REVEGETATION PLAN

Great Northern Highway (H006), Fitzroy Crossing
Fitzroy Bridge (B1311)
Emergency reinstatement works to abutment 2 left-hand side guidebank

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CONTENTS

1. PROJECT DESCRIPTION 3

1.1 PURPOSE 3
1.2 BACKGROUND 3
1.3 PREVIOUS ASSESSMENT WORK 3
1.4 PROJECT DESCRIPTION 4
1.5 EXISTING VEGETATION 6
1.6 WEEDS 6

2. SITE PREPARATION 6

2.1 VEGETATION CLEARING, MULCHING AND RE-USE 6
2.2 TOPSOIL STRIPPING AND RE-USE 6

3. WEED CONTROL 6

4. REVEGETATION THROUGH REGENERATION 7

4.1 REVEGETATION OBJECTIVES 7
4.2 REQUIRED VEGETATION COVER 7
4.3 REVEGETATION TECHNIQUES 7
4.4 TIMING AND STAGING OF REVEGETATION WORKS 8

5. VEGETATION ESTABLISHMENT PERIOD 8

6. ONGOING MAINTENANCE AND MONITORING 8

6.1 MAINTENANCE AND MONITORING 8

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REVEGETATION PLAN

1. PROJECT DESCRIPTION

1.1 Purpose

Main Roads Western Australia (MRWA) has a policy aim to "protect and enhance the environmental values of road reserves". This document has been prepared to ensure compliance with Main Roads' Environmental Policy and Main Roads' statewide Purpose Permit CPS 818/6.

In the process of establishing new roads and upgrading existing roads, there is often a need to undertake revegetation of the road reserve or other affected areas. Where clearing of native vegetation is to occur under Main Roads' statewide Purpose Permit CPS 818/6, a revegetation plan is required for temporary clearing (eg. borrow pits, access tracks, camps etc.). Where the temporary clearing exceeds 0.5ha, the revegetation plan needs to be forwarded to the Department of Environment and Conservation prior to clearing.

This revegetation plan sets out the rehabilitation requirements for clearing of native vegetation associated with the emergency reinstatement of the Fitzroy River Bridge guidebank, Fitzroy Crossing townsite.

The purpose of the revegetation plan is to identify effective revegetation practices that help accelerate the natural succession processes that occur following the clearing of native vegetation and soil disturbance.

1.2 Background

Main Roads Kimberley region are required to undertake emergency reinstatement works to abutment 2 left-hand side guidebank of the Fitzroy Bridge (B1311) located in Fitzroy Crossing townsite.

Significant erosion and scour has occurred to the Fitzroy Bridge guidebank and adjacent river bank from recent rain events. If reinstatement works do not occur as soon as possible, there is a high risk the bridge could collapse and / or further erosion could occur along the river bank, primarily toward the Fitzroy Lodge. Reinstatement works are expected to commence early September 2011 and continue for a 10 week period.

Figures 1 and 2 provide a broad locality and close-up image of the project area respectively.

1.3 Previous Assessment Work

Main Roads Western Australia (July 2011) Preliminary Environmental Impact Assessment, Fitzroy Bridge Emergency Guidebank Reinstatement Works.

1.4 Project Description

The project involves transporting and depositing gravel and rock material to a hardstand and turn-around area near the guidebank. Gravel material will be used to fill the guidebank area to its previous shape, geofabric will be placed over the fill material to minimise scour. Rock material will be placed over the geofabric to create a solid guidebank structure. Rock protection will be placed around the guidebank and along the river bank toward the Fitzroy Lodge with the aim of minimising future erosion and scour.

Clearing of native vegetation is the main environmental impact of the project with 1 ha approximately to be cleared adjacent to the Fitzroy Bridge. This clearing will provide a laydown and turn-around area where machinery can access the guidebank to be reinstated. Clearing is proposed to be undertaken using Main Roads' clearing permit CPS 818/6. Clearing activities are deemed to not be at variance with any of the 10 clearing principles.

The following areas to be rehabilitated are shown in Table 1:

Table 1: Revegetation Area Details

Type	**Area**
Temporary clearing revegetation	1 hectare
Other revegetation	Nil

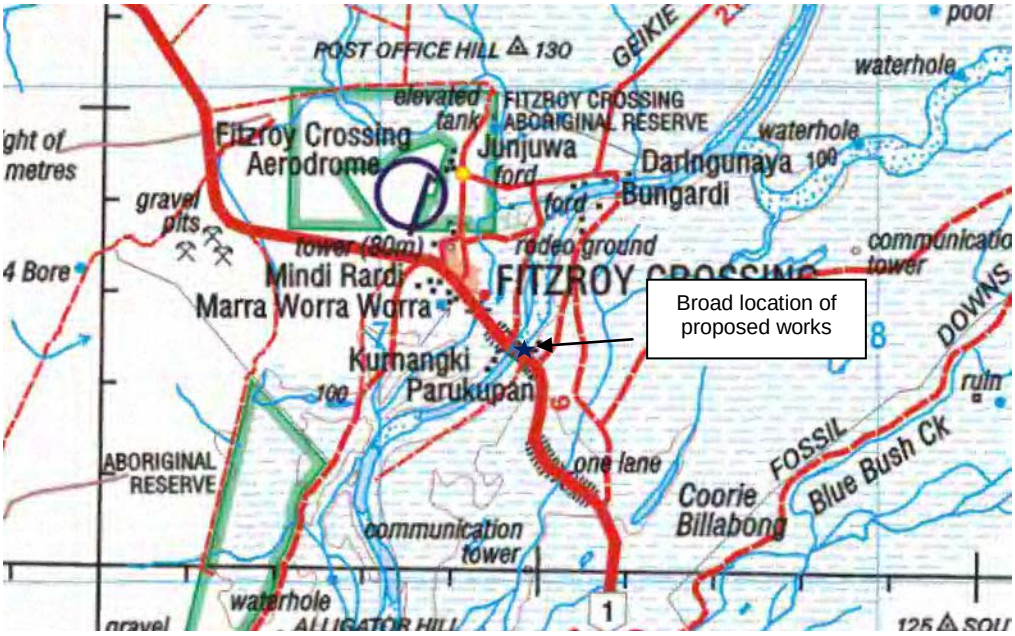

Figure 1…Broad locality image of the project area.

Figure 2…Close-up image of project area and location of clearing activities.

1.5 Existing vegetation

Vegetation type, extent and conservation status (after Shepherd *et al*., 2002) for the Gibb River Road upgrade works:

Vegetation Association Number	Association Description	% Remaining
61	Grasslands, tall bunch grass savannah woodland, coolabah over ribbon grass (*Crysopogon spp*.).	99.9

1.6 Weeds

Weeds of National Significance (WONS), Declared Plants and Regionally significant weed species that *may* occur in the project area are as follows:
Parkinsonia – *Parkinsonia aculeata*
Noogoora Burr – *Xanthium strumaruim*
Calotrope – *Calotropis procera*

2. SITE PREPARATION

2.1 Vegetation clearing, mulching and re-use

All vegetation will be cleared from the works area 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. Weed infested vegetation will be disposed of at an appropriate site. Burning of the cleared vegetation will not be permitted.

2.2 Topsoil stripping and re-use

Topsoil will be stripped to a maximum depth of 100 mm. Topsoil will be stored in a weed free (as far as possible) area, as close as possible to the area to be rehabilitated. The topsoil will be placed in windrows of less than 1.5m in height and reinstated as soon as possible, to prevent deterioration to the in-situ seeds and maintain seed viability.

3. WEED CONTROL

Weeds can out-compete the local native species and reduce the habitat value. The following management procedures will be implemented to minimise the potential for spread of Declared Plants and environmental weeds:

- Adequate control measures will be incorporated to ensure weeds are killed or not transported to other areas. Control measures include removal of weeds to an approved dump site or treatment of weeds such as using herbicide spraying;
- Herbicide spraying shall only be carried out by licensed operators and herbicide shall be mixed and applied in accordance with manufacturer's instructions;

- Any observed Declared Plant infestations shall be treated prior to clearing if an effective control is available;
- Where practicable, weeds should not be removed when they are in flower or seeding;
- Minimum clearing footprints will be utilised where practicable to avoid creating conditions suitable for weed proliferation;
- Measures to prevent plants, seeds and topsoil being moved to non-infested areas will be implemented;
- All machinery shall be free of built up soil and vegetative material before entering and leaving the site to help minimise the transportation of weeds and their seeds;
- No weed-infested soil material or road-building material shall be imported into the area as fill;
- Exploration of soils should be avoided in those areas affected by infestation;
- Exposed areas such as bare batters and borrow pits shall be promptly rehabilitated to reduce the ingress of weeds;
- Where works are adjacent to good quality vegetation, weeds within the project area will be removed or killed once a year for up to three years.

4. REVEGETATION THROUGH REGENERATION

4.1 Revegetation objectives

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 Required vegetation cover

The roadside vegetation should 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 bushland. The width of the vegetation setbacks and clearances will be appropriate for the specific location and will be dependent on an assessment of the road design speed, road alignment and the roadside batter slopes.

4.3 Revegetation Techniques

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

- Topsoil will be uniformly respread to a minimum depth of 100mm over the area; and
- Area to 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.

The following rehabilitation work shall be undertaken at borrow/gravel pits:

- Overburden and then topsoil shall be uniformly and evenly spread over the disturbed areas of the pit. Depending on the slope of drainage lines within the pit, it may be necessary to form small swales from the topsoil to reduce erosion velocities and encourage the deposition of seeds.
- The existing pit floor shall be ripped to a depth of 300 – 500mm deep with rip lines between 500 - 800mm apart, if the material in the floor of the pit is able to be ripped. The whole area of the pit, including drainage lines, shall be ripped.
- All stockpiled vegetation shall be spread along the contour and pit floor to help promote seed deposition and further reduce erosion velocities.

4.4 Timing and Staging of Revegetation Works

Since project works were deemed emergency works, clearing activities have already been undertaken. Topsoil and vegetative material was respread over disturbed areas. The project area will be monitored over most of the wet season, primarily to investigate any further scour in the area, but in addition to observe the regeneration success of native seed and potential weed spread. All weeds will be either manually removed and disposed of in a quarantined area or sprayed with herbicide.

5. VEGETATION ESTABLISHMENT PERIOD

The vegetation establishment period will be for at least two years following the completion of the works. During this period, the maintenance and monitoring will be undertaken, see Section 6.

6. ONGOING MAINTENANCE AND MONITORING

Maintenance and monitoring of the project shall be ongoing to measure regeneration effectiveness and to control weeds.

6.1 Maintenance and Monitoring

After rehabilitation activities are undertaken, rehabilitated areas will be inspected for a minimum of two years following completion of works. Rehabilitated areas will be inspected in December 2011, February 2012, May 2012 and six months for up to 2 years to assess rehabilitation performance against the completion criteria outlined below. Monitoring of the rehabilitation activities will determine if follow up seeding will be required.

If required, follow up herbicide applications will occur on problem weeds for up to three years after topsoil respread or planting/seeding. This herbicide will be spot sprayed on the weeds by hand to avoid overspray onto native plants and will allow these plants to develop without competing with weeds.

Monitoring will essentially involve visual assessment to ensure the rehabilitation works have been implemented as planned. Table 2 shall be used as the monitoring guide to assess the success or otherwise of the revegetation / rehabilitation plan.

Due to the variable rainfall patterns in pastoral areas, revegetation works may not be successful, despite the use of best management practices.

Table 2: Revegetation Monitoring Guide

Criterion	Target	After six months	After one year	After three years
Mean vegetation foliage cover (%) excluding weeds.	>50	0	20	40
Mean number of stems (excluding weed species) / ha within each rehabilitated area	100 stems / ha	400 stems / ha	300 stems / ha	200 stems / ha
Mean weed foliage cover (%).	<20	<20	<20	<20
Amount of bare soil areas >4m^2 (%).	<30	<100	<80	<70