Hornsdale Wind Farm SEB Offset Area

Annual Monitoring Report 2025

Final

September 2025

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Prepared by
Umwelt (Australia) Pty Limited

On behalf of
NEOEN Australia Pty Ltd

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt acknowledges the Traditional Owners of Country throughout Australia and their continuing values, culture and connection to the land, waters and sky.

We pay our respects to Elders past and present.

The below image is from the artwork *Yapung Maryiyang* (Pathway Forward) by Saretta Fielding.

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Executive Summary

Hornsdale Wind Farm (HWF) is a 315 Megawatt (MW) renewable electricity project consisting of 99 wind turbine generators and battery storage (the Project) located north of Jamestown in the Mid North region of South Australia (SA). The Project Area extends approximately 15 kilometres (km) in a north-south direction, and approximately 8 km in an east-west direction, with a footprint covering 75 hectares (ha).

As part of the EPBC Act approval process an offset was calculated to offset the potential impacts to the EPBC Act listed Pygmy Blue-tongue Lizard (PBTL) (*Tiliqua adelaidensis*) (see EPBC Act referral 2012/6573). To meet the requirements under the *Native Vegetation Act 1991* (NV Act) figures for a Significant Environmental Benefit (SEB) were calculated to determine the required offset for clearance of native vegetation associated with the construction of the Project (see *Hornsdale Wind Farm Native Vegetation Clearance Report* (EBS Ecology 2013)).

Annual PBTL and vegetation surveys within the SEB Offset Area are part of a long-term annual monitoring program, which is an EPBC Act approval condition (approval 3d) of the Project (see *Hornsdale Wind Farm Annual Compliance Report under the EPBC Act September 2018* (EBS 2018a)). The program involves annual surveys that will run until 2027, as per the approval conditions.

The key results of the 2025 PBTL survey include:

- A total of 1,582 burrows across the 11 quadrats were checked for PBTL occupancy in 2025, of which 99 burrows (6.26 %) contained one or more PBTLs (480 burrows in 2024, 11.46% containing PBTL).
- A total of 101 PBTLs were recorded in 99 burrows including 70 adults and 31 juveniles (56 PBTL in 2024). PBTLs were found in 10 of the 11 quadrats.
- The mean number of PBTLs per quadrat observed in 2025 was less than the baseline but was the highest recorded since the 2020 surveys. There was a significant difference in the mean number of PBTLs between the seven sampling years.
- There was a significant relationship between the spring-summer rainfall and both the total number of PBTLs and the number of spider holes observed.
- The mean number of PBTLs per quadrat across the five surveys was significantly greater on eastern than western slopes.

The key results of the 2025 vegetation survey include:

- A total of 65 flora species were observed across the 12 one ha quadrats in 2025. This included 36 native flora species, three of which are State Rare, and 29 weed species, six of which are Declared under the *Landscape South Australia Act 2019*. Weed cover was lower in 2025 than in 2024.
- Based on the data to date native and weed species diversity has significantly increased since 2018. However, this may reflect variations in survey effort and climatic conditions, not improvement in condition. Pleasingly however, after increasing every year since 2018, weed species diversity decreased for the first time in 2025. Also, despite annual fluctuations, native species diversity remains significantly higher than the 2018 baseline.

- Relative to the 2024 results, there has been an increase in tussock spacing and decrease in tussock height, demonstrating an opening up of vegetation cover. There was also an increase in the percentage of dead material on grass tussocks.
- The mean percentage of cryptogam cover increased in 2025 from the 2024 survey, as did bare ground cover. While both statistics were significantly lower than the baseline measure in 2024, this is no longer the case, indicating that vegetation structure has returned to more ideal conditions for PBTLs.
- Data continues to show relationships between rainfall experience in the year and months leading into monitoring surveys and most vegetation data sets.

The following recommendations have been made:

- Continue grazing management as per the Hornsdale Windfarm SEB – Native Vegetation and Pygmy Bluetongue Lizard Management Plan (EBS Ecology, 2013).
- During the spring/summer growing season 2025, continue control of woody weeds, specifically Dog Rose and Bathurst Burr.
- Concentrate weed control efforts in drainage lines and sites frequented by livestock, such as feed out areas and watering points.
- When stock are removed from the SEB and PBTL offset area in late 2025, in consultation with the landowner consider closing off watering points to reduce summer grazing pressure from kangaroos.

Abbreviations

Abbreviation	Definition
ANOVA	Analysis of Variance – statistical method used to test differences between two or more means by analysing the variance of the sampling distribution of the mean.
app	Application
BOM	Bureau of Meteorology
Cryptogram	Biological soil crust most often composed of fungi, lichens, cyanobacteria, bryophytes and algae in varying proportions.
DP	Declared Plant
DSE	Dry Sheep Equivalent – standard measure of feed demand which represents a 50 kg wether which consumes 1 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.
EBS Ecology	Environmental and Biodiversity Services Pty Ltd – trading as EBS Ecology
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GPS	Global Positioning System
HWF	Hornsdale Windfarm
HWF1	Hornsdale Windfarm Stage 1
HWF2	Hornsdale Windfarm Stage 2
HWF3	Hornsdale Windfarm Stage 3
JPH	Juveniles Per Hectare - the mean of the total number of juvenile perennial native grass tussocks (i.e. multiplied by 10,000).
LSA Act	*Landscape South Australia Act 2019*
MW	Mega Watt(s)
NPW Act	*National Parks and Wildlife Act 1972*
NV Act	*Native Vegetation Act 1991*
PBTL	Pygmy Blue-tongue Lizard (*Tiliqua adelaidensis*)
PCQM	Point Centre Quarter Method
p-value	The level of marginal significance within a statistical hypothesis test representing the probability of the occurrence of a given event. The p-value is used as an alternative to rejection points to provide the smallest level of significance at which the null hypothesis would be rejected.
r^2	The coefficient of determination – the proportion of the variance in the dependent variable that is predictable from the independent variable(s).
SA	South Australia(n)
SEB	Significant Environmental Benefit
sp.	Species
ssp.	Sub-species

Abbreviation	Definition
TPH	Tussocks per hectare
WoNS	Weed of National Significance
$\bar{x}$	Sample mean
%	Percent

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1.0 Introduction

1.1 Hornsdale Windfarm

Hornsdale Wind Farm (HWF) is a 315 Megawatt (MW) renewable electricity project consisting of 99 wind turbine generators and battery storage (the Project) located north of Jamestown, South Australia (SA). The location of HWF is shown on the map in **Figure 1.1**. The project was constructed in three stages, HWF1, HWF2 and HWF3.

A Significant Environmental Benefit (SEB) offset was required under the *Native Vegetation Act 1991* (NV Act) to offset the clearance of native vegetation associated with the construction of each stage. A Pygmy Blue-tongue Lizard (PBTL) (*Tiliqua adelaidensis*) offset was also required as part of an approval condition under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), to compensate for the potential impact to PBTLs resulting from the wind farm development. The PBTL is listed as Endangered under the EPBC Act and the *National Parks and Wildlife Act 1972* (NPW Act). A summary of EPBC Act and previous NV Act approvals for the Project is provided in **Table 1.1**.

The SEB offset for native vegetation has been delivered for all three stages of the Project in a parcel of land 142.54 hectares (ha) in size, located [redacted] (SEB Offset Area). A significant population of PBTLs is present in the SEB Offset Area and a PBTL offset of 3.1 ha has been incorporated inside it. The SEB Offset Area is protected under the NV Act and is listed on the property title.

The establishment of the SEB Offset Area and PBTL offset has required the implementation of a management plan which aims to ensure the habitat suitability and vegetation condition are maintained and/or improved over time.

Table 1.1 Summary of the Relevant Environmental Approvals for the Hornsdale Windfarm

Development Stage	Relevant Legislation	Approval Reference
HWF1	NV Act	2013/3012/764
HWF2	NV Act	2013/3012/764
HWF3	NV Act	2016/3101/764
All stages	EPBC Act	EPBC 2012/6573

FIGURE 1.1

Hornsdale Windfarm Location

Legend

- Hornsdale Windfarm
- PBTL Monitoring quadrat
- Access track

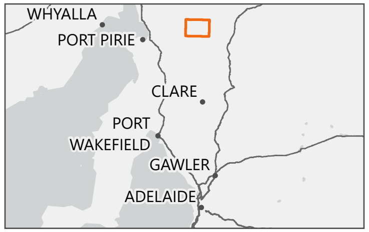

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Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

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1.2 Objectives

To assess the effectiveness of the management plan, monitoring of vegetation (grassland) condition and the PBTL population inside the offset areas is required. The objectives of this monitoring are as follows:

- Undertake long-term (10 years) monitoring of native vegetation and the PBTL population.
- Identify any threats acting on native vegetation condition and/or the PBTL population that may be occurring in the SEB Offset Area, such as increasing weed presence/abundance or changing vegetation structure.
- Identify any actions that are required to manage any threats or undesirable outcomes identified.

This report discusses the results of the 2025 survey, which is the eighth year of monitoring. The report aims to compare results between years to determine any trends that can be linked to threats. Where threats are identified, the report makes recommendations for management actions that may address these threats.

1.3 SEB Offset Area

The SEB Offset Area within the HWF was selected based on the following key considerations:

- The occurrence of a poor to moderate quality native grassland that could be improved over time with active management.
- The occurrence of a significant population (>30 individuals) of PBTLs.
- The location within the HWF Project Area and the Northern and Yorke Landscape Management Region (LMR).

A management plan was prepared for the SEB Offset Area by EBS Ecology (EBS Ecology, 2017a). The management plan developed long-term management measures aimed at improving vegetation condition and maintaining the PBTL population.

1.4 Current Land Management and Ownership

The cadastral and ownership details of the SEB Offset Area are provided in **Table 1.2**. Since the land's purchase in 2008, it has been lightly grazed by sheep, mainly by lambing ewes. Generally, little to no grazing occurs prior to 1 May each year to facilitate the growth of fodder.

Since 2017, gazing has generally occurred according to the regime recommended in EBS Ecology 2017a. Since 2023 however, in response to climatic conditions that resulted in undesirable changes in vegetation structure and a perceived decrease in PBTL numbers, grazing periods were increased. This is discussed in detail in EBS Ecology, 2024.

Since the end of 2024, the grazing regime has returned to that stipulated in the management plan.

Table 1.2 SEB Offset Area Land Ownership

Owner	[redacted]
Land Manager	[redacted]
Contact Address	PO Box 233, Jamestown SA 5491
Local Government Area	Northern Areas Council
Land Management Region	Northern and Yorke
Hundred	Belalie
Parcel Details	[redacted]
Titles	[redacted]
Location	[redacted], Jamestown

1.5 Weather and Climate

1.5.1 Annual Rainfall

Rainfall data is important as it impacts heavily on vegetation growth. Monthly rainfall data was sourced from the closest weather station to HWF, which is located at Yongala (Station: 019062, BOM 2025). The recorded monthly rainfall at Yongala has been highly variable since 2015, the year preceding the commencement of monitoring, as shown in **Table 1.3**.

This table shows the mean monthly rainfall and annual total in millimetres (mm) and includes all years from 2015 until 2024. The table shows annual rainfalls recorded during that period have seldom been close to the long-term mean. Totals have tended to fluctuate from years of much higher than average to below average. In particular, the years from 2019 to 2024 have alternated between periods of very much below average to very much above average rainfall. During this period, annual totals have varied from a low of 174.2 mm in 2019 to as high as 444.3 in 2020 (see **Table 1.3**).

In 2024, the year leading up to the 2025 monitoring period, annual rainfall was 101.5 mm below the long-term mean. This followed a similar year in 2023, when only 243.1 mm was recorded.

Table 1.3 Summary of Mean Monthly and Annual Rainfall, Recorded at Yongala Station from 2015 to 2024 (BOM, 2025)

Year	Mean Monthly Rainfall (mm)	Annual Rainfall (mm)
2015	27.5	329.6
2016	41.9	502.4
2017	25.0	300.5
2018	17.8	213.2
2019	14.5	174.2
2020	37.0	444.3
2021	24.7	296.4
2022	34.8	418.1
2023	20.3	243.1
2024	21.7	260.7
Long-term Mean	30.2	362.2

1.5.2 Spring and Summer Rainfall

Following three spring-summer periods (September to January) of higher-than-average rains, the 2024-25 period returned to below average conditions. A total of 123.3 mm was recorded from September 2024 to January 2025, making it the fifth driest spring-summer period since monitoring began in 2014 (see **Figure 1.2**).

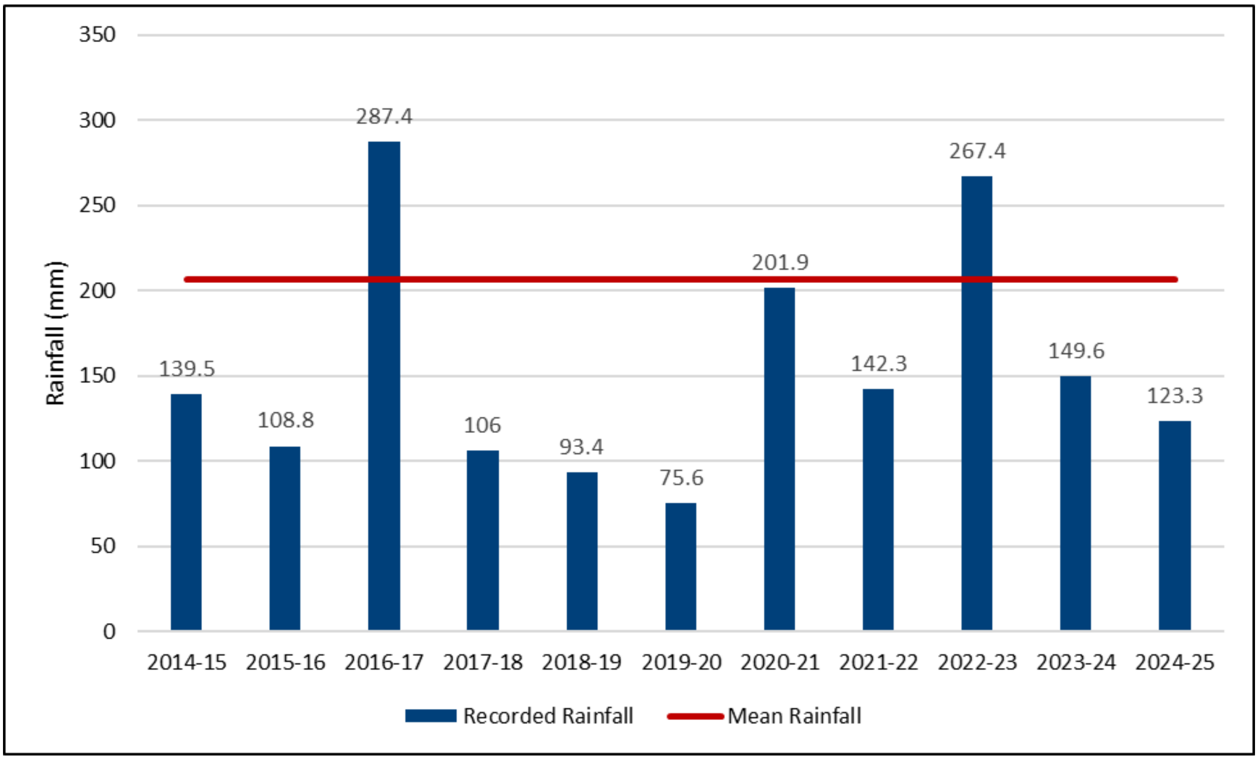

Figure 1.2 Spring-summer (September to January) Rainfall Recorded at Yongala Station Since 2014. The Graph Also Shows the Long-term Mean for the Same Period (BOM, 2025)

2.0 Methods

The 2025 monitoring survey was undertaken using the same methods as used during all previous monitoring periods. Detailed discussions of the methods used for monitoring PBTL and vegetation condition are provided in EBS Ecology 2022 and EBS Ecology 2023.

The following sections provide a summary of those methods. The 2025 survey was undertaken over two weeks, with the PBTL monitoring undertaken from 3 to 7 March 2025 and vegetation monitoring from 25 to 28 March 2025.

2.1 Monitoring Quadrats

Monitoring was conducted within 12 quadrats (see **Figure 2.1**). Eight quadrats (Quadrat 1 to 8) were established in 2015 and four (Quadrat 9 to 12) were established in 2018. Of the 12 quadrats, 11 are located within open grassland, while one (Quadrat 12) is located within a small area of *Allocasuarina verticillata* (Drooping Sheoak) Woodland. Drooping Sheoak Woodland is considered unsuitable habitat for PBTLs and, therefore, Quadrat 12 is not monitored for PBTL presence and abundance.

Each quadrat is 100 x 100 m (1 ha) in size and oriented in a north-south direction. A steel dropper is located in each corner of the quadrat and form permanent markers. The GPS Coordinates of the corner posts for each quadrat are provided in **Table 2.1**. A photo of each quadrat is taken from the north-eastern corner looking to the south-western corner during each annual monitoring survey (OEH 2009). These photos are provided in **Appendix 2**.

Table 2.1 Location Coordinates of Quadrat Corner Posts

Quadrat	[redacted]		[redacted]		[redacted]		[redacted]	
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
1	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
2	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
3	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
4	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
5	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
6	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
7	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
8	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
9	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

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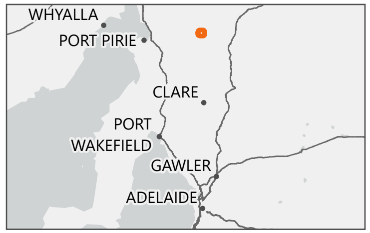
[redacted]

FIGURE 2.1

Location of Monitoring Quadrats 1-12 Within the SEB Offset Area. Pygmy Blue-tongue Lizards are not Monitored in Quadrat 12

Legend

- Hornsdale Windfarm
- PBTL Monitoring quadrat
- Access track



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GDA2020 MGA Zone 54

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Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

2.2 Monitoring History

2.2.1 PBTL Monitoring (11 Quadrats)

Eight PBTL monitoring quadrats were established in 2016 as part of HWF Stages 1 and 2, which were subsequently surveyed during the baseline survey (EBS Ecology, 2016b). Quadrats 9–11 were established and monitored, along with Quadrats 1–8, in 2018. Quadrats 1–11 have been surveyed and data analysed in all subsequent years.

2.2.2 Vegetation Monitoring (12 Quadrats)

Baseline data was collected across the 12 monitoring quadrats in 2018, with year 1 and year 2 monitoring conducted in 2019 and 2020 respectively. Additional vegetation monitoring attributes were collected as baseline data in 2020 and in 2022 to assist in determining vegetation condition trends.

2.3 Statistical Analyses

The PBTL and vegetation data analyses were conducted using the R software environment for statistical and graphical computing (R Core Team 2020). Software coding was updated in 2025 and data management protocols reconfigured to ease future data analysis processes.

2.3.1 PBTL Monitoring

Type II one-way ANOVAs were used for statistical analyses to detect differences in the number of burrows, spiders and PBTLs recorded in the Baseline, 2018, 2019, 2020, 2021, 2022, 2023, 2024 and 2025 surveys. Type II ANOVAs are used to test for effects in an unbalanced design when there is no interaction observed between the explanatory variables, which is appropriate here given the different number of quadrats sampled during the baseline survey and since no interactions between the explanatory variables were detected. When Anova model assumptions were violated, Welch's ANOVAs were used, which does not assume equal variances, a common violation of linear models. A p-value of 0.05 was used to infer a significant difference in PBTL numbers in response to the explanatory variables. If a significant difference was detected by the ANOVA tests, post hoc analyses were undertaken to determine in which year significant differences occurred. Model fit values (r^2) are provided for select models that it could be calculated.

Type II two-way ANOVAs were used for statistical analyses to detect differences in the number of PBTLs in response to year and the number of burrows and spiders, respectively, as well as any differences in the number of PBTLs in response the various rainfall variables (i.e., The total rainfall from the past 12 months and rainfall from the spring and summer period preceding surveys – data from BOM 2025).

A subset of the PBTL data (i.e., 2018–2025 data) was also analysed using ANOVAs to test for the influence of vegetation condition variables (collected during the 2018–2025 vegetation surveys) on the number of PBTLs.

2.3.2 Vegetation Monitoring

One-way ANOVAs were used for statistical analyses to detect differences in the vegetation attributes recorded in the 2018, 2019, 2021, 2022, 2023, 2024 and 2025 surveys, as well as in response to rainfall variables, namely total rainfall from the past 1 months and rainfall from the spring and summer period preceding surveys. A p-value of 0.05 was used to infer a significant difference, and post hoc analyses were undertaken to determine in which year significant differences occurred. Model fit values (r^2) are provided for select models that it could be calculated.

2.3.3 Influence of Rainfall on Vegetation Condition Variables and PBTLs

Given anecdotal comments from the landowner regarding spring – summer rainfall, the total rainfall recorded for the spring – summer period (September to January) prior to each monitoring survey was analysed. Previous years data analysis has concentrated only on rainfall totals for the three months prior to the monitoring survey, that is December, January and February.

The September to January rainfall (see **Section 1.5.2**) was compared to the total number of PBTLs recorded and variables that might influence the habitat suitability and detectability of PBTL:

- Total number of spider holes surveyed across all quadrats.
- Cover (%) of bare ground + cover (%) of cryptogam, using the mean of the 1 m x 1 m quadrat measure calculated across all 12 monitoring sites.
- Basal width, tussock height and per-cent dead material, using the mean of the 1 m x 1 m quadrat measure calculated across all 12 monitoring sites.

While weed cover and litter cover may also influence habitat suitability, these variables were not compared to rainfall as those datasets have only been recorded since 2020.

The Pearson Correlation Coefficient of each dataset was calculated to determine if any relationships exist with increasing spring – summer rainfall.

3.0 Pygmy Blue-tongue Lizard Monitoring Results

3.1 2025 Results

3.1.1 Pygmy Blue-tongue Lizards

Across all 11 PBTL monitoring quadrats, a total of 1,582 burrows were located and checked for PBTL. Of these, 99, or 6.26%, contained one or more PBTLs. Most PBTLs were found alone in burrows. However, one burrow at Quadrat 5 contained three PBTLs (one adult and two juveniles). A total of 101 PBTLs were recorded. These results are summarised in **Table 3.1** (see page 13), with the numbers of PBTLs recorded for all years illustrated on the graph in **Figure 3.1** on page 11.

PBTLs were recorded in all quadrats except Quadrat 9. More than 10 PBTLs were recorded at four quadrats (4, 5, 6, and 7), with a high of 30 recorded at Quadrat 6. This site had the second highest number of burrows detected and checked (245), and has had the highest number of PBTLs in most monitoring years. Interestingly, although 337 burrows were located and checked at Quadrat 10, the highest of any quadrat, only three PBTL were found there. Only a single PBTL was found at Quadrat 8 from 40 burrows checked.

Maps showing the locations of burrows checked and PBTLs recorded are provided in **Appendix 3**. Despite no PBTLs being observed in quadrats 2 and 11 in 2024, the 2025 monitoring recorded two and three PBTLs respectively in these same quadrats. An increased number of PBTLs since 2024 were also detected in quadrats 4, 5, 6, 7 and 10 (see **Figure 3.1**). The largest increase was in quadrat 6, where 22 more PBTLs were detected in 2025 than in 2024.

Compared to 2024, fewer PBTLs were detected at quadrats 3 and 9. Numbers of PBTLs at quadrat 9 have historically been low; the highest recorded was 9 in 2019. However, 2025 is the first monitoring year when no PBTLs have been found in that quadrat during the monitoring.

There was a high number of juvenile PBTLs found in 2025. The total of 31juveniles was the highest of any survey, comparing to a low of two in 2019 and 2021 and the next highest of 29 in 2017.

In previous years, there has been a significant correlation between the number of burrows searched in a quadrat and the number of PBTLs recorded. Although plotting the number of burrows against PBTLs in 2025 indicates a similar relationship (see **Figure 3.2** on page 12), it was found to not be significant (p-value = 0.39, r^2 = 0.08). The results are most likely affected by the occurrence of a low number of PBTLs occurring at the quadrat where the highest number of burrows were searched (quadrat 337 burrows and 3 PBTLs).

In keeping with the findings of the 2024 monitoring, there was no significant difference in the number of PBTLs observed on east or west facing slopes (p-value = 0.531).

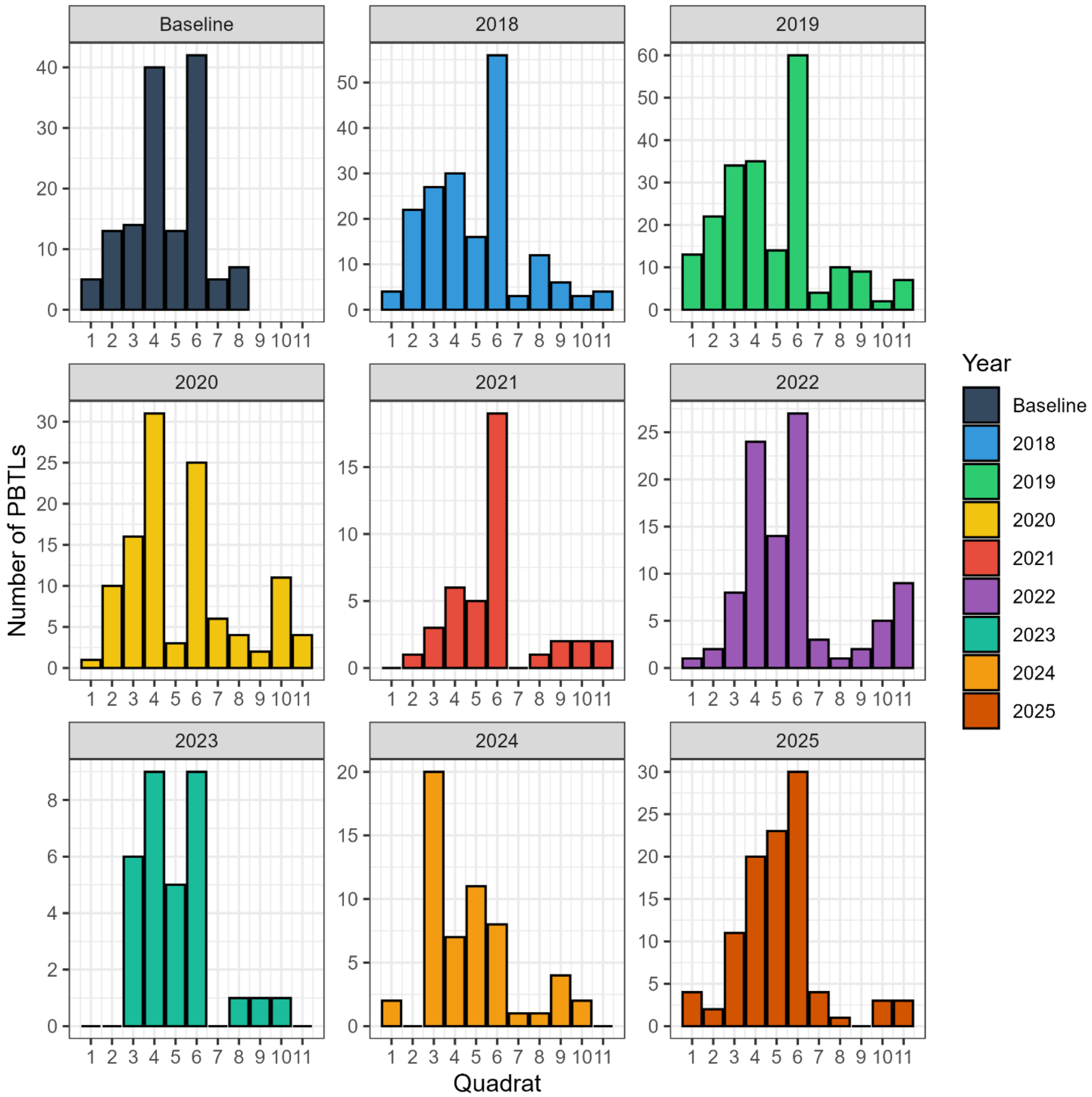

Figure 3.1 The Total Number of PBTLs Recorded During Each Monitoring Survey, From Baseline to 2025

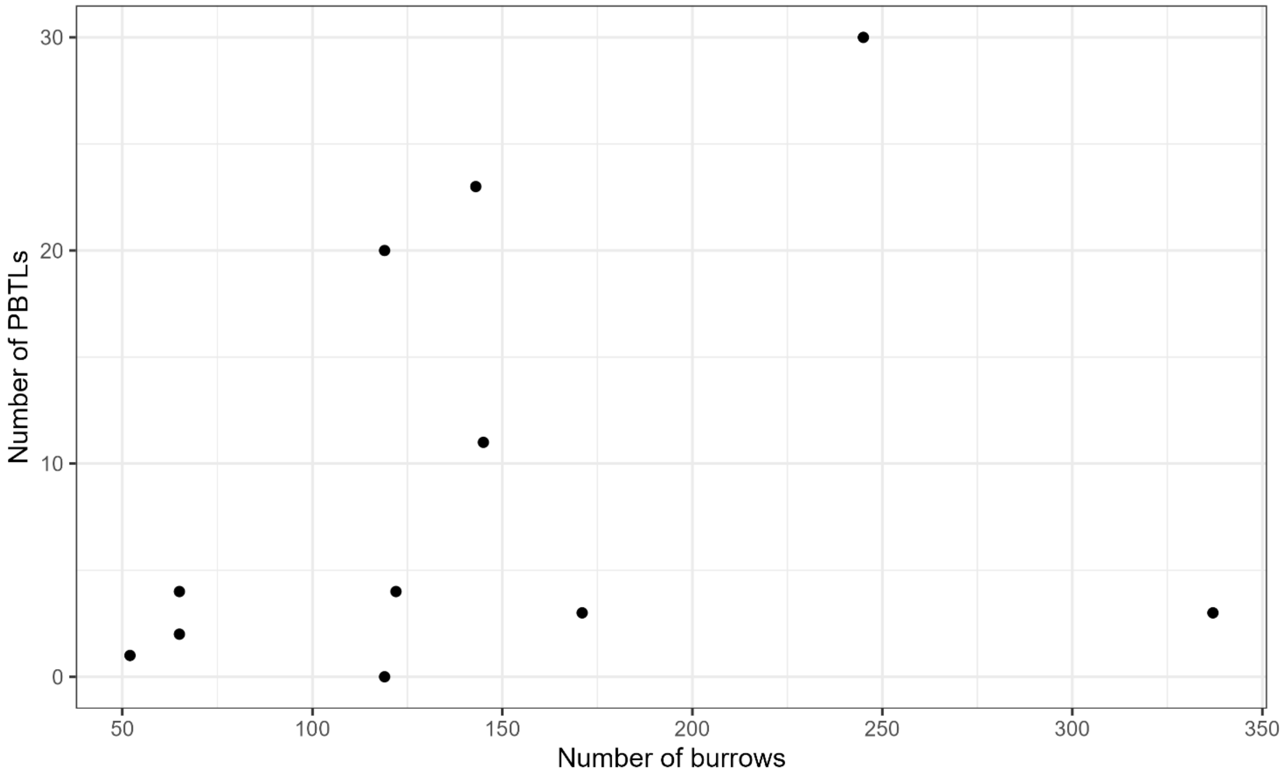

Figure 3.2 The Number of PBTLs Detected and Number Burrows Searched in 2025

Table 3.1 Summary of the Results of the 2025 PBTL Monitoring Survey

Quadrat	Slope Aspect	Burrows with PBTL	Juvenile PBTLs	Sub-adult PBTLs	Adult PBTLs	Total PBTLs	Wolf Spider	Trapdoor Spider	Other Invertebrate[1]	Delma / Skink	Debris	Empty	Total Burrows	% Burrows with PBTL
1	West	4	1	2	1	4	12	1	31	0	73	1	122	3.28
2	East	2	0	0	2	2	3	3	8	0	48	0	64	3.13
3	West	11	4	2	5	11	2	1	23	0	108	0	145	7.59
4	East	20	8	3	9	20	22	4	10	0	62	1	119	16.81
5	West	21	6	5	12	23	22	4	33	0	63	0	143	14.69
6	East	30	9	5	16	30	28	18	31	1	137	0	245	12.24
7	West	4	3	0	1	4	5	3	12	0	41	0	65	6.15
8	East	1	0	0	1	1	4	3	4	0	40	0	52	1.92
9	East	0	0	0	0	0	6	6	71	0	36	0	119	0.00
10	East	3	0	1	2	3	14	3	211	0	106	0	337	0.89
11	West	3	0	2	1	3	8	6	36	2	107	9	171	1.75

[1]Other Invertebrates includes weevils, beetles, ants, centipedes, snails etc.

Table 3.2 Burrow Depths Recorded at Each Monitoring Quadrat in 2025

Quadrat	<10 cm	10-20 cm	21-30 cm	>30 cm	Depth not Recorded	Total
1	57	34	11	20	0	122
2	25	12	17	10	0	64
3	63	34	36	12	0	145
4	42	38	28	11	0	119
5	66	45	20	11	1	143
6	62	91	47	45	0	245
7	23	23	13	6	0	65
8	10	17	8	17	0	52
9	20	54	41	4	0	119
10	60	179	84	14	0	337
11	49	57	40	25	0	171
Total Burrows	477	584	345	175	1	1582
Total PBTL	**1**	**70**	**24**	**3**	**3**	**101**

3.1.2 Spiders

The survey recorded 126 wolf spiders and 52 trapdoor spiders (see **Table 3.1** on page 13), with 11.25% of burrows containing spiders. Spiders were recorded at all monitoring quadrats, with the most recorded at Quadrat 6. There were 28 wolf spiders, and 18 trapdoor spiders recorded there. The lowest number of spiders (two wolf spiders and 1 trapdoor spider) was recorded at Quadrat 3.

3.1.3 Burrow Parameters

3.1.3.1 Density

As stated previously, 1,582 burrows were located by the survey. As expected, these were not evenly distributed across the 11 monitoring quadrats, with density between the sites highly variable. The highest number of burrows (337) was found at Quadrat 10, while only 52 were located at Quadrat 8.

An average of 156 burrows were found pre quadrat on eastern facing slopes, a higher density than western slopes, where the average was 119.8 burrows. Eastern facing sites had both the most burrows per quadrat (337 at Quadrat 10) and least (52 burrows at Quadrat 8).

3.1.3.2 Depth

Most burrows located and surveyed were between 10 and 20 cm deep, with 584 burrows, or 36.92%, within this depth range (see **Table 3.2** on page 13). Quadrat 10 had the highest number of burrows in this depth category of any site, with 179. Quadrat 6 had the deepest burrows of any site. There were 92 burrows located deeper than 20 cm at this site. By contrast, the shallowest burrows were found at Quadrat 10 where 239 burrows were less than 20 cm deep (see **Table 3.2** on page 13).

PBTLs were observed in burrows of all depth categories, with 1 PBTL recorded in burrows less than 10 cm and 70 PBTLs in burrows between 10 and 20 cm. Not surprisingly, Quadrat 6 had the highest number of burrows 10-20 cm deep (91) and also had the most PBTLs (30) of any site (see **Table 3.2** on page 13).

3.1.3.3 Other Burrow Contents

Over half of all burrows searched were filled with debris (821 burrows), consisting of vegetation litter, soil or animal material such as shed spider skins. A total of 470 burrows contained invertebrates other than spiders. This included mostly weevils, centipedes, beetles and ants, while only 11 burrows were recorded as being empty.

Excluding PBTLs, two reptile species were found inside burrows. These consisted of one legless lizard, probably *Delma molleri*, at Quadrat 6 and two unidentified skink species at Quadrat 11. No other vertebrate species were found in burrows.

3.2 Comparison of Pygmy Blue-tongue Lizard Results Between Years

3.2.1 Number of Pygmy Blue-tongue Lizards

The mean number of PBTL observed in 2025 was 9.2 individuals. This is the highest mean PBTLs observed since the 2020 monitoring survey when a mean of 10.3 was recorded (see **Table 3.3** and **Figure 3.3**). There was a significant difference in the mean number of PBTLs between the nine sampling years (p-value = 0.0006), with the significant differences occurring between years as indicated below:

- Baseline and 2021 (p-value = -0.026)
- Baseline and 2023 (p-value = 0.012)
- 2018 and 2021 (p-value = 0.025)
- 2019 and 2021 (p-value = 0.018)
- 2019 and 2023 (p-value = 0.008).

Despite the number of PBTLs reaching significantly low levels in the years 2021 and 2023, numbers have risen in 2025 (see **Table 3.3**), with no significant difference between the number of PBTL compared to baseline.

In 2025, there was a weak positive correlation between the number of burrows at each monitoring quadrat and the number of PBTLs recorded there, where R^2 = 0.08. This is illustrated by the graph shown in **Figure 3.4**.

Table 3.3 The Total and Mean Number of PBTLs Recorded Within Each Age Class for all Monitoring Surveys

Age Class	Baseline	2018	2019	2020	2021	2022	2023	2024	2025
Adult	100	142	193	95	39	84	18	47	50
Sub-adult	10	8	15	0	0	0	0	0	20
Juvenile	29	20	2	18	2	12	14	9	31
Total	139	170	210	113	41	96	32	56	101
Mean	**17.4**	**16.6**	**19.1**	**10.3**	**3.7**	**8.7**	**2.9**	**5.1**	**9.2**

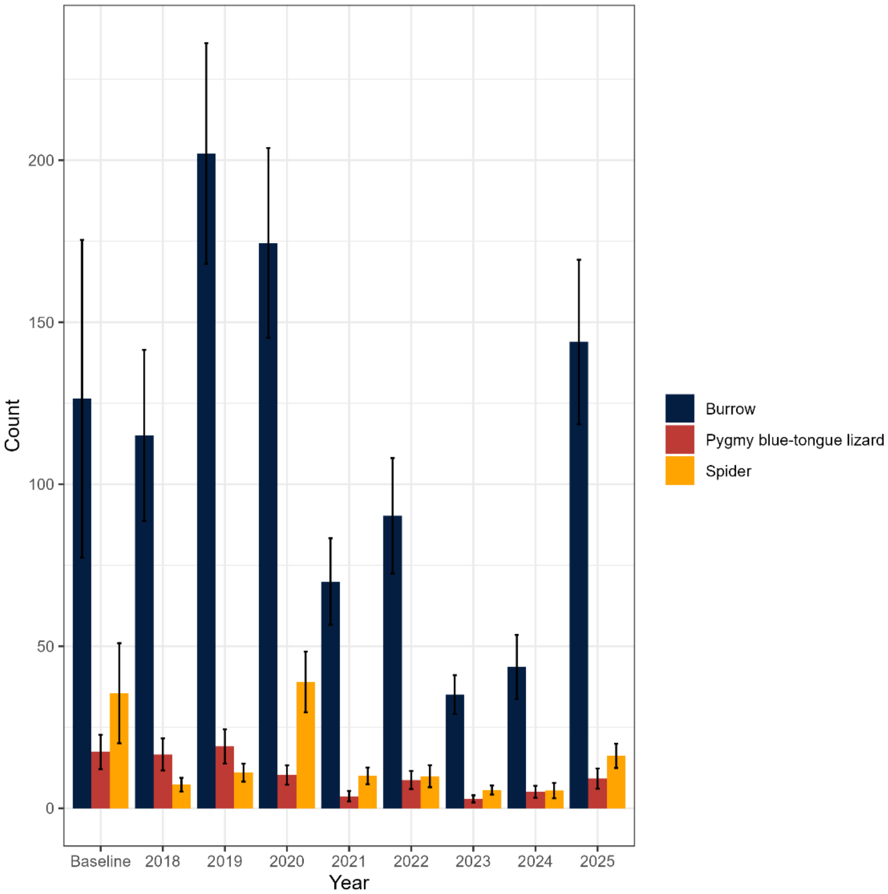

Figure 3.3 **The Mean Number of PBTL, Spiders and Burrows (+/- S.E.) Across the 11 Quadrats for all Monitoring Years, Noting that Baseline Monitoring Surveyed Quadrats 1 to 8 Only**

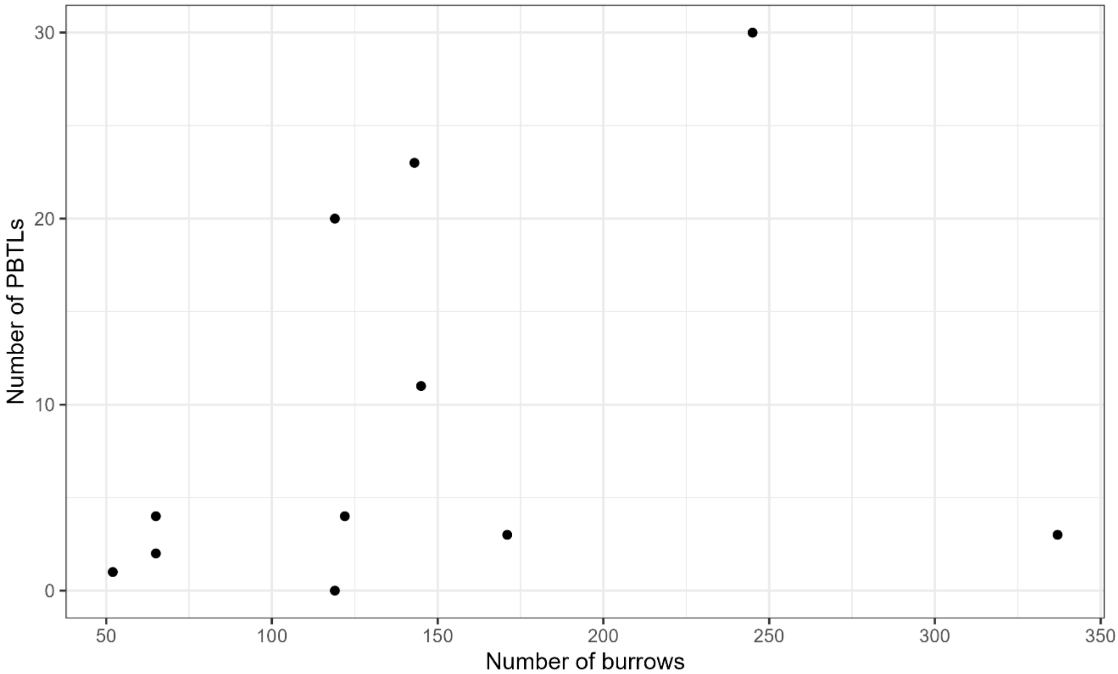

Figure 3.4 **The Number of PBTLs at Each Quadrat Plotted Against the Number of Burrows Indicates a Weak Positive Correlation**

3.2.2 Spiders

The mean number of spiders per quadrat observed in 2025 (16.2) was the highest recorded since the 2020 monitoring, as illustrated on the graph in **Figure 3.3** (page 16). The 2020 monitoring period recorded the highest mean spider abundance per quadrat of any year, with a mean of 39 spiders.

When comparing years, the following significant differences in spider numbers were found between:

- 2018 and 2020 (p-value = 0.012)
- 2020 and 2023 (p-value = 0.004)
- 2020 and 2024 (p-value = 0.002).

There was no significant difference between the mean number of spiders per quadrat recorded during baseline and 2025 monitoring. The mean number of spiders recorded per quadrat in each monitoring year is indicated on the graph in **Figure 3.5**. This shows that the highest number of spiders for any year were observed in 2020. The 2025 survey recorded the third highest mean number of spiders when compared to other years.

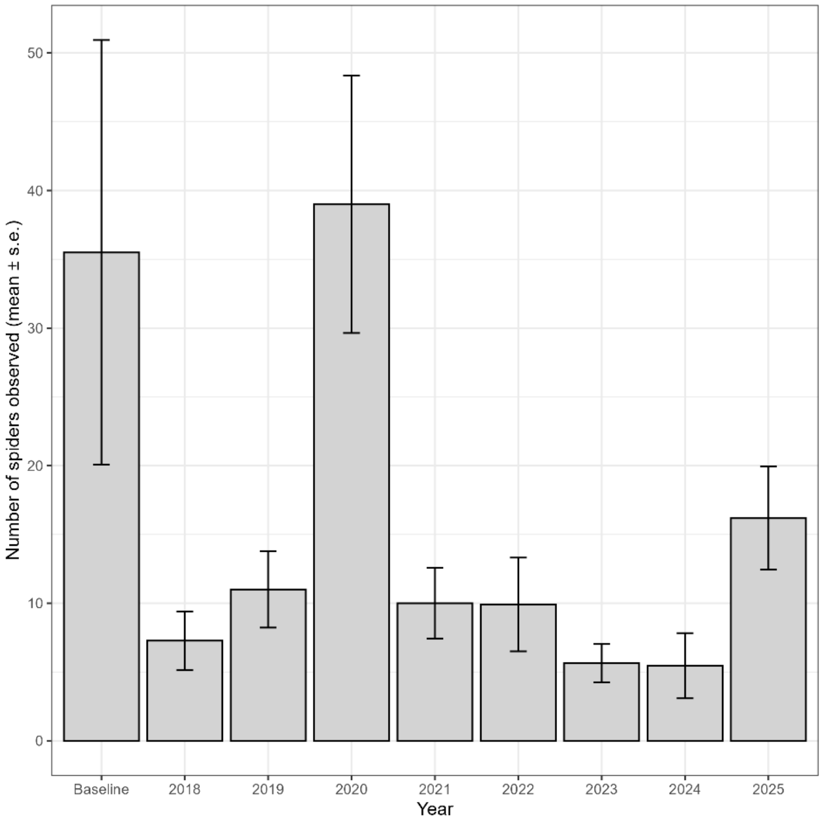

Figure 3.5 The Mean Number of Spiders per Monitoring Quadrat for Each Year of Monitoring Surveys

3.2.3 Burrows

The mean number of burrows per quadrat observed in 2025 (143.82) was greater than all years since 2020. This continues an upwards trend from a monitoring low of 35.09 PBTLs per quadrat in 2023 (**Figure 3.6**).

The increase in the mean number of burrows per quadrat from the low of 35.09 is a significant increase (p-value = 0.0024). There is no longer any significant difference between the number of burrows detected during the baseline survey (126.38) and the 2025 monitoring (p-value = 0.341).

In fact, the 2025 survey found more burrows (1,582) in total than was recorded during the 2016 baseline survey (1,011 burrows). Although it should be noted that quadrats 9, 10 and 11 were not surveyed until 2018.

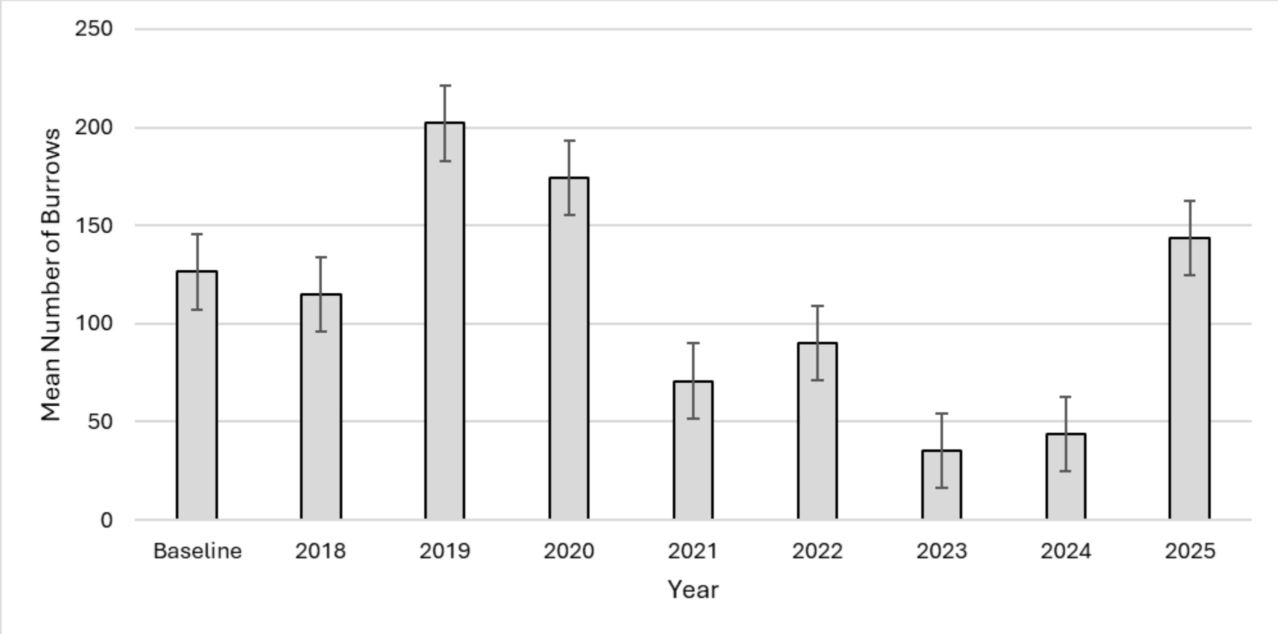

Figure 3.6 The Mean Number of Burrows Detected by Monitoring Year

3.3 Influence of Rainfall, Aspect and Vegetation Condition on PBTLs

3.3.1 Rainfall

The number of PBTLs were compared against total rainfall for the year prior to survey (see **Figure 3.7**) and rainfall during the spring – summer period preceding the survey (September 2024 – January 2025) (see **Figure 3.8**).

The analysis indicates the following relationships:

- A significant relationship between total annual rainfall and numbers of PBTLs detected (p-value = --0.001). This indicates that as annual rainfall increases, the number of PBTLs detected decreases.
- A significant relationship between spring – summer rainfall and numbers of PBTLs detected (p-value = -0.000001). Again, this indicates that as spring – summer rainfall increases, the number of PBTLs detected decreases.

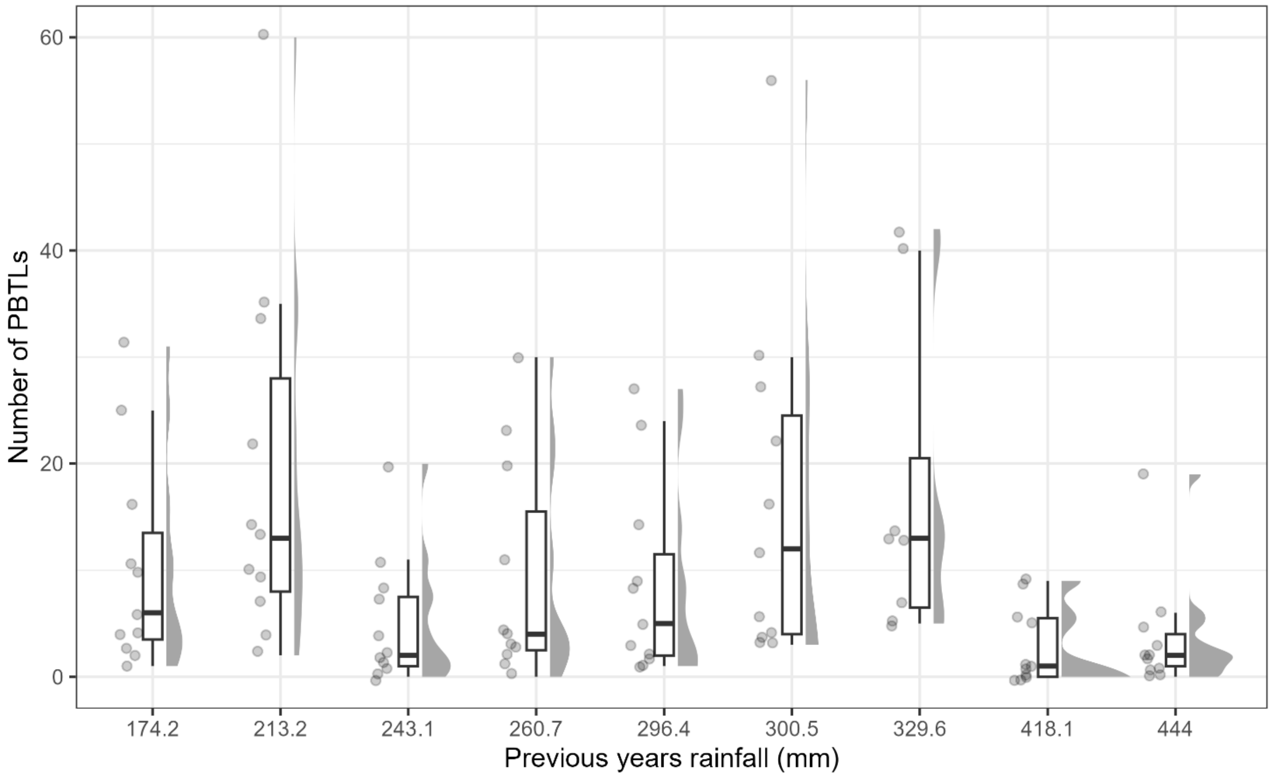

Figure 3.7 The Total Number of PBTLs Recorded Each Year Plotted Against Annual Rainfall

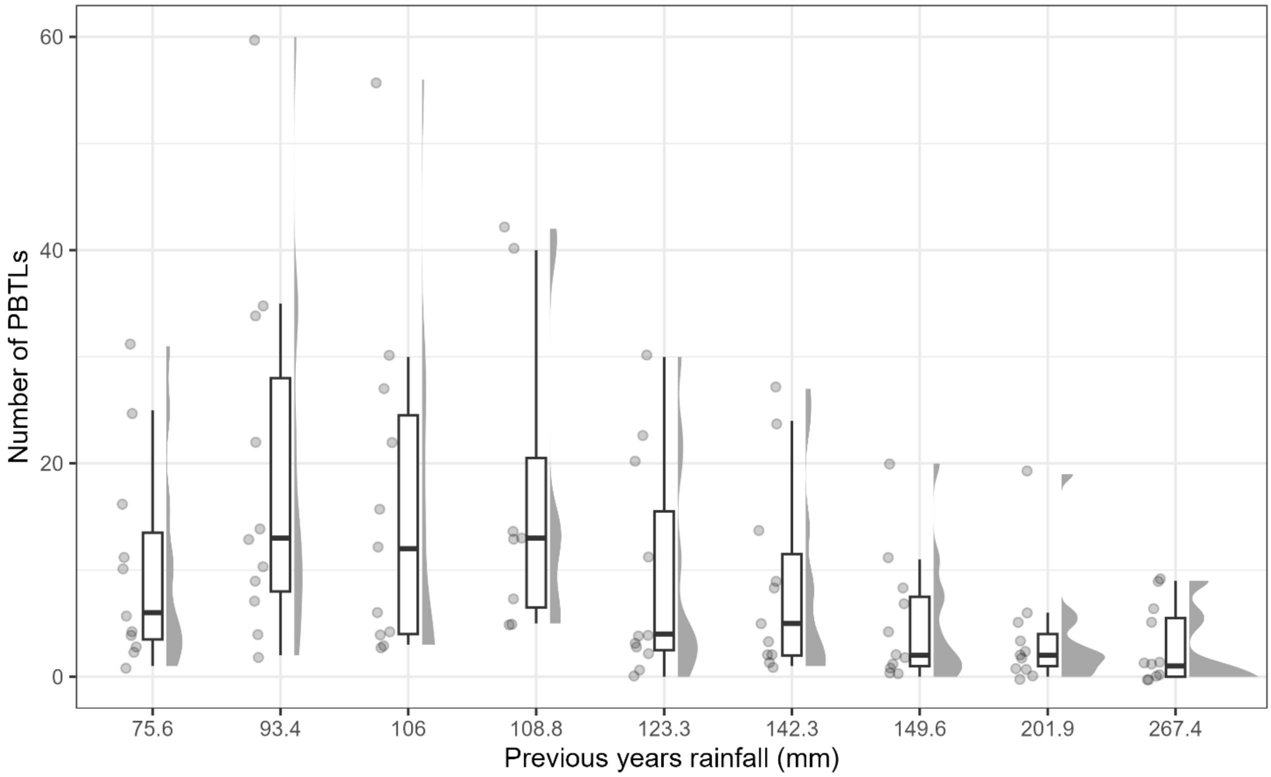

Figure 3.8 The Total Number of PBTLs Recorded Each Year Plotted Against Spring – Summer Rainfall

3.3.2 Aspect

The distribution of PBTL numbers recorded on east and west facing slopes is illustrated in **Figure 3.9**. Over the years of monitoring, there has been a significantly more PBTLs detected on east facing slopes over those that face west (p-value = 0.006).

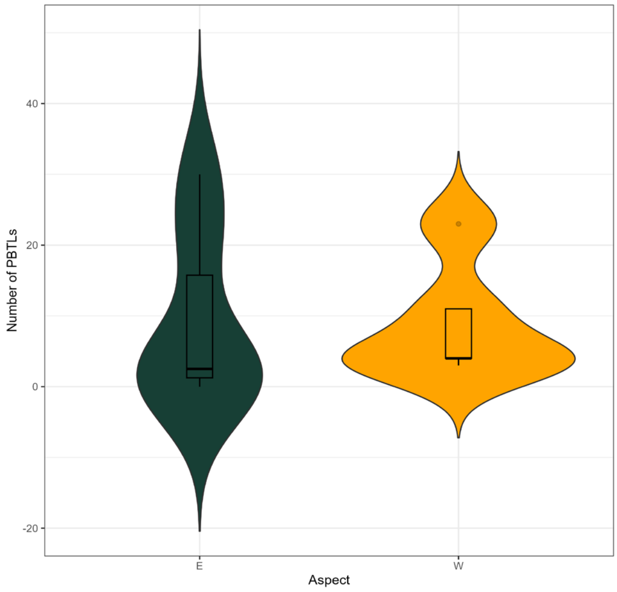

Figure 3.9 The Distribution (Minimum, Maximum, Median, 25th and 75th Percentile and Outliers) of the Number of PBTLs Observed in Quadrats on East (E) and West (W) Facing Slopes

3.3.3 Vegetation Condition Variables

As reported after the 2025 monitoring, there were significantly more PBTLs recorded at sites with more cover of bare ground, (*r*2 = 0.22, p-value = 0.008) (**Figure 3.10**), however in 2025 no relationship was found between the number of PBTLs and cryptogram over (r^2 = 0.11, p-value = 0.08) (**Figure 3.11**).

The 2025 results show a relationship between the number of PBTLs and the following vegetation variables:

- Tussock distance (r^2 = 0.12, p-value = 0.009) – a weak positive relationship, indicating the number of PBTLs increases as the distance between tussocks increases.
- Tussock height (r^2 = 0.28, p-value = 0.0004) – a weak positive relationship, indicating the number of PBTLs decreases as the height of tussocks increases.
- Weed diversity (r^2 = 0.22, p-value = 0.008) – a weak negative relationship, indicating the number of PBTLs decreases as weed diversity increases.
- Native species diversity (r^2 = 0.22, p-value = 0.008) – a weak negative relationship, indicating the number of PBTLs decreases as weed diversity increases.
- Weeds / ha (r^2 = 0.21, p-value = 0.006) – a weak negative relationship, indicating the number of PBTLs decreases as weed cover per hectare increases.
- Weeds / 1m^2 (r^2 = 0.12, p-value = 0.021) – a weak negative relationship, indicating the number of PBTLs decreases as weed cover per one metre square hectare increases.

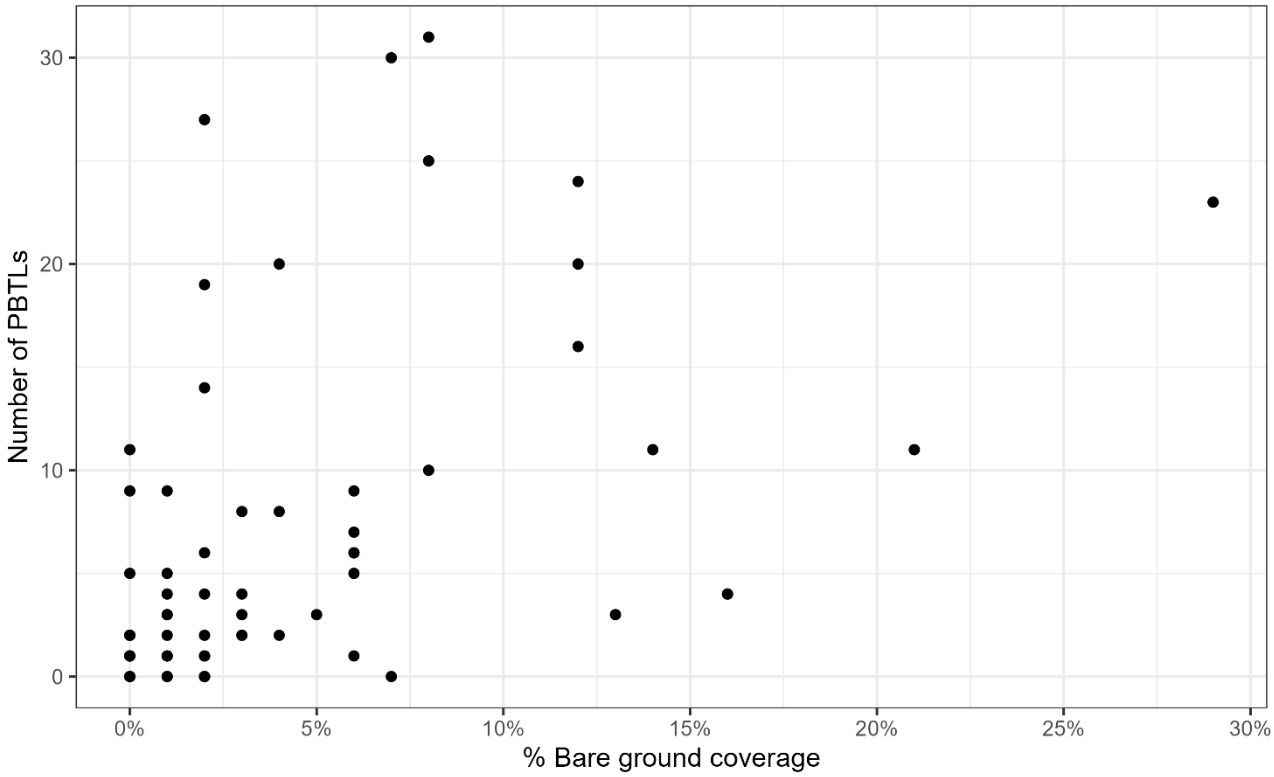

Figure 3.10 **The Number of PBTLs Plotted Against Bare Ground Cover in 2025**

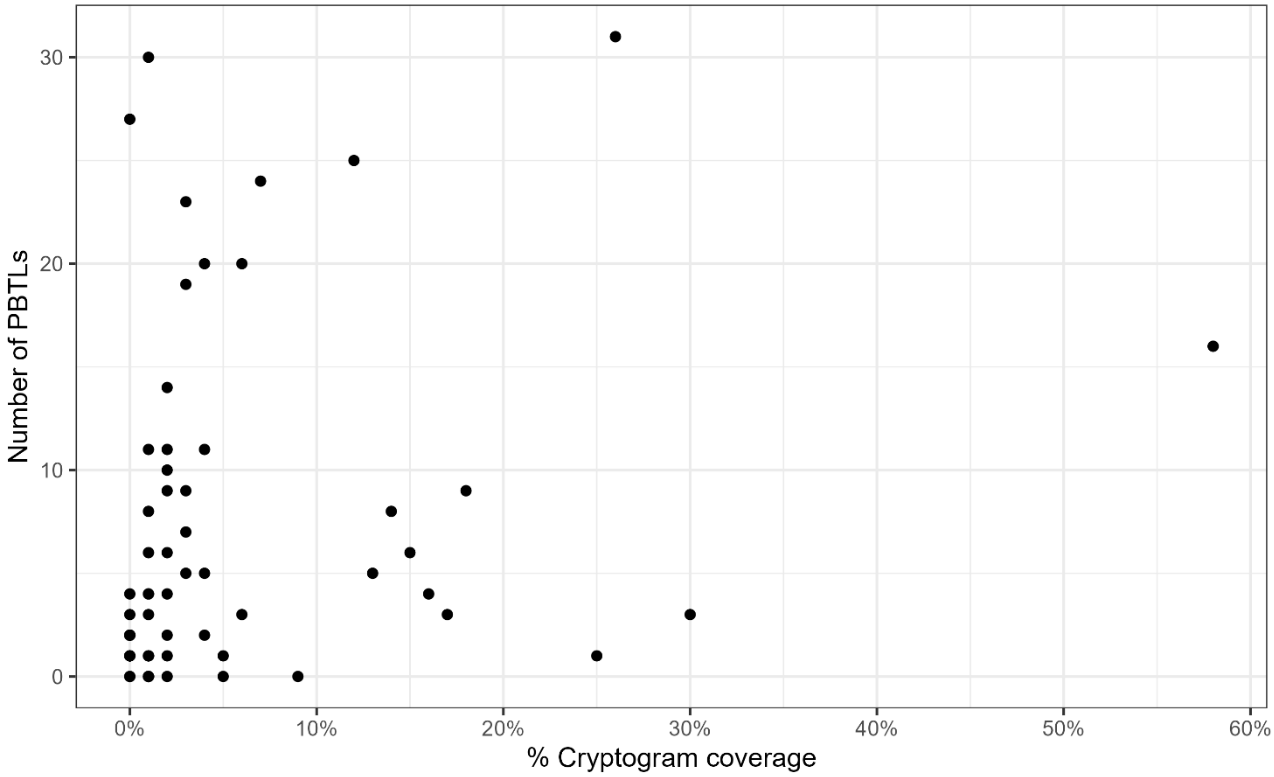

Figure 3.11 **The Number of PBTLs Plotted Against Cryptogram Cover in 2025**

4.0 Vegetation Monitoring Results

4.1 2025 Results

4.1.1 Photo Point Observations

Photographs taken from designated photopoints at each quadrat are provided in **Appendix 2**. General observations on vegetation condition based on these photographs are summarised in **Table 4.1**. Across the site, the reduced cover of weed and thatch (mat composed of dead grass and vegetative material) compared to the previous three years was easily observed.

The photographs show a more open grassland structure, with lower height and width of grass tussocks. Sites that in recent years have has an increased cover of *Themeda triandra* now show reduced foliage cover of this species, even where tussock density remains similar.

In general, vegetation condition appears similar to other lower rainfall years near the start of the monitoring program.

Table 4.1 Photographic Observations of Vegetation Condition

Quadrat	Vegetation Association	Vegetation Condition Observations
1	Tussock Grassland on Low Footslopes and Drainage Areas	Tussock width and height much reduced from 2023 and 2024. Reduced thatch and weed cover. 2025 conditions have returned to a more open grassland structure. Conditions similar to 2018 and 2019.
2	Tussock Grassland on Eastern Slopes	Reduced weed cover and thatch from 2023 and 2024. More open grassland structure with lower height and width of tussocks. Conditions similar to 2018 and 2019.
3	Tussock Grassland on Western Slopes	Vegetative cover much reduced from 2023 and 2024, but reduced tussock density from early years of monitoring. Sparse grassland structure with reduced tussock height and width from previous years.
4	Tussock Grassland on Eastern Slopes	Much less weed cover and thatch than 2023 and 2024. Open spaced tussocks with extensive areas of bare ground/cryptogram. Condition appears similar to 2019 and 2020.
5	Tussock Grassland on Western Slopes	Extensive areas of bare ground / cryptogram with openly spaced, low tussocks. Reduced tussock height, weed cover and thatch from 2023 and 2024. Condition similar to 2019 and 2020
6	Tussock Grassland on Eastern Slopes	Sparse cover of low tussocks, with weed cover and thatch much reduced from 2023 and 2024
7	Tussock Grassland on Low Footslopes and Drainage Areas	Sparse cover of low tussocks, with weed cover and thatch much reduced from 2023 and 2024. Reduced cover of Themeda due to die back.
8	Tussock Grassland on Low Footslopes and Drainage Areas	Thatch very much reduced with little weed cover. Increased impact from vehicle tracks due to SEB site clean-up activities (rubbish removal). Sparsely distributed tussocks of low height. Condition appears similar to 2018 and 2019.
9	Tussock Grasslands on Rocky Ridges	2025 photograph missing.
10	Tussock Grasslands on Rocky Ridges	Reduced weed cover.
11	Tussock Grassland on Western Slopes	The photograph indicates there is a reduced cover of Themeda from the previous two years, due to foliage die back although tussock density remains similar. Reduced weed cover and thatch resulting in a more open grassland structure.
12	Woodlands on Rocky Slopes	Vegetation condition appears similar to 2018 - 2020, with an open grassland understorey. The high weed and thatch cover present from 2021 - 2024 is now reduced.

4.1.2 Summary of 2025 Results

A total of 65 flora species were recorded across the monitoring quadrats in 2025. This included 36 native and 29 introduced species, or weeds (see **Appendix 4**). Three flora species listed as Rare under the National Parks and Wildlife Act 1972 (NPW Act) were observed within the SEB Offset Area:

- *Cryptandra campanulata* (Long-flower Cryptandra) (Quadrats 1, 3–6 and 10–12);
- *Maireana rohrlachii* (Rohrlach's Bluebush) (Quadrat 6); and
- *Rumex dumosus* (Wiry Dock) (Quadrats 3, 7 and 9).

Six weed species declared under the Landscape South Australia Act 2019 (LSA Act) were observed within the SEB Offset Area:

- *Chondrilla juncea* (Skeleton Weed) (Quadrat 10)
- *Echium plantagineum* (Salvation Jane) (Quadrats 1–12)
- *Marrubium vulgare* (Horehound) (Quadrats 1–12)
- *Reseda lutea* (Cut-leaf mignonette) (Quadrats 2, 5 and 7–9)
- *Rosa canina* (Dog Rose) (Quadrats 1–3, 5 and 7–12)
- *Xanthium spinosum* (Bathurst Burr) (Quadrats 1, 2 and 4–10).

In particular, Dog Rose and Bathurst Burr appeared to more prevalent than in recent monitoring years, while annual, difficult to control weed species such as Salvation Jane continue to be widespread. Cover of grassy weeds, such as *Avena barbata* (Bearded Oat) was noticeably reduced, probably due to the prevailing dry conditions.

The mean number of tussocks per hectare was 140,000, and the mean number of juvenile tussocks per hectare was 21,146 (Table 8). The mean percentage of dead material in grass tussocks was 27.97 %. Mean weed cover was 7.80 %, which was similar to, but slightly less than, the 1 ha estimate of weed cover (22.50 %). Mean cryptogam cover (1.33 %) and mean cover of bare ground (3.32 %) were both very low.

Mean litter cover (74.86 %) was recorded for the third time this survey year and accounts for lower weed cover percentages, since all dead plant material laying on the ground was counted as litter.

The mean plant spacing was 25.86 cm, and the mean plant basal width and height were 3.94 cm and 15.76 cm, respectively.

A summary of the 2024 per quadrat and per plant results for each of the twelve 1 ha quadrats is provided in Table 8, with vegetation data used for analysis provided in **Appendix 1**. Complete lists of all the native and weed species observed within in each quadrat are provided in Appendix 4.

Table 4.2 Summary of 2025 Vegetation Monitoring Results

Quadrat	Native Species Diversity	Weed Species Diversity	Tussocks (per ha)	Juvenile Tussocks (per ha)	Dead Material (%)	Weed Cover (%)	Weed Cover 1 ha Estimate (%)	Cryptogam Cover (%)	Bare Ground Cover (%)	Litter Cover (%)	Plant Spacing (cm)	Plant Basal Width (cm)	Plant Canopy Width (cm)	Plant Height (cm)
1	21	11	12	0	95	11	5	1	16	63	25.4	3.8	8.0	6.4
2	9	11	2	0	96	13	10	0	3	83	22.3	4.0	11.9	7.3
3	15	7	8	0	92	3	5	4	21	71	29.9	3.5	6.5	3.0
4	7	5	18	1,250	96	12	5	6	12	71	25.6	4.5	9.9	5.4
5	18	11	8	0	75	4	1	3	29	61	34.4	4.6	7.5	5.9
6	12	9	6	0	90	11	10	1	7	77	34.4	5.9	13.4	8.7
7	13	9	12	5,000	92	4	5	2	2	63	24.1	12.0	25.9	23.6
8	7	8	8	2,500	88	4	5	0	1	79	27.2	9.1	20.5	14.1
9	14	16	3	0	96	18	25	1	7	77	28.1	5.9	13.5	6.9
10	8	15	0	0	97	21	25	0	1	89	35.8	3.3	9.7	2.0
11	14	8	19	0	93	3	5	17	5	57	21.6	5.8	14.7	5.9
12	18	7	29	3,750	96	0	1	70	0	36	15.3	5.2	11.0	8.6
Mean	**13**	**9.75**	**10.44**	**1,041.67**	**92.16**	**8.54**	**8.5**	**8.64**	**8.59**	**68.93**	**27.01**	**5.64**	**12.72**	**8.15**

4.2 Comparison of Vegetation Between Monitoring Years

4.2.1 Native Species Diversity

The mean native species diversity recorded during the 2025 monitoring was lower than the previous year, with a mean of 13.0 species recorded compared to 20.25. The 2024 result was the highest mean recorded of any monitoring period. Although native species diversity has dropped from this 2024 high, it remains higher than in the early years of monitoring, with mean native species diversity being 5.75 in 2018 and 7.41 in 2019 (see **Figure 4.1**).

Compared to the baseline survey in 2018, there has been a significant increase in native species diversity (p-value = 0.0006). The mean of 13.0 native species is also a significant increase from that recorded in 2019 (7.42 species, p-value = 0.022). Conversely, the drop in native species diversity from 20.25 in 2024 represents a significant decrease (p-value = 0.028).

The 36 native plant species recorded during the 2025 survey are listed in **Appendix 4**.

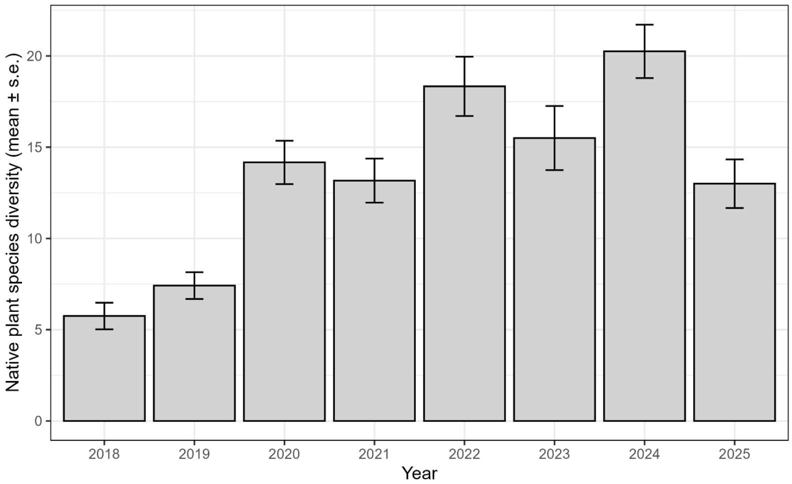

Figure 4.1 Mean Native Species Diversity During Each Monitoring Survey

4.2.2 Weed Species Diversity

Mean weed species diversity has fallen from a high of 19.08 species in 2024 to 9.75 in 2025. This is the lowest weed diversity recorded since the 2019 monitoring period. This is against the overall trend of increasing weed diversity recorded since monitoring commenced in 2018, as shown on the graph in **Figure 4.2**.

The drop in mean weed species diversity is a significant decrease from 2022 (p-value = 0.01), 2023 (p-value = 0.0000) and 2024 (p-value = 0.0000). However, it represents a significant increase since baseline surveys in 2018 (p-value = 0.0004).

The 29 weed species recorded during the 2025 monitoring period are listed in **Appendix 4**.

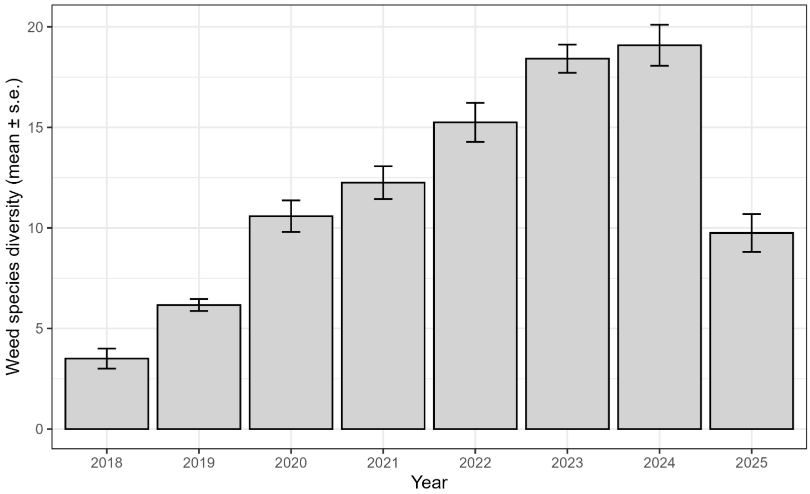

Figure 4.2 **Mean Weed Species Diversity Recorded During Each Monitoring Survey**

4.2.3 Tussock Spacing and Tussocks per Hectare (Density)

Tussock Spacing

In 2025, the mean perennial grass tussock spacing increased slightly from 2024, from 25.85 cm to 27.01 cm. This compares to a high of 56.93 cm in 2020. Since 2021, tussock spacing has remained comparable, with a mean distance ranging from a low of 20.87 in 2022 to a high of 27.01 in 2025. These years are also comparable to the baseline in 2018, when a mean tussock distance of 29.70 was recorded (see **Figure 4.3**).

The drop in tussock spacing from the high in 2020 represents a significant decrease in spacing between perennial grass tussocks in 2025 (p-value = 0.034). This significant decrease is true for all years since 2020 (2021 p-value = 0.027, 2022 p-value = 0.005, 2023 p-value = 0.036, 2024 p-value = 0.026).

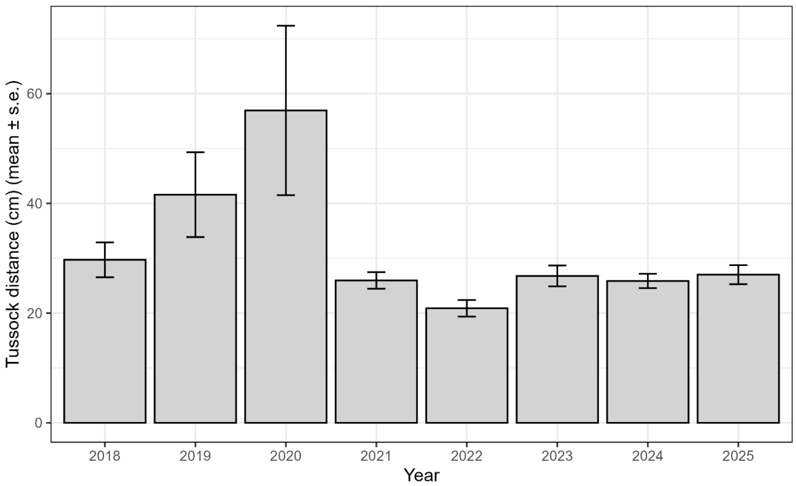

Figure 4.3 **Mean Tussock Spacing (Tussock Distance) Recorded During Each Monitoring Period**

Tussocks per Hectare

The mean number of perennial grass tussocks per hectare recorded for each year of monitoring is shown on the graph in **Figure 4.4**. It shows that in 2025, a mean of 104,166.7 tussocks per hectare was recorded. This compares to a high of 164,166.7 recorded in 2020 and only 90,000 in 2023. This was the lowest of any monitoring period. Despite this fluctuation, no significant differences in tussocks per hectare was detected by the analysis.

The analysis has not considered the 2018 data, since it contains tussocks per hectare measures for quadrats 9 – 12 only.

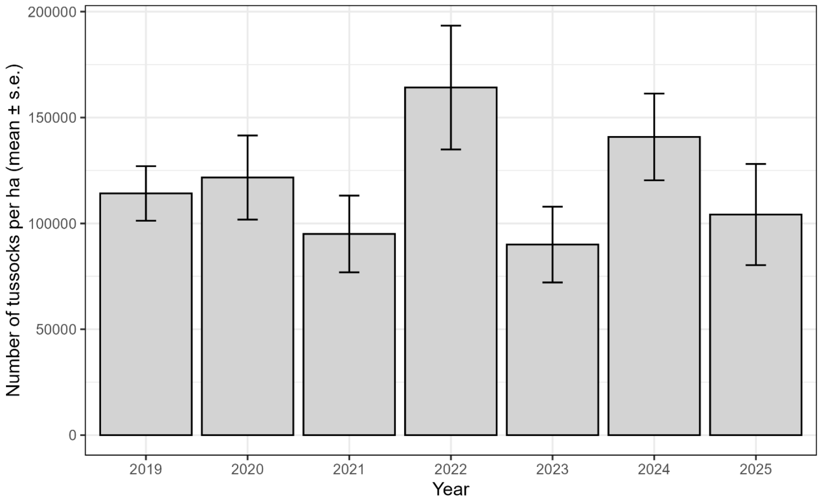

Figure 4.4 Mean Tussocks per Hectare Recorded During Each Monitoring Period

4.2.4 Juvenile Tussocks per Hectare

Few juvenile tussocks were observed during the 2025 monitoring. At 1,041.67, the mean number of juvenile tussocks per hectare was the lowest of any monitoring year. It compares to a high of 85,788.69 in 2020, with the second lowest mean occurring in 2021 when 4,444.42 juvenile tussocks per hectare were found.

There was a significantly lower number of juvenile tussocks recorded in 2025 than for all other years, except 2021 (p-value = 0.059). In that year, the survey calculated a mean of 4,444.42 juvenile tussocks per hectare.

4.2.5 Perennial Tussock Size and Health Attributes

Perennial Tussock Basal Width

The mean basal width of perennial grass tussocks for all monitoring years is shown on the graph in **Figure 4.5**. It shows that basal width has been decreasing since monitoring began in 2018 (9.67 cm), to a low of 3.94 cm in 2024. However, in 2025, basal width has increase to from 2024 to 5.63 cm.

The data analysis indicates that 2025 represents a significant decrease in the mean basal width of tussocks from the baseline data collected in 2018 (p-value = 0.0008). However, 2025 was not significantly different to the basal width measure recorded in any other year. Lower basal width means measured in 2023 (4.94 cm) and 2024 (3.94 cm) were also significantly below the baseline survey (p-value = 0.00005 and p-value = 0.00000 respectively).

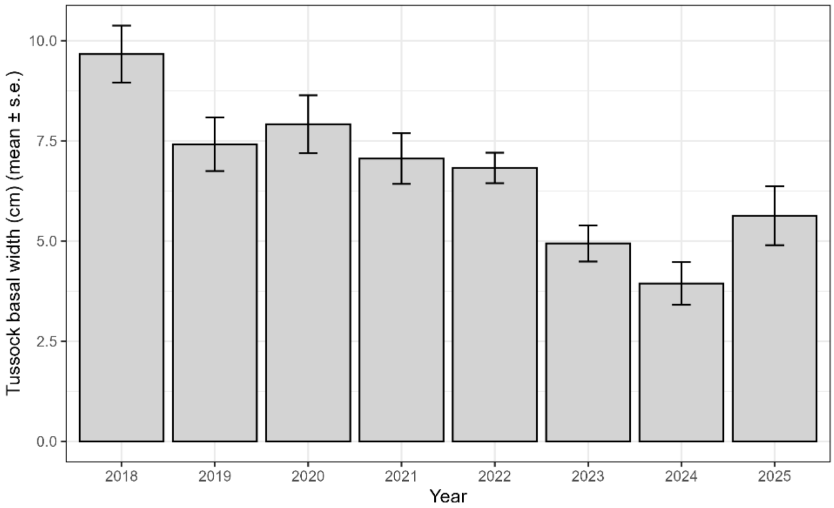

Figure 4.5 Mean Basal Width of Perennial Grass Tussocks from 2018 to 2025

Perennial Tussock Height

The mean tussock height of 8.15 cm in 2025 was the lowest recorded of any year except 2019, when tussock height was measured at only 6.88 cm. The mean tussock height for all years is shown on the graph in **Figure 4.6** and shows that since reaching a high of 25.2 cm in 2022, tussock height has continued to fall from 2023 to 2025.

The mean tussock height measured in 2025 was significantly lower than all monitoring years, except for 2019 (p-value = 0.833) and 2020 (0.271), when low heights of 6.88 cm (2019) and 11.44 cm (2020) were recorded. Tussock height in 2025 was significantly lower than the baseline survey (p-value = 0.023).

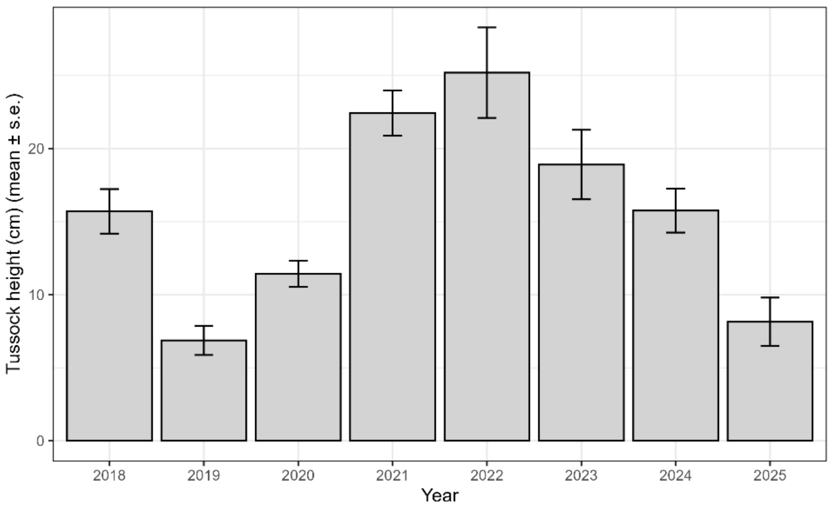

Figure 4.6 Mean Height of Perennial Grass Tussocks from 2018 to 2025

Dead Material (%) on Perennial Tussocks

The 2025 monitoring observed the highest percentage of dead material on perennial grass tussocks, with a mean of 92.17%. The next highest was that measured in 2019, where 84.75% dead material was recorded. This is illustrated on the graph in **Figure 4.7**. This graph shows how the percentage of dead foliage on tussocks fluctuates widely from year to year, with low proportions of dead material quickly followed by a year of high percentage.

The 2025 result was not significantly different from the first year this statistic was collected in 2019. However, there was a significantly larger proportion of dead tussock material in 2025 than 2020 (p-value = 0.0000), 2022 (p-value = 0.0000), 2023 (p-value = 0.0000) and 2024 (p-value = 0.0000).

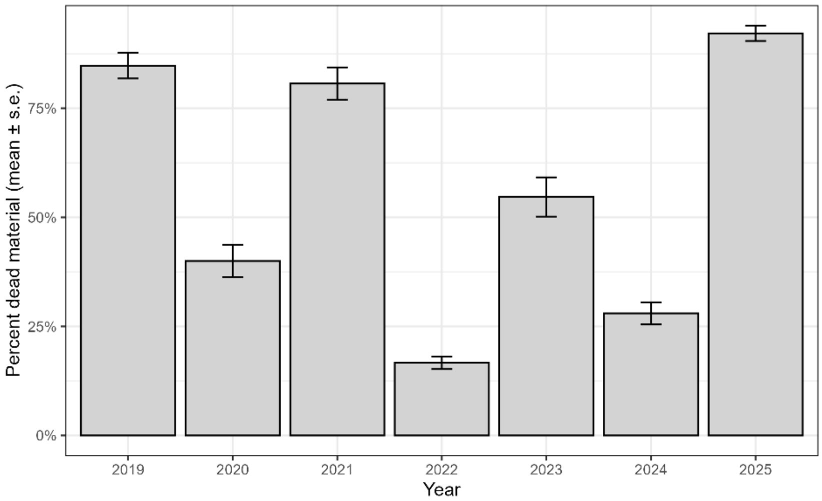

Figure 4.7 Mean Percent Dead Material on Perennial Tussocks, 2019 to 2025

Percent Weed Cover

The mean weed cover based on 1 m^2 surveys was low in 2025, being measured at only 8.67%. This is lower than that recorded in 2019, 2020, 2021, and 2023 (see **Figure 4.8**). Weed cover of the 1 m^2 quadrats was significantly below the baseline 2019 mean of 39.41% (p-value = 0.0104) and other years of high weed cover (2020, p-value = 0.002, and 2021, p-value = 0.002).

Unsurprisingly, mean weed cover based on 1 ha estimates follows similar trends to the above statistic. That is, the first three years of data collection show high, increasing weed cover per hectare, followed by four years of lower weed cover (see **Figure 4.9**). The 2025 weed cover per hectare estimate of 8.5% is the second lowest of all monitoring years. It is higher than only 2022, when 3.75% weed cover per hectare was estimated.

Weed cover per hectare remains significantly below that recorded in 2019 (p-value = 0.003), 2020 (p-value = 0.0007) and 2021(p-value = 0.0003). There was also significantly less weed cover in 2025 than the previous monitoring in 2024 (p-value = 0.046).

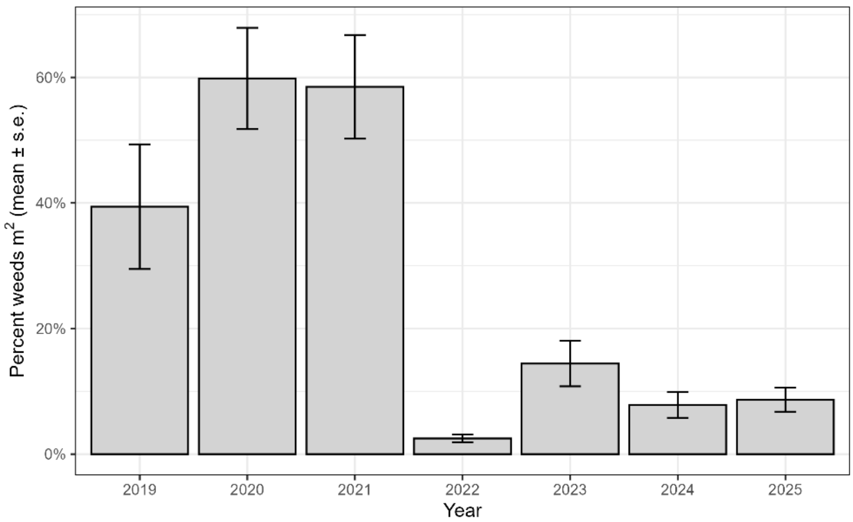

Figure 4.8 **Mean Percent Weed Cover of 1 m^2 Survey Quadrats, 2019 to 2025**

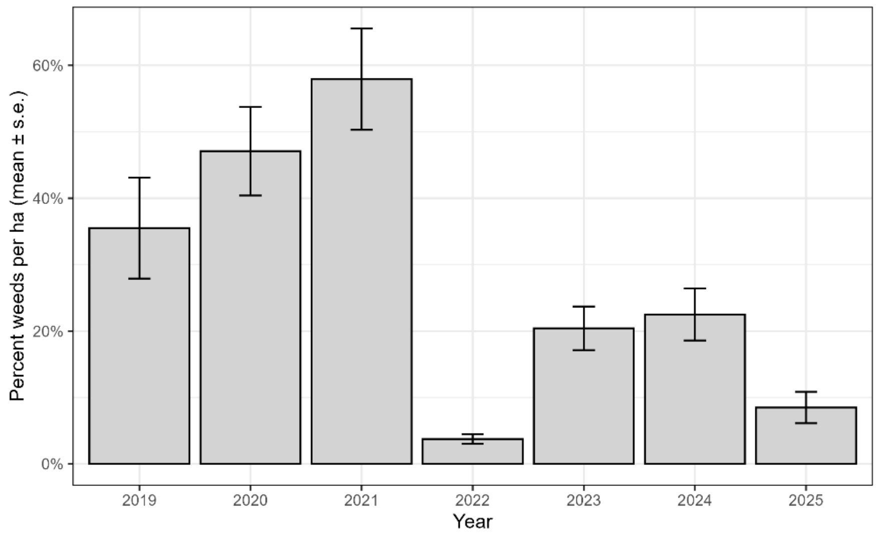

Figure 4.9 **Mean Percent Weed Cover per Hectare, 2019 to 2025**

4.2.6 Cryptogram, Bare Ground and Litter Cover

Mean Cryptogram Cover

The cover of cryptogram inside 1 m^2 quadrats was measured for the first time in 2020, when a mean of 20.25% cover was recorded. Since then, cryptogram cover has been low, reaching only 1.33% in 2024, a significant decrease (p-value = 0.003). The mean cryptogram cover for all years since 2020 is shown on the graph in **Figure 4.10**.

Cryptogram cover has risen since the low in 2024, with 8.75% recorded in 2025. This is not a statistically significant increase (p-value = 0.622); however cryptogram cover in 2025 is no longer significantly lower than in 2020 (p-value = 0.221) when those two years are compared.

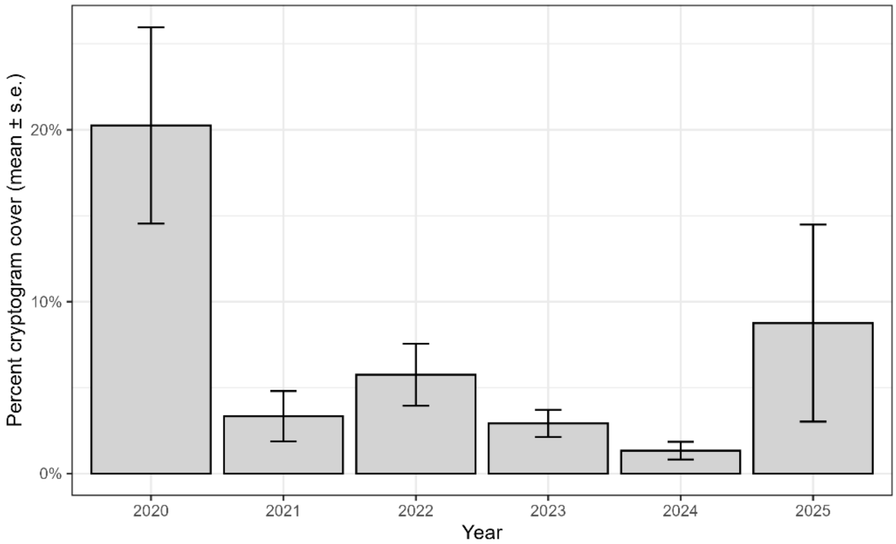

Figure 4.10 **The Mean Percent of Cryptogram Cover Measured Since 2020**

Mean Percentage of Bare Ground

The monitoring shows that after a high percentage of bare ground, relative to other years, was recorded in 2020 (8.08%), it fell to 2.33% in 2021 and remained at similar levels for the next three years. In 2025 however, the percentage of bare ground has increased to above the 2020 measure, with a mean across the 12 monitoring sites of 8.67% recorded (see **Figure 4.11**).

The initial decrease in mean bare ground from 8.08% in 2020 to 2.33% in 2021 is statistically significant (p-value = 0.026), as is the difference between 2020 and the low of 1.5% mean bare ground recorded in 2023 (p-value = 0.002). The increase in bare ground cover in 2025 represents a significant increase from that low point (p = 0.048), with bare ground again at baseline levels.

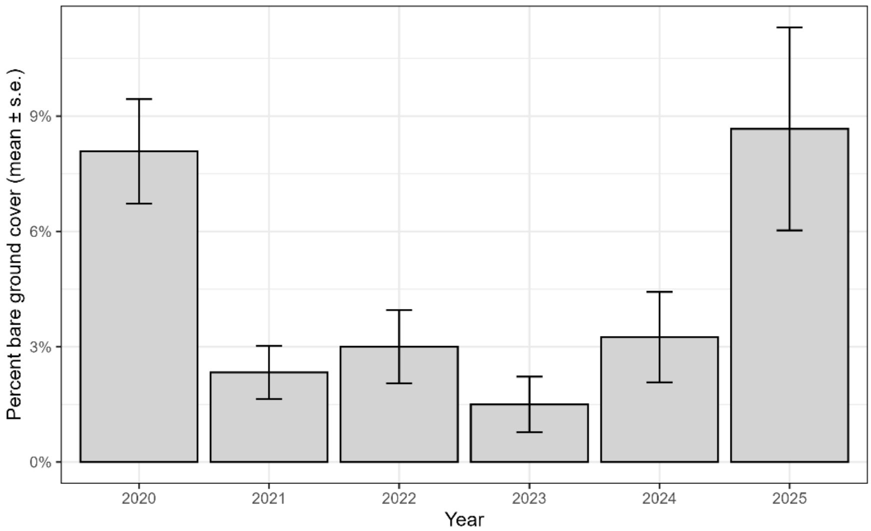

Figure 4.11 **The Mean Percent of Bare Ground Measured Since 2020**

Mean Percent Litter Cover

The percentage of litter cover has been recorded since 2022. It has fluctuated little since that year, with a cover of just over 70% recorded from 2022 to 2024, as shown on the graph in **Figure 4.12**. In 2025, litter cover fell below 70%, with a mean cover of 68.92% litter observed. There has not been a significant difference in litter cover since the collection of this statistic commenced.

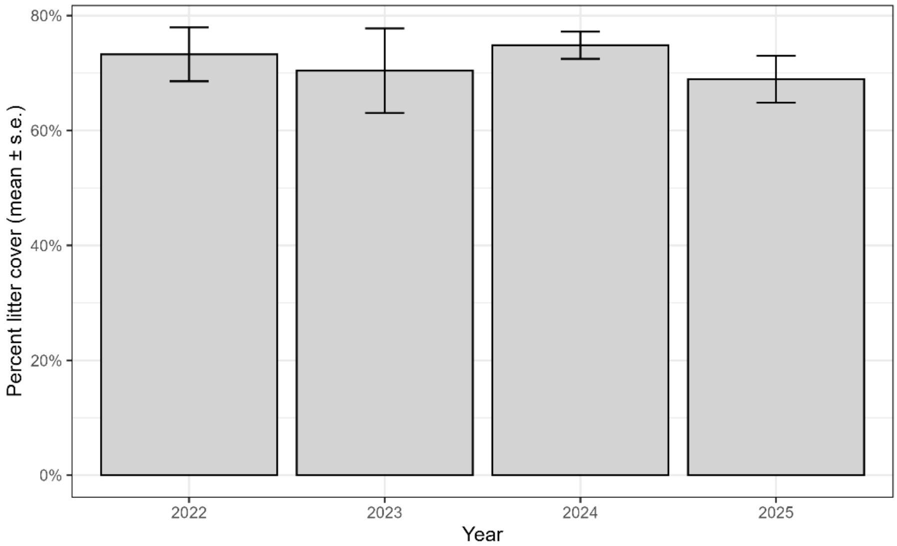

Figure 4.12 The Mean Percent of Litter Cover Recorded From 2022 to 2025

4.2.7 Influence of Rainfall on Vegetation Variables

When plotted against rainfall totals recorded during the year prior to the monitoring survey, there were strong or moderate positive correlations between the following vegetation variables:

- Native plant species diversity (r^2 = 0.61)
- Weed species diversity (r^2 = 0.79)
- Number of juvenile perennial grass tussocks (r^2 = 0.99)
- Number of perennial grass tussocks (r^2 = 0.99)
- Tussock basal width (r^2 = 0.41)
- Tussock spacing (r^2 = 0.44)
- Tussock height (r^2 = 0.58).

This means that generally, as rainfall increases, so does the measure of the above variables. As has been discussed in previous years, rainfall provides a key driver in vegetation condition in the SEB area.

5.0 Discussion

5.1 PBTL Monitoring

5.1.1 PBTL Abundance

Mean per Quadrat and Total Abundance

The mean number of PBTLs observed per quadrat during monitoring has followed a downward trend since the baseline surveys began. In that year (2017), a mean of 17.38 PBTLs was recorded. This fell to a low of 3.70 PBTLs in 2021.

Since 2021, however, there has been an increase in PBTLs detected. The 2025 monitoring continues that upward trend, with a mean of 9.20 PBTLs per quadrat recorded. The actual number of PBTLs individuals has also increased since a low of 32 PBTLs was recorded in 2023.

Monitoring data collected since baseline in 2017 suggests that the PBTL population in the SEB area is highly variable, with peaks and troughs, possibly brought on by rainfall and its influence on vegetation condition. The 2025 results support this trend, with PBTL numbers continuing to increase from a low of 32 individuals in 2023 to 101 PBTLs.

This is approaching the number of individual PBTLs observed in 2020 (113 PBTL). The final two years of monitoring under the current management plan (2026 and 2027) will determine if the upward trend towards the highest number of PBTLs recorded continues. This occurred in 2019, when 210 PBTL individuals were observed.

There were a high number of juvenile PBTLs found during 2025 compared to other years, with the 31 juvenile PBTLs detected above the baseline number of 29 (recorded in 2017). As in 2024, monitoring occurred in early March rather than late February at a time when more juveniles may be present due to the timing of PBTL breeding. Numbers of juveniles may also be related to rainfall, as discussed further in **Section 5.1.2**.

Slope Aspect and PBTL Abundance

The mean number of PBTLs per quadrat across the seven surveys was significantly greater on eastern than western slopes (p-value = 0.006). This continues the relationship between aspect and PBTLs from all previous years of monitoring.

Spiders and Burrows Influence on PBTL Abundance

The mean number of spiders per quadrat observed in 2025 (16.2) was the highest recorded since the 2020 monitoring and followed the lowest number of spiders (5.45) recorded in 2024. There were significant differences between 2025 and any other year, including the baseline survey.

As in previous years, a significant positive correlation was detected between the number of PBTLs and spiders when the 2025 data is included in the analysis (p-value = 0.0014) (r^2 = 0.1124) (**Figure 5.1**). A significant correlation was also detected between the number of PBTLs and burrows (p-value = 0.000) (r^2 =0.478) across the surveys (**Figure 5.2**). This is expected since it is widely accepted that PBTLs occupy single-entrance, vertical burrows made by Lycosid and Mygalomorph spiders (Hutchinson *et al.* 1994; Milne 1999; Milne and Bull 2000; Milne *et al.* 2003; Souter *et al.* 2007).

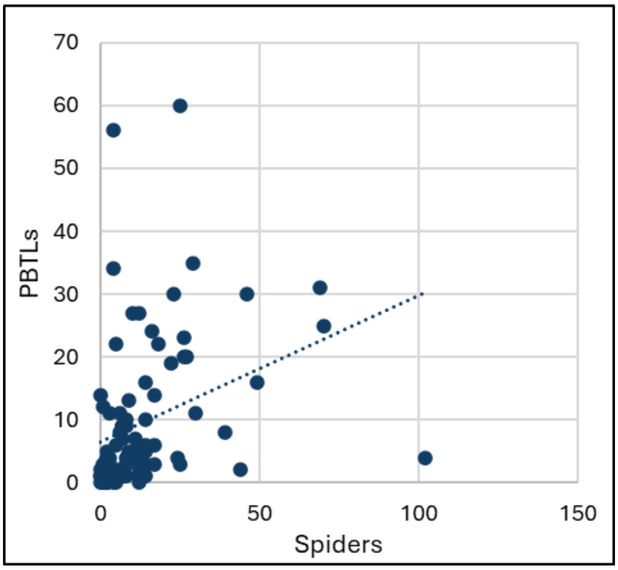

Figure 5.1 The Number of PBTLs and Spiders Recorded at Quadrats in all Monitoring Years

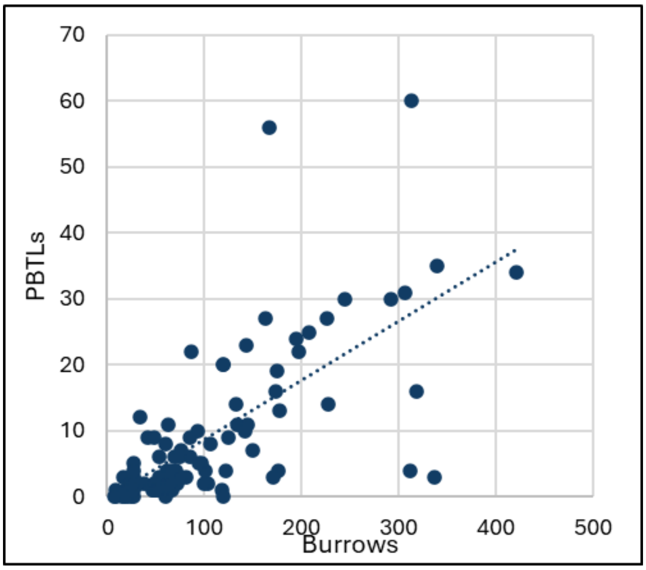

Figure 5.2 The Number of PBTLs and Burrows Recorded at Quadrats in all Monitoring Years

5.1.2 Rainfall and PBTLs

Negative relationships were detected between the number of PBTLs observed and annual rainfall. This indicates that as rainfall increases in the year prior to monitoring, the number of PBTLs detected falls. The graph in **Figure 5.3** shows that, apart from the early years of monitoring (2017 – 2020), the lowest number of PBTLs have been recorded following high rainfall years. The same can be said for rainfall recorded in the spring/summer period leading into monitoring. The number of juvenile PBTLs detected follows a similar pattern (**Figure 5.3**).

It can also be shown that there are less burrows are also found during years of high annual and spring/summer rainfall, as seen in **Figure 5.4**. Given that results indicate a positive relationship between the number of burrows and number of PBTLs, it is not surprising that less PBTLs would be detected following high rainfall periods.

The cause of these patterns is not clear and there could be a number of contributing factors, as listed below:

- High rainfall results in a higher cover of vegetation, with the following impacts on burrows and PBTLs possible:
    - Burrows are more difficult for observers to detect (**Figure 5.5**), thus influencing survey results even though the number of burrows and lizards may not actually be decreased significantly
    - A structure of dense vegetation cover caused by high rainfall represents less suitable habitat for spiders and PBTLs, resulting in an actual decrease in burrows and PBTLs.

- High rainfall temporarily influences soil characteristics, such as moisture content, that may not be as conducive to burrow integrity and longevity, resulting in loss of burrows and therefore PBTLs.

The results of the 2025 survey shows that when dry conditions return following high rainfall years, the number of PBTLs and burrows increases. This indicates that:

- Low rainfall results in die back of perennial grass tussocks and a sparse cover of annual plants that contributes to a more open vegetation structure. This could influence the number of burrows and PBTLs observed for the following reasons:
  - Burrows are more easily detected by observers thus influencing survey results even though the number of burrows and lizards may not actually be significantly changing (**Figure 5.6**)
  - An open vegetation structure represents more suitable habitat for spiders and PBTLs.
- Increase in the number of PBTLs following resource rich periods (i.e. high rainfall) impacts on survey results in the year following the high rainfall.

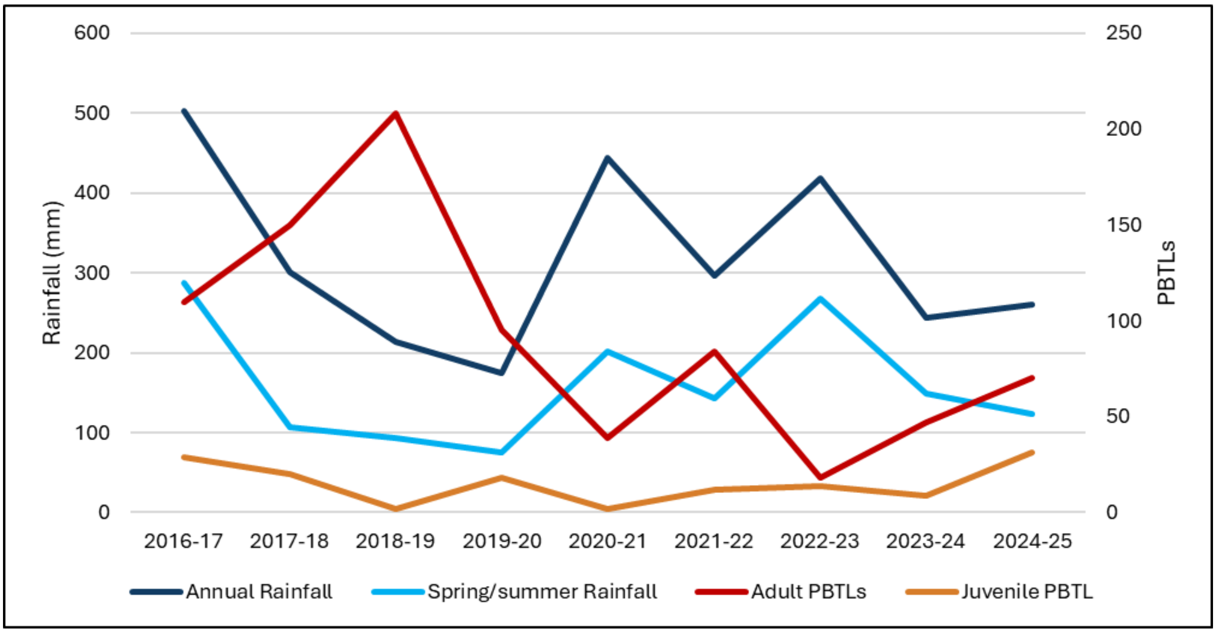

Figure 5.3 The Number of Adult and Juvenile PBTLs Observed by Each Monitoring Survey, Plotted Against Both Annual and Spring/Summer Rainfall

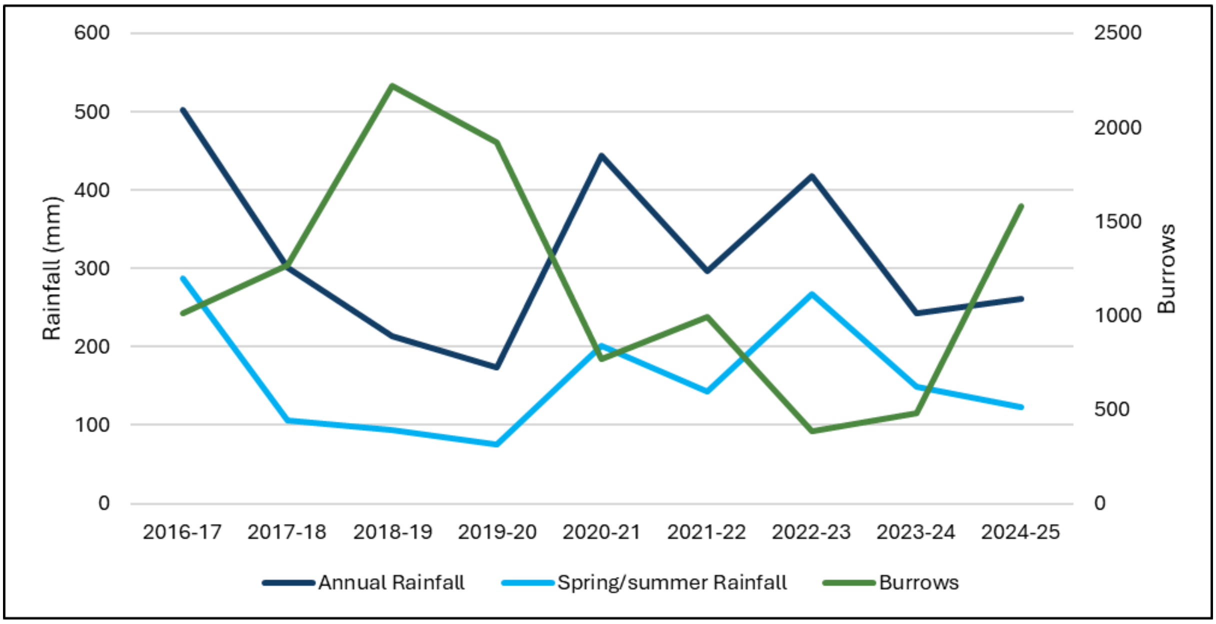

Figure 5.4 The Number of Burrows Observed by Each Monitoring Survey, Plotted Against Both Annual and Spring/Summer Rainfall

Figure 5.5 High Weed and Litter Cover Making Detection of Burrows Difficult

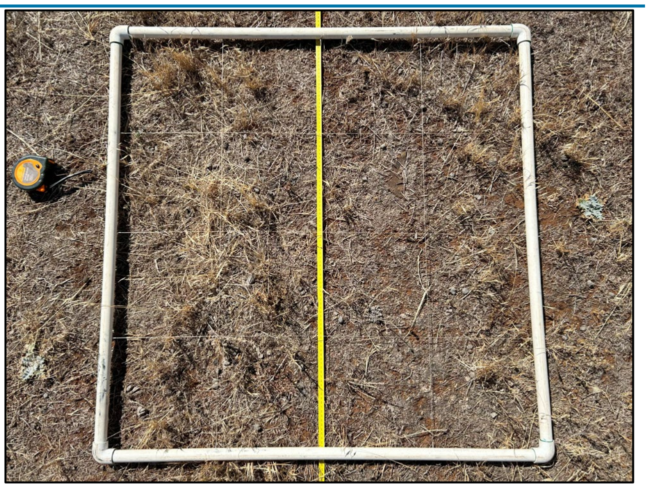

Figure 5.6 High Cover of Bare Ground and Cryptogram with Open Vegetation Structure Making Burrows Easier to Detect

5.2 Vegetation Monitoring

5.2.1 Vegetation Condition Variables

Native Plent Species Diversity

After recording the highest number of native plant species in 2024, native diversity fell to a number of species similar to that recorded in 2023, 2021 and 2020. Despite being a dry summer in which annual plant species were seldom observed, the 36 native plant species recorded in 2025 is higher than the baseline.

The mean native plant species diversity across all monitoring quadrats in 2025 was 13.0. Although this represents a significant decrease from a mean of 20.25 recorded in 2024, it remains significantly higher than the baseline and early monitoring years of 2018 (mean = 5.75, p-value = 0.0006) and 2019 mean = 7.42, p-value = 0.022).

Increases in diversity may be due to winter grazing on weedy annual grass, facilitating opportunities for recruitment of more vulnerable native herbaceous species and an overall decrease in grazing pressure. Decreased grazing pressure may result in palatable native species becoming easier to detect and increase successful recruitment. Small shrubs such as *Eutaxia microphylla* (Common Eutaxia), for example, are palatable species that suffer from preferential grazing when land is heavily grazed.

Similarly, photopoint monitoring indicates increased recruitment of canopy species (notably *Allocasuarina verticillata*) at the woodland site (quadrat 12). This species is also preferentially grazed under heavy stocking rates and thus benefits from low grazing pressure.

There is always likely to be some fluctuation in native plant diversity from year to year, brought on by climatic conditions, as discussed in **Section 5.2.2**.

Weed Diversity and Cover

After increasing every year from the baseline survey to 2024, mean weed diversity decreased in 2025 to 9.75 weed species. This reduction is a significant decrease from the previous three years' results, although weed diversity remains significantly higher than during the baseline survey. There were a total of 29 weed species recorded in 2025. While grazing remains a land management tool within the SEB area, there is a continued likelihood that new weed species might be recorded. New species might be introduced by being transported by livestock or in contaminated feed, for example.

In 2025, mean weed cover was similar for the per hectare measure (8.5%) and 1m^2 (8.54%). Per hectare, this is significantly less weed cover than recorded in 2019 (p-value = 0.003), 2020 (p-value = 0.0007), 2021 (p-value = 0.0003), and 2024 (p-value = 0.046). There was also significantly less weed cover per 1m^2 than in 2019 (p-value = 0.010), 2020 (p-value = 0.002) and 2021 (p-value = 0.002).

The period leading into the 2025 monitoring was one of the dryer years experienced during monitoring, so it is expected that weed cover would be lower, As noted following the 2024 monitoring however, the statistics do not support expectations that weed cover should be higher following years of high rainfall. This may be due to variations in observers and the way in which data has been collected. Since 2022, for example, most weed material was annual grasses and forbs that were dead and detached by the late summer monitoring period. This was therefore counted as litter cover and not weed cover. It is unclear what was counted as weed cover in previous years. So long as future monitoring is consistent with methods used since 2022, this limitation may become less prevalent.

Bare Ground, Cryptogram and Litter Cover

The mean percentage of cryptogam cover decreased to 8.75 % in 2025, rising from a monitoring low of 1.33% recorded in 2024. Although the 2025 mean is lower than the 20.25% recorded in 2020 (the first year this statistic was measured), it does not represent a significant decrease.

In 2025, the mean percentage of bare ground cover increased to its highest level of any monitoring period at 8.67%. This is similar to the first year the statistic was collected in 2020 (8.08%), but significantly higher than the intervening years of 2021, 2022, 2023 and 2024.

The cover of bare ground and cryptogam is effectively an indication of the openness of grassland habitat. Greater cover of these two variables may be indicative of more ideal PBTL habitat. It may also be true that a higher amount of bare ground and cryptogam makes detection of spider burrows easier, leading to the detection of more PBTLs.

At 68.92%, the mean percentage of litter cover remained similar to the previous years when this statistic has been collected (2022, 2023 and 2024). The mean obtained in 2025 is the lowest of the four years, dropping below 70% for the first time. As this variable was measured for the first time in 2022, it is likely that there is not enough data be able to determine whether changes in litter cover are statistically significant. Previously, litter was included as a part of weed cover percentage and may account for the reduction in weed cover in 2022 and 2023. It is important to continue to measure these variables for future data analysis.

Perennial Grass Tussock Spacing, Number of Tussocks and Juvenile Tussocks

In 2025, the mean spacing of perennial plants increased from 25.86 cm in 2024 to 27.01 cm. The monitoring shows that since a significant decrease in tussock spacing after 2020, it has remained comparable since 2021 with no significant changes. The 2025 spacing is also comparable to the baseline mean spacing of 29.70 cm.

The increase in tussock spacing from baseline to its greatest distance of 56.93 cm in 2020 indicates that grassland structure was opening up in the first three year of monitoring. The rapid decline in tussock spacing from 2020 to 2021 is potentially caused by a high survival of juvenile tussocks in those years, with 2020 also recording the highest mean number of juvenile tussocks for any year (85,788.69). Since then, it appears that management practices have been successful at maintaining tussock spacing to a level conducive to also maintaining the PBTL population.

The mean number of tussocks per hectare in 2025 was 104,166.7. This mean is approximately midway between the highest recorded, 164,166.70 in 2020, and the lowest, 90,000 in 2023. The 2025 mean is not significantly different from either the highest or lowest mean number of tussocks per hectare, with the number of tussocks possibly fluctuating due to rainfall, as discussed in **Section 5.2.2**.

Given that significantly fewer juvenile tussocks were observed in 2025 than most other years (a mean of only 1,041.67), it is unlikely that the next monitoring period would detect a decrease in tussock spacing or increase in the number of tussocks per hectare. This significant drop in juvenile tussocks has been recorded despite recent years being open to observer bias due to the difficulty of detecting small plants, as discussed in EBS 2024. It is most likely related to the overall dry conditions experienced in the latter half of 2024 and into the 2025 monitoring period.

Perennial Grass Tussocks Size and Health Attributes

The mean basal width of perennial plants has been decreasing since the baseline survey in 2018 to a low of 3.94 cm in 2024. However, in 2025, mean basal width has increased from that low to 5.63 cm. This is still below the baseline of 9.67 cm and is a significant decrease from that year. Despite this, it is pleasing that the general downward trend in basal width has been reversed in 2025. The increased basal width may be caused by high numbers of juvenile tussocks recruited in 2020 and onwards surviving to measurable size.

The mean tussock height (8.15 cm) was much reduced in 2025, continuing a decreasing trend since the tallest tussock height of 25.2 cm was recorded in 2022. The 2025 measure was significantly shorter than the 2022 height and the baseline recorded in 2018 of 15.71 cm. Although stock have been removed for the summer resting period, the shorter tussock height in 2025 may be caused by grazing pressure from kangaroos, or plant dieback caused by the dry 2024-2025 conditions, as discussed further in **Section 5.2.2**.

The mean percentage of dead material on perennial grass tussocks significantly increased from 27.97% in 2024 to 92.17% in 2025. This is the highest measure for this statistic since it was first collected in 2019 and was also significantly higher than was recorded in 2020, 2022 and 2023.

The photographs taken at each quadrat (**Appendix 2**), present visual changes in the grassland over time at Quadrats 1–8 since 2016; and all twelve quadrats since 2018. The photos show that a gradual reduction in bare ground and increase in dead litter and thatch noticed over the past few years has now decreased. Photographs now resemble conditions seen in the early years of monitoring.

5.2.2 Rainfall and Vegetation Parameters

It seems clear from relationships found between vegetation data and rainfall statistics that climatic conditions experienced in the year and months leading into monitoring surveys influences vegetation condition. Over the years of monitoring to date, this includes variable measured such as:

- Native plant species diversity
- Weed species diversity
- Number of juvenile perennial grass tussocks
- Number of perennial grass tussocks
- Tussock basal width
- Tussock spacing
- Tussock height
- Bare ground and cryptogram cover.

These parameters are closely related to the relationships between PBTLs and spider holes, indicating that with higher rainfall and resulting denser vegetation structure is linked to lower number of PBTL and spider hole detections. This would indicate that vegetation cover can increase to a point that it becomes less than ideal PBTL habitat.

Despite fluctuations in vegetation cg=characteristics that are probably influenced by rainfall, the data does indicate that there has been some improvement in vegetation condition measures over time. For example, native plant species diversity remains significantly higher than the baseline, despite annual fluctuations possibly related to rainfall.

5.3 Grazing Impact and Ongoing Management

In response to increasing weed cover and the thickening structure of vegetation that occurred prior to 2023, an on-site meeting was held to discuss management approaches. This resulted in an extended grazing period being implemented in spring 2023 and autumn 2024 (EBS Ecology, 2024).

The 2025 monitoring indicates that vegetation condition has returned to similar structural characteristics to other years when a high number of PBTLs were detected. This has occurred in part to a temporary increase in grazing pressure as described above, and a return to dryer climatic conditions in 2024 – 2025.

Whilst stock are not present in the SEB and Offset areas during the dry summer and early autumn months, light grazing pressure may still act on vegetation due to kangaroos frequenting the area. During exceptionally dry periods, impact resulting from this on native vegetation condition may be problematic. This should be addressed according to the recommendation made in **Section 6.0**.

Monitoring of grassland condition in response to rainfall and adaptive management will be important going forward, if habitat is to be maintained in an ideal condition for maintaining the PBTL population.

Weeds continue to be recorded throughout the SEB and offset area, despite annual control activities being undertaken. While grassy weeds such as Wild Oats (*Avena* sp.) are not feasible to control other than through grazing management, woody weeds such as Dog Rose (*Rose canina*) should be targeted annually during the growing season (spring and summer). Weeds are particularly prevalent near feed out areas and watering points.

6.0 Recommendations

It seems clear from the monitoring at Hornsdale that PBTLs benefit from an open grassland structure. This includes a low cover and diversity of weed species, which also benefits vegetation condition. Within the Hornsdale SEB and PBTL offset area, this structure is maintained by allowing periodic grazing in line with the current management plan.

What is clear from recent years, however, is that being reactive to climatic conditions is important in maintaining vegetation condition and ideal habitat conditions for PBTLs. This has occurred from 2023 to 2025 by increasing grazing pressure during periods of high rainfall, as discussed in the 2024 report (EBS Ecology 2024).

During this period, additional grazing periods were implemented following very low numbers of PBTL and high weed and vegetation cover recorded in the 2023 and 2024 surveys. The period between 2024 and 2025 was again dry, and grazing management has since returned to the levels set by the initial management plan. It is pleasing that grassland has returned to an open structure and that numbers of PBTLs continue to increase from the low recorded in 2023.

Whilst being reactive to high rainfall conditions has benefited the offset areas, it should be noted that dryer than average conditions may also require an adaptive management approach. Overgrazing during dry periods is also likely to be detrimental to, particularly, vegetation condition. Whilst stock may have been removed during these times (specifically dry summers), grazing pressure may still be present due to kangaroos.

Given observations made during the 2025 monitoring field work and the results of the analysis, the following recommendations have been made:

- Continue grazing management as per the *Hornsdale Windfarm SEB – Native Vegetation and Pygmy Bluetongue Lizard Management Plan* (EBS Ecology, 2013).
- During the spring/summer growing season 2025, continue control of woody weeds, specifically Dog Rose and Bathurst Burr.
- Concentrate weed control efforts in drainage lines and sites frequented by livestock, such as feed out areas and watering points.
- When stock are removed from the SEB and PBTL offset area in late 2025, in consultation with the landowner, consider closing off watering points to reduce summer grazing pressure from kangaroos.

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Appendix 1

Vegetation Monitoring Data Tables

Quadrat	Native Diversity							
	2018	2019	2020	2021	2022	2023	2024	2025
1	6	8	23	18	27	23	29	21
2	4	4	9	7	9	10	13	9
3	5	8	16	15	22	19	24	15
4	4	6	11	11	15	12	17	7
5	8	10	14	17	23	18	22	18
6	6	8	15	13	16	14	21	12
7	4	5	12	12	15	15	17	13
8	4	8	11	10	12	11	15	7
9	5	8	15	15	20	12	18	14
10	3	4	14	11	16	7	18	8
11	8	7	10	8	20	16	21	14
12	12	13	20	21	25	29	30	18
Mean	**5.75**	**7.42**	**14.92**	**13.17**	**18.33**	**15.50**	**20.42**	**13.00**

Weed Species Diversity

Quadrat	Weed Diversity							
	2018	2019	2020	2021	2022	2023	2024	2025
1	2	7	9	10	15	21	20	11
2	4	8	16	13	23	19	25	11
3	3	6	9	12	13	16	18	7
4	1	6	11	10	12	16	20	5
5	3	7	9	12	15	18	15	11
6	3	7	15	14	14	16	19	9
7	4	6	9	13	12	19	19	9
8	5	6	8	17	15	22	24	8
9	7	6	13	15	17	21	21	16
10	4	6	11	13	20	21	20	15
11	5	5	8	6	15	15	13	8
12	1	4	9	11	12	17	15	7
Mean	**3.50**	**6.17**	**10.58**	**12.25**	**15.25**	**18.42**	**19.08**	**9.75**

Mean Plant Spacing

Quadrat	Mean Perennial Tussock Spacing (cm)							
	2018	2019	2020	2021	2022	2023	2024	2025
1	24.00	22.20	30.72	18.10	12.86	17.67	24.83	25.4
2	37.50	22.50	41.48	33.90	26.89	33.55	29.70	22.3
3	15.30	21.20	23.53	20.10	15.36	26.88	23.63	29.9
4	24.50	24.50	17.73	22.90	13.30	20.97	22.29	25.6
5	32.40	31.60	40.25	29.50	19.09	35.87	32.27	34.4
6	19.70	91.10	76.78	23.40	26.66	31.69	29.44	34.4
7	23.50	30.10	69.88	24.20	20.23	24.25	24.81	24.1
8	37.70	44.90	58.15	27.80	24.69	33.85	32.33	27.2
9	49.20	38.60	45.19	31.10	27.34	31.06	26.52	28.1
10	47.40	99.80	216.88	33.20	24.88	27.77	24.67	35.8
11	21.60	24.20	29.11	26.90	19.17	18.75	23.41	21.6

Quadrat	Mean Perennial Tussock Spacing (cm)							
	2018	2019	2020	2021	2022	2023	2024	2025
12	23.60	48.30	33.45	20.30	19.77	18.61	16.42	15.3
Mean	**29.70**	**41.58**	**56.93**	**26.00**	**20.85**	**26.74**	**25.86**	**27.01**

Mean Number of Tussocks per Hectare

Quadrat	Mean Number of Perennial Tussocks per Hectare							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	150,000	204,000	230,000	302,000	144,000	150,000	
2	-	120,000	76,000	50,000	54,000	17,000	85,000	
3	-	190,000	200,000	190,000	256,000	114,000	156,250	
4	-	160,000	231,000	110,000	281,000	130,000	201,250	
5	-	100,000	95,000	90,000	151,000	48,000	77,500	
6	-	100,000	84,000	50,000	88,000	53,000	57,500	
7	-	90,000	90,000	120,000	153,000	119,000	90,000	
8	-	70,000	60,000	60,000	74,000	57,000	102,500	
9	80,000	80,000	103,000	30,000	66,000	24,000	67,500	
10	60,000	30,000	10,000	20,000	63,000	17,000	206,250	
11	120,000	150,000	111,000	90,000	166,000	149,000	193,750	
12	120,000	130,000	195,000	100,000	321,000	207,000	292,500	
Mean	**95,000**	**114,167**	**121,583**	**94,815**	**164,583**	**90,000**	**140,000**	

Mean number of Juvenile Tussocks per hectare

Quadrat	Mean Number of Juvenile Tussocks per Hectare							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	30,000	98,750	13,333	13,750	8,000	50,000	0
2	-	10,000	58,750	0	2,500	1,000	5,000	0
3	-	40,000	12,500	10,000	8,750	14,000	15,000	0
4	-	10,000	36,250	0	12,500	4,000	20,000	1,250
5	-	20,000	32,500	0	7,500	2,000	21,250	0
6	-	10,000	15,714.3	0	10,000	0	3,750	0
7	-	10,000	130,000	20,000	26,250	11,000	47,500	5,000
8	-	2,500	48,750	10,000	11,428.57	3,000	10,000	2,500
9	1,000	5,000	157,500	0	1,250	1,000	3,750	0
10	6,000	10,000	307,500	0	2,500	4,000	18,750	0
11	1,200	20,000	67,500	0	3,750	7,000	22,500	0
12	30,000	20,000	63,750	0	18,750	7,000	36,250	3,750
Mean	**9,550**	**15,625**	**85,788.69**	**4,444.42**	**9,910.71**	**5,166.67**	**21,145.83**	**1,041.67**

Mean Perennial Tussock Basal Width

Quadrat	Mean Perennial Tussock Basal Width (cm)							
	2018	2019	2020	2021	2022	2023	2024	2025
1	12.90	6.70	7.06	6.60	8.55	6.45	4.15	3.8
2	8.50	7.00	5.14	4.70	4.97	2.56	2.18	4
3	7.20	6.20	5.83	6.90	6.69	5.75	4.00	3.5
4	8.70	6.10	5.66	6.20	6.25	3.21	5.32	4.5
5	6.30	5.40	6.25	6.70	8.68	4.04	3.51	4.6

Quadrat	Mean Perennial Tussock Basal Width (cm)							
	2018	2019	2020	2021	2022	2023	2024	2025
6	9.80	4.90	7.58	7.10	6.58	6.36	5.00	5.9
7	11.40	13.20	11.27	5.20	8.25	6.67	6.83	12
8	13.50	8.20	11.30	10.40	6.79	6.18	7.02	9.1
9	6.90	6.30	6.40	4.40	5.98	3.66	2.38	5.9
10	9.10	6.60	7.69	6.10	6.91	2.82	0.89	3.3
11	11.90	8.80	8.25	8.80	7.45	6.12	3.20	5.8
12	8.80	9.80	12.81	11.60	4.45	5.33	2.85	5.2
Mean	**9.58**	**7.43**	**7.95**	**7.06**	**6.80**	**4.93**	**3.94**	**5.63**

Mean Perennial Tussock Height

Quadrat	Mean Perennial Tussock Height (cm)							
	2018	2019	2020	2021	2022	2023	2024	2025
1	21.00	9.40	12.59	22.60	38.14	29.99	21.79	6.4
2	14.00	3.50	8.06	19.70	21.78	14.69	12.25	7.3
3	13.60	5.50	10.28	29.20	17.08	18.22	10.40	3
4	10.70	3.50	8.20	22.50	25.02	14.29	12.46	5.4
5	14.50	5.70	9.59	30.50	25.25	13.28	11.09	5.9
6	17.30	4.30	10.13	26.70	21.70	12.04	10.80	8.7
7	27.90	15.90	18.00	18.60	52.68	28.93	27.04	23.6
8	19.80	7.00	12.61	20.60	25.63	28.42	18.62	14.1
9	10.00	5.00	8.05	28.30	22.66	8.46	13.61	6.9
10	9.50	5.80	11.81	14.30	14.72	10.38	17.13	2
11	13.60	7.80	12.03	14.40	13.62	17.76	20.12	5.9
12	16.60	9.10	16.03	21.80	24.08	30.44	13.82	8.6
Mean	**15.71**	**6.88**	**11.44**	**22.43**	**25.19**	**18.91**	**15.76**	**8.15**

Mean % Dead

Quadrat	Mean Dead Material per Tussock (%)							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	77.00	30.00	59.00	17.00	55.40	22.50	95
2	-	86.00	42.14	94.00	9.00	24.40	37.57	96
3	-	66.00	27.50	74.00	20.13	66.40	24.53	92
4	-	82.00	17.00	88.00	15.50	52.30	36.87	96
5	-	83.00	51.25	73.00	17.25	67.30	19.85	75
6	-	96.00	55.71	88.00	15.00	80.70	35.82	90
7	-	88.00	51.88	58.00	10.75	45.50	15.22	92
8	-	94.00	46.43	82.00	10.88	46.20	14.31	88
9	97.00	97.00	39.63	95.00	15.25	55.00	34.44	96
10	96.00	95.00	51.67	95.00	21.25	35.60	38.28	97
11	97.00	83.00	43.75	84.00	25.25	57.90	30.31	93
12	79.00	70.00	21.88	78.00	22.63	69.70	25.90	96
Mean	**92.25**	**84.74**	**39.91**	**80.67**	**16.66**	**54.70**	**27.97**	**92.17**

Mean % Weed Cover in 1x1

Quadrat	Mean Weed Cover (%) in 1m² Quadrats							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	10	36	36	1	30	7	11
2	-	41	84	90	4	4	17	13
3	-	5	16	26	1	18	3	3
4	-	19	57	48	1	43	2	12
5	-	21	60	39	2	12	7	4
6	-	53	79	69	3	15	11	11
7	-	31	76	62	1	17	3	4
8	-	86	63	74	9	1	6	4
9	62	89	79	97	2	2	12	18
10	88	98	96	94	2	2	24	21
11	7	19	68	62	2	19	2	3
12	1	1	4	5	2	10	0	0
Mean	**39.50**	**31.98**	**59.73**	**58.50**	**2.41**	**14.42**	**7.80**	**8.67**

Weed Cover 1 ha

Quadrat	Weed Cover (%) per 1 ha							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	30	30	40	1	25	10	5
2	-	30	60	90	5	15	50	10
3	-	5	20	30	1	25	15	5
4	-	25	30	50	2	50	20	5
5	-	25	40	40	5	20	20	1
6	-	40	60	70	5	20	30	10
7	-	25	50	60	5	25	20	5
8	-	70	60	70	10	10	15	5
9	70	70	75	90	3	10	35	25
10	80	85	85	90	3	10	40	25
11	10	20	50	60	3	25	10	5
12	2	1	5	5	2	10	5	1
Mean	**40.50**	**35.50**	**48.33**	**57.92**	**3.75**	**20.42**	**22.50**	**8.5**

Mean Cryptogram Cover (%) in 1 m²

Quadrat	Mean Cryptogram Cover (%), 1 m²							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	-	25.10	5.00	1.75	1.30	0.00	1
2	-	-	2.14	0.00	0.00	0.00	0.00	0
3	-	-	58.13	6.00	14.13	2.40	3.53	4
4	-	-	25.63	1.00	6.75	3.30	2.88	6
5	-	-	30.25	4.00	2.13	2.80	2.19	3
6	-	-	11.50	3.00	0.38	1.80	0.97	1
7	-	-	15.00	2.00	1.13	1.30	0.00	2
8	-	-	1.25	1.00	0.43	1.10	0.00	0
9	-	-	2.19	0.00	3.50	4.60	0.00	1
10	-	-	1.31	0.00	12.50	0.60	0.00	0

Quadrat	Mean Cryptogram Cover (%), 1 m^2							
	2018	2019	2020	2021	2022	2023	2024	2025
11	-	-	16.00	0.00	17.50	8.90	1.06	17
12	-	-	55.00	18.00	7.75	7.30	5.28	70
Mean	**-**	**-**	**20.29**	**3.33**	**5.66**	**2.95**	**1.33**	**8.75**

Mean percent (%) Bare Ground, 1 m^2

Quadrat	Mean Percent (%) Bare Ground, 1 m^2							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	-	5.80	2.00	1.75	0.33	2.22	16
2	-	-	8.13	1.00	1.38	0.00	0.25	3
3	-	-	11.63	3.00	3.38	1.90	4.28	21
4	-	-	7.63	6.00	12.25	1.30	5.53	12
5	-	-	13.38	6.00	1.75	1.10	14.16	29
6	-	-	8.00	2.00	1.63	0.20	3.94	7
7	-	-	5.63	1.00	1.13	1.20	0.25	2
8	-	-	16.13	1.00	0.00	1.80	0.47	1
9	-	-	4.38	0.00	2.88	0.10	1.03	7
10	-	-	0.19	0.00	0.00	0.00	0.16	1
11	-	-	2.75	0.00	5.50	2.10	1.78	5
12	-	-	13.13	6.00	4.38	9.00	5.78	0
Mean	**-**	**-**	**8.06**	**2.33**	**3.00**	**1.59**	**3.32**	**8.67**

Mean Litter Cover (%), 1 m^2

Quadrat	Mean Percent (%) Litter Cover, 1m^2							
	2018	2019	2020	2021	2022	2023	2024	2025
1	-	-	-	-	68.75	53.90	75.03	63
2	-	-	-	-	88.50	98.90	79.13	83
3	-	-	-	-	76.88	63.30	79.63	71
4	-	-	-	-	65.63	44.40	75.88	71
5	-	-	-	-	72.50	81.10	73.69	61
6	-	-	-	-	89.38	83.30	78.06	77
7	-	-	-	-	74.13	47.80	61.25	63
8	-	-	-	-	89.29	90.60	79.34	79
9	-	-	-	-	88.13	96.10	83.16	77
10	-	-	-	-	78.13	100.00	75.34	89
11	-	-	-	-	48.75	65.60	81.56	57
12	-	-	-	-	37.50	20.00	56.25	36
Mean	**-**	**-**	**-**	**-**	**73.13**	**70.42**	**74.86**	**68.92**

Appendix 2

Monitoring Quadrat Photographs

Appendix Table A2.1 **Quadrat 1**

Baseline (2016)

2018

2019

2020

2021

2022


2023


2024


2025

Appendix Table A2.2 **Quadrat 2**

Baseline (2016)

2018

2019

2020

2021

2022

2023

2024

2025

Appendix Table A2.3 **Quadrat 3**

Baseline (2016)

2018

2019

2020

2021

2022

2023

2024

2025

Appendix Table A2.4 **Quadrat 4**

	
Baseline (2016)	2018
	
2019	2020
	
2021	2022


2023


2024


2025

Appendix Table A2.5 Quadrat 5


Baseline (2016)


2018


2019


2020


2021


2022

2023

2024

2025

Appendix Table A2.6 **Quadrat 6**

 Baseline (2016)	 2018
 2019	 2020
 2021	 2022

2023

2024

2025

Appendix Table A2.7 Quadrat 7

Baseline (2016)

2018

2019

2020

2021

2022


2023


2024


2025

Appendix Table A2.8 **Quadrat 8**

	
Baseline (2016)	2018
	
2019	2020
	
2021	2022


2023


2024


2025

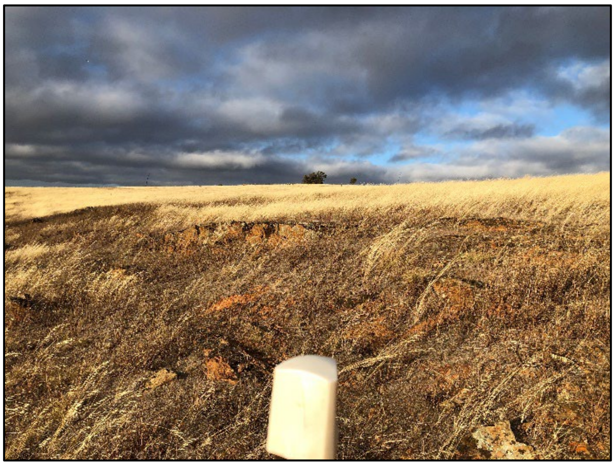
Appendix Table A2.9 Quadrat 9

	
Baseline (2018)	2019
	
2020	2021
	
2022	2023

2024

2025

Appendix Table A2.10 **Quadrat 10**

 Baseline PBTL (2018)	 2019
 2020	 2021
 2022	 2023

2024

2025

Appendix Table A2.11 Quadrat 11

Baseline (2018)

2019

2020

2021

2022

2023

2024

2025

Appendix Table A2.12 **Quadrat 12**


Baseline (2018)


2019


2020


2021


2022


2023

2024

2025

Appendix 3

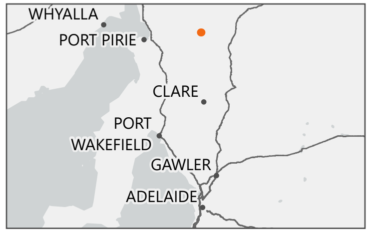
2025 PBTL Records Locations Maps

APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 1

Legend

- PBTL Monitoring quadrat
- Spider burrow searched
- PBTL



0 10 20

Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

umwelt

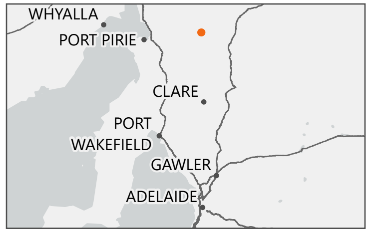
Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 2

Legend

PBTL Monitoring quadrat
Spider burrow searched
PBTL

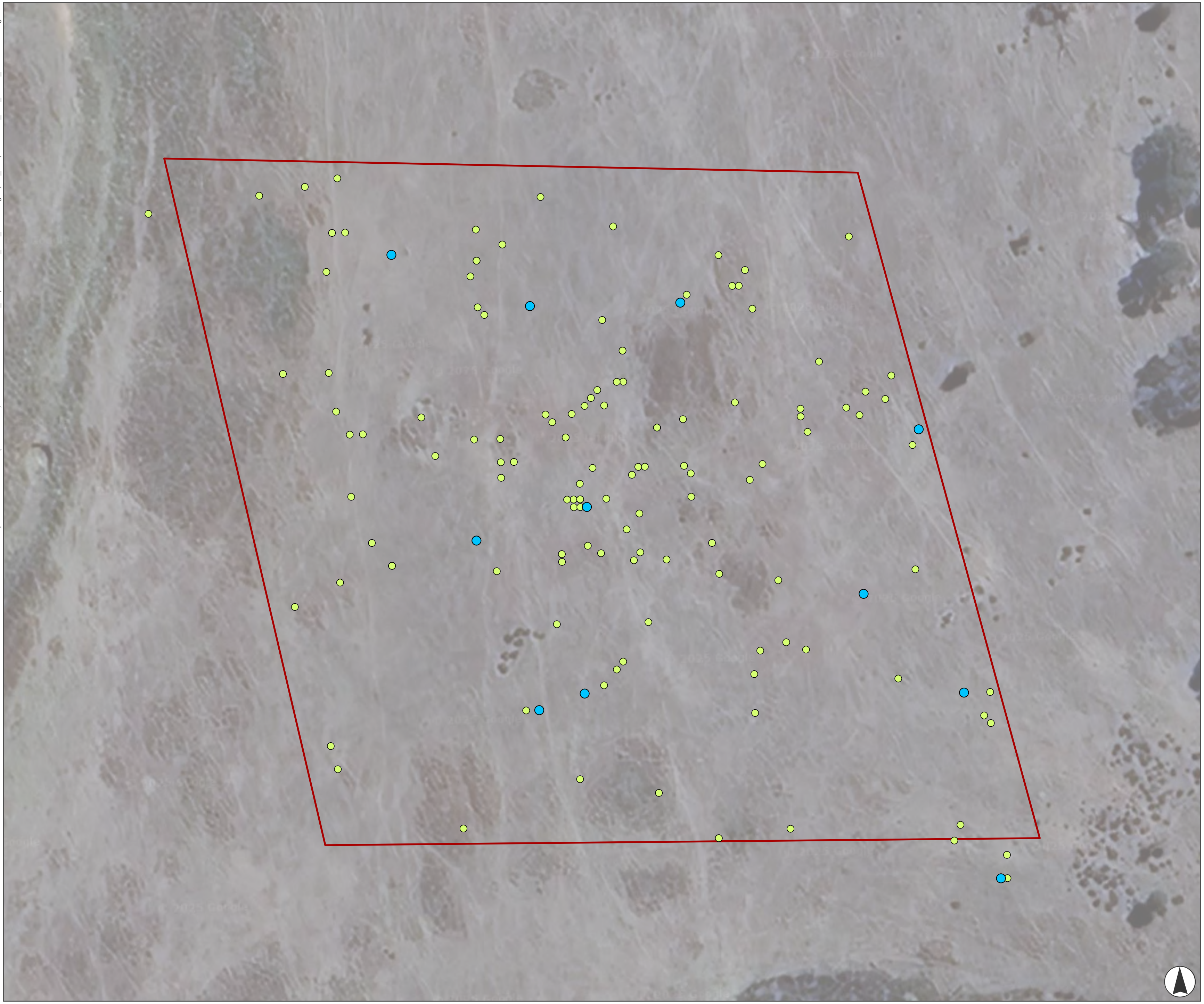


0 10 20
Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

C:\Users\sophie.haswell\UMWELT (AUSTRALIA) PTY. LTD\32154 - 03 S&V\02_Projects\32154_R01_MonitoringReport_v1.aprx - 32154_R01_A0003_PBTLMonitoring2025

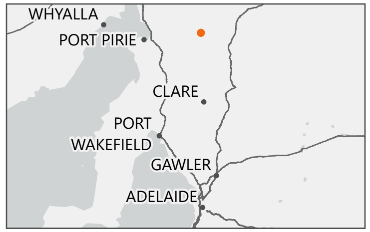


APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 3

Legend

- PBTL Monitoring quadrat
- Spider burrow searched
- PBTL



0 10 20

Metres

Scale 1:750 at A4

GDA2020 MGA Zone 54

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

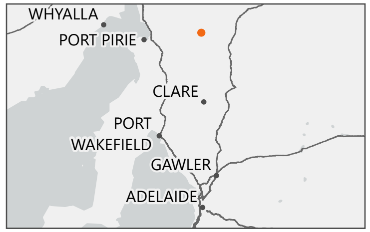
C:\Users\sophie.haswell\UMWELT (AUSTRALIA) PTY. LTD\32154 - 03 S&V\02_Projects\32154_R01_MonitoringReport_v1.aprx - 32154_R01_A0003_PBTLMonitoring2025

APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 4

Legend

- PBTL Monitoring quadrat
- Spider burrow searched
- PBTL



0 10 20

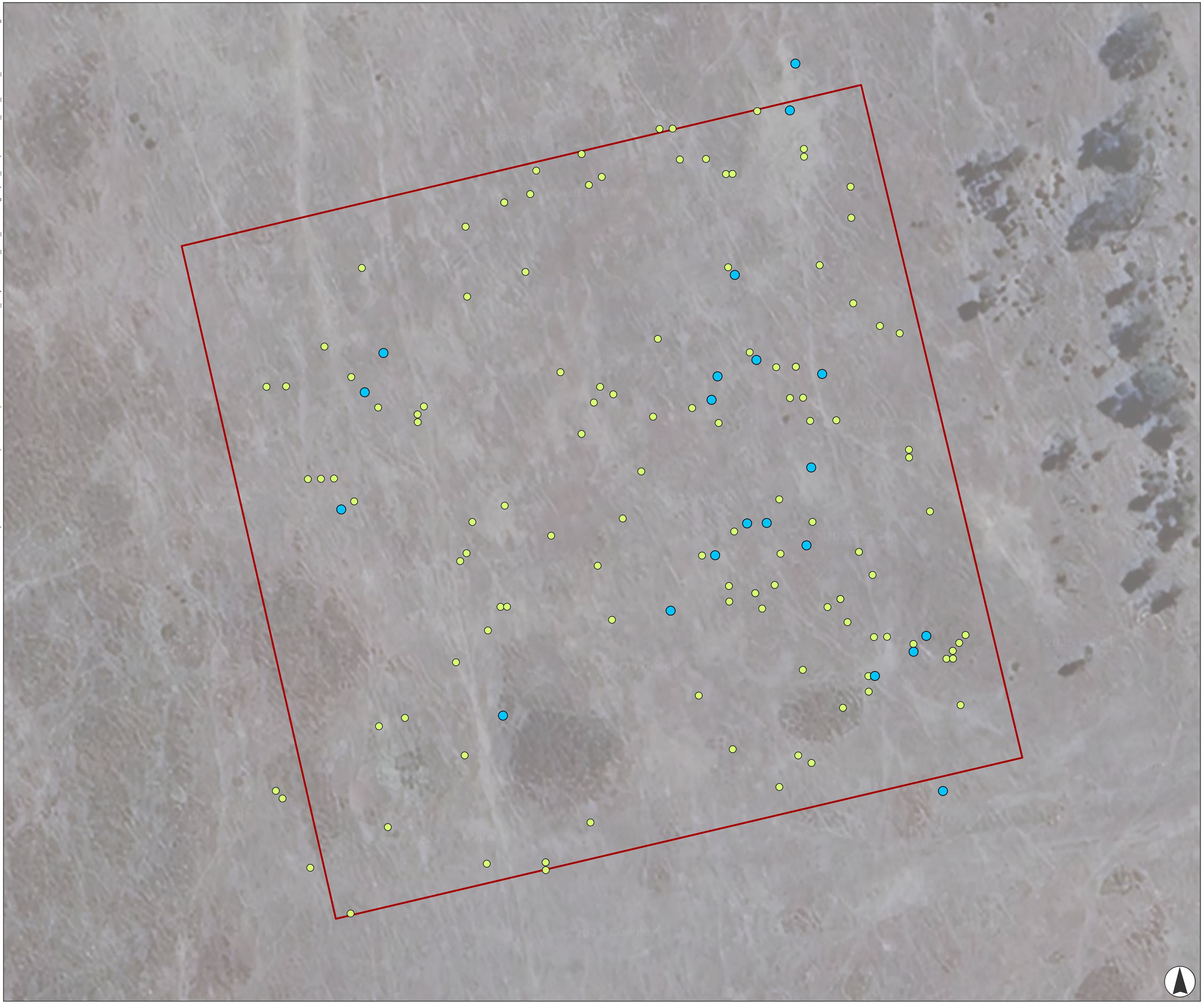
Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

umwelt

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

C:\Users\sophie.haswell\UMWELT (AUSTRALIA) PTY. LTD\32154 - 03 S&V\02_Projects\32154_R01_MonitoringReport_v1.aprx - 32154_R01_A0003_PBTLMonitoring2025

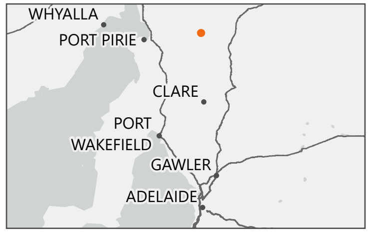


APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 5

Legend

- PBTL Monitoring quadrat
- Spider burrow searched
- PBTL



0 10 20
Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

umwelt

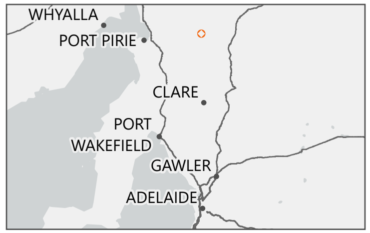
Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 6

Legend

- PBTL Monitoring quadrat
- Spider burrow searched
- PBTL



0 10 20

Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

C:\Users\sophie.haswell\UMWELT (AUSTRALIA) PTY. LTD\32154 - 03 S&V\02_Projects\32154_R01_MonitoringReport_v1.aprx - 32154_R01_A0003_PBTLMonitoring2025

APPENDIX 3

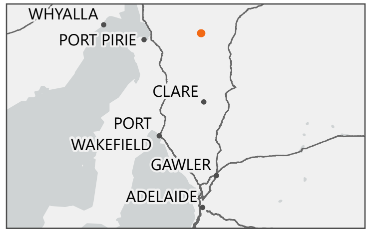
2025 PBTL Records Locations Map - Quadrat 7

Legend

PBTL Monitoring quadrat

Spider burrow searched

PBTL



0 10 20

Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

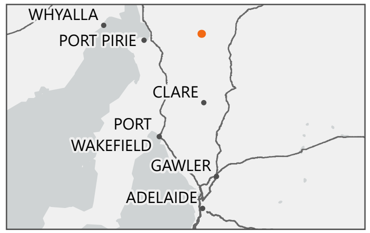
Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 8

Legend

- PBTL Monitoring quadrat
- Spider burrow searched
- PBTL



0 10 20

Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

umwelt

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

C:\Users\sophie.haswell\UMWELT (AUSTRALIA) PTY. LTD\32154 - 03 S&V\02_Projects\32154_R01_MonitoringReport_v1.aprx - 32154_R01_A0003_PBTLMonitoring2025

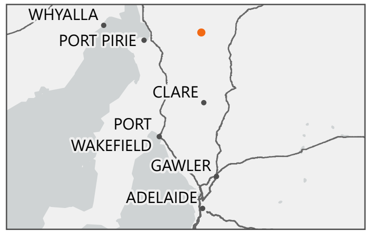
APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 9

Legend

PBTL Monitoring quadrat

Spider burrow searched



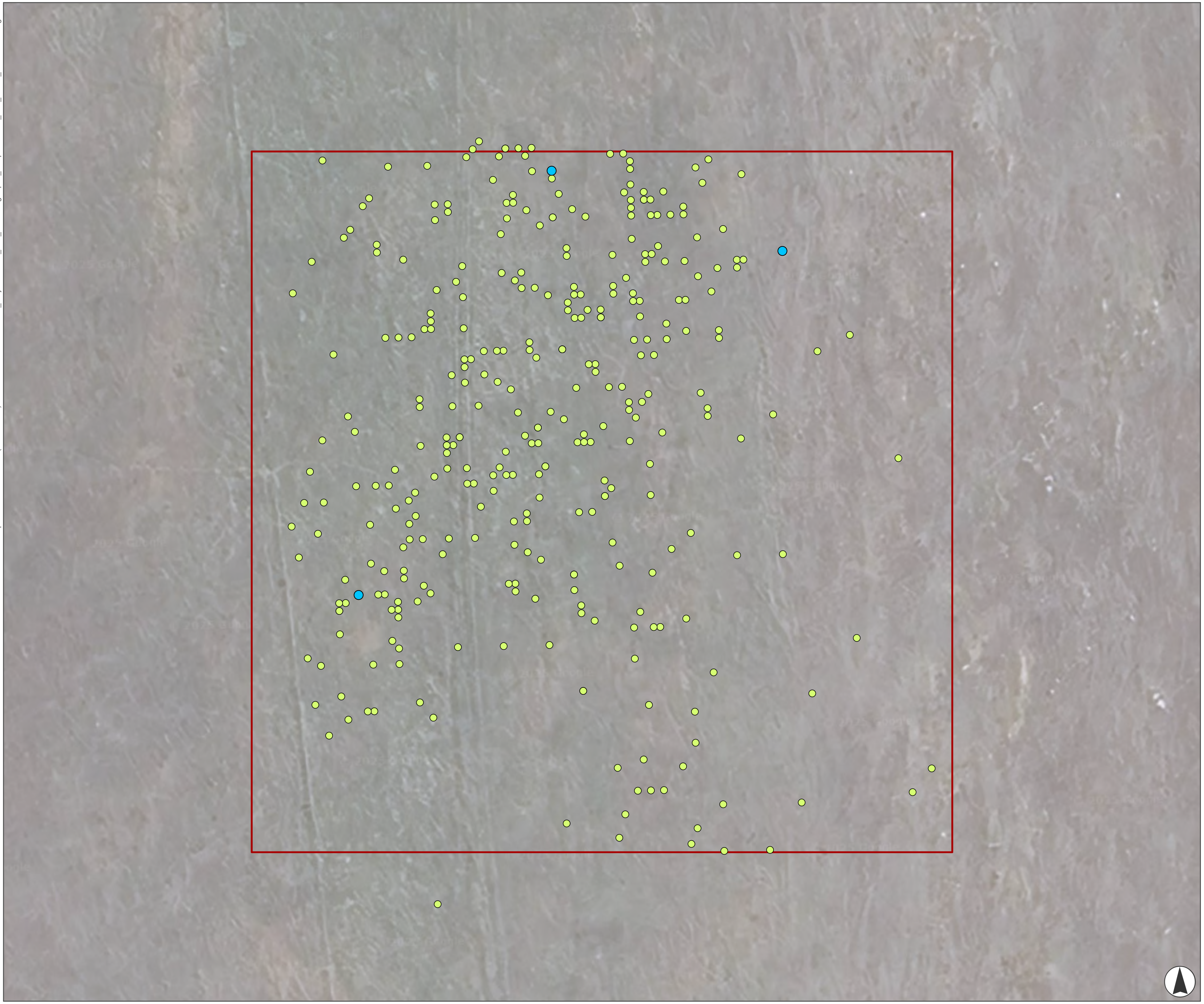
0 10 20

Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

umwelt

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)



APPENDIX 3

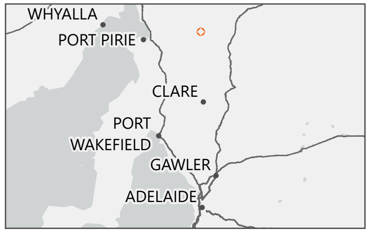
2025 PBTL Records Locations Map - Quadrat 10

Legend

PBTL Monitoring quadrat

Spider burrow searched

PBTL



0 10 20

Metres

Scale 1:750 at A4
GDA2020 MGA Zone 54

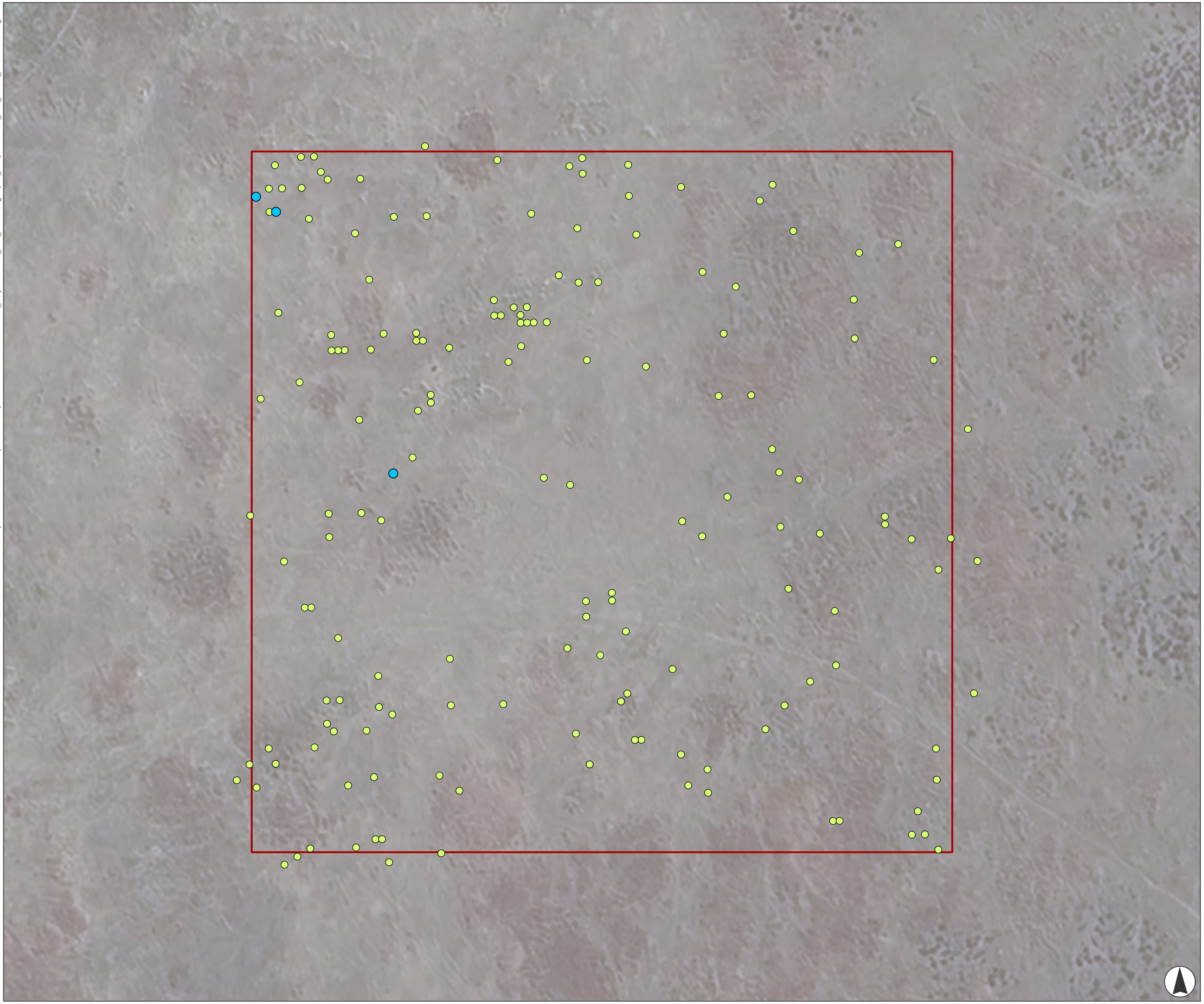
umwelt

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

C:\Users\sophie.haswell\UMWELT (AUSTRALIA) PTY. LTD\32154 - 03 S&V\02_Projects\32154_R01_MonitoringReport_v1.aprx - 32154_R01_A0003_PBTLMonitoring2025

APPENDIX 3

2025 PBTL Records Locations Map - Quadrat 11

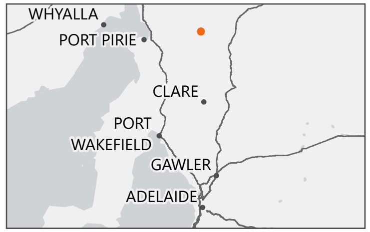


Legend

PBTL Monitoring quadrat

Spider burrow searched

PBTL



0 10 20

Metres

Scale 1:750 at A4

GDA2020 MGA Zone 54

Image Source: ESRI Basemap (2025) | **Data Source:** SA DIT (2025)

Appendix 4

Flora Species Recorded in 2025

Scientific Name	Common Name	EPBC Act Status[1]	NPW Act Status[1]	Weed Status[3]	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Acacia pycnantha	Golden Wattle	-	-	-												✓
Allocasuarina verticillata	Drooping Sheoak	-	-	-	✓				✓	✓						
Aristida behriana	Bruch Wire-grass	-	-	-	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
Atriplex semibaccata	Berry Saltbush	-	-	-			✓									
Austrostipa scabra	Falcate-awn Spear-grass	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Austrostipa sp.	Spear-grass	-	-	-	✓								✓			
Avena barbata	Bearded Oat	-	-	Int	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Boerhavia dominii	Tar-vine	-	-	-							✓		✓			
Bromus diandrus	Great Brome	-	-	Int									✓	✓		
Bursaria spinosa	Bursaria	-	-	-												✓
Calocephalus citreus	Lemon Beauty-heads	-	-	-	✓		✓		✓							✓
Carthamus lanatus	Safron Thistle	-	-	Int			✓	✓	✓					✓	✓	
Chondrilla juncea	Skeleton Weed	-	-	D				✓	✓				✓			
Cichorium intybus	Chicory	-	-	Int							✓					
Citrullus colocynthis	Colocynth	-	-	Int	✓								✓	✓		
Convolvulus remotus	Grassy Bindweed	-	-	-	✓		✓	✓	✓		✓		✓		✓	✓
Cryptandra campanulata	Long-flower Cryptandra	-	-	-	✓		✓		✓				✓		✓	✓
Cucumis myriocarpus	Paddy Melon	-	-	Int	✓	✓										
Cullen australasicum	Tall Scurf-pea	-	-	-									✓			
Echium plantagineum	Salvation Jane	-	-	D		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Enneapogon nigricans	Black-head Grass	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Enteropogon acicularis	Umbrella Grass	-	-	-					✓							
Erodium cicutarium	Cut-leaf Herons-bill	-	-	Int			✓		✓	✓		✓			✓	✓
Euphorbia drummondii	Euphorbia drummondii	-	-	-	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
Gonocarpus elatus	Hill Raspwort	-	-	-											✓	✓
Heliotropium curassavicum	Smooth Heliptrope	-	-	Int	✓											
Heliotropium europaeum	Common Heliotrope	-	-	Int		✓				✓			✓	✓	✓	

Scientific Name	Common Name	EPBC Act Status[1]	NPW Act Status[1]	Weed Status[3]	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Hordeum glaucum/leporinum	Hordeum glaucum/lepinorum	-	-	Int	✓	✓							✓	✓		✓
Juncus aridicola	Inland Rush	-	-	-	✓		✓	✓	✓							
Lepidium africanum	Common Peppercress	-	-	Int										✓		
Lolium sp.	Ryegrass	-	-	Int									✓	✓		
Lomandra multiflora ssp. *dura*	Hard Mat-rush	-	-	-	✓	✓	✓	✓	✓		✓				✓	✓
Lysiana exocarpi ssp. *exocarpi*	Harlequin Mistletoe	-	-	-	✓											✓
Maireana enchylaenoides	Wingless Fissure-plant	-	-	-	✓				✓		✓		✓	✓	✓	✓
Maireana rohrlachii	Rohrlach's Bluebush	-	R	-	✓					✓						
Maireana sp.		-	-	-	✓											
Marrubium vulgare	Horehound	-	-	D	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓
Onopordum acaulon	Horse Thistle	-	-	Int									✓	✓		
Onopordum acanthium		-	-	Int		✓				✓	✓		✓	✓		
Poa bulbosa		-	-	Int					✓	✓						
Reseda lutea	Cut-leaf Migonette	-	-	D	✓				✓							✓
Rosa canina	Dog Rose	-	-	D	✓		✓				✓	✓	✓		✓	✓
Rumex dumosus	Wiry Dock	-	R	-		✓			✓							✓
Rumex sp.		-	-	Int								✓				
Rytidosperma caespitosum	Common Wallaby-grass	-	-	-	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Rytidosperma sp.		-	-	-										✓		
Salsola australis	Buckbush	-	-	-									✓			
Salvia verbenaca	Wild Sage	-	-	Int	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sida corrugata	Corrugated Sida	-	-							✓						
Sida petrophila	Rock Sida	-	-											✓		
Sonchus oleraceus	Common Sow-thistle	-	-	Int		✓					✓		✓	✓		
Teucrium racemosum	Grey Germander	-	-	-		✓										
Themeda triandra	Kangaroo Grass	-	-	-	✓		✓	✓	✓	✓	✓	✓			✓	✓
Tribulus terrestris	Caltrop	-	-	Int		✓										

Scientific Name	Common Name	EPBC Act Status[1]	NPW Act Status[1]	Weed Status[3]	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12
Trifolium angustifolium		-	-	Int	✓				✓	✓	✓	✓	✓	✓		
Trifolium campestre	Hop Clover	-	-	Int		✓										
Trifolium sp.	Clover	-	-	Int									✓		✓	
Triodia irritans	Spinifex	-	-	-											✓	✓
Verbascum virgatum	Twiggy Mullein	-	-	Int					✓							
Vittadinia cuneata	Fuzzy New Holland Daisy	-	-	-			✓			✓					✓	✓
Vittadinia gracilis	Woolly New Holland Daisy	-	-	-	✓		✓		✓	✓	✓	✓	✓			
Vittadinia sp.		-	-	-	✓		✓		✓		✓		✓	✓		
Walwhalleya proluta	Rigid Panic	-	-	-	✓	✓	✓		✓	✓	✓				✓	
Xanthium spinosum	Bathurst Burr	-	-	D	✓											
Xanthorrhoea quadrangulata	Rock Grass-tree	-	-		✓										✓	✓

[1]EPBC Act (*Environment Protection and Biodiversity Conservation Act 1999*) Status: CR, Critically Endangered. EN, Endangered. VU, Vulnerable.
[2]NPW Act (*National Parks and Wildlife Act 1972*) Status: E, Endangered. V, Vulnerable. R, Rare.
[3]Weed Status: D, Declared under the LSA Act (*Landscape South Australia Act 2017*). Int, Introduced species.

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