



**Hornsedale Wind Farm SEB  
Native Vegetation and Pygmy Blue-tongue Lizard  
Management Plan**

# Hornsedale Wind Farm SEB Native Vegetation and Pygmy Blue-tongue Lizard Management Plan EPBC 2012/6573

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Prepared by EBS Ecology for Hornsdale Wind Farm Pty Ltd (HWF)

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Front cover photo: *Austrostipa scabra* (Spear Grass) +/- *Themeda triandra* (Kangaroo Grass) +/- *Aristida behriana* (Brush Wire-grass) Open Grassland within the Native Vegetation and PBTL offset area.

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## ACKNOWLEDGMENTS

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- Martin, Dom and Jim Clark, landholders.
- Anne Brown, Greening Australia and Millie Nichols, Mid North Grasslands Working Group for information on the management of native grasslands and existing Greening Australia programs.
- Mark Hutchinson, South Australian Museum, for assistance regarding PBTB management measures.

## EPBC Approval Conditions Reference Table

Ref	Condition	Condition Requirement	Plan reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
1	2	Secure the proposed offset site. Heritage agreement approved prior to construction.	Section 4.2	Advice from native veg regarding SEB offset area instead of Heritage Agreement.
2	3a	Textual description of the area and map to define locations and boundaries of the offset site.	Section 2 Property Details Figure 1. Location of proposed Hornsdale Wind Farm SEB area, Offset attributes	The plan describes the property details and map to clearly describe the location and boundaries of the offset area.
3	3b	Details of Management Actions to protect and enhance the extent and condition of habitat values of the offset site	4.5 Management measures required under the <i>EPBC Act</i> approval conditions	Details of Management actions include <ul style="list-style-type: none"> <li>• Limiting stocking rates</li> <li>• Additional fencing and water points</li> <li>• Weed management</li> <li>• Feral animal control</li> </ul>
4	3c	The timing, responsibilities and performance criteria for management actions	Table 3. Management actions. Table 4. Monitoring and evaluation criteria. Table 5. Ecological Indicators and desired outcomes	Management actions including monitoring on <ul style="list-style-type: none"> <li>• Landscape integrity                             <ul style="list-style-type: none"> <li>- soils and land surfaces</li> </ul> </li> <li>• Ecosystems                             <ul style="list-style-type: none"> <li>-Vegetation communities</li> <li>- Plant bio-mass management</li> <li>- Fauna</li> <li>- Pest fauna</li> </ul> </li> <li>• Research                             <ul style="list-style-type: none"> <li>-Improving knowledge</li> </ul> </li> <li>• Access Arrangements</li> </ul>
5	3d	Monitoring schedule including the undertaking of ecological surveys by a qualified ecologist to assess the success of the management actions against identified milestones and objectives	5 Annual Monitoring Program	Annual monitoring program includes <ul style="list-style-type: none"> <li>• Soil disturbance</li> <li>• Photo points and reference sites for vegetation communities</li> <li>• Grassland health monitoring</li> <li>• Weed</li> <li>• Initial map population and extent of PBTL</li> <li>• Annual PBTL population surveys</li> </ul>
6	3e	A process Report to the DotE	5.2.2 HWF / 'project owner'	Reporting requirements by the landholder include (to be passed on to project owner):

Ref	Condition	Condition Requirement	Plan reference	Demonstration of how the plan addresses condition requirements and commitments made in the plan to address condition requirements
				<ul style="list-style-type: none"> <li>• Paddock monitoring sheet</li> <li>• Activity Record sheet</li> </ul> Reporting requirements by the Project owner include: <ul style="list-style-type: none"> <li>• Annual monitoring and reporting requirements set out in the management plan</li> <li>• Submit an annual report to NVC and DoE including all monitoring results and actions undertaken in the offset area.</li> </ul>
7	3f	Description Risk Assessment	6 Risk management	Details including <ul style="list-style-type: none"> <li>• Change in Land use</li> <li>• Sale of property</li> <li>• Lack of funding/ lack of agreement with the landholder and HWF</li> <li>• Population decrease in PBTL</li> </ul>
8	3g	Details of parties responsible for management and monitoring and implementing the plan, including their position	Section 4	Details of parties responsible for Management actions are included in the plan
9		The offset plan must be approved prior to construction	n/a	Construction is yet to commence

## GLOSSARY AND ABBREVIATION OF TERMS

DEWNR	Department for Environment, Water and Natural Resources.
DotE	Department of the Environment. Commonwealth of Australia.
DSE	Dry Sheep Equivalent - Standard measure of feed demand which represents a 50 kg wether which consumes 1.0 kg dry matter per day. A pregnant or lactating ewe has a greater energy requirement, and the amount varies according to the advancing pregnancy, and the size of the lamb once it is born and feeding.
Greening Australia	Non-Government Conservation Organisation
HWF	Hornsedale Wind Farm Pty Ltd.
Native Vegetation Council	<p>The Native Vegetation Council (NVC) is an independent body established under the <i>Native Vegetation Act 1991</i>. The NVC monitors the overall condition of the state's vegetation and makes decisions on a wide range of matters concerning native vegetation in South Australia.</p>
Native Vegetation Council Secretariat	<p>Provides support to the Native Vegetation Council. Sits within the Native Vegetation &amp; Biodiversity Management Unit of DEWNR.</p>
PBTL	Pygmy Blue-tongue Lizard
Project owner	Hornsedale Wind Farm Pty Ltd is the project developer/ project owner for the Hornsedale Wind Farm. This involves the planning of the wind farm site, including seeking and obtaining relevant planning and environmental approvals under State and Federal legislation. The implementations of this SEB Management Plan will be the responsibility of the 'project owner'.

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# 1 BACKGROUND

Hornsedale Wind Farm Pty Ltd (HWF) is proposing to construct the Hornsedale Wind Farm north of Jamestown in the Mid North of South Australia. The project site extends about 15 km in a north-south direction, and about 8 km in an east-west direction, covering a site area of 75ha.

A Significant Environmental Benefit (SEB) associated with the Wind Farm has been calculated in the *Hornsedale Wind Farm Native Vegetation Clearance Report* (EBS, 2013), and is required to offset the clearance of native vegetation proposed to be removed to meet the SEB requirements under the *Native Vegetation Act, 1991*. As part of the approval process under the *Environmental Protection and Biodiversity Conservation Act, 1999*, an offset of 3.1 ha of habitat has been determined as a result of the potential impact on Pygmy Blue-tongue Lizard habitat. HWF have proposed to achieve these offsets through on-ground works identified on private property within the Wind Farm area. See Figure 1 for the location of the proposed SEB area.

The relevant approval references are 2013/3012/764 under the *Native Vegetation Act 1991* and EPBC 2012/6573 under the *Environment Protection and Biodiversity Conservation Act 2001* (EPBC Act).

HWF has negotiated an agreement with the landholders to manage the offset area (75 hectares) containing degraded native grassland and woodland communities. This site was previously being managed in accordance with a Greening Australia Southern Flinders Biodiversity Hotspots Management Plan (Greening Australia 2008). Whilst it will be the responsibility of the landholders to implement this plan, HWF will still be responsible for ensuring the plan is implemented to a suitable standard. If the implementation of the plan does not occur or is not the required standard, HWF, in consultation with the landholder, can undertake corrective action to ensure the plan is implemented. This may involve providing further direction to the landholder or utilising the resources of an external contractor to implement specific tasks.

The management plan for the offset area aims to assist in putting in place measures to provide long-term management strategies that will result in improvements in the vegetation condition and protection of Pygmy Blue-tongue Lizards. The offset area will be protected under the *Native Vegetation Act, 1991* and listed as a Significant Environmental Benefit Offset on the property title. Actions required for the implementation of the plan include the management of grazing, weed management and feral animal control.

The SEB area was selected based on a number of key considerations:

- Site contains a poor to moderate quality native grassland that could be improved over time with active management.
- Site contains a significant population (>150 individual) nationally endangered Pygmy Blue-tongue Lizards.
- Located within the Hornsedale Wind Farm Project area and the Northern and Yorke NRM Board area.

HWF's involvement in the management of the SEB area will continue for the life of the Hornsdale Wind Farm (25 years), at which time care and control of the SEB area will be the exclusive responsibility of the landowners, to be managed in perpetuity.

## **1.1 Aims / Objectives**

This plan aims to outline the proposed methodologies and set out the management and monitoring activities for a 10 year period, at which point it will be subject to review. More specifically the aims of the plan are to:

- Describe the area's biodiversity assets, including nationally threatened ecological communities and nationally and state threatened species
- Describe the primary threats to biodiversity
- Detail the management actions for improving the sites biodiversity value including management of grazing, weed and feral animal control program.
- Set out the proposed annual monitoring plan to measure the management success.

The core management objectives for the SEB area include:

- Provide suitable conditions to maintain or increase existing population numbers of PBTLs (including their habitat, refuges and habitat requirements and resources).
- Develop native grasslands with a rich diversity of species, and little disturbance from exotic weeds
- Provide grazing resources for pastoral activities
- Manage feral animal populations
- Provide the ability to establish long-term scientific monitoring sites.

Management issues and challenges associated with the conservation of Pygmy Blue-tongue Lizards include:

- Maintaining optimal habitat cover for the PBTL through grazing management
  - Particularly through times of drought when cover is diminished
  - Through extensive high rainfall periods when cover is exceptionally high
- Maintaining genetic diversity of the PBTL population
- Maintaining population stability and carrying capacity of the PBTL
- Protection from poaching for illegal trade
- Predation, from both native and exotic predators
- Widespread plague locust spraying and threats to PBTL prey items.



Figure 1. Location of proposed Hornsedale Wind Farm SEB area

## 2 PROPERTY DETAILS

### 2.1 Land Owner and Location Details

<b>Owner</b>	Clark Brothers Shorts Trust
<b>Manager</b>	Martin Clark
<b>Address</b>	PO Box 233, Jamestown SA 5491
<b>Local Government Area</b>	Northern Areas Council
<b>NRM Region</b>	Northern and Yorke NRM
<b>Hundred</b>	BELALIE
<b>Parcel details</b>	F218216 A5 H240200 S298
<b>Title/s</b>	Vol 5727 Folio 243 Vol 5833 Folio 106
<b>Property Area (ha)</b>	77.54 ha (approximately)
<b>Location</b>	Hall Road Jamestown

The SEB offset area is located on Hall Road, 860 metres from the intersection with the Jamestown to Robertstown Road. Its southern boundary reaches from the intersection of an unnamed road and Hall road in a generally easterly direction for 650 metres. The western boundary runs along the unnamed road for 1 250 m in a generally northerly direction. The northern boundary follows the edge of the native grassland, skirting to the south of the central ridge and extending to the north again for another 250 metres. The eastern boundary follows the property boundary fencing, in a generally southerly direction for 1 292 metres to meet with the southern boundary.

The PBTL offset area is located within the parcels of land detailed above and within the SEB offset area. The location is shown in Figure 1 (the area shaded green) and is located within the south east corner of the SEB offset area. The PBTL offset area will not be fenced off as fencing this area will disturb PBTL habitat and possibly individual PBTL's. The management of the PBTL area will be consistent with the management of the broader SEB offset area. The habitat is the same, PBTL's occur throughout both areas and the SEB offset area will also be managed for the benefit of PBTL's.

### 2.2 Land Use History

The land in question has been owned by the Clark Brothers Shorts Trust since 2008. Prior to this it was owned by a large pastoral company and although it had a history of light grazing, prior to the sale it was heavily grazed (Greening Australia 2008). Since purchase, the land has been used primarily for grazing of lambing ewes. Generally, little to no grazing has been undertaken prior to May 1<sup>st</sup> each year to allow the development of good cover. Ewes have been stocked from the start of May to late August at a rate of 2.5 ewes per ha. (NB. Not DSE (Dry Sheep Equivalent) which is standard for stocking rate measure. Pregnant ewes can add 1.4 – 2.8 times DSE).

Uneven grazing pressure, due to sheep preferentially grazing eastern facing slopes, has resulted in ‘thatching’ of the native grass tussocks on the western slopes of the ridge (A. Brown *pers. comm*, 2013). Many of the tussocks possess high levels of dead material which inhibits the plants ability to grow, and they begin to die back from the centre. Plants then become fragmented and take on the appearance of numerous small grasses in a circular formation, when really it is the remains of one old, large tussock.

## 2.3 Regional Setting

### 2.3.1 Region

The proposed Hornsedale Wind Farm is situated in the mid-north region of South Australia. The mid-north region contains a number of operational wind farms, and several others are approved or proposed for the region.

The mid-north region has some of the best agricultural and pastoral land in the SA, with 78 % of land used for either cropping or pastures. The region experiences a Mediterranean climate with warm to hot summers and mild to cool winters, with an annual rainfall of between 300-700 mm (Graham et al. 2001).

### 2.3.2 Interim Biogeographical Regionalisation of Australia (IBRA)

Interim Biogeographical Regionalisation of Australia (IBRA) is a landscape based approach to classifying the land surface across a range of environmental attributes, which is used to assess and plan for the protection of biodiversity (SEWPaC 2011). The project area falls within the Finders Lofty Block IBRA Bioregion, Broughton Subregion, and Tarcowie IBRA Environmental Association. Native vegetation remnancy within the Tarcowie Environmental Association is moderate (26%), however none of the vegetation is conserved within NPW Reserves or Heritage Agreements (Table 1).

**Table 1. IBRA Region, sub-region, and environmental association environmental landscape summary.**

<b>Flinders Lofty Block (FLB) IBRA Bioregion</b>	
Temperate to arid Proterozoic ranges, alluvial fans and plains, and some outcropping volcanics, with the semi arid to arid north supporting native cypress, black oak (belah) and mallee open woodlands, Eremophila and Acacia shrublands, and bluebush/saltbush chenopod shrublands on shallow, well-drained loams and moderately-deep, well-drained red duplex soils. The increase in rainfall to the south corresponds with an increase in low open woodlands of <i>Eucalyptus obliqua</i> and <i>E. baxteri</i> on deep lateritic soils, and <i>E. fasciculosa</i> and <i>E. cosmophylla</i> on shallower or sandy soils.	
<b>Broughton (FLB2) IBRA Sub-region</b>	
This subregion is characterised by a series of wide undulating intramontane basins with red duplex soils, separated by low but distinct northerly trending strike ridges. In the north the region leads into the Southern Flinders Ranges with no sharply defined landform boundary but a land use boundary marking the northern extremity of wheat cultivation. Due to widespread clearing for farming the only significant remnant of native vegetation is found in the Mt Remarkable area, where an open forest dominated by <i>Eucalyptus cladocalyx</i> or by <i>E. goniocalyx</i> and <i>E. leucoxydon</i> on reddish dense loams remains. Degraded remnants of <i>E. leucoxydon</i> and <i>E. odorata</i> woodlands can still be found on stony crests and steep slopes.	
Remnant vegetation	10% (105,852ha) of the sub region is vegetated of which 2% (2,051ha) is protected.
Landform	Hills and valleys; alternating subparallel hilly ridges and valleys with a general N-S trend in north. In south, hilly dissected tableland.
Geology	Dissected lateritized surface in south.

Soil	Hard setting loams with red clayey subsoils, highly calcareous loamy earths, hard setting loams with mottled yellow clayey subsoil, coherent sandy soils, cracking clays.
Vegetation	Eucalyptus woodlands with a shrubby understorey.
<b>Tarcowie IBRA Environmental Association</b>	
Remnant vegetation	26% (20,520ha) of the association is mapped as remnant native vegetation none of which is formally conserved.
Landform	Plain on metasediments, with a series of narrow, northerly trending quartzite strike ridges.
Geology	Colluvium, metasediments, quartzite and alluvium.
Soil	Hard pedal red duplex soils, reddish powdery calcareous loams and brown self-mulching cracking clays.
Vegetation	Low woodlands of peppermint box, drooping sheoak and peppermint box and SA bluegum and peppermint box.

Source: DEH (2007).

### 2.3.3 Climate

The most comprehensive available climate dataset is from the Yongala weather station approximately 20 km north-east of the Hornsdale project area. Both rainfall and temperature follow typical Mediterranean seasonal climate, with cool wet winter months and warm dry summer months. The long-term mean annual rainfall for the area is 365.3 mm, with June through to September typically the wettest months (BOM 2011) (Figure 2).

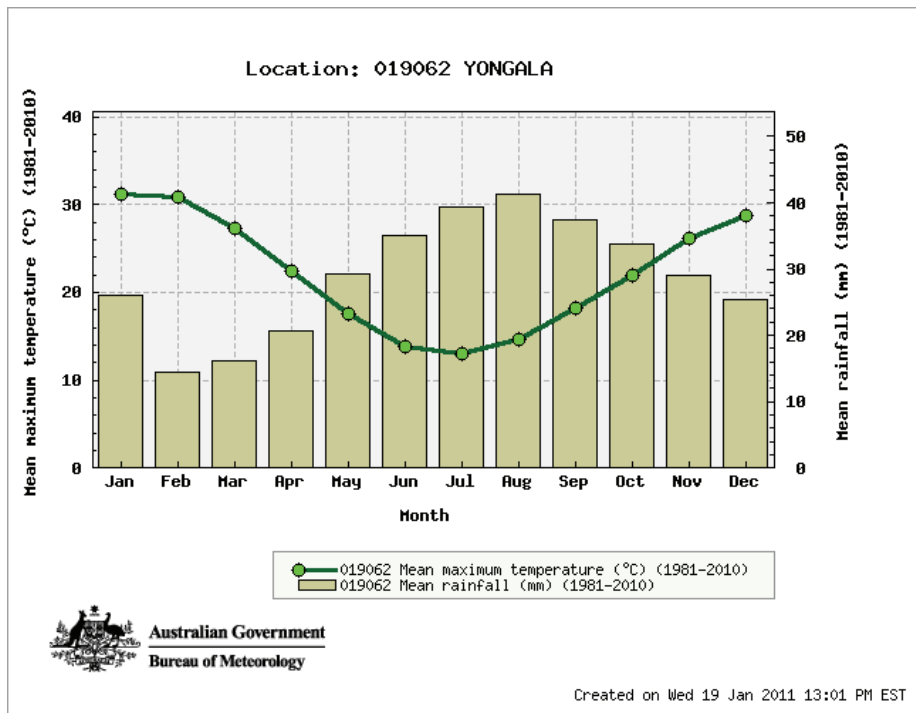


Figure 2. Mean maximum temperature and rainfall data for Yongala weather station (1981-2010). Data source: Bureau of Meteorology 2011.

#### **2.3.4 Geology, landform and soils**

Soils of the Broughton Subregion are typically hard setting loams with red clayey subsoils, highly calcareous loamy earths, hard setting loams with mottled yellow clayey subsoil, coherent sandy soils and cracking clays (DEWNR 2013). Landforms of the Broughton Subregion can be described as hills and valleys; alternating subparallel hilly ridges and valleys with a general N-S trend in north. In south, hilly dissected tableland (DEWNR 2013).



## 2.4 SEB Area

The nominated area is a large block of grassland on the ridgeline of hills running north – south in the Narien Range. It is characterised by grassland associations dominated by *Themeda triandra* and *Austrostipa scabra* with *Allocasuarina verticillata* woodland on the higher slopes. The condition of the native vegetation communities varies from moderate condition with mostly intact overstorey vegetation with moderate weed infestation to poor condition with mostly intact overstorey vegetation with considerable weed infestation amongst understorey vegetation. There is very good recruitment of *Allocasuarina verticillata* around old and existing individuals.

### 2.4.1 Vegetation Associations

During initial flora and fauna assessments for the Hornsdale Wind Farm (EBS 2011a, EBS2011b) two broad vegetation associations were recorded across the site:

- Association 4 (EBS 2011b) = Open grassland +/- emergent exotic trees and shrubs +/- planted indigenous species
- Association 6 (EBS 2011b) = *Allocasuarina verticillata* (She-oak) low open woodland

Additional vegetation survey was undertaken in February 2013 to further inform this management plan which defined six main vegetation associations and a list of species present.

See Figure 3 for the location of the identified vegetation associations and Figure 4 for condition ratings.



Figure 3. Vegetation associations across the SEB area



Figure 4. Vegetation Condition

**Association 1: *Themeda triandra* (Kangaroo Grass) +/- *Avena barbata* (Bearded Oat) +/- *Austrostipa scabra* (Spear Grass) Open Grassland. SEB 3:1.**

This association is rated as a poor to moderate condition grassland due to widespread domination by wild oats in places. Primarily found in the area where water run-off contributes higher resource availability for exotic annual grasses. A creek line occupies this association and runs generally from north to south. Some weed control has been conducted for Dog Rose and appears to be largely successful.



**Figure 5. Vegetation Association 1 - *Themeda triandra* (Kangaroo Grass) +/- *Avena barbata* (Bearded Oat) +/- *Austrostipa scabra* (Spear Grass) Open Grassland**



Figure 6. Vegetation Association 1 - *Themeda triandra* (Kangaroo Grass) +/- *Avena barbata* (Bearded Oat) +/- *Austrostipa scabra* (Spear Grass) Open Grassland

**Association 2. *Austrostipa scabra* (Spear Grass) +/- *Themeda triandra* (Kangaroo Grass) +/- *Aristida behriana* (Brush Wire-grass) Open Grassland. SEB 6:1**

The density of native grasses in this association is very high and would mostly be too thick and rocky for Pygmy blue-tongue lizards. It's low plant species diversity indicates that this association is very much a climax community.



**Figure 7. Association 2: *Austrostipa scabra* (Spear Grass) +/- *Themeda triandra* (Kangaroo Grass) +/- *Aristida behriana* (Brush Wire-grass) Open Grassland**



**Figure 8. Association 2: *Austrostipa scabra* (Spear Grass) +/- *Themeda triandra* (Kangaroo Grass) +/- *Aristida behriana* (Brush Wire-grass) Open Grassland**

**Association 3: *Allocasuarina verticillata* (Drooping She-Oak) Low Open Woodland over *Austrostipa scabra* (Spear Grass) +/- *Themeda triandra* (Kangaroo Grass) +/- *Aristida behriana* (Brush Wire-grass) +/- *Vittadinia* spp. (New Holland Daisy) +/- *Cryptandra amara* (Bitter Cryptandra). SEB 6:1**

This *Allocasuarina verticillata* Low Open Woodland is in moderate condition. There is very good recruitment of *Allocasuarina verticillata* evident around the bases of mature trees and some recruitment of *Acacia pycnantha*. There is a higher diversity of other species around rock piles and other grazing impediments. A lack of fire history is evident as there are high thatch levels in the grass stratum, no scarring on tree trunks, no obvious evidence of a single cohort of trees following a germination event post fire and a lack of dead standing shrubs.



**Figure 9. Association 3: *Allocasuarina verticillata* (Drooping She-Oak) Low Open Woodland over *Austrostipa scabra* (Spear Grass) +/- *Themeda triandra* (Kangaroo Grass) +/- *Aristida behriana* (Brush Wire-grass) +/- *Vittadinia* spp. (New Holland Daisy) +/- *Cryptandra amara* (Bitter Cryptandra)**





Figure 10. Association 3: *Allocasuarina verticillata* (Drooping She-Oak) Low Open Woodland over *Austrostipa scabra* (Spear Grass) +/- *Themeda triandra* (Kangaroo Grass) +/- *Aristida behriana* (Brush Wire-grass) +/- *Vittadinia* spp. (New Holland Daisy) +/- *Cryptandra amara* (Bitter Cryptandra)

**Association 4. *Walwhalleya proluta* (Rigid Panic) Open Grassland. SEB 6:1**

This association is found within two small disjunct patches associated with temporary wet places. The eastern side patch is associated with the dam. It is considered to be in a moderate condition with low weed abundance patches.



Figure 11. Association 4. *Walwhalleya proluta* (Rigid Panic) Open Grassland



Figure 12. Association 4. *Walwhalleya proluta* (Rigid Panic) Open Grassland



Figure 13. Association 4. *Walwhalleya proluta* (Rigid Panic) Open Grassland

**Association 5. *Juncus subsecundus* (Finger Rush) Open Sedgeland. SEB 2:1**

This association consists of small groups of tussocks around small depressions that collect water and hold it for short timespans. It is usually in poor condition with associated weed species always present when not inundated.



**Figure 14. Association 5. *Juncus subsecundus* (Finger Rush) Open Sedgeland**

**Association 6. *Austrostipa scabra* (Spear Grass) +/- *Austrodanthonia* spp. (Wallaby Grass) Open Grassland. SEB 3:1**

This association consists of open tussock grassland which has a generally sparse cover with high incidence of perennial herbaceous exotic species, especially *Salvia verbenaca* (Wild Sage).



**Figure 15. Association 6. *Austrostipa scabra* (Spear Grass) +/- *Austrodanthonia* spp. (Wallaby Grass) Open Grassland**

## 2.4.2 Flora

A total of 37 flora species were recorded across the SEB area during the February 2013 field survey, 22 native species and 15 exotic species. See Table 2 for total species.

**Table 2. List of flora species recorded during February 2013 Field Survey**

Species	Common Name	Conservation status		
		AUS	SA	NL
<i>Acacia pycnantha</i>	Golden Wattle			
<i>Allocasuarina verticillata</i>	Drooping Sheoak			
<i>Aristida behriana</i>	Brush Wire-grass			
* <i>Asphodelus fistulosus</i>	Onion Weed			
<i>Austrostipa</i> sp.	Spear-grass			
* <i>Avena barbata</i>	Bearded Oat			
* <i>Carthamus lanatus</i>	Saffron Thistle			
* <i>Centaurea calcitrapa</i>	Star Thistle			
<i>Convolvulus angustissimus</i> ssp.				
<i>Cryptandra amara</i> var.	Cryptandra			
<i>Enneapogon nigricans</i>	Black-head Grass			
+ <i>Eucalyptus cladocalyx</i>	Sugar Gum			
<i>Eucalyptus microcarpa</i>	Grey Box			R
<i>Euphorbia drummondii</i>				
<i>Haloragis aspera</i>	Rough Raspwort			
<i>Heliotropium europaeum</i>	Common Heliotrope			
* <i>Hypochaeris radicata</i>	Rough Cat's Ear			
<i>Juncus subsecundus</i>	Finger Rush			
* <i>Lactuca serriola</i> f.				
<i>Lomandra multiflora</i> ssp. <i>dura</i>	Hard Mat-rush			
<i>Malva preissiana</i>	Australian Hollyhock			
* <i>Marrubium vulgare</i>	Horehound			
* <i>Medicago</i> sp.	Medic			
* <i>Onopordum acaulon</i>	Horse Thistle			
* <i>Rosaceae</i> sp.	Rose Family			
* <i>Salvia verbenaca</i> var.	Wild Sage			
* <i>Scabiosa atropurpurea</i>	Pincushion			
* <i>Solanum nigrum</i>	Black Nightshade			
<i>Themeda triandra</i>	Kangaroo Grass			
* <i>Trifolium arvense</i> var. <i>arvense</i>	Hare's-foot Clover			
<i>Triodia</i> sp.				
* <i>Verbascum virgatum</i>	Twiggy Mullein			
<i>Vittadinia gracilis</i>	Woolly New Holland Daisy			
* <i>Vulpia myuros</i> f.	Fescue			
<i>Walwhalleya proluta</i>	Rigid Panic			
<i>Xanthorrhoea quadrangulata</i>	Rock Grass-tree			

\*denotes exotic species, +denotes non-local native, Aus: Australia (Environment Protection and Biodiversity Conservation Act 1999). SA: South Australia (National Parks and Wildlife Act 1972). NL: Northern Lofty Ranges (Florist Regional Ratings, now considered outdated). Conservation Codes: CE: Critically Endangered. EN/E: Endangered. VU/V: Vulnerable. R: Rare. U: Uncommon. K: Unknown

### 2.4.3 Fauna

Data was collected during the Spring 2010 and Spring 2011 flora and fauna assessments for the Hornsdale Wind Farm Project Area (EBS 2011a, EBS 2011b) and a specific PBTL survey undertaken in March and May of 2012. This survey included areas of proposed infrastructure locations including those for wind turbines, access tracks and reticulation trenches. As no infrastructure was proposed for the western portion of the SEB area, a detailed search of the entire SEB area for PBTL has not yet been undertaken. The confirmed presence of one individual PBTL on the western slopes of the SEB area (James McGregor, *pers comm* 2013), suggests that the population may be larger.

### 2.4.4 Matters of National Environmental Significance

#### ***Pygmy Bluetongue Lizard***

##### Distribution

The **Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*)** (PTBL) is a moderate sized skink with short limbs, a relatively heavy body and large head, with a total length of less than 20 cm (Duffy *et al*, 2012) (see Figure 16). It is endemic to South Australia and occurs within the mid-north region of the state. The Pygmy Bluetongue Lizard had been considered extinct until it was rediscovered near Burra in 1992 (the first record for 36 years). Since this time other small isolated populations of this species have been found in the mid-north region of South Australia, from north of Port Wakefield in the Hummocks to south of Peterborough and west of Clare.

In 2009, 24 small, isolated populations were known on private land, most of which is used for sheep grazing. Additional populations have been identified by EBS Ecology since this time. The full extent of most populations has not yet been determined, and it is possible that some apparently isolated localities belong to single contiguous populations (Duffy *et al*. 2012; Milne 2000).

Milne (1999) conservatively estimated that the population size in 1999 (when 10 populations were known) was approximately 5,800 individuals. Annual counts are being conducted but an accurate population estimate is not yet known (Duffy *et al*. 2012; T. Milne *pers. comm.*). A recovery plan has been developed for the species (Duffy *et al*. 2012) which includes developing a better understanding of the extent and size of Pygmy Bluetongue populations as a high priority.

Prior to the findings of the PBTL surveys associated with this project, the closest known population was approximately 10 km south of the Hornsdale project area. All known populations of this species are either on privately owned land or land that is not currently protected for conservation purposes. One reserve (Tiliqua Reserve), established by the Nature Foundation of SA, has been established recently to conserve the species. The reserve is located near Burra and conserves 85 ha of core habitat for the species.

## Habitat

The Pygmy Bluetongue Lizard relies on spider burrows, made by wolf spiders and trapdoor spiders, as refuge sites, and this can be used as an indicator of the species potential presence. Availability of suitable spider holes which are stable and not subject to winter flooding has proven to restrain the species distribution (Milne 1999; Milne *et al.* 2003; Souter *et al.* 2004). Suitable spider holes utilised as burrows are typically vertical and circular up to 20 mm in diameter (Milne *et al.* 2000) and 23 cm deep, although burrows as short as 12 cm have been utilised (Milne 1999). This species is known to occupy native grassland habitats (Milne 1999) and even highly degraded grasslands (dominated by exotic species) are potential habitat, providing that the area is unploughed and the soil structure remains intact (J. Schofield *pers. comm.* 2008).

The species has been recorded at sites dominated by species including *Austrostipa* spp. (Spear-grasses), *Austrodanthonia* spp. (Wallaby Grasses), *Maireana* spp. (Bluebush), *Aristida behriana* (Brush Wire-grass) and *Lomandra* spp. (Iron-grasses) (Hutchinson *et al.* 1994, Souter *et al.* 2007, in Duffy *et al.* 2012).

Pre-1992 specimens of the Pygmy Blue-tongue Lizard were collected in chenopod and mallee scrublands with compacting or crusty sandy soils associated with hollow mallee lignotubers, low stump hollows, near surface limestone sheets, and large slab floaters. The species was thought to burrow into moisture pockets in limestone sheeting, under outcroppings and slabs, between mallee lignotubers and sheeting, and into insect hollowed lignotubers and trunks (Duffy *et al.* 2012; Ehmann 1982, from DSEWPAC 2012).

Post-1992 specimens of the Pygmy Blue-tongue Lizard have been found in a variety of habitats, ranging from highly degraded grasslands (dominated by exotic grasses) to grasslands with high native biodiversity. In addition, vegetation cover ranges from moderate to sparse or light (Pettigrew & Bull 2011 cited in Duffy *et al.* 2012, from DSEWPAC 2012). The lizard uses empty spider burrows of wolf (lycosid) and trapdoor (mygalomorph) spiders as refuges, basking sites and hunting ambush sites. Whilst Ehmann (1982) originally suggested the Pygmy Blue-tongue Lizard was adapted for digging, further studies have shown the species does not dig its own burrows nor adapt those it utilises to any great extent (Clarke 2000; Duffy *et al.* 2012, from DSEWPAC 2012).

The region in which Pygmy Blue-tongue Lizards occur has hot, dry summers and cool, moist winters, with mean annual rainfall ranging from 366 mm at Yongala, 446 mm at Burra, to 632 mm at Clare (Duffy *et al.* 2012; Milne & Bull 2000, from DSEWPAC 2012). The species is found in a variety of soil types, but are known to be more abundant in areas of free-draining grey-brown or red calcareous soils and lithosol soils (Duffy *et al.* 2012, from DSEWPAC 2012).



Soil which is either not deep enough or free-draining enough inhibits spiders from constructing suitable burrows, and therefore these areas lack habitat suitable for Pygmy Blue-tongue Lizards. The lizards tend to be present in greatest densities on the lower slopes of hillsides, where the soil and consequently the spider burrows are deepest (Schofield 2006, in Duffy *et al.* 2012).



Figure 16. Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*)

It is recommended that a Pygmy Blue-tongue population study is undertaken, followed by annual monitoring to determine what impacts the land management strategies are having on the population. This data should be provided annually to DEWNR and the *Pygmy Bluetongue Lizard Recovery Team*. Known PBTL sites are shown in Figure 17. Observations of PBTLs within the SEB area are shown in Figure 18.

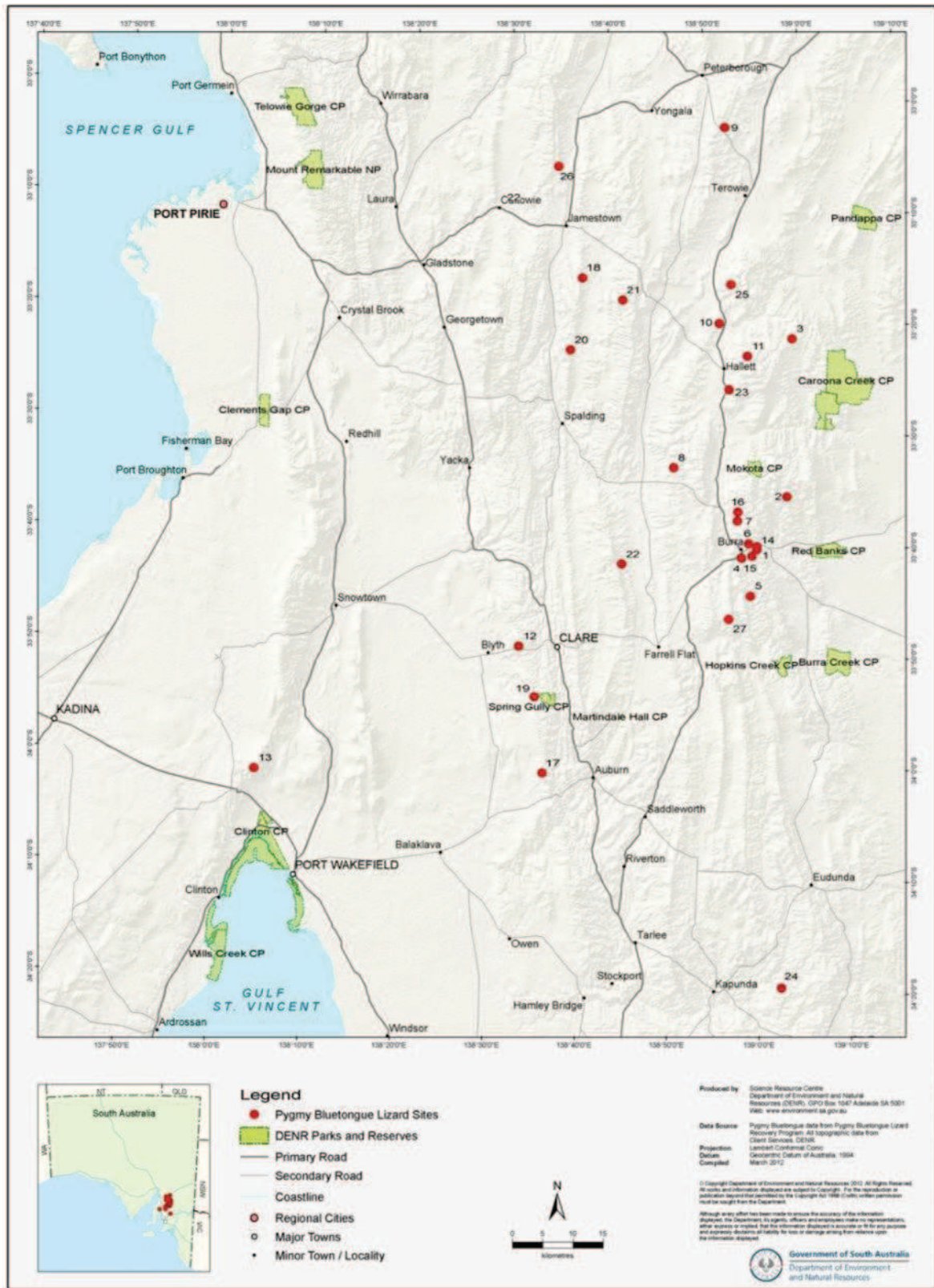


Figure 17. Location of known populations of Pygmy Blue-tongue Lizards (*Tiliqua Adelaidensis*).  
Source: Duffy *et al* (2012)

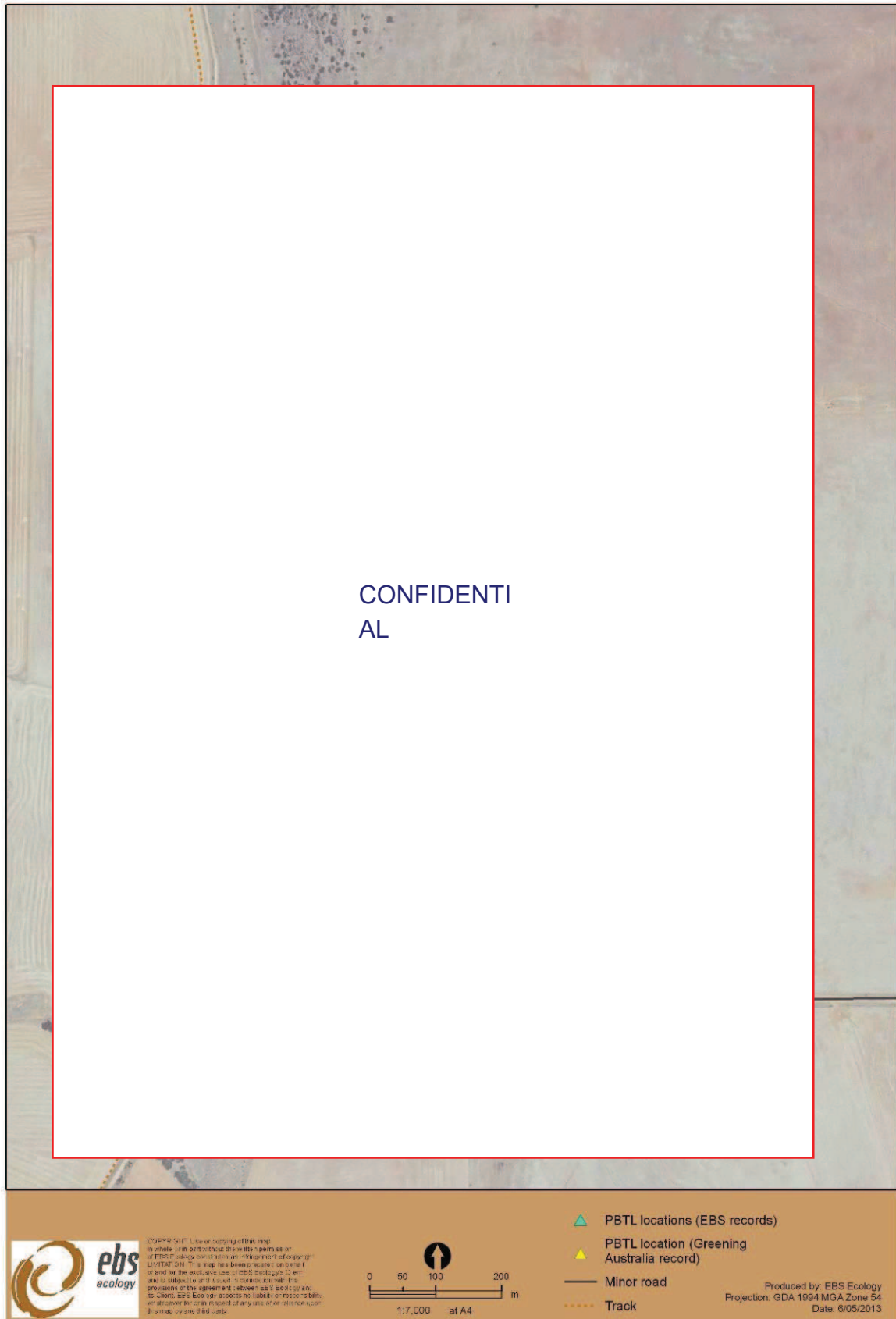


Figure 18. Pygmy Blue-tongue Lizard Observations within the SEB area

### **Flinders Ranges Worm Lizard**

Though no individuals were found during any of the surveys associated with the Hornsdale Wind Farm, it is likely that the Flinders Ranges Worm Lizard occurs within the project area, particularly where flat surface rocks are present (EBS 2011b).

The **Flinders Ranges Worm-lizard (*Aprasia pseudopulchella*)** is a very small, worm-like, burrowing lizard with poorly developed hind limb flaps (that is endemic to South Australia. It burrows freely in loose sand and soil, under rocks and litter in open woodland, native tussock grassland, riparian habitats and rocky isolates. It prefers stony soils, or clay soils with a stony surface, and has been found sheltering beneath stones and rotting stumps or occasionally in ant and termite nests. Their diet consists almost entirely of the larvae and pupae of ants (DSEWPaC 2011).

The species is listed as vulnerable under the EPBC Act but does not have a State conservation rating. At the time (approximately 1993) when the national conservation rating was assigned, little was known about the habits and abundance of the species (M. Hutchinson. pers. comm.). Since this time, Flinders Ranges Worm-lizard has been found at numerous sites, with a number of populations recorded in native shrubland and grassland in the mid-north. The state conservation ratings have also been updated more recently than the national ratings, which accounts for the lack of a state rating (DSEWPaC 2011).

#### **2.4.5 Grassland communities**

Temperate native grasslands are considered to be the most threatened ecosystem in Australia with 99.5% lost or seriously modified through past practises (Kirkpatrick et al, 1995 as cited in Graham et al, 2001). In South Australia, less than 2% of the true native grasslands remain (Prescott and Nicholls, 1997). Conservation and management of temperate native grasslands is therefore a high conservation priority within the region.

## 3 THREATS TO BIODIVERSITY

### 3.1 Change of land use / development

As outlined in Section 2.3, the mid-north region contains a number of operational wind farms and several others are approved or proposed for the region. The region has some of the best agricultural and pastoral land in the SA, with 78 % of land used for either cropping or pastures. Although the current land use of the subject land (sheep grazing between May and August) is generally compatible with the conservation of grasslands and PBTs, the possibility of the land being sold or subject to other development is a considerable threat to these biodiversity assets. This could include increased grazing pressure from higher stocking rates of sheep leading to lower quality native grasses or a change in stock type (ie cattle) where trampling on PBT burrows are destroyed.

Neither native grasslands nor PBT are well represented within formal Reserve systems, with Tiliqua Reserve (owned by Nature Conservation Society) being the only formal reserve for PBT (EBS Ecology 2011c) and Mokota Conservation Park (DENR 2011) and Tiliqua Reserve providing protection for grassland communities (EBS Ecology 2011c).

### 3.2 Grazing pressure

The subject land has been owned by the Clark Brothers Shorts Trust since 2008. Prior to this it was owned by a large pastoral company and although it had a history of light grazing, prior to the sale it was heavily grazed (Greening Australia 2008). Since purchase, the land has been used primarily for grazing of lambing ewes. Generally, little to no grazing has been undertaken prior to May 1st each year to allow the development of good cover. Ewes have been stocked from the start of May to late August at a rate of 2.5 ewes per ha (M Clark *pers. Comm*, 2013). (NB. Not DSE (Dry Sheep Equivalent) which is standard for stocking rate measure. Pregnant ewes can add 1.4 – 2.8 times DSE).

Uneven grazing pressure, due to sheep preferentially grazing eastern facing slopes, has resulted in 'thatching' of the native grass tussocks on the western slopes of the ridge (A. Brown *pers. comm*, 2013). Many of the tussocks possess high levels of dead material which inhibits the plants ability to grow, and they begin to die back from the centre. Plants then become fragmented and take on the appearance of numerous small grasses in a circular formation, when really it is the remains of one old, large tussock.

It is recognised in the *Biodiversity Plan for the Northern Agricultural Districts* (2001), that in the absence of any grassland management activities or adopting the 'do nothing' approach, is a threat to the community's biodiversity. Weeds tend to proliferate in the understorey, native grass tussocks develop high proportions of dead material which accumulate and smother the plant and inhibit natural regeneration. Modifications in grazing regime coupled with the strategic use of fencing and waters can

allow regeneration by stimulating the effects of a ‘cold burn’, and therefore is important in maintaining and promoting plant species diversity (Barlow, 1998).

### 3.3 Weeds

The landholder has been managing perennial woody weeds, such as Boxthorn, and Horehound (both declared under the *Natural Resource Management Act, 2004*) consistently since the land was purchased in 2008 (M. Clark *pers. comm*, 2013). Consequently there were only scattered individuals observed during the field survey. It is anticipated that annual weed management will be a manageable task for the landholder given the low levels of infestation. Table 6 lists exotic flora recommended for ongoing weed management.

Table 6. Weeds requiring ongoing management

Species	Common Name	Comments
<i>Marrubium vulgare</i>	Horehound	Isolated individuals
<i>Lycium ferocissimum</i>	African Boxthorn	Although not found on property during field survey, on adjoining road reserves and pose a continuing threat.

### 3.4 Feral animals

When in high numbers, European Rabbits have the potential to compete with native animals for food resources and damage native plants by ringbarking trees and shrubs, inhibiting regeneration by eating seed and seedlings and in extreme cases, causing soil disturbance.

## 4 MANAGEMENT ACTIONS

The management objectives for the SEB offset area and the PBTl offset area are outlined in Section 1.1. Management actions to achieve these are provided in Table 3. Key actions are discussed in the following section in addition to being listed in Table 3. Due to the SEB offset area and the PBTl offset area occurring within the same area, containing the same habitat and having the same management issues, the two areas have been group for implementing management actions. Management actions will be implemented across both areas to ensure adequate and consistent management of PBTl's and native vegetation within these areas.

### 4.1 Management Action Responsibilities

Management responsibilities are allocated for each Management Action in Table 3.

**HWF / 'project owner'** - HWF is the project developer for the Hornsdale Wind Farm. This involves the planning of the wind farm site, including seeking and obtaining relevant planning and environmental approvals under State and Federal legislation and construction and operation of the project. The implementation of this SEB Management Plan will be the responsibility of the 'project owner' for the 25 year life of the wind farm.

**Landowner / Manager** – is responsible for undertaking the day to day management of the SEB area on behalf of the 'project owner' and completing reporting responsibilities outlined in Section 5.2.1. Upon completion of the 25 year life of the wind farm, the landowner is responsible for the protection of the native vegetation in the SEB area in perpetuity.

To ensure continuous improvement towards the Management Objectives in Section 1.1, the suitably qualified consultant outlined in Section 5.5.2 to continue to work towards the improvement of the grasslands and maintenance of the PBTl populations.

### 4.2 Change in Land use / Development

To provide an increased level of protection for the native grasslands and PBTls, a SEB offset area is sought. When a SEB offset is entered into, it protects the indigenous plants and animals in the area in perpetuity. In this case, this SEB Management Plan forms part of the conditions of the Regulation Advice Notification which provided approval for the native vegetation removal associated with the Hornsdale Wind Farm. Once accepted, this SEB Management Plan will form part of the SEB offset area and sets out what management must be undertaken on the site in perpetuity. This includes the management actions outlined in this section such as the stocking rate as outlined in 4.2.1, stock type (sheep), no further use of fertilizer etc.

## 4.3 Grazing Levels

### 4.3.1 Limiting stocking rates

Ewes have been stocked from the start of May to late August at a rate of 2.5 ewes per ha (M Clark *pers. comm* 2013). (NB. Not Dry Sheep Equivalent (DSE)).

Dry Sheep Equivalent, or DSE, is a standard measure of feed demand which represents a 50 kg wether which consumes 1.0 kg dry matter per day. A pregnant or lactating ewe has a greater energy requirement, and the amount varies according to the advancing pregnancy and the size of the lamb once it is born and feeding. It may be between 1.4 – 2.8 times DSE.

Stocking rates should be limited to 2.2 – 2.4 DSE/ha when measured over 12 months.

Length of stocking should be reduced, where possible, to allow for longer native grass regeneration periods. Grazing should be limited to May to September of any given year. This allows for native grasses and herbs to grow and set seed and for sheep to graze on annual introduced grasses (ie *Avena barbata* (Bearded oat)) and hence reduce their dominance.

### 4.3.2 Additional fencing and water points

A fence running north – south through the SEB area should be installed to ensure more even grazing of east and western facing slopes. See Figure 18 for proposed locations.

It is preferable that the fence is of a minimal impact construction to avoid any impact to the PBTL ie no grading of additional access tracks. Reticulation to new water points should be run above ground. Micro-siting of the installation of fence posts and water points must be undertaken by an appropriately qualified ecologist to avoid any impacts to PBTL. Once fence is in, northern and southern gates (as marked on Figure 19) should have limited use due to PBTL locations. It is recommended that the central gate be the main entry/ exit to avoid a higher impact on the PBTL.

If the condition of the native grasslands does not improve, as demonstrated through annual monitoring and compared to the baseline data, then additional management of the site may be required. The adaptive management approach may result in alterations to the grazing regime which could include creating smaller paddocks and the provision of additional water points.



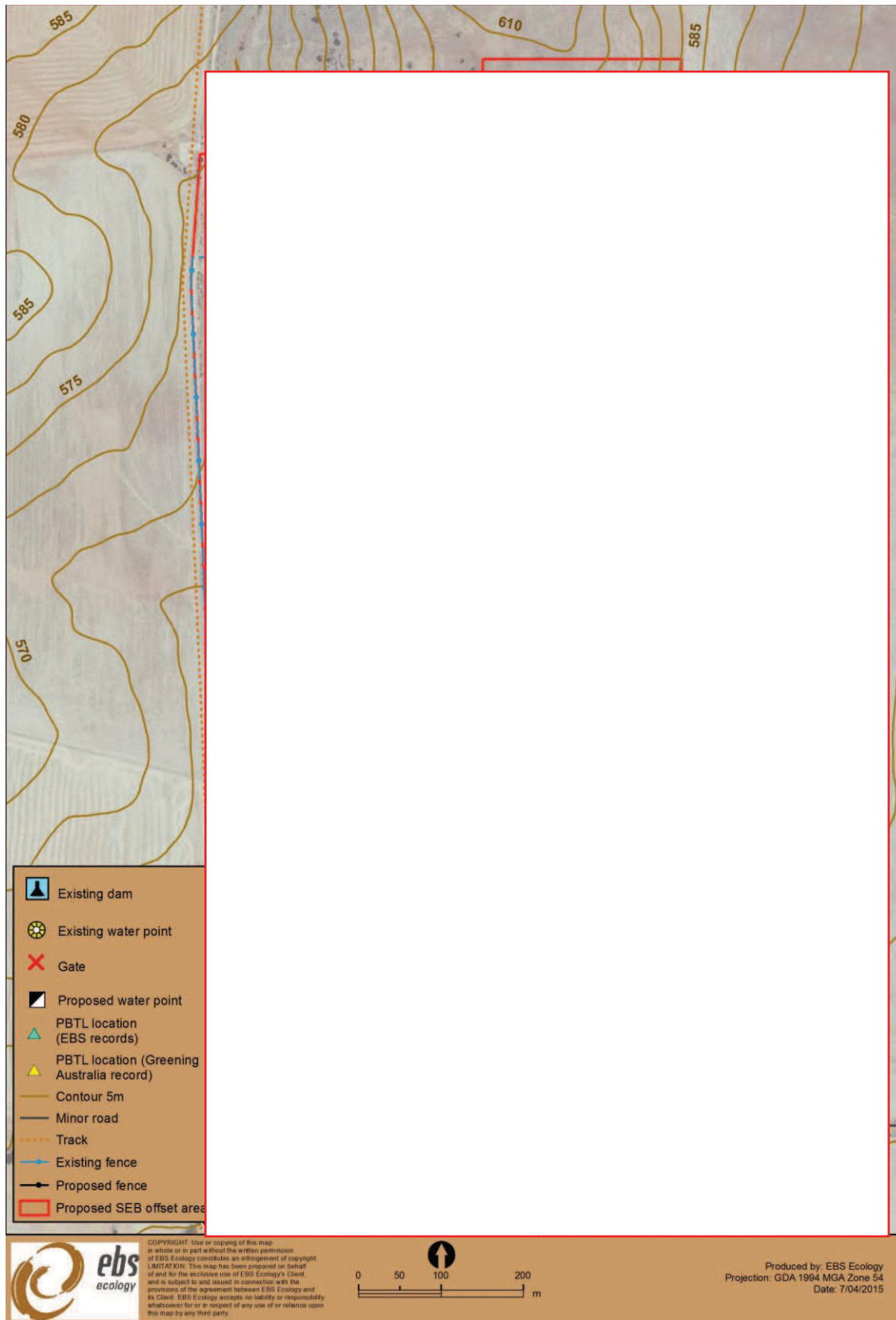


Figure 19. Location of new fence and water point locations

### 4.3.3 Discontinue Use of Fertilisers

Historically, fertiliser has been applied to the SEB area to provide additional feed for pregnant and lambing ewes. This practice promotes the growth of introduced annual grasses which compete with perennial native grasses (A. Brown *pers. comms* 2013).

Biosolids have been added to cropping areas under Clarke Brothers management but not on the SEB Area (M. Clark *pers. comms* 2013). It is recommended that this is not undertaken.

Actions such as providing more even grazing across the SEB area are aimed at increasing the health and vigour of the native grasses and hence providing more feed. It is considered very beneficial for the long-term condition of the native grasslands to cease the application of fertiliser which promotes the growth of introduced species.

### 4.3.4 Grazing training for land managers

It would be beneficial for the landholders to undertake training so that they can better understand how to manage their native grasslands. The training would need to include plant identification, animal nutrition, monitoring and record keeping, and learning to estimate food on offer in a paddock.

## 4.4 Weed/Feral Animal Management

### 4.4.1 Weed management

The land holders will undertake all weed management. Due to the extensive experience of the current landholders in weed management, no weed identification or management training is considered to be required. However, if the property was sold off or run under management, this will be re-assessed and training undertaken with landholders / managers if required.

Some weeds can potentially be managed opportunistically, as this may be a more efficient way of operating in some cases. For example, if small Boxtorn plant is observed close to a track or water point, it may be convenient to remove the individual whilst in the area.

### 4.4.2 Feral animal control

The land holders will undertake all feral animal management. Rabbits, Feral Cats and Foxes are the key feral animals within the project area. Control effort for these species will be part of annual program undertaken by the property owner. Any Rabbit warrens will need to be fumigated, or ripped, and if rabbit numbers rise, a targeted baiting program will need to be developed and implemented.

See Appendix 1 for *Activity Record Datasheet*.

## 4.5 Management measures required under the *EPBC Act* approval conditions

Condition 3.b of the *EPBC Act* approval conditions includes a range of management measures to be addressed in this management plan. As detailed in previous ecology reports for the Hornsdale Wind Farm, the PBTTL lives in spider holes in native / exotic grasslands across the mid north region of South Australia. Their reliance on spider holes means that any areas that have been previously cropped or surface layers physically disturbed, will not be suitable habitat for the species. Therefore, implementing revegetation programs is not effective management tool for this species as these areas generally do not contain the required spider holes and the species does not occur in shrubland / woodland areas.

Due to the specific habitat requirements, long-term management needs to focus on habitat quality for the species within areas they are known to occur. Some research has been undertaken on creating artificial burrows, however, this is not at a stage where it can be implemented on a large scale. The management actions proposed have been developed in conjunction with Dr Mark Hutchinson (Curator of Herpetology at SA Museum and Chair of the Pygmy Blue-tongue Lizard Recovery Team). These actions reflect the latest management and findings from research undertaken on the species.

Therefore, the management actions proposed for the PBTTL offset area are aimed at maintaining and improving habitat quality for the species over the long term. This will be achieved by:

- Managing grazing pressure and intensity to reduce vegetation cover (the species prefers more open grass areas) but also promote native flora species
- Timing grazing to reduce seed set in annual grassy weed species (which are a major contributor to dense vegetation cover)
- Increase native vegetation species diversity and cover

### 4.5.1 Management of Livestock

This is addressed in Section 4.3 Grazing Levels and Table 3.

### 4.5.2 Weed Control

This is addressed in Section 4.4.1 Weed management and Table 3.

### 4.5.3 Erosion and Sediment Control

No major construction activities are to occur as part of the implementation of the plan and no construction works related to the construction of the wind farm are to be undertaken in the SEB area. As such, erosion and sedimentation are not considered to be risks that require management.

If rabbit warren ripping is required to be undertaken (no warrens are currently present), it will be undertaken in small, confined areas that will regenerate quickly. It is unlikely that any sediment and erosion control measures will be required. However, if ripping is extensive or in an area that is likely to be prone to erosion, sediment control structures (such as silt fences, straw bales) will be implemented. These will be implemented on the downslope of the disturbance area to catch any sediment that may leave the area. These structures will be implemented until such time that the disturbed area has stabilised.

#### **4.5.4 Fire Management**

Fire management in addition to any management the landholder would reasonably be expected to currently undertake is not required to achieve any of the conservation objectives of the SEB area. As such, fire management is not considered to be a risk that requires specific management actions.

#### **4.5.5 Restrictions on Access**

The SEB offset area and PBTL offset area is on private property with the perimeter of the entire area fenced with stock fencing. The PBTL offset area will not be fenced off separately to the SEB offset area as there is no benefit in doing this. To fence off the PBTL area as a separate area, PBTL area would be degraded and quite possibly individuals impacted upon. Fencing the PBTL area would not afford it any additional protection from public access. Additionally, as detailed in Section 4.5.1, livestock area required to assist with the management of vegetation within the PBTL offset area, therefore fencing this area would be counter-productive.

As such, it is not currently open to indiscriminate access by the public and any access is managed by the property owners/managers. Although the property is bounded by two public roads, there will be no signage or other information readily available to distinguish this area from any other in the region. Any publication of this management plan in public forums will remove detail of PBTL populations at a paddock level.

No additional restrictions on access are considered necessary.

**Table 3. Management actions.**

Action No.	Asset / Feature	Action	Priority	Timeframe	Responsibility
<b>Landscape integrity</b>					
1.1	Soils and land surfaces	<p>Practice minimal disturbance of soil and vegetation during all activities (including weed control, fire management, grazing, fauna surveys and vehicle access) within the entire SEB area.</p> <ul style="list-style-type: none"> <li>• only drive on identified vehicle tracks where possible</li> <li>• limit excessive driving (walk where possible)</li> <li>• avoid driving on wet tracks</li> <li>• avoid un-necessary digging and soil disturbance.</li> </ul>	Medium	On-going	Landholder/ Manager
1.2		Avoid any ripping (for activities such as laying water pipelines for stock watering points, and installation of utility services) with the exception of ripping of rabbit warrens if required.	High	On-going	Landholder/ Manager
1.3		Maintain existing vehicle tracks for access, sheep movement and access to infrastructure.	High	On-going	Landholder/ Manager
1.4		Avoid creating new vehicle tracks.	High	On-going	Landholder/ Manager
<b>Ecosystems</b>					
2.1	Vegetation communities	Establish permanent photo-monitoring points and reference sites (as outlined in table 5) targeting the different vegetation communities across the two paddocks (using marker posts to the ensure location and direction is consistent over time).	High	2015, 1 <sup>st</sup> quarter	HWF / 'project owner' through appropriate consultant
2.2		Avoid planting trees and shrub species that will alter the integrity of the native grasslands of the SEB area.	High	On-going	Landholder/ Manager
2.3		Utilise Ecological Indicators and suggested methods outlined in Table 5 to develop a detailed annual monitoring program to assess grassland health.	High	2015, 1 <sup>st</sup> quarter	HWF / 'project owner' through appropriate consultant
2.4		Eradicate declared and environmental weed species, using spot-spraying and minimal disturbance methods. Work with neighbouring landholders, where appropriate, to control weed species such as Horehound and African Boxthorn that need to be controlled on a landscape scale.	Medium	On-going	Landholder/ Manager

Action No.	Asset / Feature	Action	Priority	Timeframe	Responsibility
2.5		Prevent the establishment of new weed species and/or infestations by practicing minimal disturbance methods, and hygiene practices when bringing in equipment, vehicles, and other materials which may harbor weed seeds.	Medium	On-going	Landholder/ Manager
2.6		Conduct an annual survey to identify the location and extent of all weed species within the SEB area, and noting the areas immediately adjacent.	Medium	Annually from 3 <sup>rd</sup> quarter	Landholder/ Manager
2.7	Plant bio-mass management	Continue low-level sheep grazing to ensure the areas between tussock grasses is kept open. Limit stocking rates to a maximum of 2.2 – 2.4 DSE / ha / annum, if possible.	High	On-going	Landholder/ Manager
2.8		Install north-south fence to divide east and western facing slopes, and associated new water points, using minimum disturbance methods and micro-siting of fence posts and watering points with appropriately qualified ecologist to ensure no disturbance to PBTL.	High	Prior to grazing of SEB paddock in 2014.	HWF / 'project owner' through Landholder/ Manager
2.9		Utilise Ecological Indicators and suggested methods outlined in Table 5 to develop a detailed annual monitoring program to assess grassland health (see Action No. 2.3 above).	High	2015, 1 <sup>st</sup> quarter	HWF / 'project owner' through appropriate consultant
2.10		Assess plant bio-mass and alter sheep grazing routine if deemed necessary – increasing grazing/stocking rate if biomass is high in fire risk periods or high cover is impeding the Pygmy Blue-tongue, reducing if cover is diminished.	High	On-going, bi-monthly	Landholder/ Manager
2.11		Ensure artificial fertilizer is not applied.	Medium	On-going	Landholder/ Manager
2.12		Undertake training in management of native grasslands.	High	As soon as possible	Landholder/ Manager
2.13	Fauna	Map the extent and outer extremities of the Pygmy Blue-tongue Lizard population, particularly in the western portion of the SEB area which has not been surveyed for PBTL. Refer to EBS Ecology (2015) Pygmy Blue Tongue Lizard Scientific Research and Monitoring Plan Offset Management Area	High	2015, 1 <sup>st</sup> quarter	HWF / 'project owner' through appropriate consultant
2.14		Conduct annual surveys to monitor the Pygmy Bluetongue population abundance. Refer to EBS Ecology (2015) Pygmy Blue Tongue Lizard Scientific Research and Monitoring Plan Offset Management Area	High	On-going, bi-repeat bi-annually	HWF / 'project owner' through appropriate consultant

Action No.	Asset / Feature	Action	Priority	Timeframe	Responsibility
2.15	Pest fauna	Control declared pest animal species (especially Rabbits, Foxes and Cats) by fumigating (Rabbit warrens), poisoning (Rabbits and Foxes), shooting (Foxes and Cats), and manually filing-in warrens and dens, ensuring minimal disturbance methods are used. Undertake in collaboration with adjoining landholders, where possible.	Low	2015, 2 <sup>nd</sup> quarter, on-going maintenance as necessary	consultant Landholder/ Manager
2.16		Consult with PIRSA during plagues of locusts to ensure the widespread aerial spraying program does not cover the SEB area, or within 1 km of the SEB area, and taking into consideration a 5 km upwind buffer zone.	High	Ongoing, especially during plague locust periods	Landholder/ Manager
2.17		Avoid the use of insecticides to control locusts, grasshoppers, and snails.	High	On-going	Landholder/ Manager
<b>Research</b>					
3.1	Improving knowledge	Support research endorsed by the Pygmy Blue-tongue Recovery Team and Mid North Native Grassland Working Group by allowing reasonable access to the SEB area.	High	On-going	Landholder/ Manager
<b>Access Arrangements</b>					
4.1		Maintain external fencing to ensure neighbouring stock prevented from accessing the SEB area.	High	On-going	Landholder/ Manager
4.2		Display caution in identifying the location of the SEB area and this Management Plan and therefore, Pygmy Bluetongue population, in any publicly available information to ensure the population is protected from poaching and illegal trade.	High	On-going	Landholder/ Manager and HWF / 'project owner'.

## 5 ANNUAL MONITORING PROGRAM

An effective annual monitoring program will be implemented and carried out by an independent suitably qualified ecologist to audit the implementation of the management actions and to assess and quantify changes brought about by these management actions. The results of this monitoring will be provided to the Native Vegetation Council and DotE and used to direct the land owner's management of the SEB area to work towards improvement of the grasslands and maintenance of the PBTL populations.

An appropriately qualified consultant will be engaged to establish and undertake annual survey and reporting of monitoring sites.

It will be important to note that seasonal variation will likely impact on results and that general trends emerging from the data are probably more significant than annual fluctuations.

The baseline of condition for the site will be established as part of the setup of the monitoring program with the first round of data collected acting as the baseline for the site. During the second year of the plan, the monitoring will commence to see if there are improvements. The monitoring program needs to be adaptive, if improvements to the grassland condition have occurred then management actions can be maintained and monitoring continued. If improvements to the grassland condition have not occurred then changes to the grazing regime may be required. This may include increasing the number of paddocks and water points to allow greater management of grazing duration, location and stocking rates.

The two main objectives for the SEB management area are:

- To maintain or increase the current population levels of PBTL over the long term
- Increase in the key native grassland health indicators



**Table 4. Monitoring and evaluation criteria.**

Action No.	Brief description of Action	Desired Outcome
1.1	Minimal disturbance of soils and vegetation.	No significant observed soil or vegetation disturbance noted during site investigations following activities such as weed control, fire management, alterations to grazing regimes, research activities, and vehicle access. Signs of disturbance could include wind-rows, flattened and damaged vegetation, obvious tyre tracks.
1.2	Avoid ripping.	No ripping activities undertaken with the exception of ripping of rabbit warrens if required.
1.3	Maintain existing vehicle tracks and define car-parking areas.	Vehicle tracks maintained.
1.4	Avoid creating new tracks.	No, or very limited new tracks created.
2.1	Establish permanent photo-points & reference sites targeting the different vegetation communities.	Photo monitoring points & reference points established, and photographs taken and data collected using a standardised methodology.
2.2	Avoid planting trees and shrub species that will alter the integrity of the native grasslands of the SEB area.	No trees or inappropriate shrubs planted.
2.3	Utilise Ecological indicators and suggested methods outlined in table 5 to develop a detailed annual monitoring program.	Ecological indicators effectively measured and recorded using standardised methods.
2.4	Eradicate all declared and environmental weed species using spot-spraying and minimum disturbance methods.	Declared and environmental weeds eradicated.
2.5	Prevent the establishment of new weeds by practicing minimal disturbance methods and maintaining good hygiene practices.	No new weed outbreaks.
2.6	Conduct an annual survey to identify the location and extent of all weed species within the SEB area, and noting areas immediately adjacent.	Annual weed survey conducted.
2.7	Continue low-level sheep grazing to ensure areas between tussock grasses is kept open.	Optional biomass is maintained through appropriate Sheep grazing regime (with the exception of the Research plots).
2.8	New fence and watering points installed using minimum disturbance methods and micro-siting with appropriately qualified ecologist.	New fence and watering points installed using minimum disturbance methods and utilising appropriately qualified ecologist.
2.9	Utilise Ecological indicators and suggested methods outlined in Table	Ecological indicators effectively measured and recorded using standardised methods.

Action No.	Brief description of Action	Desired Outcome
	5 to develop a detailed annual monitoring program. See Action No. 2.3 above	
2.10	Assess plant-biomass and alter sheep grazing routine if deemed necessary.	Plant biomass optimised for PBTL habitat and native grassland health.
2.11	Ensure artificial fertilizer is not applied.	No artificial fertilizer applied.
2.12	Undertake training in the management of native grasslands.	Training undertaken.
2.13	Map the extent and outer extremities of the Pygmy Bluetongue population.	Outer extremity of the Pygmy Blue-tongue Lizard population mapped accurately.
2.14	Conduct annual surveys to monitor the Pygmy Bluetongue population abundance, condition and longevity of individuals.	Annual surveys conducted
2.15	Eradicate declared pest animal species by removing refuges (following minimum disturbance methods), and/or poisoning, shooting.	Pest fauna refuges eradicated with minimal disturbance.
2.16	Consult with PIRSA during plague locust periods to ensure the widespread aerial spraying program does not cover the SEB area or within 1 km.	PIRSA consulted prior to locust spraying programs commence.
2.17	Avoid the use of insecticides to control locusts, grasshoppers and/or snails.	No insecticides used.
3.1	Support research endorsed by the PBT Recovery Team and Mid North Native Grassland Working Group by allowing reasonable access to the SEB area.	Research permitted to be conducted in compliance with this management plan.
4.1	Maintain external fencing to ensure neighbouring stock are prevented from accessing the SEB area.	External fencing is maintained.
4.2	Display caution in identifying the location of the Pygmy Bluetongue population, and therefore the SEB area in any publicly available information.	No accidental or inappropriate publicity of the Pygmy Bluetongues presence within the SEB area taken place.

**Table 5. Ecological Indicators and desired outcomes**

Ecological Indicator	Suggested Method	Desired Outcome*
Grassland health (% dead material)	Transects (1 x Reference site 1 x site vegetation association per paddock)	Increased proportion of living material on mature tussocks based on initial baseline surveys Increase in plant basal cover composition based on initial baseline surveys Less thatch as proportion of whole plant based on initial baseline surveys
Dominant species cover and abundance	Quadrats / Transects Photo points Abundance ratings (1 x Reference site 1 x site vegetation association per paddock)	Increase in tussocks per hectare to reference site levels in grassland communities based on initial baseline surveys Increase in tree species per hectare to reference site levels in woodland communities based on initial baseline surveys
Vegetation composition (Plant species diversity/presence/absence)	30 x 30m Quadrats (1 x Reference site 1 x site per vegetation association per paddock)	Increase in plant species diversity over long term in each vegetation association based on initial baseline surveys
Seedling recruitment and regeneration	Jessup Transects Point counts	Mixed aged spread of grassland species and other native flora
Landscape function (soil surface condition)	LFA (Landscape Function Analysis) (1 x Reference site 1 x Site per degraded area)	Improvement of soil function based on initial baseline surveys
Pygmy Blue-tongue Lizard population	Establishment of 10 x 1ha monitoring sites	Maintain or increase the current population levels over the long term

\*when compared against the baseline data collected during year 1 of the monitoring program

## 5.1 Monitoring Indicators

Overall, the desired outcomes are for the existing plants to be healthier, a highly functional soil surface condition, less bare ground, and ultimately a more diverse grassland, which will depend on seasonal factors to a large extent. Some of the following indicators can be measured annually and directly linked to management changes.

### 5.1.1 Grassland health (% dead material)

Grassland health is related to health of the tussocks, amount of bare ground and litter on the surface. Monitoring will partly focus on whether the tussocks are actively growing, and whether the tussocks are large, or small and struggling. The percentage of dead material will be measured for each tussock along a permanent 50 metre transect, so that the same individuals can be remeasured the following year.

### **5.1.2 Dominant species cover and abundance**

Cover and abundance can be simply measured along the permanent 50 metre transect using a 1 x 1m quadrat to count tussocks per square metre. This can be averaged out over a number of repeated counts. Juvenile plants can also be recorded using this methodology. The Grassland communities with a high density of tussocks already may not show any significant change from year to year, so it may be more appropriate to measure changes in cover and abundance of shrub, herbaceous or regenerating tree species. Changes to exotic levels can also be measured here.

### **5.1.3 Vegetation composition (Plant species diversity / presence/absence)**

An overall increase in plant species diversity is one of the desired outcomes of the management plan, however the difficulty in monitoring diversity is that significant changes, or no change at all, cannot be directly attributed to changed management as plant recruitment is so dependent on favourable seasonal conditions. It may be preferable to assess diversity improvement over the long term, rather than after the first year.

A 30 x 30m quadrat can be established to measure plant species diversity, whilst presence/absence can be measured using the same permanent 50 metre transect established to measure Grassland health, % bare ground and cover/abundance.

### **5.1.4 Seedling recruitment and regeneration**

With strategic timing of grazing, perennial plants and grasses will have a greater opportunity to recruit seedlings into the population. Juvenile recruitment can be monitored using the permanent 50 metre transects and 30 x 30m Quadrats.

### **5.1.5 Landscape Function Analysis (LFA) (soil surface condition)**

LFA is a monitoring procedure developed by the CSIRO. It provides a rapid, reliable, and easily applied method for assessing and monitoring landscape restoration. A series of overall soil health indicators include surface stability, infiltration capacity and nutrient cycling can be used to interpret whether the natural resources of the site are being lost, maintained or enhanced over time. To effectively establish an LFA program, a series of analogue (reference sites) within the prominent vegetation communities across the site need to be established to provide a 'target range' of values in which the 'restoration' sites are aiming for.

### **5.1.6 Pygmy Blue-tongue Lizard**

From the initial baseline survey, the extent of the population within the management area will be known. The baseline survey will be undertaken in early summer 2015 (optimum survey period for the species is November to April). The initial survey will be undertaken in early summer to allow the establishment of a population number prior to commencing with the implementation of the management actions.

The initial survey will involve establishing up to ten quadrats, each one will be one hectare in size. The location of each quadrat will be selected to represent the area and set up for annual monitoring of the population. One quadrat will be located within the PBTL offset area whilst the remainder will occur within the SEB offset area. The annual monitoring will be undertaken in March / April each year as this is the most appropriate time of year to survey for the species.

The initial annual monitoring will act as the baseline assessment of the site. Whilst there will be natural variation in PBTL population numbers, the aim is to maintain the current populations levels over the long term. The results of each monitoring event will be discussed with the SA Museum and Flinders University to ensure any fluctuations observed are within the natural limits for the species. If a reduction in population numbers is considered to be outside natural fluctuations, then management actions will be reviewed, in conjunction with the climatic and vegetation data, to determine possible causes. Management actions, where required, will then be altered and updated.

The full extent of the PBTL distribution within the 75 ha offset area is yet to be determined. To date a total of >150 individual lizards have been located. Management decisions within the offset area will rely heavily on the overall distribution and total population number of PBTL. It is recommended that a full PBTL population assessment within the offset area is conducted. The assessment would involve the following steps:

- Conducting a survey using two teams of two people. The survey should be carried out during March to April when the cover of grass is at its lowest. This allows the surveyors to detect spider holes with less effort than when cover of grass is high. The survey should be completed in one session (i.e. over a two week period) to ensure that the number of lizards counted is accurate. Intervals between surveys may result in a false count of lizards as they are likely to move between burrows over a period of time.
- All suitable spider holes would be marked temporarily with survey tags. Once an area has been checked for spider holes and the surveyors are confident that all holes have been located a survey for PBTL presence is then carried out. All marked spider holes will be checked for PBTL occupancy using an optic fibre 'Burrowscope'. Spider holes that will not be checked include holes containing ants and holes with a diameter of less than 5 mm which are considered too small for juvenile PBTL.
- All spider holes and PBTL burrows will be marked using a GPS. Other data to be recorded will include the quantity and estimated age (juvenile, sub-adult, adult) of PBTL present and the estimated depth of the burrow.

Following the initial full PTBL survey of the site, the annual monitoring program should be implemented. The data collected from the monitoring surveys will assist in making management decisions to ensure that the PBTL population remains healthy and viable. The monitoring program will include the following steps:

- The set up of 10 x 1 ha quadrats within the 75 ha offset area. The location of the 10 permanent monitoring sites will be selected after the initial PBTL survey.
- The 10 permanent monitoring sites will be spread throughout the offset area with an aim of representing landscape types and varying PBTL population densities.
- The quadrats will be marked using permanent steel droppers. Each corner of the quadrat will have an 1800 mm steel dropper installed.
- The 10 quadrats should be surveyed for PBTL on an annual basis at the same time between March and April.
- The annual survey should be conducted by two people. The survey should be completed in one session (i.e. over a one week period) to ensure that the number of lizards counted is accurate. Intervals between surveys may result in a false count of lizards as they are likely to move between burrows over a period of time.
- The 1 ha quadrats will need to be traversed and all spider holes to be marked with survey tags. Once an area has been checked for spider holes and the surveyors are confident that all holes have been located a survey for PBTL presence is then carried out. All marked spider holes will be checked for PBTL occupancy using an optic fibre 'Burrowscope'. Spider holes that will not be checked include holes containing ants and holes with a diameter of less than 5 mm which are considered too small for juvenile PBTL. Survey tags are removed once hole has been recorded, as a way of insuring all holes in the quadrat are surveyed and there are no double ups.
- All spider holes and PBTL burrows will be marked using a GPS. Other data to be recorded will include the quantity and estimated age (juvenile, sub-adult, adult) of PBTL present and the estimated depth of the burrow.

## 5.2 Annual reporting responsibilities

### 5.2.1 Landholder

The landholder must:

1. Complete and submit the *Paddock Monitoring Sheet* (Appendix 2) to HWF / 'project owner' to assist with management of the grazing program.
2. Submit the *Activity Record Datasheet* (Appendix 1) to HWF / 'project owner' at the end of each financial year until 2028.

### 5.2.2 HWF

HWF must:

1. Contract a suitably qualified consultant to undertake the annual monitoring and reporting requirements set out in the Management Plan.

2. Submit an annual report to the Native Vegetation Council Secretariat and DotE detailing the monitoring results of the program including management actions undertaken in the offset areas and the outcome of those actions including identifying any need for improved management.

### **5.3 Ongoing Management of SEB Area**

#### **5.3.1 Annual review**

As part of the annual monitoring and reporting program the Land Manager and HWF is to work with the suitably qualified ecologist (see Section 5.2.2) to determine ongoing management actions to continue to work towards the improvement of the grasslands and maintenance of the PBTL populations.

Any significant changes to the SEB Management Plan must be approved by the Native Vegetation Council Secretariat and DotE.

#### **5.3.2 Ten year review**

At the completion of the initial ten year period (2025) a review of the management plan will be undertaken using the annual monitoring data that has been collated in association with valuable landholder input. This adaptive management approach will help to inform any future management plan amendments and inclusions and determine the overall success of the existing management strategies.

The report, which will set out 2025 – 2042 management, will then be submitted to the current property owners and the Native Vegetation Council for approval.

HWF will contribute to the implementation of this SEB offset and PBTL offset until 2042. After that date, the management of the SEB offset and PBTL offset areas will be the responsibility of the landholder.

## 6 RISK MANAGEMENT

It is acknowledged that despite good planning, there are still potential risks to the successful management of the SEB area. The following section outlines these potential risks and provides a description of the contingency measures that should be implemented to mitigate them.

### **Change of land use**

The change of land use is one of the biggest threats to the implementation of this SEB Management Plan. If the land was to be used for a ground disturbing activity such as cropping, mining or other industry then the ability for the SEB Management Plan to be implemented is low. Additionally, a change in the type of grazing animal (eg from sheep to cattle) will have a significant impact on the offset area.

The contingency measures include:

- The offset area will be registered with the Native Vegetation Council which is then added to the relevant property titles.
- Have an agreement signed by the current landholders that they fully understand this management plan and the requirements contained within it.

### **Sale of property**

The SEB area is currently owned and managed by the Clark Brothers Shorts Trust. It is possible that the land is sold in the future. To ensure continuity of the delivery of the SEB Management Plan, the following actions should be undertaken:

- The offset area will be registered with the Native Vegetation Council which is then added to the relevant property titles.
- Ensure an agreement is signed between HWF and any new landholder regarding the implementation of the SEB Management Plan.

### **Lack of Funding / Lack of agreement with landholder and HWF**

If an agreement cannot be reached between HWF and the landowner to implement the SEB Management Plan, HWF' must develop a new offset strategy under EPBC Act and *Native Vegetation Act 1991*. Note that whilst it is possible to make a fund payment into the Native Vegetation Fund under the *Native Vegetation Act 1991* to cover offset obligations under the *Native Vegetation Act 1991*, this would not discharge the responsibility of HWF under the EPBC Act.



**A decrease in the population of PBTL / grassland condition**

Initial population surveys will determine a baseline PBTL population for the area and the condition of the native grasslands. Annual monitoring will be used as a tool to measure the changes in these indicators over time. The risk is that the management of the site, for some reason, results in a decline of PBTL numbers and grassland condition. The contingency for this will be the annual review of management actions compared to changes in PBTL numbers and grassland condition scores. Adaptive management will be implemented to ensure the most appropriate management is implemented.

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## 8 APPENDICES

### Appendix 1. Activity Record Datasheet

Activity Record Datasheet - To be filled in by landholders as work progresses, then issued to HWF at the end of each financial year

Management Action (eg fox baiting / shooting, boxthorn control, horehound control)	Date	Time spent on task (hrs / days)	Comments (Completed/more remaining/ follow up required – provide estimate of time remaining)

Appendix 2. Paddock Monitoring Sheet

**Paddock Monitoring Sheet - To be filled in by landholders as grazing management progresses**

Source: Mid North Grasslands Working Group and Land Water & Wool (1986)

Paddock Name:.....											
Paddock Size	Date in	Date out	A. Grazing Days	B. Estimate of feed left (kg/DM/ha)	C. Sheep number and type	D. DSE rating	E. Total DSE of mob	F. Feed utilised (kg)	G. Rest Period (days)	I. DSE days/ha	J. DSE days/ha/yr



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