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TORO ENERGY LIMITED

Evaluation of post-fire emergent species in  
Fire Regeneration *Eucalyptus* (FRE) Vegetation

Memo Report

28 January 2015

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## Introduction

Toro Energy Limited (Toro) has recently acquired the Lake Maitland uranium deposit and plans to seek environmental approval for the mining of this deposit as well as the Millipede deposit. Toro plans to process ore from Centipede and Lake Way along with ore from Millipede and Lake Maitland at one central processing plant located adjacent to the Centipede deposit. The project, known as the Wiluna Extension Project, will be assessed through a Public Environmental Review (Figure 1).

Based on comments received from the Office of the Environmental Protection Authority (OEPA) on the draft Environmental Scoping Document for the Extension to the Wiluna Uranium Project, Toro commissioned *ecologia* Environment (*ecologia*) to undertake an assessment of potentially restricted post-fire emergent plant species within the Fire Regeneration *Eucalyptus* (FRE) vegetation unit mapped by Outback Ecology (2009), and also to refine the mapping boundaries of the FRE within the Lake Maitland deposit study area.

## Methods

In January 2015, 5.8 km of transects (Figure 1) were surveyed through the FRE vegetation unit mapped by Outback (2009) as Open Low Woodland of *Eucalyptus eremicola* subsp. *peeneri* over *Acacia sibina*, *Alyogyne pinoniana*, *Kennedia prorepens* and *Leptosema chambersii*, over very dense *Triodia basedowii* hummock grassland (Quadrats LM21 and LM85). Potentially restricted post-fire emergent species were targeted along these transects, in addition to any species not recorded during the survey of Lake Maitland by Outback (2009).

Three 30 x 30 m quadrats were surveyed within recently burnt vegetation in the study area (Figure 1) (Q25B, Q26B, and Q801). One quadrat surveyed by *ecologia* in 2014 as part of the haul road assessment (Q44) was also identified as recently burned *Eucalyptus* vegetation in the vicinity of the FRE unit, and was included in this evaluation.

Species were assessed as potentially post-fire emergent on the basis of their exclusive or near-exclusive presence within the FRE vegetation as mapped by Outback (2009). Species recorded from all Outback (2009) quadrats, as well as from 107 quadrats surveyed by *ecologia* within the Lake Maitland deposit and haul road study area (that were located outside of the mapped FRE unit) were used for comparison (Figure 1 inset).

## Results and Discussion

### *Post-fire emergent species*

Eight species recorded along the transects and within FRE quadrats were assessed as potentially post-fire emergent species, or are known to be post-fire emergent species (e.g. *Leptosema chambersii*) (Crisp 1999), having been recorded primarily or exclusively by Outback (2009) and/or *ecologia* (2014-15) within the FRE vegetation unit (Table 1). All of these species, however, are otherwise widespread (based on current Western Australian Herbarium records), and are not considered locally endemic or restricted.

### *Refined mapping of the FRE*

Outback (2009) mapped a large portion of recently burned vegetation as the FRE vegetation unit. One quadrat surveyed by *ecologia* (Q801) fell within the FRE unit mapped by Outback (2009). This quadrat, although lacking *Eucalyptus*, otherwise contained several dominant species used to define the FRE unit, namely *Alyogyne pinoniana*, *Leptosema chambersii*, and *Triodia basedowii*. Quadrat Q25B represented *Acacia* (mulga) woodland, and although bordering the FRE unit, fell within the mosaic of *Acacia* woodland vegetation mapped by Outback (2009). Quadrat Q26B represented *Triodia basedowii* grassland; this portion of the Lake Maitland deposit study area was not mapped by Outback (2009). The vegetation units delineated

by Outback (2009) that correspond to the three *ecologia* quadrats are shown in Table 2. Based on these data, the vegetation unit boundaries within the study area were refined (Table 3, Figures 2 and 3).

### References

- Crisp, M. D. 1999. Revision of *Leptosema* (Fabaceae: Mirbelieae). Australian Systematic Botany. 12:1-54.
- Outback Ecology. 2009. Lake Maitland Baseline Vegetation and Flora Surveys - May and November 2007 and May 2009. Unpublished report for Mega Uranium Ltd.
- Western Australian Herbarium. 1998-2015. FloraBase - The Western Australian Flora. Government of Western Australia Department of Parks and Wildlife. Available at: <http://florabase.dpaw.wa.gov.au/>.



**Table 1. Potential post-fire emergent species recorded from the Fire Regeneration *Eucalyptus* (FRE) unit.**

Species	Sites recorded ( <i>ecologia</i> 2014-15)	Sites recorded (Outback 2009)	WA Distribution (IBRA Region)*
<i>Dicrasyllis brunnea</i>	T-EUC01, T-EUC03, Q25B, Q801	Not recorded	Widespread (COO, GAS, MUR)
<i>Dicrasyllis flexuosa</i>	Q801	LM80 (non-FRE)	Widespread (COO, MUR)
<i>Kennedia prorepens</i>	T-EUC03	LM21 (FRE), LM50 (FRE)	Widespread (AVW, CER, COO, DAL, ESP, GAS, GES, GID, GSD, GVD, LSD, MAL, MUR, PIL, YAL)
<i>Keraudrenia velutina</i>	T-EUC03, T-EUC-04	Not recorded	Widespread (CAR, GAS, GVD, MUR, PIL)
<i>Leptosema chambersii</i>	T-EUC03, Q801, Q44	LM21 (FRE), LM50 (FRE)	Widespread (CER, COO, GAS, GID, GSD, GVD, LSD, MUR, PIL, TAN)
<i>Swainsona microphylla</i>	T-EUC03	LM50 (FRE), LM80 (non-FRE)	Widespread (CER, COO, GAS, GID, GSD, GVD, HAM, LSD, MUR, NUL, PIL)
<i>Sida cardiophylla</i>	Q801	Not Recorded	Widespread (CER, DAL, GAS, GID, GSD, GVD, LSD, MUR, PIL)
<i>Scaevola parvifolia</i>	Q801	Not recorded	Widespread (CAR, CER, COO, DAL, GAS, GID, GSD, GVD, LSD, OVP, PIL, TAN, YAL)

\*Distribution based on FloraBase records (accessed 23/1/2015) (Western Australian Herbarium 1998-2015)

**Table 2. *ecologia* quadrats and corresponding Outback (2009) vegetation units**

<i>ecologia</i> quadrat	Dominant species	Corresponding Outback (2009) vegetation unit/s*
Q25B	<i>Acacia ?aptaneura</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Triodia basedowii</i>	Plains <i>Acacia</i> Woodland 2 or Plains <i>Acacia</i> Open Low Woodland (PAW2/PAOW)
Q26B	<i>Hakea lorea</i> subsp. <i>lorea</i> , <i>Androcalva loxophylla</i> , <i>Triodia basedowii</i>	Plains <i>Triodia</i> grassland (PTG)
Q801	<i>Acacia pachyacra</i> , <i>Melaleuca eleuterostachya</i> , <i>Alyogyne pinoniana</i> , <i>Leptosema chambersii</i> , <i>Triodia basedowii</i>	Fire Regeneration <i>Eucalyptus</i> (FRE)

\*See Table 3 for vegetation descriptions

**Table 3. Descriptions of vegetation units (Outback 2009) used in the refined mapping**

Vegetation Unit	Description	Area (ha) within Lake Maitland deposit study area
FRE	Open Low Woodland of <i>Eucalyptus eremicola</i> subsp. <i>peeneri</i> over <i>Acacia sibina</i> , <i>Alyogyne pinoniana</i> , <i>Kennedia prorepens</i> and <i>Leptosema chambersii</i> , over very dense <i>Triodia basedowii</i> hummock grassland.	29.05
PTG	Open Low Scrub of <i>Hakea lorea</i> subsp. <i>lorea</i> and <i>Hakea preissii</i> over <i>Ptilotus obovatus</i> , <i>Sclerolaena parviflora</i> , over <i>Triodia basedowii</i> and <i>Triodia desertorum</i> hummock grassland and open low grass <i>Aristida contorta</i> .	4.81
<i>Acacia</i> woodland mosaic*	Mosaic of PAF, PAF2, PALW, PALW2, PAOW, PAW2, PEW, PMW, PTH.	133.96**

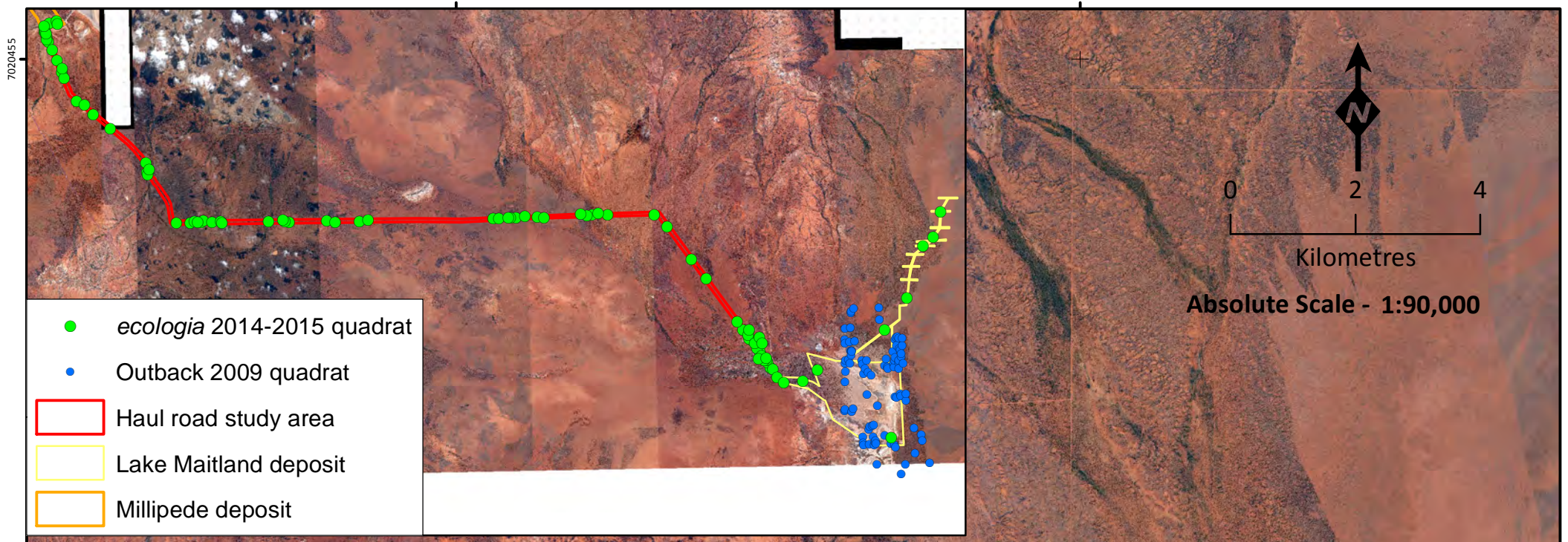
\*See Outback (2009) for vegetation descriptions

\*\*Value corresponds to area of *Acacia* woodland mosaic within the study area refined by *ecologia* in this memo report, and not the whole of the Lake Maitland deposit study area



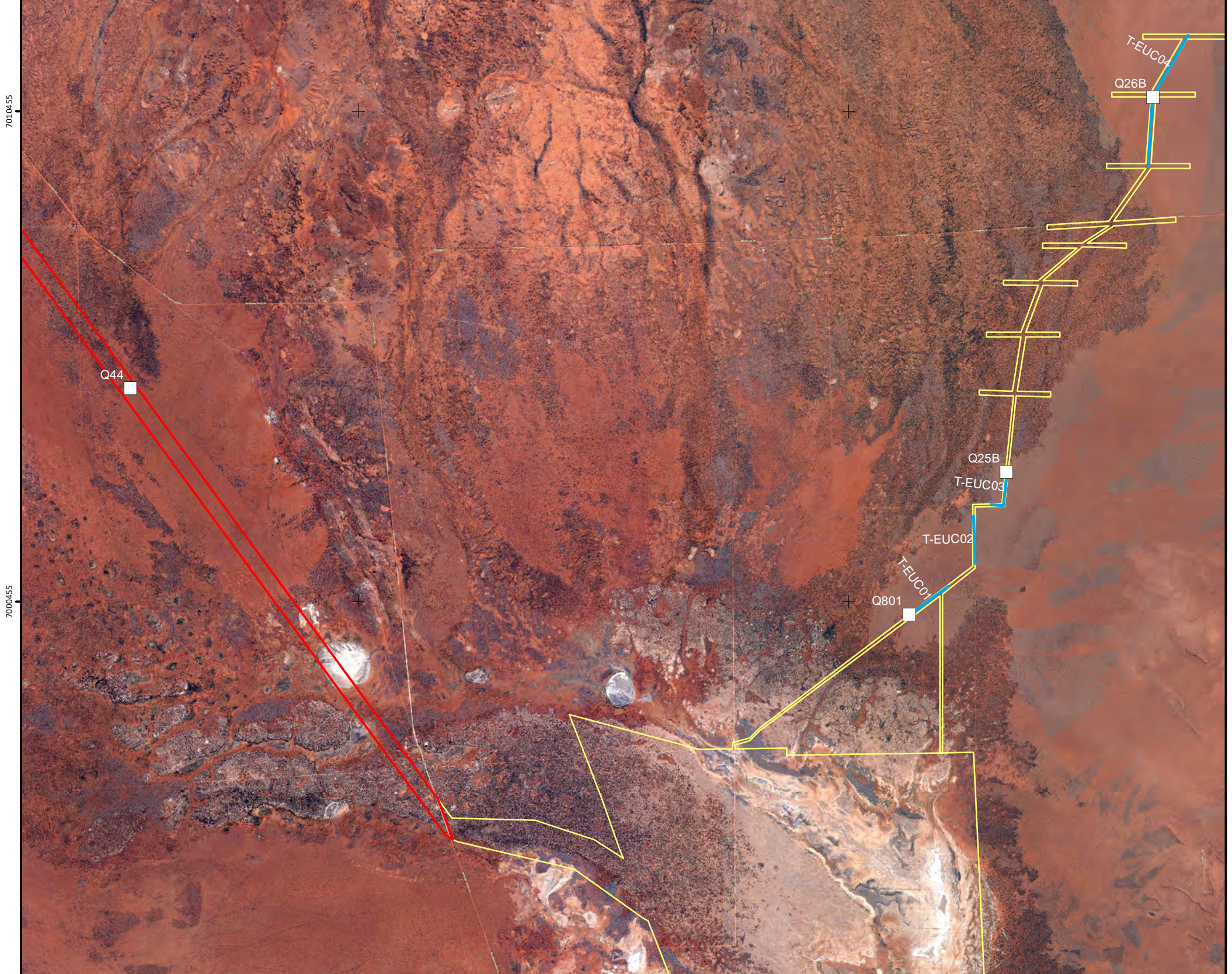
299798

309798



- ecologia 2014-2015 quadrat
- Outback 2009 quadrat
- Haul road study area
- Lake Maitland deposit
- Millipede deposit

0      2      4  
Kilometres  
**Absolute Scale - 1:90,000**



- Legend**
- Fire Regenerating *Eucalyptus* quadrat
  - Transect
  - Haul road study area
  - Lake Maitland deposit



## Location of Fire Regeneration *Eucalyptus* (FRE) quadrats and transects

**Figure: 1**  
Project ID: 1625      Drawn: AC  
Date: 23/01/2015

*Coordinate System*  
Name: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Datum: GDA 1994

311798

313798

### Legend

□ Fire Regenerating *Eucalyptus* quadrat

□ Lake Maitland study area

### Vegetation unit (Outback 2009)

■ Acacia woodland mosaic

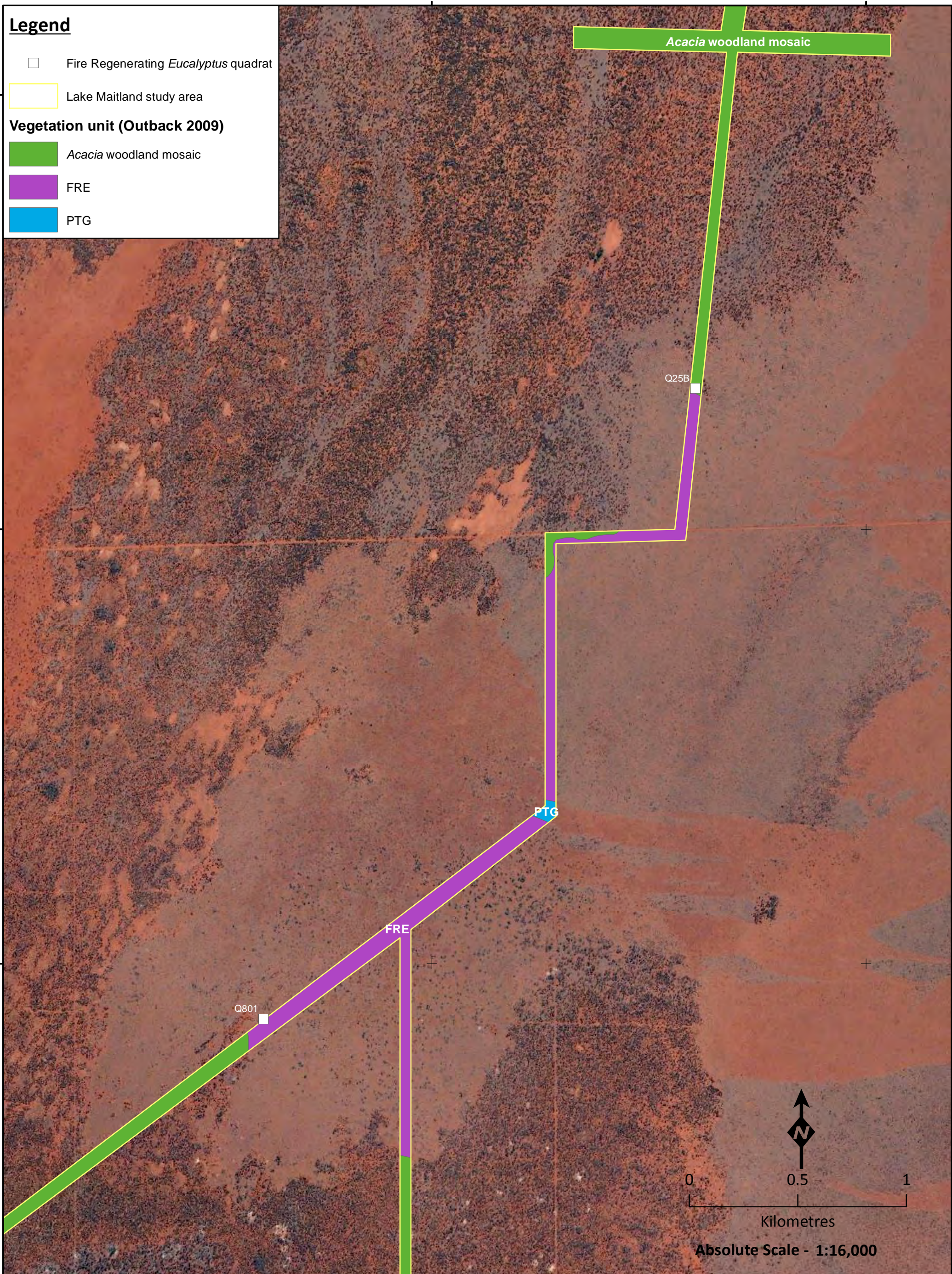
■ FRE

■ PTG

7004455

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## Refined vegetation mapping of the Fire Regeneration *Eucalyptus* vegetation unit

Figure: 2  
Project ID: 1625

Drawn: AC  
Date: 23/01/2015

Coordinate System  
Name: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Datum: GDA 1994

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### Legend

□ Fire Regenerating *Eucalyptus* quadrat

□ Lake Maitland study area

### Vegetation unit (Outback 2009)

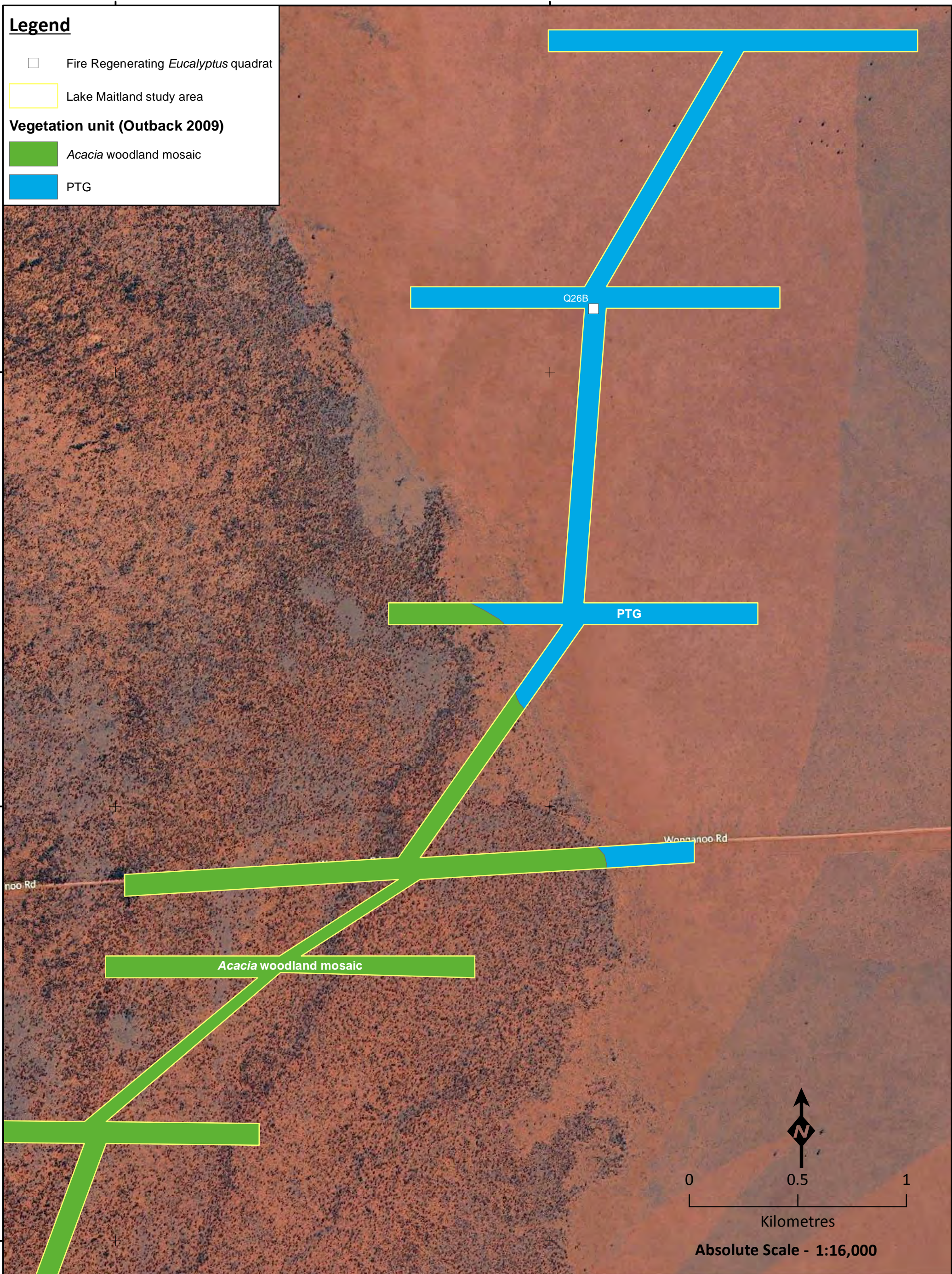
■ *Acacia* woodland mosaic

■ PTG

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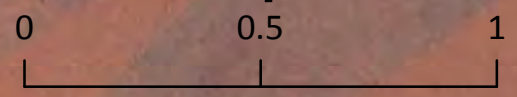
PTG

Q26B

Wongaroo Rd

Wongaroo Rd

*Acacia* woodland mosaic



Kilometres

Absolute Scale - 1:16,000



## Refined vegetation mapping of the Fire Regeneration *Eucalyptus* vegetation unit

Figure: 3  
Project ID: 1625

Drawn: AC  
Date: 23/01/2015

Coordinate System  
Name: GDA 1994 MGA Zone 51  
Projection: Transverse Mercator  
Datum: GDA 1994