# Offset Monitoring Report

## Spring 2012

Prepared for
**ACTEW Water**

January 2013

## DOCUMENT TRACKING

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# Abbreviations

| ABBREVIATION | DESCRIPTION |
|---|---|
| BWA | Bulk Water Alliance |
| CEMP | Construction Environmental Management Plan |
| DoP | NSW Department of Planning |
| DPI | NSW Department of Primary Industries |
| EMSP | Environmental Management Sub-Plan |
| EPA | Environment Protection Authority |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth) |
| LMA | Land Management Agreement |
| LRMP | Landscape Rehabilitation Management Plan |
| M2G | Murrumbidgee to Googong Water Transfer Project |
| ODP | Offset Delivery Plan |
| OEMP | Operation Environmental Management Plan |
| ORMP | Offset Rehabilitation Management Plan |
| TEMP | Terrestrial Environment Management Plan |

# 1 Introduction

## 1.1 BACKGROUND

Eco Logical Australia Pty Ltd (ELA) was commissioned by ACTEW Water (ACTEW) to deliver terrestrial ecology services as required by the environmental approval process for the Murrumbidgee to Googong Water Transfer Project (M2G).

The M2G projects falls under the jurisdiction of the Commonwealth (Department of Sustainability, Environment, Water, Population and Communities), NSW (Department of Planning), and ACT (ACT Planning and Land Authority) Governments and has been subject to assessment and environmental approval processes in all three jurisdictions. Project approval has been attained from all three governments, with a considerable number of approval conditions and commitments applied.

Under the environmental approvals process, ACTEW is required to provide compensatory habitat as an offset to compensate for vegetation and habitat losses arising from the construction activities associated with the M2G pipeline. The offset needs to be delivered to meet the requirements in relation to a range of documents including but not limited to, the Environmental Impact Statement (EIS) and Public Environment Report (PER) prepared for the development and relevant approval conditions.

## 1.2 PURPOSE OF DOCUMENT

Under Condition 2.9b of the NSW Approval and Condition 3.l of the Commonwealth approval conditions for the M2G Project (see Offset Delivery Plan for further information), management and monitoring of the offset site provided for the project is required. The Offset Delivery Plan (ODP) prepared by ELA (April 2012) describes the actions to be taken in establishing and managing the offset site under the approval conditions and commitments including the provision of monitoring actions.

This report details the spring monitoring surveys for 2012 that were undertaken in accordance with the methodology and aims established in the ODP. It is designed to be a standalone monitoring report mimicking the format for the autumn 2012 monitoring report, but also read in context with the ODP. The purpose of this document is to report on management actions conducted within the previous year and to guide future actions within the offset site.

ELA conducted the baseline monitoring outlined in the ODP and the autumn 2012 surveys outlined in the Autumn 2012 Monitoring Report. The Spring 2012 Monitoring Report incorporates the results of the field surveys and where applicable, provide a comparison against previous monitoring surveys.

## 1.3 STUDY AREA

ACTEW own a land parcel in the southern ACT (Block 1675), referred to here as the Williamsdale property (or 'the property'). The property is located just south of Williamsdale and is bounded by the Monaro Highway to the east; the NSW border to the south; Angle Crossing Road to the north; and the Murrumbidgee River corridor to the west (**Figure 1**). The monitoring surveys were conducted within the offset site (study area of approximately 110 ha), which is wholly contained within the property.

The offset site has been set aside for conservation due to its high biodiversity value; including the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed Box-Gum Woodland, threatened flora and fauna species and/or threatened species habitat.


**Figure 1: Study area**

# 2 Native Vegetation and Biodiversity Values

The native vegetation and biodiversity values present within the offset site are managed under the ODP and its sub-plans. The ODP establishes the monitoring methodology for each of these values. A summary of the monitoring methodology outlined in the ODP is presented below, followed by the results of the spring 2012 monitoring surveys.

## 2.1 VEGETATION MONITORING METHODOLOGY

The monitoring methodology has been adapted from the NSW Biobanking methodology to suit the offset site management requirements. The modified Biobanking methodology proforma uses a combination of quadrat and transects surveys to establish vegetation condition and this approach is mirrored under the ELA monitoring methodology.

Vegetation surveys have been designed to collect the following data:

- Species diversity, including native and exotic species.
- Cover abundance of native and exotic species.
- Identification of any threatened flora.
- Condition of vegetation community.

Eight 20mx20m monitoring quadrats or plots were established in spring 2011 to collect baseline data on the condition and species composition of the offset site during autumn and spring each year (**Figure 2**). The quadrats are permanently erected and marked using a star picket at each corner tagged with flagging tape. The location of each quadrats has been referenced using a GPS device (north-west corner) and their location plotted on a map (**Figure 2**).

Each quadrat was surveyed by walking back and forth along 10 parallel transects approximately 2m apart. A cumulative list of flora species within each quadrat was recorded and assigned a cover abundance score using the Braun-Blanquet scale. It should be noted that Quadrats 2, 6, and 7 were established in March 2012, which serve as the baseline data for these monitoring plots.

Two of the eight plots were chosen in order to observe natural changes in species composition over time and both were located in areas of good quality EPBC Act listed Box-Gum Woodland. No management actions are planned to occur within these monitoring plots over the duration of the monitoring period.

The other six monitoring plots were located in areas where management actions were planned to occur as outlined in the management sub-plans, in order to observe the effect that management actions have on species composition.

The monitoring plots were assigned as follows:

- Two control plots – MU3 & MU5
- Six standard monitoring plots – MU1A, MU2B, MU3, MU4, MU6 & MU7

A 50m transect (50m length of tape) was established at each of the monitoring plots to compliment the quadrat surveys and to determine the projected foliage cover and structural components of the community. Each transect was referenced using a GPS device and 3 photos were taken from the beginning of the transect (left side, centre, and right side). The 50m transect was surveyed as follows:

- At every 1m along the 50m tape, the understory layer was assessed (50 survey points per transect) as either native grass, native shrub, native other or exotic species. The understory cover was then presented as a percentage cover of each vegetation type (native or exotic)
- At every 5m along the 50m tape, the foliage cover of the native and exotic species in the mid and overstorey layer was recorded (10 survey points per transect). The foliage cover was then recorded as a percentage for each layer.

## 2.2 FAUNA MONITORING METHODOLOGY

Visual and aural observations of all vertebrate fauna species were recorded opportunistically whilst conducting targeted monitoring surveys across the offset site **(Appendix B)**. Locations of conservation dependent fauna were referenced using a GPS device.

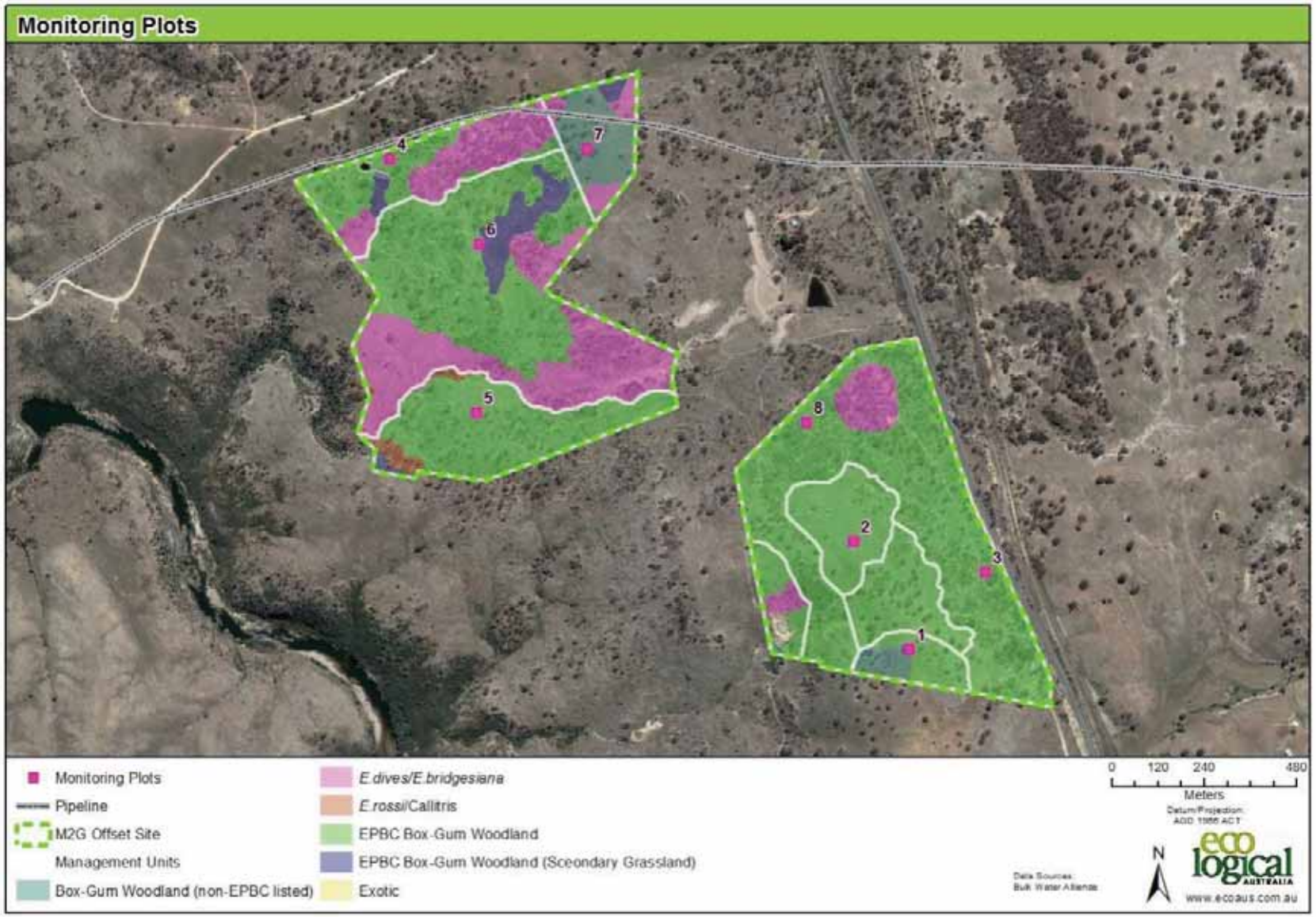


**Figure 2: Monitoring plot and offset site ecological values**

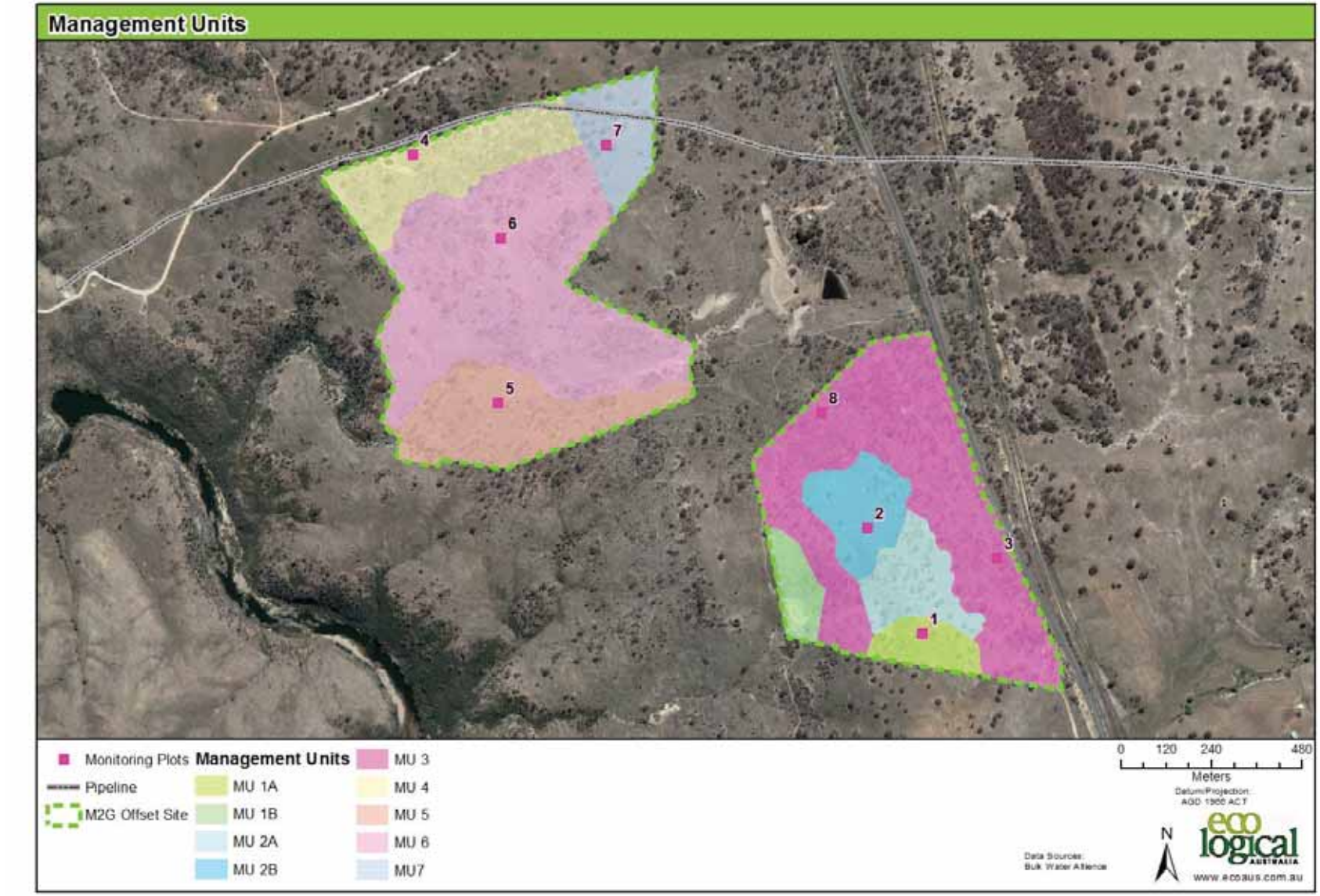


**Figure 3: M2G Offset Site Management Units**

## 2.3 VEGETATION MONITORING RESULTS

A description of the monitoring plots is provided in the pages below and outlined in **Figures 4-10**. The GPS co-ordinates of the north-west corner of each monitoring plot is provided below in **Table 1**. A species list for each of the monitoring plots is included in **Appendix A.**

**Table 1: Monitoring plot co-ordinates in GDA 1994 MGA Zone 55.**

| MONITORING PLOT NO. | MANAGEMENT UNIT | NORTH WEST CORNER | | TRANSECT | |
|---|---|---|---|---|---|
| | | EASTING | NORTHING | EASTING | NORTHING |
| **1** | MU1 | 693669.49 | 6059272.51 | 693674.98 | 6059300.56 |
| **2** | MU2 | 693529.99 | 6059555.34 | 693541.22 | 6059504.10 |
| **3** | MU3 | 693872.06 | 6059467.44 | 693874.65 | 6059490.73 |
| **4** | MU4 | 692349.35 | 6060568.08 | 692365.82 | 6060517.43 |
| **5** | MU5 | 692559.98 | 6059906.52 | 692526.40 | 6059902.85 |
| **6** | MU6 | 692576.25 | 6060344.05 | 692622.53 | 6060358.54 |
| **7** | MU7 | 692860.59 | 6060583.39 | 692874.01 | 6060542.87 |
| **8** | MU3 | 693414.37 | 6059863.02 | 693445.95 | 6059828.31 |

### 2.3.1 Overview of Monitoring Results

The monitoring surveys were conducted in mid-November 2012, towards the end of the spring season. The timing of the surveys was such that the majority of annual species present were flowering, increasing the chance of detection and increasing identification confidence.

Daily mean temperate and monthly rainfall in the preceding months to the monitoring surveys was similar to monthly means. October saw a total rainfall of 53mm (13mm below average), while September had 54mm (average). The preceding 2 weeks to the monitoring surveys received 37mm of rain. All rain data was obtained from the Tharwa General Store (BOM, station number 070083).

A high diversity of both native and annual exotic species was recorded across the offset site, with increases in native species diversity recorded (compared to baseline surveys) within all monitoring plots. A number of previously unrecorded species such as *Thysanotus* spp., *Microseris lanceolata* and *Thelymitra pauciflora* were recorded during surveys.

The main management actions undertaken locally to improve vegetation condition to date include:

- The removal of exotic grazers from the property
- The control of feral pigs
- Targeted weed control of African Lovegrass and Serrated Tussock

### 2.3.2 Monitoring Plot 1

| PLOT DESCRIPTION | | | | |
|---|---|---|---|---|
| *Management unit*<br>*Dominant vegetation type* | MU1<br>Box-Gum Woodland | | *Plot number*<br>*Condition* | 1<br>Low-Mod |
| **PLOT STATISTICS** | | | | |
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | Yes (low) |
| *Native over storey cover*<br>*Native mid storey cover*<br>*Native under storey cover*<br>*Exotic mid storey plant cover*<br>*Exotic under storey plant cover*<br>*Native species diversity* | <br><br>46%<br><br>58%<br>14 | <br><br>70%<br><br>24%<br>18 | Species | *E. blakelyi* |

**Monitoring plot 1** is located within MU1 on the southern offset. The monitoring plot is composed of relatively lower condition Box-Gum Woodland. Natural regeneration of the overstorey was present with a low number of saplings observed within the monitoring plot. This is in comparison to no regeneration recorded during the baseline surveys. An increase in native species diversity (18) compared to the baseline surveys (14) was also observed. The dominant species were *Austrostipa* spp., *Microlaena stipoides* (Weeping Grass) and *Carex inversa* (Common Sedge). Note the presence of several Serrated Tussock (*Nassella trichotoma*) individuals in the plot that have been controlled through the weed control program (red circles). In addition, the growth of Saffron Thistle during 2012 has been significantly less than the growth observed from the 2011 baseline surveys.

**Figure 4: Monitoring plot 1 (left: Baseline monitoring photo, November 2011. Right: Monitoring photo, November 2012)**

### 2.3.3 Monitoring Plot 2

| PLOT DESCRIPTION | | | | |
|---|---|---|---|---|
| *Management unit*<br>*Dominant vegetation type* | MU2<br>Box-Gum Woodland | | *Plot number*<br>*Condition* | 2<br>Mod-Good |
| **PLOT STATISTICS** | | | | |
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | Yes |
| *Native over storey cover* | | 2% | Species | *E. blakelyi* |
| *Native mid storey cover* | | | | |
| *Native under storey cover* | 84% | 86% | | |
| *Exotic mid storey plant cover* | | | | |
| *Exotic under storey plant cover* | 6% | 18% | | |
| *Native species diversity* | 30 | 40 | | |

N.B. Monitoring plot 2 was established in autumn 2012.

**Monitoring plot 2** is located within MU2 within the southern offset. It is situated on a rocky hill containing Pink-tailed Worm Lizard habitat. It contains relatively good condition mature Box-Gum Woodland with limited regeneration present. It contains a moderate to high diversity of native understorey species and is generally devoid of exotic grasses. The groundlayer is dominated by *Austrodanthonia* spp., *Austrostipa* spp. and *Chrysocephalum apiculatum* (common everlasting). The 2012 monitoring surveys recorded 40 native species (primarily herbs and forbs), compared to 30 native species in the baseline monitoring. The increase is likely to at least be attributed to a combination of rain events and the removal of exotic grazers. An increase in exotic understorey species cover was also recorded and is likely due to annuals such as Clovers (*Trifolium* spp.), *Aira* sp. and *Paronychia brasiliana*.

**Figure 5: Monitoring plot 2 (left: Baseline monitoring photo, March 2012. Right: Monitoring photo November 2012)**

### 2.3.4 Monitoring Plot 3

| PLOT DESCRIPTION | | | | |
|---|---|---|---|---|
| *Management unit*<br>*Dominant vegetation type* | MU3<br>Box-Gum Woodland | | *Plot number*<br>*Condition* | 3<br>Mod-Good |
| **PLOT STATISTICS** | | | | |
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | Yes |
| *Native over storey cover* | | 2% | Species | *E. blakelyi* |
| *Native mid storey cover* | 8.5% | 5% | | |
| *Native under storey cover* | 94% | 90% | | |
| *Exotic mid storey plant cover* | 2% | 2% | | |
| *Exotic under storey plant cover* | 4% | 10% | | |
| *Native species diversity* | 26 | 48 | | |

N.B. Note that the 2011 photo below was taken in-front of the *R. rubiginosa* shrub

**Monitoring plot 3** is located within MU3. The plot is located in the ecotone of moderate to good quality Box-Gum Woodland. The plot is dominated by mature *E. blakelyi* and a significant amount of natural regeneration is present. The mid-storey is composed of *R. Rubiginosa* (Sweet Briar). The Sweet Briar will be targeted as part of the weed control program. A diverse understorey exists with dominant species including *Themeda australis* (Kangaroo Grass), *Austrodanthonia* spp. and *Bothriochloa macra* (Red-leg Grass). The understorey has a high diversity of native species (48) with significant increases compared to the baseline monitoring diversity (26). The increase is likely to at least be attributed to a combination of rain events and the removal of exotic grazers. Seasonal variation in the understorey and the growth resulting from good rain events can be seen in the photos below.

**Figure 6: Monitoring plot 3 (left: Baseline monitoring photo, November 2011. Right: Monitoring photo, November 2012)**

### 2.3.5 Monitoring Plot 4

| PLOT DESCRIPTION | | | | |
|---|---|---|---|---|
| *Management unit*<br>*Dominant vegetation type* | MU4<br>Box-Gum Woodland | | *Plot number*<br>*Condition* | 4<br>Mod-Good |
| **PLOT STATISTICS** | | | | |
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | Yes |
| *Native over storey cover* | 4.7% | 3% | Species | *E. blakelyi* |
| *Native mid storey cover* | 7.5% | 4% | | |
| *Native under storey cover* | 92% | 90% | | |
| *Exotic mid storey plant cover* | 2% | 3.5% | | |
| *Exotic under storey plant cover* | 28% | 16% | | |
| *Native species diversity* | 26 | 30 | | |

**Monitoring plot 4** is located in the northern offset in MU4. The plot is located in moderate to good quality Box-Gum Woodland dominated by *E. blakelyi*. The plot supports a moderately diverse understorey composed of 30 native species compared to 26 recorded in the baseline surveys. The dominant species are *Themeda australis*, *Schoenus apogon* and *Haloragis heterophylla*. A moderate level of exotic cover is present in the understorey, comprised primarily of annual species. The woody weed, *R. rubiginosa* comprise the majority of the mid-storey and will be part of the targeted weed control occurring in January 2013. A moderate to strong level of regeneration exists within the MU with the qualitative assessment indicating an increase in regeneration compared to the baseline monitoring, prior to grazing exclusion.

**Figure 7: Monitoring plot 4 (left: Baseline monitoring photo, November 2011. Right: Monitoring photo, November 2012)**

### 2.3.6 Monitoring Plot 5

| PLOT DESCRIPTION | | | |
|---|---|---|---|
| *Management unit*<br>*Dominant vegetation type* | MU5<br>Box-Gum Woodland | *Plot number*<br>*Condition* | 5<br>Mod-Good |

| PLOT STATISTICS | | | | |
|---|---|---|---|---|
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | Yes |
| *Native over storey cover* | 0% | 0.2% | Species | *E. blakelyi* |
| *Native mid storey cover* | 11% | 8% | | |
| *Native under storey cover* | 98% | 110% | | |
| *Exotic mid storey plant cover* | | | | |
| *Exotic under storey plant cover* | 4% | 18% | | |
| *Native species diversity* | 29 | 60 | | |

N.B. % cover is over 100% as the assessment allows for multiple veg types at a single point.

**Monitoring plot 5** is a control plot located in MU5. No management actions will occur within the bounds of the monitoring plot. Plot 5 is located in moderate-good quality Box-Gum Woodland dominated by *E. blakelyi* with a significant amount of natural regeneration present. The monitoring plot supports a highly diverse understorey of grasses, herbs and forbs with 60 native species recorded in spring 2012. This is a significant increase to the baseline monitoring that recorded 29 native species and shows the temporal and seasonal variation that can occur between surveys. The variation is also likely to be a result of a combination of rain events and the removal of exotic grazers. The understorey supported a high diversity of forbs including typically grazing intolerant species, such as *Swainsona sericea, Microseris lanceolata*, *Arthropodium minus* and *Microtis unifolia*.

**Figure 8: Monitoring plot 5 (left: Baseline monitoring photo, November 2011. Right: Monitoring photo, November 2012)**

### 2.3.7 Monitoring Plot 6

| PLOT DESCRIPTION | | | | |
|---|---|---|---|---|
| *Management unit*<br>*Dominant vegetation type* | MU6<br>Box-Gum Woodland | | *Plot number*<br>*Condition* | 6<br>Mod-Good |
| **PLOT STATISTICS** | | | | |
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | Yes |
| *Native over storey cover* | 5.3% | 4% | Species | *E. blakelyi* |
| *Native mid storey cover* | | | | |
| *Native under storey cover* | 92% | 80% | | |
| *Exotic mid storey plant cover* | | | | |
| *Exotic under storey plant cover* | 8% | 26% | | |
| *Native species diversity* | 28 | 45 | | |

N.B. Monitoring plot 6 was established in autumn 2012.

**Monitoring plot 6** is located in MU6 in moderate-good quality Box-Gum Woodland dominated by *E. blakelyi.* The plot supports a diverse under storey of grasses, herbs and forbs with 45 native species recorded. This is compared to 28 native species recorded during the baseline monitoring surveys. The under storey was dominated by native perennial tussock grasses including *Austrostipa* spp. *R. rubiginosa* was present at low abundance in the plot and observed more broadly in the MU. It will be targeted for control in January 2013. A higher native diversity was observed in the spring surveys compared to the autumn surveys. However, this is likely to be a result of the seasonal variation and occurrence of annual species during spring. The growth of annual species is also likely to explain the decreased abundance of native species in the under storey compared to the autumn baseline surveys.

**Figure 9: Monitoring plot 6 (left: Baseline monitoring photo, March 2012. Right: Monitoring photo, November 2012)**

### 2.3.8 Monitoring Plot 7

| PLOT DESCRIPTION | | | | |
|---|---|---|---|---|
| *Management unit* | MU7 | | *Plot number* | 7 |
| *Dominant vegetation type* | *E. blakelyi* Woodland | | *Condition* | Low |
| **PLOT STATISTICS** | | | | |
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | No |
| *Native over storey cover* | | | Species | N/A |
| *Native mid storey cover* | | | | |
| *Native under storey cover* | 74% | 30% | | |
| *Exotic mid storey plant cover* | | | | |
| *Exotic under storey plant cover* | 34% | 70% | | |
| *Native species diversity* | 13 | 15 | | |

N.B. Monitoring plot 7 was established in autumn 2012

**Monitoring plot 7** is located within MU7 in the northern offset. The plot is composed of degraded Box-Gum Woodland dominated by *E. blakelyi*. However, no native over storey or mid storey was recorded within the plot. Native species diversity was low (15 species) in comparison with other monitoring plots with very little change compared to the baseline surveys (13 native species). Exotic species dominated the under storey with an increased abundance observed between the autumn and spring monitoring surveys. The increase in exotic abundance has resulted from the growth of annual species, possibly due to the good preceding conditions. Dominant exotic annuals include *Bromus* spp. and *Trifolium* spp. *Rosa rubiginosa* was observed in high numbers across the MU and will be targeted in January 2013 as part of the weed control program. Consideration for improving native under storey abundance is recommended within the northern part of the MU.

**Figure 10: Monitoring plot 7 (left: Baseline monitoring photo, March 2012. Right: Monitoring photo, November 2012)**

### 2.3.9 Monitoring Plot 8

| PLOT DESCRIPTION | | | | |
|---|---|---|---|---|
| *Management unit*<br>*Dominant vegetation type* | MU3<br>Box-Gum Woodland | | *Plot number*<br>*Condition* | 8<br>Low |
| **PLOT STATISTICS** | | | | |
| Cover expressed as % | Baseline | Sp 2012 | Regeneration | No |
| *Native over storey cover* | | | Species | N/A |
| *Native mid storey cover* | 8.5% | 4% | | |
| *Native under storey cover* | 94% | 94% | | |
| *Exotic mid storey plant cover* | | | | |
| *Exotic under storey plant cover* | 4% | 6% | | |
| *Native species diversity* | 26 | 41 | | |

**Monitoring plot 8 (3b)** is a control plot located in MU3. No management actions are proposed to occur within the bounds of the plot. The plot is located in good quality Box-Gum Woodland dominated by *E. blakelyi.* The plot supports a diverse under storey of grasses, herbs and forbs with 41 native species recorded. The dominant species included *Themeda australis*, *Austrodanthonia* spp. and *Chrysocephalum apiculatum*. Photo comparison shows a healthy understorey dominated by native species with good inter-tussock spacing. The photo also shows greener growth in 2012 as a result of the good preceding conditions (rain events). This is likely to have attributed (as well as the removal of grazing) to a higher native diversity recorded compared to the baseline surveys. Examples of previously unrecorded species in this plot include *Thelymitra pauciflora* and *Microtis unifolia*.

**Figure 11: Monitoring plot 8 (left: Baseline monitoring photo, November 2011, Right: Monitoring photo, November 2012)**

# 3 Weed Monitoring

The management of weeds within the M2G offset site is undertaken in accordance with the Weed Monitoring Sub-Plan. The sub-plan outlines the weed management activities to be undertaken in order to satisfy relevant approval conditions and commitments. As an action under the sub-plan, the monitoring of weeds within the offset is required. The following sections briefly describe the methods outlined in the sub-plan and present the results of the spring weed monitoring for 2012.

## 3.1 WEED MANAGEMENT ACTIONS UNDERTAKEN TO DATE

It should be noted that prior to the spring 2012 monitoring surveys, only *Eragrostis curvula* (African Lovegrass) and *Nassella trichotoma* (Serrated Tussock) had been controlled. This is consistent with the Weed Management Sub-Plan. The remaining weed species identified for control will be targeted over the summer of 2012/2013 (recommended control period) as outlined in the weed management sub-plan.

For further detail on the management actions recommended refer to the ODP and associated sub-plans.

## 3.2 WEED MONITORING METHODOLOGY

Weed monitoring will be undertaken on a biannual basis in autumn and spring using a random meander method, to fully cover the area within each MU.

Weed control for African Lovegrass and Serrated Tussock took place from the 24$^{th}$ – 27$^{th}$ July 2012. Successful control of these species is considered likely to require a number of re-visits. As such, following the weed control activities in July, areas of African Lovegrass and Serrated Tussock observed post-control were marked using a GPS and subsequently mapped in November 2012.

## 3.3 WEED MONITORING RESULTS

A summary of the weed occurrences across the offset site and the 2012 spring monitoring results is provided in **Table 2** below.

The relative distribution of African Lovegrass and Serrated Tussock has been mapped in **Figure 12** and **Figure 13**.

## 3.4 ADAPTIVE MANAGEMENT RECOMMENDATIONS

ELA recommends that follow-up weed control for African Lovegrass (year 2 control program) is brought forward and occur as soon as possible. Alternatively, an additional control for African Lovegrass should take place. The control should target the drainage lines within the offset site, particularly the main east-west drainage line within the northern offset.

No additional management actions to the weed control outlined in the weed management sub-plan have been proposed as a result of the spring 2012 monitoring surveys. Targeted weed control programs are to be implemented in 2013 as part of the ODP, with except of African Lovegrass.

**Table 2: Summary of weed occurrence across the offset site and 2012 spring monitoring result**

| SPECIES | WEED OCCURRENCE PRIOR TO SURVEYS* | SPRING 2012 MONITORING RESULTS** |
|---|---|---|
| African Lovegrass (*Eragrostis curvula*) | Low, localised areas of dominance.<br>Present across the offset site in isolated patches. Where it occurs, it forms a dense mat of tussocks and dominates the understory. | A number of isolated individuals observed across the offset site with some heavier infestations around main drainage line.<br>**Recommendation**: Follow-up weed control (year 2) to be brought forward and occur as soon as possible. Target drainage lines. |
| Serrated Tussock (*Nassella trichotoma*) | Low, scattered individuals in some areas.<br>Present in the more open areas of the offset site. The species was primarily present as a number of scattered individuals within MU1 along the southern boundary. | Control for this species was highly successful with only a few isolated individuals observed close to the border of the southern offset (MU1)<br>**Recommendation**: Maintain weed control program as outlined in the sub-plan. |
| Blackberry (*Rubus fruticosus*) | Low, localised areas of dominance.<br>Predominantly found within the northern offset, and was more or less restricted to the drainage lines or moist areas of the site. | Targeted for control January 2012 to February 2013. |
| Hawthorn (*Crataegus monogyna*) | Very low, isolated individuals.<br>Present within the study area as isolated individuals. | Targeted for control January 2012 to February 2013. |
| Scotch Thistle (*Onopordum acanthium*) | Low, localised areas of dominance.<br>Present in some areas as scattered individuals. A greater proportion was present around both dams where it was locally dominant. | Targeted for control January 2012 to February 2013. |
| Sweet Briar (*Rosa rubiginosa*) | Moderate, widely distributed at low density with scattered individuals, some areas of dominance.<br>Present right across the offset site, often with larger infestations under mature trees. | Targeted for control January 2012 to February 2013. |

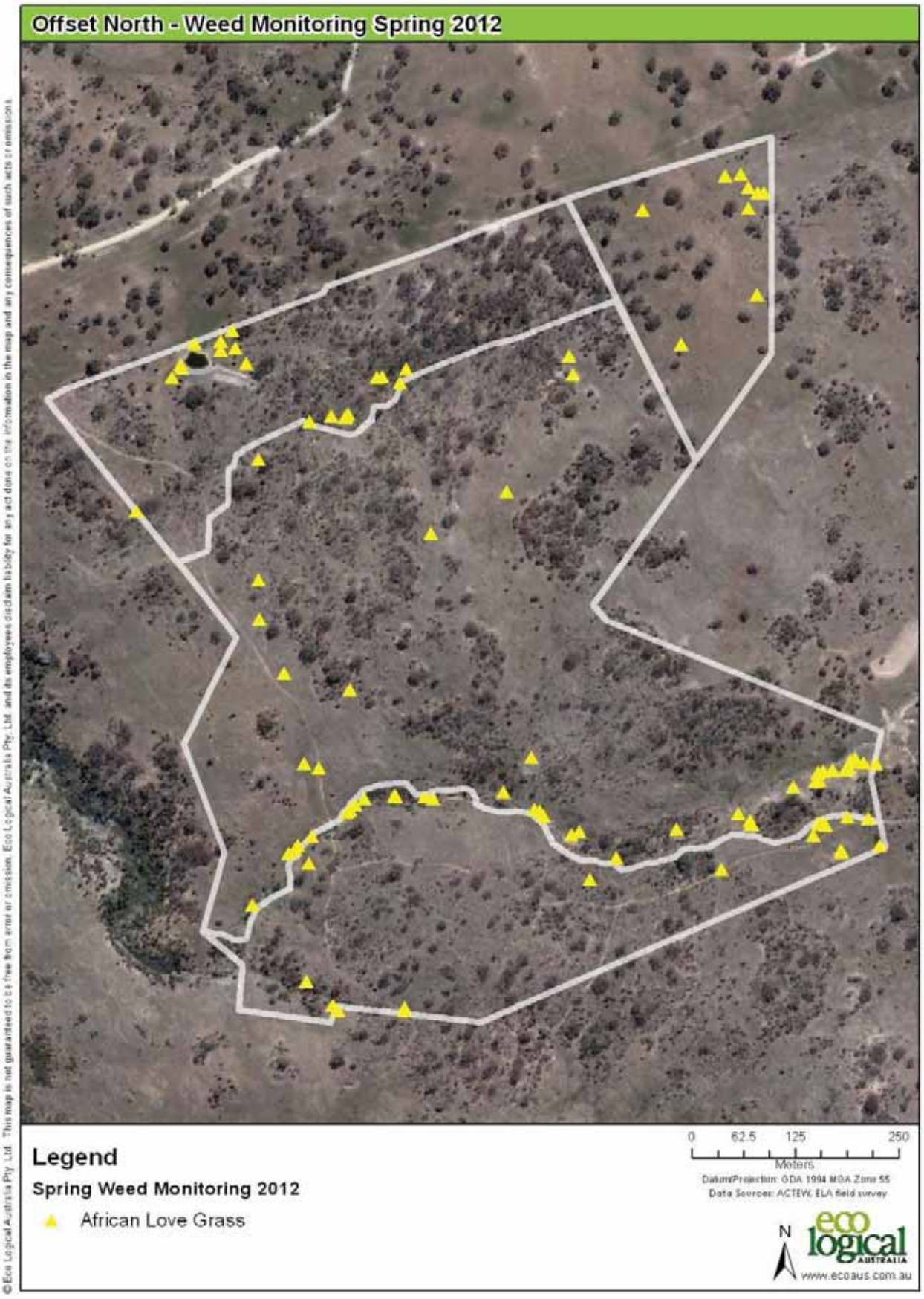


**Figure 12: African Lovegrass and Serrated Tussock occurrences in northern offset**

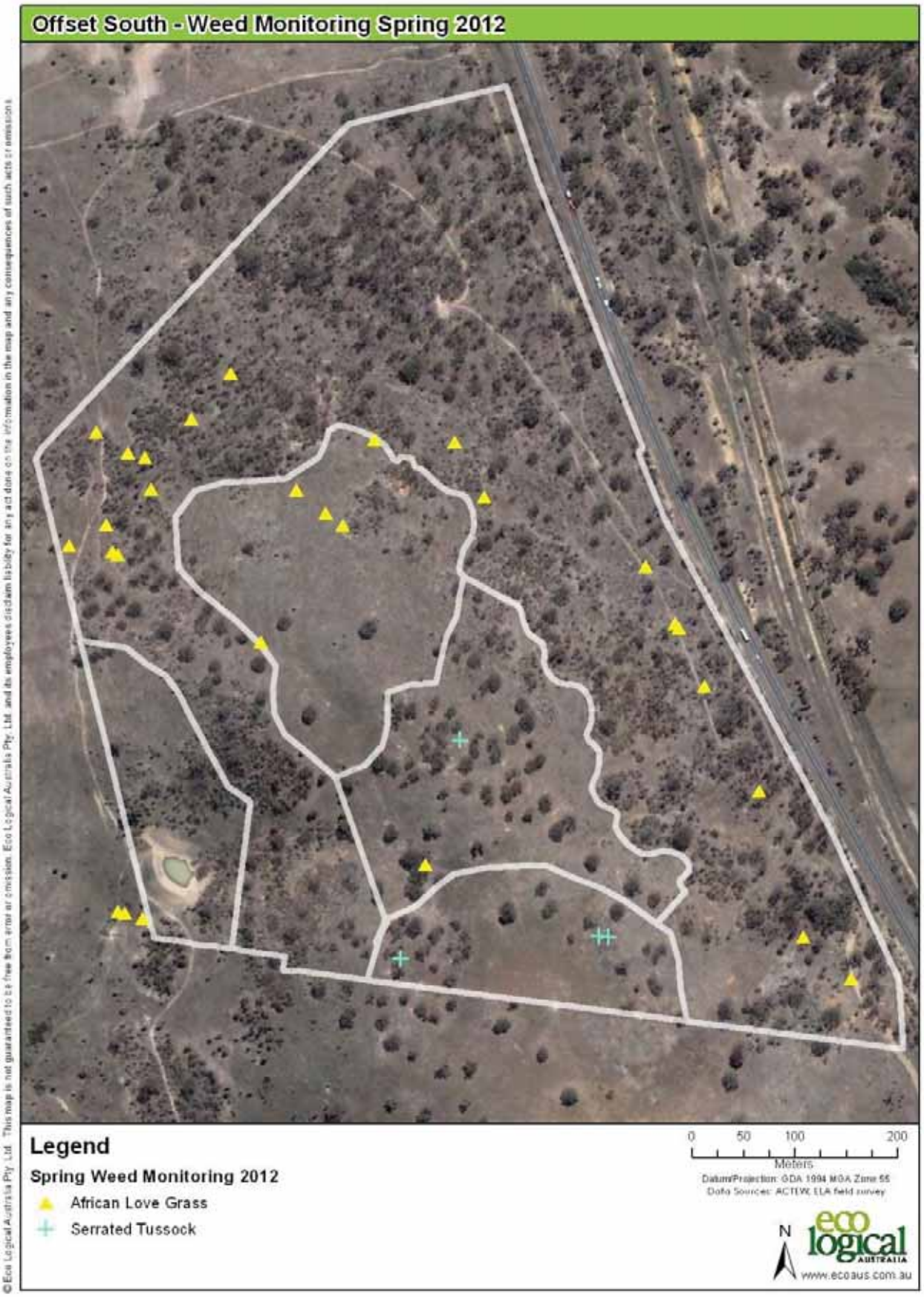


**Figure 13: African Lovegrass and Serrated Tussock occurrences in southern offset**

# 4 Erosion Monitoring

The following sections briefly describe the monitoring methods outlined in the Erosion Management Sub-plan and present the results of the spring erosion monitoring for 2012. It should be noted that no on-ground erosion management activities have been undertaken to date. However, soil testing is currently being undertaken in response to the recommendations outlined in the Autumn 2012 Monitoring Report. For further detail on management actions recommended refer to the ODP and Erosion Management Sub-plan.

## 4.1 EROSION MONITORING METHODOLOGY

Erosion monitoring sites were established during the autumn monitoring surveys. Meandering traverses were conducted across the offset site, with particular attention paid to ephemeral drainage lines and higher erosion risk areas. Points of erosion encountered were described in terms of size and their location recorded using a GPS. A photo (shown below) was taken of each point in order to observe any changes over time. Erosion point locations are mapped in **Figure 14** and **Figure 15**. It's important to note that not all points of erosion originally observed were established as a monitoring point, but rather a representative sample of all erosion points encompassing each of the drainage lines was selected.

## 4.2 EROSION MONITORING RESULTS AND MANAGEMENT ACTIONS

A total of 18 erosion points were recorded during the autumn 2012 monitoring surveys with all points falling within Erosion Management Zone 1 (see ODP). An additional 3 monitoring points were established in spring 2012.

The majority of erosion points are located along ephemeral drainage lines in the northern offset. The erosion points are in a variety of conditions; however vegetative cover surrounding each point is generally high. Some of the points may require minor remediation works in the near future, while others require continued monitoring. It should be noted that approval is required to undertake any remediation works within a drainage line, and may influence the type of work to be undertaken. A summary of the erosion points within the offset property is provided below followed by a more detailed description of each point and an accompanying photo.

### 4.2.1 Active Sites

A number of points show minor signs of active erosion (e.g. points 5, 10, 13, 16 & 17) including active head cuts, ponding and the development of plunge pool formations. These sites fall within Erosion Management Zone 1, which is a priority zone for remediation and management (refer to ODP for further detail). While it is considered that these points are unlikely to stabilise themselves due to the potential soil characteristics within the offset property, the ephemeral nature of the drainage line indicates that these sites will only erode following a large rainfall event, as vegetative cover abundance at each site is high. The high vegetative cover significantly limits the potential for erosion to occur outside heavy rain events as vegetation slows the rate of flow and encourages infiltration of water into the soil profile. This in turn limits the damage caused by surface flows (highest erosion contributor at these points).

The Erosion Management Sub-plan of the ODP has identified that erosion points within Erosion Management Zone 1 are to be remediated though minor works such as re-shaping and stabilisation, if

required. The Autumn 2012 Monitoring Report recommended that before any such works are undertaken, that soil testing be conducted to ensure that the most appropriate erosion control measures can be implemented. The testing of soils within the offset property is currently being undertaken. The results of the soil testing, including laboratory analysis will be incorporated into a separate addendum to the Spring 2012 Monitoring Report.

It is expected that the soil testing will confirm that the sub-soils within the offset property are likely to have sodic properties (soil that is dispersive and highly erodible). These soil traits would be consistent with the Burra and Campbell Soil Landscape Units within which the offset property is situated (Refer to Appendix C of the ODP for further detail).

### 4.2.2 Stable Sites

A number of points (Points 6, 9-12 & 14) within the offset site show signs of historical erosion activity, which has since mostly stabilised, limiting the risk of active erosion. The sites are considered to be sufficiently stable that no remediation works are required at this stage. In addition, the removal of stock (grazing management action) from the offset site has further limited the potential for disturbance to these areas and will continue to enable natural stabilisation.

It is recommended that continued monitoring occurs at these points with re-assessment of the erosion potential following the spring 2012 monitoring surveys and soil testing. In addition, a target monitoring survey is recommended following any heavy rain events at the offset site.

Erosion point 12 is similar in nature to erosion point 7 and 8 (see major drainage line sites below), but at a reduced scale. There is current bed-rock exposure, some pooling and in-stream vegetation showing. Continued monitoring and re-assessment will determine whether it is grouped with erosion points 7 and 8 in the future.

### 4.2.3 Major Drainage Line Sites

Erosion points 7 and 8 are located within the main ephemeral creek line that bisects the northern offset. The Erosion Management Sub-plan states that these areas will be monitored through the establishment of a permanent monitoring point and compared through a qualitative assessment process.

A photo monitoring photo (Photo Point 1: 6059835, 692700) was established during the autumn 2012 surveys to monitor the nominated erosion points 7 (facing north-west from photo point) and 8 (facing north-east from photo point). The permanent photo monitoring point consists of a star picket and the photos have been taken with the camera placed on top of the picket (see below for photos).

A comparison of images between autumn 2012 and spring 2012 does not show any significant differences. The June-September period (2012) recorded a number of moderate rainfall events (up 28mm in 24 hours), however, it appears that the erosions point have remained in a stable condition.

Despite significant signs of erosion of the gully wall, it is unlikely that erosion will become much deeper due to the current exposure of the stream bed (erodible soils have already been stripped at these locations). Erosion in this gully is also likely to occur only after heavy rain events. If on-ground works were required in the future, the works would be extensive in nature and be guided by the soil testing analysis currently being conducted.

At this stage, no immediate action is recommended for these erosions points. However, it is recommended that the erosions points continue to be monitored.

**Erosion Point 1:**

*Description:* Small erosion point located in southern offset, MU3 situated within a small ephemeral drainage line.

*Size:* Approximately 1.5m across 0.3m deep and 1.5m long.

*Change:* No significant change observed compared to baseline monitoring (autumn 2012).

*Action required:* No ground works required at this stage. Continue bi-annual monitoring.

Autumn 2012 (baseline)

Spring 2012

**Erosion Point 2:**

*Description:* Situated within an ephemeral drainage line in MU4, northern offset. Evidence of a recent rain event. Some in stream vegetation present.

*Size:* Approximately 4m across, 0.8m deep and 2.0m in length.

*Change:* No significant change observed since previous monitoring survey.

*Action required:* No ground works required at this stage. Continue bi-annual monitoring.

*Note*: Spring 2012 monitoring photo incorporates more of the erosion point on right hand-side of the photo.

Autumn 2012

Spring 2012

**Erosion Point 3:**

*Description:* Located within an ephemeral drainage line within MU4, northern offset. No evidence of active erosion during recent rain events.

*Size:* Approximately 1.0m across, 0.4m deep and 1.5m long.

*Change:* No significant change observed since previous monitoring survey.

*Action required:* No ground works required at this stage. Continue bi-annual monitoring.

Autumn 2012

Spring 2012

**Erosion Point 4:**

*Description:* Located within an ephemeral drainage line within MU4, northern offset. Pooling water indicates evidence of recent rain event prior to monitoring survey (both photos).

*Size:* Approximately 2.0m wide, 0.5m deep, 2.5m long.

*Change:* No significant change observed since previous monitoring survey.

*Action required:* No ground works required at this stage. Continue bi-annual monitoring.

Autumn 2012

Spring 2012

**Erosion Point 5:**

*Description:* Located within an ephemeral drainage line within MU4, northern offset. Slight evidence of active erosion during recent rain events increasing undercut.

*Size:* Approximately 0.3m wide, 0.5m deep and 1.5m long.

*Change:* Limited erosion occurring at gully head.

*Action required:* No ground works required at this stage. Continue bi-annual monitoring. Soil testing to inform any possible works.

*Note:* There is a difference in the scale of the 2 photos. The right photo is zoomed out to incorporate a broader picture of the erosion point.

Autumn 2012

Spring 2012

**Erosion Point 6:**

*Description:* Located within an ephemeral drainage line within MU4, northern offset. Evidence of sheet erosion along bank and rilling.

*Size:* Approximately 6m long, 1.5m deep and 2.5m wide.

*Change:* No significant change observed since previous monitoring survey.

*Action required:* Continued bi-annual monitoring and targeted monitoring following heavy rains.

Autumn 2012

Spring 2012

**Erosion Point 7:**

*Description:* Located along the main creek line within northern offset. Photo taken from Photo Point 1 (6059835, 692700) looking north-west (335$^{o}$) and showing the north bank with slumping.

*Size:* Approximately 20m long and 1.0m deep.

*Change:* No significant change observed since previous monitoring period.

*Action required:* Targeted monitoring at photo point following heavy rain and continue bi-annual monitoring.

Autumn 2012

Spring 2012

**Erosion Point 8:**

*Description:* Located along the main creek line within northern offset. Photo taken from Photo Point 1 (6059835, 692700) looking north-east (45$^{o}$) and showing the north bank (upstream from erosion point 7) with slumping.

*Size:* Approximately 15m long and 1.0m deep.

*Change:* No significant change observed since previous monitoring survey.

*Action required:* Targeted monitoring at photo point following heavy rain and continue bi-annual monitoring.

Autumn 2012

Spring 2012

**Erosion Point 9**

*Description:* Situated near the western boundary of the southern offset. High vegetative abundance surrounding erosion point.

*Size:* Approximately 6-8m long and 0.5m deep

*Change:* No significant change observed since previous monitoring survey.

*Action required:* Continued bi-annual monitoring and targeted monitoring following heavy rains.

Autumn 2012

Spring 2012

**Erosion Point 10:**

*Description*: Situated along the western fence line of the southern offset. Small area of erosion due to upslope runoff.

*Size:* Approximately 5.0m long, 0.5m deep.

*Change:* Some minor erosion has occurred adjacent to the new fence line (this is within the neighbouring property to the south of the offset site). Soil testing to inform any control action.

*Action required:* No immediate action required. Continued bi-annual monitoring and targeted monitoring following heavy rains.

Autumn 2012

Spring 2012

**Erosion Point 11**

*Description: Small area of erosion along an ephemeral drainage line located in offset south.*

*Size: Approximately 3.0m long, l.5m wide and 0.5m high.*

*Change:* No significant erosion has occurred since the previous monitoring period.

*Action required:* Continued bi-annual monitoring and targeted monitoring following heavy rains.

**Erosion Point 12:**

*Description:* Erosion point on western boundary of northern offset. Bed rock showing and in-stream vegetation

*Size:* Approximately 5.0m long, 0.8 - 1.0m deep (sloping).

*Change:* No significant erosion has occurred since the previous monitoring period.

*Action required:* Continued bi-annual monitoring and targeted monitoring following heavy rains.

**Erosion Point 13:**

*Description:* Moderately sized erosion points in northern offset. Evidence of recent slumping and pooling water following recent rain.

*Size:* Approximately 4.0m long, 1.5m deep and 2-3.5m wide.

*Change:* Some minor slumping has occured

*Action required:* No immediate action required. Continue to monitor.

**Erosion Point 14:**

*Description*: Small area of erosion along an ephemeral drainage line located in offset north.

*Size:* Approximately 1.5m wide, 1.5m long and 0.5m deep.

*Change:* No significant erosion has occurred since the previous monitoring period.

*Action required:* Continued bi-annual monitoring and targeted monitoring following heavy rains.

**Erosion Point 15:**

*Description:* Heavily vegetated erosion point along small ephemeral drainage line. Undercutting forming and ponding.

*Size:* Approximately 1m long, 1m wide, 0.5m deep

*Change:* No significant erosion has occurred since the previous monitoring period.

*Action required:* No ground works required at this stage. Continue to monitor and re-assess following soil testing

***Erosion Point 16:***

*Description: Active erosion likely to be present with evidence of plunge pool formation and ponding.*

*Size: Approximately 3.0m long, 1.5m wide, 1.0m deep*

*Change:* No significant erosion has occurred since the previous monitoring period. Some slight erosion is occurring at the head cut.

*Action required: No ground works required at this stage. Continue to monitor and re-assess following soil testing.*

***Erosion Point 17:***

*Description*: Located along an ephemeral drainage line within northern offset. Evidence of recent erosion, undercutting, pooling and in-stream vegetation.

*Size:* Approximately 2.5m wide, 2.5m long and 1.0m deep.

*Change:* Some erosion has occurred since the previous monitoring period at the gully head.

*Action required:* No ground works required at this stage. Continue to monitor and re-assess following soil testing.

***Erosion Point 18:***

*Description: Located along an ephemeral drainage line within northern offset. Evidence of stream bed exposure, pooling and in-stream vegetation.*

*Size: Approximately1.5m deep, 3.0m wide, 4.0m long.*

*Change:* No erosion has occurred since the previous monitoring period.

*Action required: No ground works required at this stage. Continue to monitor and re-assess following soil testing.*

***Erosion Point 19:***

*Description: Located in the southern offset, to the east of the Dam. Game trail crosses erosion point.*

*Size: 0.3m wide, 0.3m deep, 1m long*

*Action required: No action is required at this stage. Incorporation into future monitoring works is recommended.*

| | |
|---|---|
| Not available – Erosion point added spring 2012 |  |

***Erosion Point 20:***

*Description: Located in the southern offset, to the east of the Dam. Base of head gully has exposed bedrock, low risk of additional erosion.*

*Size: 1-2m wide, 0.9m deep, 2m long*

*Action required: No action is required at this stage. Incorporation into future monitoring works is recommended.*

| | |
|---|---|
| Not available – Erosion point added spring 2012 |  |

***Erosion Point 21:***

*Description: Located west (just downstream) from the access track running along the western boundary in the northern offset. The site has developed a plunge pool, which has exposed the bedrock in some parts.*

*Size: 1-2m wide, 0.6m deep, 1.5-3m long*

*Action required: No action is required at this stage. Incorporation into future monitoring works is recommended.*

| | |
|---|---|
| Not available – Erosion point added spring 2012 |  |

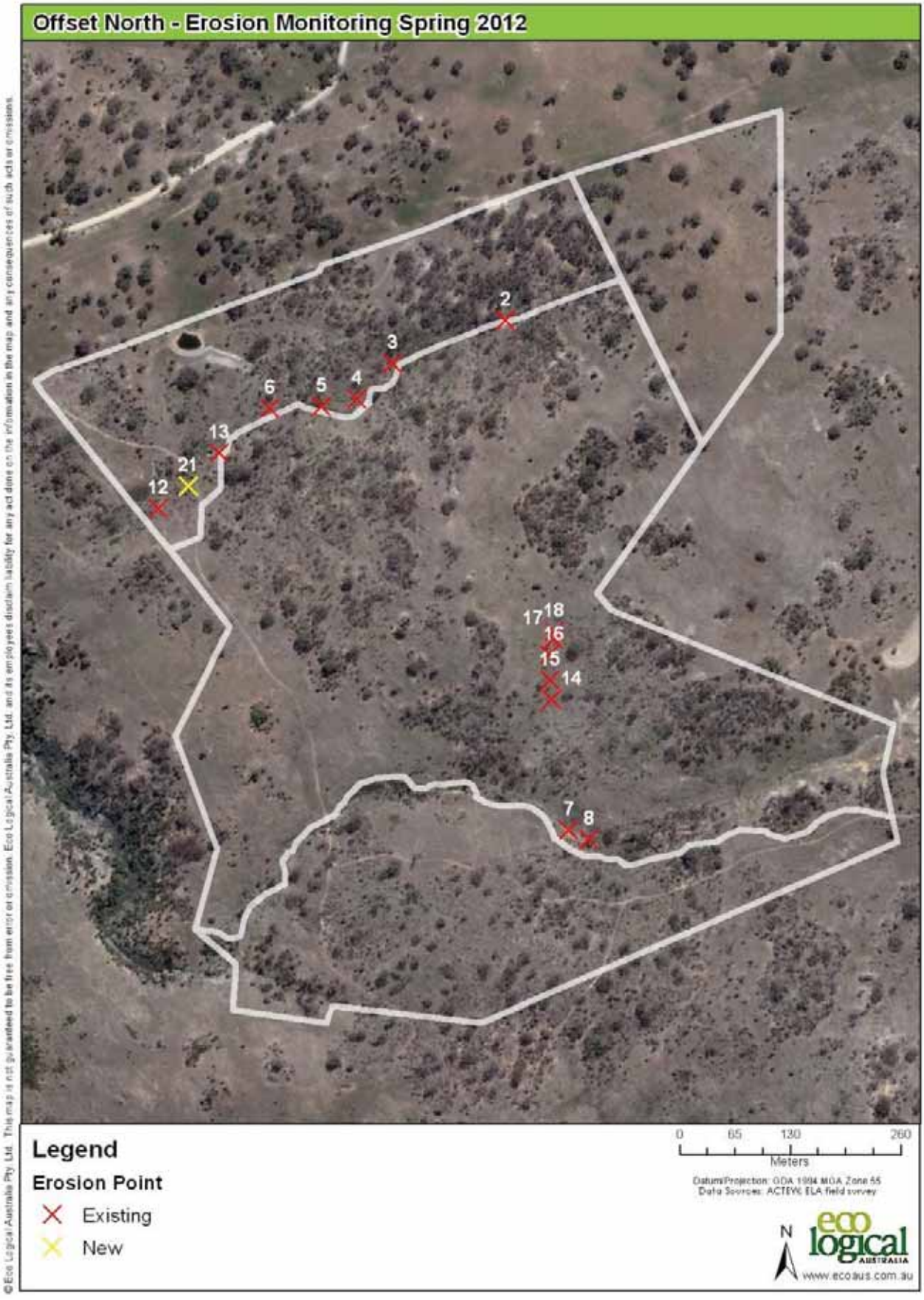


**Figure 14: Erosion monitoring points in northern offset**


**Figure 15: Erosion monitoring points in southern offset**

# 5 Feral Animal Monitoring

In accordance with the Feral Animal Sub-plan (see ODP) monitoring of the offset site for feral animal activity is being undertaken on a bi-annual basis to inform potential future feral animal control actions. The monitoring results for the first year's spring survey are presented below.

In addition, the Autumn 2012 Monitoring Report identified the occurrence of a moderate number of Feral Pigs (*Sus scrofa*) across the offset site and recommended targeted control to be implemented. Also presented below are the results of the targeted Feral Pig control.

## 5.1 FERAL ANIMAL MONITORING METHODOLOGY

Feral animal monitoring has been undertaken using random meander survey techniques and opportunistic observations while undertaking monitoring surveys for other sub-plans outlined in the ODP. Opportunistic observations included details of feral animal disturbance, tracks or scats.

In addition, the use of infra-red cameras was recommended as a monitoring method in the Autumn 2012 Monitoring Report. Remote cameras have been used with success in the United States in determining the presence of Feral Pigs, estimating abundance, and determining trapping success (Hamrick et al., 2011). An infra-red camera was set-up in the southern offset as a trial to detect the occurrence of feral animals within the offsite. The infra-red camera was set up for 7 nights overlooking a game trail near the dam in the southern offset.

## 5.2 MANAGEMENT ACTIONS TO DATE

The autumn monitoring surveys identified feral pigs within the offset property. Prior to the autumn monitoring, this species had not previously been observed. Disturbance within the offset included pig rooting, often in areas associated with a forage source, and tracks through boggier areas of the site. The disturbance caused by the pigs was locally significant but at a low density across the whole of the offset.

The '*Predation, habitat degradation, competition and disease transmission by feral pigs*' are listed as a key threatening process under the EPBC Act. Feral Pigs compete with native species for food and shelter resources and actively contribute to erosion and land degradation. The impact of feral pigs on threatened plants and ecological communities present within the offset site needs to be monitored and appropriately managed using adaptive management techniques.

It was recommended that the level of disturbance be monitored and appropriate action taken if the level of disturbance increased significantly.

### 5.2.1 Feral Pig Control (Regional Feral Animal Control)

In response to the recommended action, Regional Feral Animal Control (RFAC) was engaged to conduct control activities at the M2G offset site from 11th September 2012 to 3rd October

2012. The offset site was divided into 3 sections based on areas where pigs were frequenting. The method of control included the following procedures:

- Free feeding stations was set up and feed provided daily until evidence of pig usage occurred
- A central station was then established once free feeds were taken. Cameras were established to monitor numbers and to confirm feed was still being taken.
- A baited trap was then set up to capture pigs.

A total of 21 pigs were trapped and destroyed over the control period. Follow-up monitoring (17th October) conducted by RFAC two weeks following control period did not record any fresh signs of Feral Pigs.

**Photos**: Bait stations and trapped pigs (photos taken by RFAC).

## 5.3 FERAL ANIMAL MONITORING RESULTS

Monitoring of feral animals using infra-red cameras and opportunistic observations was conducted as part of the spring monitoring surveys. The observations included:

- Feral Pigs (*Sus scrofa*): No signs of Feral Pigs were recorded across the northern and southern offset (monitoring occurred post Feral Pig control).
- Feral goats (*Capra aegagrus hircus*): The infra-red camera recorded upwards of twenty (20+) individuals on a single occasion.
- European Foxes (*Vulpes vulpes*): Two foxes were recorded within the offset site. One was recorded from the opportunistic observations and the other from the infra-red camera
- European Rabbits (*Oryctolagus cuniculus*): Signs (scats and infrequently used warren) of low rabbit presence / abundance were observed.

### 5.4 RECOMMENDATIONS

It is recommended that ACTEW liaise with TAMS to determine the best approach for Feral Goat control within the offset site and broader region. It is likely that the Feral Goats primarily utilise the adjacent river corridor and are transient within the offset site. A broader approach to conducting Feral Goat control is therefore expected to be the most efficient and successful use of resources.

It is also recommended to continue monitoring as outlined in the Feral Animal Management Sub-Plan to monitoring the presence and abundance of Foxes, Rabbits and Pigs.

# 6 Fencing Monitoring

## 6.1 MANAGEMENT ACTIONS TO DATE

Fencing of the offset site is one of the actions highlighted to be undertaken in the ODP. Fencing is required to prevent grazers such as sheep and cattle entering the offset site from the neighbouring properties. The primary aim of a stock proof fence is to keep grazing stock out of an area (e.g. conservation area) where it is bordered by a private rural property. This type of fencing generally consists of 4 or 5 stranded wire (including 2 or 3 barbed wire strands) with wooden posts and/or star-pickets, approximately 1.2 m high.

In July 2012, Tennant Rural undertook works to remove the existing fence and erect a new fence along the southern boundary of the Williamsdale property (**Figure 16**). The fence was built to specifications to exclude both cattle and sheep (5 wires and 2 barbed wires). The fence was approximately 1.6km in length and included the replacement of 3 gateways.

## 6.2 FENCING MONITORING METHODOLOGY

A full survey of the fence line was not undertaken as part of the spring 2012 monitoring surveys, as the erection of the new southern boundary fence had just taken place. It is considered that a full survey of the fence line will be required during the autumn 2012 surveys. Particular attention should be paid to points along the boundary fence that were identified as possibly requiring repair during the autumn 2012 monitoring surveys.

## 6.3 FENCING MONITORING RESULTS

The ODP and Autumn 2012 Monitoring Report identified points along the Williamsdale property boundary fence that are likely to require maintenance (excluding the southern boundary fence that required full replacement); however no maintenance has been conducted to date. These points are displayed in **Figure 16** below.

The condition of the current fence outlined below is a combination of the works completed to date and the autumn 2012 monitoring surveys:

- *Northern boundary*: The northern boundary fence is considered adequate along most of its length. However, minor maintenance is recommended to be undertaken in a few points along the north-eastern section. Whilst the fence is still capable of excluding cattle and sheep, further degradation in the short to medium term may present opportunities for sheep to enter through enlarging holes.
- *Eastern boundary*: The eastern boundary fence adjacent to the Monaro Highway is considered adequate to exclude stock. Some points along southern end of the eastern boundary were identified as slightly degraded and/or is recommended for maintenance.
- *Western boundary*: The western boundary fence is adequate to exclude stock.
- *Southern boundary*: The southern boundary fence is adequate to exclude stock.

## 6.4 RECOMMENDATIONS

Management actions recommended to be undertaken in 2013 by ACTEW Water include:

- Repair points / sections along the boundary fence identified in **Figure 17**.
- Remove erroneous internal fencing.

The Fencing Management Sub-Plan proposed that ACTEW Water "*Investigate the possibility of removing panels from this internal fencing to potentially reduce wildlife movement restrictions and injury risks to wildlife*", but did not specify a timeframe for implementation. The removal of the internal fences would enhance the wildlife friendly nature of the offset site and be consistent with the biodiversity conservation ideals of the ODP and associated sub-plans.

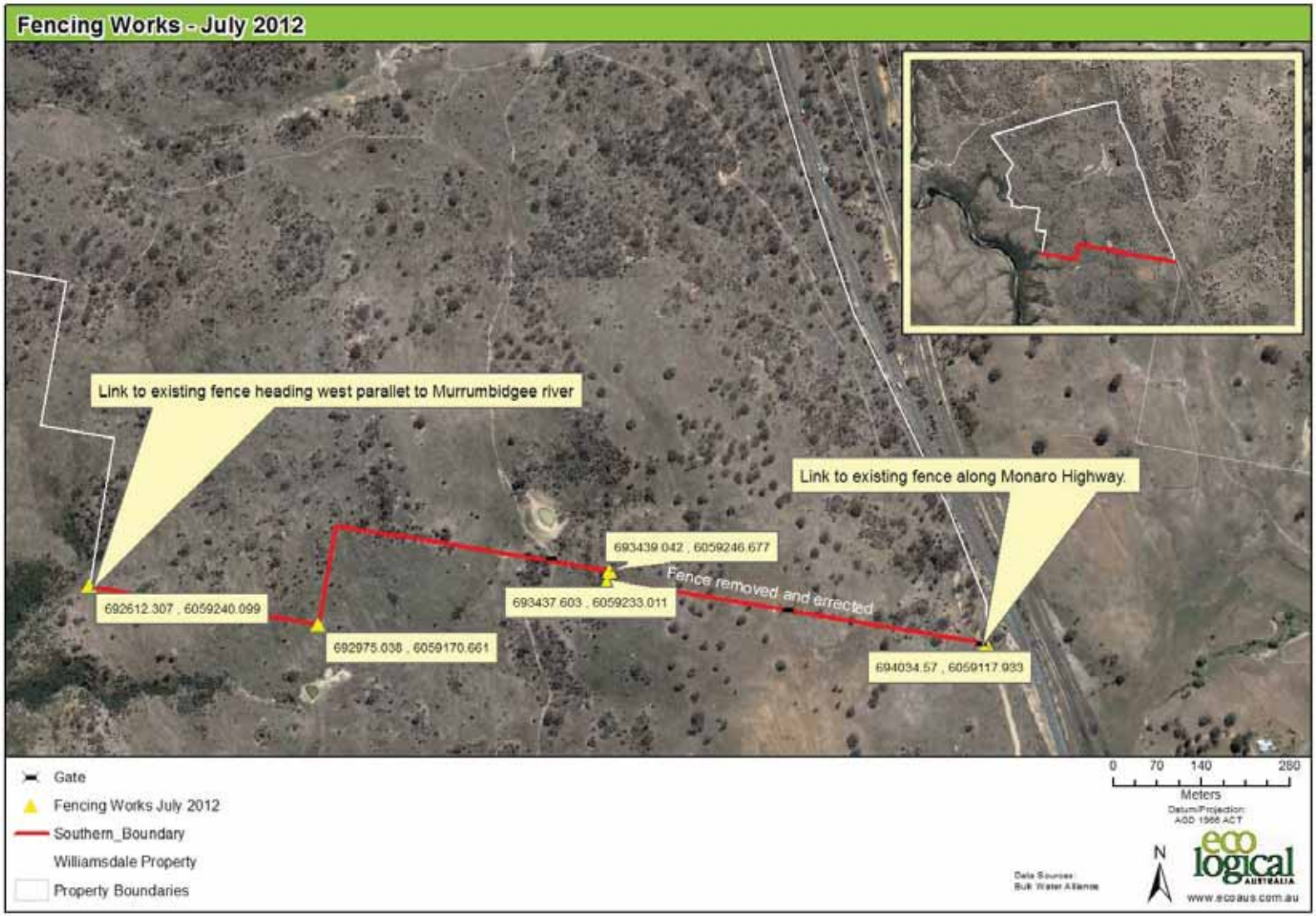


**Figure 16: Williamsdale property southern boundary fence**

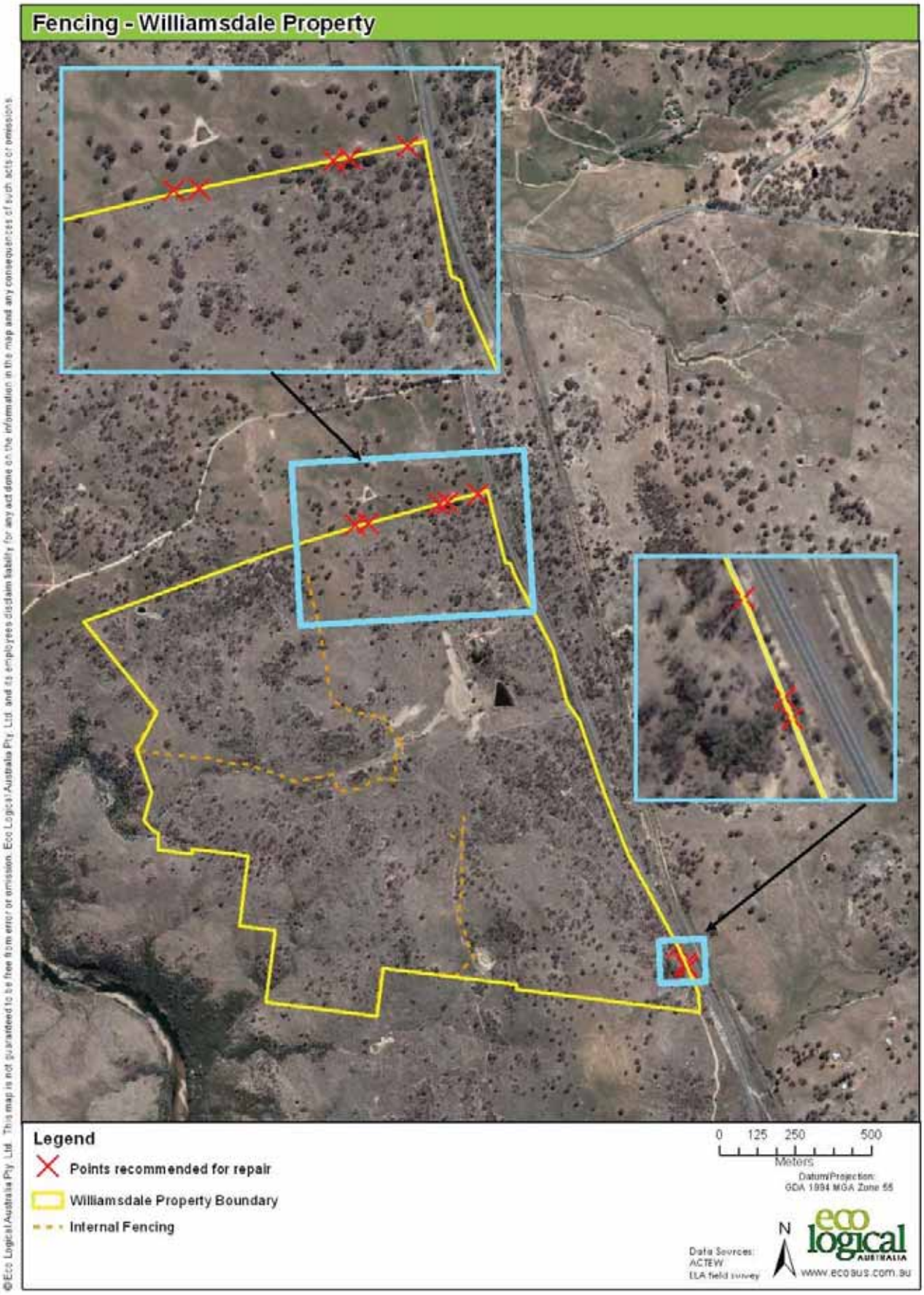


**Figure 17: Williamsdale property fence with points recommended for repair**

# 7 Summary

A summary of the actions relating to the offset site is provided in **Table 3** below and includes the recommended adaptive management actions based on the results presented in the above sections. The management actions proposed are described according to the corresponding Management Unit.

The primary on-ground works that were undertaken in 2012 (to date) include:

- Erection of new Williamsdale property southern boundary fence (July 2012)
- Feral Pig control (September 2012)
- Weed Control for African Lovegrass and Serrated Tussock (July 2012)
- Weed Control for other weed species (to be completed)
- Soil sampling as part of the Erosion Management Sub-Plan (currently being conducted)
- Spring 2012 monitoring surveys

**Table 3: Summary of proposed actions within each Management Unit***

*Highlighted cells indicate tasks to be completed, or currently under action. Monitoring is excluded as a task. Monitoring is on-going.

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| MU1A | *Weeds*: Control required for *R. rubiginosa, H. perforatum, C. lanatus* and *N. trichotoma*. | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: Possible revegetation of over storey Eucalypt species and / or native grasses. | To be completed / to be revised. | Over-storey planting possible after first years weed control. May not be required as natural regeneration evident. |
| | *Fencing*: Property fencing is required along the southern border of the Management Unit (ACT/NSW border). | Completed in August 2012. | N/A |
| | *Feral Animal Control*: Low numbers of rabbits were observed on site. No control required at this stage. Monitoring to establish control in the future. | Pig control was undertaken in September and October 2012. Monitoring in progress. | Pigs were observed after OPD completion. Targeted pig control was implemented with follow up monitoring occurring. No pigs have been evident following control. |
| | *Sediment and Erosion Control*: No sediment and erosion required at present. Monitoring to establish control in the future. | No action required. | Continue monitoring. |
| | *Monitoring Plot*: Plot has been established in centre of MU, within an area potentially requiring revegetation and high weed control. | Plot set up and 2012 monitoring complete. | Weed control for noxious species successful. May reconsider revegetation of over-storey species. |

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| MU1B | *Weeds*: Control required for *R. rubiginosa, H. perforatum* and *E. curvula*. | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: Possible revegetation of over storey Eucalypt species. | To be completed / to be revised. | Over-storey planting possible after first years weed control. May not be required as natural regeneration evident. |
| | *Fencing*: Property fencing is required along the southern border of the Management Unit (ACT/NSW border). | Completed in August 2012. | N/A |
| | *Feral Animal Control*: Low numbers of rabbits were observed on site. No control required at this stage. Monitoring to establish control in the future. | Pig control was undertaken in September and October 2012. Monitoring in progress. | Pigs were observed after OPD completion. Targeted pig control was implemented with follow up monitoring occurring. No pigs have been evident following control. |
| | *Erosion Control*: Limited control may be required for minor erosion on north-south drainage line and along the western edge. | Currently undertaking soil testing. | Targeted monitoring following heavy rain events for specified erosion points. Soil testing to inform control action if required. |
| | *Monitoring Plot*: No monitoring plot was established in this area. | Plot set up and 2012 monitoring complete. | N/A |
| MU2A | *Weeds*: Control required for *R. rubiginosa* and *H. perforatum*. | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: No revegetation required. | No action required. | N/A |

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| | *Fencing*: No fencing required. | No action required. | N/A |
| | *Feral Animal Control*: No feral animal control required at present. Monitoring to establish control in the future. | Monitoring in progress. | Pig control completed in other MU's of offset site. |
| | *Sediment and Erosion Control*: No sediment and erosion required at present. Monitoring to establish control in the future. | No action required. | N/A |
| | *Monitoring Plot*: No monitoring plot established in this area. | Plot set up and 2012 monitoring complete. | Continue monitoring. |
| **MU2B** | *Weeds*: Control required for *R. rubiginosa, H. perforatum* and *N. trichotoma*. | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: No revegetation required. | No action required. | N/A |
| | *Fencing*: No fencing required. | No action required. | N/A |
| | *Feral Animal Control*: No feral animal control required at present. Monitoring to establish control in the future. | Monitoring in progress. | Pig control completed in other MU's of offset site. |
| | *Erosion Control*: No sediment and erosion required at present. Monitoring to establish control in the future. | No action required | Continue monitoring. |

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| | *Monitoring Plot*: Establish monitoring plot. | Plot set up and 2012 monitoring complete. | N/A |
| **MU3** | *Weeds*: Control required for *H. perforatum* and heavy infestations of *R. rubiginosa* (particularly within 30-40m of Monaro Highway). | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: No revegetation required. | No action required. | N/A |
| | *Fencing*: Fencing is required along the southern border of the MU (ACT/NSW border). | Completed in August 2012. | Completed in August 2012. |
| | *Feral Animal Control*: No feral animal control required at present. Monitoring to establish control in the future. | Pig control was undertaken in September and October 2012. Monitoring in progress. | Pigs were observed after OPD completion. Targeted pig control was implemented with follow up monitoring occurring. No pigs have been evident following control. |
| | *Erosion Control*: No sediment and erosion required at present. Monitoring to establish control in the future. | Currently undertaking soil testing | Targeted monitoring following heavy rain events for specified erosion points. Soil testing will inform appropriate erosion control measures if required. |
| | *Monitoring Plot*: Two monitoring plots were established within MU3. The northern monitoring plot will function as a control plot. | Plot set up and 2012 monitoring complete. | N/A |
| **MU4** | *Weeds*: Control required for *R. fruticosus*, *H. perforatum*, *R. rubiginosa* and other woody weeds. Heavy infestations around drainage lines and dam. | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| | *Revegetation*: Possible revegetation surrounding the dam following weed control could be beneficial. | To be completed | Determine whether revegetation is required around dam after weed control is completed. |
| | *Fencing*: No fencing required. | No action required | N/A |
| | *Feral Animal Control*: No feral animal control required at present. Monitoring to establish control in the future. | Pig control was undertaken in September and October 2012. Monitoring in progress. | Pigs were observed after OPD completion. Targeted pig control was implemented with follow up monitoring occurring. No pigs have been evident following control. |
| | *Erosion Control*: Erosion control may be required within the east-west drainage line east of the dam. | Currently undertaking soil testing. | Targeted monitoring following heavy rain events for specified erosion points. Soil testing will inform appropriate erosion control measures if required. |
| | *Monitoring Plot*: Monitoring plot established in the north-eastern section of the MU. | Plot set up and 2012 monitoring complete. | N/A |
| **MU5** | *Weeds*: Control required for *R. rubiginosa* and *H. perforatum*. | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: No revegetation required. | No action required. | N/A |
| | *Fencing*: Fencing may be required for the south-western corner of MU. | In progress – consideration for removal of internal fencing. | Fencing not required for south-west corner. Consider removing internal property fences. |

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| | *Feral Animal Control*: No feral animal control required at present. Monitoring to establish control in the future. | Pig control was undertaken in September and October 2012. Monitoring in progress. | Pigs were observed after OPD completion. Targeted pig control was implemented with follow up monitoring occurring. No pigs have been evident following control. |
| | *Erosion Control*: Sediment and erosion control is unlikely to be required at present. | No action required. | No erosion points currently with MU. |
| | *Monitoring Plot*: Monitoring plot established in the centre of the MU to serve as a control site. | Plot set up and 2012 monitoring complete. | N/A |
| | *Note*: MU5 does not include the main drainage line running east-west through the offset site. | N/A | N/A |
| **MU6** | *Weeds*: Control required for *R. rubiginosa* and *H. perforatum*. Heavy infestations of *R. rubiginosa* occur along the drainage lines. | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: No revegetation required. | No action required. | N/A |
| | *Fencing*: No fencing required. | In progress – consideration for removal of internal fencing. | Consider removing internal property fences. |
| | *Feral Animal Control*: No feral animal control required at present. Monitoring to establish control in the future. | Pig control was undertaken in September and October 2012. Monitoring in progress. | Pigs were observed after OPD completion. Targeted pig control was implemented with follow up monitoring occurring. No pigs have been evident following control. |

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| | *Erosion Control*: Sediment and erosion control may be required in the main drainage line running east-west. Establish permanent photo monitoring point for erosion with main-drainage line | Currently undertaking soil testing | Targeted monitoring following heavy rain events. Soil testing will inform appropriate erosion control measures if required. |
| | *Monitoring Plot*: Monitoring plot established in the far east of the MU within an area of moderate to high Sweet Briar abundance. | Plot set up and 2012 monitoring complete. | N/A |
| | *Note*: MU6 includes the drainage line running East-West through the offset site. | N/A | N/A |
| **MU7** | *Weeds*: *R. rubiginosa* control will be required | Control for *N. trichotoma* and *E. curvula* commenced. Other species scheduled for January 2013. | Maintain weed control program as outlined in ODP. |
| | *Revegetation*: Possible ground-layer rehabilitation maybe required. Monitoring of weed control success will inform rehabilitation needs. | To be completed | Determine whether revegetation is required for groundlayer after weed control is completed. Note, includes electricity easement so no overstorey planting permitted. |
| | *Fencing*: No fencing required. | In progress – consideration for removal of internal fencing. | Consider removing internal property fences. |
| | *Feral Animal Control*: No feral animal control required at present. Monitoring to establish control in the future. | Monitoring in progress. | Pig control completed in other MU's of offset site. |

| MANAGEMENT UNITS | ODP PROPOSED MANAGEMENT ACTIONS | ACTION STATUS | COMMENTS (Spring Monitoring 2012) |
|---|---|---|---|
| | *Erosion Control*: Erosion control is unlikely to be required at present. Monitoring will determine if future control is required. | No action required. | No erosion points within MU. |
| | *Monitoring Plot*: Monitoring plot established within area that may require future rehabilitation of the ground-layer | Plot set up and 2012 monitoring complete. | N/A |

# 8 References

Department of Sustainability, Environment, Water, Population and Communities, 2011, The Feral Pig (*Sus scrofa*), Department of Sustainability, Environment, Water, Population and Communities, Australian Government, Canberra.

Department of Sustainability, Environment, Water, Population and Communities, 2011, The Feral Goat (*Capra hircus*), Department of Sustainability, Environment, Water, Population and Communities, Australian Government, Canberra.

Hamrick B, Smith M, Jaworowski C, Strickland B, 2011, *A landowners guide for wild pig management: Practical methods for wild pig control*, Mississippi State university Extension Service & Alabama Cooperative Extension System.

# Appendix A: Vegetation Monitoring Species List

+ = few, small cover (<5%)

r = solitary, small cover (<5%)

1 = numerous (up to 5%)

2 = 5-25%

3= 25-50%

4= 50-75%

5=>75%

Note: The species list for 'All' includes all species observed opportunistically and those observed inside the regular monitoring plots.

| NATIVE SPECIES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Plot Number | All | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Species | | MU1A | MU2B | MU3 | MU4 | MU5 | MU6 | MU7 | MU3 |
| *Acacia mearnsii* | ✓ | | | | | | | | |
| *Acacia rubida* | ✓ | | | | | | | | |
| *Acaena novae-zelandiae* | ✓ | | | | | | | | |
| *Acaena ovina* | ✓ | | + | 1 | + | 1 | 1 | | 1 |
| *Ajuga australis* | ✓ | | | | | r | | r | |
| *Aristida ramosa* | ✓ | | + | + | | r | + | | |
| *Arthropodium minus* | ✓ | | r | | | r | | | + |
| *Asperula conferta* | ✓ | | 1 | 1 | 1 | 1 | 1 | | 1 |
| *Asplenium flabellifolium* | ✓ | | | | | | | | |
| *Astroloma humifusum* | ✓ | | | | | | | | |
| *Austrodanthonia carphoides* | ✓ | | | | | | | | |
| *Austrodanthonia racemosa* | ✓ | | | | | | | | |
| *Austrodanthonia* sp. | ✓ | | 1 | 1 | | 1 | 1 | | 1 |
| *Austrostipa bigeniculata* | ✓ | 1 | 2 | | | | | | 2 |
| *Austrostipa densiflora* | ✓ | | | | | | | | |
| *Austrostipa scabra* | ✓ | 2 | 2 | | 1 | 1 | 3 | | |
| *Bossiaea buxifolia* | ✓ | | | | | | | | |
| *Bossiaea prostrata* | ✓ | | | | | 1 | r | | |
| *Bothriochloa macra* | ✓ | 1 | 1 | | 1 | + | + | | 1 |
| *Brachycome* sp. | ✓ | | | | | | | | |
| *Brachyloma daphnoides* | ✓ | | | | | | | | |
| *Bulbine bulbosa* | ✓ | | | r | | + | | | 1 |
| *Bursaria spinosa* | ✓ | | | r | | | | | |
| *Calocephalus citreus* | ✓ | | | r | | | | | |
| *Callitris endlicheri* | ✓ | | | | | | | | |
| *Carex appressa* | ✓ | | | | | | | r | |
| *Carex inversa* | ✓ | 2 | 1 | + | 1 | r | r | 2 | |
| *Cassinia aculeata* | ✓ | | | | | | r | | |
| *Cheilanthes sieberi* | ✓ | | 1 | + | | + | + | | + |
| *Chrysocephalum apiculatum* | ✓ | | 2 | 1 | | 1 | 1 | | 2 |
| *Chrysocephalum semipapposum* | ✓ | | | | | | + | | |
| *Clematis microphylla* | ✓ | | | + | r | r | r | | |
| *Convolvulus erubescens* | ✓ | 1 | 1 | | | | r | | |
| *Craspedia variabilis* | ✓ | | | | + | | | | |
| *Crassula sieberana* | ✓ | 1 | 1 | + | | + | 1 | | r |
| *Cryptandra amara* | ✓ | | | | | + | r | | |
| *Cymbonotus lawsonianus* | ✓ | | 1 | r | r | 1 | + | r | r |
| *Cymbopogon refractus* | ✓ | | | r | | | | | |
| *Cynoglossum suaveolens* | ✓ | | | | | | | | r |
| *Daucus glochidiatus* | ✓ | | + | + | | 1 | r | r | r |
| *Desmodium varians* | ✓ | + | 1 | + | | + | 1 | | r |
| *Dianella revoluta* | ✓ | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Dichondra repens* | ✓ | | + | r | | + | | | |
| *Dichopogon fimbriatus* | ✓ | | | | r | | | | |
| *Dillwynia sericea* | ✓ | | | | | | | | |
| *Drosera peltata* | ✓ | | | | | | | | + |
| *Einadia nutans* | ✓ | r | | | | | r | | |
| *Elymus scaber* | ✓ | | + | + | | + | r | | |
| *Enneapogon nigricans* | ✓ | | | | | | | | |
| *Epilobium billardiereanum* | ✓ | | r | | r | | | | |
| *Erigeron karvinskianus* | ✓ | | | | | | | | |
| *Erodium crinitum* | ✓ | + | | | | | | + | |
| *Eryngium ovinum* | ✓ | | | + | r | | | | |
| *Eucalyptus blakelyi* | ✓ | | r | + | r | r | r | | + |
| *Eucalyptus blakelyi (Juvenile)* | ✓ | r | 1 | 2 | + | 2 | 1 | | + |
| *Eucalyptus bridgesiana* | ✓ | | | | | | | | |
| *Eucalyptus dives* | ✓ | | | r | | | | | r |
| *Eucalyptus mannifera* | ✓ | | | | | | | | |
| *Eucalyptus melliodora* | ✓ | | | | | | | | |
| *Euchiton* sp. | ✓ | + | 1 | 1 | | 1 | 1 | + | + |
| *Gallium gaudichaudii* | ✓ | | 1 | r | | 1 | + | | |
| *Geranium solanderi* | ✓ | | 1 | 1 | 1 | + | + | 1 | |
| *Geranium* sp. | ✓ | | | | + | 1 | + | | |
| *Glycine clandestina* | ✓ | | + | r | | r | | | |
| *Glycine tabacina* | ✓ | | | | | | | | |
| *Gonocarpus tetragynus* | ✓ | | | + | | 1 | | | 1 |
| *Goodenia hederacea* | ✓ | | | | | | | | |
| *Haloragis heterophylla* | ✓ | | r | 1 | 2 | + | | | 1 |
| *Hibbertia obtusifolia* | ✓ | | | | | | | | |
| *Hydrocotyle laxiflora* | ✓ | + | 1 | 1 | 1 | 1 | 1 | + | 1 |
| *Hypericum gramineum* | ✓ | | r | 1 | 1 | + | | | 1 |
| *Indigofera australis* | ✓ | | | | | | | | |
| *Isolepis* sp. | ✓ | | | r | | r | | | |
| *Joycea pallida* | ✓ | | | | | | | | |
| *Juncus* sp. | ✓ | | r | r | | r | | | |
| *Juncus* spp. | ✓ | | | | 1 | | | 1 | |
| *Kunzea ericoides* | ✓ | | | | | | | | |
| *Leucochrysum albicans* var. *tricolor* | ✓ | | | | | | | | |
| *Leptorhynchos squamatus* | ✓ | | | + | + | 2 | | | 1 |
| *Linum marginale* | ✓ | | | | | | | | |
| *Lomandra filiformis* | ✓ | | | + | + | + | + | | + |
| *Lomandra multiflora* | ✓ | | | r | | r | | | |
| *Luzula densiflora* | ✓ | | | | | + | | | + |
| *Melichrus urceolatus* | ✓ | | | | | + | r | | r |
| *Microlaena stipoides* | ✓ | 2 | 1 | 1 | | | + | 1 | |
| *Microseris lanceolata* | ✓ | | r | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Microtis unifolia* | ✓ | | | | r | + | | | + |
| *Myosotis sylvatica* | ✓ | | | | 1 | r | + | | r |
| *Oreomyrrhis eriopoda* | ✓ | | | | | | | | |
| *Oxalis perennans* | ✓ | 1 | 1 | + | | r | | 1 | |
| *Panicum effusum* | ✓ | | + | + | r | + | + | | |
| *Pimelea curviflora* | ✓ | | | | | | | | |
| *Plantago varia* | ✓ | r | | 1 | | + | | | |
| *Poa sieberiana* | ✓ | | | 1 | 1 | + | r | | 1 |
| *Pseudognaphalium luteoalbum* | ✓ | | | | | | | | r |
| *Pultenaea procumbens* | ✓ | | | | | | | | |
| *Ranunculus sp.* | ✓ | | | | r | | | r | |
| *Rumex brownii* | ✓ | + | r | + | 1 | + | + | + | |
| *Schoenus apogon* | ✓ | | 1 | 2 | 4 | 2 | | | 1 |
| *Sebaea ovata* | ✓ | | | | | + | + | | |
| *Senecio quadridentatus* | ✓ | r | r | | | r | r | | |
| *Solenogyne dominii* | ✓ | | | r | | r | + | | r |
| *Spergularia brevifolia* | ✓ | | | | | | | r | |
| *Stackhousia monogyna* | ✓ | | | + | | + | | | 1 |
| *Swainsona recta (propagated)* | ✓ | | | | | | | | |
| *Swainsona sericea* | ✓ | | | + | | 1 | | | |
| *Thelymitra pauciflora* | ✓ | | | | | | | | r |
| *Themeda australis* | ✓ | | | 4 | 3 | 3 | 1 | | 3 |
| *Thysanotus patersonii* | ✓ | | | | | | | | |
| *Thysanotus tuberosus* | ✓ | | | | | | | | |
| *Tricoryne elatior* | ✓ | | | | | | | | |
| *Triptilodiscus pygmaeus* | ✓ | | 1 | | | + | 1 | | + |
| *Veronica calycina* | ✓ | | | | | r | | | |
| *Vittadinia cuneata* | ✓ | | | | | + | + | | |
| *Vittadinia muelleri* | ✓ | r | 1 | | | + | + | | 1 |
| *Wahlenbergia luteola* | ✓ | | 1 | 1 | | + | 1 | | 1 |
| *Wahlenbergia* sp. | ✓ | | 1 | | | + | 1 | | 1 |
| *Wurmbea dioica* | ✓ | | | r | r | r | r | | 1 |
| **Total Native Species** | **199** | **18** | **40** | **48** | **30** | **60** | **45** | **15** | **41** |

| EXOTIC SPECIES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Plot Number | All | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Species | | MU1A | MU2B | MU3 | MU4 | MU5 | MU6 | MU7 | MU3 |
| *Acetosella vulgaris* | ✓ | | 1 | | 1 | | 1 | 1 | |
| *Aira* sp. | ✓ | 1 | 1 | 1 | 1 | 1 | 1 | | 1 |
| *Anagallis arvensis* | ✓ | | | r | | | | r | |
| *Arctotheca calendula* | ✓ | | | | | | 1 | | |
| *Briza minor* | ✓ | | | 1 | 1 | 1 | | | + |
| *Bromus diandrus* | ✓ | | | + | | | r | | |
| *Bromus hordeaceus* | ✓ | 1 | r | r | 1 | | + | 2 | |
| *Capsella bursa-pastoris* | ✓ | | | | | | | + | |
| *Carduus tenuiflorus* | ✓ | | | | | | | + | |
| *Carthamus lanatus* | ✓ | | | | | | | r | |
| *Centaurium erythraea* | ✓ | | | + | | r | | | + |
| *Cerastium* sp. | ✓ | | | r | | | | 1 | |
| *Cirsium vulgare* | ✓ | | | | r | | | | |
| *Conyza sp.* | ✓ | + | + | + | | + | | 1 | + |
| *Crataegus monogyna* | ✓ | | | | | | | | |
| *Cynosurus echinatus* | ✓ | | | | | | | | |
| *Cyperus eragrostis* | ✓ | | | | | | | + | |
| *Echium plantagineum* | ✓ | | | | | + | | | |
| *Eragrostis curvula* | ✓ | | | r | r | | | r | |
| *Erodium cicutarium* | ✓ | | | | | | | + | |
| *Holcus lanatus* | ✓ | | | | | | | | |
| *Hordeum* sp. | ✓ | 1 | | r | | | | 1 | |
| *Hypericum perforatum* | ✓ | | + | 1 | + | 1 | 1 | + | |
| *Hypochaeris radicata* | ✓ | + | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| *Linaria arvense* | ✓ | + | 1 | + | + | + | 1 | | |
| *Linaria pelisseriana* | ✓ | | | r | | + | | | 1 |
| *Lolium rigidum* | ✓ | + | | | | | | | |
| *Malva* sp. | ✓ | r | | | | | | + | |
| *Marrubium vulgare* | ✓ | | | | | | | r | |
| *Nassella trichotoma* | ✓ | | | | | | | | |
| *Onopordum acanthium* | ✓ | | | | | | | | |
| *Orobanche minor* | ✓ | | | r | | | | | |
| *Parentucellia latifolia* | ✓ | | | | | | | r | |
| *Paronychia brasiliana* | ✓ | 1 | + | r | | | 1 | 1 | + |
| *Petrorhagia nanteuilii* | ✓ | + | + | 1 | | + | + | r | 1 |
| *Plantago lanceolata* | ✓ | | r | 1 | 1 | 1 | + | 1 | |
| *Prunus* sp. | ✓ | | | | | | | | |
| *Rosa rubiginosa* | ✓ | r | r | 1 | 1 | 1 | + | 1 | r |
| *Rubus fruticosus* | ✓ | r | r | | r | | | | |
| *Sonchus sp.* | ✓ | | | r | | | | | r |
| *Taraxacum officinale* | ✓ | | | | | | + | | |
| *Tolpis umbellata* | ✓ | | r | + | | | + | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Trifolium arvense* | ✓ | 1 | 1 | 1 | | 1 | 1 | + | 1 |
| *Trifolium campestre* | ✓ | | + | 1 | 1 | 1 | 1 | 1 | 1 |
| *Trifolium glomeratum* | ✓ | | + | | + | 1 | + | + | 1 |
| *Trifolium repens* | ✓ | + | | + | | | | | |
| *Trifolium subterraneum* | ✓ | 1 | r | | | | | 3 | |
| *Trifolium* sp. | ✓ | | | r | | | | | |
| *Verbascum thapsus* | ✓ | r | | | | | r | r | |
| *Verbena bonariensis* | ✓ | | | | r | | | r | |
| *Vicia* sp. | ✓ | | | | | | | | |
| *Vulpia* sp. | ✓ | | | | + | 1 | | 2 | r |
| **Total Exotic Species** | **51** | **16** | **17** | **25** | **16** | **16** | **18** | **28** | **14** |

# Appendix B: Opportunistic Fauna Species

**Fauna species recorded in the Spring 2012, Autumn 2012 and the 2011 baseline monitoring surveys**

| Common Name | Latin Name | 2011 | 2012A | 2012B |
|---|---|---|---|---|
| Australasian Grebe | *Tachybaptus novaehollandiae* | | ✓ | |
| Australian Magpie | *Gymnorhina tibicen* | ✓ | ✓ | ✓ |
| Australian Raven | *Corvus coronoides* | ✓ | ✓ | ✓ |
| Australian Wood Duck | *Chenonetta jubata* | | | ✓ |
| Black-faced Cuckoo-Shrike | *Coracina novaehollandiae* | | ✓ | ✓ |
| Common Bronzewing | *Phaps chalcoptera* | ✓ | | |
| Diamond Firetail | *Stagonopleura guttata* | ✓ | | |
| Galah | *Eolophus roseicapillus* | ✓ | | ✓ |
| Grey Butcherbird | *Cracticus torquatus* | | ✓ | ✓ |
| Grey Fantail | *Rhipidura albiscapa* | ✓ | ✓ | ✓ |
| Grey Shrike-Thrush | *Colluricincla harmonica* | | ✓ | |
| Hard Head | *Aythya australis* | | | ✓ |
| Honeyeater, White-Eared | *Lichenostomus penicillatus* | ✓ | ✓ | |
| Honeyeater, Yellow Faced | *Lichenostomus chrysops* | | | ✓ |
| Jacky Winter | *Microeca fascinans* | ✓ | | ✓ |
| Kookaburra | *Dacelo novaeguineae* | ✓ | | ✓ |
| Leaden Flycatcher | *Myiagra rubecula* | | | ✓ |
| Magpie Lark | *Grallina cyanoleuca* | ✓ | ✓ | ✓ |
| Noisy Friarbird | *Philemon corniculatus* | | | ✓ |
| Noisy Miner | *Manorina melanocephala* | ✓ | ✓ | ✓ |
| Pacific Black Duck | *Anas superciliosa* | | | ✓ |
| Pardalote, Spotted | *Pardalotus punctatus* | ✓ | ✓ | ✓ |
| Pardalote, Striated | *Pardalotus striatus* | ✓ | | ✓ |
| Pied Currawong | *Strepera graculina* | ✓ | ✓ | ✓ |
| Quail | *Coturnix sp.* | ✓ | | |
| Red-Browed Finch | *Neochmia temporalis* | | | ✓ |
| Robin, Flame | *Petroica phoenicea* | ✓ | | |
| Robin, Hooded | *Melanodryas cucullata cucullata* | ✓ | | |
| Robin, Scarlet | *Petroica boodang* | | ✓ | |
| Rosella, Crimson | *Platycercus elegans* | ✓ | ✓ | ✓ |
| Rosella, Eastern | *Platycercus adscitus* | ✓ | ✓ | ✓ |
| Sacred Kingfisher | *Todiramphus sanctus* | | | ✓ |
| Sulphur-Crested Cockatoo | *Cacatua galerita* | ✓ | | ✓ |
| Superb Fairy Wren | *Malurus cyaneus* | ✓ | ✓ | ✓ |
| Thornbill, Brown | *Acanthiza pusilla* | ✓ | | ✓ |

| | | | | |
|---|---|---|---|---|
| Thornbill, Yellow | *Acanthiza nana* | ✓ | | |
| Thornbill, Yellow-Rumped | *Acanthiza chrysorrhoa* | ✓ | ✓ | ✓ |
| Wedge-Tailed Eagle | *Aquila audax* | ✓ | ✓ | ✓ |
| Whistler, Golden | *Pachycephala pectoralis* | ✓ | ✓ | |
| Whistler, Rufous | *Pachycephala rufiventris* | | | ✓ |
| White Throated Tree Creeper | *Cormobates leucophaeus* | ✓ | ✓ | ✓ |
| White-fronted Gerygone | *Gerygone olivacea* | | | ✓ |
| White-winged Chough | *Corcorax melanorhamphos* | | ✓ | ✓ |
| Willie Wagtail | *Rhipidura leucophrys* | ✓ | ✓ | ✓ |
| | | | | |
| **Mammals** | **Latin Name** | **2011** | **2012A** | **2012B** |
| Cow | *Bos Taurus* | ✓ | | |
| European Rabbit | *Oryctolagus cuniculus* | ✓ | ✓ | ✓ |
| Feral Goat | *Capra aegagrus hircus* | | ✓ | ✓ |
| **Feral Pig** | ***Sus scrofa*** | | ✓ | |
| Fox | *Vulpes vulpes* | ✓ | ✓ | ✓ |
| Kangaroo | *Macropus giganteus* | ✓ | ✓ | ✓ |
| Wombat | *Vombatus ursinus* | ✓ | ✓ | ✓ |
| | | | | |
| **Other** | **Latin Name** | **2011** | **2012A** | **2012B** |
| Eastern Bearded Dragon | *Pogona barbata* | | | ✓ |
| Eastern Common Froglet | *Crinia signifera* | | ✓ | ✓ |
| Eastern Long-necked Tortoise | *Chelodina longicollis* | | ✓ | |
| Mountain Dragon | *Rankinia diemensis* | ✓ | | |
| Plains Froglet | *Crinia parinsignifera* | | | ✓ |
| Spotted Marsh Frog | *Limnodynastes tasmaniensis* | | | ✓ |

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