ENVIRONMENTAL IMPACT ASSESSMENT

DESIGN PACKAGE 1 - MUCHEA INTERSECTION

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CONTENTS

1. SUMMARY OF STATUTORY APPROVALS REQUIRED

Following the preparation of this report, it was established that an application under Section 18 Aboriginal Heritage Act will be required as the project requires the extension of existing culverts that will disturb part of an area forming a registered ethnographic site. The ACMC will decide on the need for a section 18 Notice.

The project will not be referred to the Commonwealth Department of the Environment, Water, Heritage and Arts, nor the WA Environmental Protection Authority for reasons outlined within the report.

Native vegetation clearing is proposed under the MRWA Purpose Permit.

2. INTRODUCTION

2.1 Background

Main Roads Western Australia (Main Roads) proposes to undertake road widening and upgrades to the Great Northern Highway between Muchea and Wubin, with the primary aim of improving road safety along the highway.

Realignment of various sections will improve visibility, increase passing opportunities thus reducing the conflict between vehicle types such as trucks and cars, and show a reduction in the fatigue and frustration of drivers (MRWA, 2007).

Other project benefits have also been identified. These include:

- Decreased travel time and cost, particularly for road trains;
- Environmental improvements, such as enhancement of road reserves through revegetation; and
- Reduction in maintenance.

Staff of the Access Alliance (Maunsell Australia and MRWA) conducted an Environmental Impact Assessment (EIA) of Design Package 1 (DP1) of the proposed project (Figure 1). All information presented within this document was obtained through a desktop assessment based on existing data records and additional literature and reports provided to Maunsell by Main Roads.

The primary objective of this EIA is to identify areas of environmental significance and constraints associated with the project.

2.2 Location

The project area is located along Great Northern Highway, approximately 2.5km south east of Muchea and extending north to the intersection of Great Northern Highway and Brand Highway. The entire design package is located within the Shire of Chittering and is approximately 50km north of Perth.

Figure 1: Design Package 1 of the proposed Muchea to Wubin upgrade.

2.3 Scope of the Report

This Environmental Impact Assessment aims to identify and review existing and relevant environmental reports and conduct a desktop assessment to determine if any environmental constraints are present within DP1. Subsequent site inspection has been conducted to supplement issues of interest.

Additionally the report assesses relevant environmental aspects to determine whether the project will require referral to the Environmental Protection Authority (EPA) or the Commonwealth under environmental legislation.

2.4 Objectives

This Environmental Impact Assessment has been prepared to advise Main Roads of areas of potential environmental sensitivity along GNH within DP1. It will be utilised as a tool to determine further areas that will require environmental investigations in order to obtain statutory approvals.

3. PROPOSAL DESCRIPTION

Main Roads is proposing to widening and upgrade the GNH between Muchea and Wubin to improve the safety of the road for all road users. This project has been separated into 16 design packages that are proposed to be upgraded and will be constructed at various intervals.

The Design Packages moving in a northerly direction for the entire alignment are summarised below.

Table 1: Summary of Design Packages for GNH Access Alliance.

Design Package	SLK
1	sale yards and intersection of Brand and Great Northern Highways (centred on 36.86 SLK)
2a	37.00 to 39.80
2b	39.80 to 44.67
3a	50.04 to 52.48
3b	54.50 to 58.05
3c	59.20 to 62.30
4	80.20 to 85.20 86.70 to 93.00
5	93.00 to 104.00

	104.00 to 112.70
6	112.70 to 115.80
7	117.36 to 126.40
8a	126.40 to 131.10
8b	131.10 to 145.75
9	150.70 to 166.00
10	166.00 to 168.00
11	168.00 to 177.00
12	177.00 to 183.00
13	184.30 to 220.13
14	220.70 to 223.40
15	Wubin Realignment section (253.40 – 255.00 SLK)
16	GNH to Ballidu (129.12 – 152.40 SLK)

Design Package 1 extends 700m along the Great Northern Highway, 300m south and 400m north from the intersection with Brand Highway and Muchea East Road. Works are also proposed along the Brand Highway (700m) and Muchea East Road (1,400m), totalling approximately 2.8 km of road work within this design package – see Figure 1. The proposed upgrade works will consist of reconstruction and widening of the existing formation, with improvements to vertical and horizontal geometry where necessary to achieve acceptable National Highway standards. The principal objective is to improve the level of service and safety for road users along with access to the future Muchea livestock sale yards. The sale yards are located on Muchea East Road and due to the increased traffic in and out of the yards traffic lights will be installed on the Great Northern Highway where it intersects Brand Highway and Muchea East Road.

4. EXISTING ENVIRONMENT

4.1 Climate

The Muchea region typically experiences a Warm Mediterranean climate characterised by hot dry summers and cool wet winters. Rainfall increases during the winter months ranging between 458mm to 1000mm annually with an average rainfall off 698mm per annum. The temperature ranges from an average of 33°C in the hottest months of January and February to an average of 17.7°C in the colder month of July (Bureau of Meteorology, 2007).

The Mediterranean climate does not typically have extreme weather events, with annual rainfall generally recorded across a series of rainfall events in the winter period. Summer rain is usually minimal.

4.2 Landforms, Soil and Geology

Design package 1 is situated within the Yoganup Formation on the eastern edge of the Swan Coastal Plain approximately 4km west of the interface with the Darling Plateau. The Yoganup Formation consists of inter bedded sand, conglomerate and clay, and occurs along ancient shorelines at the foot of the Darling Scarp and contains localised concentrations of heavy metals (Churchward & McArthur, 1978). Sediments of the Yoganup Formation represent the actual beach deposits of the ancient shoreline formed during the Pliocene to Late Pleistocene. These sediments are predominately sandy in texture, however clay-rich zones do occur having formed in an estuarine setting (Soil Water Consultant, 2005)

Churchward and McArthur (1978) landform and soil mapping has identified that Design package 1 crosses two differing soil units. The majority of the alignment occurs within the Yanga Unit, whilst the eastern section of the package along Muchea east Road occurs within the Coonambidgee Units. These units have been described by Churchward & McArthur as:

Ya (Yanga) – Poorly drained plain with grey sandy benches and intervening swamps. It also includes areas of bog iron ore, marl or solonetzic soils. The Yanga unit is a pattern of flat sandy benches with intervening swamps.

Cm (Coonambidgee) – Gently sloping fringe to the Dandaragan Plateau with deep grey sand.

4.3 Hydrology

The proposed works are located within an area of low lying land which is classified as palusplain (seasonally waterlogged flats) categorised as Multiple Use. Ellen Brook runs under Brand Highway at the western extent of the works and is classified as non-perennial watercourse. It is recognised as an Environmentally Sensitive Area however no work will take place within 50m of the waterway that requires the clearing of vegetation.

5. ENVIRONMENTAL ASPECTS

An assessment of the DP1 Project area and its potential constraints was undertaken by interrogating and compiling relevant information available from within the project area. These are described in further detail below.

5.1 Fauna

Threatened and Specially Protected fauna are protected by a number of guidelines and legislation to ensure they are not detrimentally impacted. Threatened fauna species are protected under Section 16 of the Wildlife Conservation Act, 1950. It is an offence to "take, destroy or possess" threatened fauna without Ministerial approval. Similarly, a significant impact on protected fauna is a trigger for referral to the Environmental Protection Authority (EPA) under the *Environmental Protection of Biodiversity and Conservation (EPBC) Act, 1999.*

A DEC Threatened and Priority Fauna Database search was conducted for the Design package 1 project area. The area searched encompasses the entire design package as well as a 10km buffer. Historical fauna records indicate the presence of Threatened or Priority Fauna within a 10km radius of the project area.

The DEC Threatened Fauna database suggests the potential for six threatened fauna species and four protected or priority species to occur within or adjacent to the proposed DP1 alignment. The species are summarised in Table 2. The results of the DEC Threatened and Priority Fauna Database enquiry are presented in Appendix A.

Table 2: Threatened Fauna Species potentially present within the proposed Design package 1.

Species	Common Name	WA Conservation Category	EPBC Conservation Category	IUCN Threatened Species Category	Likelihood of occurring within project area
Calyptorhynchus latirostris	Carnaby's Black Cockatoo	Schedule 1	Endangered	Endangered	*Likely* to occur
Calyptorhynchus sp. (record pertains to Baudin's Black – Cockatoo or Carnaby's Black Cockatoo)	White – tailed Black Cockatoo	Schedule 1	N/A	N/A	*Likely* to occur
Dasyurus geoffroii	Chuditch	Schedule 1	Vulnerable	Vulnerable	*May* occur
Leioproctus douglasiellus	Leioproctus douglasiellus	Schedule 1	Rare/Likely to become extinct	N/A	*May* occur
Phascogale tapoatafa sp. (WAM M434)	Brush – tailed Phascogale	Schedule 1	Vulnerable	Low Risk Near Threatened	*May* occur
Morelia spilota imbricata	Carpet Python	Schedule 4 and Priority 4	N/A	N/A	*May* occur
Arbanitis inornatus	Arbanitis inornatus	Priority 1	N/A	N/A	*Unlikely* to occur
Hylaeus globuliferus	Hylaeus globuliferus	Priority 3	N/A	N/A	*May* occur
Leioproctus contrarius	Leioproctus contraries	Priority 3	N/A	N/A	*May* occur

Fauna species may be directly or indirectly impacted by the proposed upgrade to WP1 through the removal of remnant trees and vegetation within or adjacent to the alignment. Significant trees and remnant vegetation may provide nesting hollows and fauna habitat as well as provide a potential food source, which may be reduced if trees and vegetation are removed.

Fauna surveys specifically targeting Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) have previously been conducted along Great Northern Highway by ATA Environmental Consultants (2006) and Biota (2005). Both surveys identified the presence of Cockatoo nesting hollows in trees along the entire alignment, which extends from Muchea to Wubin. However, the area surveyed for nesting hollows was between 37.2 SLK to 165 SLK, which is located just north of DP1.

Previous surveys had not covered DP1 the site was inspected for suitable fauna habitat by Main Roads' Environment Officer, Nigel Rowe and Maunsell's Environment Advisor, Andrew Batty on the 7th November 2007. The inspection revealed an area devoid of understorey with several large Marris, one that may contain a hollow. A photo of this hollow was shown to Ron Johnstone, who is the head of the ornithology department at the WA Museum and the world leading Carnaby's Black Cockatoo expert. Ron indicated that although the diameter of the hollow is small, if deep enough then it could be a potential nesting hollow. Any loss of this potential hollow can be compensated by the deployment of an artificial nesting box in a nearby area.

5.2 Vegetation and Flora

Floristic and conservation values are afforded protection by legislation and guidelines, ensuring they are not detrimentally impacted. Conservation of biological diversity and ecological integrity should be a fundamental consideration (EPA, 2004).

Floristic and vegetation assessments have been previously conducted along the Great Northern Highway upgrade between Muchea to Wubin, by Western Botanical (2005 & 2006) and Env. Australia (2006). Collectively these floristic assessments do not cover the proposed work area of WP1. The

southern most portion of GNH previously assessed for flora and vegetation during 2004 and 2005, stops at 37.2 SLK and is the same location where the northern most portion of WP1 begins.

DP1 is situated on the eastern edge of the Swan Coastal Plain Sub Region near the interface with the Dandaragan Sub Region. The Swan Coastal Plain Sub Region is part of the South West Botanical Province which has a very high degree of species diversity (Mitchell *et al*, 2002). Broadly, the low lying coastal plain is mainly covered with woodlands and is dominated by *Banksia* species or *Eucalyptus gomphocephala* (Tuart) on sandy soils, *Casuarina obesa* on outwash plains, and *Melaleuca* species (paper bark) in swampy areas (Mitchell *et al*, 2002) whilst to the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah woodland.

Currently only 10.74% of the subregion is protected under conservation reserves (Mitchell *et al*, 2002). The subregion has been extensively cleared and impacts small isolated remnants predominately in the central and southern areas of the sub region are frequent.

The proposed upgrade to the intersection of Brand Highway and Great Northern Highway will involve road widening where a number of trees within the road reserve will need to be removed. No known areas of remnant vegetation occur along the proposed road alignment and a site inspection located only serval Marris dominating an area devoid of understorey. In total the 2.8km of road works will clear an area of 1.03ha under Main Roads vegetation clearing Purpose Permit (818) – see Appendix B for vegetation clearing assessment report.

5.2.1 Beard Mapping

Beard's (1975) 1:1,000,000 scale mapping of the Swan region identified that the following broad terrestrial vegetation types occur within the proposed project area:

- e_3Mi *Corymbia calophylla* (Marri) woodland;

Beard's vegetation mapping is at a broad scale and requires amalgamation of minor vegetation types. This may provide a bias towards large and commonly distributed units, as associations that are less common and/or isolated, therefore significant communities are not included as individual vegetation communities. Additionally, due to limited sampling, Beard's vegetation units often contain inaccuracies.

5.2.2 Declared Rare and Priority Flora

Any species listed in State and Commonwealth legislation as being of conservation significance is said to be a significant species (EPA, 2002) and incorporates species that are endangered, vulnerable and rare or those covered by international conventions. Species at risk of extinction are recognised at a Commonwealth level and are categorised according to the *Environment Protection and Biodiversity Conservation (EPBC) Act, 1999.*

Species designated as Priority Flora are under consideration for declaration as 'Rare Flora' and are in urgent need of further survey (Priority One to Three) or require monitoring every 5-10 years (Priority Four). Interrogation of the Department of Environment and Conservation's Threatened and Priority Species Database and all literature relevant to the proposed project area, has identified the potential occurrence of seven Declared Rare Flora and 22 Priority Flora species. These species are summarised in Table 3.

Table 3: Declared Rare and Priority Flora known to occur within the Muchea Region

Species	Conservation Status	Species Description	Preferred Habitat	Likelihood of occurring within either site
Acacia anomala	R	Slender rush like shrub 0.2 – 0.5m tall. Flowers yellow Aug - Sept	Lateritic soils. Slopes.	*May* occur
Darwinia foetida	R	Tangled, domed shrub, to 0.6 m high. Fl. green, Oct–Nov.	Peaty, sandy clay. Winter-wet flats, swamps.	*May* occur
Grevillea althoferorum	R	Compact, rounded, lignotuberous shrub, 0.25–0.5 m high. Fl. yellow, cream, Sep–Nov.	Grey sand with gravel.	*May* occur
Grevillea curviloba sp. *curviloba*	R	Prostrate to erect shrub, 0.1–2.5 m high. Fl. white, cream, Oct. Grey sand.	Winter-wet heath.	*May* occur
Grevillea curviloba sp. *incurva*	R	Prostrate to erect shrub, 0.1–2.5 m high. Fl. white, cream, Aug–Sep.	Sand, sandy loam. Winter-wet heath.	*May* occur
Thelymitra stellata	R	Tuberous, perennial, herb, 0.15–0.25 m high. Fl. yellow, brown, Oct–Nov.	Sand, gravel, lateritic loam.	*May* occur
Verticordia plumosa var. *pleiobotrya*	R	Dense shrub, 0.2–1 m high. Fl. pink, Oct–Dec. Clay, sandy loam.	Seasonally inundated swamps, road verges.	*Unlikely* to occur
Schoenus sp. Bullsbrook (JJ Alford 915)	P2	Grass-like or herb (sedge), ca 0.15 m high. Fl. green, brown.	Grey peaty sand. Low-lying flats	*Unlikely* to occur
Stenanthemum sublineare	P2	Erect shrub, to 0.1 m high. Fl. green, Oct–Dec.	Littered white sand. Coastal plain.	*Unlikely* to occur
Stylidium aceratum	P2	Fibrous rooted annual, herb, 0.05–0.09 m high, leaves spathulate. Fl. pink, white, Oct–Nov.	Sandy soils. Swamp heathland.	*Unlikely* to occur
Stylidium squamellosum	P2	Caespitose perennial, herb, 0.12–0.35 m high, leaves tufted, linear to narrowly oblanceolate, 1-5 cm long, 0.8-2.5 mm wide, apex subacute, margin entire, glandular. Scape glandular throughout. Inflorescence racemose. Fl. yellow, Oct–Nov.	Brown to red-brown clay loam. Winter-wet habitats and depressions, open woodland, shrubland	*Unlikely* to occur
Trichocline sp. Treeton (B.J. Keighery & N. Gibson 564)	P2	Tuberous, perennial, herb, to 1.6 m high.	Sand over limestone, sandy clay over ironstone. Seasonally wet flats.	*May* occur
Acacia drummondii sp. *affinis*	P3	Erect shrub, 0.3–1 m high. Fl. yellow, Jul–Aug.	Lateritic gravelly soils.	*May* occur
Adenanthos cygnorum sp. *chamaephyton*	P3	Prostrate, mat-forming, non-lignotuberous shrub, to 0.3 m high. Fl. white, cream, pink, green, Jul–Jan.	Grey sand, lateritic gravel.	*May* occur
Chamaescilla gibsonii	P3	Clumped tuberous, herb. Fl. blue, Sep.	Clay to sandy clay. Winter-wet flats, shallow water-filled clay pans.	*May* occur
Cyathochaeta teretifolia	P3	Rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2 m high, to 1.0 m wide. Fl. brown.	Grey sand, sandy clay. Swamps, creek edges.	*May* occur

Species	Conservation Status	Species Description	Preferred Habitat	Likelihood of occurring within either site
Eryngium pinnatifidum sp. *palustre* ms	P3	Erect perennial, herb, 0.15–0.5 m high. Fl. white, blue, Oct–Nov.	Clay, sandy clay, clay pans, seasonally wet flats.	*May* occur
Guichenotia tuberculata ms	P3	Erect, open shrub, 0.6–0.9 m high. Fl. purple, pink, Aug–Oct.	Sand clay over laterite, sand	*Unlikely* to occur
Haemodorum loratum	P3	Bulbaceous, perennial, herb, 0.45–1.2(–2) m high. Fl. black, brown, green, Nov.	Grey or yellow sand, gravel	*Unlikely* to occur
Persoonia rudis	P3	Erect, often spreading shrub, 0.2–1 m high. Fl. yellow, Sep–Jan.	White, grey or yellow sand, often over laterite.	*May* occur
Platysace ramosissima	P3	Perennial, herb, to 0.3 m high. Fl. white, cream, Oct–Nov.	Sandy soils	*May* occur
Rhodanthe pyrthrum	P3	Erect, slender annual, herb, 0.05–0.2 m high. Fl. white, yellow, Oct–Dec.	Clay, sandy clay. Winter-wet depressions, clay pans, swamps.	*Unlikely* to occur
Stylidium longitubum	P3	Erect annual (ephemeral), herb, 0.05–0.12 m high. Fl. Pink, Oct–Dec.	Sandy clay, clay. Seasonal wetlands.	*Unlikely* to occur
Verticordia serrata var. *linearis*	P3	Shrub, to 1 m high, differs from other varieties in the linear acuminate leaves 6-20 mm long; cilia to 1.2 mm long. Fl. golden, Sep–Oct.	White sand, gravel. Open woodland.	*Likely* to occur
Baeckea sp. Chittering (RJ Cranfield 1983)	P4	Erect open shrub, ca 0.4 m high. Fl. pink, white, Dec.	Lateritic gravel.	*Unlikely* to occur
Calytrix sylvana	P4	Shrub, 0.4–1 m high. Fl. purple, blue, pink, Aug–Oct.	Lateritic soils, sand. Sandplains, ridges.	*May* occur
Drosera occidentalis sp. *occidentalis*	P4	Fibrous-rooted, rosetted perennial, herb, to 0.01 m high. Fl. pink, white, Nov–Dec.	Sandy & clayey soils. Swamps & wet depressions	*May* occur
Synaphea grandis	P4	Tufted shrub, ca 0.3 m high. Fl. yellow, Oct–Nov.	Laterite.	*Likely* to occur
Verticordia lindleyi sp. *lindleyi*	P4	Erect shrub, 0.2–0.75 m high. Fl. pink, May/Nov–Jan.	Sand, sandy clay. Winter-wet depressions.	*May* occur

The presence of DRF within the proposed project area may be a trigger of the *Environment Protection & Biodiversity Conservation Act, 1999,* and would require the project to be referred to the EPA. Spatial Flora Data obtained from the DEC does not indicate any known populations of DRF or Priority Flora to occur within the proposed project alignment. Currently, the nearest known location of Priority Flora species occurs approximately 700m north of Muchea East Road (Figure 2), whilst the nearest know location of DRF species occurs approximately 1.2km west of Brand Highway (near Muchea South Road).

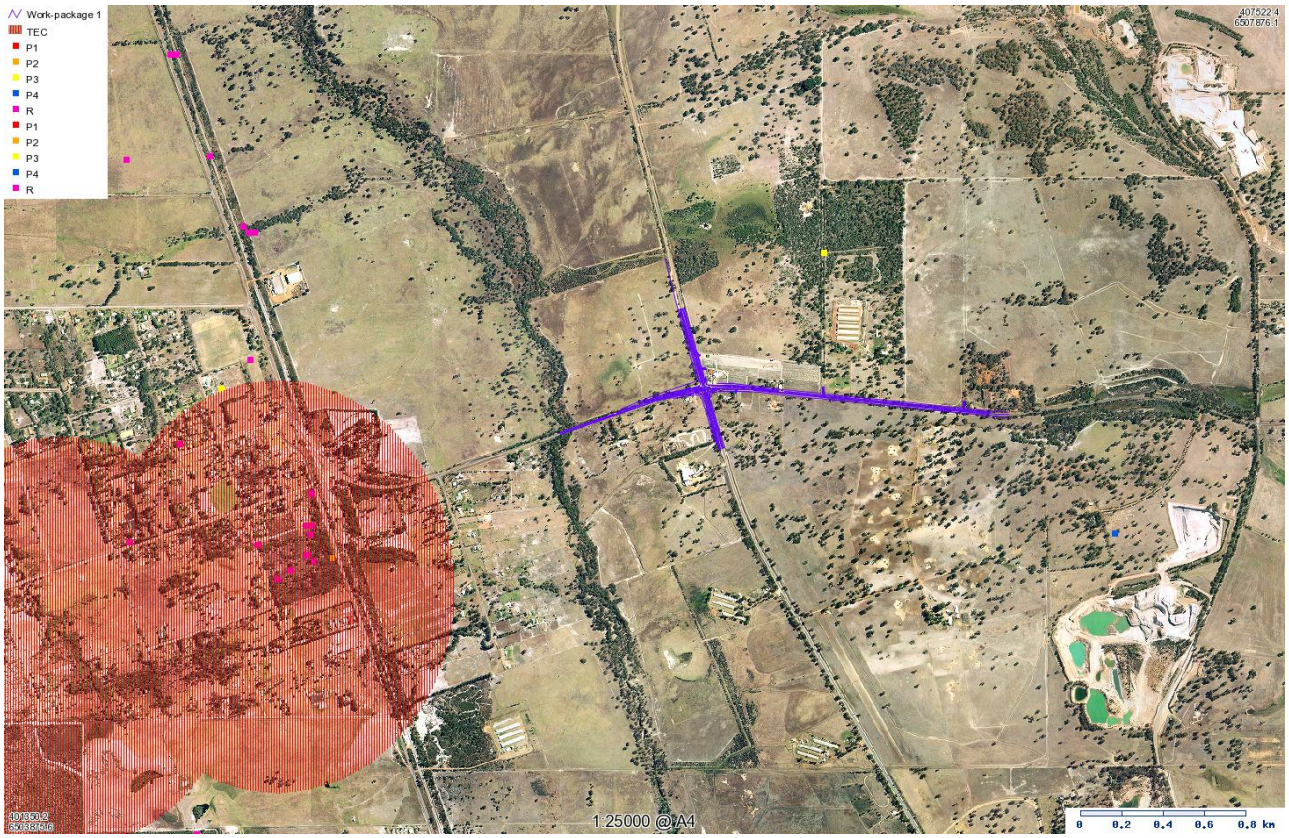

Figure 2: Known occurrences of Threatened Flora & TEC's (red) within the Muchea Region.

5.2.3 Threatened and Priority Ecological Communities

Threatened Ecological Communities (TEC's) are naturally occurring biological assemblages that occur in a particular type of habitat, which are subject to processes that threaten to destroy or significantly modify the assemblage across its range (DEC, 2001). These communities are of conservation significance because they are likely to contain rare organisms or a group of rare organisms.

Mitchell *et al*., (2002) identifies 25 known Threatened Ecological Communities (TEC's) to occur within the Swan Coastal Plan Sub Region. Of these eleven are listed as Critically Endangered, 5 are listed as Endangered and 9 are listed as Vulnerable. Additional to the TEC's, there are 25 known Priority Ecological Communities within the Swan Coastal Plain, including;

- 6 Priority 1 Ecological Communities;
- 8 Priority 2 Ecological Communities;
- 10 Priority 3 Ecological Communities; and
- 1 Priority 4 Ecological Community.

A search of the DEC's Threatened and Priority Ecological Communities database of DP1 project area, indicted that there are no known occurrences of Threatened or Priority Ecological Communities within the immediate vicinity of DP1. However five TEC's were identified within a 10km radius of the package. The closest Threatened Ecological Community to DP1 is Muchea Limestone. This TEC is described as *Shrublands and Woodlands on Muchea Limestone* and is listed as Endangered, however occurs 1km from DP1 – see Figure 2.

Additional to the TEC's recognised to occur within the vicinity of the project, Mitchell *et al.,* (2002) identifies additional vegetation communities to be at risk based on vegetation communities previously mapped by Beard (1975). Although they are not categorised as TEC's, communities are determined to be at risk where a number of threatening processes have been identified with the potential to destroy or significantly modify biological assemblages on the community.

The status for the Beard's vegetation community is provided below in Table 4.

5.2.4 Associations, representative and clearing

An extremely high proportion of the vegetation community, as mapped by Beard, within the project area has been extensively cleared throughout the State. Currently, only 11.16% of Medium Marri Woodland remains within the state since European settlement and clearing.

Table 4: Community Reservation Priority Status for Communities within the Proposed Project Area

Vegetation Code No.	Beard Code	Current extent (ha)	Pre – European extent (ha)	Remaining (%)	Description
999	e_3Mi	28,185	252,446	11.16	Medium woodland: marri

Due to the small percentage of the vegetation community remaining within the state, clearing should be minimised where possible.

5.2.5 Dieback and other diseases or pathogens

Generally, plant communities comprising of susceptible plant species and are threatened by dieback (*Phytopthora cinnamomi*) can be considered as ecosystems at risk (Mitchell *et al*., 2002). Areas of dieback affected flora have been identified within the Muchea region (KBR, 2005). A Dieback assessment was conducted by Gleven Dieback Consultants during November 2004 along a portion of the highway. This assessment occurred along Great Northern Highway to the north of WP1 between 54.6 SLK and 62 SLK, outside of the project area.

Interrogation of the DEC's *Phytophthora Dieback Atlas* indicates the confirmed presence of *Phytophthora* along Great Northern Highway to the north of DP1 (Figure 3). The Atlas also indicates a high proportion of cleared land surrounding DP1, which would not provide a good indication of the potential presence or absence of Dieback due to the highly degraded nature.

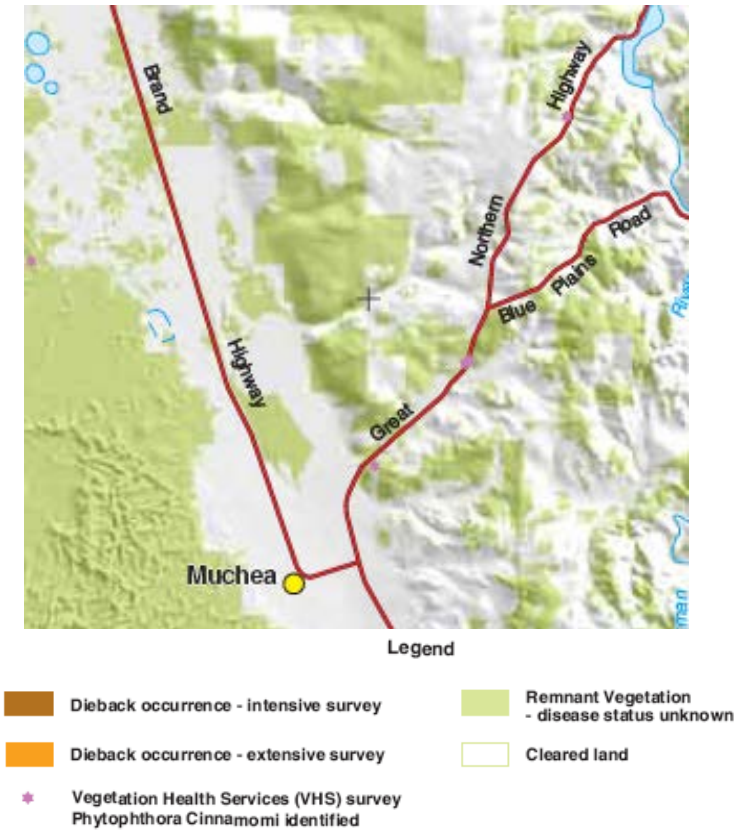

Figure 3: Known occurrences of Dieback within the Muchea Region, extrapolated from the DEC *Phytophthora Dieback Atlas*.

5.2.6 Introduced Flora (Weeds)

Within Western Australia there have been over 1,200 weed species recognised. Specifically within the Swan Coastal Plain a total of 801 weed species are known. Of these, 61% have been classified as Environmental Weeds (EPA, 2007). Environmental Weeds establish in natural ecosystems and adversely modify natural processes, resulting in the decline of the invaded community. Weeds threaten the survival of many flora species because of their rapid growth and the ability to out-compete native plants for available nutrients, water, space and sunlight.

The *Agriculture and Related Resources Protection Act, 1976,* lists weeds species (92 species within WA) as Declared Plants or pest weeds. Under the Act, these species are subject to restrictions on movement or sale and landholders are obliged to carry out control measures to prevent their spread. Most weed species are known to be effective in colonising areas and can rapidly invade natural sites that have been disturbed or where there has been clearing.

The following Declared Plants have been identified to occur within the Shire of Chittering and require specific control measures enforced by the Department of Agriculture and Food to prevent further infestation:

- *Argemone mexicana* – Mexican Poppy;
- *Argemone ochroleuca* – Mexican Poppy;
- *Echium plantagineum* – Paterson's curse;
- *Carthamus lanatus* – Saffron thistle;
- *Datura stramonium* – Thornapple;
- *Datura ferox* – Fierce Thornapple;
- *Datura leichhardtii* – Leichhardt's or Mexican Thornapple;
- *Datura wrightii* – Hairy Thornapple;
- *Datura innoxia* – Downy Thornapple; and
- *Datura metel* – Thornapple.

5.3 Heritage

Heritage places are defined by the heritage values that people recognise in them (EPA, 2007). Various searches of Commonwealth, State and Local Government Heritage databases identified that the proposed Design package is within close proximity to known areas of Indigenous and Non Indigenous significance.

5.3.1 Non-indigenous Heritage

A search of the Australian Heritage Council, the Heritage Council of Western Australia and the Shire of Chittering Municipal Inventory Databases identified two Non Indigenous Heritage sites near the project area. These sites are summarised in Table 5. Of these sites only one site, namely Muchea Roadhouse (14150) is adjacent to DP1. Road access improvements to the roadhouse are proposed.

Table 5: Listed Municipal Sites within or in close proximity to DP1

Name	Site Number	Register	Data source	Location
Muchea Roadhouse	14150	Municipal Heritage Inventory	Heritage Council of Western Australia	23 Great Northern Highway, corner of Brand Highway
Muchea Store & House (old)	14118	Municipal Heritage Inventory	Heritage Council of Western Australia	1 & 2 Brand Hwy, Muchea

Although Municipal Heritage Inventories are not afforded protection under Commonwealth and State legislation, it warrants consideration under the Shire of Chittering *Town Planning Scheme No. 6 District Zoning Scheme*. Under the Scheme, Clause 7.1.1 states:
The Local Government is to establish and maintain a Heritage List to identify those places within the Scheme Area which are of cultural heritage significance and worthy of conservation under the provisions of the Scheme, together with a description of each place and the reasons for its entry.

Additional to this, Main Roads has a mandatory heritage obligation under the Government Heritage Property Disposal Process for properties that are:

- Listed on any Municipal, State or National heritage register;
- Older than 60 years; and
- Having other heritage sites of significance in terms of historic, aesthetics, social or scientific value.

5.3.2 Aboriginal Heritage

A search of the Department of Indigenous Affairs register identified one site of Aboriginal Cultural significance within the vicinity of the proposed works (Site 3525). A summary of the site is presented in Table 6.

Table 6: Aboriginal Heritage Sites within DP1

Site ID	Status	Site Name	Site Type
3525	Permanent register	Ellen Brook: Upper Swan	Mythological

The listed site is shown below with the demarcated bed and banks of Ellen Brook draining from north (top of diagram) into a broad polygon over the catchment. The works at DP1 are marked in purple.

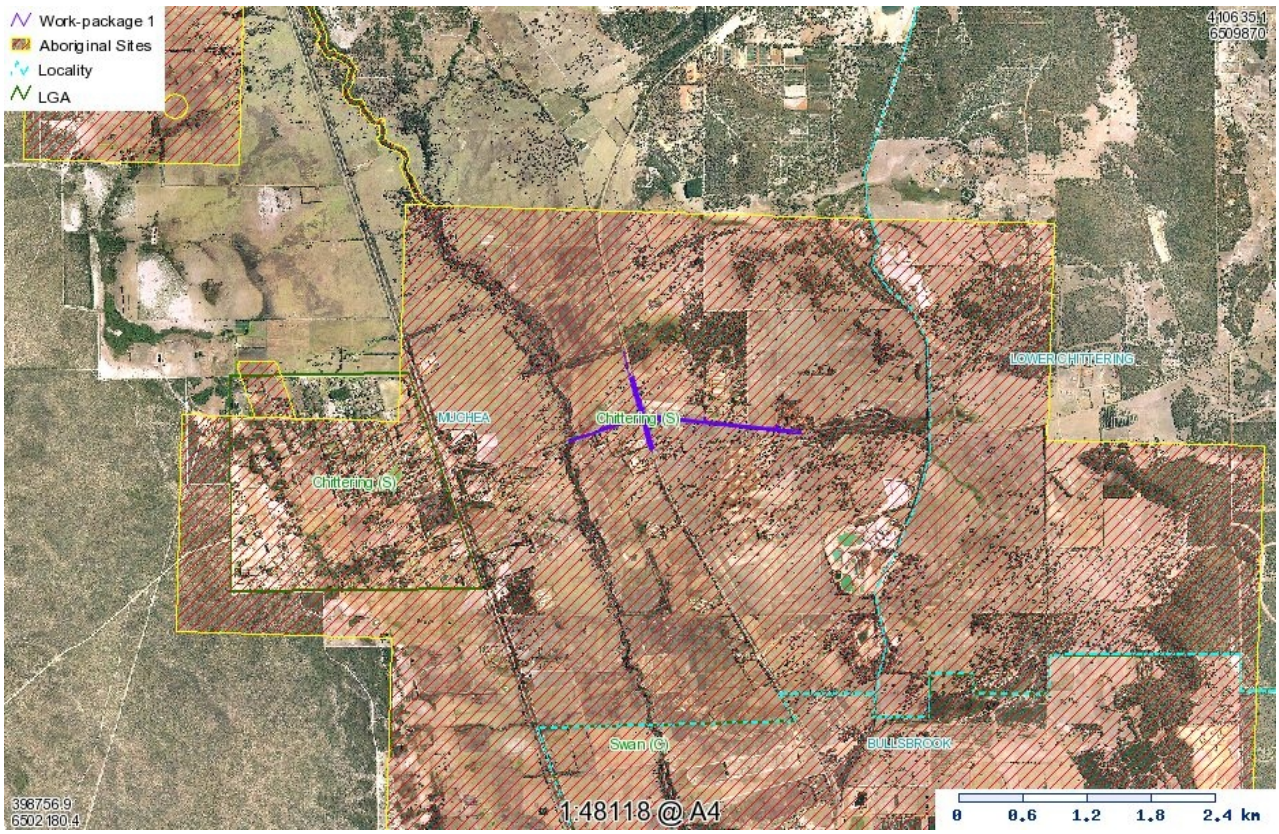

Figure 4: DIA database map of listed sites in region.

A small ephemeral tributary draining from east to west beneath the southern approach to the intersection in DP1 may form part of the basis of the Ellen Brook site listing. This tributary is proposed to be disturbed by earthworks required for drainage improvement.

Figure 5: Location of small ephemeral tributary south of GNH-Brand Hwy intersection proposed works.

The best way to determine any values is to conduct an aboriginal cultural heritage survey by a qualified consultant working with traditional informants able to speak for indigenous people. That survey and report will determine whether the works will require a section 18 application and, if so, what findings and conditions may be recommended as part of an ACMC decision on the application.

Currently, it is unclear whether a section 18 notice under Aboriginal Heritage Act will be required. As a result, a section 18 application will be made to disturb areas given its vicinity of a known site. It is anticipated that the ACMC may choose to:

- Not decide on the application; or
- Approve the works, subject to conditions such as:
    - A monitor on site during the ground disturbance;
    - Earthworks to be managed to control sediment and erosion effects on Ellen Brook.

5.4 Groundwater

Groundwater comprises approximately 50% of Perth's water supply and the protection of these public water supplies is of great importance. Most of this water comes from the shallow groundwater resources of the Gnangara Mound, which is the most valuable source of fresh water in the Perth Region, with contributions from the Jandakot Mound and other deeper confined aquifers (WAPC, 2001).

The project area is located within the Ellen Brook catchment, which supports many land uses that effect groundwater. For example, in the Chandala Brook area pastoral activities are predominant, where in the area between Chandala Lake and Muchea cattle grazing is the primary land use with some large pine plantations along the edge of the scarp. In the area near Muchea, new urban development is occurring along the hills of the Darling Scarp. The Tiwest Mineral Sands Processing Plant is located to the east of Ellen Brook in this area. The Ellen Brook catchment, on the outskirts of Perth is in transition from rural to intense horticultural, light industrial and residential land use.

Therefore in the Ellen Brook catchment area groundwater is mainly used for domestic supplies, irrigation and livestock. (Smith. R.A, and Shams, R., 2002).

Groundwater within the study area is unlikely to be impacted by the proposed works as there is no abstraction of groundwater or dewatering within the scope of the project. In order to reduce dust suppression, water will be purchased from the Shire of Chittering and therefore a permit will not be required for abstraction of groundwater.

5.5 Surface Waters and Wetlands

The DEC's *Geomorphic Wetlands Swan Coastal Plain* dataset identified a number of wetlands within or in close proximity to the east of DP1 (Figure 6). These wetlands are as follows:

- A large Multiple Use (MU) wetland (UFI 14255), which is classified by the DEC's *Geomorphic Wetlands Swan Coastal Plain* dataset as a Palusplain (seasonally waterlogged flat). This wetland extends east to Gulliente Road and covers the majority of DP1; and

- A small Multiple Use (MU) Palusplain (UFI 12251), a seasonally waterlogged flat occurs approximately 310 metres east of GNH along Muchea East Road.

The DEC classifies MU wetlands as wetlands with few important ecological attributes and functions remaining. There is no impediment to development of MU wetlands. Both Palusplain wetlands are identified within the Ellen Brook consanguineous suite. Recent analysis of data indicates that only 3.8% of Palusplain wetlands on the Swan Coastal Plain are identified as Conservation Category (J Higbid, *pers comm*.)

None of the aforementioned wetlands are protected under the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* (EPP).

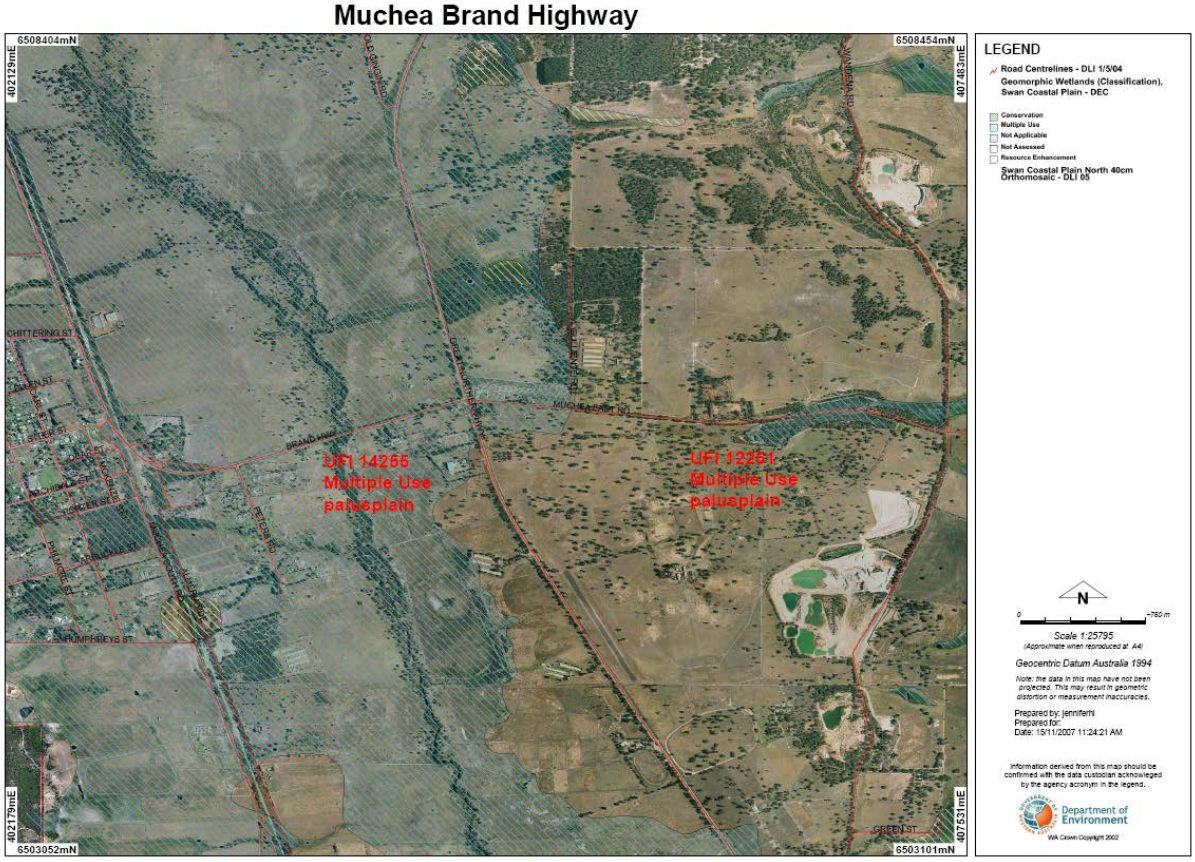

Figure 6: Geomorphic Wetlands occurring within close proximity to Design package 1.

5.6 Acid Sulphate Soils

The DEC (2006) describes Acid Sulphate Soils (ASS) as naturally occurring soils and sediments containing sulphide minerals, predominantly pyrite (an iron sulphide). In an undisturbed state below the watertable, these soils are benign 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 disturbances of these soils can generate large amounts of sulphuric acid and leaching of contaminants naturally occurring in soils. Flushing of acidic leachate into ground water and surface waters can cause off site impacts including:

- Significant environmental and economic impacts including fish kills;
- Damage to estuarine fisheries and loss of biodiversity in wetlands and waterways;
- Contamination of surface and ground water resources by acids, arsenic, heavy metals and other contaminants;
- Loss of agricultural productivity through metal contamination of soils (predominantly by aluminium); and
- Ecological damage to aquatic and riparian ecosystems;
- Corrosion of concrete and steel infrastructure by acidic sol and water

The Western Australian Planning Commission (WAPC) Planning Bulletin 64 (WAPC, 2003) identifies areas of high, medium and low risk of potential acid sulphate soils in the south-west of Western Australia. Interrogation of Planning Bulletin 64 indicates that the majority of DP1 lies within areas of; *No known risk of ASS occurring within 3m of the natural soil surface or deeper*. However, Ellen Brook to the west of the package has been identified as; *Moderate to low risk of ASS occurring within 3m of natural soil surface.* As no dewatering or excavation below the watertable is required for the project further investigations will not be necessary.

5.7 Contaminated Sites

Land contamination is defined as land that has pollutant (or pollutants) at above background concentrations causing, or with the potential to cause, adverse impacts to human health, the environment or any environmental value. The toxicity and persistence of pollutants in soils, as well as their direct uptake by people, plants and animals is the major concern with land contamination (EPA, 2007).

At present a total of 1,350 contaminated sites have been reported in WA (EPA, 2007). Contaminated land is defined as land that has a pollutant or pollutants at above background concentrations causing, or with the potential to cause adverse impacts to human health, the environment of any other environmental values.

A Basic Summary Record database search was conducted through the DEC to determine the occurrence of known contaminated sites within DP1. No Contaminated sites have been reported to occur within the site. The closest known contaminated site occurs approximately 20km south of the proposed alignment within the City of Swan. Due to the lack of known contaminated sites within the proposed project area and the distance to the closest known site, contaminated sites are not anticipated to pose any environmental constraints upon the project.

5.8 Salinity

Salinity is a major problem in the Wheatbelt region however there were no visual signs of salinity observed in the project area.

5.9 Adjacent Land Uses

The proposed works require land to be added to the existing road reserve. This additional adjoining land is zoned as an Intensive Land Use Zone and is currently freehold title. No amendments are needed to the Local Government Planning Scheme or Region Scheme for this change in land tenure.

5.10 Reserves and Conservation Areas

There are no conservation areas or reserves adjacent to the project area.

6. CONCLUSION

6.1 Referral

The decision whether to refer the project to the Commonwealth Department of the Environment, Water Heritage and Arts (DEWHA) was based upon whether the project would impact upon matters of national significance. The only aspect of national environmental significance that may be impacted by the proposed works is Carnaby's Black Cockatoo. The work does not have a significant impact in relation to the terms of Significance Guidelines (for Carnaby's Black Cockatoo) and therefore will not be referred to the DEWHA.

Given the scale of the project and the environmental management measures proposed, the project does not require referral to the WA Environmental Protection Authority.

6.2 Further Approvals required

- A section 18 (AHA) application because of DIA site number 3525.

7. SUMMARY ASSESSMENT OF ASPECTS AND IMPACTS

Table 7: Aspects and Impacts – *Great Northern Highway/Brand Highway 36.9 SLK*

Aspect	Evaluation of Potential Impacts
Aboriginal heritage	A search of DIA's database identified one site of Aboriginal heritage significance (site 3525) within the vicinity of the project area. Aboriginal heritage field surveys were undertaken towards the end of 2004 and 2007 along Great Northern Highway. As a result of these surveys, a Section 18 was obtained to disturb site 3525 – Ellen Brook as it related to MRWA Bridge 853. A similar application is recommended, particularly in relation to the risk from civil works (sedimentation and earthworks around drainage and culverts).
Acid Sulfate Soils	This project requires no dewatering or excavation below the water table therefore not relevant to the proposed works.
Air quality	Not relevant to the proposed works.
Contamination	Given the relatively superficial nature of the required earthworks, there appears to be a low risk of any significant contamination issues.
Dust	Likely to be a minor issue during earthworks. No major sensitive receivers adjacent to the proposed works, but excessive dust could impact vegetation. Activities will need to be subject to dust suppression to control short-term dust generation. Likely to be easily managed by standard construction dust management techniques.
Fauna	No impact on Carnaby's Black Cockatoo nesting hollows or any other significant fauna as part of the proposed upgrade works. One potential site is identified. An artificial nesting box can be used as part of a regional mitigation.
Groundwater	No dewatering or drainage modifications are required, hence no change to groundwater level or quality.
Hazardous substances	Not relevant to the proposed works.
Heritage (non-indigenous)	There are two registered European Heritage sites near the work site. One is adjacent to DP1. However neither will be impacted by the proposed works.
Noise and vibration	No major sensitive local receivers. Construction works is not be expected to significantly contribute to noise levels at the nearest sensitive receivers, provided works are limited to normal working hours. The requirements of the Shire of Chittering must be met in respect of noise management and construction working hours.
Vegetation – clearing	• 1.03 ha of native vegetation will be cleared. • The condition of the native vegetation to be cleared is poor. • The project will not involve temporary clearing. • The native vegetation to be cleared is well represented regionally, except for a section of vegetation association 999 which possesses less than 30% of its pre-European extent. • The native vegetation to be cleared *does not* occur within an ESA. • The native vegetation can be cleared using Main Roads' purpose permit.
Vegetation – dieback	The area is dieback 'uninterpretable' and should therefore be treated as dieback free.
Vegetation – TEC's/DRF	None present in the work zone, areas outside the project area must not be disturbed as part of the proposed works.

Table 7: Aspects and Impacts – *Great Northern Highway/Brand Highway 36.9 SLK*

Aspect	Evaluation of Potential Impacts
Vegetation – weeds	Numerous common weed species occur throughout the proposed works areas however no declared plants are present in the project area. Although these common species are likely to be widespread within the general area the risk of spreading these weeds species as part of the proposed work should be minimised. Standard weed hygiene measures should be applied for all earthworks in the area, including ensuring that plant and equipment brought on to the site are clean of soil.
Public safety and risk	Provided traffic management and signage to Main Roads standards is employed, none of the proposed works present any significant hazards to public safety. The proposed works will serve to enhance public safety by improving the GNH and access into the Chittering Roadhouse.
Reserves / Conservation areas	There are no conservation areas or reserves adjacent to the project area.
Salinity	There were no visual signs of salinity observed in the project area.
Statutory Land Use Planning	The proposed works are entirely within the existing road reserve and the adjoining land is zoned as an Intensive Land Use Zone. No further amendments would be required to the Local Government Planning Scheme or Region Scheme.
Surface water/drainage	One water course occurs within the site. The proposed works will not disturb or interrupt any natural drainage and surface run-off patterns with existing flows maintained.
Visual amenity	The proposed works will result in minor and short-term visual impacts. Revegetation will occur post construction.
Wetlands	The majority of the site is within a palusplain (seasonally waterlogged flats) categorised as Multiple Use. Flows through this area will not change as a result of the works and the majority of the clearing is outside of this palusplain area.

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APPENDIX A - DEC THREATENED & PRIORITY FAUNA DATABASE Search

Threatened and Priority Fauna Database

31.4798 °S 115.8857 °E / 31.6939 °S 116.1184 °E Muchea area (plus~10km buffer)

*	Date	Certainty	Seen	Location Name	Method
Schedule 1 - Fauna that is rare or is likely to become extinct					
Dasyurus geoffroii				**Chuditch**	*2 records*
This carnivorous marsupial occupies large home ranges, is highly mobile and appears able to utilise bush remnants and corridors.					
	2002	3	0	Bullsbrook	Definite signs
	2006	1	1	Walyunga National Park	Night sighting
Phascogale tapoatafa ssp. (WAM M434)				**Brush-tailed Phascogale**	*1 records*
This arboreal marsupial occurs in forest and woodland where suitable tree hollows are available. Populations fluctuate dramatically in response to invertebrate prey abundance.					
	2005	1	1	Lower Chittering	Night sighting
Calyptorhynchus latirostris				**Carnaby's Black-Cockatoo**	*1 records*
This species moves around seasonally in flocks to feeding areas in proteaceous scrubs and heaths and eucalypt woodlands as well as pine plantations. Breeding occurs in winter/spring, mainly in the eastern forests and wheatbelt where they can find mature hollow-bearing trees to nest in.					
	2006	1	1	Pinjar	Day sighting
Calyptorhynchus sp				**White-tailed Black Cockatoo**	*1 records*
These records pertain to either Baudin's Black-Cockatoo or Carnaby's Black-Cockatoo.					
	1996	1		Barracca Nature Reserve	Day sighting
Leioproctus douglasiellus				**Leioproctus douglasiellus**	*1 records*
This species of native bee appears to be dependent on the flowers of Goodenia filiformis. It is known only from specimens collected at Pearce and Forrestdale Lake.					
	1954	1	3	Pearce	
Schedule 4 - Other specially protected fauna					
Morelia spilota imbricata				**Carpet Python**	*1 records*
This species occurs in a variety of habitats including forest and heathland. It is often arboreal and preys on birds, other reptiles and small to medium size mammals. This species is listed under both Schedule 4 and Priority 4.					
	2005	1	1	Bullsbrook	Day sighting
Priority One: Taxa with few, poorly known populations on threatened lands					
Arbanitis inornatus				**Arbanitis inornatus**	*1 records*
This species of trapdoor spider is found on the Darling Range escarpment between the Brockman and Serpentine Rivers south to the Murray River system. Small isolated populations also occur on the Swan Coastal Plain. The species is under threat from land development.					
	1950	1	1	Bullsbrook	Caught or trapped
Priority Three: Taxa with several, poorly known populations, some on conservation lands					
Hylaeus globuliferus				**Hylaeus globuliferus**	*2 records*
This species of native bee is known to feed on the flowers of Adenanthos cygnorum in particular but has also been collected from the flowers of Grevillea cagiana, Banksia grossa and Banksia attenuata.					
	1996	1		Melaleuca Conservation Park	
	1996	1		Melaleuca Conservation Park	

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31.4798 °S 115.8857 °E / 31.6939 °S 116.1184 °E Muchea area (plus~10km buffer)

*	Date	Certainty	Seen	Location Name	Method
Leioproctus contrarius				**Leioproctus contrarius**	*2 records*
This species of native bee is apparently dependent on flowers of Goodeniaceae and possibly Lechenaultia stenosepala. Recent surveys have shown that it is more widespread than previously thought.					
	1954	1	1	Bullsbrook	Caught or trapped
	1954	1	1	Bullsbrook	
Priority Four: Taxa in need of monitoring					
Morelia spilota imbricata				**Carpet Python**	*1 records*
This species occurs in a variety of habitats including forest and heathland. It is often arboreal and preys on birds, other reptiles and small to medium size mammals. This species is listed under both Schedule 4 and Priority 4.					
	2005	1	1	Bullsbrook	Day sighting

* Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation

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APPENDIX B - MRWA VEGETATION CLEARING ASSESSMENT REPORT

This report has been prepared to assist MRWA in addressing condition 7 "Assessment of Clearing Impacts" under Clearing Permit CPS 818/3.

For guidance on how to complete the form, refer to DEC completed reports (active permits) at http://203.20.251.100/cps_reports/.

AREA UNDER ASSESSMENT DETAILS

Proponent details

Proponent's name: **MRWA**

Contacts:
Name: Nigel Rowe
Phone: 9622-4740
Fax: 9622-3767
Email: nigel.rowe@mainroads.wa.gov.au

Property details

Property: Great Northern Highway 36.9 SLK

Colloquial name:

Area under assessment

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:	Site Plan Attached
1.03		Machine	Road Improvements	☐ Yes ✔ No

Avoidance/Minimise clearing

How have the clearing impacts been minimised? Woks have been reduced in size and designed to avoid large trees where possible

BACKGROUND

Existing environment and information

Description of the native vegetation under application

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

Site Visit Undertaken	✔ Yes ☐ No	**Fauna / Flora Survey Undertaken**	✔ Yes ☐ No
Site Report Attached	☐ Yes ✔ No	**Fauna / Flora Survey Report Attached**	☐ Yes ✔ No
Site Photos Attached	☐ Yes ✔ No	**Other Relevant References Attached**	☐ Yes ✔ No

Vegetation Complex	Clearing Description	Vegetation Condition	Comment
999	Machine clearing for road improvements	Poor	Complex 999 - 13.1% pre European extent remaining

ASSESSMENT OF APPLICATION AGAINST CLEARING PRINCIPLES

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

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

Methodology The biological surveys to the north and follow up site visits found vegetation complex 999 in poor condition within the work area The extent of clearing from this complex is very minor, resulting in the proposal being not at variance with this principle.

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

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

Methodology Fauna searches located significant fauna within a 10km radius of the works however due to the degraded nature of the site it is unlikely this fauna would be located within the road reserve. A survey located no known Carnaby's Black Cockatoo nesting hollows in the work area. The works are therefore not at variance to this principle. One potential site is identified. An artificial nesting box can be used as part of a regional mitigation.

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

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

Methodology Biological survey and database seraches found no rare flora in the work area.

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

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

Methodology Biological survey and database seraches found no TEC's in the work area.

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

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

Methodology The proposal clears a small amont of vegetation complex 999, which has 13.1% of the pre European extent remaining. The small amount of vegetation complex 999 within the site is rated as poor condition and is highly degraded. There is currently 15,161.705ha of vegetation complex 999 remaining, of which 2,127.441ha or 14.0% is located within the DEC estate. Due to the degraded nature of the vegetation and small amount of clearing the proposal is determined to be not at variance with this 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.

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

Methodology A watercourse (Ellen Brook) is located at the eastern extent of the works and is an ESA however no vegetation clearing will occur within this area. The majority of the site is within a palusplain (seasonally waterlogged flats) categorised as Multiple Use, although the majority of the clearing is along Muchea East Road outside of this palusplain area. Due to the clearing being outside of Ellen Brook, the proposal is not at variance with this principle.

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

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

Methodology Only a thin strip of vegetation is to be cleared with revegetation to follow at the completion of the works.

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

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

Methodology The work area is not close enough to any conservation areas to have an impact on their values.

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

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

Methodology Works will not impact any surface water areas and as there is no dewatering underground water won't be efected.

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

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

Methodology Area is generally waterlogged in the winter with only a small amount of vegetation to be cleared not effecting this water level or increasing any risk of flooding.

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

Comments

Methodology

SUBMISSIONS

If required have submissions been requested and addressed

Submission requested from	Request Sent (Date)	Submission Received (Date)	Issues Raised / Comments Made

ASSESSOR'S RECOMMENDATIONS

List of Principles seriously at variance, at variance or maybe at variance	Recommendation (does this clearing require a Revegetation Management Plan / Offset Proposal / Environmental Management Plan / Management Strategy/New Application, under CPS 818/3)
N/A	N/A

References

OFFICER PREPARING REPORT

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Position: Nigel Rowe – Environment Officer
Wheatbelt North Regional Office
MRWA
9622-4740

6 December 2007