



**Willogoleche Hill
EPBC Offset Area Investigation**

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Front cover photo: *Ptilopus spathulatus* (Pussy Tails) in offset area - Patch1.

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1 INTRODUCTION

EBS Ecology were contracted by Wind Prospect (on behalf of Willogoleche Power Pty Ltd) to undertake an assessment of *Lomandra* grassland communities as a potential offset to satisfy the requirements of DSEWPC in relation to the current EPBC assessment within the proposed Willogoleche Wind Farm project. The offset area is aimed at providing a representative patch of an Iron Grass Natural Temperate Grassland of South Australia community which can be restored and protected and provide an overall biodiversity gain. The patch must meet minimum criteria to qualify as a 'Class C' patch as listed under the *Commonwealth Listing Advice on Iron-grass Natural Temperate Grassland of South Australia* (TSSC 2007). Previously, suitable offset areas have been identified which are now lie within the boundaries of an environmental stewardship program. The program aims to maintain and / or improve the condition and extent of targeted matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999*. Patches of *Lomandra* grassland cannot be covered under multiple agreements and therefore suitable areas outside the stewardship program needed to be identified.

1.1 Objectives

The objectives of the project were to:

- Identify an offset area of at least 3.6ha in size as required by DSEWPC.
- Identify the vegetation type and condition of potential offset areas
- Identify the range and extent of *Lomandra* grasslands in potential offset areas
- Assess the condition of the *Lomandra* Grassland
- Make observations of any other potential benefits of offset area

2 BACKGROUND INFORMATION

The majority of Iron-grass grassland remnants are on land currently used for agricultural production, either in non-arable grazing areas, or non-arable patches within cropping land (Turner, 2010). This area is extensively grazed by sheep with other native grazing animals prevalent in the wider area.

EBS Ecology has conducted numerous ecological assessments within proximity of this site and all background information regarding this proposal should be referred to in the following reports:

- EBS (2010) *Willogoleche Wind Farm B-WTG01 – BWTG10 and B-WTG12, Ecological Assessment.*
- EBS (2010) *Willogoleche Wind Farm Extension, Ecological Assessment.*
- EBS (2010) *Willogoleche Wind Farm Assessment against the EPBC Criteria for Iron-grass Grassland Threatened Ecological Community*
- EBS (2011) *Willogoleche Wind Farm Native Vegetation Clearance Report.*

2.1 Site details

The patches assessed as part of this survey are located on the western foot slopes of Willogoleche Hill (

Figure 1). The slopes are gentle to moderate with clay loam soils of very shallow depths with rock outcropping occurring throughout. Slopes further to the west of these patches are used for cropping and grazing where the soil depth allows tillage. Some pasture improvement is evident throughout the foot slope areas, most likely through periodical addition of phosphorus fertilizers and legume broadcast seeding.

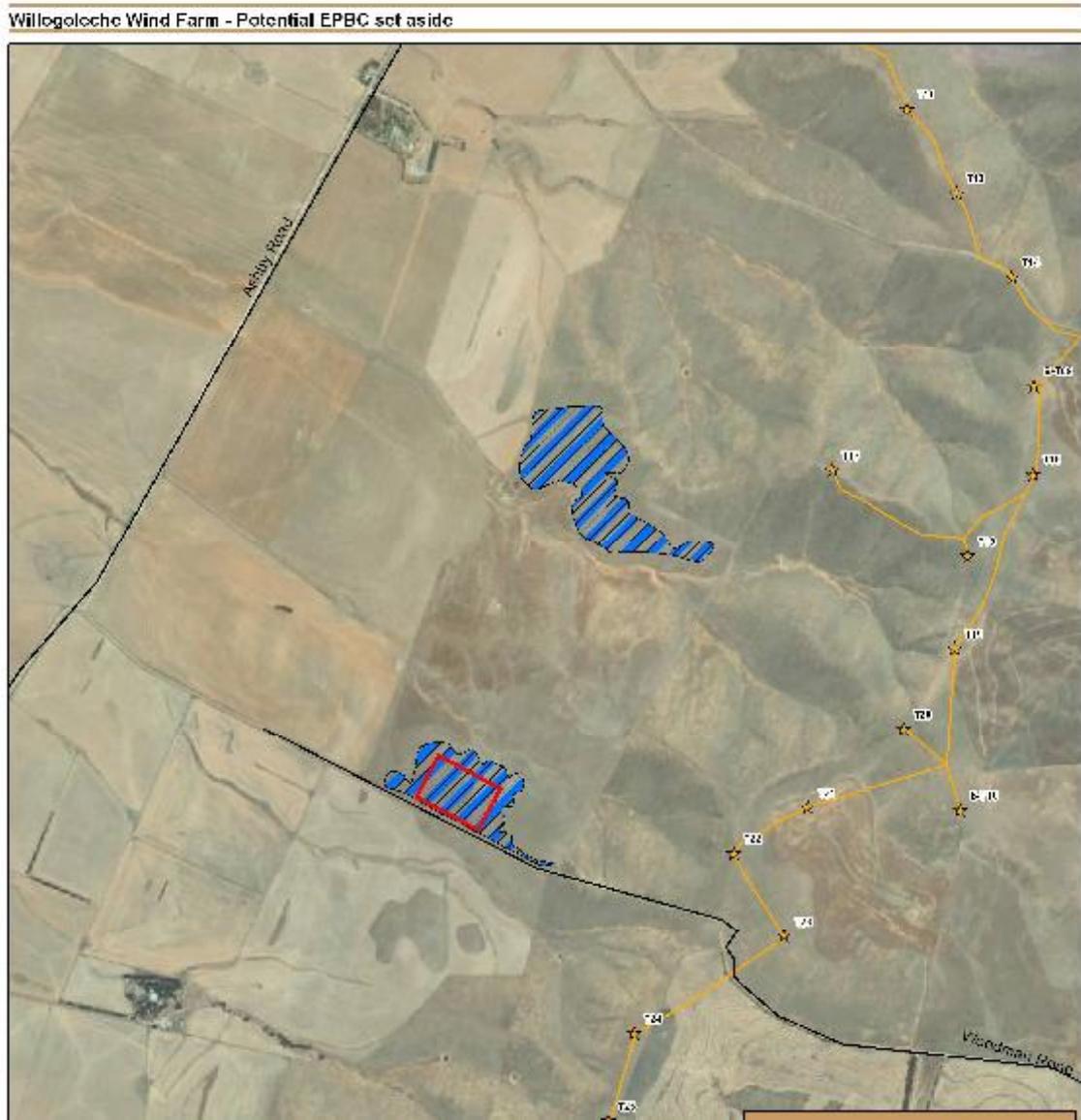


Figure 1. Survey location and assessment sites.

3 METHODS

Targeted surveys for the potential offset areas were undertaken following communication with the landowner and having previous knowledge of the vegetation associations present in the wider area. The survey was undertaken at a time of year which allowed for highest potential species diversity. This coincides with the emergence of annual herbaceous species and bulbous species from families such as Liliaceae (*Bulbine bulbosa*, *Wurmbea dioica*, and *Arthropodium* spp.), Stackhousiaceae (*Stackhousia monogyna*) and Orchidaceae.

3.1 Field survey

3.1.1 Species diversity

Species diversity totals were based on a 50 x 50m plot. These were measured with a tape and squared using an opti-square with each corner pegged. The plot was traversed on foot in a series of transects approximately five metres apart. All species observed within this plot were recorded with totals calculated to compare against benchmark criteria outlined in the *Commonwealth Listing Advice on Iron-grass Natural Temperate Grassland of South Australia* (Table 1) (TSSC 2007).

Table 1. Condition Classes for *Lomandra* grasslands.

Class	Minimum Size	Diversity of Native Species ¹	No. of Broad-leaved Herbaceous Species ¹ in addition to identified disturbance resistant species ²	No. of Perennial Grass Species ¹	Tussock Count ³
Listed ecological community					
A	0.1 ha	> 30	+10	≥5	1/m
B	0.25 ha	> 15	+3	>4	1/m
Degraded patches amenable to rehabilitation					
C		> 5	No minimum	≥1	No minimum

¹ As measured in a 50m X 50m quadrat;

² The following species are identified as disturbance resistant species: *Ptilotus spathulatus* forma *spathulatus*; *Sida corrugata*; *Oxalis perennans*; *Convolvulus erubescens*; *Euphorbia drummondii*; and, *Maireana enchylaenoides*; and,

³ As measured along a 50m transect.

3.1.2 Grassland extent

The extent of *Lomandra* grassland patches were recorded using hand held Garmin GPS (Accuracy +/- 15m) units which are carried around the extent of the grassland present. The track log was saved with the relevant patch number and entered into Arc GIS software to enable the total area to be calculated.

3.1.3 Tussock Density

Tussock density is calculated by using the point centred quarter method. This is used to quickly and accurately establish the population densities of any given species or stratum (Mitchell 2007). It is

considered that this is far more efficient than a plot method and more accurate for estimating cover than a qualitative measure over a wider area. Data was collected at 10m intervals along a 100m transect giving a total of ten replicates per transect. Approximate cover values were assigned based on individual tussocks covering an area of 50cm x 50cm each.

3.1.4 Fauna

Suitable offset areas containing *Lomandra* Grassland communities were checked for the presence of Pygmy Blue-tongue Lizards as the lower slopes in this area provide optimum habitat conditions for this species. This was conducted by using an opti-scope to check spider holes observed in the area.

4 RESULTS

The potential offset areas were assessed over two days (5th and 6th September 2012). A number of potential sites were highlighted prior to the site visit. Two of these were suitable for a thorough assessment due to having a dominant overstorey of *Lomandra multiflora* subsp. *dura* tussocks. Each of these sites were assessed using 50 x 50m plots and a point centred quarter for tussock density. The general vicinity of each site was checked for the presence of Pygmy Blue-tongue Lizards. The two patches qualify as Class C grasslands based species diversity and number of native grass species. There is no minimum for tussock counts and size of patch in this class.

4.1 Field survey

The two sites assessed were mapped with a hand held GPS unit. Patch one was the smallest area covering a total of just over 9 hectares. Patch 2 covered an area of over 14 hectares (Table 2).

Table 2. Patch area

Site	Area (Ha)
Patch 1	9.11
Patch 2	14.24
Total	23.35

4.1.1 Flora species

The two patches were assessed with 50 x 50m plots for species diversity. Patch 1 had a total of 17 species of which 9 were native indigenous species (Table 3). Patch 2 had a total of 15 species of which 7 were native indigenous species (Table 4).

Table 3. Offset patch 1 - 50 x 50m plot results.

Family Name	Scientific Name	Common Name	Introduced
LILIACEAE	<i>Lomandra multiflora</i> ssp. <i>dura</i>	Hard Mat-rush	
GERANIACEAE	<i>Erodium botrys</i>	Long Heron's-bill	*
BORAGINACEAE	<i>Echium plantagineum</i>	Salvation Jane	*
GRAMINEAE	<i>Avena barbata</i>	Bearded Oat	*
LEGUMINOSAE	<i>Trifolium</i> sp.	Clover	*
POLYGONACEAE	<i>Rumex</i> sp.	Dock	*
CHENOPODIACEAE	<i>Maireana enchylaenoides</i>	Wingless Fissure-plant	
COMPOSITAE	<i>Vittadinia cuneata</i> var.	Fuzzy New Holland Daisy	
COMPOSITAE	<i>Onopordum acaulon</i>	Horse Thistle	*
GRAMINEAE	<i>Austrostipa scabra</i> ssp.	Rough Spear-grass	
OXALIDACEAE	<i>Oxalis perennans</i>	Native Sorrel	
RHAMNACEAE	<i>Cryptandra amara</i> var.	Cryptandra	

Family Name	Scientific Name	Common Name	Introduced
GRAMINEAE	<i>Enneapogon nigricans</i>	Black-head Grass	
LEGUMINOSAE	<i>Medicago minima var. minima</i>	Little Medic	*
LABIATAE	<i>Salvia verbenaca var.</i>	Wild Sage	*
AMARANTHACEAE	<i>Ptilotus spathulatus</i>	Pussy-tails	
CARYOPHYLLACEAE	<i>Scleranthus pungens</i>	Prickly Knawel	
		Native	9
		Exotic	8
		Species Total	17

Table 4. Offset patch 2 - 50 x 50m plot results.

Family Name	Scientific Name	Common Name	Introduced
GRAMINEAE	<i>Austrostipa scabra ssp.</i>	Rough Spear-grass	
LILIACEAE	<i>Lomandra multiflora ssp. dura</i>	Hard Mat-rush	
COMPOSITAE	<i>Hypochaeris radicata</i>	Rough Cat's Ear	*
GRAMINEAE	<i>Avena barbata</i>	Bearded Oat	*
BORAGINACEAE	<i>Echium plantagineum</i>	Salvation Jane	*
LEGUMINOSAE	<i>Trifolium sp.</i>	Clover	*
LEGUMINOSAE	<i>Medicago minima var. minima</i>	Little Medic	*
GERANIACEAE	<i>Erodium botrys</i>	Long Heron's-bill	*
POLYGONACEAE	<i>Rumex sp.</i>	Dock	*
RUBIACEAE	<i>Asperula conferta</i>	Common Woodruff	
OXALIDACEAE	<i>Oxalis perennans</i>	Native Sorrel	
RHAMNACEAE	<i>Cryptandra amara var.</i>	Cryptandra	
ROSACEAE	<i>Acaena novae-zelandiae</i>	Biddy-biddy	
COMPOSITAE	<i>Vittadinia cuneata var.</i>	Fuzzy New Holland Daisy	
CONVOLVULACEAE	<i>Convolvulus erubescens complex</i>		
		Native	7
		Exotic	8
		Species Total	15

4.1.2 Lomandra Density

Point centred quarters were used to assess the density of the *Lomandra* tussocks as an indication to the cover they provide. An area previously assessed as a Class B grassland was also assessed to give an indicative value of area cover in a very good condition site.

Table 5. Lomandra density with reference patch and two offset areas.

Site	Lomandra density / ha	Approximate cover
Class B grassland	2,006	5.01%
Patch 1	1,238	3.09%
Patch 2	1,587	3.96%

4.1.3 Fauna species

Very few spider holes were observed in the general area. A total of three spider holes were found in the general area of the Lomandra patches. All holes had spiders occupying them at the time of the survey and no Pygmy Blue-tongue Lizards were recorded.

5 DISCUSSION

5.1 Species diversity

Both plots assessed as part of this survey had more than the minimum requirement of five indigenous species (Table 1). Species diversity was low in comparison to typical *Lomandra* grassland plots of this size. Dominant cover primarily consisted of *Medicago* (Medic Clovers), *Trifolium* spp. (Clovers) and *Avena barbata* (Wild Oats). These compete heavily with native species for available resources. Small herbaceous and shrubby native species such as *Vittadinia cuneata* (Fuzzy New Holland Daisy) and *Cryptandra amara* (Cryptandra) were subject to considerable grazing pressure at the time of the survey.

5.2 Tussock density

The density of *Lomandra* plants was assessed using a point centred quarter methodology. Previous literature gives cover of *Lomandra* tussocks in listed communities at 10 – 30% (Robertson 1998). This seems far higher than what is commonly observed in other good quality *Lomandra* patches and assessing cover based on a percentage range over a one hectare plot is extremely subjective. Less than 50% of *Lomandra* quadrats assessed as part of the Robertson survey contained greater than 5% cover so cover values assessed as part of this survey may be more typical for this community.

5.3 Community extent

Patch 1 was measured at 9.11ha and Patch 2 at 14.24ha. Fragmented *Lomandra* grasslands were recorded along the roadside adjacent to Patch 1 representing degraded edges of the wider community.

5.4 Pygmy Blue-tongue Lizards

It is unlikely that Pygmy Blue-tongue lizards would be found in the immediate area. The low slopes in this area are ideal habitat from a visual perspective. The number of spider holes found in the area was extremely low. These patches are very fragmented from other areas that support ideal habitat so it would be unlikely that these patches support Blue-tongue communities. Restoration and connectivity with the wider stewardship areas may allow an improvement in the overall quality of habitat and provide suitable conditions in the future.

5.5 Overall condition and management issues

The overall condition of Patch 1 and Patch 2 at the time of the survey was poor with vegetative cover being dominated by alien species. There were moderate numbers of native species present in the ground layer but these were being fairly heavily grazed, most probably by kangaroos and rabbits in addition to domestic stock. Significant weeds were not recorded in high densities throughout the wider area. Low densities of *Echium plantagineum* (Patterson's Curse) were widespread and scattered individual occurrences of *Onopordum acaulon* (Horse Thistle) were recorded. Primarily, weed

management will be focussed on reducing the nitrate in the soil which will enable native species to compete with the more aggressive annual grasses.

6 RECOMMENDATIONS

It is the opinion of EBS Ecology that Patch 1 (Figure 1) is the most suitable as an offset area for the following reasons:

- Patch 1 qualifies as Condition Class C when assessed against the benchmark criteria outlined in the *Commonwealth Listing Advice on Iron-grass Natural Temperate Grassland of South Australia* (Table 1) (TSSC 2007).
- Patch 1 can be more easily fenced due to the existing fencing on the boundary;
- Patch 1 adjoins the road reserve which also contains some fragmented remnants of the wider community;
- Patch 1 has a higher species diversity in the representative 50 x 50m plot; and
- Patch 1 can be accessed from the road reserve and therefore managed more easily.

Approximately 4ha within Patch 1 has been selected to establish the offset area. This area is part of the core community contained within Patch 1. It has a *Lomandra* density more consistent with the better reference communities within the wider area. A number of native species are also persisting Patch 1 despite current grazing regimes. Negotiations with the local council are recommended to avoid sub-lease of the adjacent road reserve as a grazing area and protection for the community on a long term basis would provide additional connectivity of the offset area to the stewardship area. A management plan outlining targets, goals, threats, management and monitoring comparisons with good quality reference communities within the region should be undertaken.

7 REFERENCES

Mitchell, K (2007) *Quantitative Analysis by the Point-Centred Quarter Method*, Department of Mathematics and Computer Science, Hobart and William Smith Colleges Geneva, NY 14456

Threatened Species Scientific Committee (TSSC) (2007) *Commonwealth Listing Advice on Iron-grass Natural Temperate Grassland of South Australia*, website, viewed on 13 September 2012, <<http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=37&status=Critically%20Endangered>>

Turner, J (2010) *National Recovery Plan for the Iron-grass Natural Temperate Grassland of South Australia ecological community*. Department of Environment and Natural Resources Adelaide SA.



EBS Ecology
3/107 Hayward Avenue
Torrensville, SA 5031
www.ebsecology.com.au
t. 08 7127 5607
f. 08 8354 2403

