



Main Roads Western Australia

**Road Fencing Projects -
Ashburton & Carnarvon Shires**

Environmental Impact Assessment and
Management Plan

Report

May 2006



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1. Introduction

1.1 Background and project scope

GHD was engaged by Main Roads Gascoyne Region to provide an Environmental Impact Assessment and Environmental Management Plan (EIA/EMP) for proposed road reserve fencing in the Ashburton and Carnarvon Shires. Currently, these sections of State Highways and Main Roads road reserves border unfenced pastoral properties. Road fencing along regional highways is a public safety issue, as stock often congregate on or near the road.

The following scope of works was carried out for the Environmental Impact Assessment and Management Plan (EIAMP):

- Identification of potential environmental impacts on vegetation and other relevant issues. Field surveys were conducted to examine flora and landform present.
- Desktop review of relevant European heritage issues.
- Recommended mitigation strategies and management options to minimise impacts on the environment or heritage sites.

The following road sections were surveyed:

- Mt Stuart Station:
Nanutarra-Munjina Road – 73.0 SLK to 89.5 SLK (16.5 km on both sides of road).
A short (ca. 1 km) section has already been fenced on the north side of the road;
- Peedamulla Station – Yarraloola Station:
North West Coastal Highway – 907.7 SLK to 945.0 SLK (37.3 km on both sides of road);
- Yanrey/Nyang Stations ('Barradale South'):
North West Coastal Highway – 761.06 SLK to 767.94 SLK (6.88 km on both sides of road);
- Warroora Station:
Minilya-Exmouth Road – 24.39 SLK to 68.64 SLK (44.25 km on both sides of road).
A 9 km section has already been fenced by the station manager on the east side of the road. The fenceline on the west side of the road will largely follow an existing Telstra optic cable line.

The locations of the proposed road fencing sections are shown in Figure 1 - 4.

The proposed fences will be constructed 100 m from the centreline of the road. However, in some areas local topography makes this impractical and the fenceline will be placed for ease of construction and maintenance, usually closer to the road. The survey was limited to the area to be cleared for the fences.



1.1.1 Previous reports

An EIAMP for other road fencing sections in the area was prepared by GHD (2005) for sections of Onslow Road, North West Coastal Highway and Nanutarra-Munjina Road. The report describes the existing climate and geology of the region. The regional environment of the road reserve sections considered here is identical. Site-specific vegetation and landform data are detailed in sections 2.2 to 2.4.

The section of Nanutarra-Munjina Road (Mt Stuart Station) surveyed here directly adjoins that included in GHD's previous report to the east, and the section of North West Coastal Highway (Yanrey/Nyang Stations) surveyed here adjoins that surveyed previously to the south.

Beard (1975) extensively mapped the vegetation of the region, and also gives detailed descriptions of dominant soils and geological formations.

1.2 Methodology

The EIA/EMP for the fencing is based on desktop and field investigations. The field survey was conducted by Greg Guerin in January 2006, assisted by Main Roads WA staff (Paul Hoare). The field survey ascertained the following:

- ▶ vegetation communities and landform present along the road reserves, recorded in relation to SLK;
- ▶ plant species present and presence of threatened flora;
- ▶ opportunistic observations of fauna;
- ▶ presence of potential European heritage sites;

Desktop investigations included the following:

- ▶ records of Declared Rare and Priority Flora held in Department of Conservation and Land Management (CALM) databases;
- ▶ examination of vegetation communities previously mapped for the area, and known occurrences of Threatened Ecological Communities;
- ▶ associated landuse and European heritage. Several databases were searched for records of known heritage sites;
- ▶ legal requirements pertaining to identified environmental impacts.

Aboriginal Heritage Survey(s) and reports will be undertaken by others.



2. Existing Environment

Details of the regional climate are given by GHD (2005) and can be examined further in Beard (1975). Climatic regions in the study area range from deserts with summer and winter annual rainfall of 200 – 250 mm to tropical deserts further inland with an annual rainfall of 250 – 300 mm (e.g. Mt Stuart region).

2.1 Soils and landform

Nanutarra-Munjina Road

The soil is brown sand with gravel, or stony laterite with quartz. The terrain is largely a flat to undulating plain interspersed with low rocky hills.

North West Coastal Highway

The soil in the survey area is mostly red-brown sand with pebbles of laterite. Much of the area is a flat plain with occasional low rises. Occasionally the land is undulating with rocky ridges. Warrambo Creek has outcropping solid laterite with gravel or sand.

North West Coastal Highway (Barradale South)

The survey area is mostly flat with hard, red sandy soil. The area is intersected by minor waterways.

Minilya-Exmouth Road

The landform of the survey area is mostly flat, sometimes with minor undulations and occasional low hills. The area is characterised by brown or red-brown sandy soils. Soils at the southern end of the survey area are gravelly sand. The area around Lyndon Crossing has fine brown alluvial sand.

2.2 Surface hydrology and drainage

Nanutarra-Munjina Road

The area is characterised by a complex drainage pattern. There are numerous creek-channels running approximately north-south. After heavy rains, these ephemeral creeklines may flow strongly and flood the surrounding area, depending on which local catchments received rain. Due to the rocky soils in the area, there is substantial immediate runoff after large rainfall events. There are also a number of floodways crossing the road. Water collecting in these may infiltrate or eventually flow into creeklines. Capewells Creek intersects the survey zone.

North West Coastal Highway

The drainage pattern of the area is characterised by large, ephemeral creeks. Warrambo Creek crosses the survey zone. There are a number of less defined floodways and depressions which become wet after rainfall.



North West Coastal Highway (Barradale South)

Runoff from these plains is drained via narrow floodways, with the water either infiltrating or flowing into creek channels. The major drainage channel of the area is Yannarrie River, at the north-eastern end of the survey area.

Minilya-Exmouth Road

Runoff in the region either infiltrates straight in to the ground or collects in depressions, or ultimately drains into Lake MacLeod (a large salt lake which sits between the Minilya-Exmouth Road and the Indian Ocean) via Lyndon River and its tributary, Cardabia Creek. Lyndon River crosses the road in the southern part of the survey area, and the water here is saline.

2.3 Vegetation and flora

All dominant plant species were identified, however, a number of species were not able to be accurately identified to species due to a lack of flowering or fruiting material. The survey was not conducted during the peak flowering season for the area, and reproductive structures were often limited to species growing in wetter locations or to old fruits remaining on plants such as acacias. Furthermore, due to the prevailing dry conditions, very few annual or ephemeral species were present, although a number of these were identified from dead or nearly dead material.

All vegetation types were documented and mapped, and flora was thoroughly examined at regular intervals or whenever communities or species present appeared to change.

A full list of the plant species recorded is included in Appendix B.

Nanutarra-Munjina Road

Beard (1975) mapped shrub steppe with *Acacia xiphophylla* (Snakewood), and *Triodia pungens* (Soft Spinifex) and *T. wiseana*, and patches of *Triodia wiseana* hummock grassland, for the area. The dominant vegetation recorded in the survey zone consists of a mosaic of *Acacia* shrubland in different phases of regeneration following fire. Mature vegetation generally consists of *Acacia xiphophylla* shrubland/low open woodland, typically with *A. synchronicia* and *Triodia pungens*. In areas that have been burnt, the overstorey includes a wider range of *Acacia* spp. or is dominated by *Triodia*. Depressions and floodways typically carry *A. citrinoviridis* (Black Mulga), often with *A. farnesiana* (Mimosa Bush). Rocky rises tend to carry monospecific stands of *T. pungens*.

Much of the vegetation is sparse, with areas of bare ground and few shrubs. Ephemerals grow rapidly after rainfall, including a range of herbs, small shrubs and grasses, evident during the survey mainly as dead plants.

The following notes describe the vegetation communities along the road starting at the eastern end of the section and heading west.



SLK 89.5 - SLK 88.1

The start of the survey section is a flat plain between two rocky hills. The south side had been recently burnt and was mostly open grassland of **Cenchrus ciliaris* (Buffel Grass). There was some regrowth of the *Acacia* shrub layer. The north side had not been burnt. This carries mature *A. xiphophylla* open shrubland to 3-4 m with *Triodia pungens*, *A. synchronicia* and scattered *A. tetragonophylla* (Kurara) and *A. bivenosa*. Understorey species include *Sclerolaena* sp. and *Corchorus laniflorus*.

SLK 88.1 - SLK 87.1

Moderate easterly slope with rocky outcrop. The south side of the road has mostly bare ground or grasses. At SLK 87.7 there is a low hill with *Triodia pungens* on stony soil on north side. The vegetation on the south side continues over some minor undulations.

SLK 87.1 – SLK 86.2

Mature *A. xiphophylla* – *A. synchronicia* shrubland/low open woodland. There are patches of *Eremophila fraseri*.

SLK 86.2 –SLK 86.1

A. citrinoviridis to 5 m with very open understorey.

SLK 86.1 – SLK 74.0

The usual vegetation of this zone consists of *Acacia xiphophylla* with *Triodia pungens* and *A. synchronicia* and occasional **A. farnesiana*. Variations within this zone are described below:

SLK 85.0, SLK 83.8, and SLK 78.1

Minor floodways carrying the same vegetation or with denser shrubs.

After SLK 85.0, the south side has *Triodia* grassland, or burnt grasses with shrub regrowth.

SLK 78.9 and SLK 78.0

Stands of *A. citrinoviridis* around drainage ditches.

SLK 76.7

On the north side there is a small, stony hill with *Triodia* and *A. trachycarpa* (Minni Ritchi). This section is already partly fenced.

SLK 76.0

Capewells Creek. The fence on the northern side stops here. Vegetation is of *A. citrinoviridis* and **A. farnesiana*.

SLK 75.5

On the south side there is a series of large rocky peaks ca. 100-200 m from the road. The north side has low gravelly hills carrying *Triodia* with *A. citrinoviridis* in between.

There are patches of *A. bivenosa*.



SLK 74.5 – SLK 73.0

Vegetation dominated by *A. ancistrocarpa*, *A. citrinoviridis* and *A. bivenosa*, *T. pungens*.

North West Coastal Highway

Beard (1975) mapped sparse shrubs (*Acacia inaequilatera* (Baderi) and *A. bivenosa*, with *A. xiphophylla* on drainage lines) over spinifex (*Triodia basedowii* and *T. wiseana*) for the area. The dominant vegetation recorded in the survey area is a mosaic of mixed *Acacia* spp. shrubland over *Triodia pungens*, sometimes also with *Triodia basedowii* (Lobed Spinifex). The most abundant *Acacia* species include *A. bivenosa*, *A. arida*, *A. inaequilatera* and *A. xiphophylla*. Patches of *Corymbia hamerslyana* and *A. tumida* are also common. Floodways are characterised by stands of *Eucalyptus victrix* (Coolibah), while *E. camaldulensis* (River Red Gum) occurs in wetter areas.

The following notes describe the vegetation communities along the road starting at the northern end of the survey section.

SLK 945.0 – SLK 942.5

Flat plain with 50% open ground carrying *Triodia pungens* and with shrubland dominated by *A. arida* and *A. inaequilatera*. The east side had been recently burnt and the shrubs were not mature. Vegetation on the west side includes *A. bivenosa*, *Grevillea wickhamii* ssp. *?hispidula*, *Corymbia hamerslyana*, *A. ancistrocarpa* and sparse *A. xiphophylla*. The vegetation is open to dense.

SLK 942.5 – SLK 941.8

Patches of denser emergent *A. xiphophylla*.

SLK 941.8

Minor flood zone with stands of *Corymbia hamerslyana* and denser shrubs.

SLK 941.8 – SLK 940.7

Open *Triodia* grassland with dense patches of *A. ancistrocarpa* ± *A. bivenosa*, which is sometimes dominant.

SLK 940.7

Warrambo Creek crossing. The creek bed carries *Eucalyptus camaldulensis*. The flanking vegetation is mostly continuous with the surrounding areas but includes *A. synchronicia*, *Acacia ancistrocarpa*, scattered *A. arida* and **Cenchrus ciliaris*. The northern side of the creek was inaccessible but has dense grassy understorey near the creekline. There are some young individuals of *A. xiphophylla*.

The west side of the road, south of Warrambo Creek is open plain with bare ground or *Triodia* with sparse emergent *Acacia*. The area appears to be an ephemeral floodplain. On the east side of the road south of the creek is a bare sand area (created artificially). South of this is a copse of *E. camaldulensis* in a depression.



SLK 940.0 – SLK 938.5

The dominant vegetation returns to *A. ancistrocarpa* ± *A. inaequilatera* and *A. bivenosa* with *Triodia pungens*. Sections along the east side have been burnt recently and have regenerating shrubs plus dead annuals

SLK 938.5 – SLK 937.5

A. xiphophylla becomes the dominant species over *Triodia*, and there is no more *A. ancistrocarpa*. There are scattered patches of *A. arida*. There are patches of dense **Cenchrus ciliaris* and *A. bivenosa*.

SLK 937.5 - SLK 934.5

Low open shrubland of *A. bivenosa*, *A. ancistrocarpa*, young *A. xiphophylla* and *A. inaequilatera*, and scattered patches of *A. tumida* and *Tephrosia uniovulata* and very occasional emergent *Corymbia hamerslyana*. From SLK 936.0 to SLK 933.5 there are stands of *A. arida*.

SLK 934.5 – SLK 931.7

Mature *A. xiphophylla* with understorey of *A. bivenosa* and patches of *Triodia pungens* and occasional *A. synchronicia* and **A. farnesiana*.

SLK 931.7 – SLK 931.0

Open area on both sides, carrying dead annual grasses or burnt shrubland.

SLK 931.0 – SLK 928.0

Vegetation reverts to mature *A. xiphophylla* with *Triodia* and ephemeral grasses in open areas, and understorey containing typical mixed *Acacia* spp. as described previously, including *A. arida* and *A. ancistrocarpa*. At SLK 929.8 – SLK 929.5 there is a floodway with *Eucalyptus victrix* and dense shrubby area including *A. arida*, *A. ancistrocarpa*, *A. tumida* and *Triodia*. Trees of *Corymbia hamerslyana* occur on either side of the floodway. Also occasional emergent *A. synchronicia*, *A. bivenosa* and very sparse *A. xiphophylla*. At SLK 928.5 there is a minor floodway in a slight depression with dense mixed *Acacia* spp.

SLK 928.0 – SLK 925.5

Mature *A. xiphophylla* shrubland with dense *Triodia* and annual grasses and occasional mixed *Acacia* spp. At SLK 926 there is floodplain with *A. ancistrocarpa*, *Corymbia hamerslyana* and *Eucalyptus camaldulensis*.

SLK 925.5 – SLK 923.9

A. bivenosa and regenerating *A. xiphophylla* with scattered mixed *Acacia* spp. understorey. The vegetation in some parts has been burnt.

SLK 923.9 – SLK 921.0

Lower shrubland vegetation dominated mostly by *A. bivenosa*, *A. synchronicia* and *Triodia pungens* and *T. basedowii*, with patches of *A. ancistrocarpa*. At SLK 921.8 there is a patch of *Corymbia hamerslyana* and *Acacia tumida*.



SLK 921.0 – SLK 919.7

Regrowth *Corymbia hamerslyana* after fire with mixed *Acacia* spp. and *Triodia basedowii*. *Triodia pungens* is also present after SLK 919.9

SLK 919.7 – SLK 919.5

Floodway with *E. victrix* and *C. hamerslyana* and dense **Cenchrus ciliaris* and dense patches of *A. ancistrocarpa*.

SLK 919.5 – SLK 919.7

Mature *A. xiphophylla* over sparse *T. pungens* and *A. bivenosa*.

SLK 917.9 – SLK 915.5

Open mixed *Acacia* spp. shrubland dominated by *A. bivenosa* and *T. pungens* and scattered *A. xiphophylla*, *C. hamerslyana* and *A. inaequilatera*.

SLK 915.5 – SLK 915.0

Mature *A. xiphophylla* shrubland.

SLK 915.0 – SLK 914.5

Rises with *T. pungens* and small *A. xiphophylla* and *A. bivenosa*.

SLK 914.5 – SLK 913.9

Slightly undulating area with rocky ridges carrying mostly *Triodia* with emergent *A. bivenosa* and *A. synchronicia*.

SLK 913.9 – SLK 912.5

Corymbia hamerslyana and *A. tumida* with occasional *A. inaequilatera* and *A. ancistrocarpa* and sparse patches of *Triodia* and **Cenchrus*.

SLK 912.5 – SLK 911.2

Acacia ancistrocarpa and *A. bivenosa* and dense *T. pungens*, with *A. xiphophylla* and *A. tumida* in depressions.

SLK 911.2 – SLK 910.5

Eucalyptus victrix woodland with dense understorey of *A. ancistrocarpa*, *A. tumida* and *T. pungens*, with occasional *E. camaldulensis*, *C. hamerslyana* and grasses.

SLK 910.5 – SLK 909.5

Very low open shrubland of *A. ancistrocarpa*, *A. bivenosa* and regrowth of *Triodia pungens* and *A. arida*. Occasional patches of *C. hamerslyana* and *A. xiphophylla* or with open patches of monospecific *Triodia*.

SLK 909.5 – SLK 908.9

Sparse mature *A. xiphophylla* vegetation.



SLK 908.9 – SLK 907.7

Mostly regenerating *A. xiphophylla* shrubland with *A. bivenosa* and *A. ancistrocarpa* ± *C. hamerslyana* and *A. tumida* in depressions.

The final section reverts to mature *A. xiphophylla*.

North West Coastal Highway (Barradale South)

Beard (1975) mapped shrub steppe of *Acacia inaequilatera* over *Triodia pungens* and *T. basedowii*. The dominant vegetation recorded in the survey area consists of a mosaic of *Acacia* open shrubland to low woodland characterised by *A. xiphophylla*, *A. synchronicia*, *A. bivenosa*, *A. inaequilatera* and *A. ancistrocarpa*. Ground cover and some areas of open plain are dominated by *Triodia basedowii*. Depressions and minor floodways carry *Eucalyptus camaldulensis*.

The following notes describe variations in the vegetation relative to SLK location:

SLK 767.94 – SLK 767.43

Eucalyptus camaldulensis woodland fringing Yannarrie River.

SLK 767.43 - 765.7

Very open vegetation dominated by *A. xiphophylla*, *A. synchronicia*, and *T. basedowii*. There are scattered patches of *A. bivenosa*, *A. ancistrocarpa* and *A. inaequilatera*. At SLK 766.9 – 766.6 the vegetation is interrupted by a depression with *Eucalyptus camaldulensis* and scattered *Hakea lorea* (Witinti). The last part of this section has only scattered *A. xiphophylla* and is mainly *Triodia* with scattered *Acacia* spp.

SLK 765.7 – 765.2

A waterway carrying *Acacia* spp. precedes a mostly open plain with *Triodia* and sparse *Acacia ancistrocarpa*, and scattered plants of *H. lorea* and *A. bivenosa*.

SLK 765.2 – 763.1

Low open shrubland 0.30 to 1.0 m high dominated by *Acacia* sp. with only very rare individuals of *H. lorea*, *A. bivenosa*, *A. ancistrocarpa*, and *A. trachycarpa*. There are patches of abundant (dead) *Goodenia lamprosperma* and occasional trees of *Corymbia zygophylla* and *E. camaldulensis* (in depressions). After SLK 763.7 there are dominant patches of *A. bivenosa* and *Codonocarpus cotinifolius* (Native Poplar).

SLK 763.1 – 761.3

Mixed *A. ancistrocarpa*, *A. sp.*, and *A. bivenosa* over *Triodia basedowii* with occasional *H. lorea*, rarely also scattered *A. inaequilatera*. At SLK 762.5 there are scattered *Corymbia zygophylla* trees.

SLK 761.3 – 761.06

The vegetation reverts to being dominated almost solely by *Acacia* sp. ca. 0.3 m high with *T. basedowii*.

Minilya-Exmouth Road

Beard (1975) mapped several vegetation types for the area intersected by this section of road:

- Shrub steppe of scattered shrubs (mixed *Acacia* spp.) over spinifex (*Triodia pungens* and *T. basedowii*);
- Lightly wooded succulent steppe with *Acacia inaequilatera* and *A. synchronicia* over Saltbush and Bluebush and;
- Unwooded succulent steppe with Saltbush and Samphire

The survey recorded a mosaic of mixed shrubland and areas of hummock (spinifex) grassland with emergent shrubs. The following notes describe variations in the vegetation relative to SLK location.

SLK 68.6 – 61.0

Low open mixed spp. shrubland to 0.30 m with *Thryptomene baekeacea*, *Acacia* sp., and a ground cover dominated by *Triodia pungens*, *Cenchrus *ciliaris* and mixed native grasses including scattered patches of *Themeda ?triandra* and sub-shrubs. At SLK 67.6 a rise carries similar shrub species with *Labichea cassioides*, *Grevillea stenobotrya*, *Calothamnus borealis*, *Acacia coriacea* ssp. *coriacea* and *Scaevola sericophylla*.

SLK 61.0 – 60.8

Vegetation mostly dominated by an unknown shrub species (no fruits or flowers) and Buffel Grass.

SLK 60.8 – 54.5

Co-dominant shrub species include *Grevillea* sp., *Scaevola sericophylla*, *Senna* sp. There are also rare emergent shrubs of *Acacia tetragonophylla*. This section also features sandhills with *A. tetragonophylla*, *Pityrodia loxocarpa* and abundant *Triodia pungens* and *Olearia dampieri*, with *Grevillea* sp. and *A. sclerosperma* on the summit.

SLK 54.5 – 52.7

More open vegetation dominated by grasses and mostly only emergent shrubs. Shrub species include *Melaleuca eleuterostachya* and *Acacia ampliceps*. The Priority 3 plant *A. startii* occurs throughout this section in a scattered population, occasionally becoming the dominant shrub, becoming denser towards the south.

SLK 52.7 – 51.8

This section is often dominated by **Cenchrus ciliaris* with sparse emergent *Acacia* spp. and patches of mixed spp. chenopod shrubland.

SLK 51.8 – 42.8

Sparse shrubs of *Acacia cuspidifolia* and *A. synchronicia* and *A. sclerosperma* with occasional *Exocarpos aphyllus*. The ground is often covered with **Cenchrus ciliaris*.



SLK 42.8 – 39.8

Open vegetation similar to the previous section but with only scattered sparse patches of *A. sclerosperma*. **Cenchrus ciliaris* dominates much of the area.

SLK 39.8 – 36.0

Abundant *Triodia pungens* with open shrubland to 1 m or patches of dense **Cenchrus ciliaris*.

SLK 36.0 – 34.9

Dense *Acacia sclerosperma* with patches of emergent *A. tetragonophylla*.

SLK 34.9 – 32.5

Very low chenopod shrubland with **Cenchrus ciliaris* and sparse *Acacia* spp.

SLK 32.5 – 30.0

Moderate rise with similar species but much sparser vegetation.

SLK 30.0 – 25.1

Vegetation dense with *Acacia synchronicia* and *A. xiphophylla*.

SLK 25.1- 24.4

Lyndon Crossing. Low Samphire (*Halosarcia doleiformis*) vegetation surrounding a saline wetland with *Eragrostis falcata*. The last section of the survey area has grasses and low *Maireana* sp. shrubland.

2.3.1 Threatened flora

Databases of CALM and the Western Australian State Herbarium (WAHERB) were queried for known occurrences of Declared Rare and Priority Flora near the survey areas (Tables 1 and 2). Threatened taxa known to occur in the wider Nanutarra region are also included.

Table 1 Priority Flora previously recorded near the Nanutarra survey areas (ie. excluding Warroora Station)

Taxon	CALM code	Description	Preferred habitat
<i>Abutilon uncinatum</i>	P1	Prostrate perennial, herb, 0.2–1 m high, grey foliage, spined pods.	Red sand. Flat plain.
<i>Helichrysum oligochaetum</i>	P1	Erect annual, herb, to ca 0.25 m high. Fl. yellow, Aug–Nov.	Red clay. Alluvial plains.
<i>Myriocephalus nudus</i>	P1	Annual, herb, to 0.2 m high. Fl. yellow, Jan/Apr–Nov.	Moist areas, along rivers & creeks, granite outcrops.
<i>Dicladanthera glabra</i>	P2	Spreading perennial, herb or shrub, to 0.6(–1) m high. Fl. white, blue, Apr/Aug–Oct.	Alluvium. Along watercourses, near rock pools.
<i>Olearia fluvialis</i>	P2	Shrub, to 0.6 m high. Fl. blue, purple, white, yellow, Apr–May.	Iron rich alluvium, pebbly sand. Stony creek beds.
<i>Abutilon trudgenii</i>	P3	Herb, ca 0.6 m high.	On stony plain with sandy patches in <i>Acacia xiphophylla</i> and spinifex shrubland.
<i>Calotis latiuscula</i>	P3	Erect herb, to 0.5 m high. Fl. yellow, Jun–Oct.	Sand, loam. Rocky hillsides, floodplains, rocky creeks or river beds.
<i>Eragrostis crateriformis</i>	P3	Annual, grass-like or herb, 0.17–0.42 m high. Fl. Jan–Jul.	Clayey loam or clay. Creek banks, depressions.
<i>Goodenia nuda</i>	P3	Erect to ascending herb, to 0.5 m high. Fl. yellow, Apr–Aug.	No data
<i>Goodenia pascua</i>	P3	Ascending to erect herb, to 0.5 m high. Fl. yellow, May–Aug.	Red sandy soils. Basaltic plains.
<i>Rhynchosia bungarensis</i>	P3	Perennial shrub/herb up to 0.4m with sticky leaves. Flowering May to Oct.	In rocky river beds and creeklines.
<i>Sida sp. Wittenoom</i>	P3	Spreading shrub, to 0.6 m high. Fl. yellow, Mar–Apr.	Disturbed roadside.

Table 2 Priority Flora previously recorded near the Warroora Station survey area

Taxon	CALM Code	Description	Preferred habitat
<i>Acacia ryaniana</i>	P2	Prostrate, straggly or domed, spinescent shrub, 0.1–0.4 m high. Fl. yellow, Jun–Nov.	White or red sand. Coastal sand dunes.
<i>Acacia startii</i>	P3	Dense, rounded, much-branched shrub, 1–2 m high, to 3 m wide. Fl. green, yellow, Jul–Aug.	Calcareous loam with limestone pebbles. Stony hills & watercourses.
<i>Beyeria cygnorum</i>	P3	Open, erect shrub, 0.3–0.9 m high, 0.4–0.8 m wide. Fl. green, yellow, Aug–Nov.	Sand over limestone. Road verges, gullies.
<i>Bulbine pendula</i>	P3	Upright annual, herb, to 0.1 m high, with succulent foliage.	Cracking clay pan. Margins of tracks, tussock grassland.
<i>Crinum flaccidum</i>	P2	Bulbaceous, perennial, herb, to 1 m high. Fl. white, cream, yellow, Oct–Jan/May.	Loam, clay, sandstone. Swamps, creeks.
<i>Eremophila glabra</i> subsp. <i>psammophora</i>	P2	Low or tall spindly shrub, 0.4–3 m high. Fl. red, Aug–Dec.	Sand. Sand dunes.
<i>Eremophila youngii</i> subsp. <i>lepidota</i>	P4	Dense, spreading shrub, (0.2–)1–3 m high. Fl. purple, red, pink, Jan–Mar/Jun–Sep.	Stony red sandy loam. Flats plains, floodplains, sometimes semi-saline, clay flats.
<i>Gymnanthera cunninghamii</i>	P3	Erect shrub, 1–2 m high. Fl. cream, yellow, green, Jan–Dec.	Sandy soils.
<i>Hibiscus brachysiphonius</i>	P3	Procumbent perennial, herb or shrub, 0.1–0.3 m high. Fl. pink, Aug–Oct.	Clay. Creeklines, clay flats.
<i>Ptilotus alexandri</i>	P2	Annual, herb. Fl. pink, Sep.	Sand.
<i>Stackhousia clementii</i>	P1	Dense broom-like perennial, herb, to 0.45 m high. Fl. green, yellow, brown.	Skeletal soils. Sandstone hills.



CALM assigns these taxa with a code relating to their conservation significance (Table 3)

Table 3 CALM Conservation code descriptions for Priority Flora

Conservation Code	Description
P1: Priority One - Poorly Known Taxa	Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P2: Priority Two - Poorly Known Taxa	Taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
P3: Priority Three - Poorly Known Taxa	Taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
P4: Priority Four - 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.

The Priority 3 species *Acacia startii* was recorded over a 1.8 km section of road reserve at Warroora Station (Minilya-Exmouth Road). The population is widely scattered, near and far from the road verge, on both sides of the road, sometimes forming large patches or becoming the dominant shrub species. This species is similar to *Acacia bivenosa*, having short, broad, obtuse leaves, but it is easily distinguished by its finer, curved, more papery pods which have straight sides. The species has been recorded a number of times in the area (Table 4).

Table 4 Previous collections of *Acacia startii* near the survey area (Warroora Station)

SITE	VEGETATION	LOCALITY
Calcrete.	With <i>A. gregorii</i> .	Tropic of Capricorn, North West Coastal Highway
On sandhills.	Spinifex.	Learmonth Road, 5 miles N of Warroora turnoff
Calcrete soils.	With <i>Triodia</i> sp. Associated sp. <i>Melaleuca eleuterostachya</i> .	160 km S of Exmouth
Gradual slope SE aspect, running down to creek, powdery clay and surface limestone gravel.	Very open low scrub with <i>Acacia victorie</i> & <i>A. tetragonophylla</i> over open dwarf chenopods & open tall spinifex.	34.4 km E then SE along road from junction of North West Coastal Highway & turnoff to Coral Bay, ca 35 km ESE of Coral Bay
On top of low crest of long, low rise in gently undulating country. Calcareous brown loam with limestone rubble.	<i>Triodia</i> and scattered <i>Melaleuca</i> scrub.	24.1 km S of turn-off to Coral Bay on Exmouth Road
	Open scrub with <i>Acacia sclerosperma</i> , <i>A. tetragonophylla</i> , <i>Eremophila</i> and <i>Solanum</i> spp. over open low spinifex.	Ca 23 km E along road from junction of North West Coastal Highway & turnoff to Coral Bay. On E side of Giralia Range on track, ca 29 km E of Coral Bay

No other Declared Rare or Priority Flora were observed. However, it cannot be completely ruled out that other threatened taxa occur in the survey areas, as dry conditions at the time of survey meant there was little flowering material, and ephemerals were mostly dead (although often still identifiable). Also, due to the scale of the survey area, it was not possible to traverse the entire length of the proposed fencing on foot.

2.3.2 Threatened Ecological Communities

Records of CALM were queried for recorded occurrences of Threatened Ecological Communities (TECs) in or near the survey area. No TECs are known for the area and none were recorded during the field survey.

2.3.3 Weeds

The introduced Buffel Grass (**Cenchrus ciliaris*) is abundant throughout much of the region. It tends to be most abundant in disturbed areas and where water is more



available, for example along road verges and creeklines. It is also capable of displacing spinifex in disturbed areas. Buffel Grass was observed frequently in the survey areas, but was less common in drier, undisturbed sites.

Mimosa Bush (**Acacia farnesiana*) is native to tropical America, but was possibly introduced to Australia prior to European settlement (Hussey *et al.*, 1997). It is not listed as a Declared Weed by the Department of Agriculture, however, it is a pest plant which can spread readily and grow quickly. It is capable of forming thickets which may displace native vegetation or hinder stock movement and access to water (Natural Resources and Mines, Queensland Government 2006).

Mimosa Bush was observed in scattered populations at Mt Stuart Station (Nanutarra-Munjina Road) and Peedamulla/Yarraloola Stations (North West Coastal Highway), more commonly in depressions and other wetter areas. No large infestations were observed, however, the spread of this weed should be avoided during fence construction and its numbers monitored along new fence lines, as it prefers disturbed soils.

2.4 Fauna

Databases of CALM and the EPBC Act were queried for recorded occurrences of threatened fauna in the region of the survey areas (Table 5). Only fauna considered to potentially occur in the survey areas are considered here (e.g. marine species or species considered to be locally extinct are excluded). No threatened fauna were observed during the field survey.

Fauna were observed opportunistically during the field survey.

Nanutarra-Munjina Road

Zebra Finches were observed in two locations. The preferred habitat of this species appears to be patches of *Acacia citrinoviridis*, particularly where drainage ditches preventing water from flooding over the road provide open water (e.g. at SLK 78.9). Family groups were observed nesting gregariously in clumps of trees. Both patches of *A. citrinoviridis* observed to be utilised by finches were less than 100 m from the road.

Other fauna seen along Nanutarra-Munjina Road (not necessarily within the survey area) include Rainbow Bee-eaters and Fairy Martins (vicinity of Duck Creek bridge), Bustards, Wedgetailed Eagles and Murray Magpies.

North West Coastal Highway

No fauna were observed in the survey area.

North West Coastal Highway (Barradale South)

A Wedgetail Eagle was seen perched in a River Red Gum near the northern end of the survey area.

Minilya-Exmouth Road

Kangaroo scats, and burrows with entrances approximately an inch wide in mounded sand were observed near the road verge at SLK 67.6. No fauna were observed using

the burrows, but they were possibly made by lizards. Other unknown species of lizards were observed sporadically throughout the survey area. Zebra Finches were heard in the vegetation at scattered locations.

Table 5 CALM and EPBC Act records of threatened fauna which may occur near the survey areas

Family	Genus	Species	Common Name	CALM Rating	EPBC Act Rating
Muridae	<i>Pseudomys</i>	<i>chapmani</i>	Western Pebble-mound Mouse (Ngadji)	Priority 4	n/a
Passeridae	<i>Neochima</i>	<i>ruficauda subclarescens</i>	Star Finch (western)	Priority 4	n/a
Falconidae	<i>Falco</i>	<i>peregrinus</i>	Peregrine Falcon	Schedule 4	n/a
Dasyuridae	<i>Dasyurus</i>	<i>hallucatus</i>	Northern Quoll	n/a	Endangered
Dasyuridae	<i>Dasyercus</i>	<i>cristicauda</i>	Mulgara	n/a	Vulnerable
Hipposideridae	<i>Rhinonictis</i>	<i>aurantius (Pilbara form)</i>	Pilbara Leaf-nosed Bat	n/a	Vulnerable
Boidae	<i>Liasis</i>	<i>olivaceus barroni</i>	Olive Python (Pilbara subspecies)	n/a	Vulnerable

Northern Quoll. The Northern Quoll is a solitary carnivorous marsupial, that makes its dens in rock crevices, tree holes or occasionally termite mounds, and is predominantly nocturnal. The species formerly occurred almost continuously and commonly across northern Australia from the Pilbara, Western Australia to near Brisbane, Queensland.

Factors considered to threaten the survival of the species include inappropriate fire regimes, predation following fire and lethal toxic ingestion of Cane Toad toxin.

Pilbara Leaf-nosed Bat. The Pilbara Leaf-nosed Bat occurs in less than ten localities in the Pilbara and one in the Gascoyne (Rangelands NRM region, Western Australia). There are five known roost sites, all in the east Pilbara consisting of abandoned mines, deep and partially flooded mines and smaller less complex mines and two natural roost sites in the Gascoyne (a cave, and a fissure beneath an ephemeral waterfall, both in Barlee Range National Park).

The key threat to the Pilbara Leaf-nosed Bat is the loss of its remaining roost sites.



Olive Python (Pilbara subspecies). Restricted to ranges within the Pilbara region, such as the Hamersley Range, and islands of the Dampier Archipelago. Prefers deep gorges and water holes in the ranges of the Pilbara region.

Western Pebble-mound Mouse (Ngadji). This species is well-known for the characteristic pebble-mounds which it constructs over underground burrow systems. These mounds are most common on spurs and lower slopes of rocky hills. Records in surrounding areas suggest that this species may occur in the area in question.

Star Finch (western). A nomadic species inhabiting grasslands and eucalypt woodlands near water.

Peregrine Falcon. This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. It has been recorded from Nanutarra Station.

2.5 Surrounding land use

The proposed fencing sections will divide road reserves from adjacent pastoral land. The fencing will prevent stock from entering the road reserve where they are a hazard to motorists in a 110 kmph speed zone.

2.6 European heritage

Records of the Heritage Council of Western Australian, the Australian Heritage Database and the EPBC Act were searched for registered European heritage sites near the survey areas (Appendix C).

Peedamulla Station (North West Coastal Highway) contains the Peedamulla Homestead ruins, consisting of buildings constructed between 1885 and 1915. Yanrey Station contains the Yanrey Homestead (constructed 1901 to 1915), and Nyang Station contains the Nyang Homestead. These sites are listed on the Municipal Inventory (Ashburton Shire). None of the three sites are located near highway road reserves and they will not be impacted by fence construction.

No other European heritage issues have been identified.

2.7 Contaminated Sites

There were no contaminated sites identified during the survey.

3. Potential impacts and their management

A summary of recommendations for reducing environmental impacts is shown in Table 7.

3.1 Vegetation clearing

The most significant environmental impact that will result from the fencing construction is the clearing of native vegetation. The required clearing width for the construction is 3 to 5 m along the entire length of the fence. Using an averaged multiplier of 4 m for both sides of the roads, the total area of vegetation to be cleared is 12.8 Ha (Mt Stuart Station), 30.4 Ha (Peedamulla and Yarraloola Stations), 2.8 Ha (Yanrey/Nyang Stations), and 31.8 Ha (Warroora Station), giving a total of 77.8 Ha for all four road fencing projects.

An extensive, scattered population of the Priority 3 species *Acacia startii* occurs over a 1.8 km stretch of road reserve on the Minilya-Exmouth Road (Warroora Station). This population may be impacted by the fence construction but the population and habitat will not be extensively cleared. *Acacia startii* is not listed as threatened by the *EPBC Act*, however, the presence of this species means that the construction of the fenceline in this area is at variance with Clearing Principle 3: 'Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora' (Table 6). This principle refers to Declared Rare as well as Priority and other significant flora.

A statewide vegetation clearing permit ("Purpose Permit") was issued to Main Roads by the Department of Environment (DoE) on 1 February 2006. The Purpose Permit applies to the clearing of native vegetation for road construction projects and allows vegetation to be cleared for project activities including fences placed upon a road that are necessary for the use of the road. The permit holder must minimise the amount of native vegetation to be cleared and reduce the impacts of clearing. Clearing of a strip of vegetation is necessary for fence construction, but the width of clearing needs to be minimised. In particular, care should be taken in the area containing a population of *Acacia startii* to minimise clearing and avoid removing patches of this plant.

The Permit conditions require that Main Roads' internal environmental processes are followed. Adherence to the Main Roads Environmental Assessment and Approval process will ensure compliance with the permit conditions. Detailed records must be kept. The implications of the recorded occurrence of *Acacia startii* at Warroora Station were discussed with the DoE (Clare Woods). Although Priority species are generally considered as part of the assessment process for clearing permits, there is no related legislature that would prevent approval. The DoE advised that CALM be informed of the matter and that MRWA's internal environmental procedures be followed as detailed in the Purpose Permit. CALM is already aware of records of this species in the area. GHD has written to the District Manager, CALM Exmouth, detailing the recorded population, the likely impacts the project will have on it, and management strategies included in this report to minimise impacts.



Regions must submit a Revegetation Plan for revegetation works more than 0.5 Ha or where the clearing is at variance with one or more of the clearing principles (Condition 14), prior to clearing. The total clearing for the road fencing projects is 77.8 Ha, but revegetation is not required for road fencing projects.

Whilst the total hectares to be cleared on these six pastoral stations totals 77.8 Ha, the actual quantities cleared annually will depend on funding being made available. For example the proposed fencing of Peedamulla and Waroora Stations is currently budgeted over two financial years, whilst funding has yet to be sourced for Yarraloola and Yanrey/Nyang Stations.

The Purpose Permit allows for a maximum of 150 Ha of annual clearing in each of the Pilbara and Gascoyne regions.

Approval of clearing against the Clearing Principles may also require offsets. However, offsets are of limited applicability in these regions as the area of the proposed fencelines already has almost complete vegetation cover.

Table 6 Assessment against the ten clearing principles

Clearing Principle	Yes/No
Does the area to be cleared comprise a high level of biological diversity?	No
Does the area to be cleared comprise the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia?	No
Does the area to be cleared include, or is necessary for the continued existence of, rare flora?	Yes ¹
Does the area to be cleared comprise the whole or a part of, or is necessary for the maintenance of, a threatened ecological community?	No
Is the area to be cleared significant as a remnant of native vegetation in an area that has been extensively cleared?	No
Does the area to be cleared within, or in association with, an environment associated with a watercourse or wetland?	Yes ²
Is the clearing of the vegetation likely to cause appreciable land degradation?	No
Is the clearing of the vegetation likely to have an impact on the environmental values of any adjacent or nearby conservation area?	No
Is the clearing of the vegetation likely to cause deterioration in the quality of surface or underground water?	No
Is the clearing of the vegetation likely to cause, or exacerbate, the incidence or intensity of flooding?	No

¹The Priority 3 species *Acacia startii* was recorded over a 1.8 km stretch of road reserve at Warroora Station (Minilya-Exmouth Road).



²The proposed fencelines cross depressions, ephemeral floodways and creeks in some places. The project does not represent extensive or significant damage to vegetation surrounding or within a wetland.

In order to minimise the environmental impacts of vegetation clearing, the following guidelines should be adhered to:

- ▶ The clearing line should be kept within the limit of 3-5 m and reduced where possible.
- ▶ Access to the fenceline should be from existing tracks or areas with minimal existing vegetation.
- ▶ Materials should be stored in areas that are sparsely vegetated or have been previously cleared.
- ▶ Patches of habitat trees should be retained where possible, including *Acacia citrinoviridis* near water.
- ▶ Clearing width should be minimised in the area containing the Priority 3 plant *Acacia startii* and the removal of patches of this plant should be avoided where possible.

3.2 Spread of weeds

The movement of soil and vegetation within the project areas, and to and from the site from other locations, has the potential to introduce or spread weeds. No Declared Weeds were recorded during the field surveys, but the principal weeds in the area are Buffel Grass and Mimosa Bush. Buffel Grass is most abundant along road verge, drains and creeklines, and the movement of soil from these areas to the fenceline should be avoided.

Both native and introduced disturbance plants will benefit from the creation of cleared space along the new fenceline, and weed growth needs to be monitored and controlled on the disturbed soil.

To prevent the spread of weeds to and from the site, all machinery and vehicles used on the site should be cleaned of soil before entering or leaving.

In areas infested with Buffel Grass intersecting the fenceline, machinery should be cleaned of loose soil before proceeding into unaffected vegetation.

3.3 Fauna impacts

The area surrounding the surveyed road reserves is largely vegetated, and given that the fencing will only disturb vegetation along a line, the overall potential for fauna to be significantly impacted is low. The vegetation clearing required will affect only a tiny percentage of the habitat available.

The introduction of a physical barrier may affect the movement of some larger animals but most species are able to cross standard fencelines and there are already numerous fences in the pastoral zone.



The most immediate threat to fauna is the potential destruction of stands of *Acacia citrinoviridis*, which as mentioned above, provides nesting habitat for families of finches. However, the stands of this tree with observed nesting areas were within the 100 m width of the road reserve and should not be damaged. However, impacts on fauna can generally be minimised by selecting a route for the fencelines on a local scale that bypasses patches of *A. citrinoviridis* and other habitat trees in a largely shrubland landscape. This would also reduce the labour and cost involved with removing larger trees for fence construction.

3.4 Visual impact

The construction of fencelines may have some affect on visual amenity, due to the open nature of the vegetation. Fencelines will be most obvious where they pass over stony rises with only sparse or low shrubs, or only spinifex.

The impact on visual amenity can be minimised by grading as close to natural levels as possible, following the contour of the land and not creating any soil or rock piles.

3.5 Soil erosion

The creation of a cleared strip has the potential to produce soil erosion due to wind and water. The soil in the survey areas is not particularly susceptible to wind erosion, but the sandier soils of the Peedamulla-Yarraloola area are most at risk. Heavy runoff likely to occur in parts of the Mt Stuart section due to heavier soils may create water erosion, and localised rills may form, especially where the fenceline runs downslope.

Design and maintenance options for the fencelines which minimise soil potential erosion are limited. Where fencelines run directly down steep slopes, it is advisable to create lateral drains off the fenceline to reduce the amount and velocity of water flowing downslope along the fenceline.

3.6 Restriction of access

The proposed fencelines will limit access to adjoining land to some degree. Access points should be discussed with pastoral leaseholders prior to construction. No need has been identified for public access in the areas to be fenced.



Table 7 Summary of recommendations for minimising environmental impacts

Issue/objective	Recommendation	Responsibility
1. Vegetation clearing <i>Minimise loss of vegetation</i>	<ul style="list-style-type: none"> ▸ The clearing line should be limited to a maximum 5 m width, less where possible. ▸ Minimal clearing and disturbance to patches of shrubs in the area of the recorded <i>Acacia startii</i> population. ▸ Access to fenceline by existing tracks or poorly vegetated areas. ▸ Materials stored in cleared or poorly vegetated areas. 	Fencing contractor/MRWA
2. Weeds <i>Reduce risk of weeds spreading</i>	<ul style="list-style-type: none"> ▸ The blade should be lifted after clearing areas infested with Buffel Grass, before entering areas not infested. ▸ Clearing equipment should be cleaned of loose earth prior to moving on site and prior to moving to new sections of fencing. 	Fencing contractor/MRWA
3. Fauna <i>No unnecessary loss of fauna habitat</i>	<ul style="list-style-type: none"> ▸ Avoid removal of habitat trees. 	Fencing contractor/MRWA
4. Visual impact <i>Reduce visual impact of clearing</i>	<ul style="list-style-type: none"> ▸ Minimise soil movement and keep grading as close as possible to natural contours. ▸ Avoid creating rock piles. 	Fencing contractor/MRWA
5. Soil erosion <i>Reduce risk of soil erosion by wind and water</i>	<ul style="list-style-type: none"> ▸ Avoid creating windrows. If windrows are created, they should have regular gaps to prevent water build-up. ▸ Where the fence runs parallel to steep slopes, small drains should be created to allow water to runoff from the fenceline. 	Fencing contractor/MRWA
6. Restriction of access <i>Current access to pastoral lease maintained</i>	<ul style="list-style-type: none"> ▸ Consult with leaseholders to ensure access is satisfactory. 	MRWA



4. Summary and conclusions

The environmental issue of the greatest relevance to the project is the potential clearing for fenceline through a population of the Priority 3 plant species *Acacia startii* at Warroora Station. No other significant environmental impacts have been identified by this investigation as a result of the proposed fencing of road reserves on the Minilya-Exmouth Road, North West Coastal Highway and Nanutarra-Munjina Road. The fences are required to improve public safety on busy highways with a 110 kmph speed zone in areas where stock frequently congregate on or near the road reserve. The construction of fencing also has the benefit of effectively creating a ca. 200 m wide reserve which will no longer be affected by grazing, potentially providing a refuge for preferentially grazed plant species.

There are several actual and potential impacts of the fences:

- A total of approximately 77.8 Ha of vegetation will need to be cleared for all four road reserves, including both sides of the road.
- The proposed fenceline at Warroora Station will intersect a scattered population of *Acacia startii* (Priority 3) which occurs along a 1.8 km stretch of road.
- There is a risk of soil erosion along the fenceline.
- There is risk of introducing, spreading, or encouraging the growth of weeds.
- There will be a minor visual impact.
- There is a small chance of bird nesting habitats being disturbed.
- The fences may create a barrier to wildlife movement.

Given the size of the disturbance in the context of the extensive regional vegetation, these impacts are not significant and are considered an acceptable risk given the public safety pay-off. Careful grading can minimise impacts on habitat trees and soil erosion, and the exacerbation of weed problems.

MRWA has obtained a Purpose Permit which covers the proposed clearing, but internal assessment, approval and recording procedures are required in order to uphold the conditions of the permit. Clearing will occur through an area containing the Priority 3 species *Acacia startii* on Minilya-Exmouth Road. CALM has been informed in writing of the recorded occurrence, likely impacts, and management strategies. Clearing likely to be at variance with the Clearing Principles (such as clearing which impacts significant flora) generally requires offsets, however, offsets are of limited applicability in the relevant area. The impact on Priority Flora is not expected to be significant, and the proposed clearing is not considered to be seriously at variance with the clearing principles.



5. References

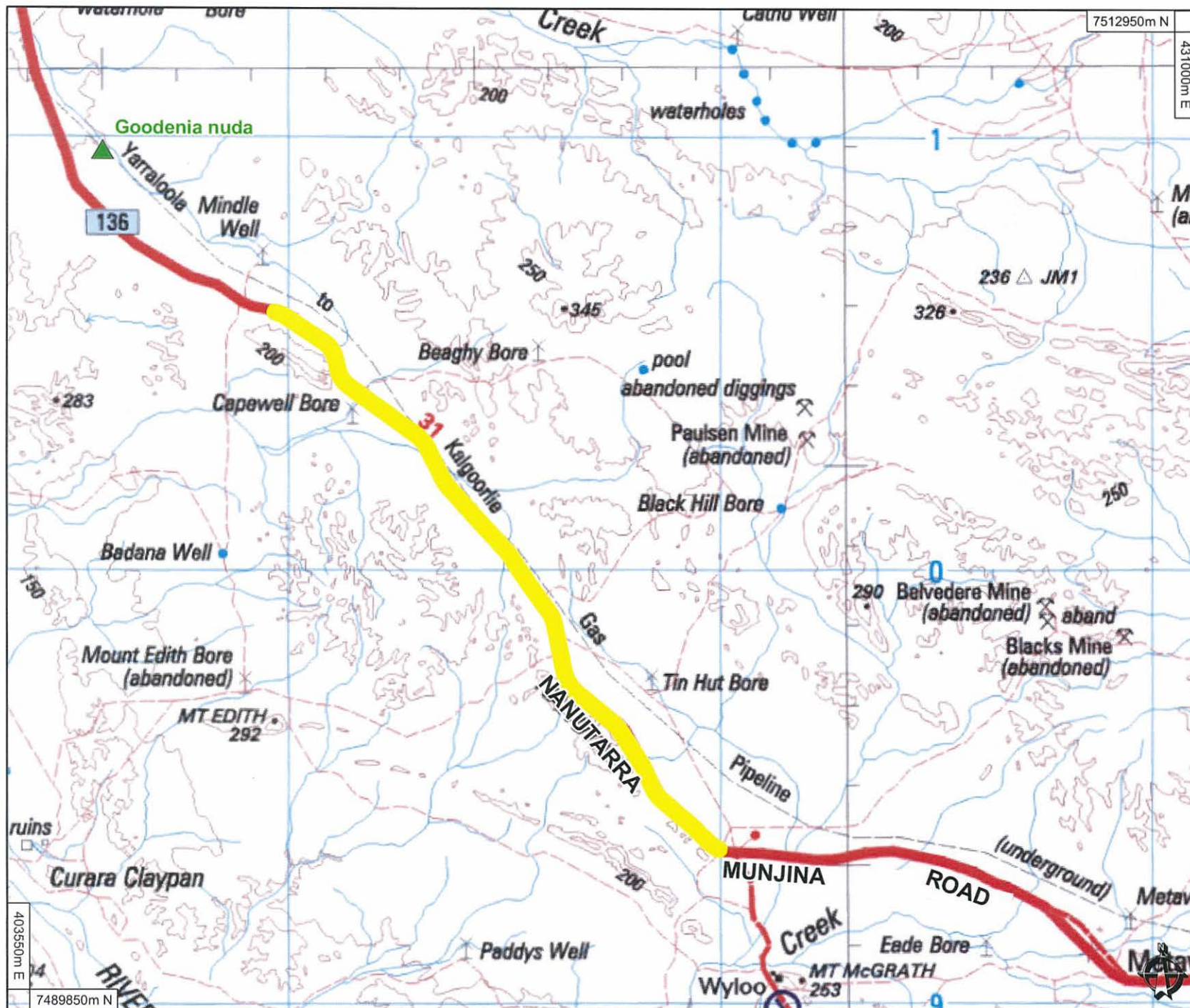
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Appendix A

Location of Survey Areas

Map



LEGEND

- Surveyed Section**
- Declared Rare & Priority Flora**
- ▲ (R) Declared Rare Flora - Extant Taxa
 - ▲ Priority 4 - Rare Taxa
 - ▲ Priority 3 - Poorly Known Taxa
 - ▲ Priority 2 - Poorly Known Taxa
 - ▲ Priority 1 - Poorly Known Taxa

SCALE

1.25 0 1.25 2.5 3.75km

1:125,000 at A4

LOCALITY MAP



Pilbara Region

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CREATED BY	CHECKED	APPROVED
MD		

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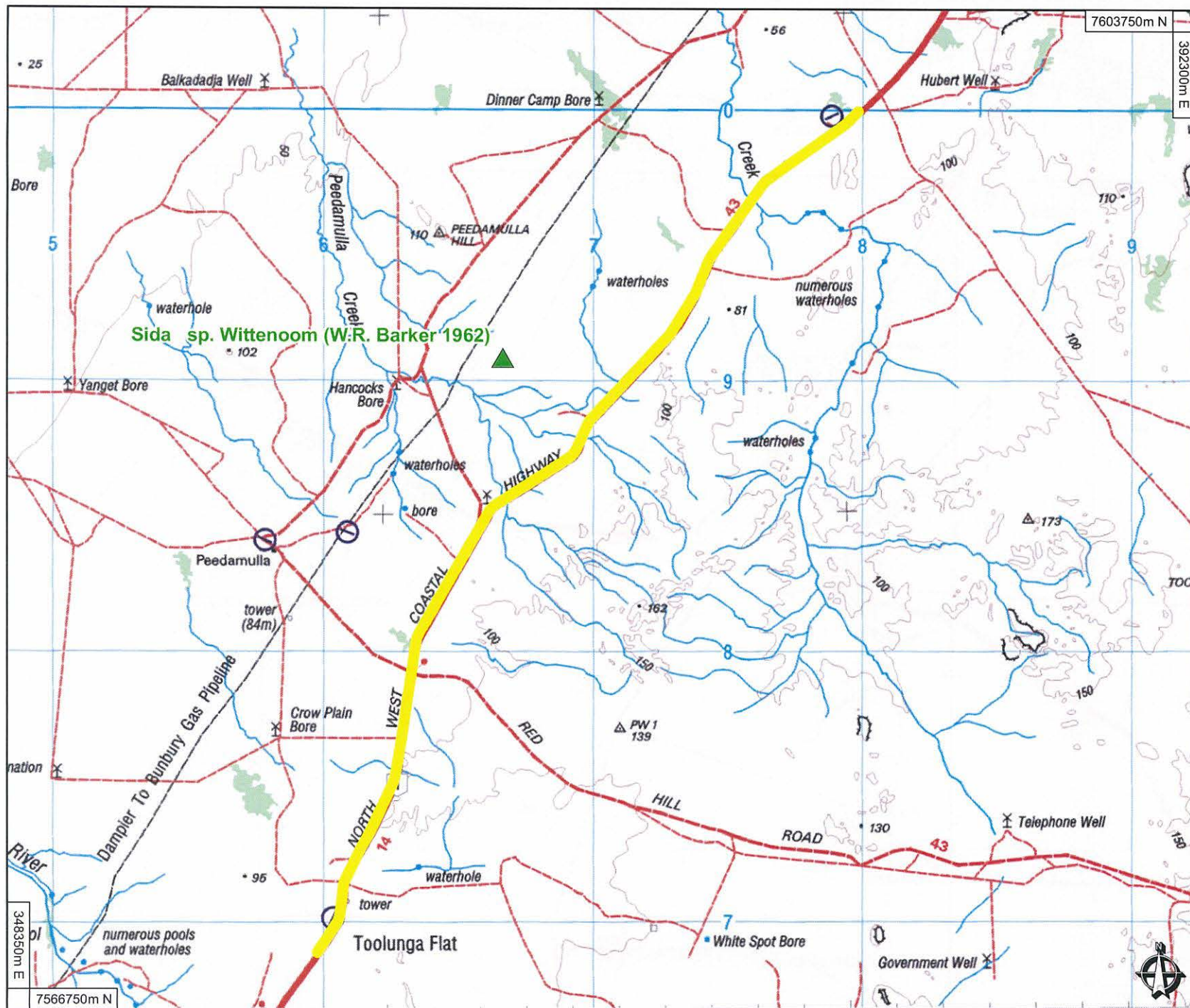
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MAIN ROADS
Western Australia

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN

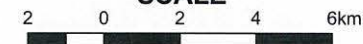
Figure 1
Mt Stuart Station Locality
Nanutarra - Munjina Road
73.00 SLK to 89.52 SLK



LEGEND

- Surveyed Section**
- Declared Rare & Priority Flora**
- ▲ (R) Declared Rare Flora - Extant Taxa
 - ▲ Priority 4 - Rare Taxa
 - ▲ Priority 3 - Poorly Known Taxa
 - ▲ Priority 2 - Poorly Known Taxa
 - ▲ Priority 1 - Poorly Known Taxa

SCALE



1:200,000 at A4

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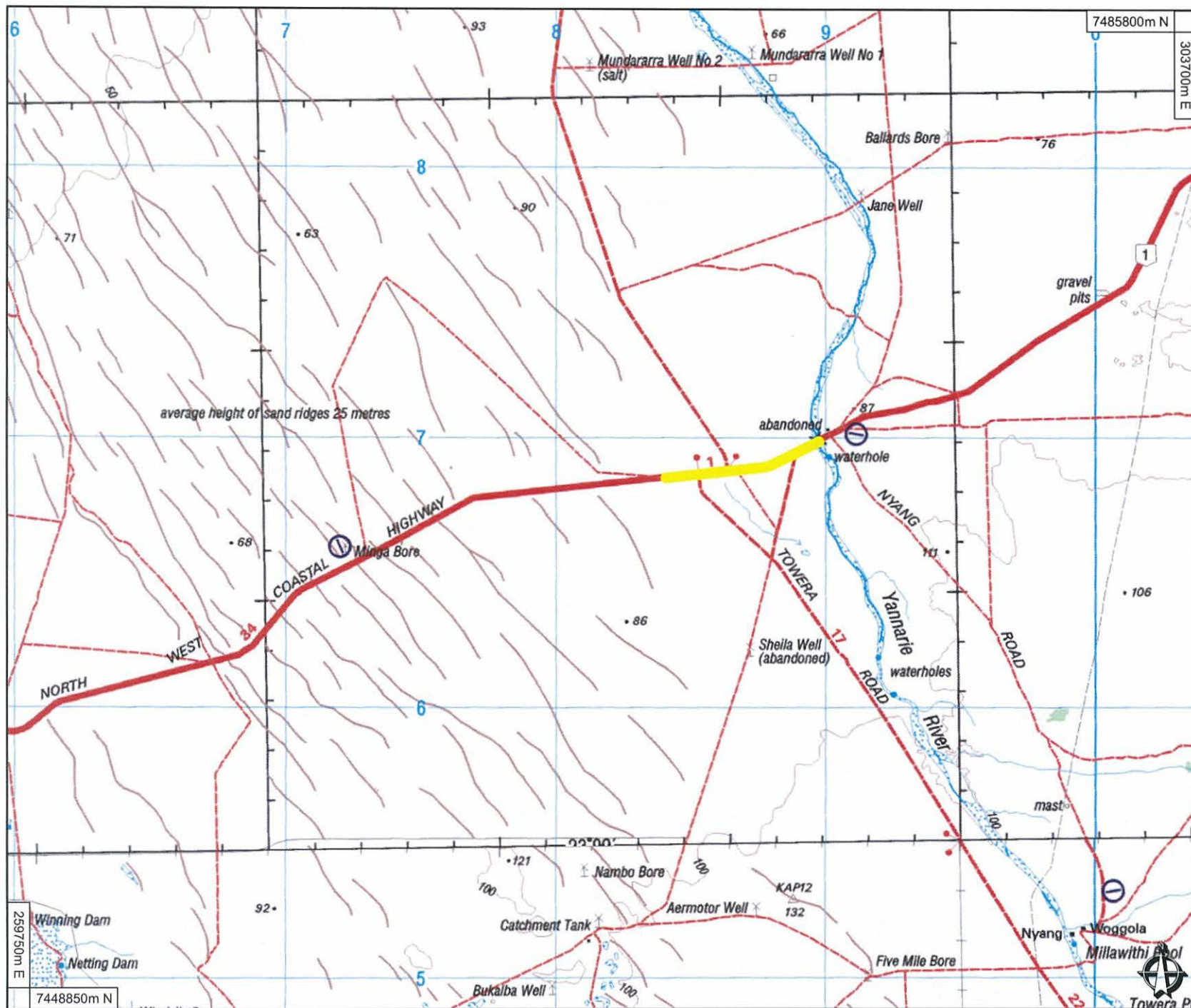
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MAIN ROADS
Western Australia



ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN

Figure 2
Peedamulla & Yarraloola Stations Locality
North West Coastal Highway
907.76 SLK to 945.80 SLK



LEGEND

- Surveyed Section**
- Declared Rare & Priority Flora**
- ▲ (R) Declared Rare Flora - Extant Taxa
 - ▲ Priority 4 - Rare Taxa
 - ▲ Priority 3 - Poorly Known Taxa
 - ▲ Priority 2 - Poorly Known Taxa
 - ▲ Priority 1 - Poorly Known Taxa

SCALE

2 0 2 4 6km

1:200,000 at A4

LOCALITY MAP



Pilbara Region

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HORIZONTAL DATUM: GDA94 PROJECTION: MGA Zone 50

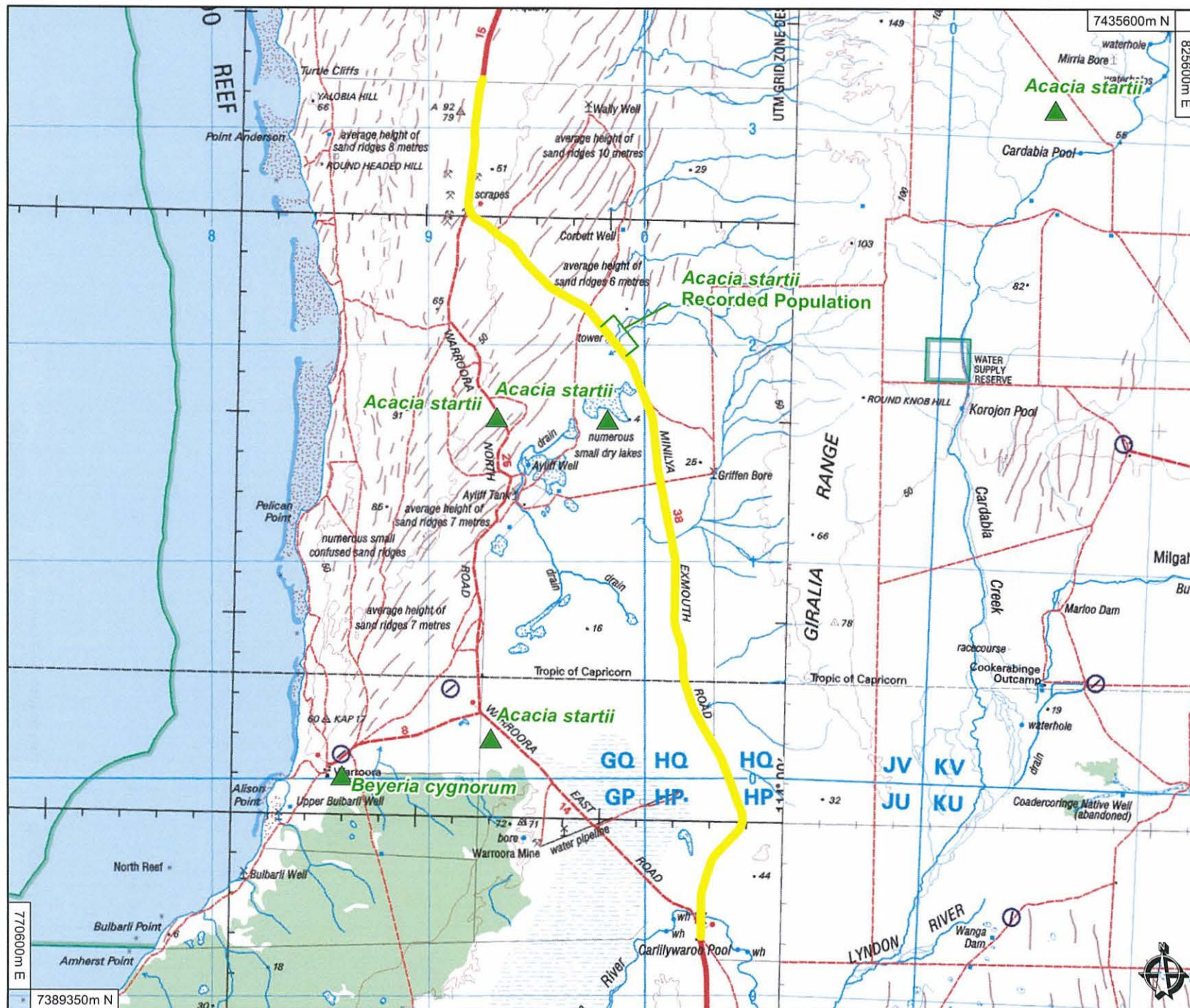
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DATE: 23.03.06 FILE LOCATION: N:\6117088\GIS\MXDS\6117088-G4.MXD

REVISION: 0 DRAWING NO: 6117088-G4

MAIN ROADS Western Australia 
ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN

Figure 3
Yanrey and Nyang Stations Locality
North West Coastal Highway
761.06 SLK to 767.94 SLK



LEGEND

Surveyed Section

Declared Rare & Priority Flora

- ▲ (R) Declared Rare Flora - Extant Taxa
- ▲ Priority 4 - Rare Taxa
- ▲ Priority 3 - Poorly Known Taxa
- ▲ Priority 2 - Poorly Known Taxa
- ▲ Priority 1 - Poorly Known Taxa

SCALE

2.5 0 2.5 5 7.5km

1:250,000 at A4

LOCALITY MAP



Gasgoyne Region

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MAIN ROADS
Western Australia
ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN

Figure 4
Warroora Station Locality
Minilya - Exmouth Road
24.39 SLK to 68.64 SLK



Appendix B

Field Data

Flora lists



Table 8 Plant species recorded during the survey of Ashburton and Carnarvon Shire road reserves

Family	Genus	Species	Status	Common name	Warroora Station	Mt Stuart Station	Peedamulla/Yarraloolie Stations	Yanrey/Nyang Stations
Amaranthaceae	<i>Ptilotus</i>	<i>sp.</i>						
Amaranthaceae	<i>Ptilotus</i>	<i>lanatus</i>					x	
Asteraceae	<i>Olearia</i>	<i>dampieri</i>			x			
Boraginaceae	<i>Heliotropium</i>	<i>glanduliferum</i>						
Boraginaceae	<i>Heliotropium</i>	<i>heteranthum</i>						
Caesalpiniaceae	<i>Labichea</i>	<i>cassioides</i>						
Caesalpiniaceae	<i>Senna</i>	<i>sp.</i>			x			
Chenopodiaceae	<i>Maireana</i>	<i>sp.</i>			x			
Chenopodiaceae	<i>?Maireana</i>	<i>sp.</i>				x		
Chenopodiaceae	<i>Atriplex</i>	<i>sp.</i>			x			
Chenopodiaceae	<i>Enchylaena</i>	<i>tomentosa</i>		Ruby Saltbush				
Chenopodiaceae	<i>Halosarcia</i>	<i>doleiformis</i>		Samphire	x			
Chenopodiaceae	<i>Sclerolaena</i>	<i>sp.</i>			x			
Chenopodiaceae	<i>Sclerolaena</i>	<i>sp.</i>				x		
Convolvulaceae	<i>Cressa</i>	<i>australis</i>				x		
Goodeniaceae	<i>Dampiera</i>	<i>incana var. incana</i>			x			
Goodeniaceae	<i>Goodenia</i>	<i>?lamprosperma</i>					x	x
Goodeniaceae	<i>Scaevola</i>	<i>sericophylla</i>			x			
Gyrostemonaceae	<i>Codonocarpus</i>	<i>cotonifolia</i>		Native Poplar			x	x



Family	Genus	Species	Status	Common name	Warroora Station	Mt Stuart Station	Peedamulla/Yarraloolie Stations	Yanrey/Nyang Stations
Gyrostemonaceae	<i>Gyrostemon</i>	<i>ramulosus</i>		Corkybark	x			
?Lamiaceae	UNKNOWN					x		
Lamiaceae	<i>Pityrodia</i>	<i>loxocarpa</i>			x			
Lauraceae	<i>Cassytha</i>	<i>sp.</i>			x			
Malvaceae	<i>Alyogyne</i>	<i>pinoniana</i>			x			
Malvaceae	? <i>Abutilon</i>	<i>sp.</i>			x			
Malvaceae	<i>Abutilon</i>	<i>sp.</i>					x	
Malvaceae	<i>Sida</i>	<i>fibulifera</i>			x			
Mimosaceae	<i>Acacia</i>	<i>ampleiceps</i>			x			
Mimosaceae	<i>Acacia</i>	<i>ancistrocarpa</i>		Fitzroy Wattle		x	x	x
Mimosaceae	<i>Acacia</i>	<i>arida</i>					x	
Mimosaceae	<i>Acacia</i>	<i>bivenosa</i>				x	x	x
Mimosaceae	<i>Acacia</i>	<i>citrinoviridis</i>		Black Mulga		x		
Mimosaceae	<i>Acacia</i>	<i>coriacea ssp. coriacea</i>			x			x
Mimosaceae	<i>Acacia</i>	<i>cuspidifolia</i>			x			
Mimosaceae	<i>Acacia</i>	<i>farnesiana</i>	*	Mimosa Bush		x	x	
Mimosaceae	<i>Acacia</i>	<i>inaequilatera</i>		Baderi			x	x
Mimosaceae	<i>Acacia</i>	<i>sclerosperma</i>		Limestone Wattle	x			x
Mimosaceae	<i>Acacia</i>	<i>sp.</i>			x			
Mimosaceae	<i>Acacia</i>	<i>sp.</i>						x



Family	Genus	Species	Status	Common name	Warroora Station	Mt Stuart Station	Peedamulla/Yarralooie Stations	Yanrey/Nyang Stations
Mimosaceae	<i>Acacia</i>	<i>sp.</i>			x		x	
Mimosaceae	<i>Acacia</i>	<i>startii</i>	P3		x			
Mimosaceae	<i>Acacia</i>	<i>synchronicia</i>			x	x		
Mimosaceae	<i>Acacia</i>	<i>tetragonophylla</i>		Kurara		x		
Mimosaceae	<i>Acacia</i>	<i>trachycarpa</i>		Minni Ritchi		x		x
Mimosaceae	<i>Acacia</i>	<i>tumida</i>		Pindan Wattle			x	
Mimosaceae	<i>Acacia</i>	<i>xiphophylla</i>		Snakewood	x	x	x	x
Myoporaceae	<i>Eremophila</i>	<i>fraseri</i>		Burra		x		
Myrtaceae	<i>Calothamnus</i>	<i>borealis</i>			x			
Myrtaceae	<i>Corymbia</i>	<i>hamerslyana</i>					x	
Myrtaceae	<i>Corymbia</i>	<i>zygophylla</i>		Broome Bloodwood				x
Myrtaceae	<i>Eucalyptus</i>	<i>victrix</i>		Coolibah			x	
Myrtaceae	<i>Eucalyptus</i>	<i>camaldulensis</i> var. <i>obtusa</i>		Northern River Red Gum			x	x
Myrtaceae	<i>Eucalyptus</i>	<i>sp.</i>				x		
Myrtaceae	<i>Melaleuca</i>	<i>eleuterostachya</i>			x			
Myrtaceae	<i>Thryptomene</i>	<i>baekeacea</i>			x			
Papilionaceae	<i>?Cullen</i>	<i>sp.</i>				x		
Papilionaceae	<i>Cullen</i>	<i>leucochaïtes</i>					x	
Papilionaceae	<i>Tephrosia</i>	<i>uniovulata</i>					x	



Family	Genus	Species	Status	Common name	Warroora Station	Mt Stuart Station	Peedamulla/Yarralooie Stations	Yanrey/Nyang Stations
Phormiaceae	<i>Dianella</i>	<i>revoluta</i> var. <i>divaricata</i>			x			
Poaceae	<i>Aristida</i>	<i>holathera</i> var. <i>holathera</i>					x	
Poaceae	<i>Cenchrus</i>	<i>ciliaris</i>	*	Buffel Grass	x	x	x	x
Poaceae	<i>Cymbopogon</i>	<i>sp.</i>			x			
Poaceae	<i>Enneapogon</i>	<i>caerulescens</i>					x	
Poaceae	<i>Eragrostis</i>	<i>eriopoda</i>			x	x		
Poaceae	<i>Eragrostis</i>	<i>falcata</i>			x			
Poaceae	<i>Eragrostis</i>	<i>sp.</i>					x	
Poaceae	<i>Themeda</i>	<i>?triandra</i>			x			
Poaceae	<i>Triodia</i>	<i>basedowii</i>		Lobed Spinifex			x	x
Poaceae	<i>Triodia</i>	<i>pungens</i>		Soft Spinifex	x	x	x	
Proteaceae	<i>Grevillea</i>	<i>sp.</i>				x		
Proteaceae	<i>Grevillea</i>	<i>sp.</i>			x			
Proteaceae	<i>Grevillea</i>	<i>stenobotrya</i>			x			
Proteaceae	<i>Grevillea</i>	<i>wickhamii</i> ssp. <i>?hispidula</i>		Wickham's Grevillea			x	
Proteaceae	<i>Hakea</i>	<i>lorea</i>		Witinti				x
Santalaceae	<i>Exocarpus</i>	<i>aphyllus</i>			x			
Solanaceae	<i>Solanum</i>	<i>lasiophyllum</i>		Flannel Bush		x		



Family	Genus	Species	Status	Common name	Warroora Station	Mt Stuart Station	Peedamulla/Yarralooie Stations	Yanrey/Nyang Stations
Solanaceae	<i>Solanum</i>	<i>sp.</i>			x			
Sterculiaceae	<i>Hannafordia</i>	<i>quadri-valvis</i>			x			
Tiliaceae	<i>Corchorus</i>	<i>laniflorus</i>				x		
Zygophyllaceae	<i>Tribulus</i>	<i>sp.</i>				x		
UNKNOWN					x			



Appendix C

European Heritage



Table 9 Listed European heritage sites near road fencing survey areas (source: Heritage Council of W.A.)

No.	Name	Est. date	Type
04656	Peedamulla Homestead (Ruins)	1885 – 1915	Municipal Listing
15397	Yanrey Homestead	1901 – 1915	Municipal Listing
15371	Nyang Homestead		Municipal Listing



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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	G Guerin	A Napier		A Napier		
1	G Guerin / E Tomich	G Guerin / A Napier	<i>A. C. Napier</i>	A Napier	<i>A. C. Napier</i>	<i>19/5/06</i>