

**Main Roads Western
Australia**

Lake Raeside Goldfields
Highway (HO49) 293.00 to
307.78 SLK

Preliminary Environmental
Impact Assessment

April 2007



Contents

Executive Summary

1.	Introduction	1
1.1	Scope of Report	1
2.	Project Description and Justification	3
3.	Environmental Aspects and Management	4
3.1	Climate	4
3.2	Geology	5
3.3	Soils	5
3.4	Hydrology	5
3.5	Vegetation	6
3.6	Declared Rare and Priority Flora Species	7
3.7	Fauna	9
3.8	Threatened Ecological Communities	10
3.9	Environmentally Sensitive Areas	10
3.10	Weeds and Declared Plants	10
3.11	Dieback	11
3.12	Clearing of Native Vegetation	11
3.13	Contaminated Sites	13
3.14	Air Quality and Dust	13
4.	Social Aspects and Management	14
4.1	Non-Indigenous Australian Heritage	14
4.2	Indigenous Australian Heritage	14
4.3	Native Title	16
4.4	Land Use	17
4.5	Construction Phase Impacts	18
5.	Consultation	19
6.	Environmental Approvals	20
6.1	Commonwealth Approvals	20
6.2	Government of Western Australia	20
6.3	Clearing Regulations	20



7.	Recommendations	21
8.	References	23

Table Index

Table 1	Environmental Issues Not Relevant to the Project	2
Table 2	Soil Summary of Project Area	5
Table 3	Lake Raeside survey area Vegetation Types and Condition Rating	6
Table 4	Remnant Vegetation Extents	7
Table 5	Declared Rare and Priority Flora Species	7
Table 6	Conservation Codes and Descriptions	8
Table 7	Assessment Against the Ten Clearing Principles	11
Table 8	List of Registered Sites within the Region	15

Appendices

- A Figures
- B Searches



Executive Summary

Main Roads Western Australia (Main Roads WA) commissioned GHD Pty Ltd to complete a Preliminary Environmental Impact Assessment (PEIA) for roadworks along a section of the Goldfields Highway, traversing Lake Raeside (293.00 SLK to 307.78 SLK).

Main Roads WA have indicated that the section of the Goldfields Highway under scrutiny is subject to flooding. The purpose of this roadwork is to minimise the impact of flooding on the highway by:

- » Realigning the highway;
- » Upgrading drainage structures and waterways;
- » Providing a number of floodways; and
- » Constructing a bridge over a section of Lake Raeside.

A number of desktop assessments including database, literature reviews and consultation with State Government Departments were undertaken to determine the potential environmental impacts of the development. These included identification and reporting of:

- » rivers, water catchments and drainage;
- » vegetation – Declared Rare and Priority Flora (DRF), clearing of vegetation;
- » weed management;
- » significant fauna;
- » Aboriginal heritage;
- » European heritage;
- » land use; and
- » construction phase impacts.

This PEIA indicates that the potential for environmental impact is considered to be low.

Main Roads WA holds valid Ministerial consent, pursuant to s18 of the *Aboriginal Heritage Act* 1972 in respect to the proposed road works between SLK 293.32 and 307.78 which includes the proposed realignments and bridge construction. Consent was received on 13 April 2005 and included approval of 23 material pit (borrow pit) sites. The Ministerial consent does not include the southern 320 m extent of the proposed road works.

No Environmentally Sensitive Areas or Threatened Ecological Communities were identified.

Based on available information during the development of this PEIA, there appear to be no issues that require referral to the Environmental Protection Authority or to the Commonwealth under the *Environmental Protection and Biodiversity Conservation Act* 1999.



An area specific clearing permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* is not required as it is assumed Main Roads WA will work within the conditions of the “Purpose Permit” issued by the Department of Environment and Conservation (DEC).



1. Introduction

Main Roads Western Australia (Main Roads WA) have commissioned GHD Pty Ltd to complete a Preliminary Environmental Impact Assessment (PEIA) associated with the realignment of a 15 km section of the Goldfields Highway (H049) at Lake Raeside, between Menzies and Leonora (293.00 to 307.78 SLK).

The site location is indicated in Figure 1.

1.1 Scope of Report

This PEIA has been prepared to conform with the Main Roads WA project brief and:

- » describes the significant aspects of the existing environment;
- » details the primary environmental and social impacts of the proposed works; and
- » provides recommendations for:
 - environmental aspects that may require referral to the Environmental Protection Authority;
 - additional investigations that may be required to clarify the expected environmental impacts of the proposed works;
 - developing appropriate management measures during the development of the project design; and obtaining the necessary statutory approvals.

Based on the information provided by Main Roads, relevant stakeholders and database/literature reviews, the environmental and social aspects considered and discussed in this PEIA include:

- » rivers, water catchments and drainage;
- » vegetation – Declared Rare Flora and clearing of vegetation;
- » weed management;
- » fauna;
- » Aboriginal heritage;
- » European heritage;
- » land use; and
- » construction phase impacts.

The Main Roads WA study brief required the desktop investigation to assess a number of issues. However, some of these issues are not considered to be relevant to this study. Table 1 identifies these issues and provides reasons why they were not assessed.



Table 1 Environmental Issues Not Relevant to the Project

Issue	Reason for non - assessment
Reserves and conservation areas (such as Environmentally Sensitive Areas)	There are no reserves or conservation areas located within or adjacent to the study area, including the proposed borrow pits.
Public safety and risk	Public safety and risk will be managed in accordance with standard Main Roads WA specifications.
Noise and vibration	Noise and vibration are considered not to be an issue based on the lack of sensitive receptors in the project area. It is assumed that either a Construction Environmental Management Plan or Main Roads WA specifications will be developed to manage this issue in accordance with Main Roads WA policies.
Visual amenity	Visual impact is considered not to be relevant as the works consist of upgrading an existing infrastructure. It is assumed that borrow pits will be effectively rehabilitated by Main Roads WA.



2. Project Description and Justification

Main Roads WA have indicated that the section of the Goldfields Highway under scrutiny is subject to flooding. The purpose of the proposed roadworks is to minimise the impact of flooding on the highway by:

- » Redesigning and realigning the highway;
- » Upgrading drainage structures;
- » Upgrading waterways;
- » Providing a number of floodways; and
- » Constructing a bridge over a section of Lake Raeside.

Approximately 20 of borrow pits will be required to source basecourse material for road construction. These have been identified in Figure 2, Aerial Maps 1 to 6. The total area of these pits is approximately 382.22 ha and not all pits will require clearing as some areas are devoid of vegetation. It is unclear at this stage of the project of exactly how much vegetation will require clearing for the proposed works.



3. Environmental Aspects and Management

The following section identifies and discusses environmental issues that are considered to be relevant to the proposed roadworks, as well as providing background information deemed necessary to adequately describe the site. This section is comprised of the following desktop assessments:

- » Climate;
- » Geology;
- » Soils;
- » Hydrology;
- » Vegetation;
- » Declared Rare and Priority Flora Species;
- » Environmentally Sensitive Areas;
- » Fauna
- » Threatened Ecological Communities;
- » Dieback and Weed Management;
- » Clearing of Native Vegetation; and
- » Contaminated Sites;
- » Air Quality and Dust.

3.1 Climate

The closest meteorological station is located in Leonora. The recorded climatic data is summarised as follows:

Mean Annual Maximum Temperature Range	37.0 °C (January) & 18.4 °C (July)
Mean Annual Minimum Temperature Range	21.7 °C (January) & 6.1 °C (July)
Mean Annual Rainfall	233 mm
Mean Annual Raindays per year	43.2

(Bureau of Meteorology Climatic Averages of Australian Sites, 2006)

3.2 Geology

The project area is situated within the Yilgarn Block, which forms the nucleus of the Western Australian Shield. It is comprised predominately of gneisses and granites, with interfolded belts of metamorphic sedimentary and igneous rocks. The area is gently undulating, generally not very dissected, and consists of extensive sand plains on remnants of a Tertiary surface, with occasional hills and ranges of metamorphic rocks. Archaean granites with mafic extrusive and intrusive rocks underlie the majority of the project area (Martinick, 1996).

3.3 Soils

The soils of the project area have been mapped by Northcote et al (1967) and Thom and Barnes (1972), as part of an extensive regional study. The soils can be summarised as follows:

Table 2 Soil Summary of Project Area

Location	Thom and Barnes Soil Description	Northcote Soil Description
Southern approaches to Lake Raeside:	Alluvial and colluvial, dark brown/red clayey loams and sandy loams with an underlying kankar hardpan	Red/brown earthy loams overlying a red/brown hardpan
Northern approaches to Lake Raeside:	Alluvial and colluvial, pale red/brown silts and sands	Red siliceous sands
Southern Margins of Lake Raeside	Aeolian red/brown silty clays	Yellow calcareous sands
Samphire flats of Lake Raeside	Alluvial silts, sands and gravels	Calcareous and siliceous loams

(Martinick, 1996)

3.4 Hydrology

The regional drainage system is disorganised, consisting of a chain of lakes including Lake Raeside. During intense storm events, drainage occurs as sheetflow, especially in areas with hard setting soils such as the southern approaches of Lake Raeside (Martinick, 1996).

Lake Raeside forms part of a larger drainage system of lakes that are located in regionally extensive valley floors. This system includes Lakes Moore and Barlee, situated in the west and draining to the east and southeast. The drainage system is subject to extensive regional flooding during intense storm events, such as experienced during and after Cyclone Bobby in February 1995, and may reach the Nullarbor Plains (Martinick, 1996).

3.5 Vegetation

Martinick (1996) indicate that the project area is located within the Barlee sub-region, which is the southern portion of the Austin Botanical District of the Eremaean Botanical Province. The dominant vegetation consists of low mulga woodlands on the plains, *Acacia* shrub on the hills, shrubland on extensive sandplains and halophytic shrublands on low-lying saline areas such as Lake Raeside. Martinick (1996) also indicate that the condition of the vegetation is generally good, with no extensive areas without vegetation and few signs of vegetation death.

A biological survey carried out by GHD in October-November 2006 (GHD, 2007) confirmed that there are a total of three vegetation types within the proposed works area. These are presented in Table 3.

Table 3 Lake Raeside survey area Vegetation Types and Condition Rating

Type #	Project Area Vegetation Type	Description	Location	Vegetation Condition Rating
1	Mixed Acacia (mulga) Low Open Woodland, over Mixed shrubs and grasses.	Mixed Acacia (mulga) Low Open Woodland, over understorey dominated by <i>Eremophila forrestii</i> , with and grasses.	Scattered throughout, generally on higher ground.	1-2 (generally) although some patches 4
2	Mixed Chenopod / Samphire Low shrubland on flats	Bluebush, Saltbush, Halosarcia, and Frankenia species with scattered salt tolerant species. Grades down to bare salt lake basins	Scattered throughout on lower areas adjacent to salt lake basins and floodplain	1-2 (generally)
3	Completely degraded	Completely Degraded – no native vegetation.	Historical borrow pits	6
4	Mixed Melaleuca-Casuarina-Acacia Open shrubland on sandy rises	Mixed Melaleuca-Casuarina-Acacia Open shrubland on sandy rises with mixed <i>Eremophila</i> spp understorey.	Scattered – generally on “Lunettes” – small dunal areas with sandier soils	2-4 generally.
5	Salt lake expression	Salt Lake Basins – generally vegetation free	Salt Lake – Lake Raeside	-

Source: GHD, 2007.

A vegetation type is considered to be under-represented if there is less than 30 percent of its original distribution remaining (see below). Native vegetation types represented in the study area, their regional extent and reservation status are generally drawn from Shepherd *et al* (2002), based on Beard (1978) data. Those found in the project area are presented in Table 4.

Table 4 Remnant Vegetation Extents

Site Vegetation Type	Beard Equivalent Vegetation Association	Shepherd Vegetation Extent Data			
		Pre-European extent (ha)	Current remaining extent (%)	(%) in IUCN Class 1-4 Reserves	(%) in other Reserves
3	Succulent steppe; saltbush & samphire	64632.698	93.0%	0.0%	0.0%
1	Low woodland; mulga (with spinifex) on rises	280760.23	100.0	0.0%	0.0%
4	Thickets of <i>Acacia</i> and <i>Casuarina</i> on upland sand plain areas <i>Acacia</i> shrublands; thicket, <i>Acacia</i> - <i>Casuarina</i> alliance	495,445.22	43.7	11.6%	5.1%

(Shepherd *et al.*, 2002)

On the basis of the vegetation community extents described in Table 4 the Vegetation within the study area is considered to be of Least Concern - >50% of pre-European extent exists (GHD, 2007).

3.6 Declared Rare and Priority Flora Species

The biodiversity section of the DEC was consulted to determine the presence of any Declared Rare or Priority Flora Species that may exist within the project area. The results of the search are provided in Table 5 and descriptions of the conservation codes are provided in Table 6.

Table 5 Declared Rare and Priority Flora Species

Species	Conservation Code
<i>Baeckea</i> sp. <i>Melita</i> Stn.	P3
<i>Calytrix praecipua</i>	P3
<i>Eremophila annosocaula</i> ms	P1
<i>Hemigenia exilis</i>	P4
<i>Hybanthus floribundus</i> subsp. <i>chloroxanthus</i>	P3
<i>Micromyrtus serrulata</i>	P3
<i>Ptilotus tetrandrus</i>	P1



Species	Conservation Code
<i>Sauropus ramosissimus</i>	P3
<i>Triglochin protuberans</i>	P3

Table 6 Conservation Codes and Descriptions

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.
X: Declared Rare Flora - Presumed Extinct Taxa	Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.
1: 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.
2: 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.
3: Priority Three - Poorly Known Taxa	Taxa which are known from several populations, and the taxa are not 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.
4: 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.

GHD (2007) confirmed that no Declared Rare Flora (DRF) species were recorded from the project area.



3.7 Fauna

Martinick (1996) lists a number of species that may be found within the study area, as well as a list of rare or endangered species that utilise the mulga habitats of the arid interior. Based on the CALM 2005 *Declared Threatened Fauna Occurrence in CALM Regions*, it is perceived that this list is current.

The declared threatened fauna, based on Martinick's 1996 report, comprises of:

<i>Polytelis alexandrae</i>	Princess Parrot
<i>Neophema splendida</i>	Scarlet-chested Parrot
<i>Geopsittacus occidentalis</i>	Night Parrot
<i>Conopophila Whitei</i>	Grey Honey-eater
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo
<i>Dasycerus cristicauda</i>	Mulgara

The Commonwealth Environmental Protection Biodiversity and Conservation Act (1999) (EPBC Act) Protected Matters Search Tool was also accessed to determine potential threatened fauna within the study region. One species was identified:

<i>Acanthiza iredalei iredalei</i>	Slender-billed Thornbill (western)
------------------------------------	------------------------------------

It is unlikely that the proposed roadworks will impact fauna. The project area is situated within the Melita Pastoral Lease, which contains widespread examples of the project landscape units. Consequently, the habitats of the roadside reserve are widely represented in the surrounding landscapes and the habitat conservational value is considered relatively low, in both a local and regional context (Martinick, 2006).

Results of the GHD (2007) survey indicated a relatively low number of fauna species. It was considered that the conditions (warm and windy) and the relatively small survey area resulted in the paucity of records.

Overall a total of 19 bird species, no amphibian, 2 mammal and 2 reptile species were recorded from the (GHD, 2007) survey. This is considered to be a poor return for field observations, likely as a result of field conditions, and a limited survey area.

No significant fauna species were recorded from the survey area (GHD, 2007).

Recommendation 1

Main Roads WA should ensure that contractors are aware of potential fauna in the project area. It is recommended that fauna management strategies be incorporated into the Main Roads WA contract documentation to prevent impacts on fauna in the project area.



Recommendation 2

It is recommended that clearing be kept to a minimum in order to reduce the impact of habitat destruction on resident fauna. Windrows and felled trees should be retained for habitat.

3.8 Threatened Ecological Communities

The DEC was consulted to determine the presence of Threatened Ecological Communities (TEC) within the project area. The DEC indicated that there are no known occurrences of TEC recorded within the project boundary.

3.9 Environmentally Sensitive Areas

A search of the DEC's online database was conducted and indicated that no ESA's will be impacted by the proposed works.

3.10 Weeds and Declared Plants

The risk of spreading weeds by vehicles, machinery and clothing exists within the project area. Field surveys (Martinick, 1996) suggest that the condition of the vegetation within the study area is generally good, however it is recommended that this condition be reassessed. Martinick indicate in their report (1996) that 4 weed species were identified, notably on the southern approaches of Lake Raeside. These weeds include:

- » *Centaurea solstitialis*;
- » *Citrullus lanatus*;
- » *Salvia verbenaca*; and
- » *Rumex vesicarius*.

The weed species *Emex australis* (Double-gee) was not identified within the project area at the time of the field surveys, however due to its invasiveness and wide distribution within the region, should not be precluded.

GHD (2007) identified a total of 8 weed and introduced species were recorded during the field investigation, representing less than one third of the total number of plant species recorded from the survey area. Most species occurred in disturbed areas along the roadside, culverts and drainage lines. One Declared Plant species were recorded in the survey area: Saffron Thistle (*Carthamus lanatus*) (GHD, 2007). This was found to occur as a live specimen within vicinity of the rail crossing south of Leonora on the road formation and is classified as a Priority 1 species requiring special eradication under classes prescribed in the *Agriculture and Related Resources Protection Act, 1976*.

Recommendation 3

It is recommended that Main Roads WA incorporate weed management strategies within the Main Roads WA contract documentation to minimise the spread of weed species and declared plants during construction. It is advised that the Department of Agriculture Standard Control Codes be applied for the management of declared plants.

3.11 Dieback

Dieback is not expected to occur in the project region. 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. 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 Lake Raeside area is not vulnerable to the dieback fungus.

3.12 Clearing of Native Vegetation

The DEC uses existing information and studies as well as advice from other government agencies to determine the requirement for a clearing application under the *Environmental Protection Act 1986* (EP Act). The request for clearing is assessed against a set of principles contained in Schedule 5 of the EP Act. These principles have been outlined and addressed in Table 7.

Table 7 Assessment Against the Ten Clearing Principles

Clearing Principle	Yes/No	Comment
Does the area to be cleared comprise a high level of biological diversity?	No	The proposed area for the road works does not comprise a high level of biological diversity.
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	No significant fauna has been identified in the works area, hence the area to be cleared is not believed to be necessary to maintain fauna indigenous to Western Australia.
Does the area to be cleared include, or is necessary for the continued existence of, rare flora?	No	A desktop assessment has identified that the area to be cleared does not contain Declared Rare Flora and Environmentally Sensitive Areas.
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	No TEC's were identified within the proposed works area during desktop assessment.

Clearing Principle	Yes/No	Comment
Is the area to be cleared significant as a remnant of native vegetation in an area that has been extensively cleared?	No	The predominant vegetation formation consists of low mulga woodlands, <i>Acacia</i> shrub and halophytic shrub. The areas proposed for clearing are not considered to be remnant of the remaining vegetation complexes as the current remaining extent (according to Shepherd <i>et al.</i> , 2002) has greater than 94% (remaining). (See Table 4).
Does the area to be cleared within, or in association with, an environment associated with a watercourse or wetland?	No	Clearing is proposed for borrow pit locations in ephemeral drainage lines. The vegetation within these drainage lines is not wetland dependent vegetation. No clearing will occur within, or in association with, a wetland, including Lake Raeside.
Is the clearing of the vegetation likely to cause appreciable land degradation?	No	There will be no degradation due to the upgrading of existing road infrastructure and borrow pits will be rehabilitated.
Is the clearing of the vegetation likely to have an impact on the environmental values of any adjacent or nearby conservation area?	No	No conservation areas have been identified during the desktop assessment. Therefore it is unlikely environmental values will be compromised.
Is the clearing of the vegetation likely to cause deterioration in the quality of surface or underground water?	No	Main Roads WA will ensure that there is no deterioration in surface or groundwater quality.
Is the clearing of the vegetation likely to cause, or exacerbate, the incidence or intensity of flooding?	No	No watercourses or wetlands will be significantly impacted by the proposed road works. Therefore it is unlikely that flooding potential will be increased.

Recommendation 4

Main Roads WA should comply with the required conditions of the statewide vegetation "Purpose Permit" under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* as of 1 February 2006 by incorporating the principles into the Main Roads WA contract documentation.



3.13 Contaminated Sites

A search of the DEC's Contaminated Sites Database indicates that there are no contaminated sites within or adjacent to the project boundary. A detailed search for potentially contaminated sites was deemed unnecessary based on the existing and historical land usage. However, should any indication of contamination be identified on site, further investigation may be required to confirm or dismiss the presence of contaminated material.

Recommendation 5

It is recommended that Main Roads WA conduct a Preliminary Site Investigation should any suspect material be identified on site.

3.14 Air Quality and Dust

The proposed roadworks involve the realignment of the existing road, as well as construction of a 120 m bridge over Lake Raeside. Air emissions both during and after construction are considered to be minimal whereby traffic volumes are unlikely to change.

Airborne dust could be generated during the proposed roadworks. This dust may potentially impact users of the Goldfields Highway.

Recommendation 6

It is recommended that Main Roads WA incorporate standard dust control measures into the Main Roads WA contract documentation for the construction works.

4. Social Aspects and Management

The following section identifies and discusses social issues that are considered to be relevant to the proposed roadworks and is comprised of the following desktop assessments:

- » Non-Indigenous Australian Heritage (Section 4.1);
- » Indigenous Australian Heritage (Section 4.2);
- » Native Title (Section 4.3);
- » Land Use and Ownership (Section 4.4); and
- » Construction Phase Impacts (Section 4.5).

4.1 Non-Indigenous Australian Heritage

The Commonwealth's Australian Heritage Places Inventory and the Heritage Council of Western Australia Places Database were used to determine the presence of non-indigenous heritage sites near Lake Raeside. It is not perceived that the proposed roadworks will impact on any listed heritage.

4.2 Indigenous Australian Heritage

Several archaeological surveys (Deep Woods Surveys, 2004; Tamora Pty Ltd, 2004; Martinick, 1996) have been conducted within the project area to determine the presence of Aboriginal heritage sites.

Deep Woods Surveys (2004) identified the presence of two sites of concern, Lake Raeside A and Lake Raeside B, within an area designated for sourcing construction material. These are located in Figure 3. These two sites are both artefact scatters and are similar to other artefact scatters within the region, holding little archaeological or scientific significance (Deep Woods Surveys, 2004). The report concludes that it is unnecessary for Main Roads WA to seek approval from the Minister of Indigenous Affairs, under the *WA Aboriginal Heritage Act (1972-1980)*, provided that these two sites are not disturbed by the proposed roadworks.

The Department of Indigenous Affairs (DIA) Aboriginal Heritage Inquiry System was also accessed to identify Registered Aboriginal heritage sites within the project area. The details of the search are listed in Table 8 and the sites within close proximity to the highway are identified within Figure 3.



Table 8 List of Registered Sites within the Region

Site ID	Status	Access	Restriction	Site Name	Site Type	Coordinates	Site No.
15860	P	O	N	Central Well 01	Artefacts / Scatter	336657mE 6793928mN Zone 51 [Reliable]	
15861	P	O	N	Central Well 02	Artefacts / Scatter	336817mE 6793198mN Zone 51 [Reliable]	
2706	P	C	N	Gwalia Hill	Mythological	N/a	W00517
21517	P	O	N	Lake Raeside A	Artefacts / Scatter	341909mE 6791975mN Zone 51 [Reliable]	
21533	S	O	N	Lake Raeside Artefacts	Artefacts / Scatter	341461mE 6790377mN Zone 51 [Reliable]	
21534	S	O	N	Lake Raeside Artefacts	Artefacts / Scatter	341858mE 6791912mN Zone 51 [Reliable]	
21518	P	O	N	Lake Raeside B	Artefacts / Scatter	341660mE 679025mN Zone 51 [Reliable]	
21519	S	O	N	Lake Raeside Quartz Outcrop	Mythological	340235mE 6789124mN Zone 51 [Reliable]	
2708	P	C	M	Lake Reyside	Mythological	N/a	W00519
1737	P	C	MI	Mt Leonora	Mythological	N/a	W01425
20014	P	C	N	Win01 Creek	Mythological, Historical	N/a	

(Department of Indigenous Affairs, 2006)



Aboriginal Heritage sites, other than Lake Raeside A and Lake Raeside B, as listed in Table 8, are considered unlikely to pose a constraint to the project.

Subsequent investigation and reporting by R. & E. O'Connor in 2006, has revealed that Main Roads WA holds valid Ministerial consent, pursuant to s18 of the Aboriginal Heritage Act 1972 in respect to the proposed road works between SLK 293.32 and 307.78 which includes the proposed realignments and bridge construction. Consent was received on 13 April 2005 and included approval of 23 material pit (borrow pit) sites. The Ministerial consent does not include the southern 320 m extent of the proposed road works.

Recommendation 7

It is recommended that Main Roads WA comply with the recommendations listed in the archaeological surveys carried out for this project.

Recommendation 8

It is recommended that Main Roads seek advice upon the requirement of a s18 application under the *Aboriginal Heritage Act (1972)* for heritage sites likely to be impacted along the southern-most 320 m of the proposed road works. Additional consultation may also be required with the Aboriginal group(s) with an interest in the area.

4.3 Native Title

A search of the National Native Title Tribunal (2007) Determinants Register concluded that no Native Title Determination has been granted over the proposed project area, including the borrow pits.

Deep Woods Surveys (2004) consulted representatives from various Aboriginal Native Title Claim groups to identify and manage concerns associated with the proposed roadworks. All groups consulted showed concern for disturbance to Lake Raeside, which is considered to be a significant mythological site. The Deep Woods Surveys report (2004) concludes that the 4 material sites located on Kookynie Station and the one material site adjacent to Nambi Road are not considered to pose a restraint on the development. However the report recommends further consultation and dialogue with all groups to address concerns of those who are reluctant to agree to any development within the boundaries of Lake Raeside.

Numerous project related requests and recommendations were identified by Deep Woods Surveys (2004) during their consultations with the various native title groups. Main Roads WA should aim to comply where possible with these requests.

Recommendation 9

It is recommended that Main Roads WA comply with the recommendations of Deep Woods Surveys (2004) ethnographic survey reports.



Recommendation 10

It is recommended that Main Roads adhere to the conditions placed under the Section 18 Clearance of the *Aboriginal Heritage Act (1972)* for heritage sites likely to be impacted by the proposed works.

Recommendation 11

It is recommended that Main Roads WA comply, where possible, with the individual requests and recommendations of the Native Title groups consulted, as identified by Deep Woods Surveys (2004).

4.4 Land Use

4.4.1 Zonation

The Western Australian Planning Commission database was accessed to determine planning within the project area. The results indicated that there is no zonation within the project area.

4.4.2 Mining Tenements

The Department of Industry and Resources (DoIR) *Tengraph* database was accessed to determine mining tenements in the project area.

The search revealed that three mining tenements are located across the proposed works area.

The tenements are:

- » E 37/543 Great Gold Mines NL
- » E 37/790 Heron Resources Ltd
- » P 37/7018 St. Barbara Ltd
- » M 37/454 Triton Resources Ltd
- » M 37/849 Triton Resources Ltd

Recommendation 12

It is recommended that Main Roads WA consult the Department of Industry and Resources and the current licence holders prior to commencing works.



4.5 Construction Phase Impacts

Potential environmental and social impacts likely to require consideration during the construction phase of the project include:

- » Clearing;
- » Borrow pit rehabilitation;
- » Erosion;
- » Weed management;
- » Topsoil management;
- » Traffic safety and management;
- » Dust;
- » Fire management;
- » Fuel & chemical storage and contingencies; and
- » Waste disposal.

These issues will be managed through the implementation of a construction phase Environmental Management Plan (CEMP) and/or Main Roads WA standard contractual documentation.

Recommendation 13

It is recommended that standard Main Roads WA environmental management procedures be incorporated into the contractual construction documentation.



5. Consultation

In accordance with Main Roads WA project brief, consultations were undertaken with the following DEC representatives:

Wayne Astill – Environmental Section of the Department of Environment and Conservation (Kalgoorlie Regional Office)

The DEC expressed concern in relation to the following:

- » Modifying the drainage properties of the highway by increasing culvert size and/or increasing the size of levee banks could potentially create erosion downstream in the form of scouring. The DEC would like consideration to be made during the design phase of how the channelling of water can be minimised, eg. the use of energy dissipating strategies such as riprap. Disturbance to the natural creek system should also be minimised.
- » Borrow pit rehabilitation. Main Roads WA should ensure borrow pits are rehabilitated sufficiently.

Julie Patten – Biodiversity Section of the Department of Environment and Conservation (Kalgoorlie Regional Office)

The biodiversity section of the DEC provided limited feedback with respect to project-specific issues. However, it was requested that the standard environmental issues be managed appropriately, including but not limited to the following:

- » Flora;
- » TEC's
- » Dieback;
- » Drainage;
- » Weed management; and
- » Borrow pit placement and rehabilitation.



6. Environmental Approvals

6.1 Commonwealth Approvals

The proposed roadworks and borrow pits are within the vicinity of two Indigenous Heritage sites. At this stage, it is not perceived that these issues will be impacted on by the proposed works and referral of the project to the Commonwealth Minister of the Environment under the provisions of the *Environmental Protection and Biodiversity Conservation Act (1999)* is deemed unwarranted as no Matters of National Environmental Significance are likely to be impacted.

6.2 Government of Western Australia

The DEC is responsible for administering the *Environmental Protection Act (1986)*. This project consists of upgrading existing road infrastructure. Formal assessment by the DEC and EPA is considered unnecessary at this point whereby the environmental and social impacts, as reviewed within this PEIA, are considered minimal.

Referral under State legislation (s18, Aboriginal Heritage Act 1972) may be required should Main Roads WA deem it necessary to disturb the listed Indigenous Heritage sites that may occur on the southern 320m of highway.

6.3 Clearing Regulations

The DEC has issued Main Roads WA with a "Purpose Permit" under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. This permit supersedes the requirements to obtain individual clearing permits. Main Roads WA should comply with the conditions of the "Purpose Permit".



7. Recommendations

GHD has the following recommendations with respect to the proposed road works at Lake Raeside:

Recommendation 1

Main Roads WA should ensure that contractors are aware of potential fauna in the project area. It is recommended that fauna management strategies be incorporated into the Main Roads WA contract documentation to prevent impacts on fauna in the project area.

Recommendation 2

It is recommended that clearing be kept to a minimum in order to reduce the impact of habitat destruction on resident fauna. Windrows and felled trees should be retained for habitat.

Recommendation 3

It is recommended that Main Roads WA incorporate weed management strategies within the Main Roads WA contract documentation to minimise the spread of weed species and declared plants during construction. It is advised that the Department of Agriculture Standard Control Codes be applied for the management of declared plants.

Recommendation 4

Main Roads WA should comply with the required conditions of the statewide vegetation "Purpose Permit" under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* as of 1 February 2006 by incorporating the principles into the Main Roads WA contract documentation.

Recommendation 5

It is recommended that Main Roads WA conduct a Preliminary Site Investigation should any suspect material be identified on site.

Recommendation 6

It is recommended that Main Roads WA incorporate standard dust control measures into the Main Roads WA contract documentation for the construction works.

Recommendation 7

It is recommended that Main Roads WA comply with the recommendations listed in the archaeological surveys carried out for this project.

Recommendation 8

It is recommended that Main Roads seek advice upon the requirement of a s18 application under the *Aboriginal Heritage Act (1972)* for heritage sites likely to be impacted along the southern-most 320 m of the proposed road works. Additional consultation may also be required with the Aboriginal group(s) with an interest in the area.

**Recommendation 10**

It is recommended that Main Roads adhere to the conditions placed under the Section 18 Clearance of the *Aboriginal Heritage Act (1972)* for heritage sites likely to be impacted by the proposed works.

Recommendation 11

It is recommended that Main Roads WA comply, where possible, with the individual requests and recommendations of the Native Title groups consulted, as identified by Deep Woods Surveys (2004).

Recommendation 12

It is recommended that Main Roads WA consult the Department of Industry and Resources and the current licence holders prior to commencing works.

Recommendation 13

It is recommended that standard Main Roads WA environmental management procedures be incorporated into the contractual construction documentation.



8. References

Astill, pers. comm. (2006), Department of Water Kalgoorlie Regional Office, Viskovich House, 377 Hannan Street Kalgoorlie 6430.

Australian Heritage Council (2006), *Australian Heritage Database*.
<http://www.ahc.gov.au/>

Bureau of Meteorology (BOM) (2006), *Climatic Averages for Australian Sites*,
http://www.bom.gov.au/climate/averages/tables/cw_012046.shtml

Deep Woods Surveys Pty Ltd (2004), *Report on the Aboriginal Heritage Survey of the Lake Raeside Goldfields Highway (H049) 293.1 SLK to 304.2 SLK and Associated Material Sites, South of Leonora, Western Australia*.

Deep Woods Surveys Pty Ltd (2004), *Report on the Ethnographic Survey of the Lake Raeside Goldfields Highway (H049) 293.1 SLK to 304.2 SLK and Associated Material Sites, South of Leonora, Western Australia*.

Department of Environment and Conservation (DEC) (2006), Request for Rare Flora Information, Reference Number: 2006-003551.

Department of the Environment and Water Resources (2006), *Environmental Protection and Biodiversity Conservation Act Protected Matters Search Tool*,
<http://www.environment.gov.au/erin/ert/epbc/index.html>

Department of Indigenous Affairs (2006), *Aboriginal Heritage Inquiry System*,
<http://www.dia.wa.gov.au/Heritage/Inquiry/>

Department of Industry and Resources (2006), *Tenagraph Database*,
<http://www.doir.wa.gov.au/aboutus/FC0D43DC45B946FFAFA544EF610B0D27.asp>

Environmental Protection Authority (1974), *Conservation Reserves in Western Australia: Report of the Conservation through Reserves to the Environmental Protection Authority 1974*, Environmental Protection Authority, Perth, Western Australia.

GHD (2007). Bullabulling, Jeedamya and Lake Raeside Upgrades Biological Survey, Unpublished Draft Report for Main Roads West Australia, January 2007.

Heritage Council of Western Australia (2006), *Places Database*,
<http://register.heritage.wa.gov.au/>

National Native Title Tribunal (2007). Native Title Determinants Register
Date accessed: 8 February 2007.
http://www.nntt.gov.au/publications/data/files/Determinations_A4.pdf

Northcote, K. H, Bettenay, E, Churchward, H.M and McArthur, W.M (1967). Atlas of Australian Soils. Explanatory Data for Sheet 5; Perth-Albany-Esperance Area. Published in association with the Commonwealth Scientific and Industrial Research Organisation, Australia and the Melbourne University Press.



R. & E. O'Connor Pty. Ltd., (2006). Unpublished Report on a Preliminary Ethnographic Assessment of Proposed Work Areas on Goldfields Highway. December 2006.

Shepherd, D.P, Beeston, G.R. and Hopkins, A.J.M. (2002), *Native vegetation in Western Australia: Extent, type and status – Resource Management Technical Report 249*. Department of Agriculture, Western Australia.

Tamora Pty Ltd (2004), *Aboriginal Ethnographic Heritage Survey of Lake Raeside Goldfields Highway Gravel Pits 290 SLK to 307 SLK and Associated Material Sites*.

Western Australian Planning Commission (2006), *Local Planning Strategies*, <http://www.wapc.wa.gov.au/Region+schemes/Local+planning+schemes/533.aspx>

W G Martinick & Associates Pty Ltd (1996), *Environmental Assessment and Management Study: Kalgoorlie to Meekatharra Road Lake Raeside – 217.5 SLK to 228.6 SLK*.

Thom, R. and Barnes, R.G. (1972). *1:250,000 Geological Series, Leonora, Western Australia, Sheet SH 51/1*. Geological Survey of Western Australia.





Appendix A

Figures

Figure 1 Locality

Figure 2 Aerial Maps

Aerial Map 1

Aerial Map 2

Aerial Map 3

Aerial Map 4

Aerial Map 5

Aerial Map 6

Figure 3 Constraints – Aboriginal Heritage



Appendix B

Searches



GHD Pty Ltd ABN 39 008 488 373

GHD House, 239 Adelaide Tce. Perth, WA 6004

P.O. Box Y3106, Perth WA 6832

T: 61 8 6222 8222 F: 61 8 6222 8555 E: permail@ghd.com.au

© **GHD Pty Ltd 2007**

This document is and shall remain the property of GHD Pty Ltd. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	J. Cummings	A.Nagle K.Burke		R.Duckworth		
1	A Nagle	M Goldstone		M Goldstone		