



# Dargues Gold Mine Ecological Monitoring 2019 – Annual Report

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**Diversified Minerals Pty Ltd**

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## DOCUMENT TRACKING

<b>Project Name</b>	Dargues Gold Mine Ecological Monitoring Program 2019
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<b>Status</b>	<b>Draft</b>
<b>Version Number</b>	<b>V0a</b>
<b>Last saved on</b>	<b>15 January 2020</b>

This report should be cited as 'Eco Logical Australia 2020. *Dargues Gold Mine Flora Monitoring 2019 – Annual Report*. Prepared for Diversified Minerals Pty Ltd.'

## ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from Diversified Minerals Pty Ltd.

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## Abbreviations

Abbreviation	Description
BBAM	BioBanking Assessment Methodology
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BMP	Biodiversity Management Plan
BOA	Biodiversity Offset Area
DGM	Dargues Gold Mine
E	Exotic species
EEC	Endangered Ecological Community
ELA	Eco Logical Australia
ha	hectares
HBT	Hollow-bearing tree
km	kilometres
LWD	Large woody debris
m	metres
mamsl	metres above sea level
NGC	Native ground cover
NMS	Native midstorey
NOS	Native overstorey
NSD	Native species diversity

## Executive Summary

Eco Logical Australia (ELA) was engaged by Diversified Minerals Pty Ltd to conduct the 2019 ecological monitoring at Dargues Gold Mine (DGM). DGM is located north of Majors Creek and 13 kilometres (km) south of Braidwood in the South Eastern Highlands of New South Wales.

The surveys are required under the Biodiversity Management Plan (BMP) (R.W. Corkery & Co. 2012) and have occurred in autumn and spring since 2013. Flora (vegetation) monitoring was undertaken in both autumn and spring 2019 at six sites: three sites within the Tableland Basalt Forest Endangered Ecological Community (EEC) and three in native grassland. Within each of the two vegetation types, two sites were located within the on-site Biodiversity Offset Area (BOA) and one site was in an off-site reference site.

Annual fauna surveys have also been conducted each December since 2013 and are required under the BMP. However, due to the large fire (approximately 37,000 ha (NSW Government 2019)) in the nearby Tallaganda National Park area that began in November 2019, fauna monitoring was not undertaken in 2019.

A total of 155 plant species were recorded across the six sites during the 2019 surveys. The number of both native and exotic species decreased in all three forest sites between spring 2018 and spring 2019. Native species richness decreased at all three grassland sites, and exotic species richness decreased in one of the two on-site sites, remained unchanged at the other, and decreased at the off-site reference site. Native ground cover was relatively low compared to previous monitoring years at all forest and grassland sites.

No major changes in vegetation condition that can be attributed to activities at Dargues Gold Mine occurred between 2018 and 2019. It is likely that the relatively low native vegetation cover and species richness recorded in 2019 has been partly caused by the extremely dry conditions prior to the field survey.

Our recommendations for future management are in accordance with previous recommendations, and include ongoing weed management, with particular focus on the continued removal of *Cytisus scoparius* (Scotch Broom) and *Rubus fruticosus* (Blackberry).

As noted previously, monitoring indicates that the moderately degraded native grassland sites are not transitioning to a composition more closely aligned with Natural Temperate Grassland EEC condition thresholds. We therefore recommend that the Grazing Management Plan be revised and the potential for grazing exclusion and active restoration of target areas investigated.

# 1. Introduction

Eco Logical Australia (ELA) was engaged by Diversified Minerals Pty Ltd to undertake monitoring of terrestrial flora and fauna at the Dargues Gold Mine (DGM) on-site Biodiversity Offset Area (BOA) and associated reference sites during spring and summer 2019, as detailed in the Biodiversity Management Plan (BMP) (R. W. Corkery & Co. 2012) and previous monitoring reports (EnviroKey 2015; ELA 2017a; ELA 2018a; ELA 2019a).

Annual fauna surveys have been conducted each December since 2013 and are required under the BMP. However, a large fire in the Tallaganda National Park area (approximately 37,000 ha) began in late November 2019 (NSW Government 2019). The fauna survey scheduled for December was postponed until early January, and then cancelled because of the ongoing risk of fire and poor air quality due to smoke.

This monitoring report summarises the results of 2019 flora monitoring in the onsite BOA and associated reference sites. Recommendations are provided in **Section 4** to guide management and ongoing monitoring priorities.

## 1.1 Project context and background

DGM is located immediately north of Majors Creek and 13 km south of Braidwood, in the South Eastern Highlands Bioregion of New South Wales.

DGM was granted project approval in February 2012 and a BMP was prepared in May 2012 (R.W. Corkery & Co 2012). From December 2013 to 2017, DGM was in care and maintenance mode; results from surveys undertaken during that time represent the “baseline” condition of vegetation on-site. The 2017 report presented the first set of results with the potential to indicate any impacts directly related to project activities.

In accordance with the conditions of project approval, the BMP outlines requirements for monitoring vegetation (flora) and fauna at DGM. These requirements include:

- Monitoring of six vegetation quadrats (four on-site and two off-site reference sites) in Tableland Basalt Forest of the Sydney Basin and South Eastern Highlands Bioregion (‘Tableland Basalt Forest’) Endangered Ecological Community (EEC) and native grassland areas. The off-site monitoring sites are to be located in good condition examples of these EECs to act as references against which to assess the performance of the On-site Biodiversity Offset Strategy (R.W. Corkery & Co. 2012).
- Fauna monitoring at four locations as previously identified by EnviroKey in the Terrestrial Flora and Fauna Monitoring Report (2015). Monitoring at each location is to include surveys for diurnal birds, nocturnal species, microchiropteran bats (microbats) and ground fauna (amphibians, ground mammals and reptiles).

Flora monitoring has been undertaken biannually in autumn and spring in 2013, 2014, 2015, 2016, 2017, 2018 and 2019. Terrestrial fauna monitoring has been undertaken annually over the same period, with fauna monitoring occurring in early summer (i.e. December). As highlighted above, fauna monitoring was not undertaken in December 2019.

## 2. Methods

### 2.1 Terrestrial flora monitoring

Flora monitoring was conducted by ELA ecologists Andrew Mitchell and Clare Duck on 30 April and 1 May (autumn monitoring period), and 24 and 25 October (spring monitoring period) of 2019. Monitoring continued at the six previously established flora monitoring sites, as described in EnviroKey (2015) (**Figure 2**).

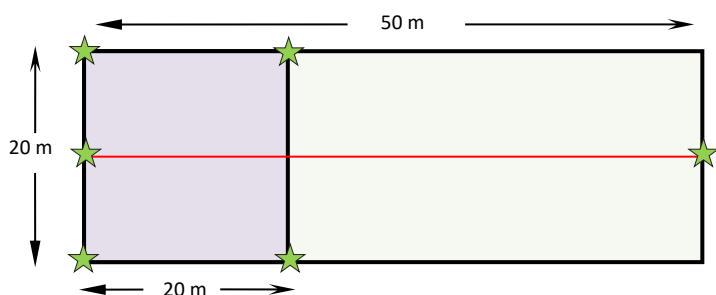
Sites 2 and 3 are located in remnant Ribbon Gum – Narrow-leaved Peppermint Grassy Open Forest ('open forest') inside the DGM project boundary ('on-site' sites). Site 5 is the 'off-site' reference for the open forest vegetation community. This vegetation community is described in the BMP as corresponding to Tableland Basalt Forest, listed as an EEC under the NSW Biodiversity Conservation Act 2016 (BC Act).

Site 1 and 4 are in areas of native-dominated grassland ('native grassland') inside the DGM project boundary. Site 6, which was relocated approximately 150 m north in 2014 due to changed access arrangements, is the native grassland off-site reference. However, following modifications to the original project approval, the DGM project boundary now encompasses Site 6. Although Site 6 can therefore no longer be considered an 'off-site' reference site in accordance with the BMP, there are no suitable alternatives available for monitoring. Monitoring at this site has continued for autumn and spring 2019 and will continue in the absence of a suitable off-site reference location. This is discussed further in **Section 4** of this report.

At each flora monitoring site, monitoring was undertaken using the BioBanking Assessment Methodology (BBAM) (OEH 2014). As highlighted in the 2014 monitoring report (EnviroKey 2015), flora monitoring sites were initially established and assessed using inconsistent methodologies. In accordance with the BBAM, as of autumn 2016 ELA has adopted the standard nested 50 m x 20 m and 20 m x 20 m quadrat (Biometric plot) for all six monitoring sites.

Biometric transects ran downslope from the start point, with the nested 20 m x 20 m floristic quadrat located at the upslope end of the transect. Photographs were taken from the start and end points, facing downslope/upslope (respectively) along the transect.

In spring 2016, monitoring sites were permanently marked with star pickets in the layout presented in **Figure 1** below (i.e. pickets placed at the start and end of the 50 m transect, and at each corner of the nested 20 m x 20 m flora quadrat).



**Figure 1:** Marking and layout of Biometric plot (★ = star picket)



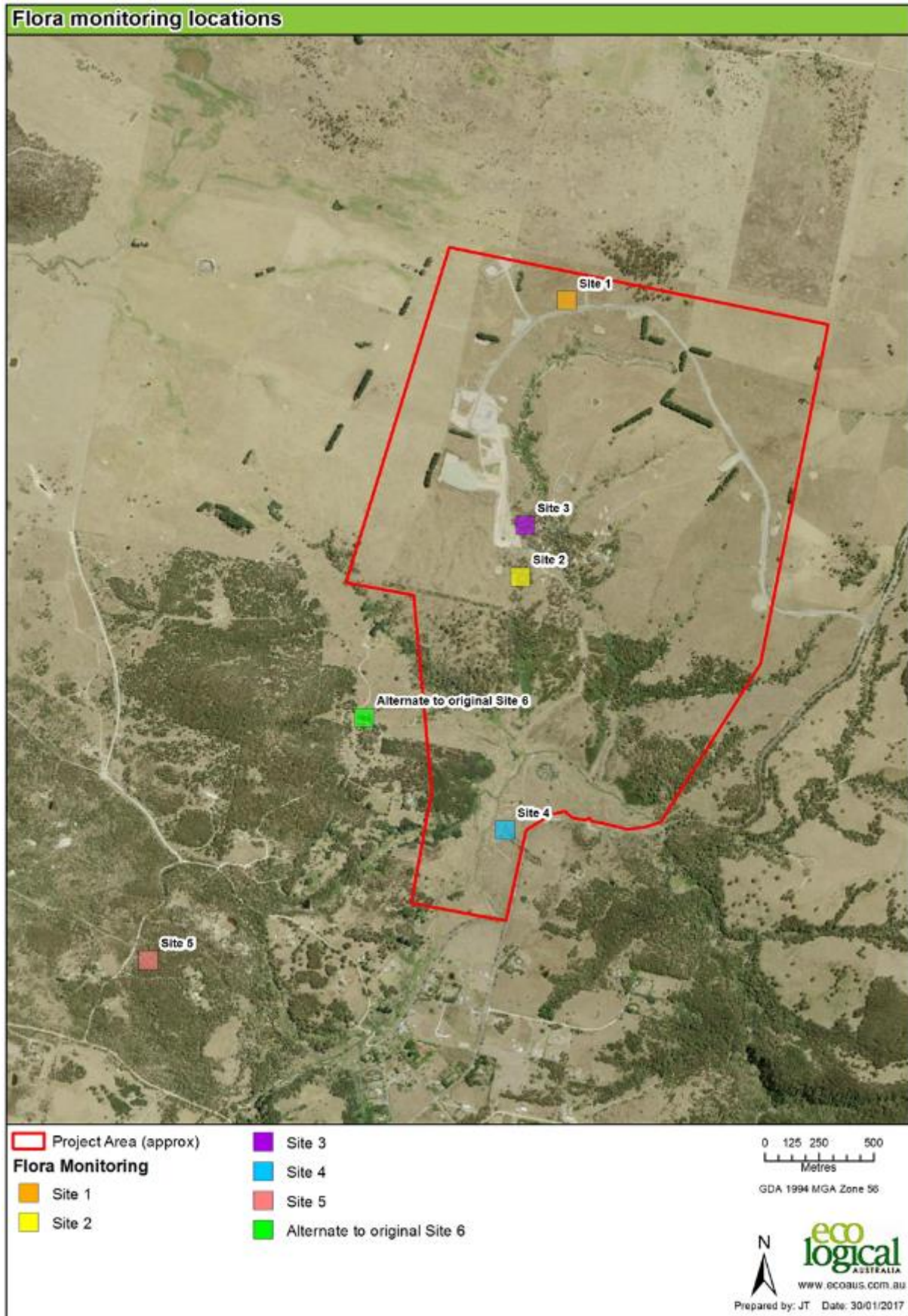


Figure 2: Flora monitoring locations



## 3. Results and Discussion

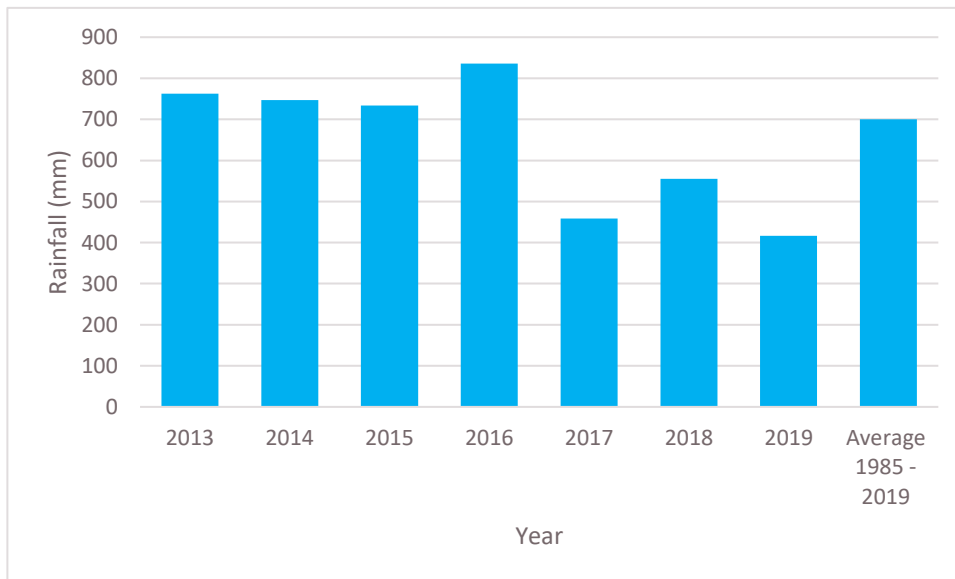
### 3.1 Terrestrial flora

A total of 155 flora species (consisting of 89 native species, 52 exotic species, and 14 species unable to be identified as native or exotic) were recorded across the six floristic monitoring sites during autumn and spring monitoring surveys (106 species, including 70 native, in autumn; 117 species, including 64 native, in spring). The following sections present detailed results of flora monitoring of open forest and native grassland sites during 2019. A list of all flora species recorded during 2019 is presented in **Appendix C**. The full floristic monitoring data from autumn and spring has been provided to Diversified Minerals in Excel format.

Photographs of each site are included in **Appendix A** (autumn) and **Appendix B** (spring).

#### 3.1.1 Rainfall

Rainfall in Braidwood (approximately 13 km north of the site) for 2019 was the lowest of any year since monitoring began (Figure 3). Monthly rainfall for 2019 was also much lower than the long-term average (Table 1).



**Figure 3: Annual rainfall at Braidwood (Wallace St) 2013-2019**

**Table 1: Average monthly rainfall at Braidwood (Wallace St)**

	Monthly rainfall 2019 (mm)	Average monthly rainfall – 1985 to 2019 (mm)
January	68.0	64.94
February	97.2	68.22
March	87.6	60.66
April	4.8	54.22
May	21.0	39.71
June	42.2	63.41
July	7.6	37.95
August	7.6	52.66
September	40.0	51.31
October	26.6	54.45
November	16.2	74.96
December	2.0	67.25
<b>Total</b>	<b>420.8</b>	<b>689.74</b>

### 3.1.2 Open forests

Biometric plot data collected at each open forest monitoring site is presented in **Table 2** below.

**Table 2: Biometric plot data 2019 – open forest sites**

Site No.	On/Off-site	Season	NSD		Cover (%)					Regen (Y/N)	# HBTs	Logs (m)
			NOS	NMS	NGC (grass)	NGC (shrub)	NGC (other)	E				
2	On-site	Autumn	19	25	0	44	0	4	10	N	1	134
		Spring	16	21	0	20	0	4	2	N		195
3	On-site	Autumn	28	17	0	44	0	6	10	N	4	139
		Spring	25	27.5	0	30	0	0	2	N		141
5	Off-site	Autumn	36	52.5	2.5	58	0	6	2	Y	2	53
		Spring	27	34.5	3.5	40	0	10	0	Y		52

NSD = Native species diversity (richness); NOS = Native overstorey; NMS = Native midstorey; NGC = Native ground cover; E = exotic species; Regen = presence of regeneration canopy species; HBTs = Hollow-bearing trees

As described in previous monitoring reports (e.g. ELA 2019a), all open forest sites are located in grassy forest dominated by an open canopy of *Eucalyptus viminalis* (Ribbon Gum) and *E. radiata* (Narrow-leaved Peppermint). The shrub layer in all plots is sparse; where present, it is dominated by *A. mearnsii* (Black Wattle) and *Kunzea parvifolia* (Violet Kunzea).

The dominant groundcover species in the on-site open forest plots was the native perennial grass *Microlaena stipoides* (Weeping Grass). Other native grass species, including *Rytidosperma racemosum*

(Wallaby Grass) and *Poa labillardierei* were also present. As in previous years, Site 5 (off-site) was dominated by the native grass *Austrostipa rudis*. Exotic ground cover was low ( $\leq 2\%$ ) in all plots.

Mature hollow-bearing trees and large woody debris (LWD) were present in all open forest monitoring sites; these features provide structural complexity and potential fauna habitat. A summary of the vegetation structure and composition of each open forest floristic quadrat recorded during spring 2019 is presented in Error! Reference source not found.

**Table 3: Vegetation structure and composition spring 2019 – open forest 20 x 20 m floristic quadrats**

Site No.	On/Off-site	Stratum	Dominant species	Height range (m)	Projected foliage cover (%)
2	On-site	Canopy	<i>Eucalyptus viminalis</i> , <i>E. radiata</i>	14-18	9
		Midstorey	N/A	N/A	0
		Groundcover	<i>Microlaena stipoides</i> , <i>Rytidosperma racemosum</i>	0.0-0.2	26 (2% exotic)
3	On-site	Canopy	<i>E. viminalis</i> , <i>E. radiata</i>	8-12	5
		Midstorey	<i>Rubus fruticosus</i> ssp. agg*	0.1-1	2
		Groundcover	<i>Microlaena stipoides</i> , <i>Poa labillardierei</i> , <i>Rytidosperma racemosum</i>	0.1-0.5	32 (2% exotic)
5	Off-site	Canopy	<i>Eucalyptus viminalis</i> , <i>E. radiata</i>	12-16	35
		Midstorey	<i>Acacia mearnsii</i>	0.1-7	<1
		Groundcover	<i>Austrostipa rudis</i> , <i>Lomandra longifolia</i> , <i>Microlaena stipoides</i>	0.1-0.5	50 (<1% exotic)

\*Exotic species

Native groundcover within the nested flora quadrats of both Site 2 and Site 3 has been consistently sparser than in Site 5 since monitoring began (Figure 4). This is likely because these quadrats are located on a low rise with slightly shallower soils and a greater area of bare soil or, in the case of Site 2, outcropping rock.

Native groundcover in both on-site sites declined between autumn and spring 2019; this is consistent with 2016, 2017 and 2018 results and the trend likely due to seasonal variation. Native groundcover in Spring 2019 was the lowest ever recorded in Site 3 and the second lowest ever recorded in Site 2. Given that native groundcover in the off-site reference Site 5 was also the lowest ever recorded, the results do not necessarily indicate that native groundcover has been negatively affected by impacts directly related to project activities.

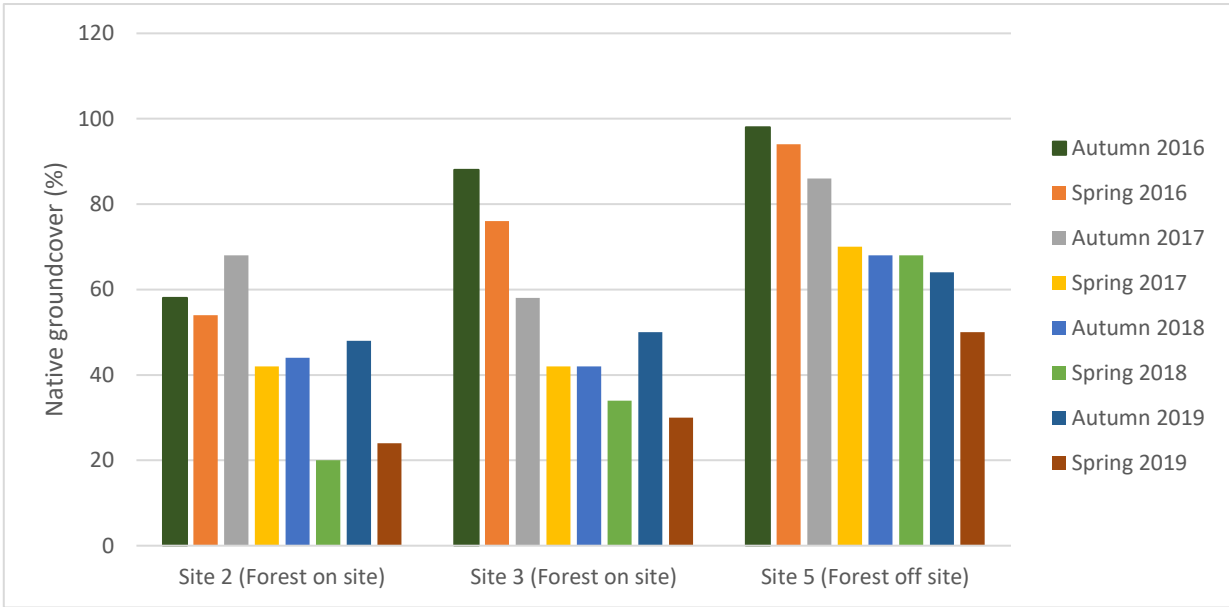


Figure 4: Native species groundcover in open forest sites (autumn 2016 – spring 2019)

The results from the nested flora quadrats show that native species richness decreased in all plots between spring 2018 and spring 2019 (Figure 5). Although the off-site reference site, Site 5, continues to have the highest native species richness of all monitoring sites, it declined substantially between spring 2018 and spring 2019 (39 to 27 species) and is currently at the lowest ever recorded. Native species richness recorded in site 2 was also the lowest ever recorded.

Since monitoring began in 2013, native species richness has been more variable across seasons at Site 3 compared to the other open forest sites. Native species richness declined at Site 3 between spring 2018 and spring 2019 and was the second lowest ever recorded in the current monitoring period.

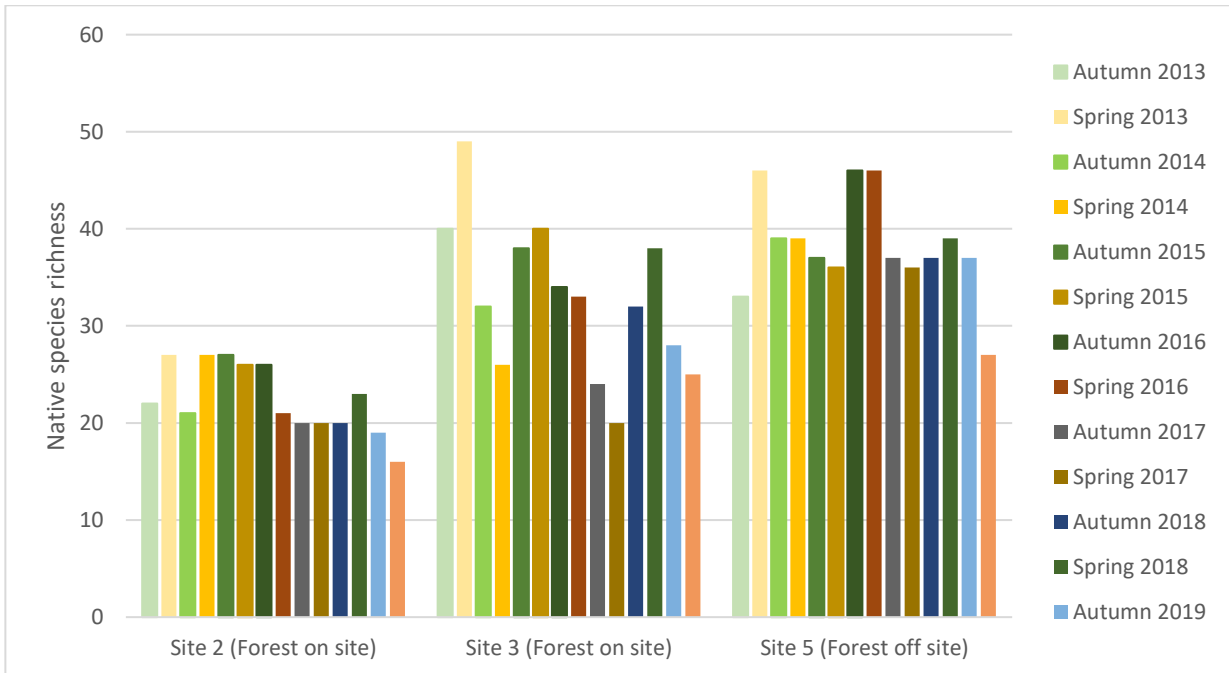


Figure 5: Native species richness in open forest sites (autumn 2013 – spring 2019)

Exotic species richness has increased at site 2, decreased at Site 3, and remained unchanged at the off-site Site 5 since spring 2018 (Figure 6). No clear trends can be detected from any of the sites. Exotic species richness tends to be lower in autumn compared to spring; this result is consistent with the ecology of the dominant exotic species in this area and the early autumn timing of surveys (i.e. before the winter growing period of many exotic annuals). This variability is therefore likely due to seasonal variation driving changes in the presence and abundance of annual species.

All sites contain more native species than exotic species. The off-site Site 5 contains the greatest disparity between exotic and native species (27 native species and 1 exotic species). Exotic species abundance is much higher in Site 2 and Site 3 than in off-site Site 5 (10 and 13 species compared to one species, respectively). The diversity of exotic annual forbs and pasture grasses at Site 2 and Site 3 is likely in part due to encroachment of exotic species from adjacent agricultural land.

All exotic species were present in relatively low cover (>2%). As was recorded in 2018, *Acetosella vulgaris* (Sheep Sorrell), *Plantago lanceolata* (Lamb’s Tongue) and *Hypochaeris radicata* (Catsear) were all present in Site 2 and Site 3 plots. *Rubus fruticosus* (Blackberry), a Priority Weed in the South East Local Land Services (LLS) Region, was recorded at all three of the open forest sites. There were approximately five individuals and 0.3% cover at Site 2, six individuals and 2% at Site 3, and one individual covering 0.1% at Site 5. *Cytisus scoparius* (Scotch Broom), also a priority weed, was recorded again at Site 3, and for the first time at Site 2, although only one small plant was recorded at Site 2.

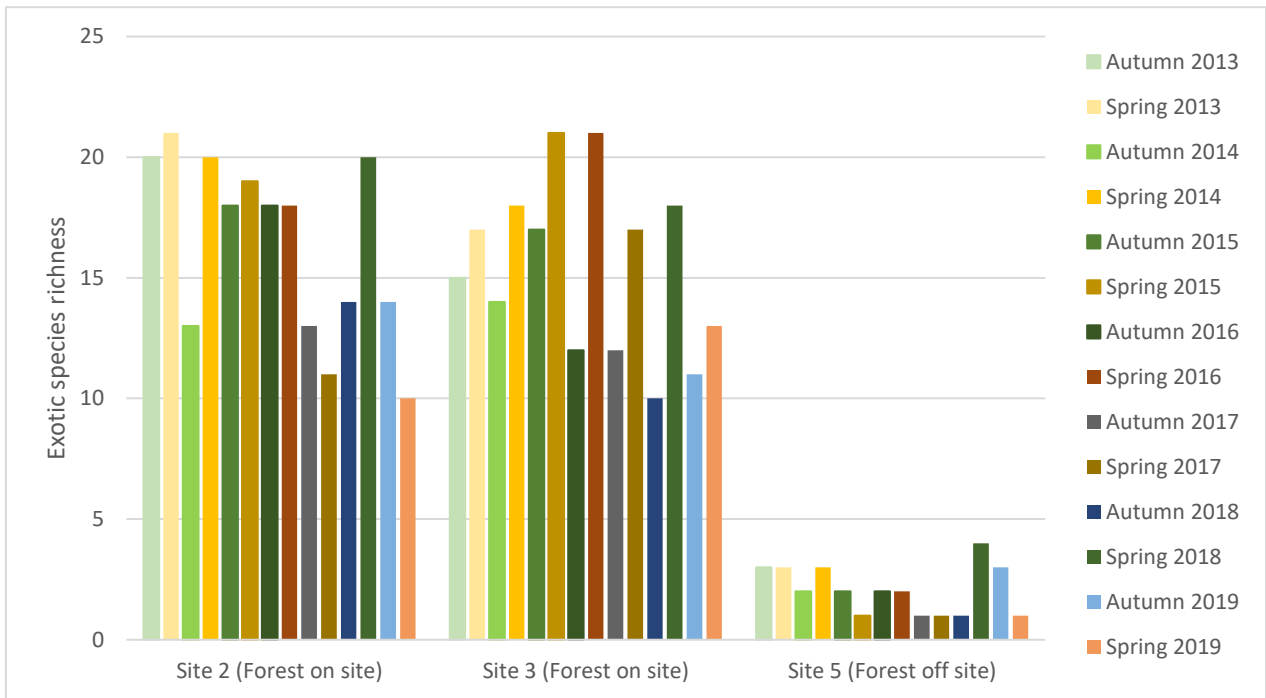


Figure 6: Exotic species richness in open forest sites (autumn 2013 – spring 2019)

### 3.1.3 Native grasslands

Biometric plot data collected at each native grassland monitoring site is presented in Table 4. As expected for grasslands, no canopy or hollow-bearing trees were recorded in any of the three sites. A low shrub layer of *Kunzea parvifolia* (Violet Kunzea) was present at Site 4. This species is often indicative of past clearing and soil disturbance and is not considered reflective of typical shrub cover or composition in the context of native grasslands.

**Table 4: Biometric plot data 2019 – native grassland sites**

Site No.	On/Off-site	Season	NSD					Cover (%)		Logs (m)	
			NOS	NMS	NGC (grass)	NGC (shrub)	NGC (other)	E			
1	On-site	Autumn	4	0	0	26	0	0	74	0	
		Spring	5	0	0	2	0	4	84	0	
4	On-site	Autumn	14	0	0	68	0	8	16	0	
		Spring	21	0	0	36	8	2	34	0	
6	Off-site	Autumn	9	0	0	62	0	0	34	0	
		Spring	7	0	0	34	0	4	44	0	

NSD = Native species diversity (richness); NOS = Native overstorey; NMS = Native midstorey; NGC = Native ground cover; E = exotic species

All grassland sites, particularly Site 1, contain a high cover of exotic species. *Hypochaeris radicata* was common at all grassland sites in spring 2019. *Vulpia* sp. was also present at all grassland sites and was very common at Site 1 and Site 6. The low native grass cover observed in spring as compared to autumn at Site 1 is consistent with 2016, 2017 and 2018 results and is likely due to seasonal variation. Site 6, the off-site 'reference', also had a high proportion of exotic ground cover (Table 5), consisting primarily of *Anthoxanthum odoratum* (Sweet Vernal Grass) and *Vulpia* sp. in spring. *Themeda triandra* was the most common native species, covering approximately 10% of the plot.

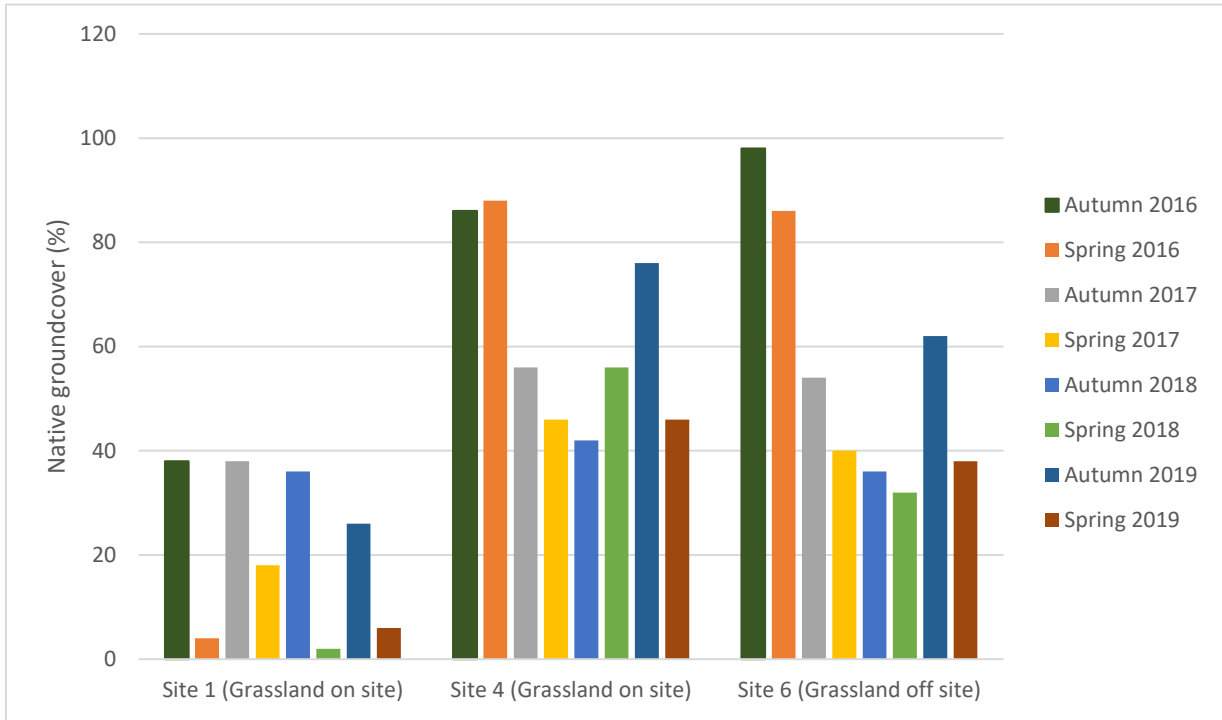
**Table 5: Vegetation structure and composition spring 2019 – native grassland 20 x 20 m floristic quadrats**

Site No.	On/Off-site	Stratum	Dominant species	Height range (m)	Projected foliage cover (%)
1	On-site	Groundcover	<i>Cynodon dactylon</i> *, <i>Microlaena stipoides</i> , <i>Eleusine tristachya</i> *, <i>Vulpia muralis</i> *, <i>Trifolium repens</i> *	0.01-0.5	90 (84% exotic)
4	On-site	Midstorey	<i>Kunzea parvifolia</i>	0.5-1	8
		Groundcover	<i>Themeda triandra</i> , <i>Hypochaeris radicata</i> *, <i>Poa labillardierei</i> , <i>Leptorhynchus squamatus</i>	0.1-1	80 (34% exotic)
6	Off-site	Groundcover	<i>Anthoxanthum odoratum</i> *, <i>Vulpia muralis</i> *, <i>Paspalum dilatatum</i> , <i>Sporobolus africanum</i> , <i>Themeda triandra</i> , <i>Poa labillardierei</i>	0.01-0.75	86 (44% exotic)

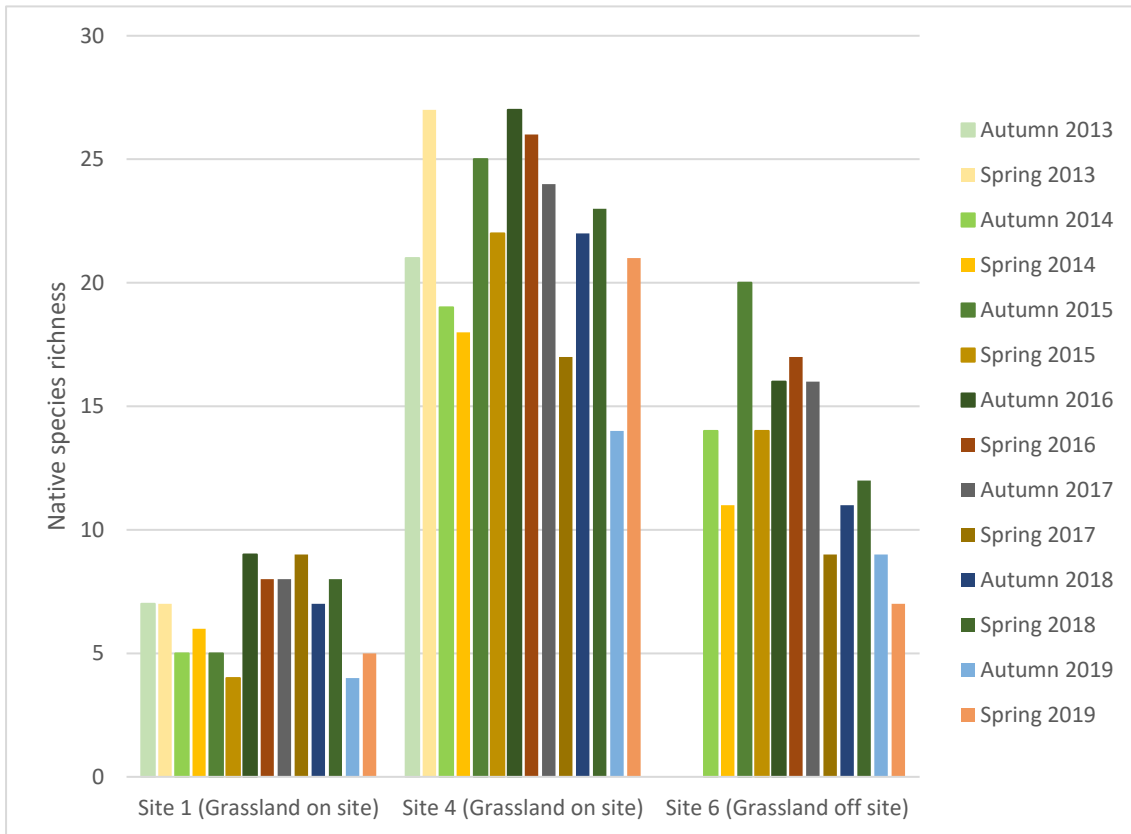
\*Exotic species



Native species groundcover is shown in **Figure 7** and native species richness is shown in Figure 8. Site 4 continues to have the most intact native groundcover of all native grassland monitoring sites (including the off-site site) and is dominated by the the native grass *Themeda triandra*.



**Figure 7: Native species groundcover in grassland sites (autumn 2016 – spring 2019)**



**Figure 8: Native species richness in native grassland sites (autumn 2013 – spring 2019)**

Exotic species richness at Site 1 and Site 4 increased between spring 2018 and spring 2019, and decreased at the off-site Site 6 (Figure 9).

Exotic species richness has shown substantial fluctuation within sites over seasons and years and continues to be lower in on-site monitoring sites than in the off-site open grassland site. As in 2017 and 2018, exotic species richness was greater than native species richness at Site 1 and Site 6. The high abundance and cover of exotic species in these areas is likely due to their ongoing agricultural use, particularly for cattle grazing.

As previously highlighted, given the dominance of exotic species at Site 6, combined with the relatively low native forb diversity, this site should not be considered a ‘good condition’ example of the Natural Temperate Grassland EEC.

Five individuals of the Priority Weed *Cytisus scoparius* (Scotch Broom) were recorded in Site 4 in spring 2018 – three more than were recorded in spring 2017 and autumn 2018. Although one individual of *Rubus fruticosus*, also a priority weed, was recorded for the first time in Site 6 in autumn 2018, this species was not recorded again in spring 2018.

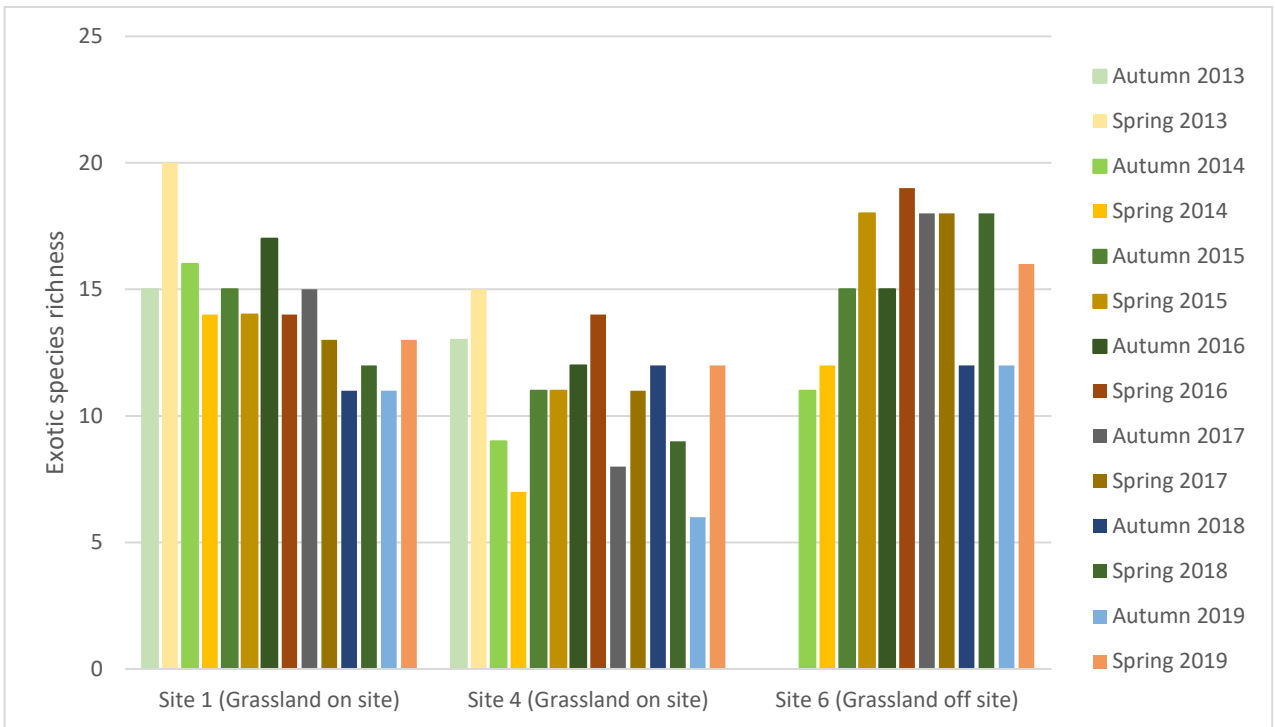


Figure 9: Exotic species richness in native grassland sites (autumn 2013 – spring 2019)

## 4. Conclusion and Recommendations

Terrestrial flora monitoring did not indicate any substantial changes in species composition or abundance since operations commenced at DGM. However, species richness and native species groundcover was low in comparison to previous surveys across most of the grassland and forest sites, including the offset sites. It is likely that the low rainfall in the months prior to the 2019 field surveys has contributed to this.

The open forest sites remain in moderate condition, although native groundcover and species richness at both on-site sites are at or close to the lowest recorded since monitoring began. Species richness at the off-site reference site, which has previously been relatively high in comparison to the two on-site sites, has declined substantially since 2018 and in spring 2019 was the lowest recorded since monitoring began. Exotic species richness was lower than or comparable to previous years at all forest sites.

Both on-site native grassland Site 1 and off-site native grassland Site 6 are in a relatively degraded condition, with a high abundance and cover of exotic perennial and annual species. Both sites appear to be subject to ongoing agricultural management (cattle grazing). Exotic species richness remains relatively high at all grassland sites. Site 4 continues to contain many more species than Sites 2 and Site 6, although native groundcover was low compared to previous years.

The diversity of habitat features associated with the open forest vegetation, such as hollow-bearing trees, large woody debris, rocks and creeks, have been shown in previous monitoring years to support a range of native fauna species. It is likely that, despite the dry conditions, this vegetation continues to support native fauna, including birds, mammals, bats, amphibians and reptiles.

Many of the management recommendations from the previous annual monitoring report remain relevant and are listed below.

### 4.1 Management recommendations

- Implement weed management activities (manual removal and/or spraying) targeting the priority weeds *Cytisus scoparius* (Scotch Broom) and *Rubus fruticosus* spp. agg. (Blackberry). As highlighted in ELA 2019a, however, previous surveys have found that Blackberry is providing habitat and a potential food source for several uncommon bird species at Site 3. Alternative natural habitat or shelter, such as native shrubs, should be established before removing weeds from the area so that native birds using these weeds for habitat or food are not adversely impacted (DPI 2008b).
- In line with Section 6.4.5.3 of the BMP, as monitoring is not indicating a transition of native grassland areas to a composition more closely aligned with Natural Temperate Grassland EEC, consider revising the Grazing Management Plan and/or investigating the potential for grazing exclusion and active restoration of target areas.

### 4.2 Monitoring recommendations

Monitoring should continue as per the current schedule to enable the identification of long-term patterns. This will allow for the results of monitoring to continue informing management.

As highlighted in previous monitoring reports (e.g. ELA 2019a), off-site Site 6 is more reflective of a modified native grassland than a “good condition” example of the Natural Temperate Grassland EEC. Assessment of aerial imagery and field visits by ELA ecologists (undertaken in 2018) have not been able to locate any alternative good condition Natural Temperate Grassland sites that would provide a suitable reference site. Given that Site 6 has been surveyed previously and has not been impacted by activities relating to the mine, it is considered the best Natural Temperate Grassland reference site available and should continue to be monitored.

## 5. References

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## Appendix A Flora site photographs – autumn 2019

### Site 1: Native grassland on-site



Photo 1: Site 1 view from transect start



Photo 2: Site 2 view from transect end



**Site 2: Open forest on-site**



**Photo 3: site 2 view from transect start**



**Photo 4: Site 2 view from transect end**



**Site 3: Open forest on-site**



**Photo 5: Site 3 view from transect start**



**Photo 6: Site 3 view from transect end**



**Site 4: Native Grassland on-site**



**Photo 7: Site 4 view from transect start**



**Photo 8: Site 4 view from transect end**



**Site 5: Open forest off-site**



**Photo 9: Site 5 view from transect start**



**Photo 10: Site 5 view from transect end**



**Site 6: Native grassland off-site**



**Photo 11: Site 6 view from transect start**



**Photo 12: Site 6 view from transect end**



## Appendix B Flora site photographs – spring 2019

### Site 1: Native grassland on-site



Photo 13: Site 1 view from transect start



Photo 14: Site 2 view from transect end



**Site 2: Open forest on-site**



**Photo 15: site 2 view from transect start**



**Photo 16: Site 2 view from transect end**



**Site 3: Open forest on-site**



**Photo 17: Site 3 view from transect start**



**Photo 18: Site 3 view from transect end**



**Site 4: Native grassland on-site**



**Photo 19: Site 4 view from transect start**



**Photo 20: Site 4 view from transect end**



**Site 5: Open forest off-site**



**Photo 21: Site 5 view from transect start**



**Photo 22: Site 5 view from transect end**



**Site 6: Native grassland off-site**



**Photo 23: Site 6 view from transect start**



**Photo 24: Site 6 view from transect end**



## Appendix C Flora species recorded to 2019

**Table 6: Flora species list 2013 – 2019, including species recorded in each plot in autumn (A19) and spring (S19) 2019**

Species	Native/Exotic	Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
		A19	S19	A19	S19	A19	S19	A19	S19	A19	S19	A19	S19
<i>Acacia mearnsii</i>	Native									X	X		
<i>Acacia melanoxylon</i>	Native												
<i>Acaena novae-zelandiae</i>	Native			X	X	X							
<i>Acetosella vulgaris</i>	Exotic	X	X	X	X	X	X		X			X	X
<i>Acianthus</i> sp.	Native									X			
<i>Acrotriche serrulata</i>	Native									X			
<i>Agrostis capillaris</i>	Exotic												X
<i>Aira</i> sp.	Exotic	X					X						
<i>Ajuga australis</i>	Native			X		X							
<i>Anagallis arvensis</i>	Exotic												
<i>Anthosachne scabra</i>	Native					X	X						
<i>Anthoxanthum odoratum</i>	Exotic								X				X
<i>Aristida</i> sp.	Native				X								
<i>Aristida ramosa</i>	Native							X					
<i>Aristida vagans</i>	Native												
<i>Asperula conferta</i>	Native		X							X	X		
<i>Asplenium flabellifolium</i>	Native			X									
<i>Asteraceae</i> sp.	Native/Exotic				X								
<i>Astroloma humifusum</i>	Native								X				
<i>Austrostipa bigeniculata</i>	Native			X		X	X						
<i>Austrostipa rudis</i>	Native									X	X		
<i>Billardiera scandens</i>	Native									X	X		
<i>Bossiaea buxifolia</i>	Native									X			
<i>Bossiaea prostrata</i>	Native									X	X		
<i>Bothriochloa macra</i>	Native												
<i>Brachyscome</i> sp.	Native												
<i>Brassica</i> sp.	Exotic												
<i>Briza minor</i>	Exotic												
<i>Bromus catharticus</i>	Exotic			X									
<i>Bromus diandrus</i>	Exotic												
<i>Bromus hordeaceus</i>	Exotic												X

Species	Native/Exotic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<i>Bromus</i> sp.	Exotic						
<i>Bursaria spinosa</i>	Native					X	
<i>Bulbine bulbosa</i>	Native				X		
<i>Caladenia</i> sp.	Native					X	
<i>Calytrix tetragona</i>	Native						
<i>Carex chlorantha</i>	Native						
<i>Carex breviculmis</i>	Native				X		
<i>Carex incomitata</i>	Native						
<i>Carex inversa</i>	Native				X		
<i>Carex</i> sp.	Native		X				
<i>Centaurium erythraea</i>	Native						
<i>Centaurium</i> sp.	Exotic				X		
<i>Centaurium tenuiflorum</i>	Exotic						
<i>Cerastium glomeratum</i>	Exotic						
<i>Cerastium</i> sp.	Exotic						
<i>Cerastium vulgare</i>	Exotic						
<i>Chloris gayana</i>	Exotic			X			
<i>Chloris truncata</i>	Native						
<i>Chondrilla juncea</i>	Exotic						
<i>Chrysocephalum apiculatum</i>	Native			X	X	X	
<i>Cirsium vulgare</i>	Exotic	X	X	X	X	X	
<i>Conyza bonariensis</i>	Exotic						X
<i>Conyza</i> sp.	Exotic		X	X	X	X	X
<i>Coronarium</i> sp.	Native						
<i>Cotula australis</i>	Native						
<i>Crassula sieberiana</i>	Native		X	X			
<i>Crataegus monogyna</i>	Exotic						
<i>Cymbonotus lawsonianus</i>	Native			X	X		
<i>Cynodon dactylon</i>	Exotic	X	X				X
<i>Cynoglossum australe</i>	Native						
<i>Cyperus</i> sp.	Native			X			
<i>Cynosurus echinatus</i>	Exotic				X		
<i>Cynosurus</i> sp.	Exotic						X
<i>Cytisus scoparius</i>	Exotic		X	X	X	X	
<i>Dactylis glomerata</i>	Exotic				X		
<i>Desmodium varians</i>	Native		X	X	X	X	X

Species	Native/Exotic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<i>Dianella revoluta</i>	Native					X	
<i>Dichondra repens</i>	Native		X X X X X			X X	
<i>Diuris sulphurea</i>	Native					X	
<i>Dysphania pumilio</i>	Native		X X				
<i>Echinopogon caespitosus</i>	Native					X X	
<i>Echinopogon sp.</i>	Native						
<i>Echium sp.</i>	Exotic						
<i>Ehrharta erecta</i>	Exotic						
<i>Einadia hastata</i>	Native		X X X X				
<i>Einadia nutans</i>	Native		X X X X				
<i>Eleusine tristachya</i>	Exotic	X X X					
<i>Eragrostis leptostachya</i>	Native						
<i>Eragrostis sp.</i>	Native						X X
<i>Ericaceae sp.</i>	Native						
<i>Eriochilus sp.</i>	Native						
<i>Erodium cicutarium</i>	Native						X
<i>Eucalyptus radiata</i>	Native		X X X X			X X	
<i>Eucalyptus viminalis</i>	Native		X X X X			X X	
<i>Euchiton sp.</i>	Native				X		
<i>Euchiton sphaericus</i>	Native						
<i>Fimbristylis dichotoma</i>	Native	X			X X		X
<i>Galium aparine</i>	Exotic		X				
<i>Galium propinquum</i>	Native						
<i>Galium sp.</i>	Exotic						
<i>Gamochoeta americanum</i>	Exotic						X X
<i>Gamochoeta sp.</i>	Exotic				X		
<i>Geranium solanderi</i>	Native						
<i>Geranium sp.</i>	Exotic		X				
<i>Glycine clandestina</i>	Native						
<i>Gonocarpus sp.</i>	Native						
<i>Gonocarpus tetragynus</i>	Native			X	X X X		
<i>Goodenia hederacea</i>	Native					X X	
<i>Haloragis heterophylla</i>	Native				X		
<i>Hardenbergia violacea</i>	native						
<i>Hibbertia obtusifolia</i>	Native						
<i>Holcus lanatus</i>	Exotic				X		

Species	Native/Exotic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<i>Hordeum leporinum</i>	Exotic						
<i>Hovea heterophylla</i>	Native					X	
<i>Hydrocotyle laxiflora</i>	Native		X	X		X	
<i>Hydrocotyle sibthorpioides</i>	Native				X	X	
<i>Hypericum gramineum</i>	Native				X	X	
<i>Hypochaeris radicata</i>	Exotic	X	X	X	X	X	X
<i>Hypoxis hygrometrica</i>	Native						
<i>Juncus australis</i>	Native						
<i>Juncus cognatus</i>	Exotic						
<i>Juncus</i> spp.	Native						X
<i>Juncus usitatus</i>	Native					X	
<i>Kunzea parvifolia</i>	Native				X	X	
<i>Lactuca</i> sp.	Exotic						
<i>Lagenophora stipitata</i>	Native						
<i>Lepidium africanum</i>	exotic			X	X		
<i>Lepidium</i> sp.	Exotic		X	X			
<i>Leptorhynchos squamatus</i>	Native					X	
<i>Linaria arvensis</i>	exotic						
<i>Lobelia purpurascens</i>	Native					X	
<i>Lolium perenne</i>	Exotic	X					
<i>Lolium rigidum</i>	Exotic						X
<i>Lolium</i> sp.	Exotic						
<i>Lomandra filiformis</i>	Native		X	X	X	X	X
<i>Lomandra longifolia</i>	Native			X		X	X
<i>Lomandra multiflora</i>	Native		X	X	X	X	
<i>Lomandra</i> sp.	Native					X	
<i>Lomatia</i> sp.	Native						
<i>Luzula densiflora</i>	Native				X		
<i>Lysimachia arvensis</i>	Exotic						X
<i>Malva</i> sp.	Exotic		X	X			
<i>Microlaena stipoides</i>	Native	X	X	X	X	X	X
<i>Microtis parviflora</i>	Native						
<i>Modiola caroliniana</i>	Exotic						
<i>Opercularia aspera</i>	Native			X			
<i>Opercularia diphylla</i>	Native						

Species	Native/Exotic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<i>Opercularia hispida</i>	Native					x	
<i>Oxalis perennans</i>	Native	x	x	x	x	x	x
<i>Oxalis</i> sp.	Native					x	
<i>Panicum effusum</i>	Native			x			x
<i>Paronychia brasiliiana</i>	Exotic		x	x	x		
<i>Paspalum dilatatum</i>	Exotic	x	x			x	x
<i>Petrorhagia nanteuillii</i>	Exotic						
<i>Petrorhagia</i> sp.	Exotic						
<i>Phytolacca octandra</i>	Exotic		x				
<i>Pimelea curviflora</i>	Native						
<i>Plantago hispida</i>	Native						
<i>Plantago lanceolata</i>	Exotic	x	x	x	x	x	x
<i>Plantago varia</i>	Native						
<i>Poa annua</i>	Exotic	x	x				
<i>Poa labillardierei</i>	Native	x	x	x	x	x	x
<i>Poa sieberiana</i>	Native			x	x	x	
<i>Poa</i> sp.	Native			x	x	x	
<i>Polyscias sambucifolia</i>	Native					x	x
<i>Poranthera microphylla</i>	Native					x	
<i>Pratia purpurascens</i>	Native					x	
<i>Prunella vulgaris</i>	Exotic						
<i>Pteridium esculentum</i>	Native					x	x
<i>Pterostylis</i> sp.	Native					x	
<i>Ranunculus</i> sp.	Native/Exotic					x	
<i>Rosa rubiginosa</i>	Exotic			x	x		
<i>Rubus fruticosus</i> spp. agg.	Exotic		x	x	x	x	x
<i>Rubus parvifolius</i>	Native					x	x
<i>Rumex brownii</i>	Native	x	x	x	x	x	x
<i>Rytidosperma pallidum</i>	Native						
<i>Rytidosperma racemosum</i>	Native		x	x	x		
<i>Rytidosperma</i> sp.	Native			x	x	x	x
<i>Salvia verbenaca</i>	Exotic			x			
<i>Schoenus apogon</i>	Native					x	
<i>Scleranthus biflorus</i>	Native						
<i>Scleranthus fascicularis</i>	Native						

Species	Native/Exotic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<i>Senecio prenanthoides</i>	Native						
<i>Senecio quadridentatus</i>	Native			x			
<i>Senecio</i> sp.	Native/Exotic			x	x		x x
<i>Setaria</i> sp.	Exotic						
<i>Silene gallica</i>	Exotic						
<i>Sisymbrium officinale</i>	Exotic						
<i>Solanum chenopodioides</i>	Exotic			x			
<i>Solanum nigrum</i>	Exotic		x	x			
<i>Solenogyne dominii</i>	Native				x	x	
<i>Solenogyne gunnii</i>	Native						
<i>Sonchus asper</i>	Exotic						
<i>Spergularia rubra</i>	Native				x		
<i>Spergularia rubra</i>	Exotic						
<i>Spergularia</i> sp.	Native						
<i>Sporobolus africanus</i>	Exotic						x x
<i>Sporobolus creber</i>	Native				x		
<i>Sporobolus</i> sp.	Exotic						
<i>Stackhousia monogyna</i>	Native					x	x
<i>Stellaria media</i>	Exotic						
<i>Stellaria pungens</i>	Native				x		
<i>Stylidium gramineum</i>	native						
<i>Taraxacum officinale</i>	Exotic			x			
<i>Themeda triandra</i>	Native				x	x	x
<i>Tricoryne elatior</i>	Native						
<i>Trifolium campestre</i>	Exotic	x					
<i>Trifolium cernuum</i>	Exotic						
<i>Trifolium dubium</i>	Exotic						x
<i>Trifolium incarnatum</i>	Exotic	x					
<i>Trifolium repens</i>	Exotic	x	x				
<i>Trifolium</i> sp.	Exotic			x		x	
<i>Trifolium subterranean</i>	Exotic	x					x
<i>Veronica gracilis</i>	Native						
<i>Veronica plebeia</i>	Native						
<i>Veronica</i> sp.	Native/Exotic						
<i>Viola betonicifolia</i>	Native					x	x
<i>Viola hederacea</i>	Native						

Species	Native/Exotic	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
<i>Viola odorata</i>	Exotic					x	
<i>Vittadinia cuneata</i>	native						
<i>Vittadinia</i> sp.	Native			x	x		
<i>Vulpia muralis</i>	Exotic	x			x		
<i>Vulpia</i> sp.	Exotic						x
<i>Wahlenbergia communis</i>	Native						
<i>Wahlenbergia gracilis</i>	Native						
<i>Wahlenbergia</i> sp.	Native		x	x	x		
<i>Xanthorrhoea</i> sp.	Native					x	

