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Main Roads Western Australia

Report for Great Northern Highway SLK
3079.12: Big McPhee Bridge Replacement
Environmental Impact Assessment and
Environmental Management Plan

December 2011



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1. Introduction

1.1 Background

Main Roads Western Australia (Main Roads) Kimberley Region proposes to reconstruct Big McPhee Bridge for which an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) is required.

Big McPhee Bridge is located along the Great Northern Highway (SLK 3079.12) between Warmun and Kununurra.

Rain events in the Kimberley region during the 2010-2011 wet season have caused damage to Big McPhee Bridge and the associated approaches. Main Roads plans to reconstruct Big McPhee Bridge during the 2012 dry season. The proposed bridgeworks will consist of:

- ▶ Demolition of the existing single lane bridge;
- ▶ Use of the previously constructed side track on the western side of existing bridge during bridge works and removal upon completion of works;
- ▶ Installation of piles and construction of bridge pier footings in the river bed;
- ▶ Construction of new two lane bridge superstructure and approach road works on the same road alignment;
- ▶ Construction of rockwork guide-banks at both bridge abutments;
- ▶ Utilisation of the existing old pit immediately to the north of the site as a hardstand/storage/temporary construction camp area; and
- ▶ Extraction of materials from nominated borrow pit areas.

The proposed works will aim to increase serviceability of the National Highway and improve safety to road users.

The EIA and EMP will be used to assess and manage the environmental impacts of the project.

1.2 Scope of Works

The need to prepare the EIA and EMP document relates to requirements contained within Main Roads environmental guideline *Environment Assessment and Approval*. Main Roads has commissioned GHD Pty Ltd (GHD) to complete the EIA and EMP works for this project.

The preparation of the Environmental Impact Assessment and subsequent report will include the following:

- ▶ Desktop assessment of the area;
- ▶ Field study of relevant biological aspects; and
- ▶ Assess the project against the Environmental Protection Act 1986 Ten Clearing Principles.

The Environmental Management Plan will include:

- ▶ A summary of management plan, including summary of commitments table;



- ▶ A summary to highlight the key environmental issues, reflecting those identified in the Environmental Impact Assessment report; and
- ▶ Suggested environmental management measures.



2. Project Methodology

2.1 Project Requirements

To achieve the scope of works the following tasks were required to complete the EIA and EMP:

2.1.1 Environmental Impact Assessment

Major tasks completed as part of the EIA include:

- ▶ Determine the key environmental aspects to be considered and the scope of investigations required;
- ▶ Assessment to confirm that no significant environmental impacts will occur and that referral to either the Environmental Protection Authority (EPA) or the Department of Sustainability, Environment, Water, Population and Community (DSEWPAC) is not required;
- ▶ Description and assessment of the existing environment, including physical, biological, social aesthetic, heritage, noise, and site contamination;
- ▶ Field investigations;
- ▶ Impact assessment that describes the proposed works and their potential impact on the existing environment, with reference to features of the project including road and bridgeworks, materials pits, access tracks and spoil sites;
- ▶ An assessment of the project against the *Environmental Protection Act 1986* (EP Act) Ten Clearing Principles.
- ▶ Consultation with regulatory stakeholders (as required) to determine requirements;
- ▶ Provide necessary information to obtain, and assist the project manager in applying for, clearances required under legislative provisions, including (but not limited to) those required under the following acts and regulations:
 - *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*;
 - *Rights in Water and Irrigation Act 1914*;
 - *Conservation and Land Management Act 1984*;
 - *Wildlife Conservation Act 1950*; and
 - *Heritage of Western Australia Act 1990*; and
- ▶ Provide environmental management actions suitable for inclusion in the tender documentation for project implementation;
- ▶ Provide a concise report on the results of environmental investigations and clearances obtained; and
- ▶ Provide sufficient information to prepare the EMP for construction.

2.1.2 Environmental Management Plan

The EMP includes the following information:

- ▶ Planning that minimises the environmental impacts of the works and identifies those responsible for implementation;
- ▶ Monitoring and maintenance program which assesses the implementation;



- ▶ List of commitments identifying management requirements; and
- ▶ Provide environmental management actions in accordance with results of EIA report.

2.2 EIA Methodology

The EIA includes a desktop and field assessment. Field investigations were undertaken for the following environmental aspects:

▶ Physical Environment

- A description and summary of climatic data and how it may affect the outcomes of the proposed works;
- Broad soil descriptions, including the presence of any special soil conditions, their relationship to topography and plant communities and their influence on rehabilitation;

▶ Vegetation and Flora

- A description and location, including mapping, of plant communities;
- A review of the local and regional significance of the plant communities in terms of their intrinsic value, extent, rarity and condition;
- A rating of condition of the vegetation communities or areas using Keighery (1994);
- A discussion of the presence, location, extent and impact of any plant pests or diseases, where known;
- An inventory of vascular species in the survey area;
- A review of, and search for, native plant species considered to be rare or potentially endangered. Other species of interest, including those of limited distribution or outliers from their known range, are discussed. Locations of Threatened (Declared Rare) or Priority flora, where present, are mapped at a suitable scale;
- An inventory of dominant exotic plants, also including declared noxious plants and environmental weed species;
- Advice on whether weeds may be likely to spread to and result in environmental harm to adjacent areas of native vegetation;
- Determine whether the project area is within an Environmentally Sensitive Area (ESA); and
- An assessment of the clearing of native vegetation against the Ten Clearing Principles.

▶ Fauna

- An inventory of the vertebrate fauna species in the area surveyed. This did not require a trapping program but a targeted search and opportunistic recording of species;
- A review of the fauna species considered to be rare or in need of special protection;



- A review of the presence and abundance of pest, declared or feral animals; and
- The identification of any habitats of significance.
- ▶ **Wetlands and Drainage**
 - A description of existing surface drainage patterns with respect to topography, and to flora and fauna communities; and
 - An inventory and brief description of any wetlands and their conservation value.
- ▶ **Management and Rehabilitation**
 - Information directed towards practical management techniques for mitigating impact and maintaining the value of roadsides for conservation of flora and fauna species.



3. Desktop Assessment

3.1 Description of the Project

The Big McPhee Project Area is located on the Great Northern Highway, approximately 100 km south-west of Kununurra, Western Australia.

Within the Big McPhee Project Area there are three areas that have been assessed:

- ▶ A 400 m wide x 1200 m long corridor around the existing Big McPhee Bridge;
- ▶ An existing hardstand north of the bridge which is to be extended; and
- ▶ Two Material Pits along an old alignment of the Great Northern Highway (now the Glen Hill Road North Access track) located to the north east of the bridge.

Project Areas surveyed are indicated in Figure 1, Appendix A.

3.2 Geology and Soils

The underlying geology of the bridge corridor and hardstand sites in the Project Area is indicated as palaeoproterozoic, with rock types from the: Speewah Group and Hart Dolerite.

Speewah Group rocks are described as undivided sandstone, feldspathic sandstones, siltstones and mudstones; with minor rhyolitic volcanoclastic sandstones. Hart Dolerite rocks are igneous mafic intrusives containing dolerite and granophyres (GeoVIEW.WA, 2011).

The material pit areas are indicated to contain rocks from the Middle Cambrian period, notably in the Antrim Plateau Volcanics and Lally Conglomerate groups, which are igneous mafic volcanics containing vesicular, amygdaloidal and porphyritic basalt, conglomerate, sandstone; minor inter-bedded agglomerate, tuff, siltstone, and stromatolitic and laminated chert (GeoVIEW.WA, 2011).

The majority of the Project Area, including bridge corridor, hardstand and material pits, are described by GeoVIEW.WA as Slope deposits; including colluvium and sheetwash.

There are small areas, particularly at the southern corner of the bridge corridor, where exposed rock in the form of saprolite and saprock occur on low hills.

3.3 Topography

The surveyed areas are relatively flat and undulating, but surrounded by low ranges. The southern corner of the bridge corridor intersects exposed rock of footslopes of a small range.

The Big McPhee Creek runs through the centre of the bridge corridor, and is somewhat lower in profile than the surrounding landscape.

3.4 Hydrology

3.4.1 Wetlands

Waterways and wetland areas within the Kimberley region are ephemeral, and typically flow or fill during seasonal rainfall events. A search of the Western Australian Wetlands Database (*WetlandBase*) and the EPBC Act Protected Matters Search Tool indicates the presence of three Wetlands of International Significance (Ramsar Listed Sites) within the same catchment as the Project Area. These are Lake Argyle, Lake Kununurra and the Ord River Floodplain. All sites are more than 40 km from the Project Area and will not be impacted by the proposed works.

The Environment and Biodiversity Protection and Conservation Act 1999 EPBC Act Protected Matters Search Tool (search number PMST_N1E2DH.pdf) indicated that the Project Area occurs upstream from the Wetland of International Significance (Ramsar Site) of the Ord River Floodplain. This wetland is considered unlikely to be impacted by the proposed works.

One small unnamed wetland is indicated by the Natural Resource Management (NRM) Shared Land Information Portal (SLIP) to occur to the north-west of the bridge corridor (NRM, 2011). This small wetland is described as an area subject to inundation and unlikely to be permanent. This wetland is outside the Project Area and will not be impacted by the proposed works.

3.4.2 Drainage

Monsoonal rainfall causes extensive sheetflow flooding over the flat landscape and often creates ephemeral, dendritic drainage lines and rivers with extensive floodplain areas. The often sandy nature of these drainage lines makes them susceptible to erosion from channelised runoff and grazing livestock.

Surface water drains directly off road surfaces. High frequency and high intensity rainfall events during the wet season often cause flooding of the road surface in floodway areas and at river crossings.

No permanent watercourses or wetlands occur within the Project Area.

The Big McPhee Creek directly intersects the bridge corridor as indicated in Figure 1, Appendix A. The Big McPhee Creek supports riparian vegetation.

Drainage at the Material Pit A and Material Pit B areas is to the east. One small ephemeral creek line runs down the southern boundary of Material Pit B. This same ephemeral creek line intersects the southern boundary of the larger Material Pit A. This ephemeral creek line does not contain riparian vegetation.

3.4.3 Water Management Areas

A search of the Department of Water (DoW) Geographic Data Atlas indicated that the project is not within any Gazetted Public Drinking Water Source Areas, but it does lie within the Canning-Kimberley Groundwater Area. The Canning-Kimberley Groundwater Area covers the entire Kimberley sub-region. It was proclaimed in 1997

under the *Rights in Water and Irrigation Act 1914* to ensure groundwater is abstracted sustainably.

The *Act* gives the DoW the power to manage ground and surface areas and use of land that may impact upon these water sources. Permits are required to allow obstruction or interference with the bed or banks of a watercourse to which there is access by a public road or reserve, or to build or alter a dam on a proclaimed or prescribed watercourse or wetland.

Where dewatering, obstruction of groundwater or modification of stream banks is required for roadworks and bridge construction Main Roads will need to complete the relevant application form as indicated below:

- ▶ For dewatering – ‘Application for a 5C Licence to take Groundwater’ (Form A); and
- ▶ For modifying beds and banks – ‘Application for a 5C Licence to Take Surface Water/Application for a 11/17/21 A permit to modify bed and banks/Application to amend a 11/17/21A permit to modify bed and banks’ (Form C).

3.5 Climate

The Kimberley region of Western Australia has a tropical monsoon climate with very hot summers and warm dry winters. The area experiences two distinct seasons. The “wet”, which generally occurs from December to March and is characterised by high temperatures and over 80% of the average rainfall, occurs between December and March due to the dominance of unstable low pressure systems.

From May to October high pressure systems and a predominantly south easterly airflow from the continent’s interior generate clear sunny days with cooler daytime and night time temperatures. Rainfall during these months is infrequent.

Two Bureau of Meteorology (BoM) weather stations that are located nearest to the Project Area are situated at Kununurra Airport. Recorded climatic data is indicated below (Source: BoM, 2011):

- ▶ Mean Daily Maximum Temperature: 30.3 °C in June – 39.0 °C in November
- ▶ Mean Daily Minimum Temperature: 15.2 °C in July – 25.5 °C in November
- ▶ Mean Annual Rainfall: 844 mm
- ▶ Mean Annual Rain Days: 36 days

3.5.1 2011 Climate

In the three months prior to the field survey (May to July 2011) the Project Area is indicated by Kununurra Airport records not to have received any rainfall. This is below the long term average for these three months (13.7 mm) but considered to be equivalent to the median rainfall recorded during the dry season. The previous wet season was the wettest on record, with 1104 mm recorded at Kununurra between January and April 2011 as compared with the long-term average of 590.9 mm over the same period.



3.6 Land Use

Land uses within the Kimberley region include traditional Indigenous uses, nature conservation and cattle grazing. It is expected that the construction/reconstruction of the Five Bridges Project will have minimal impact on the current land use within the region. Some difficulties may be encountered within pastoral leases where cattle grazing occurs on unfenced properties. Stray cattle represent a potential hazard to operating plant and machinery.

The Project Area is surrounded by land predominantly used for grazing of livestock. Material Pit A contains a defunct water bore in the western corner that GHD considers is likely to have been used for historical watering of livestock.

The existing hardstand area contains materials used in road construction.

3.7 Contaminated Sites

The DEC's Contaminated Sites database provides a record of known contaminated sites.

A search of the Contaminated Sites database indicated that there were no known contaminated sites present within the vicinity of the Project Area.

3.8 Acid Sulphate Soils

The DEC (2006) describes Acid Sulphate Soils (ASS) as naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). In an undisturbed state below the water table these soils are benign and not acidic. However, if the soils are drained, excavated or exposed by lowering of the water table the sulphides will react with oxygen to form sulphuric acid.

Inappropriate disturbance of these soils can generate large amounts of sulphuric acid and leaching of contaminants naturally occurring in soils. Flushing of acidic leachate to groundwater and surface waters can cause off-site impacts, including:

- ▶ Ecological damage to aquatic and riparian ecosystems;
- ▶ Effects on estuarine fisheries and aquaculture projects;
- ▶ Contamination of groundwater with arsenic, aluminium and other metals;
- ▶ Reduction in agricultural productivity through metal contamination of soils; (predominantly by aluminium); and
- ▶ Damage to infrastructure through the corrosion of concrete and steel pipes, bridges and other sub-surface assets.

Mapping of ASS by the Western Australian Planning Commission has been prepared for the Perth Metropolitan Region and the southwest region of the state, where the impact of ASS has been assessed as being more significant. No mapping for the East Kimberley has been prepared, however the areas surveyed do not occur in low-lying wetlands, salt marshes or tidal flats. It is therefore considered that ASS would not pose an environmental constraint to construction or materials excavation.



A search of the CSIRO Australian Soil and Resource Information System (ASRIS) confirms that soils in the Project Area have an Extremely Low Probability (albeit with a Very Low Confidence) of the presence of Acid Sulphate Soils.

3.9 Noise and Vibration

There are no residents in close proximity of the proposed works that will be impacted by construction noise or vibration.

Traffic noise and vibration occurs at present, however volume of traffic is relatively low and not likely to be impacted by proposed works.

3.10 Ambient Air Quality

Soils in the Project Area create a minor potential for dust generation during construction and rehabilitation, particularly at the proposed material pits. Given the isolation of the area and the lack of sensitive receptors it is considered that dust generated will not cause a significant environmental constraint.

3.11 Heritage

3.11.1 European Heritage

A search of the Australian Heritage Database, the Australian Heritage Inventory and the Heritage Council of Western Australia databases did not indicate any European Heritage sites within the immediate vicinity of the Project Area.

3.11.2 Aboriginal Heritage

The Aboriginal Site Register is held under Section 38 of Western Australia's *Aboriginal Heritage Act 1972*. It protects places and objects customarily used by, or traditional to, the original inhabitants of Australia.

Where an activity disturbs an Aboriginal site or object an application for permission to disturb will need to be submitted under Section 18 of the *Aboriginal Heritage Act 1972*. Where a site of previously unknown Aboriginal heritage is to be disturbed it is advised that a detailed anthropological and archaeological heritage survey is undertaken to find if there are any sites or objects of significance in that area, as it is an offence to disturb all Aboriginal Heritage sites, even those not contained on the Aboriginal Heritage Site Register. In the event that Aboriginal archaeological or ethnographic sites are discovered during construction there will be a need to meet the requirements of the *Aboriginal Heritage Act 1972*.

A search of the Department of Indigenous Affairs (DIA) Aboriginal Heritage Inquiry System indicates that numerous Aboriginal heritage sites are located within the vicinity of the Project Area. These are shown in Figure 2, Appendix A.

No registered sites intersect the proposed work areas.

In addition, it should be noted that a search under the DIA database is not a valid full assessment under the *Aboriginal Heritage Act WA 1972*. This would require consultation with Aboriginal people with knowledge of the area (usually, but not necessarily Native Title Claimants), and an archaeological survey.

3.11.3 Native Title

The following Native Title Claim exists over the Project Area:

- Miriuwung-Gajerrong (Western Australia)

It is understood the works will occur in the current road reserve. Existing infrastructure corridors are exempt from Native Title.

3.12 Reserves and Conservation Areas

The material pits within the Project Area occur within the “Parts of the Kimberley WA” Indicative Place on the Register of the National Estate (RNE). The bridge corridor and hardstand area occur to the west of the boundary of the RNE Indicative Place.

No DEC administered Reserves or Conservation Areas occur within the vicinity of the Project Area.

3.13 Environmentally Sensitive Areas

A search of the DEC’s Native Vegetation Map Viewer did not indicate the presence of any Environmentally Sensitive Areas within the vicinity of the Project Area.

3.14 Vegetation

The Project Area occurs in the Victoria-Bonaparte Interim Biogeographic Regionalisation of Australia (IBRA) region.

3.14.1 Existing Vegetation Associations

Within the Project Area a total of three Vegetation Associations are known to occur (Table 1).

Table 1 Project Area Vegetation Associations

Association Number	Description	Project Area Location
59	Grasslands, high grass savannah sparse tree; bauhinia and coolabah over mitchell, blue and tall upland grasses.	Material Pit A, and Material Pit B
808	Grasslands, curly spinifex, low tree savannah; snappy gum over curly spinifex.	Hardstand area only
817	Grasslands, high grass savannah low tree; terminalia (<i>Terminalia</i> spp.) over upland tall grass and blue grass.	Bridge Corridor and Hardstand areas

3.14.2 Vegetation Extent and Status

Within the vicinity of the Project Area the vegetation is predominantly unaltered, except due to grazing pressure from livestock and the construction of the Great Northern Highway.

A vegetation type is considered to be under-represented if there is less than 30% of its original extent remaining. From a biodiversity perspective, and taking no account of any other land degradation issues, there are several key criteria applied to vegetation where clearing is still occurring (EPA Position Statement No.2, December 2000):

- ▶ The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-European extent of the vegetation type. Vegetation communities where less than 30% of the original vegetation extent remain are referred to as “Vulnerable”; and
- ▶ A level of 10% of the original vegetation extent is regarded as being a level representing an “Endangered” vegetation community.

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

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

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

Native vegetation associations represented in the Project Area; their extent and reservation status are drawn from the Government of Western Australia (2010) *CAR Analysis Report 2009*. These are shown in Table 2, indicating that the Vegetation Associations known from the vicinity of the Project Area are considered to be of *Least Concern*.

Table 2 Project Area Vegetation Association Extent and Status

Association Number	Pre-European Extent (ha)	Current Extent (ha)	% Remaining	% Current Extent in IUCN Reserves 1-4	Status
59	138,822.58	138,397.10	99.69	8.41	Least Concern
808	34,735.50	34,735.50	100.0	0.0	Least Concern
817	5,941.46	5,941.46	100.0	0.0	Least Concern

3.14.3 Threatened Ecological Communities

Ecological communities are defined as 'naturally occurring biological assemblages that occur in a particular type of habitat (English and Blythe, 1997). Threatened Ecological Communities (TECs) are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community, i.e. *Presumed Totally Destroyed, Critically Endangered, Endangered, Endangered and Vulnerable*.

Some TECs are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Although TECs are not formally protected under the *State Wildlife Conservation Act 1950* (WC Act) the loss of, or disturbance to, some TECs trigger the EPBC Act. The EPA's position of TECs states that proposals that result in the direct loss of TECs are likely to require formal assessment.

Possible TECs that do not meet survey criteria are added to the DEC's Priority Ecological Community (PEC) Lists under Priorities 1, 2 and 3. These are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed on Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An EPBC Act Protected Matters Search was undertaken for the Project Area. No EPBC Act listed TECs were indicated to occur within the search area.

A DEC TEC databases search indicated that no TECs or PECs are likely to occur within the vicinity of the Project Area.

3.15 Diseases and Pathogens

Phytophthora cinnamomi ("Dieback) disease is generally restricted to areas in the southwest of the State, south of the 26th parallel of latitude, in areas receiving an average annual rainfall of greater than 400 mm.

As the Project Area is north of this latitude it is not considered to be susceptible to the development of the *Phytophthora cinnamomi* pathogen.

3.16 Flora

3.16.1 Conservation Significant Flora

Flora species considered to be under threat are listed under the EPBC Act and/or the WC Act. Any activities that are deemed to have a significant impact on species that are recognised by these can trigger referral to the EPA and/or the DSEWPac.

A description of conservation categories delineated under the EPBC Act is detailed in Table 8. These are applicable to threatened flora and fauna species.

A search of the EPBC Act Protected Matters Search Tool did not identify any Commonwealth flora species within the vicinity of the Project Area.

In addition to the EPBC Act, significant flora in Western Australia is protected by the WC Act. This Act, administered by the DEC, protects Threatened Flora (Declared Rare) species. The DEC also maintains a list of Priority Listed Flora species. Conservation Codes for flora species are assigned by the DEC to define the level of conservation significance (Table 11). Priority Flora taxa are not currently protected under the WC Act. Priority Flora may be rare or threatened, but cannot be considered for declaration as rare flora until adequate surveys have been undertaken of known sites and the degree of threat to these populations have been clarified. Special consideration is often given to sites that contain Priority Flora, despite them not having formal legislative protection.

A search was undertaken through the DEC Threatened (Declared Rare) Flora Database, the DEC Declared Rare and Priority List and the Western Australian Herbarium (WAHERB) (Search Number: 33-0811FL). No Priority Flora species were indicated to occur, or potentially occur, within the vicinity of the Project Area.

A search of the online database NatureMap indicated that four Priority Flora taxa are known to occur within 15 km of the Project Area.

Table 3 Conservation Significant Flora Taxa Known to Occur Within Vicinity of Project Area

Taxon	Status	Description (after <i>FloraBase</i>)	Likelihood of Occurrence in Project Area
<i>Acacia repens</i>	Priority 1	A sprawling scrambling shrub with yellow flowers present in June. Occurs in steep rugged sandstone hillslopes on the Carr Boyd Ranges.	Unlikely, habitat not present in Project Area.
<i>Heliotropium uniflorum</i>	Priority 1	An annual or biennial herb to 0.3 m high with white flowers between March and December. Occurs on Sandstone and quartzite soils on stony slopes, and undulating rocky plateaux.	Unlikely. Only a small amount of habitat present in the south-west of the bridge corridor area.
<i>Triodia fissura</i>	Priority 1	A compact perennial grass up to 0.3 m high, growing in quartz sandstone soils in narrow fissures on steep or near vertical rock faces.	Unlikely, habitat not present in Project Area.
<i>Eucalyptus ordiana</i>	Priority 1	A mallee or tree growing to 5.5 m tall with smooth, powdery white bark. Flowers are white, present between April to May. Occurs in skeletal soils over sandstone or quartzite, on steep rocky outcrops.	Unlikely. Only a small amount of habitat present in the south-west of the bridge corridor area.

An assessment of the preferred habitat of these taxa indicates that all are unlikely to occur in the Project Area.

3.16.2 Weeds and Noxious Flora

Weeds of National Significance (WONS)

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

- ▶ Invasiveness;
- ▶ Impacts;
- ▶ Potential for spread; and
- ▶ Socio-economic and environmental values.

Declared Plants (DP)

Weeds that are, or may become, a problem to agriculture or the environment can be formally classified as Declared Plants under the *Agriculture and Related Resources Protection Act 1976* (AARP Act). The Department of Agriculture and Food and the Agriculture Protection Board maintains a list of Declared Plants for Western Australia. If a plant is declared for the whole of the State or for particular Local Government Areas all landholders are obliged to comply with the specific category of control. Declarations specify a category, or categories, for each plant according to the control strategies or objectives which the Agriculture Protection Board believes are appropriate in a particular place.

Among the factors considered in categorising declared plants are:

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

Declared Plants are divided into five classes (Table 4).

Table 4 Department of Agriculture and Food Declared Plant Control Classes

Control Class Code	Description
P1	Prohibits movement of plants or their seeds within the State. This prohibits the movement of contaminated machinery and produce including livestock and fodder.
P2	Eradicate infestation to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.

Control Class Code	Description
P3	Control infestation in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set all plants.
P4	Prevent the spread of infestation from the property on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set on all plants.
P5	Infestations on public lands must be controlled.

Project Area Assessment

The EPBC Act Protected Matters search undertaken for the project (PMST_N1E2DH) indicates that three invasive plant species or species habitat may occur in the vicinity of the Project Area:

- ▶ **Urochloa [Brachiaria] mutica* (Paragrass);
- ▶ **Cenchrus ciliaris* (Buffel Grass); and
- ▶ **Parkinsonia aculeata* (Parkinsonia).

The NatureMap search indicates a further two weed species known to occur within 15 km of the Project Area:

- ▶ **Aerva javanica* (Kapok Bush); and
- ▶ **Paspalum notatum*.

Of the weed species present, or likely to be present, *Parkinsonia* is indicated to be Weed of National Significance (WONS), and rated as a Declared Plant with control class codes P1 and P4 relevant to any plants potentially found in the Project Area.

3.17 Fauna

3.17.1 Existing Fauna Records

A search on *NatureMap* Records (sourced from the DEC and records of the Western Australian Museum) was undertaken for the Project Area inclusive of a 15 km buffer. The *NatureMap* records show that 68 birds, one mammal, one amphibian and seven reptile species have been officially recorded as present within the search area (Table 14)

3.17.2 Conservation Significant Fauna

The conservation of fauna species and their significance status is currently assessed under both State and Commonwealth Acts. The Acts include the Commonwealth EPBC Act and WC Act.

Commonwealth

The significance levels for fauna used in the EPBC Act are those recommended by the International Union for the Conservation of Nature and Natural Resources (ICUN). A description of Conservation Categories delineated under the EPBC Act and the circumstances under which a project will trigger referral to the DESWPaC are described in EPBC Act Fauna Conservation Categories.

The EPBC Act protects migratory species that are listed under the following International Agreements:

- ▶ Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a range state under the Convention;
- ▶ The Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA);
- ▶ The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and
- ▶ Listed Migratory species also include species identified in other international agreements as approved by the Commonwealth Environment Minister. The Act also protects Marine species on Commonwealth Lands and Waters.

The DSEWPaC maintains a database of matters of national environmental significance that are protected under the EPBC Act. An EPBC Act Protected Matters Report was generated for the matters of significance that may occur in, or relate to, the Project Area (DSEWPaC, 2010) (Table 14). A total of two *Endangered* and three *Vulnerable* fauna taxa were indicated to occur or possibly occur within the vicinity of the Project Area as a result of the database search. The Protected Matters Search indicated that the Project Area may host 13 Migratory Listed and 13 Marine Listed fauna taxa. Many of these categories overlap.

State

The WC Act uses a set of schedules, but also classifies species using some of the ICUN categories. These Schedules are described in Table 9, Appendix B.

In Western Australia the DEC also produces a supplementary list of Priority Fauna, these being species that are not considered Threatened under the Western Australian WC Act but for which the Government feels there is a cause for concern. These species have no special legislative protection, but their presence would normally be considered. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna. Levels of Priority are described in Table 10, Appendix B.

A search of the DEC's Threatened Fauna database for any rare and priority species that may occur in the general area has previously been undertaken using the



NatureMap online database. These records are from the DEC and the Western Australian Museum (WAM). Protected fauna species were identified as potentially occurring within the Project Area are listed in (Table 14)

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

Conservation Significant Fauna Assessment

An assessment of the likelihood of the presence of conservation significant fauna occurring in the Project Area is included in Table 5. Fauna taxa listed as Marine and Migratory by the EPBC Act, and listed Schedule 3 taxa under the WC Act, have not been included in this table (except where they hold additional threatened status). Within Western Australia the majority of these fauna taxa are common and are not considered to be under threat.

Of the nine conservation significant fauna considered to potentially be recorded in the Project Area only three taxa are considered likely to be present. The remainder are considered unlikely to occur due to lack of preferred habitat.

3.17.3 Feral Fauna

A total of two exotic (feral) fauna taxa were indicated to potentially occur within the Project Area by the EPBC Act Protected Matters Search:

- ▶ Cane Toad (*Bufo marinus*); and
- ▶ Feral Cat (*Felis catus*).



Table 5 Assessment of Conservation Significant Fauna

Taxon	Common Name	Status	Description	Record	Likelihood of Occurrence
<i>Burhinus grallarius</i>	Bush Stone-curlew	Priority 4	<p>This bird is a tall (60 cm high) camouflaged species that typically nests in open or grassy woodlands. It occurs across much of Western Australia, including large islands close to the northern and upper west coasts, as well as eastern Australian and southern New Guinea (Johnstone and Storr, 2004).</p> <p>Major threats are habitat destruction and predation by introduced predators.</p>	<i>NatureMap</i>	<p>Likely to be encountered as a vagrant or during foraging.</p> <p>Not considered to be significantly impacted by the proposed works due to the mobile nature of the species.</p>
<i>Erythura gouldiae</i>	Gouldian Finch	Endangered, Migratory; Schedule 1	<p>The Gouldian Finch was formerly distributed across northern Australia but now occurs in only a few sites in Queensland and at scattered locations across the Northern Territory and in Western Australia. This species lives in savannah woodlands with a grassy understorey, often in hilly areas around permanent waters. Gouldian Finches nest in tree hollows, particularly Snappy Gum (<i>Eucalyptus brevifolia</i>) in WA and feed on grasses (Johnstone and Storr, 2004).</p>	EPBC Act	<p>Possible present, particularly during the wet season. GHD has recorded this species from Bow River (south of the Project Area in early 2007).</p> <p>Considered unlikely to be impacted by the proposed works due to the migratory nature.</p>
<i>Malurus coronatus subsp. coronatus</i>	Purple-crowned Fairy-wren (western subspecies)	Vulnerable; Priority 4	<p>This species occurs alongside permanent rives and swamps, in riparian vegetation. It occurs along waterways in the Kimberley and east to the Victoria River in the Northern Territory. It occurs along portions of the Fitzroy, Drysdale, Durack and Ord River systems (Johnstone and Storr, 2004).</p>	EPBC Act	<p>Unlikely to be present as Big McPhee Creek is not a permanent watercourse.</p>
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable, Migratory, Marine; Schedule 1, Schedule 3	<p>This species is an aquatic bird that has a scattered distribution throughout Australia. It is typically found in shallow inland waters and can occur in both fresh and brackish waters that are permanently or temporarily filled. This species nests amongst reed-like vegetation near water (Johnstone and Storr, 2004).</p>	EPBC Act	<p>Unlikely to be present, as preferred habitat is not within the Project Area. May occur as a vagrant or for foraging.</p>



Taxon	Common Name	Status	Description	Record	Likelihood of Occurrence
<i>Pristis microdon</i>	Freshwater Sawfish	Vulnerable; Priority 3	This taxon is known from fresh or weakly saline rivers in northern Australia, including the Fitzroy, Durack and Ord Rivers in WA. This species appears to be restricted to the larger tributaries of these major rivers (Morgan <i>et al.</i> , 2002).	EPBC Act	Unlikely to be present, as preferred habitat is not within the Project Area.
<i>Dasyurus hallucatus</i>	Northern Quoll	Endangered; Schedule 1	The Northern Quoll is the smallest and most arboreal of the four quoll species. This species was historically common across the breadth of northern Australia, but now occurs in fragmented populations. In the Kimberley, records are scattered discontinuously from just south of Derby across to Wyndham, declining in lowland or semi-arid fringes. Its preferred habitat comprises of rocky areas (sandstone escarpments) and tall open coastal eucalypt forest (DSEWPaC, 2011).	EPBC Act	Unlikely to be present, as preferred habitat is not within the Project Area.
<i>Hydromys chrysogaster</i>	Water-rat	Priority 4	This species is widespread across northern and eastern Australia, Tasmania, and New Guinea, with isolated populations in the south-west of WA and offshore islands. It generally occurs in permanent fresh or brackish water. It is a largely carnivorous species, with the majority of its food source being crustaceans, aquatic insects and fish. It forages close to the shoreline in shallow waters less than 2 m deep.	NatureMap	Likely to be present within the vicinity of the Project Area. Is not considered to be impacted as preferred habitat will not be altered or impacted by the proposed project.
<i>Crocodylus johnstoni</i>	Freshwater Crocodile	Marine; Schedule 4	Freshwater crocodiles are widespread across northern Australia and occur in permanent freshwater rivers, gorges and billabongs.	EPBC Act	This species occurs in the waterways in the general area and may occur in the Project Area, dependent on the water levels of the Creek.



Taxon	Common Name	Status	Description	Record	Likelihood of Occurrence
<i>Crocodylus porosus</i>	Saltwater Crocodile	Migratory, Marine; Schedule 4	This species is distributed throughout coastal regions of northern Australia, from Broome in WA to Rockhampton in Queensland. It is found primarily along mangrove-lined tidal rivers in estuarine waters up to 200 km from the coast, and in floodplains, creeks and freshwater swamps close to the coast.	EPBC Act	Unlikely to be present, as preferred habitat is not within the Project Area.



4. Field Assessment

4.1 Field Surveys

Surveys were completed during July 2011 by two Senior Ecologists (Joshua Foster and Kiera Foster).

4.2 Physical Environment

4.2.1 Influence of Climate

Climate in the Project Area is distinctly marked by wet and dry seasons. It is presumed that works undertaken for this project would be undertaken in the dry when the risk of flooding is lower, reducing the chance for weather to adversely impact construction activities.

Rehabilitation is suggested to be undertaken at the end of a dry season to ensure that native flora can take advantage of wet season rainfall.

4.2.2 Soil

Soil within the Project Area is not considered to be markedly different to that indicated in the desktop environmental assessment. There are no special soil conditions expected to occur within the Project Area that would alter the outcomes of the project.

4.3 Hydrology and Drainage

The field assessment of hydrology and drainage confirmed information collated by the desktop assessment. The hydrological regime present at the Project Area will not be altered by the proposed works. The reconstruction of the bridge will occur at the same site of the existing bridge and not impact on the riparian vegetation along the Big McPhee Creek.

GHD considers that a Bed and Banks Permit from the DoW will be required by Main Roads for any bridge reconstruction works within the Creek.

4.4 Vegetation

4.4.1 Project Area Vegetation Types

Within the Project Area a total of 10 Vegetation Types were recorded (Table 6). These broadly correspond with the Vegetation Associations indicated in Section 3.14 and are shown in Figure 3.

4.4.2 Vegetation Type Assessment

Vegetation Association descriptions are typically based on the broadest, most dominant vegetation type in an area. As such, narrow vegetation types, such as





riparian woodlands, tend to get overlooked. The Project Area Vegetation Types are deemed to correspond with the known Vegetation Associations recorded in the area, and are considered to be of *Least Concern*.



The Riparian Woodland, dominated by *Eucalyptus camaldulensis* and *Melaleuca argentea* will not be impacted by the proposed works. Main Roads (*pers com.* M. Baetge) has indicated that any disturbance at the Big McPhee Creek crossing will occur in the existing corridor.




Table 6 Project Area Vegetation Types

Number	Vegetation Type	Description	Location	Photograph
1	Mixed Open Shrubland/Woodland on Plains	<p>A Mixed Low Open Woodland/Shrubland of <i>Corymbia confertiflora</i>, <i>Eucalyptus pruinosa</i>, <i>Corymbia grandifolia</i> subsp. <i>longa</i> over <i>Terminalia canescens</i>, <i>Bauhinia cunninghamii</i> <i>Melaleuca minutifolia</i>, <i>Melaleuca viridiflora</i> with Scattered <i>Acacia colei</i>, <i>Cochleospermum fraseri</i> over Mixed Tussock Grasses dominated by <i>Eriachne</i> and <i>Aristida</i> spp.</p> <p>Contains patches dominated by <i>Acacia</i> species, and open areas where recently burnt.</p>	Plains on Bridge Corridor	
2	Quartzite Hill	<p>Mixed Open Woodland over Shrubs of <i>Corymbia dichromophloia</i>, <i>Eucalyptus confluens</i> over <i>Terminalia canescens</i>, <i>Erythrophleum chlorostachys</i> over <i>Calytrix exstipulata</i>, <i>Petalostigma quadriloculare</i> over Grasses dominated by <i>Sorghum</i> sp.</p>	Southern corner of Bridge Corridor on low hill	





Number	Vegetation Type	Description	Location	Photograph
3	Riparian Woodland	<i>Eucalyptus camaldulensis</i> Woodland with <i>Melaleuca argentea</i> , <i>Terminalia hadleyana</i> , <i>Lophostemon grandiflorus</i> subsp. <i>riparius</i> , <i>Bauhinia cunninghamii</i> over Shrubland of <i>Ficus coronulata</i> , <i>Acacia oligoneura</i> , over <i>Grewia agrifolia</i> subsp. <i>agrifolia</i> , <i>Exocarpus latifolius</i> , <i>Atalaya hemiglauca</i> over Mixed Grassland of * <i>Cenchrus ciliaris</i> , <i>Digitaria bicornis</i> , <i>Eulalia aurea</i> .	Big McPhee Creek	
4	Open Woodlands on Slightly Rocky Ground	<i>Corymbia grandifolia</i> over <i>Terminalia canescens</i> over Mixed shrubs of <i>Tephrosia leptoclada</i> , <i>T. laxa</i> , <i>T. simplicifolia</i> over <i>Triodia</i> sp. on rocky ground.	Northern Hardstand Area	
5	Mixed Shrublands on Flats	Mixed Tall Shrubland of <i>Melaleuca minutifolia</i> , <i>Acacia cyperophylla</i> , <i>Acacia colei</i> var. <i>colei</i> over <i>Calytrix exstipulata</i> , <i>Waltheria indica</i> over Mixed Grasses of <i>Aristida</i> spp., <i>Heteropogon contortus</i> , <i>Schizachyrium fragile</i> with <i>Cyperus pulchellus</i> .	Material Pit 2	-



Number	Vegetation Type	Description	Location	Photograph
6	Mixed Woodlands	Mixed Woodland of <i>Eucalyptus brevifolia</i> over <i>Acacia cyperophylla</i> , <i>Acacia colei</i> var. <i>colei</i> over <i>Dodonaea physocarpa</i> , <i>Grevillea agrifolia</i> subsp. <i>agrifolia</i> , <i>Cochleospermum fraseri</i> , <i>Terminalia canescens</i> over <i>Triodia</i> sp.	Material Pit 1	
7	Damp Woodlands	<i>Corymbia grandifolia</i> subsp. <i>longa</i> with Scattered Trees and Shrubs of <i>Adansonia gregorii</i> and <i>Melaleuca viridifolia</i> over Mixed Herbland/Grassland of <i>Eriachne glauca</i> var. <i>barbinodis</i> , <i>Goodenia bicolor</i> , <i>Fimbristylis blepharolepis</i> , <i>Stylidium adenophorum</i> , <i>Cyperus pulchellus</i> , <i>Stemodia lythrifolia</i> , <i>Mimulus uvedalei</i> var. <i>uvedalei</i> .	Bridge Corridor Material Pit 1	-
8	Melaleuca Thicket	Thicket of <i>Melaleuca minutifolia</i> , <i>Calytrix exstipulata</i> with scattered emergent <i>Eucalyptus</i> and <i>Corymbia</i> over mixed grasses.	Hardstand Material Pit 1	-



Number	Vegetation Type	Description	Location	Photograph
9	Rehabilitated Area	<i>Corymbia dichromophloia</i> , <i>Acacia cyperophylla</i> , <i>Calytrix extipulata</i> with <i>Acacia lysiphloia</i> dominating shrubs on ripped and rehabbed area.	Material Pit 1	
10	Cleared/Degraded Areas	Areas cleared for emergency works, cleared along existing road corridor and hardstand area.	All Sites	

4.4.3 Vegetation Condition

The vegetation in the Project Area was given a condition rating based on the vegetation conditions ratings scale (after Keighery, 1994). Condition is based on:

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

The scale consists of six rating levels, as outlined below in Table 4.

Table 7 Vegetation Condition Rating Scale

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

The condition of vegetation within the Project Area varied substantially with increased degradation closer to the roads and creek line due to influence of historical clearing, road maintenance and weed invasion (Figure 2).

4.5 Flora

The survey was conducted in July 2011, late in the season following the season of greatest rainfall. With the Kimberley region experiencing a record wet season the number and diversity of plants was not impacted by the late survey, due to the higher than average rainfall. GHD considers that the survey conducted was adequate and does not believe further surveys are necessary.



4.5.1 Survey Results

A total of 169 flora taxa from 44 families were recorded from the Project Area. This result reflects a medium level of diversity, and is not considered to be an under-representation of the number of flora taxa present. A total of three taxa could not be adequately identified to species level due to lack of flowering material.

Dominant families recorded from the Project Area were:

- ▶ Poaceae (grasses): 28 taxa;
- ▶ Fabaceae (wattles, peas): 24 taxa;
- ▶ Myrtaceae (melaleuca, gums): 13 taxa;
- ▶ Malvaceae (hibiscus family): 13 taxa; and
- ▶ Cyperaceae (sedges): 11 taxa.

Dominant genera recorded from the Project Area were:

- ▶ Acacia (wattles): 6 taxa;
- ▶ Euphorbia (spurges): 5 taxa; and
- ▶ Fimbristylis (a sedge): 5 taxa.

The flora list for the Project Area, per site, is located in Table 13, Appendix C.

4.5.2 Conservation Significant Flora

No Threatened (Declared Rare) Flora taxa were recorded from the Project Area.

One flora species of conservation significance was recorded from the Project Area:

- ▶ *Fimbristylis incrassata* (Priority 3).

This taxon is a sedge species, growing up to 0.3 m tall in sand, sandy clay soils associated with swamps, creek beds, clay pans and semi-saline lakes. It is found in scattered locations across the Kimberley, with an isolated occurrence on the eastern margin of the Pilbara region.

Within the Project Area this species was recorded from two locations, one in the Bridge Corridor and one in Material Pit 1. Both locations were associated with damp areas. At each site more than 100 plants were recorded. GHD does not expect that either site will be impacted by the proposed works.



Plate 1 *Fuirena incrassata* (specimen JFKF223 recorded from the Bridge Corridor).

4.5.3 Other Conservation Significant Flora

No other conservation significant flora taxa were recorded from the Project Area. This includes no species that were at or beyond their known range.

4.5.4 Weeds and Noxious Flora

A total of 15 weed taxa were recorded from the Project Area, representing approximately 9% of the total flora collected. The majority of weed species recorded from the survey were from the Fabaceae (peas) and Poaceae (grasses), and were noted to occur along the roadside in the road maintenance zone and along the creek banks.

No Weeds of National Significance were recorded from the Project Area.

Three weed species were recorded from the Project Area that are indicated by the AARP Act to be Declared Plants:

- ▶ *Calotropis procera* (Calotrope): P1, P3;
- ▶ *Sida acuta* subsp. *acuta* (Spinyhead Sida): P1; and
- ▶ *Sida cordifolia*: P1.



Of the Declared Plants recorded only two species (both *Sida*) have control codes applicable to the Project Area. Hygiene management measures are considered to be required to minimise the spread of these species.

4.6 Fauna

4.6.1 Survey Results

A total of one amphibian, four mammal, two reptile and 19 bird species were recorded from the Project Area (Appendix D, Table 14). This is considered to be an adequate record, based on the survey being conducted over three days and in conjunction with the vegetation and flora survey.

4.6.2 Conservation Significant Fauna Records

No Threatened fauna taxa were recorded from the Project Area.

A total of five EPBC Act Marine Listed fauna taxa were recorded from the Project Area. One of these species *Merops ornatus* (Rainbow Bee-eater) is also Marine Listed under the EPBC Act and as a Schedule 3 fauna taxon under the WC Act.

These species are common, widespread and not considered to be under threat.

4.6.3 Exotic Fauna

From the desktop assessment two exotic/feral fauna taxa were considered likely to occur in the Project Area, the Cane Toad and Feral Cat.

The field assessment recorded one introduced fauna taxon (Domestic Cattle) and two feral fauna, Feral Cat and Wild Horse/Brumby.

4.6.4 Fauna Habitat

Within the Project Area the extent of vegetation remains relatively unaltered apart from localised impacts from roadworks and mining and grazing impacts from pastoral activities.

Habitat Importance

Most of the survey area vegetation is in good condition and retains good quality habitat value. It is not considered that fauna habitat within the survey area contains significant habitat that is not represented by better condition habitat in the surrounding region.

Habitat Linkages

Fauna corridors and habitat linkage are important to allow animals to move between areas of resource availability. Such corridors are important for ground and aerial fauna, providing cover, resources, and linking areas suitable for rest and reproduction. Habitat corridors are important in areas where extensive clearing has occurred to help overcome the effects of habitat fragmentation. These corridors assist in maintaining genetic diversity through connection of gene pools, enabling recolonisation of disturbed



areas and the provision of habitat. Where contiguous bushland areas cannot be maintained a connection can still be maintained through “stepping stones”, which are isolated patches of vegetation close enough together to allow certain species to move between them. Stepping stones are primarily of importance to very mobile species such as birds. Birds often require ‘flyways’, vegetated areas along a bush corridor, which they can use to move between habitat areas. These corridors can provide shelter from predators and rest sites.

The Project Area is not considered to contain any significant breaks to habitat linkages, being completely surrounded by relatively unaltered rangeland. Creek line and riparian vegetation is considered to be vital for providing corridors for fauna species utilising waterways and pools.

5. Assessment Against the Department of Environment and Conservation's Ten Clearing Principles

5.1 Vegetation Clearing

Clearing applications are assessed against 10 principles outlined in Schedule 5 of the *Environmental Protection Act 2003*. These principles aim to ensure that all potential impacts resulting from removal of native vegetation can be assessed in an integrated way. The principles address three main environmental areas:

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

These principles apply to all lands throughout Western Australia. If the project involves significant impacts other than on native vegetation, or the clearing is exempt under Section 51C but is considered to have a significant impact, it should be referred to the EPA for consideration.

Any clearing of native vegetation requires a permit under Part V of the *Environmental Protection Act* (1986), except where exemptions apply under Schedule 6 of the Act or are prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. These exceptions do not apply in Environmentally Sensitive Areas (ESAs).

5.1.1 Assessment against the Ten Clearing Principles

This project has been assessed against the 'Ten Clearing Principles' (Appendix E) and found to be: "unlikely" to be at variance with Clearing Principle (a), (b) and (h); and "not" at variance with the remaining Principles.

Main Roads indicated to GHD that no works will impact riparian vegetation beyond the currently disturbed footprint of the Big McPhee Creek crossing (see Clearing Principle (f)).

Clearing Principle (a) states: "Native vegetation should not be cleared if it comprises a high level of biological diversity."

This Principle includes an examination of Priority Flora taxa, one species of which was recorded from the Project Area. GHD considers that it is unlikely that individuals or significant habitat of these Priority Flora taxa will be impacted as the location occurs away from the current road alignment and in the far corner of Material Pit A, where no clearing or plant equipment movement will occur.

Clearing Principle (b) states: "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."



This Principle covers the presence of conservation significant fauna. Fauna species that are mobile or nomadic are unlikely to be impacted by the proposed works. Better condition habitat occurs away from the Project Area.

Clearing Principle (h) states: “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 Material Pits occur in an area that is considered to be on Register of National Estate “Parts of the Kimberley WA”. However, both Material Pits contain already disturbed vegetation and the project is considered unlikely to alter the existing environmental values of the National Estate.



6. Potential Impacts and Management

There are a number of potential impacts associated with construction of the project. This section details the environmental impacts and management measures for those aspects considered relevant, as identified in Section 4.

A summary of the management actions is contained within Appendix F.

6.1 Native Vegetation Clearing

Area of Assessment

Project area.

Method of Evaluation

The purpose of the EPA is to ensure levels of abundances, diversity and productivity of flora species is maintained or that adverse impacts are managed in an appropriate manner in accordance with Schedule 5 of the *Environmental Protection Act's 2003* 10 Clearing Principles Appendix D.

Extent of Potential Impact

The potential impact of native vegetation clearing near the location of the bridge.

Proposed Management

Main Roads will manage clearing in the following manner to ensure clearing and disturbance of vegetation for the proposed project is minimised:

- ▶ The areas to be cleared will be minimised by preferentially using areas of existing disturbance, including existing access tracks and former material pit areas;
- ▶ Areas to be cleared will be pegged prior to commencing earthworks;
- ▶ No vegetation outside the designated areas will be removed during earthworks, construction or operation;
- ▶ Earthmoving equipment will be cleaned of soil and vegetation prior to entering and leaving the area to be cleared;
- ▶ Avoid impacting areas of variable vegetation, such as vegetation along creek lines, rock outcrops and breakaways as these areas generally tend to have higher biodiversity values and are of value as fauna habitat;
- ▶ Vehicle parking and temporary materials storage will be located on existing cleared areas where possible;
- ▶ Once the pits are exhausted the disturbed areas will be rehabilitated as soon as possible;
- ▶ Material cleared will be utilised in rehabilitation works where practicable;
- ▶ Earthmoving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared;



- ▶ If imported soils and materials are to be used, they will be weed free;
- ▶ Movement of soil will be avoided in wet conditions;
- ▶ Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared;
- ▶ Cleared vegetation (including stubble) will be used in site rehabilitation and erosion control where practical;
- ▶ Cleared vegetation (or stubble) will not be burnt on-site;
- ▶ Stripped topsoil will be salvaged for use in site rehabilitation if required; and
- ▶ Materials and topsoil stockpiles will be located so as not to restrict or interfere with existing site drainage.

6.2 Weed Management

Area of Assessment

Project area.

Extent of Potential Impact

There is a risk of spreading weed species during construction works. This will be managed through clearing vehicles and machinery of soil and vegetative material and also ensuring that any introduced materials are free from environmental or noxious weeds.

Proposed Management

The following management actions will be adhered to:

- ▶ Earth-moving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared;
- ▶ Movement of soil will be avoided in wet conditions;
- ▶ If imported soils and materials are to be used, they will be weed free;
- ▶ Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared; and
- ▶ Any declared flora species located in the area will be controlled in accordance with Sections 49 and 51 of the Agriculture and Related Resources Protection Act 1976.

6.3 Fauna

Area of Assessment

Project area.

Extent of Potential Impact

Impacts are likely to occur to individual animals and include:

- ▶ Minor loss of habitat and feeding areas. This is not considered to be a substantial impact on the current extent of habitat. There will be a minor loss of refuge vegetation and associated foraging resources;
- ▶ The harm, death or displacement of fauna may likely occur during material pit exploration.

Proposed Management

Main Roads will manage the project in the following manner to protect the local fauna during clearing and operation of the project works:

- ▶ Meet all requirements of the *Wildlife Conservation Act* (1950);
- ▶ Clearing will be undertaken as outlined in Section 6.1;
- ▶ Noise and vibration will be managed as outlined in Section 6.7;
- ▶ Works will cease on sighting an animal which might be at risk of injury in the Project Area. Works will recommence once the animal has moved on;
- ▶ The work site will be left in a safe condition at the end of each working day to ensure animals are not subject to harm from the project works;
- ▶ During construction works the area will be inspected each morning to ensure no fauna have been trapped during the previous evening. A regional DEC officer or designated representative will be contacted to facilitate removal if necessary;
- ▶ No native fauna (including venomous snakes) will be deliberately impaired or killed during project works;
- ▶ Where possible clearing will be undertaken at a time of year that is least likely to impact on breeding or nesting species (i.e. avoid clearing from late in the wet season to the early dry season);
- ▶ Barriers to native fauna movement will be minimised;
- ▶ Ensure material pits are left hydrologically neutral to prevent water pooling which may enhance the success of feral fauna species;
- ▶ Laydown areas will be constructed on previously disturbed areas; and
- ▶ The movement of machinery and vehicles will be minimised or restricted at dusk and dawn and during night time hours.

6.4 Surface Waters/Drainage

Relevant Area

Project area.

Extent of Potential Impact

Drainage impacts during construction works are issues in respect to maintaining existing surface water flows. The project works will alter the local hydrological regime through the following impacts:

- ▶ There are minor risks of erosion in the pit areas;



- ▶ Pit excavation has the potential to create temporary pools following rainfall;
- ▶ Alteration to natural surface water drainage may occur.

Proposed Management

In order to mitigate any drainage impacts that may occur, the following management measures will be initiated:

- ▶ No hazardous materials will be used or held on-site within 50 m of any water body;
- ▶ Existing natural drainage paths and drainage channels along road reserves will not be unnecessarily blocked or restricted by material stockpiles;
- ▶ Any material that is found to block drainage will be removed.

6.5 Groundwater

Relevant Area

Project area.

Extent of Potential Impact

The following are potential impacts to groundwater:

- ▶ Groundwater quality could be degraded by pollutants entering the soil;
- ▶ Unsustainable use of groundwater.

Proposed Management

Construction of bores and abstraction of groundwater or surface water will require a 26D Licence under the *Rights in Water and Irrigation Act 1914*.

The construction contractor is responsible for the supply and delivery of water required for the project. The construction contractor (subject to the approval of the Superintendent) is also responsible for ensuring that all water abstraction and use is licensed and all approvals have been obtained.

Main Roads will ensure adhere to the following management practices to prevent contamination of the groundwater resources in the Project Area:

- ▶ In the event that hazardous materials are to be used or held on-site, materials will be managed in accordance with Main Roads safety procedures;
- ▶ No vehicles will be serviced or refuelled on the site;
- ▶ A 'Spill Kit' will be provided on-site at all times;
- ▶ The Site Spill Response Plan will be implemented to deal with spillages and leaks within the site area. This plan provides details on methods of containment, collection and disposal, and training of personnel;
- ▶ Any accidental spillage will be reported to the contracting manager and emergency clean-up procedures will be immediately implemented. These procedures will include the control of any spilt material and removal of contaminated soil to an approved site if required; and



- ▶ Liaise and gain relevant abstraction licences from the Department of Water.

6.6 Dust

Relevant Area

Project area.

Extent of Potential Impact

Dust may be generated from the clearing of vegetation, earthworks, spillage of soil material and vehicle movements along sealed and unsealed roads.

There is likely to be some dust lift generated during the construction works and from passing traffic that has the potential to settle on, and cause impacts to, adjacent vegetation and residential premises.

Proposed Management

During vegetation clearing of the access track regular watering of the road will be undertaken to minimise dust emissions. The construction contractor will provide for the management of dust by watering of the works area and other areas immediately adjacent to the works as required.

Where it is found that vehicles leaving the site have dropped excessive soil material these sections will be swept to reduce the potential for dust generation and maintain traffic safety.

The following methods of dust management will be used:

- ▶ Water tankers will be available at all times to wet down exposed surfaces on works areas, laydown sites, spoil dumps and topsoil and materials heaps;
- ▶ Minimise as far as possible dust generating activities;
- ▶ Dust lift will be monitored through visual and other means and all complaints responded to rapidly; and
- ▶ Staged vegetation clearing will be undertaken to reduce dust generation.

6.7 Noise and Vibration

Relevant Area

Project area.

Extent of Potential Impact

Machinery and vehicles during the construction and operational phases of the project will emit some noise. However the noise impact is considered minimal.

Proposed Management

In order to control noise emissions in the project area the following site actions will be undertaken:



- ▶ All equipment will be regularly maintained and serviced, including exhaust systems; and
- ▶ Plant and equipment will only be operated in accordance with Shire of Ashburton requirements.

6.8 Use of Hazardous Substances

Relevant Area

Project area.

Extent of Potential Impact

- ▶ There is potential for vehicle fuels leaks/spills during any of the operating procedures associated with material pit construction; and
- ▶ There is risk of soil contamination resulting from any spills.

Proposed Management

The following management actions will be the responsibility of Main Roads. Overall site management will include the following:

- ▶ Any accidental spillage will be reported to the contracting manager as soon as practicable;
- ▶ Emergency clean-up procedures will immediately be implemented in the case of any spillage. These will include control of spilt material and removal of contaminated soil to an approved site if required;
- ▶ No light vehicles will be serviced or refuelled on the site;
- ▶ Larger plant machinery will be serviced off-site; and
- ▶ A 'spill kit' will be provided on-site at all times.

6.9 Aboriginal Heritage

Relevant Area

Project area.

Proposed Management

Main Roads and their contractors will be aware of their obligations under the *Aboriginal Heritage Act 1972* during the project works.

If, during project works, the construction contractor uncovers any materials that could be considered significant to Aboriginal people, Main Roads will:

- ▶ Immediately cease works within 50 m of the material and notify DIA immediately;
- ▶ If any human skeletal material is uncovered work shall cease within 20 m of the material and it shall be reported to the WA Police as soon as possible.



6.10 Visual Impacts

Relevant Area

Project area.

Extent of Potential Impact

Material pits occurring close to the road have the potential to cause a decrease in visual amenity for road users.

Proposed Management

To minimise the longer-term visual impact the following should occur:

- ▶ No spoil heaps or other materials will be left in view of the road;
- ▶ Rehabilitation will be carried out as soon as possible following completion of works in each area.

6.11 Inductions and Training

Relevant Area

Project area.

Proposed Management

The following management actions will be adhered to:

- ▶ Construction personnel should be made aware of the issues and actions in this Management Plan so that they do not unnecessarily damage the environment during the works phase;
- ▶ Emergency training in relation to fires, chemical spills or other risks shall be carried out early in the construction phase.

6.12 Complaints Handling Procedure and Register

Relevant Area

Project area.

Proposed Management

The following management actions will be adhered to:

- ▶ Any complaints received relating to the project will be notified to the site representative and MRWA representatives notified.

6.13 Management of Environmental Incidents

Relevant Area

Project area.



Extent of Potential Impact

Project area.

Proposed Management

The following management actions will be adhered to:

- ▶ Structure and content of incident reports;
- ▶ Reporting of the incident in an incident log;
- ▶ Time limits for incident reporting and response;
- ▶ Assessment of the significance of each incident;
- ▶ Discontinuation of the work which gave rise to the incident;
- ▶ Reporting incidents, where necessary, to regulatory authorities and stakeholders;
and
- ▶ Satisfactory and timely remediation/mitigation of impacts.



7. Recommendations

7.1 Commonwealth Government

A review of the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) online database was conducted as part of preparing this EIA. There are no environmental impacts or issues considered as having a significant impact on matters of national environmental significance, which would render the project a “Controlled Action” or invoke the Commonwealth EPBC Act.

Formal referral of this project to the Commonwealth Minister for the Environment is not considered warranted.

7.2 Western Australian Government

7.2.1 Environmental Protection Authority

The Project proposes to replace the existing Big McPhee Bridge.

Based on the small scale of this Project, associated level of public interest and minimal environmental impact, it is recommended that this Project not be formally referred to the Environmental Protection Authority.

Main Roads Purpose Permit (818/6) which been granted to Main Roads under section 51E of the *Environmental Protection Act 1986*, allows the clearance of native vegetation for this project activity. However, this Permit does not authorise the clearance of native vegetation for project activities where:

- ▶ The clearing may be seriously at variance with the clearing principles; or
- ▶ 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.

The project has been assessed to be not at variance any of the 10 Clearing Principles.

7.2.2 Department of Environment and Conservation

This project was found not to be at variance with any of the 10 Clearing Principles. GHD considers that the Main Roads Purpose Permit (818/6) is likely to be adequate for the purposes of this project.

7.2.3 Department of Water

GHD recommends that Main Roads consult the Department of Water (DoW) and apply if deemed necessary in relation to:

- ▶ Dewatering – ‘Application for a 5C Licence to take Groundwater’ (Form A); and
- ▶ Modifying beds and banks – ‘Application for a 5C Licence to Take Surface Water/Application for a 11/17/21 A permit to modify bed and banks/Application to amend a 11/17/21A permit to modify bed and banks’ (Form C).



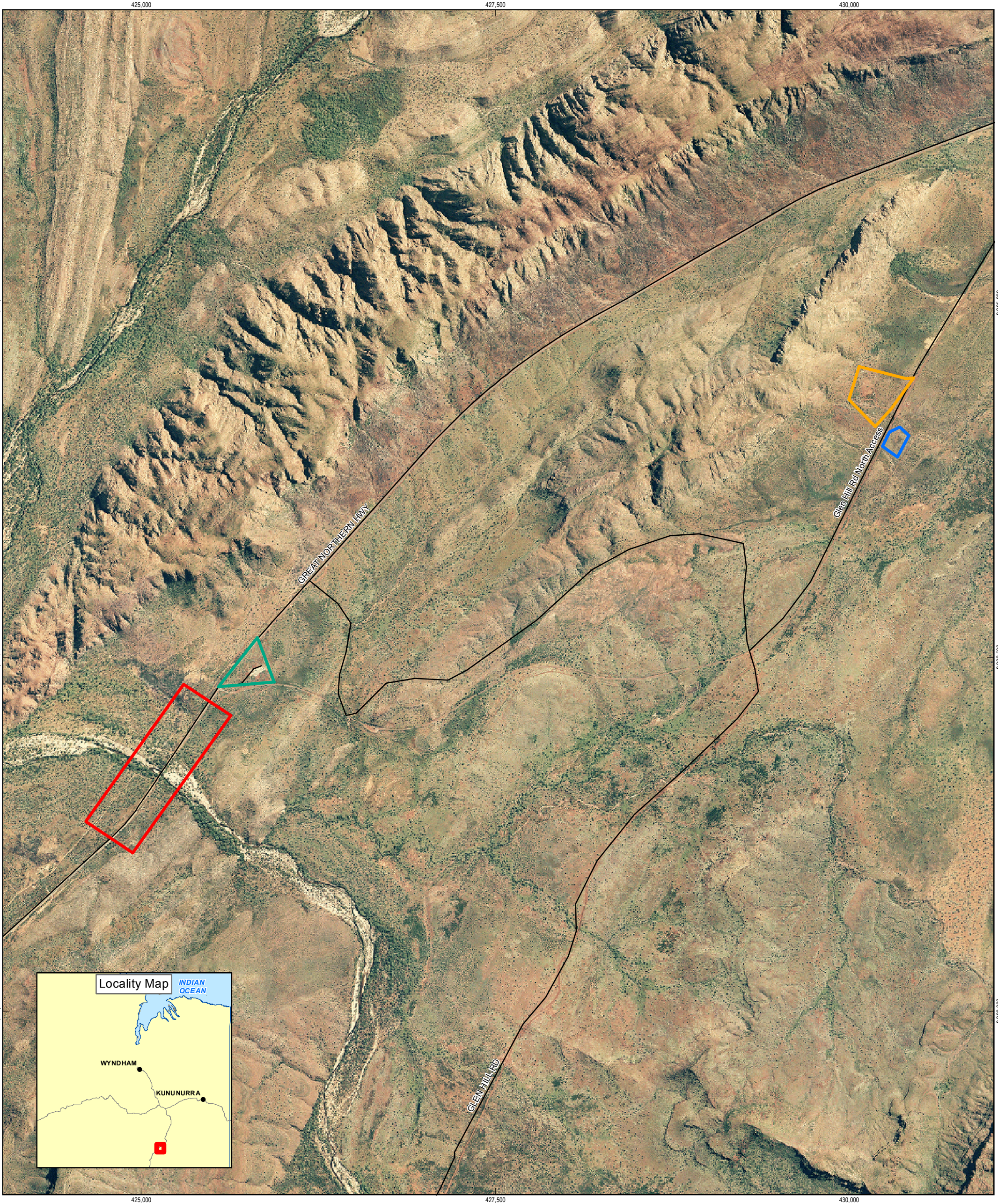
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Appendix A

Figures



LEGEND

— Roads

Study Areas

Bridge Corridor

Hardstand Area

Material Pit B

Material Pit A

0 125 250 500 750 1,000 1,250

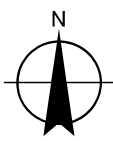
Metres

1:25,000(at A3)

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 52



GHD

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mainroads

WESTERN AUSTRALIA

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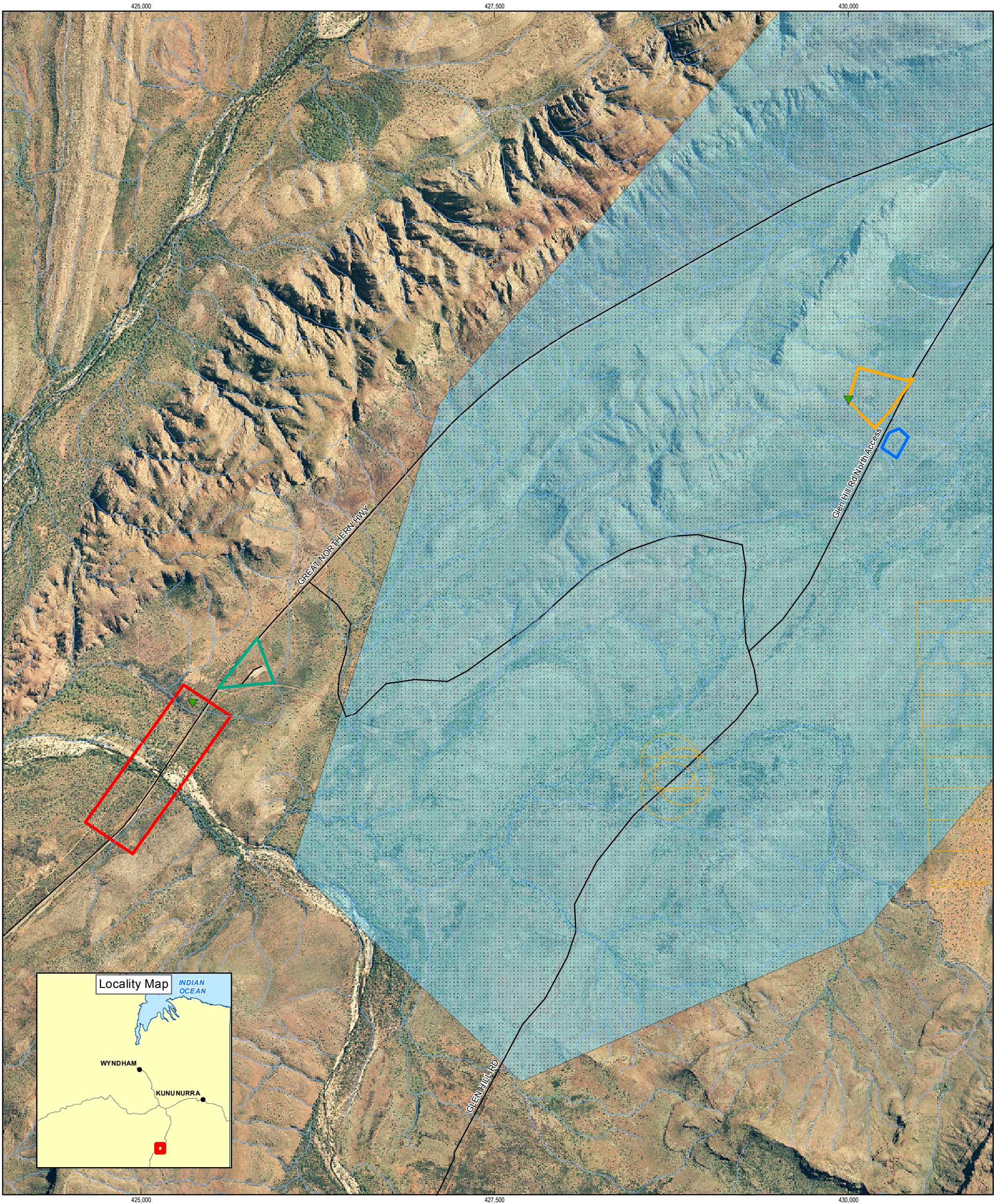
Main Roads WA - ETS

MRWA Big McPhee Bridge Replacement EIA EMP

Job Number	61-27044
Revision	0
Date	23 Nov 2011

Project Location

Figure 1



LEGEND

GHD Significant Flora

- ▼ *Fuirena incrassata* (DP i.e Declared NOXIOUS Plant)
- ▼ *Fuirena incrassata* Priority 3
- ▼ *Sida acuta* subsp. *acuta* (DP i.e. Declared NOXIOUS Plant)

- Watercourses
- Roads
- Aboriginal Heritage Sites
- Register of National Estate

Study Areas

- Bridge Corridor
- Hardstand Area

- Material Pit B
- Material Pit A

0 125 250 500 750 1,000 1,250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

N

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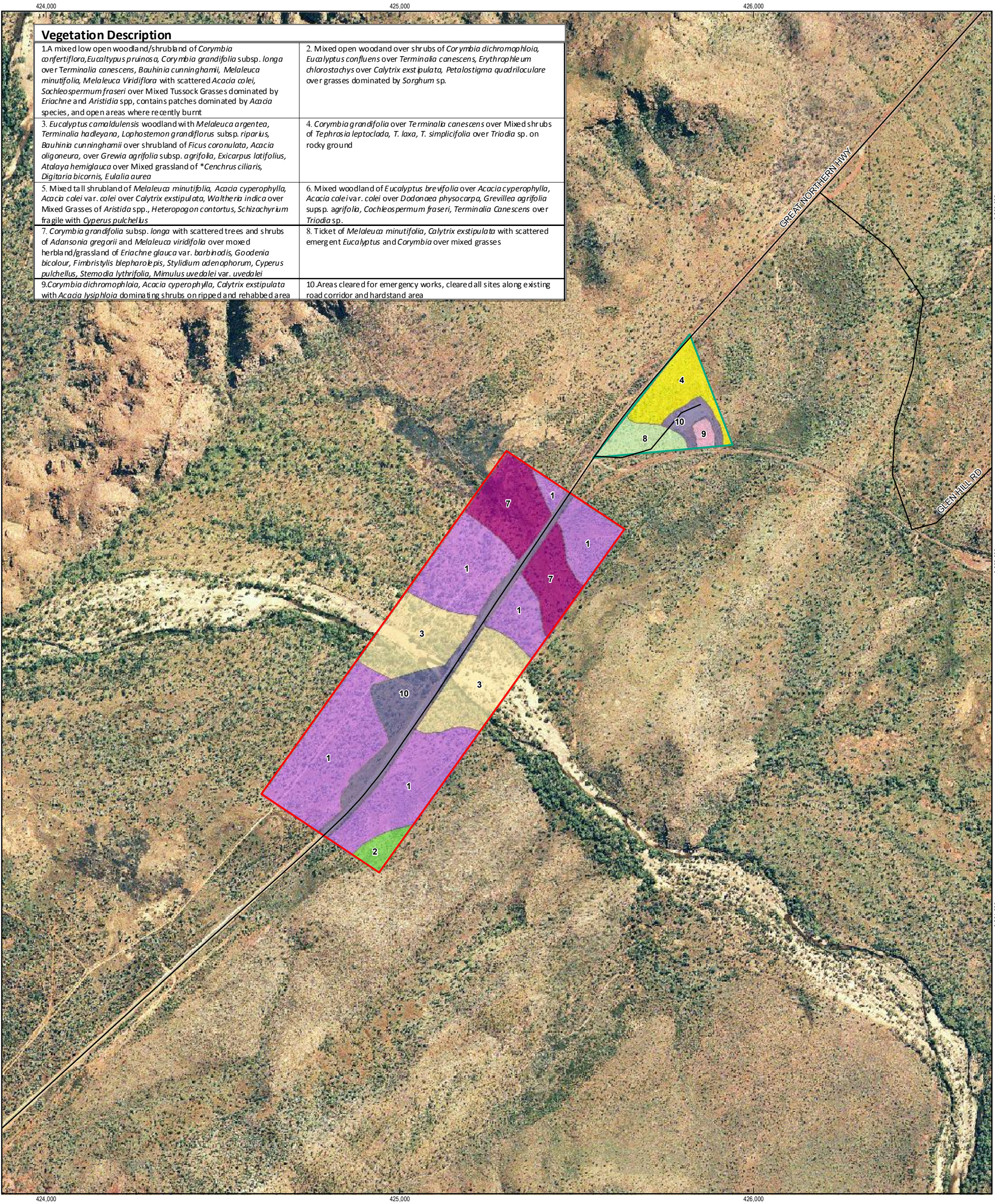
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Main Roads WA - ETS
MRWA Big McPhee Bridge Replacement EIA EMP

Job Number 61-27044
Revision 0
Date 23 Nov 2011

Environmental Constraints

Figure 2





LEGEND

— Roads

Study Areas

- Bridge Corridor
- Hardstand Area
- Material Pit A
- Material Pit B

Vegetation Condition

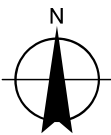
- 1. Pristine or Nearly So
- 2. Excellent
- 3. Very Good
- 4. Good
- 5. Degraded
- 6. Completely Degraded

0 50 100 200 300 400 500

Metres

1:10,000 (at A3)

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52



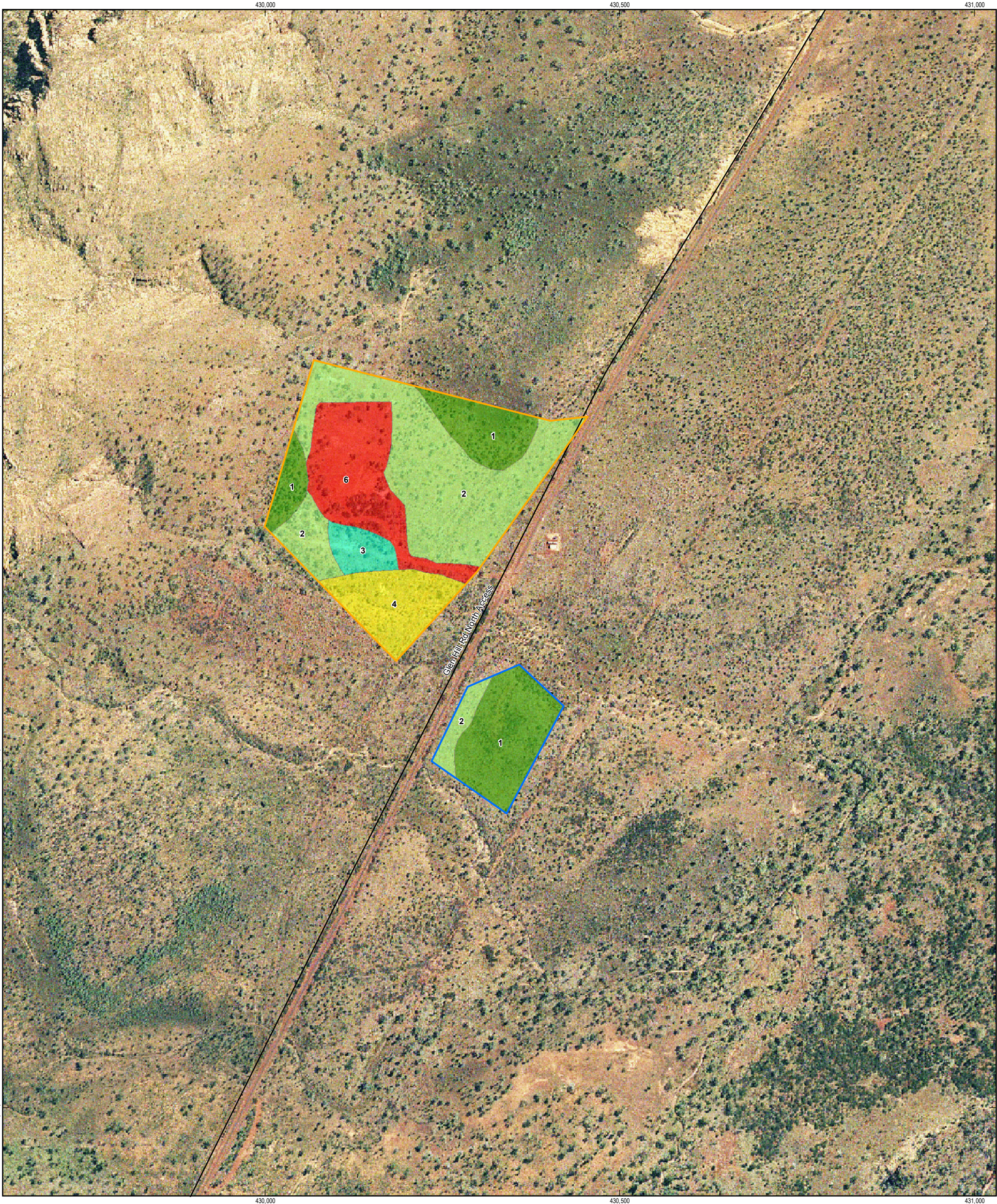
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SLIP ENABLER

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Main Roads WA - ETS
MRWA Big McPhee Bridge Replacement EIA EMP

Job Number	61-27044
Revision	0
Date	23 Nov 2011

Vegetation Condition



LEGEND

— Roads

Study Areas

Bridge Corridor

Hardstand Area

Material Pit A

Material Pit B

Vegetation Condition

1. Pristine or Nearly So

2. Excellent

3. Very Good

4. Good

5. Degraded

6. Completely Degraded

0 25 50 100 150 200 250

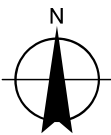
1:5,000 (at A3)

Metres

Map Projection: Transverse Mercator

Horizontal Datum: GDA 1994

Grid: GDA 1994 MGA Zone 52



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Main Roads WA - ETS
MRWA Big McPhee Bridge Replacement EIA EMP

Job Number	61-27044
Revision	0
Date	23 Nov 2011

Vegetation Condition



Appendix B

Conservation Categories

EPBC Act

WC Act

DEC



EPBC Act Conservation Categories

Listed threatened species and ecological communities

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

- ▶ Extinct in the wild,
- ▶ Critically Endangered,
- ▶ Endangered, or
- ▶ Vulnerable.

See Table 8.

Critically endangered and endangered species

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

- ▶ Lead to a long-term decrease in the size of a population, or
- ▶ Reduce the area of occupancy of the species, or
- ▶ Fragment an existing population into two or more populations, or
- ▶ Adversely affect habitat critical to the survival of a species, or
- ▶ Disrupt the breeding cycle of a population, or
- ▶ Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- ▶ Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- ▶ Interfere with the recovery of the species.

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

Vulnerable species

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

- ▶ Lead to a long-term decrease in the size of an important population of a species, or
- ▶ Reduce the area of occupancy of an important population, or
- ▶ Fragment an existing important population into two or more populations, or
- ▶ Adversely affect habitat critical to the survival of a species, or
- ▶ Disrupt the breeding cycle of an important population, or
- ▶ Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or



- ▶ Result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or
- ▶ Interferes substantially with the recovery of the species.

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

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

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

Listed Migratory species

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed migratory species. Note that some migratory species are also listed as threatened species. The criteria below are relevant to migratory species that are not threatened.

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

- ▶ Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- ▶ Result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- ▶ Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An area of important habitat is:

1. Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
2. Habitat utilised by a migratory species which is at the limit of the species range, or
3. Habitat within an area where the species is declining.

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

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



Table 8 Conservation Categories and Definitions for *EPBC Act* Listed Flora and Fauna Species

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

Table 9 Western Australian *Wildlife Conservation Act 1950* Conservation Codes

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

(Species not listed under the *Wildlife Conservation Act 1950*, but for which there is some concern).

Table 10 DEC Priority Fauna Codes

Conservation Code	Description
Priority 1	Taxa with few, poorly known populations on threatened lands.
Priority 2	Taxa with few, poorly known populations on conservation lands. Taxa



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

Table 11 Conservation Categories for WA Flora Taxa

Code	Conservation Category	Definition
X	Presumed Extinct Flora (Declared Rare Flora – Extinct)	Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such (Schedule 2 under the Wildlife Conservation Act 1950).
T	Threatened Flora (Declared Rare Flora – Extant)	<p>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 (Schedule 1 under the Wildlife Conservation Act 1950).</p> <p>Threatened Flora are further ranked by the Department according to their level of threat using IUCN Red List criteria:</p> <p>CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild;</p> <p>EN: Endangered – considered to be face a very high risk of extinction in the wild; and</p> <p>VU: Vulnerable – considered to be facing a high risk of extinction in the wild.</p>
P1	Priority 1 – Poorly Known Taxa	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
P2	Priority 2 – Poorly Known Taxa	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
P3	Priority 3 – Poorly Known Taxa	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
P4	Priority 4 – Rare, Near Threatened and other taxa in need of monitoring	<u>Rare</u> . Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These



Code	Conservation Category	Definition
		taxa are usually represented on conservation lands. <u>Near Threatened</u> . Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
P5	Priority 5 – Conservation Dependent Taxa	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.



EPBC Act Flora and Fauna Conservation Categories

Listed Threatened Species and Ecological Communities

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

- ▶ Extinct in the wild,
- ▶ Critically Endangered,
- ▶ Endangered, or
- ▶ Vulnerable.

Critically Endangered and Endangered Species

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

- ▶ Lead to a long-term decrease in the size of a population, or
- ▶ Reduce the area of occupancy of the species, or
- ▶ Fragment an existing population into two or more populations, or
- ▶ Adversely affect habitat critical to the survival of a species, or
- ▶ Disrupt the breeding cycle of a population, or
- ▶ Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- ▶ Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- ▶ Interfere with the recovery of the species.

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

Vulnerable Species

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

- ▶ Lead to a long-term decrease in the size of an important population of a species, or
- ▶ Reduce the area of occupancy of an important population, or
- ▶ Fragment an existing important population into two or more populations, or
- ▶ Adversely affect habitat critical to the survival of a species, or
- ▶ Disrupt the breeding cycle of an important population, or
- ▶ Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- ▶ Result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or



- ▶ Interferes substantially with the recovery of the species.
- ▶ An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:
 - ▶ Key source populations either for breeding or dispersal,
 - ▶ Populations that are necessary for maintaining genetic diversity, and/or
 - ▶ Populations that are near the limit of the species range.

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

Table 12 Conservation Categories and Definitions for EPBC Act Listed Flora and Fauna Species.

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



Appendix C

Flora

Project Area Flora List



Table 13 Project Area Flora List

Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Acanthaceae	<i>Dicliptera</i>	<i>armata</i>								X
Amaranthaceae	<i>Achyranthes</i>	<i>aspera</i>	Chaff Flower			X				
Amaranthaceae	<i>Alternanthera</i>	<i>pungens</i>	Khaki Weed	*		X				
Amaranthaceae	<i>Gomphrena</i>	<i>flaccida</i>	Gomphrena Weed		X			X		X
Amaranthaceae	<i>Gomphrena</i>	<i>leptoclada</i> subsp. <i>saxosa</i>			X				X	X
Amaranthaceae	<i>Ptilotus</i>	<i>fusiformis</i>							X	
Amaranthaceae	<i>Ptilotus</i>	<i>corymbosa</i>						X	X	X
Amaranthaceae	<i>Ptilotus</i>	<i>fusiformis</i>					X	X		
Apocynaceae	<i>Calotropis</i>	<i>procera</i>	Calotrope	*DP	X	X				X
Apocynaceae	<i>Carissa</i>	<i>lanceolata</i>	Conkerberry		X			X		X
Apocynaceae	<i>Marsdenia</i>	<i>viridiflora</i>				X				
Asteraceae	<i>Bidens</i>	<i>bipinnata</i>	Bipinnate Beggartick	*	X		X			
Asteraceae	<i>Blumea</i>	<i>diffusa</i>			X					X
Asteraceae	<i>Blumea</i>	<i>integrifolia</i>			X					X
Asteraceae	<i>Iotasperma</i>	<i>australiense</i>			X					
Asteraceae	<i>Pterocaulon</i>	<i>serrulatum</i>			X					X
Bignoniaceae	<i>Dolichandrone</i>	<i>heterophylla</i>	Lemonwood			X		X		
Bixaceae	<i>Cochlospermum</i>	<i>fraseri</i>	Kapok Bush		X			X	X	X



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Boraginaceae	<i>Ehretia</i>	<i>saligna</i>	False Cedar		X			X	X	X
Boraginaceae	<i>Heliotropium</i>	<i>glabellum</i>						X	X	
Byblidaceae	<i>Byblis</i>	<i>liniflora</i>	Northern Byblis				X			
Caryophyllaceae	<i>Polycarpaea</i>	<i>corymbosa</i>			X					X
Caryophyllaceae	<i>Polycarpaea</i>	<i>holtzei</i>						X		X
Caryophyllaceae	<i>Polycarpaea</i>	<i>longiflora</i>								X
Celastraceae	<i>Stackhousia</i>	<i>intermedia</i>			X			X	X	X
Cleomaceae	<i>Cleome</i>	<i>viscosa</i>	Tickweed			X				
Combretaceae	<i>Terminalia</i>	<i>bursarina</i>			X				X	X
Combretaceae	<i>Terminalia</i>	<i>hadleyana</i>			X	X				
Combretaceae	<i>Terminalia</i>	<i>canescens</i>	Joolal		X			X	X	X
Commelinaceae	<i>Murdannia</i>	<i>graminea</i>	Baniyu		X					
Convolvulaceae	<i>Evolvulus</i>	<i>alsinoides</i> var. <i>decumbens</i>	Tropical Speedwell		X					
Convolvulaceae	<i>Ipomoea</i>	<i>eriocarpa</i>					X	X		
Convolvulaceae	<i>Polymeria</i>	<i>ambigua</i>	Morning Glory		X					
Cyperaceae	<i>Bulbostylis</i>	<i>barbata</i>					X			
Cyperaceae	<i>Cyperus</i>	<i>pulchellus</i>			X				X	X
Cyperaceae	<i>Cyperus</i>	<i>viscidulus</i>								X
Cyperaceae	<i>Eleocharis</i>	<i>spiralis</i>					X		X	X



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Cyperaceae	<i>Fimbristylis</i>	<i>blepharolepis</i>							X	X
Cyperaceae	<i>Fimbristylis</i>	<i>cardiocalpa</i>			X			X		
Cyperaceae	<i>Fimbristylis</i>	<i>schultzei</i>						X	X	X
Cyperaceae	<i>Fimbristylis</i>	<i>signata</i>								X
Cyperaceae	<i>Fimbristylis</i>	<i>simplex</i>								X
Cyperaceae	<i>Fuirena</i>	<i>incrassata</i>		P3			X			X
Cyperaceae	<i>Lipocarpa</i>	<i>microcephala</i>								X
Droseraceae	<i>Drosera</i>	<i>indica</i>	Indian Sundew							X
Droseraceae	<i>Drosera</i>	<i>ordensis</i>			X					X
Elatinaceae	<i>Bergia</i>	<i>pedicellaris</i>					X			
Euphorbiaceae	<i>Euphorbia</i>	<i>australis</i>	Namana		X					
Euphorbiaceae	<i>Euphorbia</i>	<i>alsiniflora</i>	Namana					X		
Euphorbiaceae	<i>Euphorbia</i>	<i>heterophylla</i>		*		X				
Euphorbiaceae	<i>Euphorbia</i>	<i>maconochieana</i>					X			
Euphorbiaceae	<i>Euphorbia</i>	<i>hirta</i>	Asthma Plant	*		X				
Fabaceae	<i>Acacia</i>	<i>colei</i> var. <i>colei</i>			X			X	X	X
Fabaceae	<i>Acacia</i>	<i>hemignosta</i>	Clubleaf Wattle		X					
Fabaceae	<i>Acacia</i>	<i>holosericea</i>	Candelabra Wattle			X				X
Fabaceae	<i>Acacia</i>	<i>lycopodiifolia</i>							X	X



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Fabaceae	<i>Acacia</i>	<i>lysiphloia</i>	Turpentine Wattle		X			X	X	X
Fabaceae	<i>Acacia</i>	<i>oligoneura</i>			X	X		X		
Fabaceae	<i>Bauhinia</i>	<i>cunninghamii</i>	Bauhinia		X	X		X		
Fabaceae	<i>Crotalaria</i>	<i>medicaginea</i>				X				
Fabaceae	<i>Crotalaria</i>	<i>novae-hollandiae</i>	New Holland Rattlepod					X		
Fabaceae	<i>Crotalaria</i>	<i>retusa</i>	Wedgeleaf Rattlepod			X				
Fabaceae	<i>Erythrophleum</i>	<i>chlorostachys</i>	Ironwood		X			X		X
Fabaceae	<i>Indigofera</i>	<i>colutea</i>	Sticky Indigo			X				
Fabaceae	<i>Indigofera</i>	<i>linifolia</i>	Bovine Indigo		X			X		
Fabaceae	<i>Macroptilium</i>	<i>atropurpureum</i>	Purple Bean	*		X				
Fabaceae	<i>Rhynchosia</i>	<i>minima</i>	Rhynchosia			X				
Fabaceae	<i>Senna</i>	<i>oligoclada</i>						X	X	X
Fabaceae	<i>Senna</i>	<i>venusta</i>						X		
Fabaceae	<i>Stylosanthes</i>	<i>hamata</i>	Verano Stylo	*	X			X		X
Fabaceae	<i>Tephrosia</i>	<i>conspicua</i>							X	
Fabaceae	<i>Tephrosia</i>	<i>laxa</i>			X					
Fabaceae	<i>Tephrosia</i>	<i>leptoclada</i>			X			X	X	X
Fabaceae	<i>Tephrosia</i>	<i>simplicifolia</i>			X			X		
Fabaceae	<i>Vachellia</i>	<i>farnesiana</i>	Mimosa Bush	*			X			



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Fabaceae	<i>Zornia</i>	<i>prostrata</i> var. <i>prostrata</i>			X					
Goodeniaceae	<i>Goodenia</i>	<i>bicolor</i>								X
Goodeniaceae	<i>Goodenia</i>	<i>coronopifolia</i>			X			X	X	
Haemodoraceae	<i>Haemodorum</i>	<i>ensifolium</i>			X					
Hernandiaceae	<i>Gyrocarpus</i>	<i>americanus</i>	Helicopter Tree			X				
Lamiaceae	<i>Hyptis</i>	<i>suaveolens</i>		*	X					
Lamiaceae	<i>Vitex</i>	sp. (insufficient material)				X				
Loganiaceae	<i>Mitrasacme</i>	<i>exserta</i>					X		X	
Loganiaceae	<i>Mitrasacme</i>	<i>nudicaulis</i> var. <i>nudicalis</i>						X		X
Loranthaceae	<i>Dendrophthoe</i>	<i>acacioides</i>								X
Loranthaceae	<i>Lysiana</i>	<i>murrayi</i>	Misteltoe			X				
Malvaceae	<i>Abutilon</i>	<i>otocarpum</i>	Desert Chinese Lantern					X		
Malvaceae	<i>Adansonia</i>	<i>gregorii</i>	Boab		X					X
Malvaceae	<i>Brachychiton</i>	<i>diversifolius</i>			X					
Malvaceae	<i>Corchorus</i>	<i>sidoides</i> subsp. <i>sidoides</i>	Flannel Weed		X			X		X
Malvaceae	<i>Gossypium</i>	<i>australe</i>	Native Cotton			X				
Malvaceae	<i>Grewia</i>	<i>retusifolia</i>	Dog's Balls			X				
Malvaceae	<i>Hibiscus</i>	<i>meraukensis</i>	Merauke Hibiscus			X				
Malvaceae	<i>Hibiscus</i>	<i>sabdariffa</i>	Rosella	*	X					



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Malvaceae	<i>Sida</i>	<i>acuta</i> subsp. <i>acuta</i>	Spinyhead Sida	*DP		X				
Malvaceae	<i>Sida</i>	<i>cordifolia</i>		*DP		X				
Malvaceae	<i>Sida</i>	<i>hackettiana</i>			X					
Malvaceae	<i>Triumfetta</i>	<i>plumigera</i>			X			X	X	X
Malvaceae	<i>Waltheria</i>	<i>indica</i>			X			X	X	X
Menispermaceae	<i>Tinospora</i>	<i>smilacina</i>	Snakevine			X				
Moraceae	<i>Ficus</i>	<i>coronulata</i>	River Fig			X				
Moraceae	<i>Ficus</i>	<i>scobina</i>	Sandpaper Fig		X					
Myrtaceae	<i>Calytrix</i>	<i>exstipulata</i>	Kimberley Heather		X			X	X	X
Myrtaceae	<i>Corymbia</i>	<i>confertiflora</i>	Rough-leaved Cabbage Gum		X					
Myrtaceae	<i>Corymbia</i>	<i>dichromophloia</i>			X			X		X
Myrtaceae	<i>Corymbia</i>	<i>grandifolia</i> subsp. <i>longa</i>	Cabbage Gum		X			X		X
Myrtaceae	<i>Corymbia</i>	<i>opaca</i>					X			
Myrtaceae	<i>Eucalyptus</i>	<i>brevifolia</i>	Snappy Gum							X
Myrtaceae	<i>Eucalyptus</i>	<i>camaldulensis</i> subsp. <i>obtus</i>	River Gum			X				
Myrtaceae	<i>Eucalyptus</i>	<i>confluens</i>			X					
Myrtaceae	<i>Eucalyptus</i>	<i>pruinosa</i>	Silver Box		X			X		
Myrtaceae	<i>Lophostemon</i>	<i>grandiflorus</i> subsp. <i>riparius</i>				X				
Myrtaceae	<i>Melaleuca</i>	<i>argentea</i>	Silver-leaved Paperbark			X			X	



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Myrtaceae	<i>Melaleuca</i>	<i>minutifolia</i>	Tea Tree		X			X	X	X
Myrtaceae	<i>Melaleuca</i>	<i>viridiflora</i>			X			X	X	X
Onagraceae	<i>Ludwigia</i>	<i>perennis</i>			X			X	X	X
Orobanchaceae	<i>Buchnera</i>	<i>linearis</i>	Blackrod		X			X		X
Pandanaceae	<i>Pandanus</i>	<i>spiralis</i>	Screw Pine			X				
Passifloraceae	<i>Passiflora</i>	<i>foetida</i>	Stinking Passion Flower	*	X					X
Phrymaceae	<i>Mimulus</i>	<i>uvedalei</i> var. <i>uvedalei</i>			X					X
Phyllanthaceae	<i>Flueggea</i>	<i>virosa</i>			X			X		X
Picrodendraceae	<i>Petalostigma</i>	<i>quadriloculare</i>	Quinine Tree		X			X		
Plantaginaceae	<i>Bacopa</i>	<i>floribunda</i>					X			X
Plantaginaceae	<i>Stemodia</i>	<i>lythrifolia</i>			X			X	X	X
Poaceae	<i>Aristida</i>	<i>holathera</i> var. <i>holathera</i>			X			X		X
Poaceae	<i>Aristida</i>	<i>pruinosa</i>	Gulf Feathertop Grass		X			X	X	X
Poaceae	<i>Arundinella</i>	<i>nepalensis</i>				X				
Poaceae	<i>Cenchrus</i>	<i>ciliaris</i>	Buffel Grass	*		X				
Poaceae	<i>Cymbopogon</i>	<i>bombycinus</i>	Silky Oilgrass							X
Poaceae	<i>Dichanthium</i>	<i>fecundum</i>					X			
Poaceae	<i>Dichanthium</i>	<i>sericeum</i>	Queensland Blue Grass			X				
Poaceae	<i>Digitaria</i>	<i>bicornis</i>	Hairy Finger Grass			X				



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Poaceae	<i>Echinochloa</i>	<i>colona</i>	Awnless Barnyard Grass	*		X	X			
Poaceae	<i>Ectrosia</i>	<i>schultzei</i>			X					
Poaceae	<i>Elytrophurus</i>	<i>spicatus</i>	Spikegrass				X			
Poaceae	<i>Enneapogon</i>	<i>purpurescens</i>				X				
Poaceae	<i>Eragrostis</i>	<i>speciosa</i>	Handsome Lovegrass		X					
Poaceae	<i>Eragrostis</i>	<i>tenellula</i>	Delicate Lovegrass					X		X
Poaceae	<i>Eriachne</i>	<i>ciliata</i>	Slender Wanderrie Grass		X			X	X	X
Poaceae	<i>Eriachne</i>	<i>glauca</i> var. <i>barbinodis</i>	Pan Wanderrie Grass		X			X	X	X
Poaceae	<i>Eriachne</i>	<i>obtusata</i>	Northern Wanderrie Grass					X		X
Poaceae	<i>Eulalia</i>	<i>aurea</i>	Silky Browntop			X				
Poaceae	<i>Heteropogon</i>	<i>contortus</i>	Black Bunch Speargrass		X			X		X
Poaceae	<i>Mnesithea</i>	<i>rottboellioides</i>				X				
Poaceae	<i>Panicum</i>	<i>decompositum</i>	Native Millet		X					
Poaceae	<i>Pseudopogonatherum</i>	<i>contortum</i>							X	
Poaceae	<i>Schizachyrium</i>	<i>fragile</i>	Senale Redgrass		X			X	X	X
Poaceae	<i>Setaria</i>	<i>apiculata</i>	Pigeon Grass		X					
Poaceae	<i>Sorghum</i>	sp. (insufficient material)			X			X	X	
Poaceae	<i>Themeda</i>	<i>triandra</i>	Kangaroo Grass		X			X		
Poaceae	<i>Triodia</i>	sp. (insufficient material)			X		X	X	X	X



Family	Genus	Species	Common Name	Status	T1	T2	T3	L1	P1	P2
Poaceae	<i>Xerochloa</i>	<i>barbata</i>			X					
Proteaceae	<i>Grevillea</i>	<i>agrifolia</i> subsp. <i>agrifolia</i>				X				X
Proteaceae	<i>Grevillea</i>	<i>dryandri</i> subsp. <i>dryandri</i>						X		X
Proteaceae	<i>Grevillea</i>	<i>pteridifolia</i>	Silky Grevillea		X			X		
Proteaceae	<i>Grevillea</i>	<i>striata</i>	Beefwood		X					
Proteaceae	<i>Hakea</i>	<i>arborescens</i>	Common Hakea		X					
Rubiaceae	<i>Gardenia</i>	<i>ewartii</i> subsp. <i>ewartii</i>								X
Rubiaceae	<i>Oldenlandia</i>	<i>delicata</i>			X					
Rubiaceae	<i>Oldenlandia</i>	<i>galioides</i>								X
Rubiaceae	<i>Spermacoce</i>	<i>laevigata</i>			X					
Santalaceae	<i>Exocarpos</i>	<i>latifolius</i>	Broad-leaved Cherry			X				
Santalaceae	<i>Santalum</i>	<i>lanceolatum</i>	Northern Sandalwood						X	
Sapindaceae	<i>Atalaya</i>	<i>hemiglauca</i>	Whitewood			X				
Sapindaceae	<i>Distichostemon</i>	<i>hispidulus</i>						X		X
Sapindaceae	<i>Dodonaea</i>	<i>physocarpa</i>			X			X		X
Solanaceae	<i>Solanum</i>	<i>dioicum</i>						X		
Stylidiaceae	<i>Stylidium</i>	<i>adenophorum</i>			X					X
Xyridaceae	<i>Xyris</i>	<i>complanata</i>								X



Where:

- T1 Southern end of survey area
- T2 Bridge crossing of Creek
- T3 northern end
- L1 Laydown Area
- P1 Small Pit
- P2 Large Pit

* = weed, introduced species, DP = Declared Plant, P3 = Priority 3



Appendix D

Fauna

Results of Fauna Database Searches

Project Area Fauna List



Table 14 Project Area Fauna Database Records and List of Observed Fauna

Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed
Amphibian	Bufonidae	<i>Bufo</i>	<i>marinus</i>	Cane Toad				*	E	
Amphibian	Hylidae	<i>Litoria</i>	<i>rubella</i>	Little Red Tree Frog					N	
Amphibian	Myobatrachidae	<i>Crinia</i>	<i>bilingua</i>	Bilingual Froglet						X
Bird	Acanthizidae	<i>Smicromis</i>	<i>brevirostris</i>	Weebill					N	
Bird	Accipitridae	<i>Accipiter</i>	<i>fasciatus</i>	Brown Goshawk					N	
Bird	Accipitridae	<i>Haliaeetus</i>	<i>leucogaster</i>	White-bellied Sea-Eagle	Mi, Ma	S3			E	
Bird	Accipitridae	<i>Haliastur</i>	<i>sphenurus</i>	Whistling Kite	Ma				N	
Bird	Accipitridae	<i>Milvus</i>	<i>migrans</i>	Black Kite					N	
Bird	Anseranatidae	<i>Anseranas</i>	<i>semipalmata</i>	Maggie Goose	Ma				E	
Bird	Apodidae	<i>Apus</i>	<i>pacificus</i>	Fork-tailed Swift	Mi, Ma	S3			E	
Bird	Ardeidae	<i>Ardea</i>	<i>alba</i>	Great Egret	Mi, Ma	S3			E	
Bird	Ardeidae	<i>Ardea</i>	<i>ibis</i>	Cattle Egret	Mi, Ma	S3			E	
Bird	Ardeidae	<i>Ardea</i>	<i>pacifica</i>	White-necked Heron					N	
Bird	Ardeidae	<i>Ixobrychus</i>	<i>flavicollis</i>	Black Bittern					N	
Bird	Artamidae	<i>Artamus</i>	<i>cinereus</i>	Black-faced Woodswallow					N	
Bird	Burhinidae	<i>Burhinus</i>	<i>grallarius</i>	Bush Stone-curlew			P4		N	
Bird	Campephagidae	<i>Coracina</i>	<i>maxima</i>	Ground Cuckoo-shrike					N	
Bird	Campephagidae	<i>Coracina</i>	<i>novaehollandiae</i>	Black-faced Cuckoo-shrike	Ma				N	
Bird	Campephagidae	<i>Coracina</i>	<i>papuensis</i>	White-bellied Cuckoo-shrike	Ma				N	X
Bird	Campephagidae	<i>Coracina</i>	<i>tenuirostris</i> subsp. <i>melvillensis</i>	Melville Cicadabird	Mi				E	
Bird	Caprimulgidae	<i>Eurostopodus</i>	<i>argus</i>	Spotted Nightjar	Ma				N	



Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed
Bird	Centropodidae	<i>Centropus</i>	<i>phasianus</i>	Pheasant Coucal					N	
Bird	Charadriidae	<i>Charadrius</i>	<i>veredus</i>	Oriental Plover	Mi, Ma	S3			E	
Bird	Columbidae	<i>Geopelia</i>	<i>cuneata</i>	Diamond Dove					N	
Bird	Columbidae	<i>Geopelia</i>	<i>humeralis</i>	Bar-shouldered Dove					N	
Bird	Columbidae	<i>Geopelia</i>	<i>striata</i>	Peaceful Dove					N	X
Bird	Columbidae	<i>Geophaps</i>	<i>plumifera</i>	Spinifex Pigeon					N	
Bird	Columbidae	<i>Ocyphaps</i>	<i>lophotes</i>	Crested Pigeon					N	X
Bird	Coraciidae	<i>Eurostomus</i>	<i>orientalis</i>	Dollarbird	Ma				N	
Bird	Corvidae	<i>Corvus</i>	<i>orru</i>	Torresian Crow					N	
Bird	Cracticidae	<i>Cracticus</i>	<i>nigrogularis</i>	Pied Butcherbird					N	X
Bird	Cracticidae	<i>Cracticus</i>	<i>tibicen</i>	Australian Magpie						X
Bird	Cuculidae	<i>Cacomantis</i>	<i>pallidus</i>	Pallid Cuckoo	Ma					X
Bird	Cuculidae	<i>Cacomantis</i>	<i>variolosus</i>	Brush Cuckoo					N	
Bird	Cuculidae	<i>Chalcites</i>	<i>basalis</i>	Horsfield's Bronze-Cuckoo	Ma					X
Bird	Dicaeidae	<i>Dicaeum</i>	<i>hirundinaceum</i>	Mistletoebird					N	
Bird	Dicruridae	<i>Grallina</i>	<i>cyanoleuca</i>	Magpie-lark					N	X
Bird	Dicruridae	<i>Myiagra</i>	<i>inquieta</i>	Restless Flycatcher					N	
Bird	Dicruridae	<i>Rhipidura</i>	<i>leucophrys</i>	Willie Wagtail					N	X
Bird	Dicruridae	<i>Rhipidura</i>	<i>rufifrons</i>	Rufous Fantail	Mi, Ma				E	
Bird	Dicruridae	<i>Rhipidura</i>	<i>rufiventris</i>	Northern Wagtail					N	
Bird	Estrillidae	<i>Erythrura</i>	<i>gouldiae</i>	Gouldian Finch	E, Mi	S1			E	
Bird	Estrillidae	<i>Neochmia</i>	<i>phaeton</i>	Crimson Finch					N	
Bird	Estrillidae	<i>Poephila</i>	<i>acuticauda</i>	Long-tailed Finch					N	



Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed
Bird	Estrillidae	<i>Poephila</i>	<i>personata</i>	Masked Finch					N	
Bird	Estrillidae	<i>Taeniopygia</i>	<i>bichenovii</i>	Double-barred Finch					N	X
Bird	Falconidae	<i>Falco</i>	<i>berigora</i>	Brown Falcon					N	
Bird	Glareolidae	<i>Glareola</i>	<i>maldivarum</i>	Oriental Pratincole	Mi, Ma	S3			E	
Bird	Gruidae	<i>Grus</i>	<i>rubicunda</i>	Brolga					N	
Bird	Halcyonidae	<i>Dacelo</i>	<i>leachii</i>	Blue-winged Kookaburra					N	
Bird	Halcyonidae	<i>Todiramphus</i>	<i>santcus</i>	Sacred Kingfisher	Ma				N	
Bird	Hirundinidae	<i>Hirundo</i>	<i>rustica</i>	Barn Swallow	Mi, Ma	S3			E	
Bird	Hirundinidae	<i>Petrochelidon</i>	<i>nigricans</i>	Tree Martin	Ma					X
Bird	Maluridae	<i>Malurus</i>	<i>coronatus</i> subsp. <i>coronatus</i>	Purple-crowned Fairy-wren (western subsp.)	V		P4		E	
Bird	Maluridae	<i>Malurus</i>	<i>melanocephalus</i>	Red-back Fairy-wren					N	
Bird	Meliphagidae	<i>Cissomela</i>	<i>pectoralis</i>	Banded Honeyeater					N	
Bird	Meliphagidae	<i>Conopophila</i>	<i>rufogularis</i>	Rufous-throated Honeyeater					N	
Bird	Meliphagidae	<i>Lichenostomus</i>	<i>flavescens</i>	Yellow-tinted Honeyeater					N	
Bird	Meliphagidae	<i>Lichenostomus</i>	<i>plumulus</i>	Grey-fronted Honeyeater					N	
Bird	Meliphagidae	<i>Lichenostomus</i>	<i>unicolor</i>	White-gaped Honeyeater					N	
Bird	Meliphagidae	<i>Lichenostomus</i>	<i>virescens</i>	Singing Honeyeater					N	
Bird	Meliphagidae	<i>Lichmera</i>	<i>indistincta</i>	Brown Honeyeater					N	X
Bird	Meliphagidae	<i>Manorina</i>	<i>flavigula</i>	Yellow-throated Miner					N	X
Bird	Meliphagidae	<i>Melithreptus</i>	<i>albugularis</i>	White-throated Honeyeater					N	
Bird	Meliphagidae	<i>Melithreptus</i>	<i>gularis</i>	Black-chinned Honeyeater					N	
Bird	Meliphagidae	<i>Philemon</i>	<i>citreogularis</i>	Little Friarbird					N	X
Bird	Meliphagidae	<i>Ramsayornis</i>	<i>fasciatus</i>	Bar-breasted Honeyeater					N	



Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed
Bird	Meropidae	<i>Merops</i>	<i>ornatus</i>	Rainbow Bee-eater	Ma, Mi	S3			E, N	X
Bird	Oriolidae	<i>Oriolus</i>	<i>sagittatus</i>	Olive-backed Oriole					N	
Bird	Pachycephalidae	<i>Colluricincla</i>	<i>harmonica</i>	Grey Shrike-thrush					N	
Bird	Pachycephalidae	<i>Pachycephala</i>	<i>rufiventris</i>	Rufous Whistler					N	X
Bird	Pardalotidae	<i>Pardalotus</i>	<i>striatus</i>	Striated Pardalote					N	
Bird	Petroicidae	<i>Microeca</i>	<i>flavigaster</i>	Lemon-breasted Flycatcher					N	
Bird	Petroicidae	<i>Peocilodryas</i>	<i>superciliosa</i> subsp. <i>cerviniventris</i>	Buff-sided Robin	Mi				N	
Bird	Phalacrocoracidae	<i>Phalacrocorax</i>	<i>sulcirostris</i>	Little Black Cormorant					N	
Bird	Phasianidae	<i>Coturnix</i>	sp.	Quail species						X
Bird	Phasianidae	<i>Coturnix</i>	<i>ypsilophora</i>	Brown Quail					N	
Bird	Podargidae	<i>Podargus</i>	<i>strigoides</i>	Tawny Frogmouth					N	
Bird	Pomatostomidae	<i>Pomatostomus</i>	<i>temporalis</i>	Grey-crowned Babbler					N	X
Bird	Psitticidae	<i>Aprosmictus</i>	<i>erythropterus</i>	Red-winged Parrot					N	X
Bird	Psitticidae	<i>Cacatua</i>	<i>galerita</i>	Sulphur-crested Cockatoo					N	
Bird	Psitticidae	<i>Cacatua</i>	<i>sanguinea</i>	Little Corella					N	
Bird	Psitticidae	<i>Calyptrorhynchus</i>	<i>banksii</i> subsp. <i>macrorhynchus</i>	Red-tailed Black-Cockatoo					N	
Bird	Psitticidae	<i>Platycercus</i>	<i>venustus</i>	Northern Rosella					N	
Bird	Psitticidae	<i>Trichoglossus</i>	<i>haemotodus</i>	Rainbow Lorikeet					N	
Bird	Ptilonorhynchidae	<i>Ptilonorhynchus</i>	<i>nuchalis</i>	Great Bowerbird					N	
Bird	Rostratulidae	<i>Rostratula</i>	<i>australis</i>	Australian Painted Snipe	V, Mi, Ma	S1, S3			E	
Bird	Scolopacidae	<i>Tringa</i>	<i>nebularia</i>	Common Greenshank	Mi, Ma	S3			N	
Bird	Strigidae	<i>Ninox</i>	<i>novaeseelandiae</i>	Boobook Owl					N	
Bird	Sylviidae	<i>Cisticola</i>	<i>exilis</i>	Golden-headed Cisticola					N	



Type	Family	Genus	Species	Common Name	EPBC	WC	DEC	Exotic	Record	Observed
Fish	Pristidae	<i>Pristis</i>	<i>microdon</i>	Freshwater Sawfish	V		P3		E	
Mammal	Bovidae	<i>Bos</i>	<i>indicus</i>	Brahmin x Angus				+		X
Mammal	Dasyuridae	<i>Dasyurus</i>	<i>hallucatus</i>	Northern Quoll	E	S1			E	
Mammal	Equidae	<i>Equus</i>	<i>caballus</i>	Brumby				*		X
Mammal	Felidae	<i>Felis</i>	<i>catus</i>	Feral Cat				*	E	X
Mammal	Macropodidae	<i>Macropus</i>	<i>robustus</i>	Euro						X
Mammal	Muridae	<i>Hydromys</i>	<i>chrysogaster</i>	Water-rat			P4		N	
Reptile	Agamidae	<i>Chlamydosaurus</i>	<i>kingii</i>	Frill-necked Lizard					N	
Reptile	Agamidae	<i>Diporiphora</i>	<i>magna</i>							X
Reptile	Crocodylidae	<i>Crocodylus</i>	<i>johnstoni</i>	Freshwater Crocodile	Ma	S4			E	
Reptile	Crocodylidae	<i>Crocodylus</i>	<i>porosus</i>	Salt-water Crocodile	Mi, Ma	S4			E	
Reptile	Elapidae	<i>Demansia</i>	<i>papuensis</i>	Great Black Whipsnake					N	X
Reptile	Elapidae	<i>Pseudechis</i>	<i>australis</i>	Mulga Snake					N	
Reptile	Elapidae	<i>Pseudonaja</i>	<i>nuchalis</i>	Gwardar					N	
Reptile	Gekkonidae	<i>Gehyra</i>	<i>australis</i>						N	
Reptile	Gekkonidae	<i>Heteronotia</i>	<i>binoei</i>	Bynoe's Gecko					N	
Reptile	Scincidae	<i>Lerista</i>	<i>greeri</i>						N	



Appendix E

Assessment Against the DEC's Ten Clearing Principles



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

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Plant Species</p> <ul style="list-style-type: none"> ▶ Total Vascular Plant Taxa <ul style="list-style-type: none"> – A total of 169 flora taxa from 44 families were recorded from the Project Area, representing a moderate level of diversity, with 15 weed species. This total is considered to be similar to that found in the local and regional area. ▶ Vascular Plant Taxa Diversity <ul style="list-style-type: none"> – Diversity in the Project Area is considered to be comparable to that found in the local area; in similar habitat that has areas of disturbance (e.g. roads, tracks, pastoral stations). ▶ Priority Flora, Significant Flora <ul style="list-style-type: none"> – One Priority Flora taxon was recorded from the Project Area: <ul style="list-style-type: none"> ○ <i>Fuirena incrassata</i> (Priority 3). – This species were recorded in the Project Area in two locations, one away from the edge of the current road alignment, and one in the NW corner of the Material Pit A and are considered unlikely to be under threat from the proposed project activities. <p>Fauna Species</p> <ul style="list-style-type: none"> ▶ Total Fauna Taxa <ul style="list-style-type: none"> – The reconnaissance fauna survey recorded 19 bird species, four mammal species, two reptile species and one amphibian species from the Project Area. The survey result was considered to be a relatively good reflection of fauna species present in a relatively small area <p>Ecosystem Diversity</p> <ul style="list-style-type: none"> ▶ Number of Ecological Communities (Plant, Fauna) <ul style="list-style-type: none"> – A total of 10 vegetation types and four fauna habitats were recorded from the Project Area. This includes a cleared/degraded vegetation type/habitat. These communities are also present in the local area in similar or better condition. ▶ Habitat Diversity <ul style="list-style-type: none"> – Habitats (macro- and microhabitats) found in the Project Area are also present in the local area in similar or better condition. ▶ Variety of Soil Types/Geological Formations <ul style="list-style-type: none"> – Soil types or geological formations in the Project Area are also present in the local and regional area.
Assessment	The project is considered unlikely to be at variance with clearing principle. The locations of the known Priority Flora species can be avoided as part of this project.



(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.

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Significant Fauna</p> <ul style="list-style-type: none"> <p>▀ Threatened Fauna</p> <ul style="list-style-type: none"> – The desktop assessment indicated that threatened fauna may potentially utilise the Project Area. Significant habitat for threatened fauna was not recorded within the Project Area, with habitat is considered to be common in the local and regional area. No Threatened Fauna taxa were recorded from the Project Area. <p>▀ Priority Fauna</p> <ul style="list-style-type: none"> – The desktop assessment indicated that priority fauna may potentially utilise the Project Area for foraging. No Priority Fauna species were recorded in the Project Area during the field survey. <p>▀ Other Significant Fauna</p> <ul style="list-style-type: none"> – The desktop assessment indicated that significant fauna may occur in the Project Area. Five EPBC Act Marine and/or Migratory Listed species were recorded from the Project Area. These species are considered common in Western Australia and are not under threat. <p>Habitat</p> <ul style="list-style-type: none"> <p>▀ Significant Habitat / Habitats of Significance</p> <ul style="list-style-type: none"> – No habitat deemed to be significant occurs in the Project Area. Habitat in the Project Area also occurs in the local area in similar or better condition. The habitat in the Project Area is disturbed by road maintenance and pastoral activities. <p>▀ Habitat Extent and Retention</p> <ul style="list-style-type: none"> – Habitats recorded in the Project Area are also found in the local area in similar or better condition. The proposed project will not significantly diminish the extent of these habitats. <p>▀ Ecological Corridors</p> <ul style="list-style-type: none"> – The habitat in the Project Area occurs in a region with relatively undisturbed ecological corridors. Existing corridors are not considered to be significantly modified by the proposed project.
Assessment	The Project Area contains potential habitat for Threatened and Priority fauna species. No Threatened or Priority Fauna species were recorded during the survey. The project is considered unlikely to be at variance with this clearing principle.



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

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Rare Flora</p> <ul style="list-style-type: none"> ▸ Presence <ul style="list-style-type: none"> – No Threatened (Declared Rare) Flora taxa were indicated to occur within the vicinity of the Project Area as a result of database searches. No Threatened (Declared Rare) Flora taxa were recorded in the Project Area during the field survey. ▸ Habitat <ul style="list-style-type: none"> – No habitat considered to be required for the continued existence of Threatened Flora is considered to be present in the Project Area.
Assessment	Not considered to be at variance with clearing principle.

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Vegetation</p> <ul style="list-style-type: none"> ▸ Extent and Status <ul style="list-style-type: none"> – Vegetation Associations within the vicinity of the Project Area are considered to be of Least Concern with >99% remaining. – Vegetation types recorded in the Project Area are considered to be equivalent to the Vegetation Associations indicated by Beard. ▸ Communities <ul style="list-style-type: none"> – No Threatened or Priority Ecological Communities were recorded from the Project Area. ▸ Areas <ul style="list-style-type: none"> – No Environmentally Sensitive Areas occur within or immediately adjacent to the Project Area.
Assessment	Not considered to be at variance with this clearing principle.



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

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Vegetation</p> <ul style="list-style-type: none"> ▸ Extent and Status <ul style="list-style-type: none"> – Vegetation Associations within the vicinity of the Project Area are considered to be of Least Concern with >99% remaining. – Vegetation types recorded in the Project Area are considered to be equivalent to the Vegetation Associations indicated by Beard. ▸ Regionally Significant Areas <ul style="list-style-type: none"> – Vegetation within the Project Area is not considered to contain communities required to maintain ecosystem services (e.g. hydrological processes).
Assessment	Not considered to be at variance with clearing principle.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Watercourses and Wetlands</p> <ul style="list-style-type: none"> ▸ Vegetation <ul style="list-style-type: none"> – One defined wetland occurs within the vicinity of the Project Area. This will not be impacted by any proposed works. – One small ephemeral creekline occur in the vicinity of Material Pit A and B. This does not contain riparian vegetation and is also unlikely to be impacted by the proposed extraction of material. – One defined creekline – Big McPhee Creek occurs in the Bridge Corridor of the Project Area. This creek contains riparian vegetation. Main Roads has indicated that any reconstruction works for the bridge crossing will occur in the existing disturbed corridor and not impact on the riparian vegetation. ▸ Groundwater Dependent Ecosystems <ul style="list-style-type: none"> – No groundwater dependent ecosystems occur within or adjacent to the Project Area.
Assessment	Considered to be “not at variance” with clearing principle, as Main Roads has informed GHD that no works will occur beyond the existing footprint of the current disturbed road alignment at the Big McPhee Creek crossing.



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

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Land Degradation</p> <ul style="list-style-type: none"> <p>▸ Soil Erosion</p> <ul style="list-style-type: none"> – The project proposes to clear vegetation to allow for the reconstruction of the Big McPhee Creek. Erosion from wind is considered to be minimal; with soil types considered not to be conducive to wind scour. The small scale of the project is considered unlikely to impact on the risk of soil erosion in the Project Area. – The clearing of native vegetation is not expected to alter the quality or quantity of water run-off in or adjacent to the Project Area. Waterlogging and changes to nutrient levels are not expected to be altered by the clearing of vegetation in the Project Area. <p>▸ Soil Acidity</p> <ul style="list-style-type: none"> – The clearing of vegetation is not considered to alter soil acidity in or adjacent to the Project Area. Acid sulphate soils are not considered to occur within the vicinity of the Project Area. <p>▸ Salinity</p> <ul style="list-style-type: none"> – The clearing of vegetation is not considered to significantly alter the hydrological balance and cause a change in the salinity either on- or off-site.
Assessment	Not considered to be at variance with clearing principle.



(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.

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Conservation Areas</p> <ul style="list-style-type: none"> ▶ Protected Areas <ul style="list-style-type: none"> – No Conservation Areas or Reserves occur within the vicinity of the Project Area. The Material Pits both occur in an area covered by the Register of the National Estate. Both Material Pits contain areas already disturbed, and any material extraction is considered unlikely to impact on the environmental values of the National Estate. ▶ Fragmentation <ul style="list-style-type: none"> – The Project Area occurs in an area where the vegetation is relatively un-fragmented. ▶ Ecological Linkages <ul style="list-style-type: none"> – The Project Area occurs in a region where the vegetation where ecological linkages remain mostly intact. Existing ecological linkages are not considered to be impacted by the proposed works.
Assessment	Considered unlikely to be at variance with clearing principle.

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

Methodology	Desktop assessment of available information and field survey results
Survey Results	<p>Water Quality</p> <ul style="list-style-type: none"> ▶ Catchment Areas <ul style="list-style-type: none"> – The Project Area does not occur within a proclaimed Public Drinking Water Supply Catchment. ▶ Groundwater <ul style="list-style-type: none"> – The clearing of vegetation is not considered to cause an alteration to the quality of groundwater in or adjacent to the Project Area. – No groundwater dependent ecosystems occur in or adjacent to the Project Area. ▶ Surface Water <ul style="list-style-type: none"> – The clearing of vegetation is not considered to cause an alteration to the quality of surface waters in or adjacent to the Project Area.
Assessment	Not considered to be at variance with clearing principle.



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

Methodology	Desktop assessment of available information and field survey results
Survey Results	Water Quantity <ul style="list-style-type: none">▶ Flooding<ul style="list-style-type: none">– The clearing of vegetation in the Project Area is not considered to alter the frequency or intensity of flood events. Runoff coefficients in the Project Area are not likely to be significantly altered by the clearing of native vegetation.
Assessment	Not considered to be at variance with clearing principle.



Appendix F

Summary of Environmental Management Actions



Table 15 Environmental Management Commitments

Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
1.0	Vegetation	"To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge" (EPA, 2004).	Project Area	Areas to be cleared will be minimised by preferentially using areas of existing disturbance, including existing access tracks and former material pit areas.	Construction	Construction Contractor
				Areas to be cleared will be pegged prior to commencing earthworks.	Construction	Construction Contractor
				No vegetation outside the designated areas will be removed during earthworks, construction or operation.	Construction	Construction Contractor
				Earthmoving equipment will be cleaned of soil and vegetation prior to entering and leaving the area to be cleared.	Construction	Construction Contractor
				Avoid impacting areas of variable vegetation, such as vegetation along rock outcrops and breakaways as these areas generally tend to have higher biodiversity values and are of value as fauna habitat.	Construction	Construction Contractor
				Vehicle parking and temporary materials storage will be located on existing cleared areas where possible.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Once the pits are exhausted, the disturbed areas will be rehabilitated as soon as possible.	Post - Construction	Construction Contractor
				Material cleared will be utilised in rehabilitation works where practicable.	Post - Construction	Construction Contractor
				Earth-moving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared.	Construction	Construction Contractor
				Movement of soil will be avoided in wet conditions.	Construction	Construction Contractor
				If imported soils and materials are to be used, they will be weed free.	Construction	Construction Contractor
				Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared.	Construction	Construction Contractor
				Cleared vegetation (including stubble) will be used in site rehabilitation and erosion control where practical.	Construction	Construction Contractor
				Cleared vegetation (or stubble) will not be burnt on-site.	Construction	Construction Contractor
				Stripped topsoil will be salvaged for use in site rehabilitation if required.	Construction	Construction Contractor
				Materials and topsoil stockpiles will be located so as not to restrict or interfere with existing site drainage.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
2.0	Weed management	Minimise risk of weed entering/impacting the Project Area.	Project Area	Earth-moving machinery will be clean of soil and vegetation prior to entering and on leaving the area to be cleared.	Construction	Construction Contractor
				Movement of soil will be avoided in wet conditions.	Construction	Construction Contractor
				If imported soils and materials are to be used, they will be weed free;	Construction	Construction Contractor
				Movement of machines and other vehicles will be restricted to the limits of the areas to be cleared.	Construction	Construction Contractor
				Any declared flora species located in the area will be controlled in accordance with Sections 49 and 51 of the Agriculture and Related Resources Protection Act 1976.	Construction	Construction Contractor
3.0	Fauna	“To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge” (EPA, 2004).	Project Area	Meet all requirements of the <i>Wildlife Conservation Act (1950)</i> .	Construction	Construction Contractor
				Clearing will be undertaken as outlined in Section 6.1.	Construction	Construction Contractor
				Noise and vibration will be managed as outlined in Section 6.7.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Works will cease on sighting an animal which might be at risk of injury in the Project Area. Works will recommence once the animal has moved on.	Construction	Construction Contractor
				The work site will be left in a safe condition at the end of each working day to ensure animals are not subject to harm from the project works.	Construction	Construction Contractor
				During construction works, the area will be inspected each morning to ensure no fauna have been trapped during the previous evening. A Regional DEC Officer or designated representative will be contacted to facilitate removal if necessary.	Construction	Construction Contractor
				No native fauna (including venomous snakes) will be deliberately impaired or killed during project works.	Construction	Construction Contractor
				Where possible, clearing will be undertaken at a time of year that is least likely to impact on breeding or nesting species (i.e. avoid clearing from late in the wet season to the early dry season).	Construction	Construction Contractor
				Barriers to native fauna movement will be minimised.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Ensure material pits are left hydrologically neutral to prevent water pooling which may enhance the success of feral fauna species.	Construction	Construction Contractor
				Laydown areas will be constructed on previously disturbed areas where practical.	Construction	Construction Contractor
				The movement of machinery and vehicles will be minimised or restricted at dusk and dawn and during night-time hours.	Construction	Construction Contractor
4.0	Groundwater	"To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected" (EPA, 2004).	Project Area	In the event that hazardous materials are to be used or held on-site, materials will be managed in accordance with Main Roads' safety procedures.	Construction	Construction Contractor
				No vehicles will be serviced or refuelled on the site.	Construction	Construction Contractor
				A 'Spill Kit' will be provided on-site at all times.	Construction	Construction Contractor
				The site spill response plan will be implemented to deal with spillages and leaks within the site area. This plan provides details on methods of containment, collection and disposal, and training of personnel.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Any accidental spillage will be reported to the contracting manager and emergency clean-up procedures will be immediately implemented. These procedures will include the control of any spilt material and removal of contaminated soil to an approved site if required.	Construction	Construction Contractor
				Liaise and gain relevant abstraction licences from the Department of Water.	Construction	Construction Contractor
5.0	Surface Waters and Drainage	To ensure that surface waters and drainage are not unduly impacted by the project.	Project Area.	No construction works will occur within 50 m of any water body.	Construction	Construction Contractor
				No hazardous materials will be used or held on-site within 50 m of any water body.	Construction	Construction Contractor
				Existing natural drainage paths and drainage channels along road reserves will not be unnecessarily blocked or restricted by material stockpiles	Construction	Construction Contractor
				Any material that is found to block drainage will be removed	Construction	Construction Contractor
6.0	Dust	"To ensure that dust emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards" (EPA, 2004).	Project Area	Water tankers will be available at all times to wet down exposed surfaces on works areas, laydown sites, spoil dumps and topsoil and materials heaps.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Minimise as far as possible dust generating activities.	Construction	Construction Contractor
				Dust lift will be monitored through visual and other means and all complaints responded to rapidly.	Construction	Construction Contractor
				Staged vegetation clearing will be undertaken to reduce dust generation	Construction	Construction Contractor
7.0	Noise and Vibration	"To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring noise levels meet statutory requirements and acceptable standards" (EPA, 2004).	Project Area	All equipment will be regularly maintained and serviced, including exhaust systems.	Construction	Construction Contractor
				Plant and machinery will operate in accordance with Shire of Ashburton requirements.	Construction	Construction Contractor
8.0	Use of Hazardous Substances	"To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards" (EPA, 2004).	Project Area	Any accidental spillage will be reported to the management of the facility as soon as practicable.	Construction	Construction Contractor
				No light vehicles will be serviced or refuelled on the site.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Larger plant machinery will be serviced off-site.	Construction	Construction Contractor
				A 'Spill Kit' will be provided on-site at all times.	Construction	Construction Contractor
				Emergency clean-up procedures will be immediately implemented in the case of any spillage. These will include control of spilled material and removal of contaminated soil to an approved site if required.	Construction	Construction Contractor
9.0	Aboriginal Heritage	"To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation" (EPA, 2004).	Project Area	Main Roads and their contractors will be aware of their obligations under the <i>Aboriginal Heritage Act 1972</i> during the project works.	Construction	Construction Contractor
				If, during project works, the Construction Contractor uncovers any materials that could be considered significant to Aboriginal people, Main Roads will immediately cease works within 50 m of the material and notify DIA immediately.		
				If any human skeletal material is uncovered, work shall cease within 20 m of the material and it shall be reported to the WA Police as soon as possible.	Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
10.0	Visual Impacts	To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable.	Project Area	No spoil heaps or other materials will be left in view of the road.	Construction	Construction Contractor
				rehabilitation will be carried out as soon as possible following completion of works in each area.	Post-Construction	Construction Contractor
11.0	Rehabilitation	Rehabilitation of the Project Area is important to ensure that any visual and environmental impacts of the works are short term.	Project Area	Pits will be shaped and contoured to ensure that the likelihood of water ponding is reduced.	Post-Construction	Construction Contractor
				Any compacted ground will be ripped or scarified where revegetation is required.	Post-Construction	Construction Contractor
				Cleared topsoil and vegetation will be respread over disturbed areas.	Post-Construction	Construction Contractor
				If imported soils and materials are required, they will be certified weed free.	Post-Construction	Construction Contractor
				All rubbish, materials heaps or other debris will be removed.	Post-Construction	Construction Contractor
12.0	Inductions and Training	Ensure all construction personnel are inducted	Project Area	Access tracks will be deep ripped and blocked off where possible.	Post-Construction	Construction Contractor
				Construction personnel should be made aware of the issues and actions in this Management Plan so that they do not unnecessarily damage the environment during the works phase;	Pre-Construction	Construction Contractor



Reference	Issue	Objective	Relevant Area	Commitment Action	Timing	Responsible Party
				Emergency training in relation to fires, chemical spills or other risks shall be carried out early in the construction phase.	Construction	Construction Contractor
13.0	Complaints Handling Procedure and Register	Ensure any complaints received are dealt with in a timely manner.	Project Area	Any complaints received relating to the project will be notified to the site representative and MRWA representatives notified.	Construction	Construction Contractor
14.0	Management of Environmental Incidents	Ensure all incidents are reported and mitigated in a timely manner	Project Area	Structure and content of incident reports.	Pre-Construction	Construction Contractor
				Reporting of the incident in an incident log.	Construction	Construction Contractor
				Time limits for incident reporting and response.	Construction	Construction Contractor
				Assessment of the significance of each incident.	Construction	Construction Contractor
				Discontinuation of the work which gave rise to the incident.	Construction	Construction Contractor
				Reporting incidents where necessary to regulatory authorities and stakeholders.	Construction	Construction Contractor
				Satisfactory and timely remediation/mitigation of impacts.	Construction	Construction Contractor



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Document Status

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