REVEGETATION MANAGEMENT PLAN

STAGE 1 GOLDFIELDS HIGHWAY (H049) LAKE RAESIDE
Bridge Reconstruction and Road Realignment
293.00 – 300.90 SLK

JULY 2007

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STAGE 1 GOLDFIELDS HIGHWAY (H049) LAKE RAESIDE PROJECT

Revegetation Management Plan

1. PROJECT DESCRIPTION

1.1 Purpose

Main Roads Western Australia (Main Roads) has a policy aim to avoid, minimise and mitigate (in that order of preference) its environmental impacts. In the process of establishing and maintaining the road network there is often an unavoidable need to undertake the clearing of native vegetation. Main Roads seeks to revegetate all areas cleared for temporary purposes (e.g. material sources, access tracks and side tracks). This document has been prepared to ensure compliance with Main Roads' Environmental Policy and Main Roads' state-wide Purpose Clearing Permit CPS 818/3 (CPS 818/3).

This revegetation plan sets out the revegetation requirements for Stage 1 of the Goldfields Highway (H049) Lake Raeside Project: Bridge Reconstruction and Road Realignment (293.00 – 300.90 SLK). The purpose of the Revegetation Management Plan (RMP) is to identify effective practices that help accelerate a natural regeneration processes.

1.2 Background

Goldfields Highway (H049) is a major inland link between Kambalda and Meekatharra and is the main route of access between the towns of Menzies and Leonora. The section of Goldfields Highway around Lake Raeside is subject to flooding during the cyclone season and can cause significant disruptions to traffic flow between north and south.

In February of 1995 Cyclone Bobby hit the north-western coast of Western Australia. The subsequent rainfall event which occurred in the central Goldfields region created large scale flooding and prevented the movement of traffic between Menzies and Leonora for several months.

Main Roads Goldfields Esperance region is therefore proposing to upgrade the Lake Raeside section of the Goldfields Highway to ensure that interruptions to traffic flow due to flooding are avoided or at least minimised.

1.3 Project Description

The Lake Raeside project area is located between the two towns of Menzies and Leonora on the Goldfields Highway as shown in Attachment 1. The proposed works start approximately 16 km south of Leonora and end approximately 8 km south of Leonora, covering a total length of approximately 7.9 km from 293.00 SLK to 300.90 SLK. The works proposed include the following;

- demolition of the existing 3 span box culvert bridge and construction of new 12 span box culvert bridge (120 m long) at Lake Raeside,
- realignment of 3.05 km of highway curves,
- widening and resurfacing and
- improved drainage structures to accommodate a 1 in 50 year rain event.

2. EXISTING ENVIRONMENT

2.1 Existing 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 Providence. The dominant vegetation consist of low mulga 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 is a total of three vegetation types within the project area (Table 1).

TABLE 1 Vegetation Types in the Lake Raeside project Area

Vegetation Type	Description	Location	Condition Rating
Mixed Acacia (Mulga) Low Open Woodland over Mixed shrubs and grasses.	Mixed Acacia (Mulga) Low Open Woodland, over understorey dominated by *Eremophilia forrestii* and grasses	Scattered throughout, generally on higher ground	1-2 (generally) although some patches of 4
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)
Completely Degraded	Completely Degraded – no native vegetation.	Historical borrow pits	6
Mixed Melaleuca Casuarina Acacia Open shrubland on sandy rises	Mixed Melaleuca Casuarina Acacia Open shrubland on sandy rises with mixed Eremophilia spp understorey	Scattered generally on “Lunettes” small dunal areas with sandier soils	2-4 (generally)
Salt lake expression	Salt lake basins generally vegetation free	Salk lake – Lake Raeside	-

SOURCE: GHD (2007)

See Attachment 2 for a complete list of introduced and native flora species identified in the project area.

2.2 Threatened Species and Communities

Martinick (1996) and GHD (2007) did not identify any threatened flora, fauna or ecological communities within the project area.

2.3 Weeds

The biological survey carried out by GHD in 2007 (GHD, 2007) identified one declared weed species in the project area;

- Saffron Thistle (*Carthamus lanatus*)

The following weed species are also known to occur in the project area:

- Pie Melon (*Citrullus lanatus*)
- Buffell Grass (*Cenchrus cilliaris*)
- St Barnaby’s Thistle (*Centaurea solstitialis*)
- Wild Sage (*Salvia verbenaca*)
- Ruby Dock (*Rumex vesicaria*)

3. CLEARING AND REVEGETATION

3.1 Permanent Clearing

The project will require permanent clearing for the construction of the new bridge and realigned curves of the highway. These areas will not be revegetated.

3.2 Temporary Clearing and Revegetation

In accordance with the conditions of CPS 818/3 the project will require temporary clearing and subsequent revegetation of the following areas; material sources, access tracks and side tracks.

There is a degree of ambiguity regarding the exact area and location of temporary clearing and revegetation required for the material sources, access tracks and side track due to the nature of Main Roads delivering the project through a construction contract. While Main Roads nominates potential material sources in the contract, only some or none of them may be used by the contractor.

In addition to the potential material sources nominated by Main Roads, the contractor may nominate alternative material sources and provided that the requirements of CPS 818-3 are met, may be cleared under CPS 818-3.

The location and area of vegetation to be cleared for the access tracks and side tracks will be nominated by the contractor however it will be revegetated according to the conditions of CPS 818/3 and this RMP.

Records and documentation will be maintained regarding the location and areas of clearing undertaken throughout the project. All temporarily cleared areas will be revegetated in accordance with the conditions of CPS 818/3 and this RMP.

3.3 Additional Areas to be Revegetated

In compliance with the Main Roads Corporate Environmental Policy Main Roads will remove and revegetate the existing highway that will become redundant after the construction of the new highway alignment.

4. REVEGETATION MANAGEMENT PLAN

4.1 Revegetation Objectives

The revegetation will be similar in structure and content to comparable naturally occurring vegetation in the local area and will reflect the vegetation communities present in the road reserve and adjacent areas.

The revegetation objectives are to:

- Ensure roadside stability and minimise ongoing maintenance;
- Ensure that conservation values and biodiversity are protected; and
- Ensure local amenity and aesthetics are enhanced.

4.2 Site Preparation

Weed control will be carried out prior to the removal of vegetation and topsoil where unwanted weeds foliage cover represents >25% of the total foliage cover or as required otherwise.

The removal and respread of cleared vegetation and topsoil shall be undertaken in accordance with Table 2.

Table 2 Removal and Respread of Cleared Vegetation and Topsoil

Source of Cleared Vegetation and Topsoil	Nominated Area for Respread
Material sources and access tracks	*In Situ*
Side track	*In Situ*
New road alignment	Old road alignment to be demolished after construction of new alignment

4.3 Revegetation Techniques

The following rehabilitation works shall be undertaken on areas of disturbed earth requiring rehabilitation:

- Stockpiled topsoil will be uniformly respread over the area.
- For material pits only, it may be necessary to form small swales from the topsoil to reduce erosion velocities and encourage the deposition of seeds depending on the slope of drainage lines within the pit.
- Where required, the area will be ripped to a minimum depth of 200mm deep with rip lines approximately 300mm apart. Where slopes are present, rip lines shall be along contours.
- Stockpiled vegetation will then be uniformly respread, fractured and incorporated into the respread topsoil by running machinery over the area. This will promote seed deposition and further reduce erosion velocities.

4.4 Vegetation Clearing and Re-use

All vegetation will be cleared from the areas specified in Section 3 and non-weed infested vegetation will be stockpiled. Stockpiled vegetation will not be placed on the very edge of the approved cleared area in order to prevent machinery going outside the cleared area to push the stockpile forward again. Stockpiled topsoil and vegetation shall not be placed where

it may interfere with the construction of the new road. Weed infested vegetation will be disposed of at an appropriate site. Burning of the cleared vegetation will not be permitted.

4.5 Topsoil Stripping and Re-use

Topsoil will be stripped and stockpiled in weed free areas as close as possible to the area to be rehabilitated. The topsoil will be placed in windrows of less than 1 m in height and reinstated as soon as possible, to prevent deterioration to the in-situ seeds and maintain seed viability. Topsoil stockpiles shall be placed sufficiently enough away from stockpiled vegetation to allow machinery to manoeuvre behind the topsoil stockpiles to push the stockpile forward again.

4.6 Weed Control

Adequate control measures shall be incorporated into the project construction contract to ensure weeds are adequately managed. Weed control shall be undertaken to ensure that total weed foliage cover remains <25% of the total foliage cover or as required. Weed control shall be undertaken prior to the removal of vegetation and topsoil and after the respreading of vegetation and topsoil as required during the maintenance and monitoring period.

Control measures may include;

- treatment of weeds such as using herbicide spraying,
- the burial of weed infested vegetation or topsoil or
- ensuring all machinery is free of built up soil and vegetative material before entering and leaving the site.

Herbicide spraying shall only be carried out by licensed operators and herbicide shall be mixed and applied in accordance with manufacturer's instructions.

Exposed areas such as bare batters and borrow pits shall be promptly rehabilitated to reduce the ingress of weeds.

5. VEGETATION ESTABLISHMENT PERIOD

The vegetation establishment period will be for at least twelve months following the completion of the works. During this period, the maintenance and monitoring will be undertaken.

6. ONGOING MAINTENANCE AND MONITORING

Maintenance and monitoring of the project shall be ongoing to measure regeneration effectiveness and to control weeds. After revegetation works, revegetated areas will be inspected every 6 months for a total of 12 months to monitor and control weeds and to measure the effectiveness of revegetation works.

Monitoring will comprise the use of criteria. Essentially, this will involve a visual assessment to ensure the revegetation works have been implemented as planned. Attachment 4 shall be used as the monitoring guide to assess the success or otherwise of the revegetation plan.

Due to the variable rainfall patterns in pastoral areas, revegetation works may take extended periods of time to meet the targets set in Attachment 3, despite the use of best management practices and in some cases may not be achieved at all.

7. REFERENCES

GHD (2007), Report for Goldfields Highway Lake Raeside Upgrade (H049_ 293.00 – 307.78 SLK Biological Survey. Unpublished Report prepared for Main Roads Western Australia. March 2007.

W.G. Martinick & Associates Pty Ltd (1996), Environmental Assessment and Management Study: Kalgoorlie to Meekatharra Road Lake Raeside 217.5 – 228.6 SLK. Unpublished Report prepared for Main Roads Western Australia. May 1996.

Attachment 1

Project Location


Goldfields Highway (H049) Lake Raeside Project
LEONORA
KOOKYNIE
MENZIES
LAVERTON LEONORA
Lake Raeside
Lake Ballard
Lake Marmion
Lake Goongarrie
GOONGARRIE NATIONAL PARK
Mindanda
Yunndaga
Desdemona
Melita
Glenorn
Braemore
Cardonia
Merlondale
Tarmoola
Clover Downs
Minara
Kowtah
Nambi
Mt Gilfillan
Mt Newman
Sturt Meadows
Jeedamya
Morapoi
Niagara Dam
Yerilla
Mt Remarkable
Mt Remark
Meekleyarri
Menangina
Donkey Rocks
Pianto
Goongarrie
TARMOOLA
MERTONDALE
MINARA
MELITA
GLENORN
YUNDAMINDRA
MORAPOI
YERILLA
JEEDAMYA
MENDLEYARRI
MENANGINA
ADELONG
STURT MEADOWS
MT MARMION
0 12.5 25 50 Kilometers
Lake Raeside Project
Potential Material Sources

Attachment 2

Botanical Survey Species List
SOURCE: GHD (2007)

Family	Genus	Species	Common Name	Status
Adiantaceae	*Cheilanthes*	*lasiophylla*	Woolly Cloak Fern	
Aizoaceae	*Gunniopsis*	*quadrifida*	Sturt's Pigface	
Amaranthaceae	*Alternanthera*	*nodiflora*	Common Joyweed	RE
Amaranthaceae	*Ptilotus*	*?divaricatus*	Climbing Mulla-mulla	
Amaranthaceae	*Ptilotus*	*?polakii*		
Amaranthaceae	*Ptilotus*	*exaltatus*		
Amaranthaceae	*Ptilotus*	*obovatus*		
Asclepiadaceae	*Marsdenia*	*australis*	Cogia	
Asteraceae	*?Brachyscome*	*ciliaris*		
Asteraceae	*Carthamus*	*lanatus*	Saffron Thistle	*DP (P1, P3, P4)
Asteraceae	*Centaurea*	*melitensis*	Maltese Cockspur	*
Asteraceae	*Cotula*	*coronopifolia*	Waterbuttons	*
Asteraceae	*Crafystylis*	*subspinescens*		
Asteraceae	*Pterocaulon*	*spicelatum*	Apple Bush	RE
Asteraceae	*Senecio*	*?pinnatifolius*		
Asteraceae	*Sonchus*	*oleraceus*	Sowthistle	*
Caesalpiniaceae	*Senna*	*artemisioides*		
Caesalpiniaceae	*Senna*	*artemisioides* subsp. *helmsii*		
Caesalpiniaceae	*Senna*	*chatelainiana*		
Chenopodiaceae	*?Threlkeldia*	*diffusa*	Coast Bonefruit	
Chenopodiaceae	*Atriplex*	*?cephalantha*	Old Man Saltbush	
Chenopodiaceae	*Atriplex*	*codonocarpa*	Dwarf Saltbush	
Chenopodiaceae	*Atriplex*	*vesicaria*	Bladder Saltbush	
Chenopodiaceae	*Chenopodium*	*gaudichaudianum*	Cottony Saltbush	
Chenopodiaceae	*Enchylaena*	*tomentosa*	Ruby Saltbush	
Chenopodiaceae	*Halosarcia*	*halocnemoides*	Shrubby Samphire	
Chenopodiaceae	*Halosarcia*	*indica* subsp. *bidens*	Samphire	
Chenopodiaceae	*Halosarcia*	*indica* subsp. *lovistachya*	Samphire	
Chenopodiaceae	*Halosarcia*	*pergranulata*	Samphire	
Chenopodiaceae	*Maireana*	*?brevifolia*	Small Leaf Bluebush	
Chenopodiaceae	*Maireana*	*carnosa*	Cottony Saltbush	
Chenopodiaceae	*Maireana*	*glomerifolia*	Ball-leaf Bluebush	

Family	Genus	Species	Common Name	Status
Chenopodiaceae	*Maireana*	*sedifolia*	Pearl Bluebush	
Chenopodiaceae	*Sclerolaena*	*cornishiana*	Cartwheel Burr	
Chenopodiaceae	*Sclerolaena*	*cuneata*	Yellow birdii	
Chenopodiaceae	*Sclerolaena*	*diacantha*	Grey Copperburr	
Chenopodiaceae	*Sclerostegia*	*disarticulata*		
Cucurbitaceae	*Cucumis*	*melo*		
Frankeniaceae	*Frankenia*	*?pauciflora*	Seaheath	
Goodeniaceae	*Goodenia*	sp.		
Goodeniaceae	*Scaevola*	*spinescens*		
Lamiaceae	*Prostanthera*	*grylloana*		
Lamiaceae	*Salvia*	*verbenaca*	Wild Sage	*
Malvaceae	*Gossypium*	*sturtianum*	Sturt's Desert Rose	?*
Malvaceae	*Sida*	*calyxhymenia*	Tall Sida	
Marsileaceae	*Marsilea*	sp.	Nardoo	
Mimosaceae	*Acacia*	*aneura*	Mulga	
Mimosaceae	*Acacia*	*aneura* var. *major*	Mulga	
Mimosaceae	*Acacia*	*ramulosa* var. *linophylla*	Horse Mulga	
Mimosaceae	*Acacia*	*ramulosa* var. *ramulosa*	Horse Mulga	
Myoporaceae	*Eremophila*	*forrestii*	Wilcox Bush	
Myoporaceae	*Eremophila*	*forrestii complex*	Wilcox Bush	
Myoporaceae	*Eremophila*	*glabra*	Tar Bush	
Myoporaceae	*Eremophila*	*margarethae*	Sandbank Poverty Bush	
Myoporaceae	*Eremophila*	*metallicorum*		
Myoporaceae	*Eremophila*	*miniata*	Kopi Poverty Bush	
Myoporaceae	*Eremophila*	*scoparia*	Broombush	
Myrtaceae	*Melaleuca*	*?pauperiflora*	Boree	
Myrtaceae	*Melaleuca*	*uncinata s.l.*	Broombush	
Nyctaginaceae	*Boerhavia*	sp. (not flowering)	Tar Vine	
Papilionaceae	*Indigofera*	sp.		
Papilionaceae	*Swainsona*	*pterostylis*		
Pittosporaceae	*Pittosporum*	*angustifolium*	Native Apricot	
Poaceae	*?Chloris*	*truncata*	Windmill grass	
Poaceae	*Austrostipa*	*elegantissima*	Showy Feathergrass	
Poaceae	*Austrostipa*	*nitida*		

Family	Genus	Species	Common Name	Status
Poaceae	*Cenchrus*	*ciliaris*	Buffel Grass	*
Poaceae	*Enneapogon*	*avenaceus*	Bottle Washers	
Poaceae	*Eragrostis*	*curvula*	African Lovegrass	*
Poaceae	*Eragrostis*	*dielsii*	Mallee Lovegrass	
Poaceae	*Eragrostis*	*eriopoda*	Wire Wanderrie Grass	
Poaceae	*Lachnagrostis*	*filiformis*	Blown Grass	
Poaceae	*Paspalidium*	*reflexum*		
Portulacaceae	*Calandrinia*	*pleiopetala*	Parakeelya	
Portulacaceae	*Calandrinia*	sp.	Parakeelya	
Proteaceae	*Hakea*	*lorea*	Corkybark	
Proteaceae	*Hakea*	*preissii*	Needlebush	
Santalaceae	*Exocarpos*	*aphyllus*	Leafless Ballart	
Santalaceae	*Santalum*	*lanceolatum*	Northern Sandalwood	
Santalaceae	*Santalum*	*spicatum*	Sandalwood	
Solanaceae	*Solanum*	*lasiophyllum*	Flannel Bush	
Solanaceae	*Solanum*	*orbiculatum*	Wild Tomato	

Where * = weed species, + = introduced, RE = Range Extension, DP = Declared Plant (plus categories)

Attachment 3

Revegetation Monitoring Guide

Revegetation Monitoring Guide

Criterion	Target	After three months	After one year	After three years
Mean vegetation foliage cover (%) excluding weeds.	>50	>1	>10	>20
Mean weed foliage cover (%).	<25	<25	<25	<25
Amount of bare soil areas >4m^2 (%).	<50	<100	<100	<100