

**Main Roads Western
Australia**

Report for Broomehill to
Jerramungup Road
Improvements
(75.52 SLK to 77.30 SLK)
Preliminary Environmental
Impact Assessment

February 2007



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- B Declared Rare and Priority Flora Search Results
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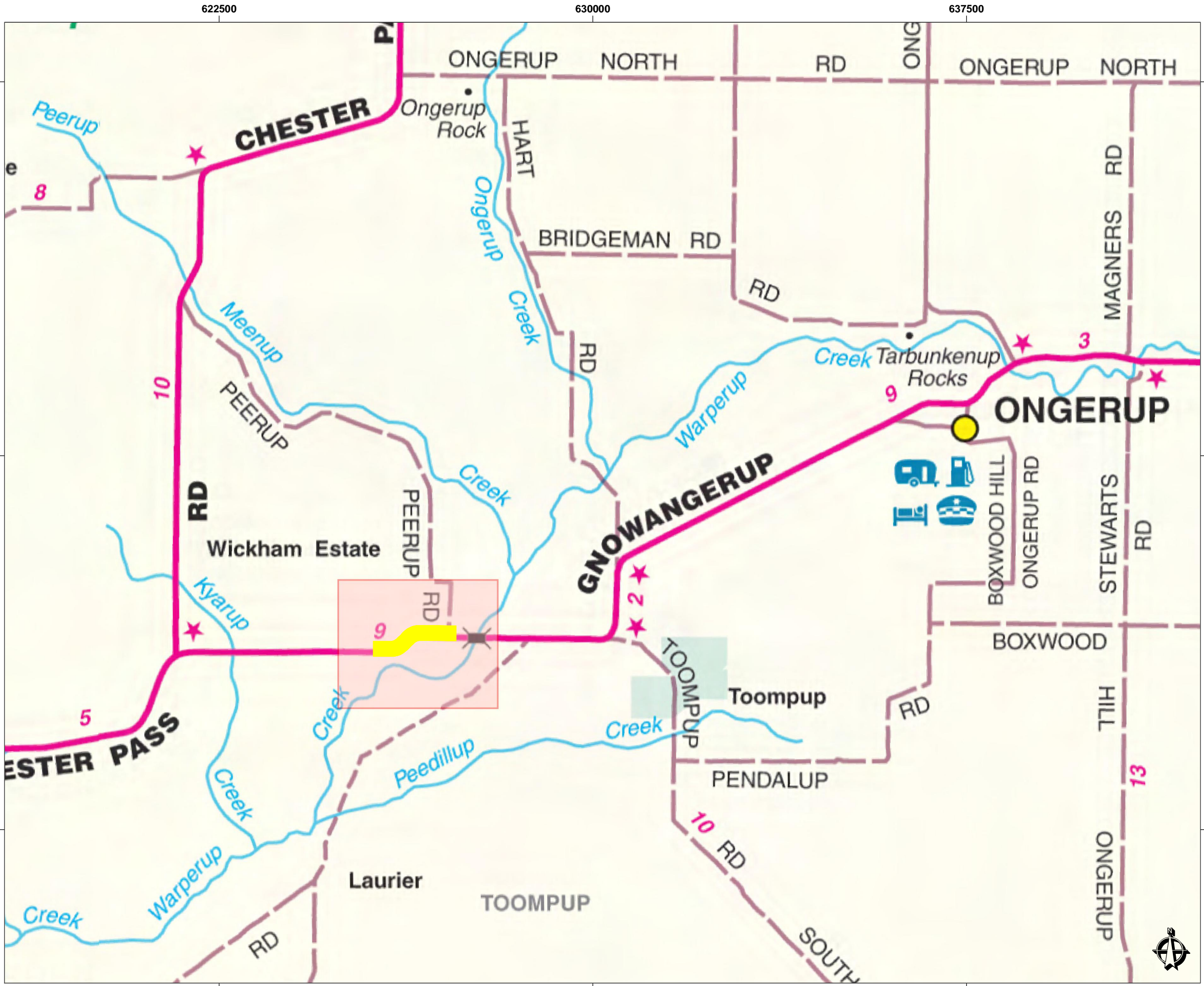


1. Introduction

Main Roads Western Australia (Main Roads) commissioned GHD Pty Ltd to complete a Preliminary Environmental Impact Assessment (PEIA) associated with upgrading and safety improvements of the Broomehill to Jerramungup Road. The section of road under scrutiny is known as Deadmans Reverse Curve, between 75.52 and 77.30 SLK i.e. a distance of approximately 1.8km. The study area is also shown in Figure 1.

Main Roads have indicated that this section is being upgraded to improve road safety. The proposed work includes the easing of the horizontal curves, including lowering the crest curves at each end to improve sight distances and provide additional seal width with at the Peerup Road intersection. The proposed works will have a 10.0m road width of which 8.0m will be sealed.

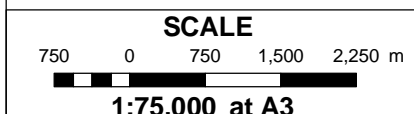
The work is programmed for construction over the summer months 2007/2008.



LEGEND

- 1:10,000 Sheet Extent
- Road Section (75.52 to 77.30 SLK)

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
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**BROOMEHILL TO JERRAMUNGUP RD
PRELIMINARY ENVIRONMENTAL
IMPACT**

Figure 1
Location Map



1.1 Road Improvement Options

Main Roads has prepared a preliminary proposal report entitled *Broomehill to Jerramungup Road (M005) Deadmans Reseve Curve Improvements – Preliminary Proposal Report*, January 2007, a copy of which is contained within Appendix A. Four options for the improvements are currently being assessed by Main Roads, namely,

- » **Option A** - consists of surface correcting the outside of curve 1, the length of work is 250 m;
- » **Option B** - consists of widening the existing formation and also surface correcting curve 1. Surface corrections include widening the formation width, widening the existing seal width, and surface correcting the outside of curve 1. The length of work is 1.0 km;
- » **Option C** - consists of realigning the existing horizontal curve along 1.3 km stretch of road (600.0 m radius curves); and
- » **Option D** - consists of upgrading the existing horizontal and vertical geometry to enhance stopping site distance (800.0m minimum radius curves). Which includes the construction of table drains 3 m minimum from the edge of the formation, 1000 m horizontal circular curves, and provide additional seal width at the intersection of Peerup Road. This option will take place along a 1.75 km stretch of road.

1.2 Description of the Project

The key characteristics of the proposed options are summarised in Table 1 and are considered the same for each option.

Table 1 Key Characteristics of the Project

Issue	Description
Roadwork length	1.78 km
Formation width (proposed)	10 m wide
Seal width (proposed)	8 m wide
Drainage	Table drains a further 3.0m outside the hinge point.
Clearing	Less than 0.5 ha clearing required within the network maintenance zone. Note – only vegetation hazardous to the road users will be removed.



1.3 Scope of the Report

The information contained in this report is based on information provided by Main Roads, existing Department of Environment and Conservation (DEC) and Department of Water (DoW) records and information available in the public domain. The PEIA has been prepared according to the brief developed by Main Roads. The PEIA includes:

- » conducting an initial assessment to determine key environmental aspects for the road proposal;
- » assessing the project against the Environmental Protection Act's 10 Clearing Principles (Schedule 5);
- » assessing all environmental aspects likely to require referral and advise whether the project should be referred to the Environmental Protection Authority (EPA);
- » assessing all matters of National Environmental Significance likely to require referral of the project and advise whether the project should be referred to the Commonwealth Department of the Environment and Water Resources (DEW);
- » consulting with relevant government agencies as required;
- » determining (but not applying for) clearances if required under the following Acts:
 - *Conservation and Land Management Act (1984)*;
 - *Wildlife Conservation Act (1950)*;
 - *Environmental Protection Act (1986)*;
 - *Rights in Water and Irrigation Act (1914)*;
 - *Heritage of Western Australia Act (1990)*; and
 - *Aboriginal Heritage Act (1972)*.
- » searching and reporting on the DEC's:
 - Declared Rare and Priority Flora database;
 - Threatened Ecological Communities (TEC's) database; and
 - Threatened Fauna database.



2. Existing Environment

This section provides a summary of the existing environmental aspects considered necessary to identify constraints in the study area. The study area includes and takes into consideration the extent of land requirements to undertake the four proposed upgrade options. Where the impact of a particular option is not consistent with the other options the report will differentiate between them.

The environmental aspects that may be potentially impacted by the works are shown in Figure 2.

2.1 Climate

The climate of the project area is best described as Mediterranean with warm dry summers and cool wet winters. The closest Bureau of Meteorology weather recording station to the project is located at Ongerup. The recorded climate data at Ongerup is summarised in Table 2.

Table 2 Climatic Information for the Study Area

Mean Annual Maximum Temperature Range	14.9°C (July) to 28.6°C (January)
Mean Annual Minimum Temperature Range	5.8°C (August) to 14.3°C (February)
Mean Annual Rainfall	386.4 mm
Mean Annual Raindays per year	100.8 days

Source: Commonwealth Bureau of Meteorology, 2004

It is noted that works are to be completed during Summer. Main Roads should give consideration to minimising dust emissions.

2.2 Surface and Groundwater

A search of the *Environmental Protection and Biodiversity Conservation Act (1999)* (EPBC) on-line Protected Matters Search Tool revealed that the project does not lie within any significant wetland catchments.

There are a number of creeks in the vicinity of the proposed study area. The highway and associated bridge traverses Warperup Creek, which is approximately 500m to the east of the project area. The existing bridge traversing Warperup Creek will not be modified as part of the works.

The highway traverses the Kyarup Creek to the west of the proposed works. This waterway is approximately 2.5 km to the west of the study area boundary.



A search of the Landgate Western Australian Atlas indicates that groundwater within the vicinity of the study area ranges from 1 - 3 m below the ground surface.

2.3 Geomorphology and Soils

The study area is combination of geological types, including reworked sand plain of yellow and white sand, containing locally abundant limonite pebbles as well as Colluvial and minor alluvial deposits of silt, sand and gravel. The deposits are generally found on slopes adjoining rock and laterite outcrops (Western Australian Government, 1985).

The study area ranges from 240m AHD near the Warperup and Kyarup Creeks to 260m AHD within elevated areas at the eastern and western extent of the study area. The highway runs through an area of the landscape where it grades into a gently undulating floodplain with the associated Warperup and Kyarup creeks (Commonwealth Government of Australia, 1975).

2.4 Land uses

2.4.1 Land Tenure and Zoning

The existing alignment of the roadway traverses a sparsely populated rural landscape located 55 km west of the Jerramungup townsite. The majority of the works will be undertaken within the existing road reserve. However, there may be a requirement for the project to impinge on private property used for grazing and cropping along the existing alignment.

Main Roads have consulted with the adjoining landholders who have indicated their willingness to sell property at a fair rate such that works can proceed. Further detailed information regarding the outcome of the consultation has been included in Section 4 of this report.

A search of the Landgate database has revealed that there is an active mining tenement within 150 m of the western extent of the study area. However, it is noted that works will not disturb the tenement (refer to Figure 1).

The private land identified within the study area is described in Table 3.



Table 3 Land in Close Proximity to the Road Works for Proposed Upgrade of the Broomehill to Jerramungup Road

Identification Number	Land Use/Purpose	Vesting
E70/2953	Mining tenement	Shire of Gnowangerup
P123638	Private land - Rural	Shire of Gnowangerup
P144857	Private land - Rural	Shire of Gnowangerup
P132632	Private land - Rural	Shire of Gnowangerup
P123631	Private land - Rural	Shire of Gnowangerup

2.4.2 Native Title

Reference to National Native Title Tribunal online register provided claimant application details for the study area. As the proposed site is located on privately owned land and existing road reserves managed by the Department for Planning and Infrastructure, Native Title does not apply to this project area.

2.5 Acid Sulphate Soils

The Western Australian Planning Commission (WAPC) has published Planning Bulletin Number 64 on acid sulphate soils (ASS), however this mapping does not extend over the study area.

As the proposal is upgrading an existing road and excavations in excess of 1m are unlikely. It is also noted that work is likely to occur in the early Summer months where water table levels may be higher. Main Roads should be aware that if dewatering is needed, a field acid sulphate soil assessment may be required.

2.6 Contaminated Sites

A search of the DEC's Contaminated Sites Database was undertaken for the study area and indicated the there were no contaminated sites registered under the *Contaminated Sites Act 2003*.

2.7 Environmentally Sensitive Areas

The DEC's on-line Native Vegetation Viewer was searched to determine the location of any environmentally sensitive areas (ESA) within the study area, as declared by a Notice under Section 51B of the *Environmental Protection Act (1986)*.

The search confirmed that there were no ESAs covering the vegetated land within the study area.



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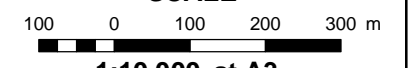
- MRWA Chainage (75.52 to 77.3 SLK)
- Major Road
- Linear Hydrography
- Cadastre
- Mining Tenements

Gnowangerup - Jerramungup Rd Declared Rare Flora

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

NOTE THAT POSITIONAL ERRORS CAN BE > 5M IN SOME AREAS
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SCALE



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LOCALITY MAP



Western Australia

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**BROOMEHILL TO JERRAMUNGUP RD
PRELIMINARY ENVIRONMENTAL
IMPACT ASSESSMENT**

**Figure 2
Environmental Constraints Map**



2.8 Reserves and Conservation Areas

The preliminary desktop investigation did not identify any reserves or conservation areas in close proximity to the study area.

2.9 Vegetation

The aerial photograph (Figure 2) indicates the study area is predominantly cleared farmland to the north and south of the existing Broomehill to Jerramungup Road. Native vegetation is most prevalent within the existing 20 m wide road reserve, on either side of the highway.

Main Roads WA has advised that vegetation will only be removed along the road alignment if it is considered necessary for the safety of the road user. The maximum area of vegetation that will be cleared is less than 0.5 ha based on the vegetation present within the road reserve.

Beard (1979) indicates that the vegetation near the project area comprises of “Shrublands; mallee scrub, black marlock” and “Medium woodland; York gum & yate”.

From a purely biodiversity perspective and taking no account of any other land degradation issues, there are several key criteria now being applied in States where clearing is still occurring (EPA Position Statement No. 2, December 2000):

- » The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation type;
- » A level of 10% of the original extent is regarded as being a level representing “endangered”; and
- » Clearing which would put the threat level into the class below should be avoided.

Such status can be delineated into five (5) classes, where:

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

Native vegetation types represented in the study, their regional extent and reservation status are generally drawn from Shepherd, *pers. comm.*, Shepherd *et al* (2002). These are displayed in Table 4.



Table 4 Vegetation extent and status.

Vegetation Association	Vegetation Community	Pre-European Extent (ha)	Current Extent (ha)	% Remaining	% in Current extent in IUCN Class I-IV Reserves
516	Shrublands; mallee scrub, black marlock	607435	34302	56.5	24.1
938	Medium woodland; York gum & yate	77513	15818	20.4	1.7

The vegetation extent and status of “Medium woodland; York gum & yate” is below the threshold of 30%. Further consultation with the DEC will be required. It must be noted that vegetation, flora and fauna surveys have not been undertaken for this project. It is estimated that less than 0.5ha of vegetation will required to be removed.

2.10 Declared Rare and Priority Flora

A search of the *EPBC Act* Protection Matters database identified four threatened flora species that may occur within the study area. These are the:

- » *Adenanthos pungens subsp. Pungens*;
- » *Caladenia bryceana subsp. Bryceana*;
- » *Eremophila veneta Chinnock ms*; and
- » *Grevillea involucrate*.

In addition to listing under the EPBC Act a search of DEC databases was undertaken to identify significant flora within the study area. A search of DEC databases identified five Declared Rare Flora (DRF) and 27 Priority Listed Flora (PLF) could potentially occur in proximity to the study area, as described in Table 5 and 6 (a copy of these search results are included in Appendix B).

Table 5 Department of Environment and Conservation Declared Rare Flora

Species Name
<i>Acacia trulliformis</i>
<i>Darwinia acerose</i>
<i>Dryandra pseudoplumosa</i>
<i>Hibbertia priceana</i>
<i>Myoporum cordifolium</i>



Table 6 Department of Environment and Conservation Priority Flora Search Results

Priority Flora	
<i>Thysanotus gageoides</i> (P3)	<i>Leucopogon florulentus</i> (P3)
<i>Acacia declinata</i> (P3)	<i>Leucopogon</i> sp. <i>Ongerup</i> (P1)
<i>Acacia mutabilis</i> subsp. <i>Incurva</i> (P2)	<i>Leucopogon tamariscinus</i> (P4)
<i>Acacia mutabilis</i> subsp. <i>rhynchophylla</i> (P3)	<i>Melaleuca araucarioides</i> (P4)
<i>Acacia newbeyi</i> (P3)	<i>Melaleuca polycephala</i> (P3)
<i>Baeckea crispiflora</i> subsp. <i>Ongerup</i> (P1)	<i>Melaleuca viminea</i> subsp. <i>Appressa</i> (P2)
<i>Boronia oxyantha</i> var. <i>brevicalyx</i> (P3)	<i>Melaleuca pritzelii</i> (P2)
<i>Chorizema carinatum</i> (P3)	<i>Microcorys lenticularis</i> (P2)
<i>Chorizema ulotropis</i> (P4)	<i>Pterostylis</i> sp. <i>Ongerup</i> (KR Newbey) (P4)
<i>Cymbonotus preissianus</i> (P3)	<i>Spyridium mucronatum</i> subsp. <i>Recurvum</i> (P3)
<i>Dryandra conferta</i> var. <i>parva</i> (P2)	<i>Tetradthea</i> sp. <i>Ongerup</i> (KR Newbey) (P1)
<i>Eremophila veneta</i> ms (P4)	<i>Trymalium myrtillus</i> subsp. <i>Pungens</i> (P1)
<i>Hakea brachyptera</i> (P3)	<i>Thysanotus gageoides</i> (P3)
<i>Leucopogon denticulatus</i> (P4)	

Figure 2 indicates the presence of one Priority 2 species approximately 1.5km to the southeast of the project area.

Main Roads has indicated to GHD that the central section of the project area that contains two 'triangular' areas of native vegetation will not be impacted. However, based on priority species being in the project area, it is recommended that a flora and vegetation assessment be completed to identify any DRF or Priority species that may occur.



Table 7 Conservation Codes and Descriptions for DEC Declared Rare and Priority Flora Species

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

2.11 Threatened Ecological Communities

Databases of the DEC and DEW were queried for recorded occurrences of TECs near the study area. No TEC's listed under the DEC's TEC database or the EPBC Act were identified within the study area.



2.12 Assessment Against the Ten Clearing Principles

Main Roads have indicated that some clearing may be required if the vegetation poses a risk to motorists along the highway alignment. It is estimated that a 0.5 ha is the maximum area of vegetation that would require clearing. It can only be confirmed once the final option for the works is selected, and the risk is assessed.

Clearing is managed by the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. However, Main Roads Statewide project "Clearing Permit" (CPS 818/2) allows clearing in certain circumstances and the project not occurring in an Environmentally Sensitive Area (ESA).

Clearing applications are assessed against the Ten Clearing Principles outlined in Schedule 5 of the *Environmental Protection Amendment Act (2003)*. These principles aim to ensure that all potential impacts resulting from removal of native vegetation can be assessed in an integrated way. Based on this desktop PEIA, the proposed project has been assessed against the ten Clearing Principles (Table 8).

Table 8 Assessment of Project Against the 10 Clearing Principles

Clearing Principle	Does Variance Occur	Comment
It comprises a high level of biological diversity.	Proposal is not at variance with this principle.	The study area is predominantly surrounded by cleared farmland and is considered not to comprise a high level of biological diversity.
It comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	Proposal is not at variance with this principle.	Clearing will be required for approximately 0.5 ha (depending on preferred option) within the road reserve. The area to be cleared is not believed to be necessary to maintain fauna indigenous to Western Australia.
It includes, or is necessary for the continued existence of, rare flora.	Not likely to be at variance with this principle.	The study area is located in an area of cleared farmland where cropping has occurred. The desktop assessment identified the presence of Priority Flora approximately 1.5km to the southeast of the project area. It is recommended that a flora investigation be completed prior to the final design stage.
It comprises the whole or in part of, or is necessary for the maintenance of, a threatened ecological community.	Proposal is not at variance with this principle.	A desktop search for TEC's has confirmed none within the study area.
It is significant as a remnant of native vegetation in an area that has been extensively cleared.	Not likely to at variance with this principle.	The project area is surrounded by cleared agricultural farmland.



Clearing Principle	Does Variance Occur	Comment
It is growing in, or in association with, an environment associated with a watercourse or wetland.	Proposal is not at variance with this principle.	Road works for the upgrade are expected to be in proximity to Warperup and Kyarup Creek. Appropriate mitigation measures are to be complied with to minimise runoff and sedimentation to these waterways.
The clearing of the vegetation is likely to cause appreciable land degradation.	Proposal is not at variance with this principle.	The surrounding land has been previously cleared for agriculture.
The clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	Proposal is not at variance with this principle.	There are no conservation areas in close proximity to the study area.
The clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water?	Proposal is not at variance with this principle.	Main Roads will ensure that there is no deterioration in surface or underground water quality as a result of the proposed works.
The clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	Proposal is not at variance with this principle.	The limited extent of clearing and subsequent road works being carried out are unlikely to increase the flooding potential of the adjacent areas.

Main Roads has informed GHD that approximately 0.5 ha of vegetation will be cleared and based on the Ten Clearing Principle assessment, is unlikely to be at variance. However it is recommended that flora assessment be completed to identify any DRF or PF species that may be impacted by the proposed works.

On the basis of this PEIA and assessment against the ten Clearing Principles, it is considered the type and nominal area of clearing proposed for the project may be authorised under Main Roads Statewide project "Clearing Permit" (CPS 818/2).



2.13 Dieback

Dieback is caused by the pathogen *Phytophthora cinnamomi*, which is confined to that part of the South-West Land Division and extensions to the NW and SE that receive in excess of 600 mm per annum rainfall (Conservation and Land Management, 2003).

Although the pathogen can occur on altered sites receiving higher effective rainfall or on natural water gaining sites situated between the 400 mm and 600 mm isohyets, available climatic and hydrological data suggests that the study area is not vulnerable to the dieback fungus.

2.14 Fauna

The conservation of fauna species and current significance status is assessed under the *Wildlife Conservation Act 1950* and the Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999*.

The DEW maintains a database of matters of national environmental significance that are protected under the *Environmental Protection and Biodiversity Conservation Act (1999)*. A Protected Matters Report was generated for the matters of significance that may occur in, or may relate to, the study area. The search identified eight protected species that could occur on and surrounding the study area.

A search of the DEC's Threatened fauna database for any rare and priority species that may occur in the vicinity of the study area was undertaken and eight Priority species were identified. Appendix C contains the list provided by the DEC.

Table 10 lists the results from the EPBC Act Protected Matters Search Tool (2005) and a DEC threatened fauna database search. An explanation of the significance levels for these fauna is detailed in Appendix D.

Table 9 Significance Fauna occurring, or likely to occur within the vicinity of the project area

Common Name	EPBC Act Status	DEC Status
Bilby	Vulnerable	Schedule 1
Baudin's Black-Cockatoo	Vulnerable	Schedule 1
Malleefowl	Vulnerable	Schedule 1
Carnaby's Black-Cockatoo	Endangered	
Western Whipbird	Vulnerable	Priority 4
Woylie		Priority 5
Quenda		Priority 5
Tammar Wallaby	Extinct	Priority 5



Common Name	EPBC Act Status	DEC Status
Chuditch, Western Quoll	Vulnerable	Schedule 1
Red-tailed Phascogale	Endangered	

The project area is surrounded by cleared farmland and therefore considered to have some habitat value. Depending on how much clearing is involved with the preferred option. Main Roads may need to give further consideration of fauna.

2.15 Aboriginal Heritage

A search of the Department of Indigenous Affairs (DIA), Register of Aboriginal Sites was conducted. There were no registered sites identified within the study area. However, Main Roads should be made aware that it is an offence under the *Aboriginal Heritage Act (1972)* to impact on any Aboriginal site whether it is registered or not.

2.16 European Heritage

The Commonwealth's Australian Heritage Places Inventory and the Heritage Council of Western Australia Places Database were used to determine the presence of European heritage sites in the vicinity of the study area. There were two sites identified within 5 km of the study area.

The Toompup Siding located on Toompup Rd, was identified as being approximately 4km from the study area, and the Warperup Crossing School Site located on Peerup Rd was also identified as being within a 5 km radius.

These sites should not be impacted by the proposal but Main Roads should be made aware of their existence.

2.17 Ambient Dust

There are four proposed options for the upgrade of the Deadmans Curve, all of which are likely to generate dust during the construction phase. Air borne dust generated during the proposed road works could potentially impact on the nearby farmhouses and/or users of the Broomehill to Jerramungup Road.

There are two sensitive receptors within close proximity to the study area. The first sensitive premises is located on the western end of the study area, approximately 1 km from the road centreline. The second is located at the eastern extent of the study area, approximately 860 m from the road centreline.

Dust management protocols should be stipulated in Main Road standard road construction documentation.



3. Environmental Aspects

Table 10 lists all of the environmental aspects assessed in Section 2 and describes and evaluates their potential impact relevant to the proposed project. The table also describes and evaluates the social aspects of the project.

Where the impact of an assessed aspect is not considered relevant, a statement will be included in the table to that effect. Alternatively, where an impact or environmental aspect has been deemed significant for the proposed project, recommendations will be included where applicable.

The environmental aspects necessary for further consideration are listed in Section 3.1.

3.1 Key Environmental Aspects

Key environmental and social aspects that have been considered to the proposed works are:

- » vegetation – clearing;
- » fauna;
- » surface waters and drainage;
- » groundwater;
- » land-use and Acquisition;
- » acid sulphate soils;
- » public safety and risk;
- » noise and vibration;
- » dust emissions; and
- » construction phase impacts – weed and topsoil management, fire management, fuel and chemical storage, local community consultation and complaints management and rubbish disposal.



3.2 Assessment of Aspects and Impacts

Table 10 lists all of the environmental aspects assessed and evaluates their potential impact relevant to the proposed project. This section includes recommendations where applicable.

Table 10 Assessments of Environmental and Social Aspects and Impacts

Aspect	Evaluation of Potential Impact	Recommendations
Land Use and acquisition	The majority of the surrounding area consists of cleared farmland land. The land is privately owned, as such Main Roads has initiated consultation with the adjacent landowners who include Darryl Hancock, Fred Duncan and Kevin Imberti to ensure that clearing within private land will be able to take place if necessary.	<p>If the construction of the road upgrade and associated road works require the acquisition of land from private property, Main Roads WA will need to reach agreement with the landholders on adequate financial compensation, based on the current local market value and the area of land required.</p> <p>Where possible Main Roads WA should minimise any land requirements from private property to that which is practicable.</p>



Aspect	Evaluation of Potential Impact	Recommendations
Fauna	The project area is surrounded by cleared farmland. As such, the project area has considerable habitat value.	<p>Once the preferred option has been developed, the DEC should be consulted to discuss habitat values.</p> <p>A Construction Environmental Management Plan (CEMP) should be developed in line with Main Road policies.</p> <p>Clearing should be clearly marked and adhered to by site personnel. No native vegetation outside of the clearing limit will be impacted.</p> <p>Main Roads should ensure that contractors are aware of potential fauna in the project area.</p> <p>It is recommended that fauna management strategies be incorporated into the Main Roads WA contract documentation to prevent impacts on fauna during the construction works.</p> <p>It is recommended that clearing be kept to a minimum in order to reduce the impact of habitat destruction on resident fauna, including retainment of felled trees for habitat.</p>
Vegetation – clearing	Following assessment against the “10 Clearing Principles” (see Table 8) it is considered that clearing of approximately 0.5 ha of native vegetation for the proposed project may proceed under CPS 818/2 (Part 1 – Type of Clearing Authorised).	<p>It is recommended that flora and vegetation assessment be completed to identify any Declared Rare or Priority Flora that may be impacted.</p> <p>The limits of clearing should be clearly marked on-site prior to works commencing and all project activities contained within them.</p>
Surface waters/drainage	The highway traverses Kyarup Creek and Warperup Creek. The creeks are outside the study area. It is not likely that there will be a significant impact on the waterway, however management measures will be recommended to prevent any drainage to or runoff into the these waters,	<p>Road drainage should be developed to ensure that there is no direct discharge or off-road runoff to the creeks.</p> <p>Given the proximity of the proposed works to watercourses, a spill kit should be available on-site and measures to control accidental spills should be included in the CEMP.</p>



Aspect	Evaluation of Potential Impact	Recommendations
Groundwater	Due to the presence of two creeks within the study area drainage modifications may be required as part of the proposed works. Additionally, if excavations are required dewatering may impact on groundwater quality. Consequently this potential impact will require management actions to prevent any disturbance to the groundwater quality or levels.	Main Roads should be aware that if dewatering is required, the water be directed into infiltration ditches to allow the water to be naturally filtered before returning to the groundwater. If dewatering is required, an acid sulphate soils investigation may have to be completed.
Construction phase impacts – fire management, fuel and chemical storage, and waste disposal.	During the construction phase of the proposed works, a number of common activities may cause environmental/social impacts.	It is recommended that Main Roads develop and implement a CEMP to address all environmental and social impact issues throughout the development of the project. These measures shall then be implemented during pre-construction and road construction activities.
Noise and Vibration	There are two sensitive receptors within 1 km of the study area. Noise and vibration levels may increase during construction, however these are not considered significant and should be managed in accordance with the recommendations.	Manage by standard noise and vibration management techniques employed by the construction contractor as specified in the CEMP.
Public safety and risk	The construction phase of the project may create some public safety and risk issues. Applying traffic management and signage to Main Roads standards will be necessary to manage these risks throughout the implementation of the project, particularly if the works will be completed under public traffic and no sidetracks will be used. A Telstra cable exists around the inside of curve 2 and adjacent to the existing fence line, which will require relocation prior to any construction works commencing.	Plan and apply traffic management and signage to Main Roads standards. A traffic management plan should also be submitted to the Shire of Gnowangerup. Relocate the Telstra cable prior to commencement of construction works.
Dust	Dust may be a potential issue during the construction phase, especially in summer when construction sites can generate wind-borne dust. Excessive dust may impact on nearby sensitive receivers and adjacent areas of native vegetation.	Apply standard dust management measures during construction.



Aspect	Evaluation of Potential Impact	Recommendations
Vegetation – Dieback	<p>The available climatic and hydrological data suggests that the study area is not vulnerable to the dieback fungus.</p> <p>However, in the absence of a Dieback survey, the presence of dieback cannot be decided with any certainty. Employing general hygiene management practices during work may reduce the risk of dieback spreading in the area if the disease does exist locally.</p>	<p>The proposed roadwork improvements in the project area should be implemented with appropriate Dieback hygiene measures to reduce the risk of introducing or spreading Dieback to any uninfected native vegetation. Generally this would include the practices outlined in CPS 818/12 Part IV – Management, Section 15 – Dieback, other pathogen and weed control.</p>
Aboriginal Heritage	<p>The results of the on-line search of Department of Indigenous Affairs (DIA) sites database show that there are no Aboriginal heritage sites in the vicinity of the study area.</p>	<p>It is recommended that Main Roads WA adhere to the conditions placed under the <i>Aboriginal Heritage Act (1972)</i> for any potential heritage sites that may be discovered during excavation or construction works. Standard Aboriginal heritage management clauses should be included in the construction Environmental Management Plan and site induction.</p>
Heritage (non-indigenous)	<p>A search of the EPBC Act Protected Matters Search Tool (2005) and Heritage Council of Western Australia online database indicated there are no World Heritage Properties and two European heritage sites of significance present in the study area.</p> <p>There is not expected to be any impact on the European heritage sites as they are more than 4 km from the study area. Additionally, the Warperup Crossing School Site has been previously demolished.</p>	<p>It is recommended that Main Roads be aware of these locations of European heritage sites even though they are unlikely to be impacted by the works.</p>
Air Quality	<p>Impacts to air quality are generally dependent on traffic flow and proximity of the road to residential dwellings and other sensitive receptors within 200m of the road centreline. Local air quality may be affected during the construction phase by the generation of dust and machinery exhaust. However, the impacts are not considered to be significant.</p>	<p>An air quality impact assessment is not required for the project provided the predicted traffic flow remains less than 15,000 vehicles per day, as specified in Main Roads <i>Environmental Guideline – Air Quality</i> (MRWA, 2004).</p>



Aspect	Evaluation of Potential Impact	Recommendations
Acid Sulphate Soils	Acid sulphates are no considered to be a major issue assuming no dewatering is required. Main Roads has informed GHD that no significant excavations will occur and no dewatering will be required.	An Acid Sulphate Soils Assessment is recommended if dewatering is required.
Visual Amenity	The proposed works and clearing of vegetation will not significantly impact upon the visual amenity. This aspect is not considered to be significant and no additional management commitments are required.	The project area is remote and visual amenity is not considered to be a major issue.
Contaminated Sites	No sites identified. The potential to encounter a contaminated site during the proposed project is considered a low risk. There are no known previous land use activities on or adjacent to the study area that had the potential to create contamination.	Not considered to be an issue.
Reserves and conservation areas	There were no Nature Reserves identified in close proximity to the study area.	Not considered to be an issue.
Wetlands	There are no significant wetlands present in the study area.	Not considered to be an issue.
Salinity	Given the nature and scale of the proposed project, this aspect is not considered relevant.	Not considered to be an issue.



4. Consultation

Adjacent Landholders (Darryl Hancock, Fred Duncan and Kevin Imberti)

Main Roads consulted with adjacent landholders in the project area in December 2006.

Discussion was held with the landholders on the 15th of December, the following topics were raised:

- » The Landholders have indicated their willingness to sell property at a fair rate such that works can proceed;
- » The requirements of the adjacent landowners are that no physical works are to commence until after harvesting has been completed (Christmas break); and
- » Prior to construction a new fence is to be erected along the new boundary line.

Department of Environment and Conservation, Albany Office

At the time of writing no response has been received from the Department of Environment and Conservation.

Department of Agriculture and Food WA, Albany Office

At the time of writing no response has been received from the Department of Agriculture and Food.

Department of Water, South Coast Region, Albany.

No response has been received from the Department of Water.



5. Requirements for Approval

Table 11 indicates that it is unlikely that approvals from government agencies are required. However, further consultation with the DEC may be required in regard to possible variance with the Ten Clearing Principles.

Table 11 Approvals from Government Agencies

Relevant Agency	Agency required Approval/Referral
Commonwealth Department of the Environment and Water	No
Environmental Protection Authority	No
Department of Environment and Conservation	No
Department of Indigenous Affairs	No
Australian Heritage Council	No
Heritage Council of Western Australia	No
Department of Agriculture and Food Western Australia	No



6. References

- Commonwealth Bureau of Meteorology, (2006), *Climate Education: 'Climate Zones for Temperature and Humidity'* [online] Available at: <http://www.bom.gov.au/lam/climate/levelthree/cpeople/travelmap.htm>, Accessed 13/11/2006.
- Beard, J. S. (1979). *Vegetation Survey of Western Australia - The Vegetation of the Dumbleyung Area WA Map and Explanatory Memoir 1:250,000 series*, Vegmap Publications, Perth.
- Commonwealth Government of Australia (1975). *National Topographic Map Series, Sheet 2530, Nyabing and Sheet 2529 Borden*, Western Australia, Edition 1.
- Conservation and Land Management (2003). *Phytophthora cinnamomi and disease caused by it, Volume I: Management Guidelines*. Department of Conservation and Land Management, Perth, Western Australia.
- Department of Environment and Heritage (2006). *Protected Matters Search Tool*. <http://www.deh.gov.au/erin/ert/epbc/index.html>. Accessed 20th February 2007.
- Department of Indigenous Affairs Website (2006). www.dia.wa.gov.au. Accessed 20th February 2007.
- Environmental Protection Authority (2004). *Environmental Protection (Clearing of Native Vegetation) Regulations*, Western Australia.
- Main Roads Western Australia (2007) *Broomehill to Jerramungup Road (M005) Deadmans Reseve Curve Improvements – Preliminary Proposal Report*.
- National Native Title Tribunal (2007) <http://www.nntt.gov.au/>. Accessed 20th February 2007.
- Western Australian Planning Commission (2003). Planning Bulletin No. 64, [Online], available from: www.wapc.wa.gov.au, accessed 8th August 2006.
- Western Australian Government (1985) *Geological Survey of Western Australia, 1:250 000 Geological Series – Dumbleyung SI 50-7*. First Edition.



Appendix A

**Broomehill to Jerramungup Road (M005)
Deadmans Curve Improvements –
Preliminary Proposal Report**



Broomehill to Jerramungup Road (M005)

75.52 SLK to 77.30 SLK

Deadmans Reverse Curve Improvements

**PRELIMINARY PROPOSAL
REPORT**



Broomehill to Jerramungup Road (M005)

75.52 SLK to 77.30 SLK

Deadmans Reverse Curve Improvements

PRELIMINARY PROPOSAL REPORT

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1 EXECUTIVE SUMMARY

There have been continuing concerns about crashes, especially those involving Road Trains, over this section of highway. The following report is a result of a desktop study carried out by Main Roads and discussion with local farmers and a Shire representative.

Four alternative options were considered from the 'do-minimum' to "realignment". These options were then costed based on previous costs for similar type work.

Due to the large cost variation and potential benefits to the road user, it was recommended that field investigations and survey be completed from which a firm proposal can be developed for this section of road.

2 EXISTING SITUATION

2.1 Geometrics

The terrain can be described as flat to undulating with horizontal curves over 500.0m resulting speed environment 115km/hr for this section of road. Both horizontal and vertical curves over the section of road under review are out of contents with the rest of the road.

Both ends of the proposed works are on a west / east alignment. The small straight between the two curves is in a north westerly direction. The radius of the western curve (curve 1) is approximately 325.0m. The radius of the eastern curve (curve 2) is approximately 360.0m.

At each end of the proposed works there are substandard crest curves on the straights past the horizontal curves. The western end vertical crest curve is not as severe as the eastern end. The eastern vertical curve is relatively uniform except for a sharp "bump" near the eastern end which restricts sight to and from Peerup Road.

The superelevation/ crossfall on curve 1, is not uniform and rolls off on the high side of the curve over approximately 200.0m.

The formation width is nominally 8.5m wide with the table drains a further 2.5m outside the hinge point.

The existing seal width is nominally 7.2m wide. There are signs of wheel tracking / edge rutting outside the edges of the existing seal especially around the outside of curve 1. Traffic lanes are not marked

2.2 Traffic data / growth

Traffic statistics obtained from IRIS indicate an Annual Average Daily Traffic volume of 230 vehicles per day in 2002 / 03. Heavies accounted for 21% of the traffic volume. Road Trains would be a considerable proportion of those heavies.

Assuming a 3% traffic growth, the traffic volume in 2006 would be around 250 vehicles per day. If a nominal 2% traffic growth is projected out to 2046 the traffic volume would be around 550 vehicles per day.

2.3 Services

The existing Telstra cable around in inside of curve 2 and adjacent to the existing fence-line will need relocation prior to any construction work commencing. This should be a relatively simple task as the cable will require shortening if it is uplifted and relocated to the new boundary line.

2.4 Environmental

There do not appear to be any heritage, flora and/or fauna sites in the area.

2.5 Land

The adjoining land owners are keen to see any improvements to the current situation be carried out as soon as possible. They have indicated their willingness to sell property at a fair rate so the works can proceed.

One requirement they impose is that no physical works is to commence till after harvesting has been completed (Christmas break). As soon as harvesting has been completed and prior to construction a new fence is to be erected along the new boundary line.

2.6 Accidents

Between January 2001 and December 2005, there have been 2 recorded crashes involving Road Trains. One was in 2004 and the other in 2005.

Local farmers implied that there have been at least 5 to 6 crashes involving Road Trains alone over the previous 10 years. They also indicated that there are another 3 wrecks on nearby land from crashes prior to that time.

The farmers also believe that most of the crashes are happening on and/or near curve 1.

2.7 Stakeholders

Discussion was held on site on 15 December 2006 with the three adjoining land owners and/or their representatives that could be affected by the proposed works (Darryl Hancock, Fred Duncan and Kevin Imberti) and the local shire representative (Jan Savage).

The following topics were raised

- Construction to commence after Christmas to avoid dust contamination and disruption of the harvest
- New boundary fences to be in place prior to any work commencing
- They would prefer a long term permanent fix and will assist in implementing this.
- They are not aware of any heritage site, identified flora and/or fauna that could have an impact on the work
- All three farmers were in agreement that at least 5 to 6 trucks (road trains) have been involved in crashes within this section of road over the past 10 that. Prior to that they are also aware of another 3 crashes involving trucks as the wrecks are on their properties.
- Review the vertical geometry at each end of the proposed works. There is major concern for vehicles exiting Peerup Road as there is a lack of site distance. If the road is realigned, there will be an increase in speed at Peerup Road reducing space and time for drivers to react to a potential situation.
- The construction of the works could be delivered through a shire under the direction of Main Roads. Paul Robertson of Paul G Robertson and Associates, Albany, Western Australia is their contact.
- If the road is not realigned, they requested that the surface shape be corrected around the outside of curve 1.

3 PROPOSALS

3.1 Adopted Standards

The following standards were adopted for all options except for the do-minimum option

- Remove unwanted and/or hazardous vegetation
- Upgrade and/or install new culverts
- Reinstate and/or construct table drains with appropriate off-shoot drains
- Construct a minimum 10.0m wide formation
- Apply a 8.0m wide seal
- Road marked 3.5m wide traffic lanes
- Install traffic facilities to current standards

3.2 Options

3.2.1 Option 'A' – Do-minimum

This option involves the following

- Length of work = 250m
- Surface correct the outside of curve 1 with no other works undertaken.

The works consist of grader lay asphalt over the existing surface and/or rip and remake of the existing pavement over a 250m x 3.0m nominal area.

The surface will require a reseal approximately 12 months after the work is completed to enhance water tightness and skid resistance.

Preliminary cost for this work is around \$10,000.00 based on a nominal rate of \$15.00 per square metre plus \$10,000.00 for Project Development and Delivery.

3.2.2 Option 'B' – Widen existing formation and surface correct curve 1

This option involves the following

- Length of work = 1.0km
- Widen the formation width
- Widen the existing seal width
- Surface correct the outside of curve 1

The works consist of the rehabilitation of the surface drains and formation to the appropriate standard, correcting the surface around the outside of curve 1, widening the existing seal width over the 2 curves and road marking the traffic lanes. No land take is required

The new formation width will be constructed by relocating (boxout) the top 200mm of the existing gravel shoulder out to form the base on which a new pavement can be built on. The new 200mm deep pavement will be constructed out of new imported gravel. Surface correction to curve 1 can be carried at the same time.

The surfacing will consist of a prime coat and a two coat first coat seal. This will provide a reasonable watertight and structurally sound green surface for the type of alignment and stress the surface has to withstand.

The Preliminary Construction Cost is approximately \$110,000.00 based on a nominal rate of \$50.00 per lane kilometre for shoulder rehabilitation, \$10,000 for the surface correction of curve 1 and \$20,000.00 for Project Development and Delivery.

3.2.3 Option 'C' – 600.0m radius curves with no vertical improvements

This option involves the following

- Length of work = 1.3km
- 600.0m minimum horizontal "SCS" curves with minimum change to the vertical geometry at the western end of the proposed works

This option reconstructs / realigns the existing curves to conform to Chapter 6 of Main Roads Road Design Standard with no consideration of the vertical geometry and having the least impact on adjoining land. Curve radii have been increased to 600.0m with 6% superelevation.

The work is limited at each end to where superelevation runoff matches into the existing road cross-fall.

The proposed works extends into the crest curve at the western end. The costs for lowering the crest curve to improve sight / safe stopping sight distance have been included in the estimate. The material from the cut can be used to raise the new road and improve overall pavement drainage.

The Preliminary Construction Cost is \$1,050,000.00 plus \$110,000.00 for Project Development and Delivery – refer to the appended Estimate

3.2.4 Option 'D' – 800.0m (min) radius curves with vertical improvements

This option involves the following

- Length of work = 1.75km
- Table drains = 3.00m minimum from edge of formation
- 1,000.0m horizontal circular curves
- Improve vertical geometry to enhance stopping site distance.
- Provide additional seal width at the intersection of Peerup Road

This option reconstructs / realigns the existing curves in accordance with Chapter 6 of Main Roads Road Design Standard. Consideration was given to vertical geometry and the Jeerup Road intersection. Impact of the works on adjoining land was not considered.

1,000.0m circular curves with 4% superelevation were used. The curve radii are large enough that spirals are not considered necessary.

The work was limited at the western end to the 300mm dia. culvert / floodway and the 100.0m east of Jeerup Road.

The proposed works lowers the crest curves at each end of the works to improve sight / safe stopping sight distance. The costs for lowering the crest curves are included in the estimate. The material obtained by lowering the crest curves can be used to raise the new road, improve overall pavement drainage and as lower pavement material.

The Preliminary Construction Cost is \$1,420,000.00 plus \$120,000.00 for Project Development and Delivery – refer to the appended Estimate

4 DISCUSSION

Any improvement to the current situation will improve safety to the road user.

4.1 Option A

Option A "Do-minimum" corrects the cross-fall on curve 1 where most of the Road Trains are leaving the sealed trafficable lane. Another probable reason why vehicles leave the road on curve 1, especially in a westerly direction, is the radius of curve 1 is tighter than that of radius of curve 2.

4.2 Option B

Option B "Widen existing formation and surface correct curve 1" includes Option A and widens the existing formation and seal to current standards over and between the two curves. This will improve safety further, by providing extra wander space around the curve and assist the driver to recover if they momentary lose control of their vehicle. The new width also provides additional space between opposing vehicles reducing the potential of side swipe.

4.3 Option C

Option C "600.0m radius curves with minimal vertical improvements" realigns the existing horizontal curves to provide a 110km/hr design speed. Vertical improvements are limited to the western end of the proposed realignment. No improvements are envisaged for this option as the work stop short of the vertical geometry on the eastern end.

This option has the potential of moving and/or increasing the likelihood of accidents occurring at Jeerup Road intersection due to the increase speed of vehicles approaching the intersection from the west. This is especially so during harvest as Road Trains enter and exit Jeerup Road to the Broomehill to Jerramungup Road. Existing sight (effective safe stopping sight distance) to and from the intersection is restricted to 100.0m. The risk could be reduced by using a spotter.

4.4 Option D

Option D "800.0m (min) radius curves with vertical improvements" upgrades both the horizontal and vertical geometry to 110km/hr and provides additional seal width (escape / safety zone) at Jeerup Road. This option provides the safest overall environment for the road user.

Speaking to locals, they want the best possible solution and would assist with any land purchase (within reason) required to get the work done. They are very concern that somewhere in the near future there is going to be a serious crash.

5 RECOMMENDATION

It is recommended that field investigations and survey be completed from which a firm proposal can be developed for this section of road.

Report prepared by:

.....
Bram van Berkel

Dated: 8 January 2007

NOTES

Extent of survey (or as shown)
Western end - 50m west of double box
Eastern End - 250m east of
Peerup Road - 100m in from M005 centreline
Width - as shown from existing centreline



Broomehill to Jerramungup Road (M005)
75.31 SLK to 77.45 SLK
Deadmans Reverse Curve Improvements
Scale 1 : 10,000



Appendix B
Declared Rare and Priority Flora Search
Results

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
DECLARED RARE AND PRIORITY FLORA LIST
21 December 2006

SPECIES / TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER
				PERIOD
<i>Acacia declinata</i>	3	SC	Borden, Boxwood Hill (Marra Bridge), Kalgan	Aug-Oct
<i>Acacia mutabilis</i> subsp. <i>incurva</i>	2	SC,WB	Ongerup, Pingrup, Needilup	Aug-Sep
<i>Acacia mutabilis</i> subsp. <i>rhynchophylla</i>	3	WB	Pingrup, Nyabing, Borden	Aug-Sep
<i>Acacia newbeyi</i>	3	WB,SC	Nyabing, Boxwood Hills, Ravensthorpe, Ongerup, Dragon Rocks	
<i>Acacia trulliformis</i>	R	SC	Ongerup, Takalarup	
<i>Acrotriche dura</i>	2	SC	Ongerup, Corackerup, Chillinup	Sep,Oct
<i>Acrotriche plurilocularis</i>	3	SC,WB	Kamballup, Cheyne Beach, Cape Riche, Tarin Rock, Bremer Bay, Pallinup River, Qualup, Ongerup	Sep
<i>Andersonia setifolia</i>	3	SC,WB	Manypeaks, Gordon River, Albany, Two Peoples Bay, Ongerup	Jul-Aug
<i>Baeckea crispiflora</i> subsp. <i>Ongerup</i> (A Scougall & C Garawanta E35)	1	WB,SC	Ongerup	
<i>Boronia oxyantha</i> var. <i>brevicalyx</i>	3	SC	Ravensthorpe, Ongerup, Boxwood Hill, - Fitzgerald River N.P., Bandalup Hill	
<i>Chorizema carinatum</i>	3	SC,SR	Stirling Range, Cranbrook, Ongerup, Cape Riche, Jerramungup, Nannup	Oct-Nov
<i>Chorizema ulotropis</i>	4	SC,SW	Jerramungup, Ongerup, Ravensthorpe, Young River, Dwellingup, Wandering, North Bannister	
<i>Cymbonotus preissianus</i>	3	SC,*	Mt Barker, Borden, Kalgan, Eastern States	-
<i>Darwinia acerosa</i>	R	MW,SW,S C,WB	Mogumber, Ravensthorpe, Ongerup, Pine Hill	Sep-Nov
<i>Dryandra conferta</i> var. <i>parva</i>	2	WB,SC	Ongerup, Nyabing, Porongurup, Stirling Range	Jun-Aug
<i>Dryandra pseudoplumosa</i>	R	SC	Stirling Range, Woogenilup, Toompup	Nov-Dec
<i>Eremophila veneta</i> ms	4	WB	NW of Newdegate, Kulin, Lake Lockhart, Ongerup, Pingrup, Bendinging	Oct-Dec
<i>Hakea brachyptera</i>	3	WB,SC	Lake Magenta, Lake Cairlocup, Ravensthorpe, ?Tambellup, ?Ongerup	
<i>Hibbertia priceana</i>	R	SC	Ongerup	Jun-Aug
<i>Leucopogon denticulatus</i>	4	SC	Ongerup to Mt Maxwell, Fitzgerald River N.P., Jerramungup	Oct
<i>Leucopogon florulentus</i>	3	SC,WB,SW	Ongerup, Esperance, Cordering, Wagin, Bannister, Jerramungup, Lake Magenta Nature Reserve	Apr-Jul
<i>Leucopogon</i> sp. <i>Ongerup</i> (AS George 16682)	1	SC,WB	Borden, Duggan (Kukerin)	Jul
<i>Leucopogon tamariscinus</i>	4	SC,WA,WB	Stirling Range N.P., Mt Barker, Mt Chudalup, Cranbrook, Ongerup	Jul, Aug- Feb
<i>Melaleuca araucarioides</i>	4	SC	Ongerup, Cape Riche, Jerramungup	Jul, Oct
<i>Melaleuca polycephala</i>	3	SC,WB	Pingrup, Kuringup, Gnowangerup, Ongerup, Amelup, Toolbrunup Siding, Dragon Rocks, Borden	Sep-Nov
<i>Melaleuca pritzelii</i>	2	WB,SC	Ongerup, Pootenup, Tambellup, Fitzgerald River NP, Quarderwardup Lake, Lake Muir, Cordering, Stirling Range National Park, Ewlyamartup	-
<i>Melaleuca viminea</i> subsp. <i>appressa</i>	2	SC,WB	Mt Burdett, Ongerup, Skeleton Rock	Sep, Oct

**DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT
DECLARED RARE AND PRIORITY FLORA LIST
21 December 2006**

SPECIES / TAXON	CONS CODE	CALM REGION	DISTRIBUTION	FLOWER PERIOD
Microcorys lenticularis	2	SC, WB	Tarin Rock, Ongerup, Beaufort Inlet	Nov-Jan
Myoporum cordifolium	R	SC	Ongerup-Jacup	Jun-Nov
Pterostylis sp. Ongerup (KR Newbey 4874) [aff. pusilla]	4	SC	Cape Arid, Stirling Range N.P., Ravensthorpe, Ongerup	Aug-Oct
Spyridium mucronatum subsp. recurvum	3	WB, SC	Borden, Lake Magenta, Ravensthorpe	Sep-Dec
Tetralochea sp. Ongerup (KR Newbey 4505)	1	SC	Ongerup	Oct
Thysanotus cymosus	3	WB	Muntadgin, Karlgarin, Hyden, Lake Grace, Ongerup, Kulin, Pingelly, Kojonup	Sep-Oct
Thysanotus gageoides	3	SC, WB, S R	Cranbrook, Cape Riche, Stirling Range, Borden, Ongerup, Mullalyup, Corackerup	Oct-Nov
Trymalium myrtilloides subsp. pungens	1	SC, WB	Lake Grace, Ongerup	Sep-Oct



Appendix C
DEC Significant Fauna Search Results

33.95743 °S 118.32277 °E / 34.19171 °S 118.5504 °E SW Hwy Broomehill-Jerramungup (plus~10km buffer)

* *Date* *Certainty* *Seen* *Location Name* *Method*

Schedule 1 - Fauna that is rare or is likely to become extinct

Leipoa ocellata **Malleefowl** *1 records*

This species was once widely distributed across southern Australia. It prefers woodland or shrubland with an abundant litter layer that provides essential material for the construction of its nest mound.

1985 1 0 Mungerup Definite signs

Calyptorhynchus latirostris **Carnaby's Black-Cockatoo** *2 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.

1985 1 Mungerup Day sighting
2000 1 12 Nalyerup Day sighting

Calyptorhynchus sp **White-tailed Black Cockatoo** *1 records*

These records pertain to either Baudin's Black-Cockatoo or Carnaby's Black-Cockatoo.

1988 1 Toompup Nature Reserve Day sighting

Platycercus icterotis xanthogenys **Western Rosella (inland ssp)** *1 records*

This subspecies of the Western Rosella occurs in eucalypt and casuarina woodlands and scrubs, especially of Salmon Gum and tall mallees.

1985 1 Mungerup Day sighting

Priority Four: Taxa in need of monitoring

Macropus irma **Western Brush Wallaby** *2 records*

This species occurs in areas of forest and woodland supporting a dense shrub layer.

1985 1 Mungerup
1986 1 Unnamed Nature Reserve Day sighting

Oreoica gutturalis gutturalis **Crested Bellbird (southern)** *1 records*

This sedentary and solitary species inhabits the drier mallee woodlands and heaths of the southern parts of the State.

1985 1 Mungerup

Pomatostomus superciliosus ashbyi **White-browed Babbler (western wheatb** *1 records*

This species of bird lives in eucalypt forests and woodlands, and forages on or near the ground for insects and seeds.

1985 1 Mungerup

Psophodes nigrogularis oregon **Western Whipbird (sthn WA subsp)** *2 records*

This subspecies occurs from the Stirling Range east to Mungerup and north to Lake Grace and inhabits areas of mallee and heath, nesting in dense vegetation.

1929 1 Ongerup
1929 1 1 Ongerup Dead

Priority Five: Taxa in need of monitoring (conservation dependent)

Isoodon obesulus fusciventer **Quenda** *1 records*

This species prefers areas with dense understorey vegetation, particularly around swamps and along watercourses, that provides ample protection from predators.

33.95743 °S 118.32277 °E / 34.19171 °S 118.5504 °E SW Hwy Broomehill-Jerramungup (plus~10km buffer)

<i>* Date</i>	<i>Certainty</i>	<i>Seen</i>	<i>Location Name</i>	<i>Method</i>
1985	1		Mungerup	
<i>Macropus eugenii derbianus</i>			Tammar Wallaby	<i>2 records</i>
This species prefers thickets of Melaleuca, Sheoak or other large shrubs associated with grassland.				
1979	3	0	Toompup Nature Reserve	Tracks
1984	1		Mungerup	

* 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



Appendix D
Description of Fauna Significance Levels



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



Status	Significance Level	Definition
EPBC Act	Migratory	<p>Taxa that are listed in</p> <p>Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a Range State under the Convention;</p> <p>The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA); and</p> <p>The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA).</p> <p>Listed migratory species also include any native species identified in an international agreement approved by the Commonwealth Environment Minister. The Minister may approve an international agreement for this purpose if satisfied that it is an agreement to the conservation of migratory species.</p>
	Marine	Species in the list established under s248 of the EPBC Act.
	Schedule 1	“...fauna that is rare or likely to become extinct, are declared to the fauna that is in need of special protection.”
DEC	Schedule 2	“...fauna that is presumed to be extinct, are declared to the fauna that is in need of special protection”



Status	Significance Level	Definition
Schedule 3		“...birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction , are declared to be fauna that is in need of special protection .”
Schedule 4		“...fauna that is in need of special protection, otherwise than for the reasons mentioned in [Schedule 1 – 3]”
Priority 1		Taxa with few, poorly known populations on threatened lands.
Priority 2		Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sights records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown Land, water reserves, etc.
Priority 4		Rare taxa. Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia) are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.
Priority 5		Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.



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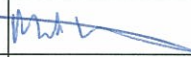
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