees with suitable hollows and possibly altered fire regimes.	This arboreal marsupial occurs in forest and woodland where suitable tree hollows are available. Requires small hollows. Prefers dense crown vegetation. Populations fluctuate dramatically in response to invertebrate prey abundance.	Yes/Marginal	Loss of a small area of foraging and dispersal habitat
Quenda <i>Isodon obesulus fusciventer</i>	-	-	LC	P5	-	Yes	-	Fox predation and land clearing	This species prefers areas with dense understorey vegetation, particular around swamps and along watercourses that provide ample protection from predators.	Yes/Marginal	Loss of a small area of habitat
Western Brush Wallaby <i>Macropus irma</i>	-	-	LC	P4	-	Yes	-	Fox predation.	The western brush wallaby prefers areas of forest and woodland supporting a dense shrub layer adjacent to small open areas.	Yes	Loss of a small area of habitat
Quokka <i>Setonix brachyurus</i>	VU	S1	VU	-	Yes	-	-	Fox predation, altered fire regimes	Densely vegetated wetlands and tea-tree thickets along creek systems and dense heath on valley slopes. Peppermint and <i>Thomasia</i> species being dominant vegetation items in their diet	No	None
Woylie <i>Bettongia penicillata ogilbyi</i>	EN	S1	CR	-	Yes	-	-	Fox predation, altered fire regimes	Open forest and woodland with a low, dense, understorey of tussock grasses or woody scrub.	No, Species Locally Extinct	None
WaterRat <i>Hydromys chrysogaster</i>	-	-	LC	P4	-	Yes	-	Fox predation and a decline in water quality.	Water rats occur along permanent watercourses where there are freshwater molluscs and crustaceans (its main prey), frogs, small mammals and water birds present. Requires healthy fresh (to brackish) water habitat containing diverse water and bank life.	No	None

declared by the Minister by notice in the Government Gazette. Under section 14(2)(ba) of The Act, Fauna Notices are made by the Minister for the Environment listing specially protected fauna.

Disturbance or destruction of any native fauna over and above that reasonably required for construction works and access is considered an offence under the Act and the proponent should take the necessary steps to inform all those involved in sites works of this fact. The proponent should therefore, as part of a site works fauna management plan implement procedures that will reduce the chances of wildlife being injured or killed during clearing and construction on the site.

6.2 ENVIRONMENTAL PROTECTION ACT 1986

The purpose of the Environmental Protection Act (1986) is “...to provide for an *Environmental Protection Authority, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection enhancement and management of the environment and for matters incidental to or connected with the foregoing*”.

The powers of the Environmental Protection Act 1986 are administered by the Department of Environment and Conservation (DEC), which in relevant cases advises to the Environmental Protection Authority (EPA).

New legislation proclaimed on 8 July 2004 protects all native vegetation in Western Australia. Under the law, clearing native vegetation is prohibited, unless a clearing permit is granted by the DEC, or the clearing is for an exempt purpose. These exemptions ensure that low impact day to day activities involving clearing can be undertaken. People that wish to clear are required to submit an application if an exemption does not apply.

Clearing applications are assessed against ten defined clearing principles related to native vegetation in the EP Act. These principles provide a guide for when native vegetation should not be cleared. The DEC must consider these principles in making a decision on whether or not to issue a clearing permit. The DEC has set out the minimum requirements and standards for addressing each of the ten principles in detail in its assessment methodology.

It is understood that the MRWA have a state-wide purpose permit issued under the Native Vegetation Clearing Regulations 2004. The use of this permit is only appropriate if the proposed clearing is not at variance to any of the 10 clearing principles, these being:

Native vegetation should not be cleared if

(a) it comprises a high level of biological diversity;



- (b) it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia;
- (c) it includes, or is necessary for the continued existence of, rare flora;
- (d) it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community;
- (e) it is significant as a remnant of native vegetation in an area that has been extensively cleared;
- (f) it is growing in, or in association with, an environment associated with a watercourse or wetland;
- (g) the clearing of the vegetation is likely to cause appreciable land degradation;
- (h) the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area;
- (i) the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or
- (j) clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

One purpose of the assessment reported on here is to provide information relevant to principle (a) & (b). Based on the assessment results and despite the fact that the area is or is possibly being utilised by some species of conservation significance it is the Author's opinion that the area requiring clearing is very unlikely to have what would be considered a high level of biological diversity or constitute the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

This opinion is based on the fact that fauna habitats present within the proposed clearing footprint are generally degraded, are common and widespread in the general area and the faunal assemblage potentially present is unlikely to be of a high diversity or different to that found in similar habitats located elsewhere in the local area or region. It can therefore be concluded that the area to be cleared does not contain habitats of high ecological significance from a faunal perspective or contain faunal assemblages that are ecologically significant.

Also the area to be cleared is relatively small and is spread along a ~7km section of road verge. The impact of clearing on fauna or fauna habitat will therefore be very small/negligible at any one location. Existing fauna populations (including those of conservation significant species) are very unlikely to be affected by the loss of small areas of habitat spread out over such a distance.



6.3 COMMONWEALTH ENVIRONMENT PROTECTION & BIODIVERSITY CONSERVATION ACT 1999

A number of fauna species known to or potentially present within the study area are listed under the federal *Environment Protection and Biodiversity Conservation Act (EPBC Act, 1999)*. The objective of the *EPBC Act* is to provide for the protection of the environment, especially those aspects that are of national significance, promote ecologically sustainable development, the conservation of biodiversity and a cooperative approach to the protection and management of the environment.

Development proposals (“actions”) that are likely to have a significant impact on any listed species should be referred to the Department of Environment, Water, Heritage and Arts (DEWHA) for assessment. The aim of a referral is to provide certainty about whether a proposal does or doesn’t need approval under the *EPBC Act*. The proposed action should be considered at its broadest possible scope. This includes all stages and components of the action, all related activities, and all related infrastructure such as roads and powerlines, if applicable.

It is the proponent’s responsibility to determine if their proposed action (e.g. clearing and development of an area of native bushland) requires referral. To aid in determining if a proposal is likely to have a significant impact DEWHA provide a series of Significant Impact Guidelines (DEH 2006). These guidelines outline a ‘self-assessment’ process, including detailed criteria, to assist persons in deciding whether or not referral may be required.

The criteria are intended to provide general guidance on the types of actions that will require approval and the types of actions that will not require approval. The criteria are not intended to be exhaustive or definitive. If a proponent is unsure whether their proposed action is likely to have a significant impact on a matter of national environmental significance it should be referred to the DEWHA for a binding decision on whether approval is required (DEH 2006).

EPBC Act listed threatened fauna species (or their habitat) identified as most likely to be present or possibly present in the study area at times are:

- *Calyptorhynchus latirostris* Carnaby's Black Cockatoo – Endangered
- *Calyptorhynchus baudinii* Baudin's Black Cockatoo – Vulnerable
- *Calyptorhynchus banksii naso* Forest Red-tailed Black Cockatoo – Vulnerable

The significant impact criteria for endangered and vulnerable species are defined in the Significant Impact Guidelines (DEH 2006) as:



An action is likely to have a significant impact on an endangered species (e.g. Carnaby's Black Cockatoo) if there is a real chance or possibility that it will:

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

An action is likely to have a significant impact on a vulnerable species (e.g. Baudin's Black Cockatoo and the FRTBC) if there is a real chance or possibility that it will:

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



- introduce disease that may cause the species to decline; or
- interfere substantially with the recovery of the species.

To have a significant impact on an endangered/vulnerable species as defined under the DEWHA Significant Impact Guidelines (DEH 2006), any proposed development would need to trigger at least one of the abovementioned significant impact criteria thresholds. Each of these is briefly assessed below.

Lead to a long-term decrease in the size of a population (or an important population)

The study area contains foraging and potential breeding habitat for black cockatoos but the extent of the proposed clearing relatively small and very unlikely to lead to a long term decrease in the size of a population (or important population). The proposed works adjoin significant areas of state forest/reserves/national parks and all three species of black cockatoo will continue to utilise the area as they do now despite the road works proceeding. No evidence has been gathered that suggests that the proposal would lead to a decrease in the size of the Carnaby's, Baudin's or the Forest Red-tailed Black Cockatoo population.

It is very unlikely that this criteria will be compromised by the development proceeding.

Reduce the area of occupancy of the species (or an important population)

The extent of the proposed clearing is relatively small and represented by thin discontinuous strip of vegetation located at various points along a 7km section of road verge. All three black cockatoo species will continue to utilise the area as they do now despite the proposal proceeding. There is no evidence to suggest that the proposed development of the land at the study site would lead to a significant reduction in the area of occupancy by any of the black cockatoo species.

This criteria will not be compromised by the development proceeding.

Fragment an existing population (or important population) into two or more populations

The extent of the proposed clearing is relatively small and represented by thin discontinuous strip of vegetation located along a 7km section of road verge. This degree of clearing could not possibly fragment any potential habitat to the extent that it would represent a barrier to black cockatoo movement.

This criteria will not be compromised by the development proceeding.



Adversely affect habitat critical to the survival of a species

The area of vegetation requiring clearing is small and not localised in one area. Substantial nearby areas of potential habitat for all the species in question will remain unaffected by the proposal and even if considered “critical to the survival of a species” will not be adversely affected by the proposal proceeding.

This criteria will therefore not be compromised by the development proceeding.

Disrupt the breeding cycle of a population (or important population)

While the probability that any black cockatoos utilise the single identified habitat tree that may require removal for breeding, it is recommended that if this tree needs to be removed that it be done outside of black cockatoo breeding season to remove the possibility that any actual breeding individuals are affected.

It is very unlikely that this criteria will be compromised by the development proceeding.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The study area contains foraging and potential breeding habitat for black cockatoos but the extent of the proposed clearing is relatively small and could not possibly lead to a long term decrease in the size of a population (or important population). All three species of black cockatoo will continue to utilise the site as they do now despite the proposal proceeding. There is no evidence to suggest that the proposed clearing of a small area of vegetation over such a wide area would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that would cause any of the black cockatoo species population numbers to decline.

It is very unlikely that this criteria will be compromised by the development proceeding.

Result in invasive species that are harmful to endangered/vulnerable species becoming established in the endangered/vulnerable species' habitat

It is extremely unlikely that the proposed development of the land would result in an invasive species that is harmful to any of the species in question would become established on the site or in the vicinity.

This criteria will not be compromised by the development proceeding.



Introduce disease that may cause the species to decline;

It is extremely unlikely that the proposed development of the land would result in the introduction of a disease that would cause any of the species in question to decline.

This criteria will therefore not be compromised by the development proceeding.

Interfere with the recovery of the species

The areas to be cleared are, in total small, and spread over a 7km length of road. Impacts at any one point will be very small/negligible. All of the species in question will continue to utilise the area adjacent to the road as they do now despite the proposal proceeding. There is no evidence to suggest that the proposed road widening and the removal of a small area of vegetation would interfere with the recovery of any of the species.

This criteria will therefore not be compromised by the development proceeding.

In all cases it is considered unlikely that the impact caused by the proposed road works would trigger any of the abovementioned criteria. This is primary because of the relatively small area of clearing required, the fact that it will be spread over a long, thin area and the existence of substantial areas of similar habitat nearby.

Besides the three black cockatoo species it is also the Authors opinion that roads works along this section of the Coalfields Highway are very unlikely to have significant impact on any other *EPBC Act* listed fauna species potentially present or known to be present in the general area.

7. MANAGEMENT RECOMMENDATIONS

The most likely impact of the proposed clearing works is the potential for fauna to be killed or injured. The following recommendations are provided for guidance and aim to reduce the potential impact on fauna and fauna habitat and should be implemented if considered reasonable and practicable for the project in question. It is recommended that:

- During clearing operations a suitably experienced “fauna spotter” should be employed to inspect logs, trees and hollows (where possible) before clearing to reduce likelihood of injury to fauna. Trees observed to contain hollows should be felled in a manner that reduces the likelihood that fauna present will be injured. Hollows within fallen trees should be inspected for fauna prior to removal from the site. If feasible any fauna encountered should be relocated to suitable retained habitat nearby.



- During site works areas requiring clearing should be clearly marked and access to other areas restricted to prevent accidental clearing of areas to be retained.
- No dead, standing or fallen timber should be removed unnecessarily. Logs (hollow or not) and other debris resulting from land clearing should be used to enhance fauna habitat in untouched and rehabilitated areas if possible. Where possible, logs are to be retained either by pushing the logs into the surrounding forest, when significant disturbance to the forest can be avoided, or the logs cut so that the length of log outside the clearing area remains insitu.
- All staff working on site should be made aware that native fauna is protected. Personnel working on the project should not be allowed to bring firearms, other weapons or pets onsite.
- Native fauna injured during clearing or normal site operations should be taken to a designated veterinary clinic or a DEC nominated wildlife carer.
- Any trenching required for services should be kept open for only as long as necessary and suitable escape ramps and bridging provided if the site is to be left unattended for extended periods. Significant sized trenches should be inspected for fauna immediately prior to filling.
- While the probability that any of the black cockatoo species breed within trees in the clearing footprint can be considered to be very low, the documented breeding and fledging times of the respective species (see below) suggests that the best time to carry out clearing at the site would be in the months of April, May or June so as to avoid the peak breeding times for all species in question. It would also be possible to carry out observations of potential nest hollows to establish if they were in use if clearing needed to be undertaken at other times.

Forest Red-tailed Black Cockatoo *Calyptorhynchus banksii naso*

J	F	M	A	M	J	J	A	S	O	N	D

Baudin's Black- Cockatoo *Calyptorhynchus baudinii*

J	F	M	A	M	J	J	A	S	O	N	D

Carnaby's Black- Cockatoo *Calyptorhynchus latirostris*

J	F	M	A	M	J	J	A	S	O	N	D



Period in which breeding is most likely to commence

Period in which fledging could extend through



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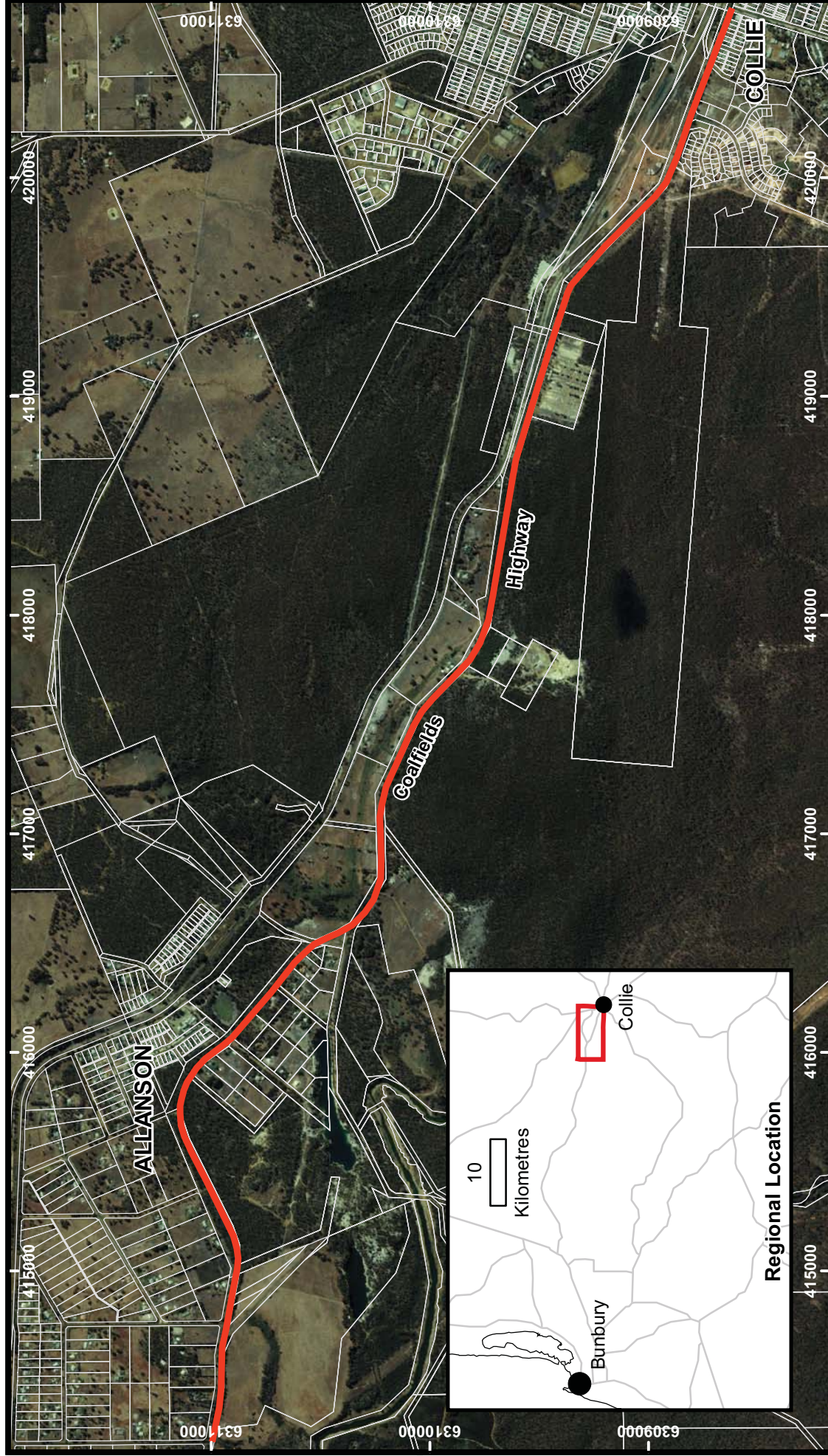
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FIGURES

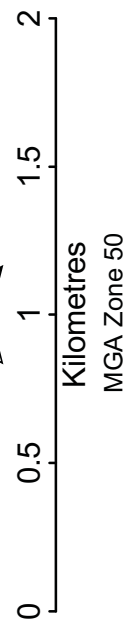




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DATE: Jun 2010
SCALE: 1:25,500

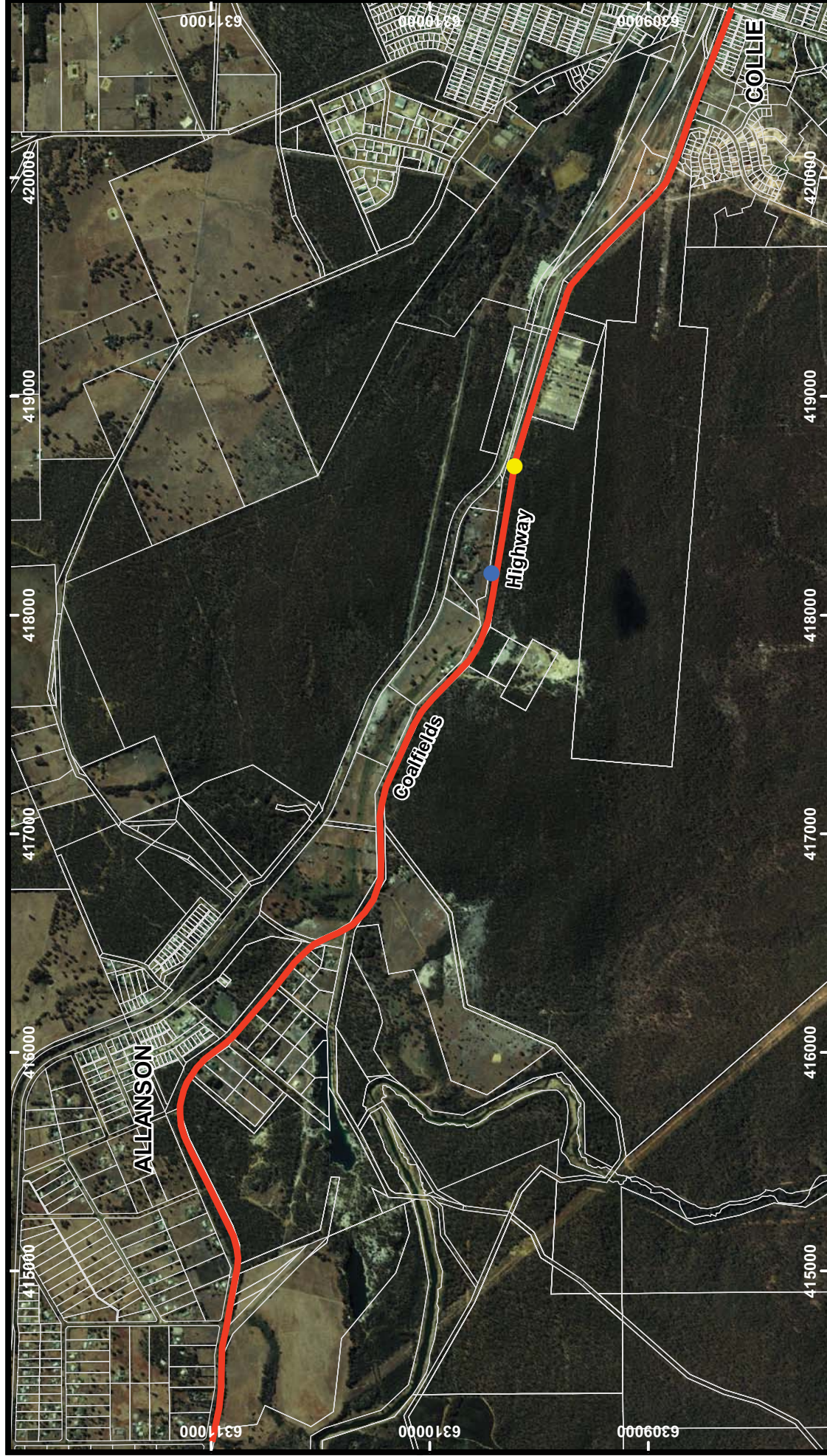
Coalfields Highway
SLK 28 - 35

Study Area



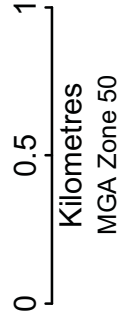
Legend

-  Cadastral Boundaries (Existing)
-  Study Area



Legend

- Cadastral Boundaries (Existing)
- Study Area
- Tree with Large Hollows (>12cm entrances)
- Tree with Small Hollows (<12cm entrances)



DRAWN: G Harewood
DATE: Jun 2010
SCALE: 1:25,500

Coalfields Highway
SLK 28 - 35

Habitat Trees

PLATES





Plate 1: Example of Habitat Tree Tag

APPENDIX A

DETAILS OF HABITAT TREES

Habitat Tree details

Waypoint Number	Zone	mE	mN	Side of Road	Tree Species	Tree Height (m)	Number of Hollows	Hollow Type 1	Hollow Size 1 (cm)	Hollow Type 2	Hollow Size 2 (cm)	Hollow Type 3	Hollow Size 3 (cm)	Hollow Type 4	Hollow Size 4 (cm)	Hollow Type 5	Hollow Size 4cm	Occupancy	Chew Marks	Potential Occasio Nest Hollow	Comments
wpt002	50H	418680	6309609	South	Jarrah	20+	5+	Branch	5-10	Branch	5-10	Branch	10-20	Branch	10-20	Spout	20+	No signs	No signs	Yes	
wpt005	50H	418190	6309716	North	Jarrah	15-20	?											No signs	No signs	No	Possible small hollows

APPENDIX B

DETAILS OF FORAGING EVIDENCE

Black Cockatoo Foraging Evidence

Waypoint Number	Zone	mE	mN	Evidence Age	Evidence Type 1	Likely Species
wpt001	50H	419248	6309460	Recent	Marri Seeds	Baudin's
wpt003	50H	418480	6309643	Old	Pine Cones	Carnaby's
wpt004	50H	418226	6309691	Recent	Marri Seeds	FRTBC
wpt006	50H	415941	6311076	Old	Marri Seeds	FRTBC
wpt007	50H	415519	6311076	Old	Marri Seeds	FRTBC
wpt008	50H	415238	6310932	Recent	Marri Seeds	FRTBC
wpt008	50H	415238	6310932	Old	Marri Seeds	FRTBC

APPENDIX C

OPPORTUNISTIC FAUNA OBSERVATIONS

Fauna observed in or near study area

Coalfields Highway, SLK 28 - 35

Compiled by Greg Harewood - May 2010

Observed (Sighted/Heard/Signs) = +

Class Family Species	Common Name	Conservation Status	Observed May '10
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Amphibians

Myobatrachidae

Ground or Burrowing Frogs

<i>Crinia glauerti</i>	Glauert's Froglet	LC	+
<i>Crinia pseudinsignifera</i>	Bleating Froglet	LC	+
<i>Geocrinia leai</i>	Lea's Frog	LC	+

Birds

Cacatuidae

Cockatoos, Corellas

<i>Calyptorhynchus banksii naso</i>	Forest Red-tailed Black Cockatoo	S1 VU Be VU	+
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo	S1 EN Bp EN C2a(ii)	+
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	S1 EN Bp EN A2bcd+3bcd	+

Psittacidae

Parrots

<i>Platycercus icterotis icterotis</i>	Western Rosella (Western ssp)	Bp LC	+
<i>Platycercus zonarius</i>	Australian Ringneck Parrot	LC	+

Pardalotidae

Pardalotes, Bristlebirds, Scrubwrens, Gerygones, Thornbills

<i>Acanthiza apicalis</i>	Broad-tailed Thornbill	Bh LC	+
<i>Gerygone fusca</i>	Western Gerygone	LC	+

Meliphagidae

Honeyeaters, Chats

<i>Anthochaera carunculata</i>	Red Wattlebird	LC	+
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Dicruridae

Monarchs, Magpie Lark, Flycatchers, Fantails, Drongo

<i>Grallina cyanoleuca</i>	Magpie-lark	LC	+
<i>Rhipidura fuliginosa</i>	Grey Fantail	LC	+

WAWC Act Status - S1 to S4, EPBC Act Status - EX = Extinct, EN = Endangered, VU = Vulnerable, Mg = Migratory, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions = LC, LR, NT, DD ect - see www.iucnredlist.org/info/categories_criteria2001#categories.

Class Family Species	Common Name	Conservation Status	Observed May '10
Artamidae Woodswallows, Butcherbirds, Currawongs			
<i>Cracticus tibicen</i>	Australian Magpie	LC	+
Corvidae Ravens, Crows			
<i>Corvus coronoides</i>	Australian Raven	LC	+
Hirundinidae Swallows, Martins			
<i>Hirundo neoxena</i>	Welcome Swallow	LC	+
Zosteropidae White-eyes			
<i>Zosterops lateralis</i>	Grey-breasted White-eye	LC	+
Mammals			
Macropodidae Kangaroos, Wallabies			
<i>Macropus fuliginosus</i>	Western Grey Kangaroo	LR/LC	+

WAWC Act Status - S1 to S4, EPBC Act Status - EX = Extinct, EN = Endangered, VU = Vulnerable, Mg = Migratory, DEC Priority Status - P1 to P5, Int. Agmts - CA = CAMBA, JA = JAMBA, RK = ROKAMBA, Bush Forever Decreaser Species - Bh = habitat specialists, Bp = wide ranging species, Be = extinct in Perth Coastal Plain Region. IUCN Red List Category Definitions = LC, LR, NT, DD ect - see www.iucnredlist.org/info/categories_criteria2001#categories.

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
1	N McCarthy	F Hannon	<i>F Hannon</i>	F. Hannon	<i>F Hannon</i>	08/09/10
2	N McCarthy	F Hannon	<i>Fionnuala Hannon</i>		<i>Fionnuala Hannon</i>	28/09/10