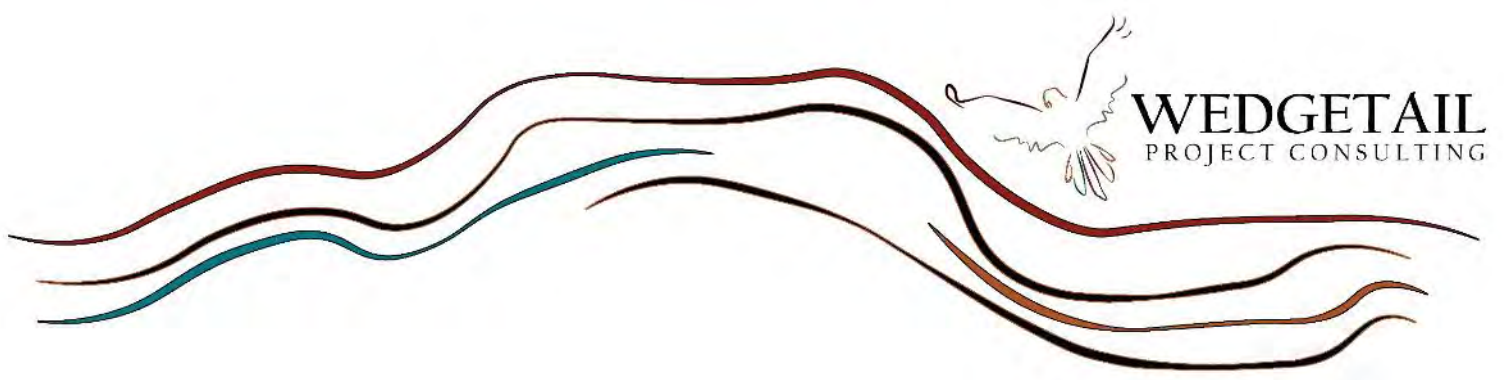


APPENDIX 5 – Ecological Monitoring Report



Karuah East Quarry Biodiversity Offset Area Monitoring Report

Karuah East Quarry Biodiversity Offset Area and Lot 12



**Report prepared for:
Hunter Quarries**

Rev 2
23 March 2023



Karuah East Quarry
Biodiversity Offset Area Monitoring Report
Karuah East Quarry Biodiversity Offset Area and Lot 12
Report Prepared for Hunter Quarries

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Rev 1	21 March 2023	Mark Dean	Samara Schulz	Draft
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1. INTRODUCTION

1.1 BACKGROUND

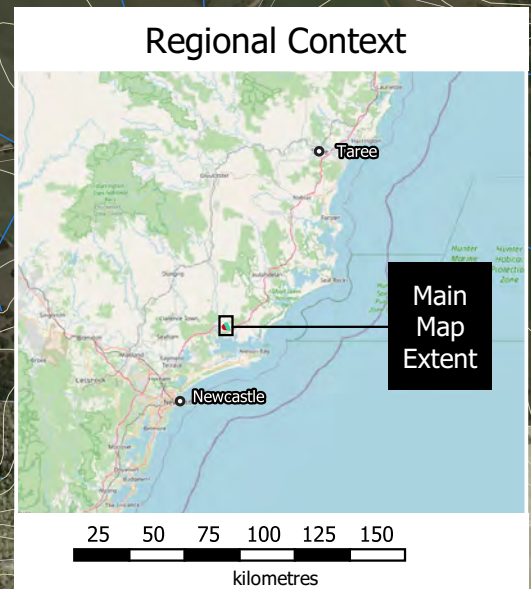
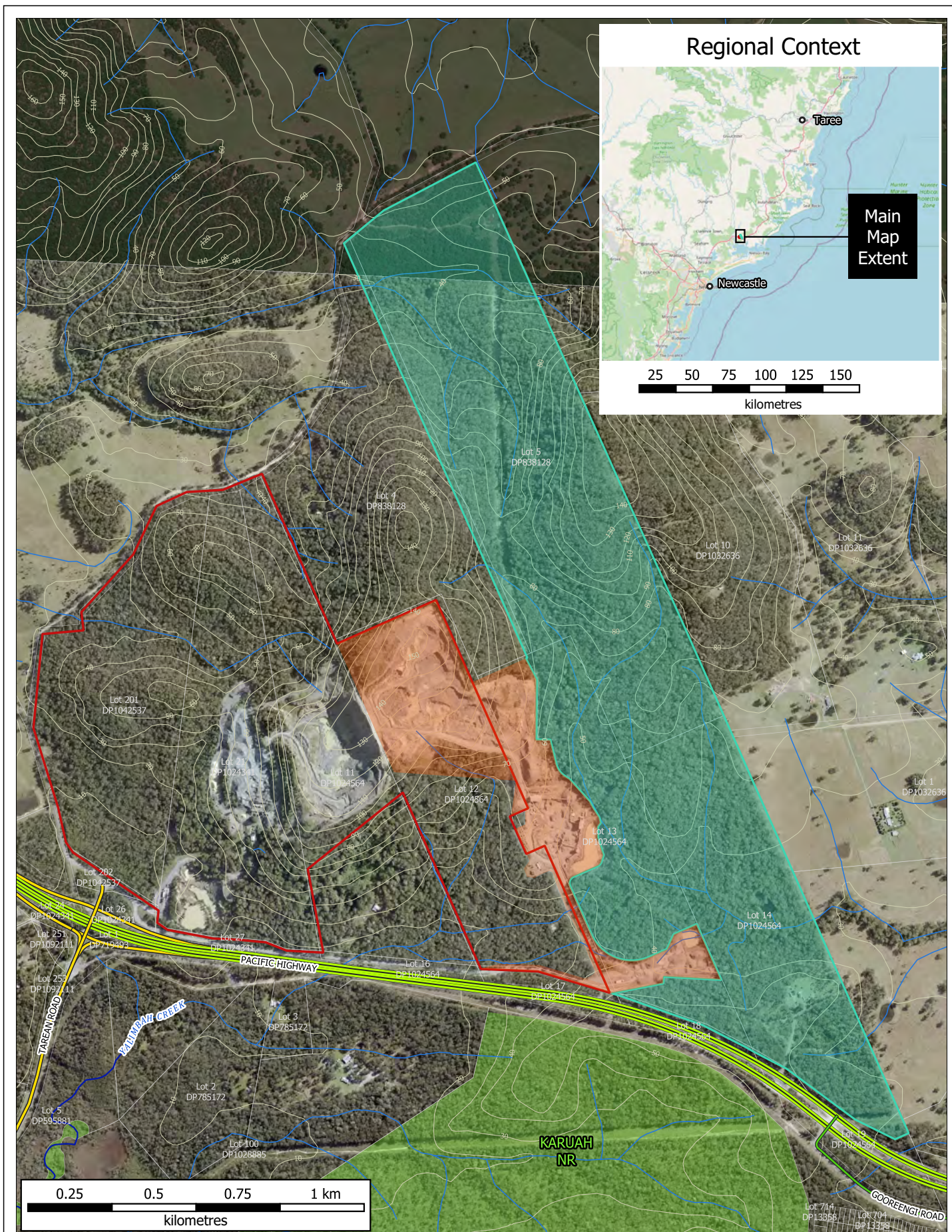
The Karuah East Quarry (KEQ) Project was subject to an assessment under part 3A of the NSW Environmental Planning and Assessment Act 1979 (EP&A Act). The project was approved by the Planning Assessment Commission on 17 June 2014 subject to conditions set out in Schedules 2 to 5 of the Project Approval (09_0175). Subsequent modification was approved on 27 April 2018 (Modification 1) and 19 December 2018 (Modification 2) under Section 75J of the EP&A Act (Modification 1). A referral under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) for the project was also lodged with the Department of the Environment (DotE) (now known as Department of Agriculture, Water and the Environment - DAWE) on 29 July 2014 (EPBC 2014/7282). On 25 August 2014 the project was determined as a Controlled Action under the EPBC Act requiring further assessment subject to the controlling provision 'listed threatened species and communities'. The action was approved by DotE on 20 March 2015 subject to 17 conditions of approval.

Condition 33 of the NSW Project Approval and Condition 9 of the EPBC Act approval require the implementation of a Biodiversity Offset Area Management Plan (BOAMP) for the KEQ biodiversity offset area (BOA), which is a 138.22 ha consolidated land parcel (part Lot 13 DP1024564, Lot 14 DP1024564, Lot 5 DP838128) adjoining the western boundary of the project disturbance area (Figure 1). The BOAMP was prepared by Kleinfelder (2015) and subsequently approved by the NSW Department of Planning and Environment (DP&E) on 14 December 2015, and approved by the DotE on 16 March 2016. The BOAMP has since been updated in consideration of Modification 1 (February 2019) and Modification 2 (June 2021). Establishment of a Conservation Agreement or Stewardship Site Agreement for the BOA is currently in progress (with the Biodiversity Conservation Trust) as required under the project approval - Condition 29.

Baseline ecological surveys and monitoring were undertaken in October 2015 prior to commencement of clearing and construction as required under Section 3 of the BOAMP. The baseline monitoring surveys involved the establishment of 13 permanent monitoring sites within the Karuah East BOA in accordance with the BOAMP. An additional five permanent monitoring sites were also established on the adjoining Lot 12 DP 1024564 as per Sections 3.2 and 4.1 of the Statement of Commitments in accordance with Section 11.1.3 of the Landscape and Rehabilitation Management Plan (L&RMP) (SLR 2015). In addition to establishing the permanent monitoring sites, the surveys also involved baseline assessment of fencing, access tracks, erosion, weeds and vertebrate pests in accordance with Section 3 of the BOAMP. The baseline ecological surveys and monitoring report (Kleinfelder 2016) was submitted as an addendum to the BOAMP in January 2016 (available from <http://hunterquarries.com.au/karuah-east-documents/>).

The first year of annual monitoring of the BOA and Lot 12 was undertaken in October 2016. This report provides the results of the seventh annual monitoring event undertaken in November/December 2022. Monitoring including analysis of monitoring data to date to evaluate changes in vegetation condition and threatened flora populations in the BOA.

This report also provides a summary of management actions completed within the BOA to date and recommendations for implementation of management actions in Year 8 of the BOAMP implementation to ensure compliance with relevant performance criteria.



1.2 SCOPE

Section 3 of the BOAMP details the annual monitoring requirements for the Karuah East Quarry BOA. Additionally, Section 12.1 of the L&RMP details the ecological monitoring requirements for the Karuah East Quarry project area, adjoining vegetation within 50 m of the project area boundary on Lots 12 and 13, and along Yalimbah Creek (Lot 12). A summary of the Karuah East Quarry annual ecological monitoring requirements is provided in **Table 1**. It is noted that not all monitoring activities listed in **Table 1** are required for the 2022 monitoring (refer to the timing/frequency).

Table 1: Summary of annual monitoring requirements for Karuah East Quarry BOA and Lot 12

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2022
<p>Vegetation and Threatened Flora Monitoring</p> <p>The 18 permanent monitoring sites established in the BOA and Lot 12 during the baseline are to be surveyed annually in accordance with Section 3.13 of the BOAMP and Section 12.1.3 of the L&RMP.</p> <p>Monitoring is to be undertaken during spring to coincide with the flowering times of threatened flora species in the BOA.</p>	<p>Section 3.13 of BOAMP</p> <p>Section 12.1.3 of L&RMP</p>	<p>Annually for the life of quarry (LOQ)</p>	<p>Completed</p>
<p>Fencing</p> <p>Inspections of boundary fencing will be undertaken as part of annual monitoring to identify maintenance requirements and record fencing activities undertaken in previous year.</p> <p>The effectiveness of fencing in excluding stock and unauthorised activities (e.g. rubbish dumping) will also be evaluated during annual monitoring and any additional controls will be identified if required.</p>	<p>Section 3.2 of BOAMP</p> <p>Section 12.1.2 of L&RMP</p>	<p>Annually for LOQ</p>	<p>Completed</p>
<p>Tracks</p> <p>Inspections of retained and redundant access tracks will be undertaken as part of annual monitoring to identify maintenance requirements and record maintenance activities undertaken in previous year.</p>	<p>Section 3.3 of BOAMP</p>	<p>Annually for LOQ</p>	<p>Completed</p>
<p>Erosion</p> <p>Inspections of erosion sites will be undertaken as part of annual monitoring to identify maintenance requirements and record maintenance activities undertaken in previous year.</p> <p>Erosion and sediment control structures installed within the project disturbance area to protect retained vegetation will be inspected as part of annual ecological monitoring.</p>	<p>Section 3.4 of BOAMP</p> <p>Section 12.1.2 of L&RMP</p>	<p>Annually for LOQ</p>	<p>Completed</p>

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2022
Existing Dwellings Inspections of the dwellings, access tracks, and asset protection zones (APZs) will be undertaken as part of annual monitoring to identify maintenance requirements. These inspections will focus on fencing, weeds, and unauthorised access / disturbance.	Section 3.5 of BOAMP	Annually for LOQ	Completed
Habitat Augmentation and Nest Boxes Nest boxes will be inspected and maintained (or replaced) every two years following installation: Nest boxes 1 – 30 installed in April 2016 Nest boxes 31 – 125 installed in February 2018 Nest boxes 126 – 318 installed in July-August 2020	Section 3.8 of BOAMP	Boxes 1-30, 31 – 125 and 126 - 319 monitoring required in 2022.	Monitoring completed for nest boxes 1 – 319 2022
Weeds Target weed species will be mapped on an annual basis within the Project Disturbance Area and adjoining vegetation on Lots 12 and 13 (within 50 m of the project disturbance area boundary). Additionally, weed mapping along Yalimbah Creek will also be undertaken as part of the ecological monitoring program. Weed mapping for the BOA will be undertaken every two years and compared to the previous mapping to assess changes in the extent and density of target weeds. Monitoring results will be used to develop a control strategy for the following two years, identifying target locations and timing for primary and follow-up control.	Section 12.1.1 of L&RMP Section 3.10 of BOAMP	Annually (KEQ, 50 m buffer and Yalimbah Creek) Every 2 years from baseline survey for LOQ (BOA)	Completed (KEQ, 50 m buffer, Yalimbah Creek) Weed mapping for BOA updated in this report (2022).
Vertebrate Pest Assessment Monitoring of vertebrate pests will be undertaken using the same methods, locations and effort as the baseline assessment unless otherwise recommended in the annual monitoring reports. This will enable results to be accurately compared to the baseline assessment.	Section 3.11	Every 2 years from baseline survey for LOQ (BOA)	Pest management to be conducted when weather conditions improve.
Aerial Fauna Crossings A 12-month monitoring program of the two aerial fauna crossings will be undertaken using remote motion sensing	Section 12.1.4 of L&RMP	12 months from installation of the crossings	Aerial fauna crossings installed. Monitoring program proposed. Remote

Monitoring Requirements	BOAMP / L&RMP Section(s)	Timing / Frequency	Completed in 2022
cameras mounted on each pole (four cameras in total) once the crossings have been installed.			cameras to be installed on either side of each crossing.
Threatened Flora Translocation – refer to <i>Tetratheca juncea</i> Translocation Management Plan (TjMP; Firebird 2015).	Refer to TjMP	Refer to TjMP	Completed – refer to Tj Translocation Monitoring Report (Firebird 2021)

1.3 KARUAH EAST QUARRY PROGRESS

The Karuah East Quarry (KEQ) Project commenced operations in May 2019 after the plant's construction in 2018. Vegetation clearing commenced in April 2016, and the majority of the KEQ project area was primarily cleared between April and June 2016, with some additional clearing also occurring in November 2016, May 2018, July 2018, October 2019, November 2019, September 2020, March 2021, June 2021, October 2021 and May 2022. The majority of the disturbance area has been cleared to date. Major earthworks have also been completed, including the construction of the haul road, detention basins, and other infrastructure areas.

The current extent of clearing within the KEQ project area is shown in **Figure 2**.



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Legend

- Current Clearing Extent
- Biodiversity Offset Area
- Cadastre
- Primary Road
- Minor watercourse

Current Extent of Clearing within the Karuah East Quarry Project Area

Karuah East Quarry Pty Ltd
2022 Annual Monitoring Report
Karuah East Quarry Project

Figure:

2



1.4 BIODIVERSITY VALUES

Section 2.3 of the BOAMP provides a detailed description of the biodiversity values identified in the Karuah East Quarry BOA during previous assessments (RPS Australia Pty Ltd 2013; Eco Logical Australia (ELA) 2013, 2014). Additional baseline ecological surveys were also undertaken within the BOA in October 2016 (Kleinfelder 2016). A summary of the key biodiversity values present (or previously recorded) within the site is provided in **Table 2**. The locations of threatened flora species and the distribution of vegetation communities across the BOA are shown in **Figure 3**.

Table 2: Key Biodiversity Values Recorded within the Karuah East BOA

	Biodiversity Values	Area (ha) / No. of individuals
Vegetation Communities	Spotted Gum – Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin.	69.98
	Sydney Peppermint – Smooth barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin.	3.96
	Smooth-barked Apple - Red Bloodwood open forest on coastal plains on the Central Coast, Sydney Basin.	26.58
	Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast.	28.30
	Brush Box - Turpentine shrubby open forest of the coastal ranges of the North Coast.	2.62
Threatened Flora Species	* [^] <i>Tetradlea juncea</i> (Black-eyed Susan)	6,907
	* [^] <i>Grevillea parviflora subsp. parviflora</i> (Small-flower Grevillea)	100+
	* [^] <i>Asperula asthenes</i> (Trailing Woodruff)	399
Threatened and Migratory Fauna Species	* <i>Falsistrellus tasmaniensis</i> (Eastern Falsistrelle)	-
	* <i>Miniopterus australis</i> (Little Bent-winged Bat)	-
	* <i>Miniopterus orianae oceanensis</i> (Eastern Bent-winged Bat)	-
	* <i>Micronomus norfolkensis</i> (Eastern Coastal Free-tailed Bat)	-
	* <i>Myotis macropus</i> (Southern Myotis)	-
	* <i>Vespadelus troughtoni</i> (Eastern Cave Bat)	-
	* <i>Calyptorhynchus lathamii</i> (Glossy Black-Cockatoo)	-
	* <i>Daphoenositta chrysoptera</i> (Varied Sittella)	-

	Biodiversity Values	Area (ha) / No. of individuals
	* <i>Ninox strenua</i> (Powerful Owl)	-
	+ <i>Rhipidura rufifrons</i> (Rufous Fantail)	

* = listed as Vulnerable under the BC Act 2016

^ = listed as Vulnerable under the EPBC Act 1999

+ = listed as Migratory under the EPBC Act 1999

2. METHODS

2.1 VEGETATION AND THREATENED FLORA MONITORING

A total of 18 monitoring sites were established in October 2015, including 13 sites within the Biodiversity Offset Area (BOA), and five sites on Lot 12 DP 1024564 within 50 m of the project disturbance area and along Yalimbah Creek. The location of each monitoring site was recorded with a handheld GPS (Trimble™ Juno 5S unit) and permanently marked with a capped star picket (see **Figure 4**).

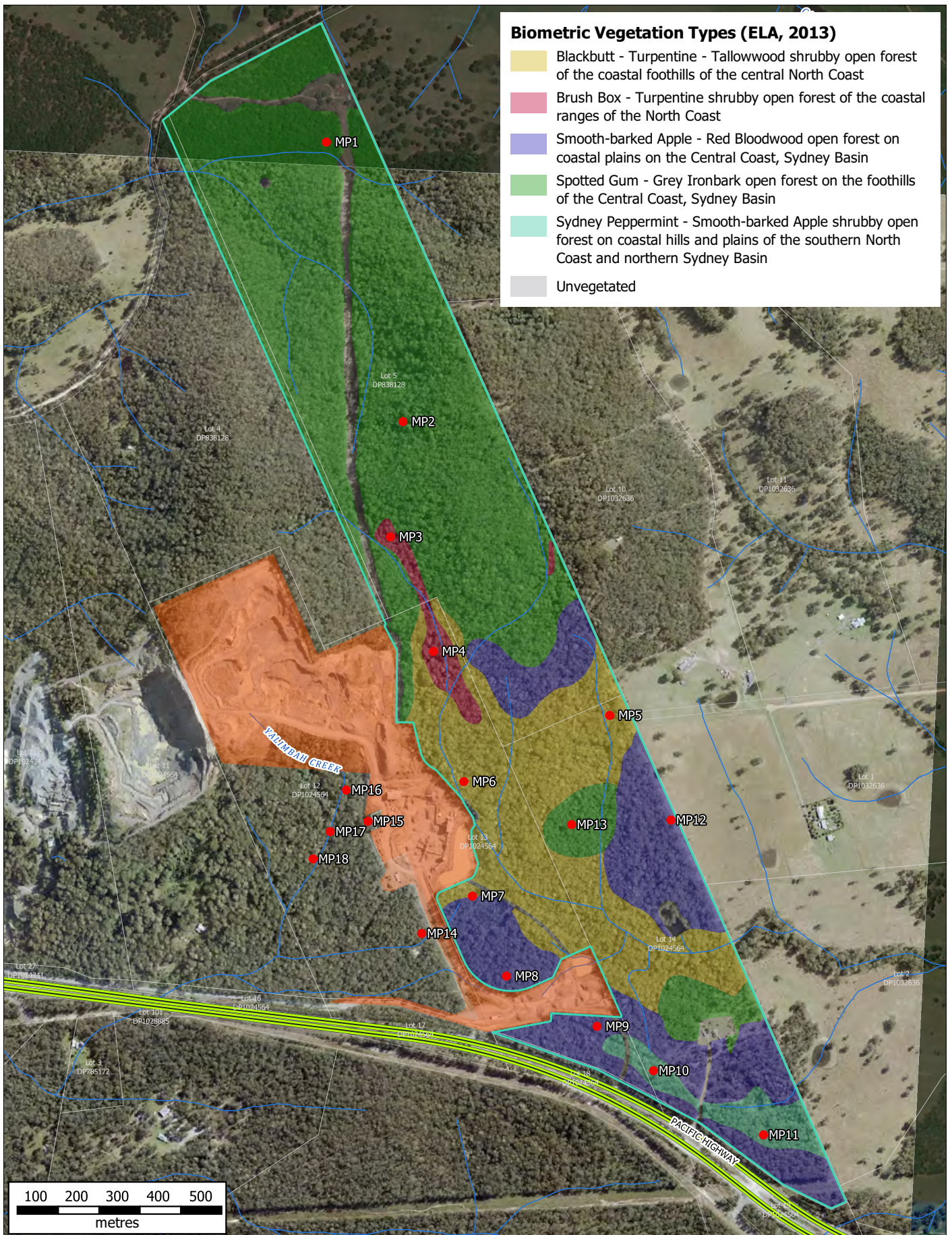
Baseline surveys were completed across the 18 monitoring sites in October 2015 and subsequently surveyed in October 2016, 2017, 2018, 2019, 2020, 2021 and 2022 (18th, 19th and 20th October 2022). Vegetation condition monitoring was conducted across all 18 monitoring sites. Threatened flora monitoring was previously carried out at nine of the monitoring sites, however, *Asperula asthenes* was identified in MP16 during the 2021 monitoring period. As such, threatened species monitoring was completed at ten of the monitoring sites in 2022 (**Table 3**).

Table 3: Summary of vegetation and threatened flora monitoring sites

Monitoring Site	Location	Vegetation Community	Threatened Flora Species Monitored
MP 1	BOA – Lot 5	Spotted Gum - Grey Ironbark open forest	-
MP 2	BOA – Lot 5	Spotted Gum - Grey Ironbark open forest	-
MP 3	BOA – Lot 5	Brush Box - Turpentine shrubby open forest	<i>Asperula asthenes</i>
MP 4	BOA – Lot 13	Brush Box - Turpentine shrubby open forest	<i>Asperula asthenes</i>
MP 5	BOA – Lot 14	Blackbutt - Turpentine - Tallowwood shrubby open forest	-
MP 6	BOA – Lot 13	Blackbutt - Turpentine - Tallowwood shrubby open forest	-
MP 7	BOA – Lot 13	Smooth-barked Apple - Red Bloodwood open forest	<i>Tetratheca juncea</i>
MP 8	BOA – Lot 13	Smooth-barked Apple - Red Bloodwood open forest	<i>Tetratheca juncea</i> and <i>Grevillea parviflora</i> subsp. <i>parviflora</i>
MP 9	BOA – Lot 13	Smooth-barked Apple - Red Bloodwood open forest	-
MP 10	BOA – Lot 14	Sydney Peppermint - Smooth-barked Apple shrubby open forest	-
MP 11	BOA – Lot 14	Sydney Peppermint - Smooth-barked Apple shrubby open forest	<i>Grevillea parviflora</i> subsp. <i>parviflora</i> and <i>Tetratheca juncea</i>
MP 12	BOA – Lot 14	Smooth-barked Apple – Red Bloodwood open forest	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>
MP 13	BOA – Lot 14	Spotted Gum – Grey Ironbark open forest	-
MP 14	Lot 12	Smooth-barked Apple - Red Bloodwood open forest	-
MP 15	Lot 12	Blackbutt - Turpentine - Tallowwood shrubby open forest	<i>Tetratheca juncea</i>
MP 16	Lot 12	Spotted Gum – Grey Ironbark open forest	<i>Asperula asthenes</i>
MP 17	Lot 12	Brush Box - Turpentine shrubby open forest	<i>Asperula asthenes</i>
MP 18	Lot 12	Brush Box - Turpentine shrubby open forest	<i>Asperula asthenes</i>

Biometric Vegetation Types (ELA, 2013)

- Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal foothills of the central North Coast
- Brush Box - Turpentine shrubby open forest of the coastal ranges of the North Coast
- Smooth-barked Apple - Red Bloodwood open forest on coastal plains on the Central Coast, Sydney Basin
- Spotted Gum - Grey Ironbark open forest on the foothills of the Central Coast, Sydney Basin
- Sydney Peppermint - Smooth-barked Apple shrubby open forest on coastal hills and plains of the southern North Coast and northern Sydney Basin
- Unvegetated



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Legend

- Biodiversity Offset Area
- Project Disturbance Area
- MonitoringPoints
- Cadastre
- Primary Road
- Minor watercourse
- Contours (10m)

Vegetation & Threatened Flora Monitoring Locations

Karuah East Quarry Pty Ltd
2022 Annual Monitoring Report
Karuah East Quarry Project

Figure:

4



2.1.1 Vegetation Condition Assessment

A qualitative assessment of vegetation condition and photo monitoring was undertaken at each of the 18 monitoring points, involving collection of the following data:

- Vegetation type and structure, including dominant species and estimated percentage foliage cover of each stratum (within 20 m radius of monitoring point);
- General health and condition of vegetation, including evidence of foliage die-off;
- Weed species and abundance; and
- Any management issues or indirect impacts from the project area or adjoining lands.
- Four photographs (north, south, east and west) were taken at each of the monitoring points.

2.1.2 Threatened Flora Monitoring

Monitoring of threatened flora species was undertaken at the previously observed nine monitoring sites as per the BOAMP and L&RMP as well as MP16, where *Asperula asthenes* was identified in 2021. At these sites, all threatened flora individuals within 10 m of the monitoring point were recorded. The bearing and distance of each clump / individual from the star picket recorded during the baseline survey was used to accurately re-locate known individuals in the survey area. The bearing (degrees) for each clump was measured using a Suunto compass, and the distance was determined using a tape measure attached to the star picket. Additionally, each clump/individual was permanently marked with a steel peg (positioned 20 cm to the south of each clump/individual to avoid damaging plants); a metal tag was attached to each peg which provides a unique ID number. Note separate individual plants were delineated based on criteria described in **Table 4**.

Table 4: Criteria for delineation of "individual" plants

Species	Definition of "individual"
<i>Asperula asthenes</i>	Individual plants were delineated based on the methodology used by ELA (2014) during previous targeted surveys to ensure a consistent approach for population surveys and monitoring across the BOA. Based on this method, stems (or groups of stems) of <i>Asperula asthenes</i> occurring 40 cm or more apart are considered separate individuals.
<i>Tetratheca juncea</i>	Individuals or 'clumps' were delineated and counted in accordance with the standardised method described by Payne et al. (2002), in which individual clumps occurring 30 cm or more apart are considered separate, individual plants.
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Stems occurring 30 cm or more apart were considered separate individuals.

For each individual identified in the survey area, the following information was recorded:

- Clump/individual ID number;
- Distance and bearing from centre star-picket to the clump;
- The size of the clump measured across the widest and narrowest points (cm) (for *A. asthenes* and *T. juncea*) or max height (for *G. parviflora* subsp. *parviflora*);
- Presence or absence of flowers (for *A. asthenes* and *G. parviflora* subsp. *parviflora*). The number of flowers and fruit on *T. juncea* plants were recorded to enable monitoring of reproductive output of this species; and
- Notes on general health of the plant, including any die-back or disease.

Following assessment of all previously recorded individuals, an additional survey of the area was performed at each site to identify any new individuals. For all new individuals identified within the survey area, the above listed information was collected.

2.2 SITE WALKOVER AND INSPECTION

Inspection of key management features was undertaken across the BOA and Lot 12 (within 50 m of the project area and along Yalimbah Creek) in December 2021 in accordance with Section 3 of the BOAMP. The following features were inspected and assessed:

- Internal and external fencing;
- Access tracks and gates;
- Areas of active erosion and sedimentation;
- Areas surrounding the two existing dwellings within the BOA;
- Redistribution of habitat resources salvaged during clearing for the KEQ Project;
- Extent and density of priority and environmental weeds within the project disturbance area, adjoining vegetation within 50 m of the disturbance area boundary on Lots 12 and 13, and along Yalimbah Creek.

2.2.1 Weed Mapping

Weeds for which detailed mapping was undertaken (i.e. target weed species) are those:

- Listed under the Biosecurity Act 2015 as priority weeds within the MidCoast Council control area;
- Identified as a Weed of National Significance (WoNS); and / or
- Environmental weeds which represent major infestations and / or have the potential to adversely affect ecological values within the BOA.

The most widespread and abundant weed species across the site is *Lantana camara* (Lantana). Four categories were used during field surveys to map areas of different Lantana density based on the percentage foliage cover:

- Nil: no Lantana observed;
- Scattered: $\leq 20\%$ Lantana cover;
- Moderate: 21-60% Lantana cover; and
- High: $> 60\%$ Lantana cover.

Other target weed species occurring outside moderate to high Lantana areas were mapped separately (i.e. weeds which may not be identified and treated as part of Lantana control).

3. RESULTS AND DISCUSSION

3.1 ENVIRONMENTAL CONDITIONS

Monitoring point field surveys were conducted on the 18th, 19th and 20th October 2022. Rainfall in the preceding months was variable, with higher-than-average rainfall occurring in July, September and October (**Table 5** and **Plate 1**). Rainfall was generally higher in 2022 when compared to the dry conditions recorded throughout 2019, which recorded an annual rainfall total (597.8 mm) half of the annual long-term average (1069.7 mm) and was the driest year since baseline monitoring was completed in 2015.

Table 5: Local Rainfall Data in mm (Clarence Town (Prince Street) Station – BOM Station 61010) (BOM 2021)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2015	134.2	32.0	128.2	451.8	130.6	54.0	25.2	35.6	85.6	48.6	162.8	147.4	1436.0
2016	472.2	38.6	36.4	43.0	14.8	113.0	54.6	68.2	55.0	50.0	64.6	83.6	1094.0
2017	62.4	88.8	218.0	91.2	14.8	121.6	8.6	17.4	8.0	91.0	41.2	53.2	816.2
2018	16.2	79.2	149.2	83.4	15.4	153.6	1.0	28.4	49.8	143.2	90.2	87.0	896.6
2019	23.4	73.6	152.0	53.8	36.0	77.6	16.8	36.0	85.0	19.6	21.0	3.0	597.8
2020	78.0	274.0	110.0	26.8	82.4	56.6	141.8	44.0	34.6	169.2	48.2	163.2	1228.8
2021	200.4	141.4	363.8	31.0	61.2	72.2	35.0	60.6	62.0	72.0	236.4	92.6	1428.6
2022	85.0	94.6	307.0	104.6	82.0	19.2	282.8	54.0	121.0	89.6	54.4	28.4	1322.6
Mean	104.9	111.6	126.2	99.9	86.4	100.7	69.7	60.2	62.3	69.1	79.2	99.7	1069.7

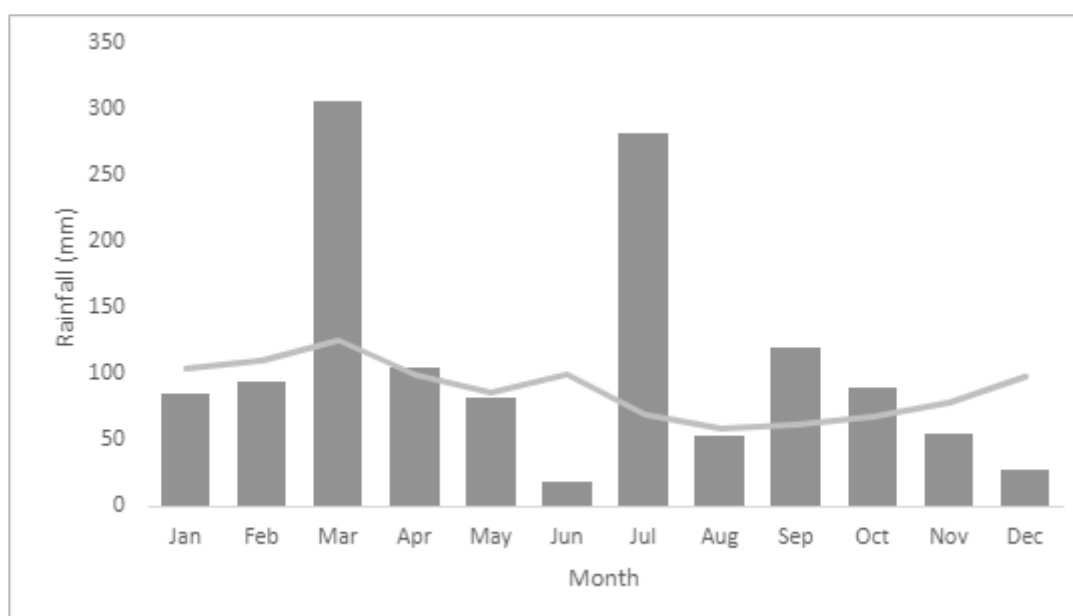


Plate 1: Local Rainfall Data (BOM Station 61010) (BOM 2022) – Columns (2022 rainfall data), Line (Long-term mean rainfall)

3.2 VEGETATION AND THREATENED SPECIES MONITORING

3.2.1 Vegetation Condition

The 2022 KEQ vegetation condition assessment was completed over three days (18th, 19th and 20th October 2022) across all 18 monitoring sites and represents the seventh annual inspection of vegetation condition within the KEQ BOA and Lot 12, with baseline data collected in 2015.

Vegetation condition, exotic species cover and records of disturbance are summarised in the results below. Site-specific results and photo monitoring results are detailed further in **Appendix A** and **Appendix B**.

General health of vegetation

Vegetation condition across KEQ BOA and Lot 12 monitoring sites remain relatively stable since the previous monitoring event in 2021, with almost all monitoring sites recording signs of regeneration.

Canopy condition, measured as Projected Foliage Cover (PFC%), shows small increases since 2021, and similar to the baseline results collected in 2015 (see **Plate 2**), beyond natural variation likely in response to prevailing weather conditions (see **Plate 1**). The results from the current monitoring event indicate that canopy cover has largely stabilized within the communities recovering from the drought conditions on 2019/2020, further monitoring events will identify any longer term trends in canopy condition. Signs of dieback have decreased from the monitoring in 2022, trees also show signs of recovering, with new growth recorded in 2022 and higher PFC% within the canopy. Several of the monitoring points experienced an increase in overall PFC during this year, likely in response to improved conditions such as high rainfall.

There have been discernable changes in PFC across mid-storey or shrub strata since baseline records in 2015, including between 2021 and 2022 (current survey) (see **Plate 3** and **Plate 4**). These changes are largely within the natural variation of each of the vegetation communities within the Subject Site, and likely the result of variable conditions within the site since 2015 (i.e. rainfall and dry conditions). The largest change in shrub PFC was recorded within *Smooth-bark Apple – Red Bloodwood open forest* (increase from 11% to 14%) sites (**Plate 4**). As with canopy PFC, the continuation of this monitoring program will allow for the identification of any long-term trends in shrub/mid-storey cover within the Subject Site.

Grass groundcover PFC has declined across all vegetation communities, when comparing to the baseline surveys in 2015 (**Plate 5**). Increases have been observed in 2022 within three of the communities and the other two communities still showing a decline. This is unlikely to be the result of any direct or indirect impacts of quarry operations, instead is more likely a combination of natural variability and increasing competition from shrub/mid-storey species as well as a small level of variability expected between surveyors. Additionally, non-grass groundcover, appears to be recovering despite a substantial decrease in 2020 (**Plate 6**).

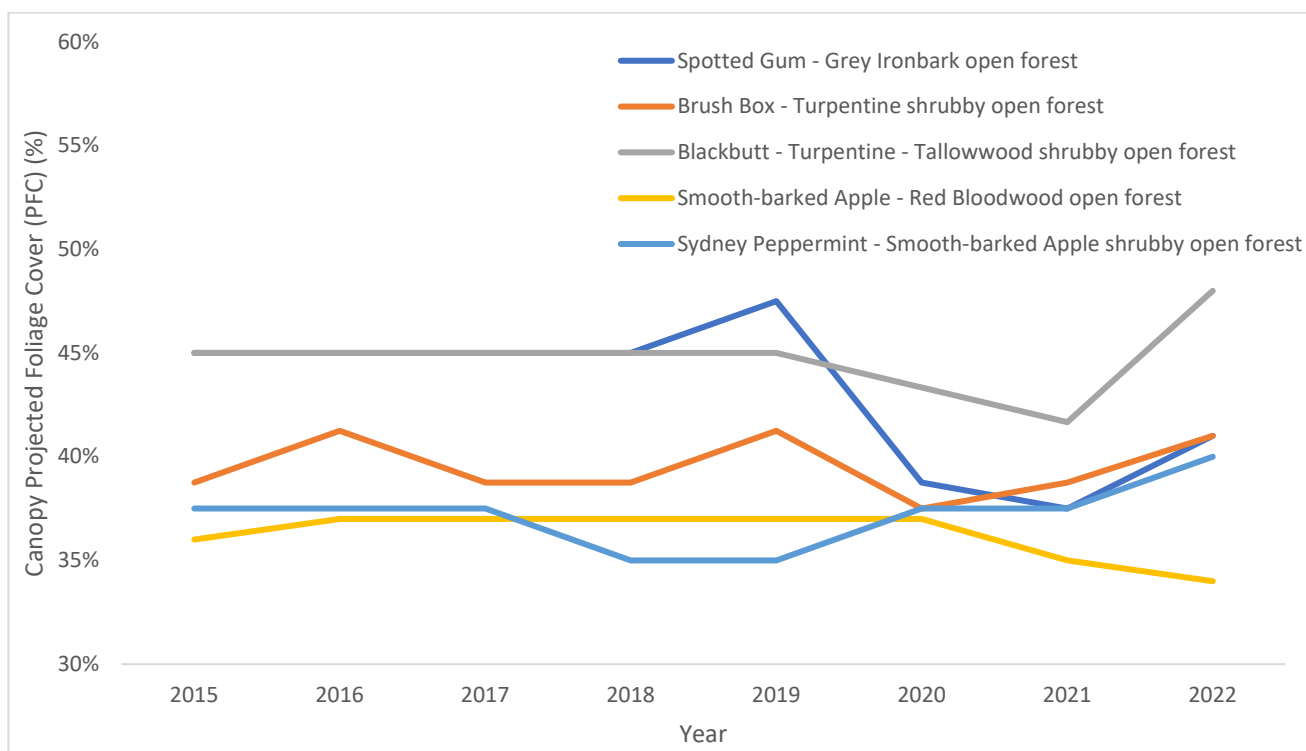


Plate 2 Mean Canopy Projected Foliage Cover (%) by vegetation community (2015-2022)

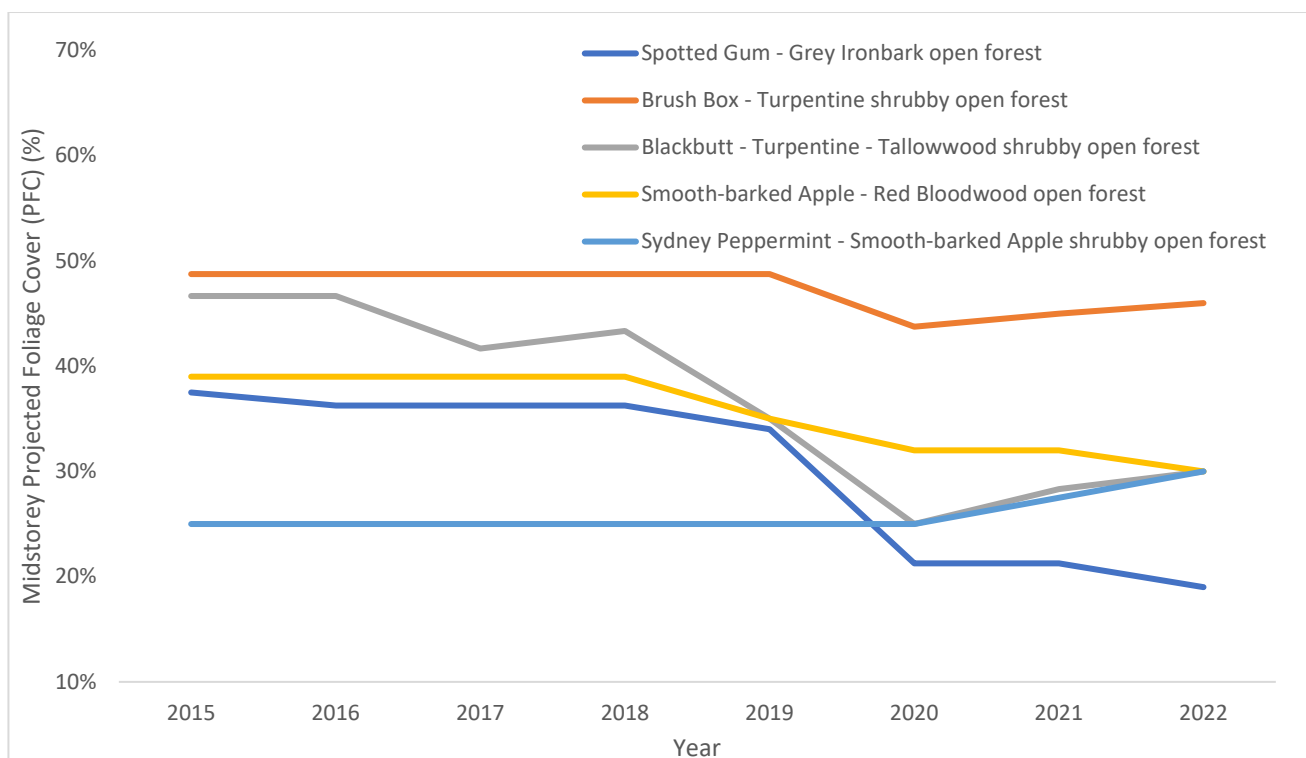


Plate 3 Mean Mid-storey Projected Foliage Cover (%) by vegetation community (2015-2022)

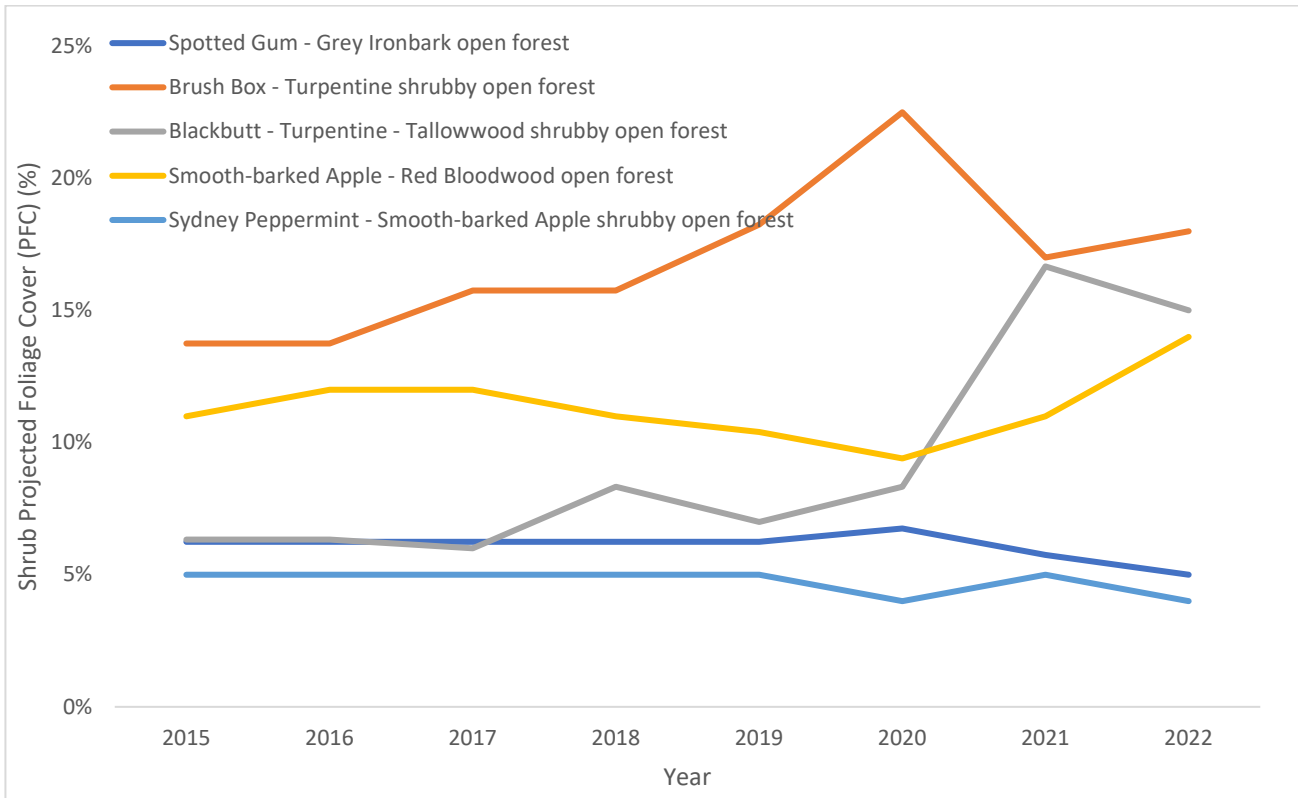


Plate 4 Mean Shrub Projected Foliage Cover (%) by vegetation community (2015-2022)

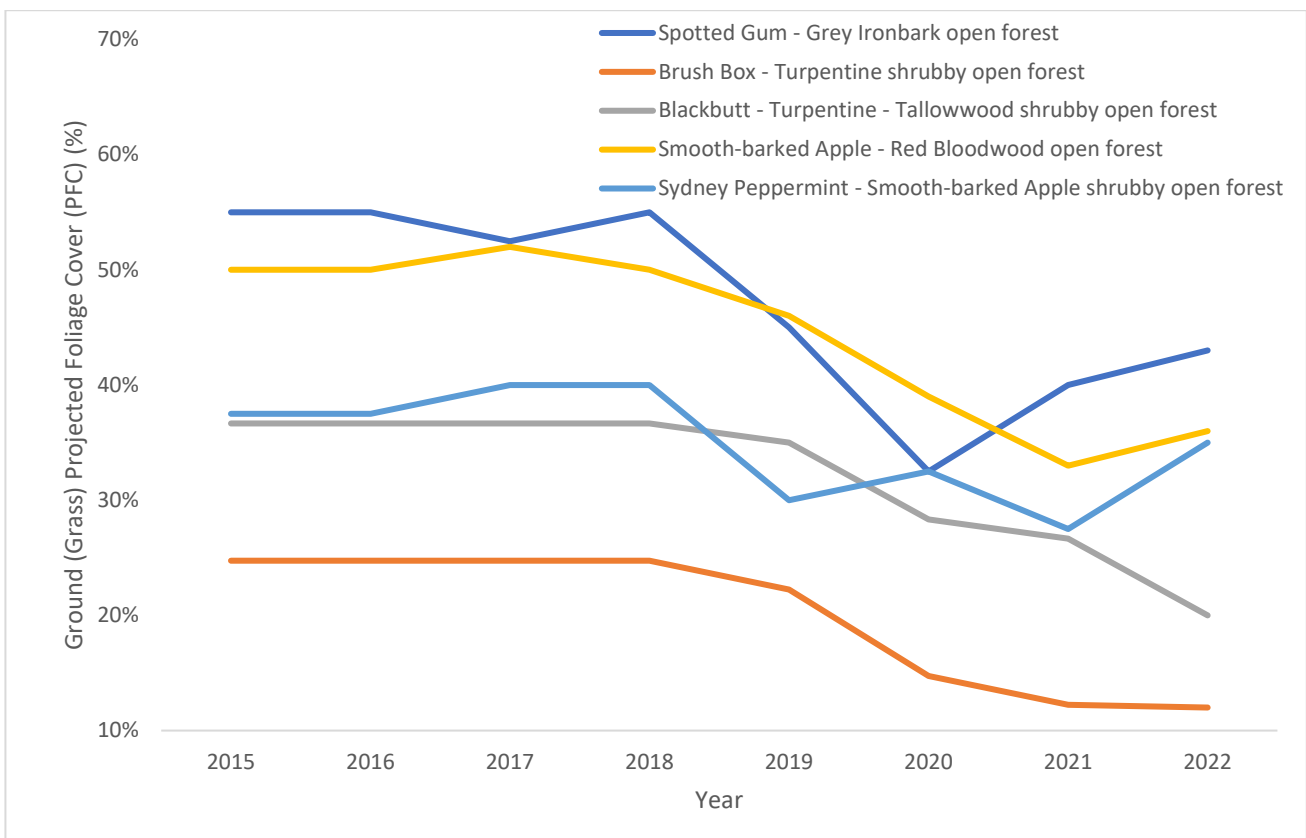


Plate 5 Mean Ground (Grass) Projected Foliage Cover (%) by vegetation community (2015-2022)

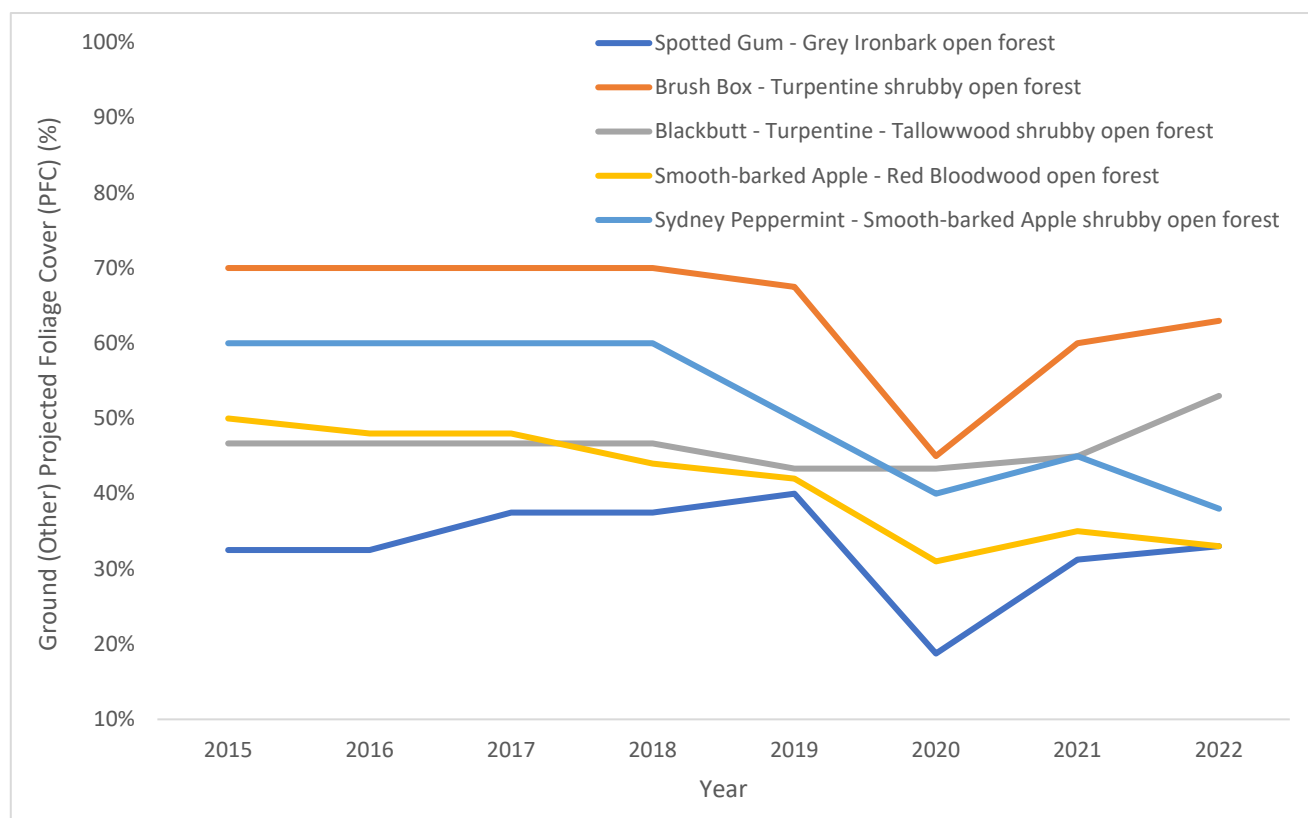


Plate 6: Mean Ground (Other) Projected Foliage Cover (%) by vegetation community (2015-2022)

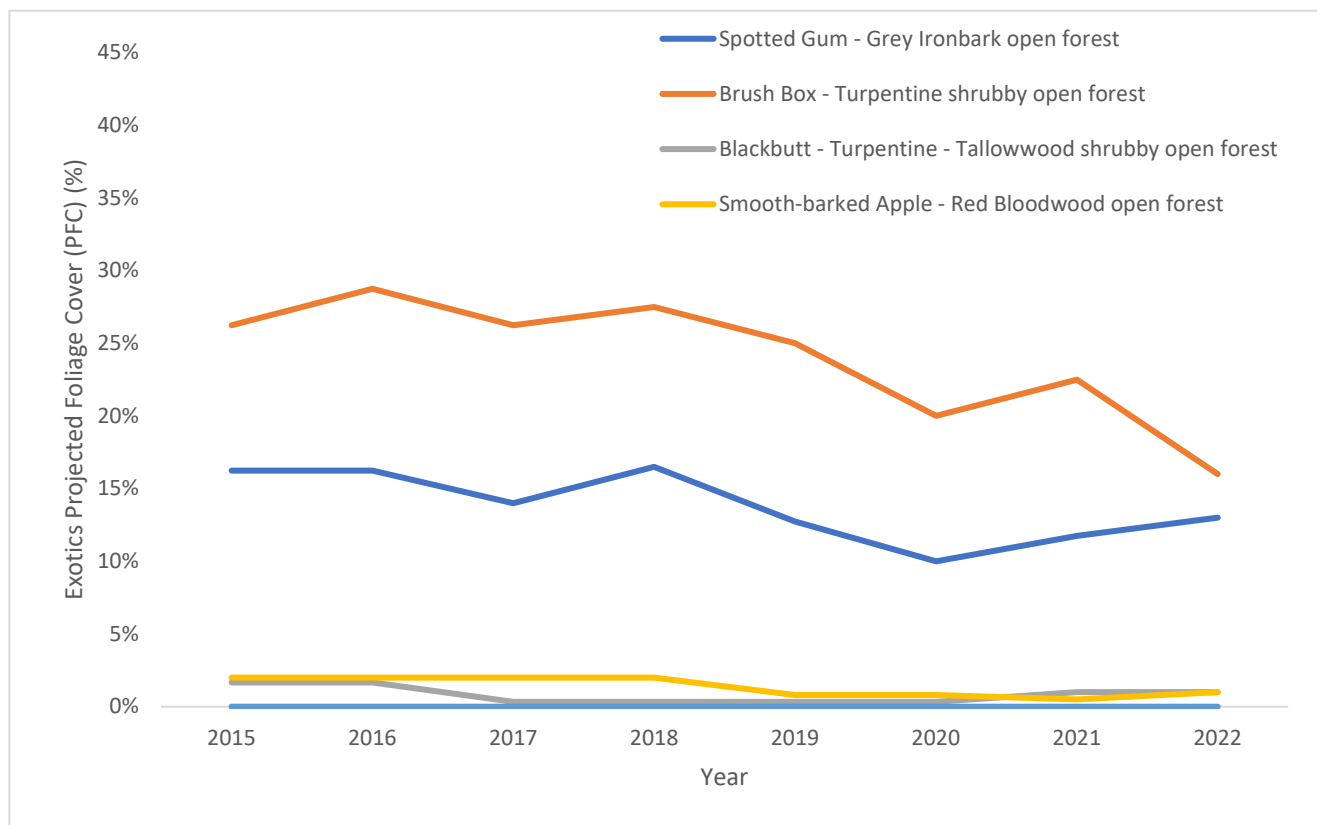


Plate 7: Mean Exotics Projected Foliage Cover (%) by vegetation community (2015-2022)

Exotics

Exotic species cover has remained relatively stable since baseline surveys in 2015, with a minor increases and decrease across the communities since the last survey period (**Plate 7**). This may also be attributed to the high rainfall throughout 2022, creating more favourable conditions for pre-established communities of exotic plants. The highest level of exotic species cover continues to occur within *Brush Box – Turpentine shrubby open forest* sites and includes large thickets of *Lantana camara* var. *camara*. Weed coverage is further discussed and mapped **Figure 5**.

Disturbance

Minor disturbance was recorded at a number of monitoring sites. These are detailed in **Appendix A**, however, the following key observations are noted below:

- Similar to the 2021 monitoring, minor scouring of creek bank was recorded at MP 18, MP 17 within a gully to the west of the quarry. This is likely the result of high rainfall events during the preceding months and may have removed several of *Asperula asthenes* individuals growing on the creek banks.
- Past clearing at MP 12 is beginning to show signs of regeneration, despite continued maintenance of the accessway. The stockpiled timber of removed trees may have impacted several *Grevillea parviflora* individuals that were not observed in 2022.
- Moderate levels of dust were observed on foliage (see **Photo 1**) and on the ground at several monitoring sites along the boundaries of quarry operations. Dust levels remain relatively similar to the previous survey period, as such monitoring of this disturbance should be continued in future years to assess any potential influence on remnant vegetation.
- Evidence of sedimentation and erosion has been observed in a few locations around the extent of the quarry along the south eastern edge of the extraction area and along the western side of the haul road into the Karuah Quarries Conservation Area (**Photo 2**).



Photo 1: Dust Cover on Foliage recorded at MP 4 in 2020



Photo 2: Sedimentation and Erosion into the Karuah Quarry Conservation Area into Dam.

3.2.2 Threatened Flora

The 2022 threatened species monitoring identified a total of 45 individual *Asperula asthenes* plants, 27 clumps of *Tetratheca juncea*, and 17 *Grevillea parviflora* subsp. *parviflora* shrubs representing a decrease in threatened flora abundance for two species and at the majority of the monitoring locations.

Species specific results are discussed below, for more detailed threatened flora results including site specific observations on abundance and condition see **Appendix C**.

Asperula asthenes

Monitoring for *A. asthenes* was completed at the four original monitoring sites; MP 3, MP 4, MP 17, and MP 18, as well as MP16, where the species was identified during the 2021 surveys. MP 18 experienced a small increase in *A. asthenes* abundance since 2021 with 9 individuals in 2021 to 10 in 2022. The remaining monitoring points experienced a decrease in the overall abundance of this species (**Plate 8**). The most significant decrease was at MP 4 where 32 individuals were recorded in 2021 and 15 individuals in 2022. This was followed by MP 17 where 10 individuals were recorded in 2021 and 6 were recorded in 2022. MP 3 experienced a decrease from 18 individuals in 2021 to 14 in 2022. It is likely that many new individuals that germinated in 2020 in response to favourable conditions and have subsequently been outcompeted following the return of other groundcover species. Additionally, several of the individuals residing on the banks of a creek may have been removed by heavy rainfall events especially seen within MP4 which has seen the greatest loss with no leaf litter on the ground with it being washed away.

The decrease in abundance for the species across the majority of the monitoring sites continues a pattern of fluctuating abundance results for the species since 2015. There is no discernible pattern to suggest impacts from quarry operations in relation to *A. asthenes* abundance.

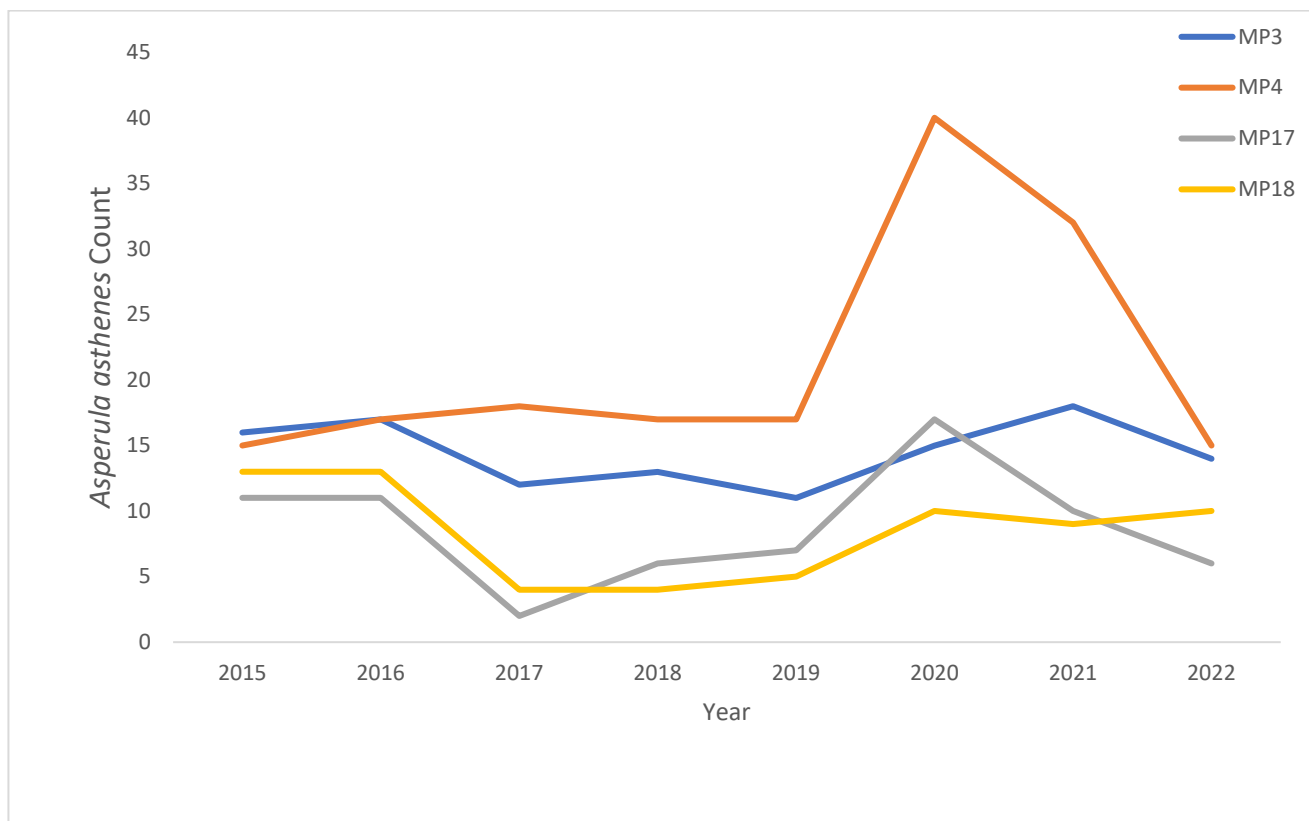


Plate 8: *Asperula asthenes* abundance at monitoring sites, excluding the newly added MP16 (2015-2022)

Tetratheca juncea

Monitoring for *T. juncea* was completed at four monitoring sites; MP 7, MP 8, MP 11 and MP 15. The population remains stable with a decline in abundance recorded between 2021 and 2022 at MP 7 (15 to 10 plants), MP 8 (13 to 9 plants) and MP 15 (12 to 7 plants) (see **Plate 9**). Monitoring point 11 remain equally as abundant as in 2021 (1 individual). *T. juncea* abundance has generally remained stable across the original monitoring sites (MP 7, MP 8, and MP 15) since the 2015 baseline monitoring event (**Plate 9**). A reduction in numbers has occurred within MP 7, MP 8 and MP 15 with MP 7 and MP 8 with similar numbers to the baseline monitoring in 2015 although MP 15 currently has less than half the original plants than the 2015 baseline monitoring.

No major disturbances were recorded within MP 15 during the 2022 monitoring event, however, some dust on foliage has been noted for the last couple of years seemingly becoming thicker. Overall, the abundance of *T. juncea* individuals within the monitoring plots has decreased within the monitoring plots.

Flowering was recorded for the species across all four monitoring plots (MP 7, MP 8, MP 11 and MP 15) during the 2022 monitoring event. Of the plants recorded at MP 7, four were in flower (44%) with a mean of 12.25 flowers per flowering plant, compared to 53% flowering and 4.75 flowers in 2021. MP 8 saw a increase from 38% flowering and 5.6 flowers on average in 2021 to 78% flowering and a mean of 10.5 flowers per flowering plant. The single plant identified within MP 11 continued to be viable and was in flower during this monitoring period (37 flowers, 0 fruit in total). MP 15 increased from 50% flowering and 2 flowers per flowering plant in 2021 to 86% and 5.6 flowers per flowering plant in 2022. Overall, despite a reduction in the overall abundance of plants, the results indicate *Tetratheca juncea* is in good reproductive condition.

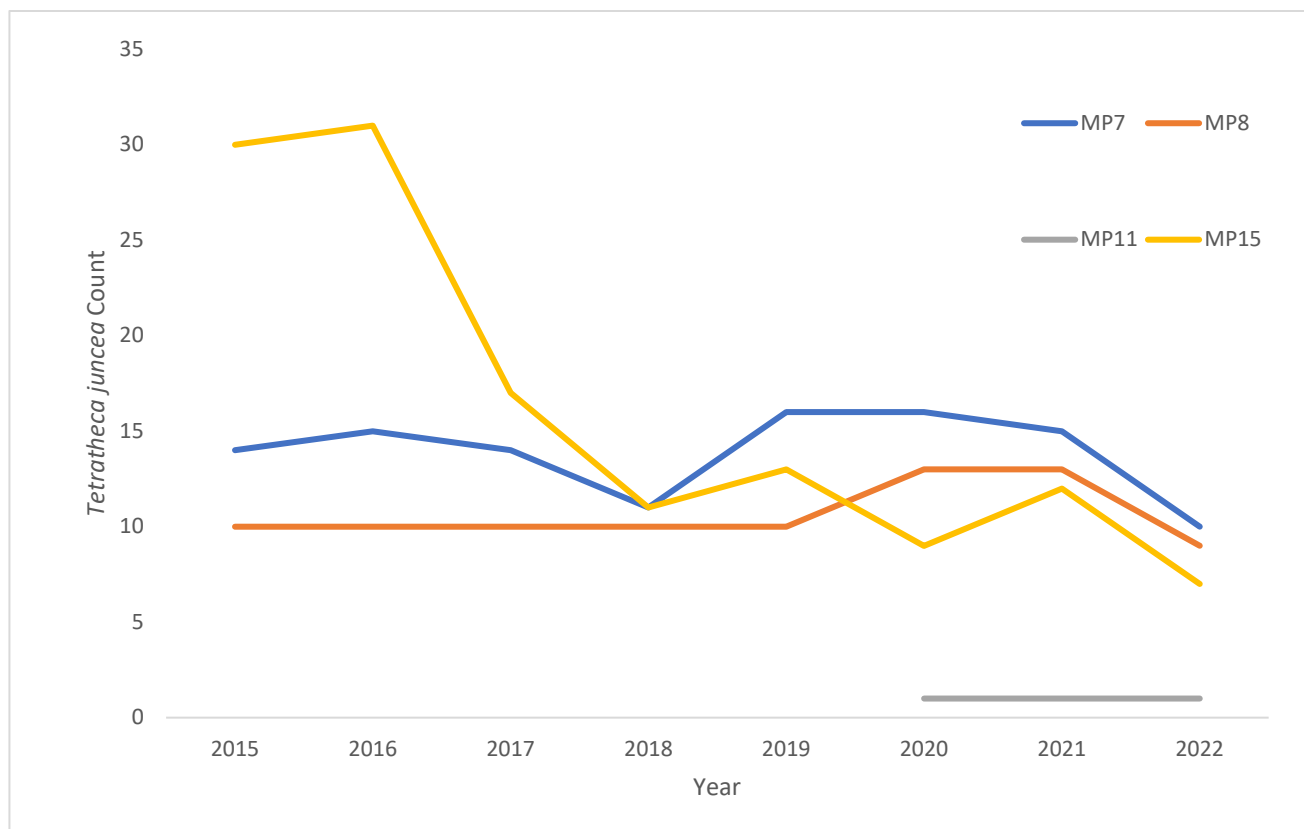


Plate 9: *Tetratheca juncea* abundance at monitoring sites (2015-2022)

Grevillea parviflora* subsp. *parviflora

Monitoring for *G. parviflora* subsp. *parviflora* was completed at three monitoring sites; MP 8, MP 11 and MP 12. A decrease of one individual plant was recorded between 2021 and 2022 at the monitoring points (MP 8: 0 to 0 plants, MP 11: 11 to 10 plants, MP 12 7 to 7 plants) (**Plate 10**). The total number of *G. parviflora* subsp. *parviflora* individuals across all monitoring sites is lower than that recorded in 2015.

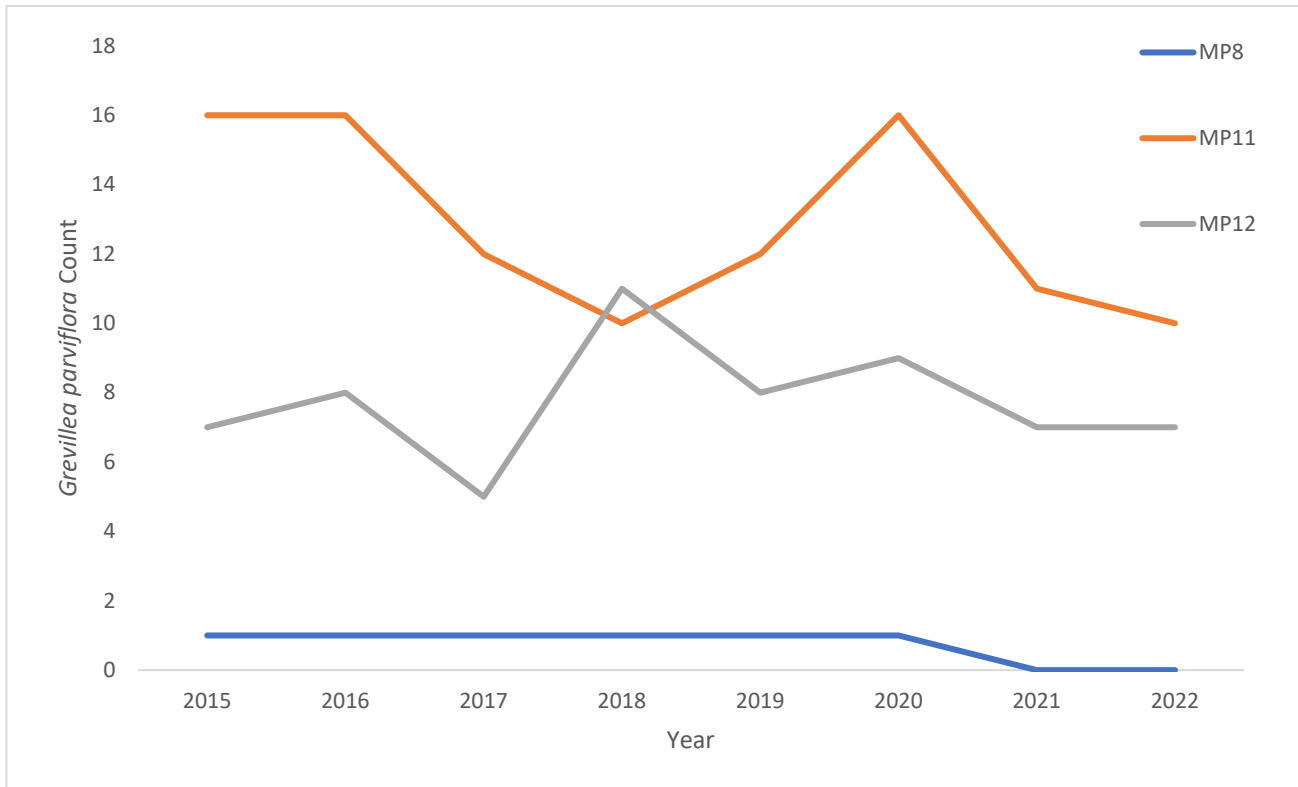


Plate 10: *Grevillea parviflora* subsp. *parviflora* abundance at monitoring sites (2015-2022)

3.3 SITE WALKOVER AND INSPECTION

3.3.1 Weed Infestations

Weed mapping was conducted across the BOA during field surveys on the 18th, 19th and 20th October 2022, within the project disturbance area, within 50 m of the project disturbance area, and along Yalimbah Creek on Lot 12. The resulting weed map (**Figure 5**) illustrates the cover of the most abundant weed species across the site, *Lantana camara* var. *camara* (Lantana) (Priority Weed within the MidCoast LGA). As with previous monitoring events, major infestations occur throughout the site, with the majority of infestations occurring across the northern extent of the BOA, however the extent of this species has expanded in comparison to previous years (**Figure 5**).

One other Priority Weed species was identified in the BOA: *Senecio madagascariensis* (Fireweed). This species only occurs as small discrete patches in a few locations in the BOA.

Notable areas of exotic perennial grasses previously mapped along road and track sides were recorded again in 2022 and are mapped in **Figure 5**. The dominant exotic grass species in these areas include *Setaria sphacelata* (South African Pigeon Grass), *Andropogon virginicus* (Whisky Grass), and *Axonopus fissifolius* (Narrow-leafed Carpet Grass), as well as a variety of annual and perennial exotic herbs. The areas dominated by exotic grasses are primarily restricted to the power line easement,

around existing dwellings, track edges, perimeter of quarry disturbance area and previously cleared regrowth areas on the southern part of Lot 14.

While the dense areas of exotic grasses have been mapped, they are not considered target weed species at this stage. They represent a relatively low threat to the integrity of ecological values within the site. The exotic grasses occurring in the areas of native regrowth are also likely to be shaded out over time as the canopy, and midstorey cover continues to regenerate. However, the distribution of exotic grasses will continue to be monitored, and any increases will be evaluated to determine if management is required.

It is recommended weed control works for the next 12 months should focus on the Lantana infestations in Lot 5 and north-east part of Lot 13, especially within the vicinity of MP 3 and MP 4, to protect *Asperula asthenes* individuals. Priority should also be given to controlling infestations alongside waterways where Lantana has become most abundant. These weed control activities must be undertaken in spring in accordance with the procedures detailed in Section 3.10 of the BOAMP due to the presence of threatened flora (*Asperula asthenes*) in these areas.

A combined list of weed species from the surveys completed by ELA (2013) and Kleinfelder (2017) across the BOA is provided in **Appendix 4**. One additional weed species, *Ageratina adenophora* was identified in small, localised communities during the 2021 surveys.

3.3.2 Fencing and Tracks

The layout of existing and required fencing, gates and tracks across the BOA is shown in **Figure 6**. Boundary fencing is required around the entire KEQ project area. Fencing of KEQ project area / BOA boundary has commenced (approximately 70% completed in 2017). A new fence was installed along the eastern boundary of the BOA adjoining Lot 10 in 2017. Fencing along the remaining 30% of project area / BOA boundary, and Lot 5 / Lot 14 boundary is required. Key fencing requirements within the site include:

- Internal fencing is also required around the existing dwellings on Lot 5 and Lot 14.
- The barbed-wire fence alongside the far northern boundary of Lot 5 requires repair throughout due to the fence having either fallen, lost tension or damage from fallen trees (**Photo 3** and **Figure 6**).
- Fencing alongside the north-eastern boundary of Lot 5 has been removed with the intention of replacing it.
- Fencing is absent along the western boundary of Lot 5 and will need installation
- Fencing along the western boundary of Lot 13 and haul road has been repaired from prior damage (see **Photo 4**).
- Fencing (Koala Fence) has been removed from the large dam to the south-east of the rock crushing area due to dam wall repairs. Repairs have now been completed and the fence needs to be re-installed.
- All fencing works are required to be undertaken in accordance with Section 3.2 of the BOAMP.

Several redundant sections of tracks within the southern part of the BOA are being successfully rehabilitated following the placement of branches, hollow logs / sections and other organic debris salvaged from the KEQ disturbance area during vegetation clearing. Maintenance is required at an access track to the south of the stockpile area. It has experienced minor erosion but is still traversable.

Additional maintenance is recommended at the access tracks along the north-western boundary of Lot 5, that have become overgrown and are no longer accessible by vehicle.



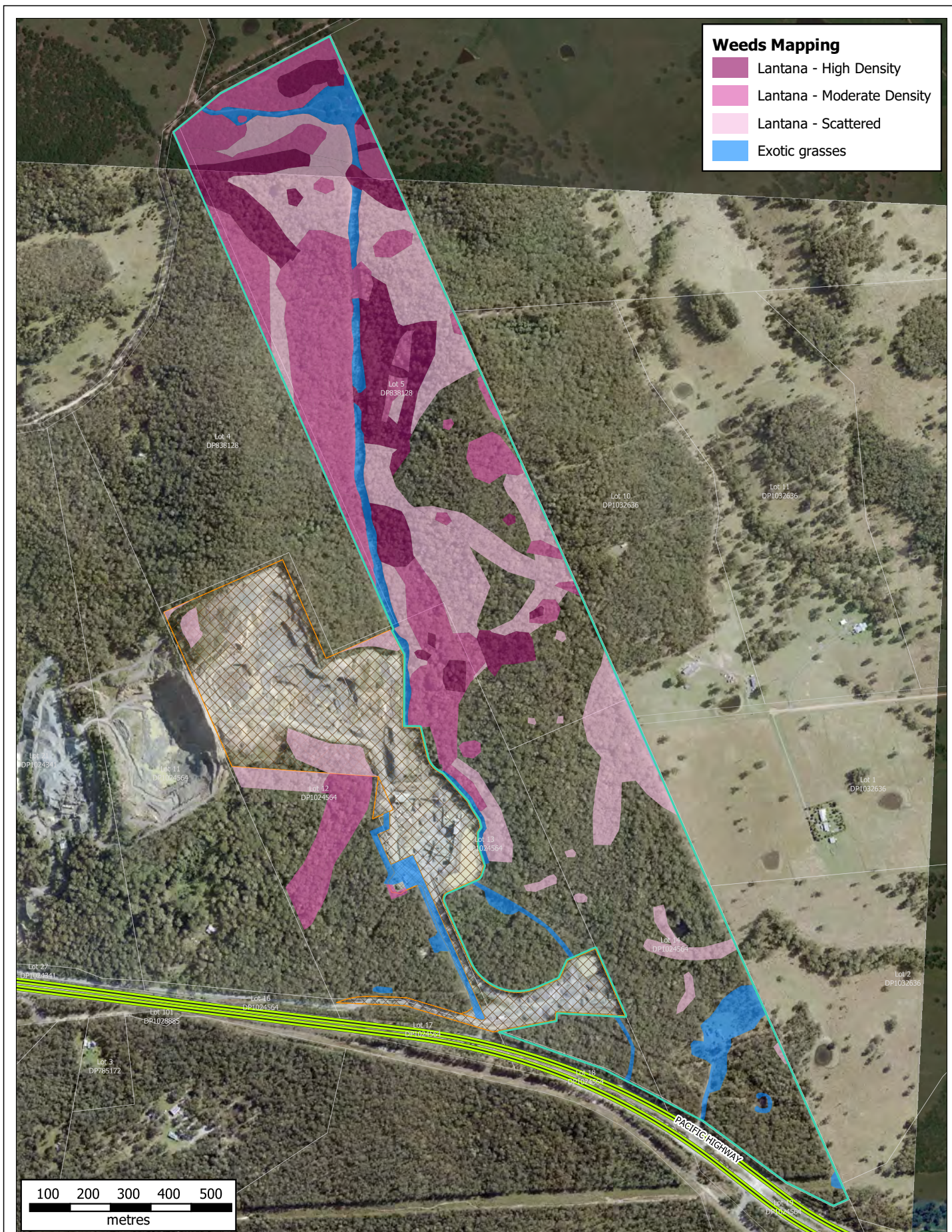
Photo 3: Fallen fence along far northern boundary of Lot 5.



Photo 4: Fixed fence along western boundary of haul road



Photo 5: No fence along south eastern side of dam. Needs to be re-installed after dam wall repairs.



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Date: 07/12/2022



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Legend

- Biodiversity Offset Area
- Project Disturbance Area
- Cadastre
- Primary Road

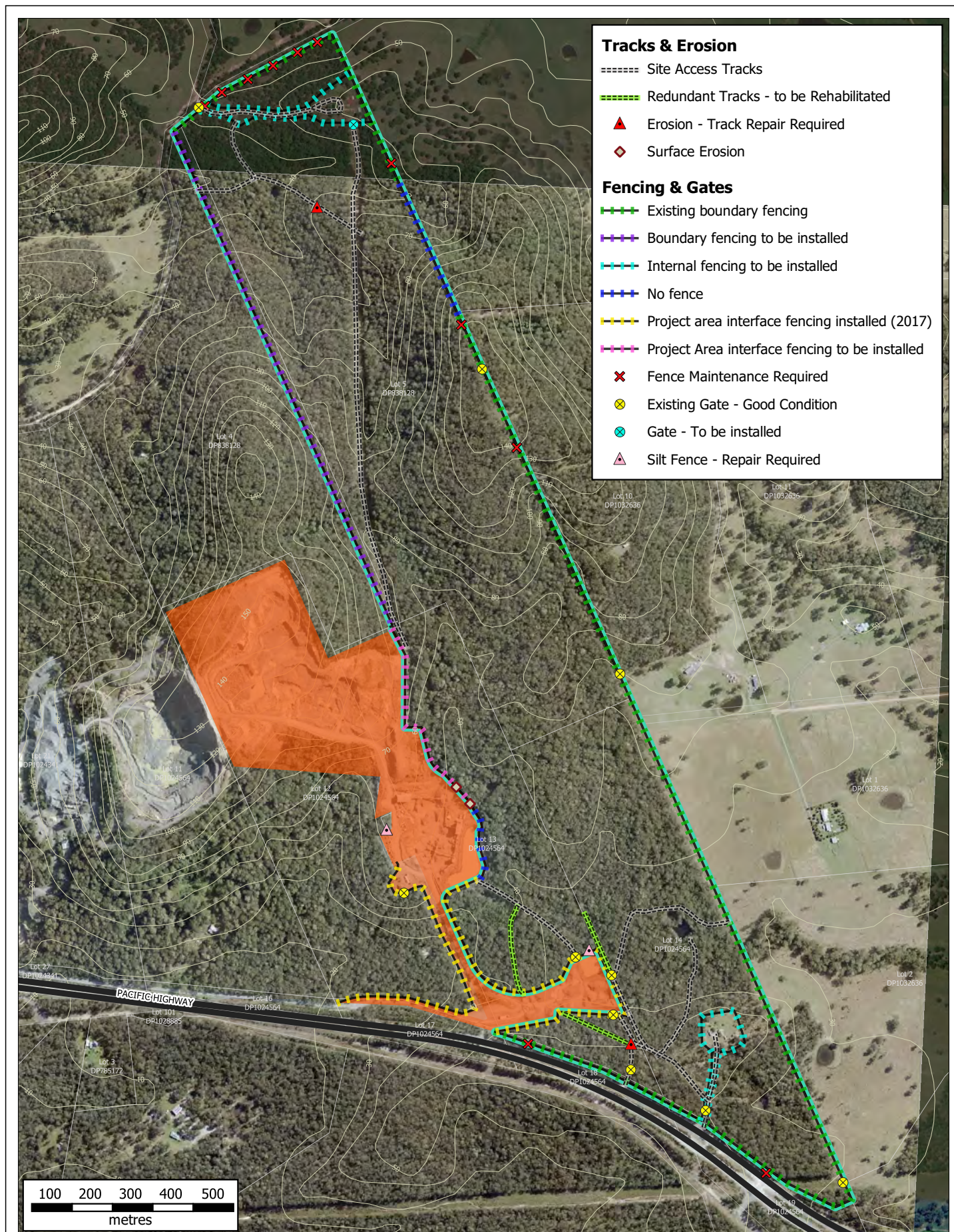
Weed Mapping

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Figure:

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Legend

- Biodiversity Offset Area
- Project Disturbance Area
- Cadastre
- Primary Road
- Contours (10m)

Fencing, Tracks, Erosion & Pest Issues

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Figure:

6



3.3.3 Erosion

No areas of major active erosion were identified within the BOA during the 2022 monitoring. Areas of bare ground previously identified on the access tracks within the BOA predominantly appeared to be stable with no substantial active erosion or sedimentation observed. Minor scouring was still evident in several locations along the drainage lines within Lot 5 and within the vicinity of monitoring sites MP 17 and MP 18 in Lot 12, as recorded in the previous survey period. This scouring is considered to be natural stream bank erosion, as there was no evidence of unnatural disturbance in these areas, and overall the streams have relatively high ground vegetation cover and appear stable.

Certain areas of the BOA (primarily the steep slopes on Lot 5) have the potential to develop erosion following Lantana control works. The need for erosion or soil stabilisation measures following initial treatment of moderate and high density Lantana areas on steep slopes will be assessed at each maintenance / monitoring event. No weed control had taken place within Lot 5 over the previous monitoring round, therefore no change of conditions was observed.

Sediment fencing and bund walls/diversion drains were in place in all areas downslope of disturbed areas except for the area north of Dam 1. However, the sediment fences installed along the eastern extent of the overburden stockpile and the area south east of Dam 1 had failed at the time of the 2018, 2019, 2020, 2021 and 2022 inspection. Active erosive processes are evident in several locations where rill erosion can be observed along the wall of Dam 1 and the overburden stockpile wall. These processes are washing away sediments and rocks overtopping the sediment fence, and spilling over the surrounding bushland. Many of these areas have begun to stabilise in some areas through the spread of exotic grass species over the disturbed areas, including roadsides and dam walls.

Key erosion and sedimentation issues were observed in multiple areas surrounding the quarry disturbance area:

- In three locations, the installed sediment fencing was overtopping (observed in 2018, 2019, 2020, 2021 and 2022) and, therefore, no longer provided active sediment control (**Figure 6**). It was observed in these locations that some sediment had been deposited within the surrounding environment. The overtopping sediment fencing along the western boundary of the quarry, within Lot 12, and adjacent to monitoring site MP 15 has fallen and is no longer adequately collecting sediment (see **Photo**).
- It was noted during the 2017 monitoring event that the overflow for Dam 3 was depositing small amounts of sediment into the receiving environment with water being retained in the bushland east of the basin for a period. It was noted during the 2018 monitoring event that a small trough had been dug to allow the overflow from the dam to drain out of the area and into Bulga Creek. While some minor erosion and sedimentation was observed on the discharge side of the dam wall, it was still contained within the project disturbance area. This management action has remediated the waterlogging issue and no die-back or change in vegetation structure and composition was observed in 2018. No further changes were noted in 2019, 2020, 2021 or 2022. Ongoing annual monitoring will be required to assess the effectiveness of the drainage and ensure no die-back or change in vegetation structure and composition occurs.
- It was observed in the 2021 monitoring event that excavated rock and sediment produced by the quarry operations has runoff the eastern boundary of the quarry into the BOA (**Photo 4**). This material forms a layer across this area where it is mixed in with organic material. It is recommended that silt fencing or bunding be installed to prevent the further introduction of this material into the BOA. Further excavated rock has been noted to the west of the haul road which has been deposited into the Karuah Quarry Conservation area into the dam (**Figure 6** and **Photo 6 – 7**).

- Moderate and high levels of dust were observed on foliage (see **Photo 1**) and on the ground at several monitoring sites along the boundaries of quarry operations. Dust levels remain relatively similar to the previous survey period, as such monitoring of this disturbance should be continued in future years to assess any potential influence on remnant vegetation.



Photo 6: Sediment fencing down and overtopping within Lot 12.



Photo 7: Excavated rock and sediment that has runoff from the eastern boundary of the quarry into the BOA.

3.3.4 Vertebrate Pests

No feral pests, or evidence thereof, were detected in the 2022 monitoring period. Despite this, feral pigs (*Sus scrofa*) were recorded during the 2020 site inspections along the powerline easement in Lot 5 and in proximity to monitoring site MP 4, supporting previous observations of suspected Feral Pig diggings recorded in the southern half of the BOA area during previous site inspections (**Figure 6**). Karuah East Quarry conducted Feral Pig trapping in Lot 14 in March 2019 and implemented a broader feral animal control baiting programme in the BOA during December 2020.

Additionally, the red fox (*Vulpes vulpes*) has been identified within the BOA and was also targeted in the December 2020 baiting programme. Further trapping is recommended on a scheduled basis to manage the population within the BOA. Attempts to conduct baiting programs in 2022 have been put on hold due to heavy rainfall conditions before the baiting events.

3.3.5 Habitat Resources

Section 6.3.1 of the L&RMP and Section 3.8 of the BOAMP detail the protocol and requirements for salvaging habitat resources (i.e. logs, hollows and other large organic debris) during the KEQ project and redistributing into the rehabilitation or offset areas. Vegetation clearing undertaken in 2016 for the KEQ project has included the salvage of a large quantity of organic material (primarily large trees and logs). These resources were stockpiled on the boundaries of the KEQ project area (see **Figure 7**).

In addition to this, a total of 77 hollows and hollow log sections were previously salvaged and set aside for redistribution into the BOA. The location of the hollow logs to be redistributed throughout the BOA is shown on **Figure 7**. Inspections in 2020 indicated that most hollows are unsuitable for reinstallation due to cracks in hollow walls or the requirement to substantially modify the hollow for reinstallation. As such, in July/August 2020, 193 nest boxes were installed to compensate for the loss of 116 hollows and also compensate for the need to reinstall 77 salvaged hollows. It is recommended that the 77 salvaged hollows be redistributed terrestrially within the BOA to provide habitat for terrestrial fauna species.

Tree hollows removed as part of clearing works completed on site in November 2016, May and August 2018, and October and November 2019, have now been sufficiently replaced as per the requirements of the BOAMP.

Tree hollows removed as part of clearing works completed on site in September 2020, March, June, October and November 2021 and May 2022 (58 nest boxes) have now been sufficiently replaced as per the requirements of the BOAMP.

Details on nest box installation are covered below.

Nest Boxes

Since 2016 a total of 377 nest boxes have been installed within the Karuah East Quarry BOA. Details of nest boxes installed are outlined in **Table 6**.

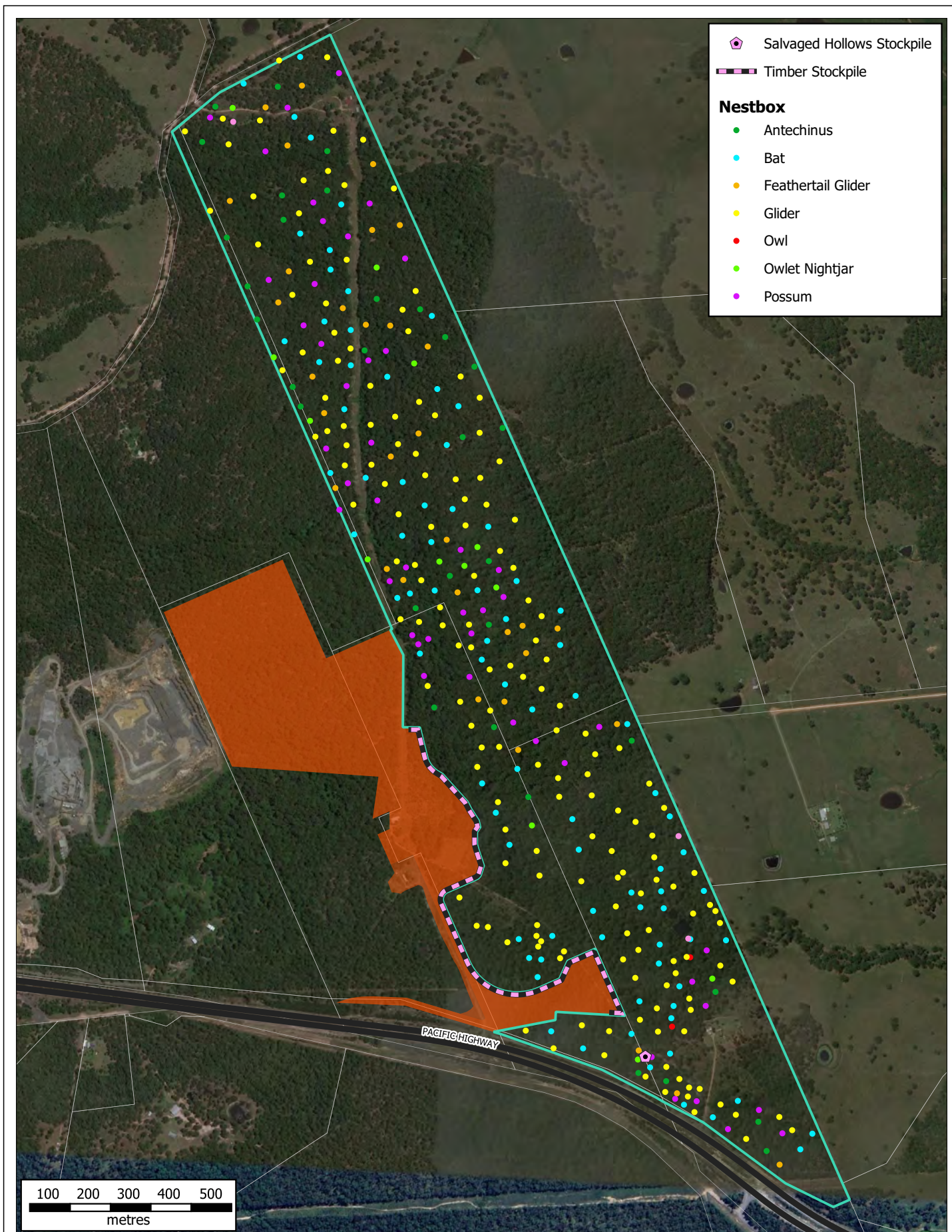
Table 6: Nest box installation details across KEQ BOA (2016-2022)

Installation Date	Installation Details	Box Type Installed
April 2016	30 nest boxes were installed within the BOA in April 2016 as per Section 3.8 of the BOAMP.	<ul style="list-style-type: none"> • 20 Glider boxes • 10 Microchiropteran bat boxes
February 2018	93 nest boxes were installed between the 3rd and 6th of February 2018 and two large owl boxes were installed by quarry staff on 14 February 2018 (totaling 125) offsetting the original clearing works and loss of hollows at a 1:1 ratio assuming the 77 salvaged hollows are distributed throughout the BOA.	<ul style="list-style-type: none"> • 62 Glider boxes • 31 Microchiropteran bat boxes • Two owl nest boxes
July-August 2020	193 nest boxes were installed within the BOA to replace hollows removed during clearing undertaken on site in May and August 2018 at a ratio 1:1 as per the requirements of the L&RP and the BOAMP.	<ul style="list-style-type: none"> • 70 Glider boxes • 33 Possum boxes • 25 Antechinus boxes • 33 Microchiropteran bat boxes • 23 Feathertail Glider boxes • Nine Owlet Nightjar boxes
November-December 2022	58 nest boxes were installed within the BOA to replace hollows removed during clearing undertaken on site in November and December 2022 at a ratio 1:1 as per the requirements of the L&RP and the BOAMP.	<ul style="list-style-type: none"> • 14 Possum boxes • 10 Microbat boxes • 10 Feathertail boxes • 8 Sugar/squirrel Glider boxes • 7 Antechinus boxes • 5 Small Parrot boxes • 4 Owlet Nightjar boxes

Biennial nest box monitoring was completed by Kleinfelder in 2018, 2020 and Wedgetail in 2022, results from these inspections are summarized below in Table 7.

Table 7: Nest box monitoring results (2022)

Installation Date	Usage Rate	Details
2018 Inspection	2016 Install of 30 nest boxes (2yrs old) = 27% usage.	<ul style="list-style-type: none"> 30 boxes were deemed to be available for use No boxes recorded as damaged or unusable. Eight Glider boxes showed signs of use including one being actively occupied by two Sugar Gliders (<i>Petaurus breviceps</i>). None of the Microchiropteran bat exhibited signs of use during the survey.
2020 Inspection	2016 Install of 30 nest boxes (4yrs old) = 47% usage. 2018 Install of 95 nest boxes (2yrs old) = 28% usage.	<ul style="list-style-type: none"> 122 boxes were deemed to be available for use Two boxes were found to be damaged and one unusable box (termite infested). 40 Glider boxes showed signs of occupation, this included, three boxes occupied by Sugar Gliders (<i>Petaurus breviceps</i>) and 37 other boxes showing signs of use either from Sugar Gliders, Brown Antechinus (<i>Antechinus stuartii</i>) and Feathertail Gliders (<i>Acrobates pygmaeus</i>). Almost half of all the glider nest boxes have either been utilised by or contain fauna species (usage rate of 49%). None of the Microchiropteran bat boxes exhibited signs of use
2022 Inspection	2016 Install of 30 nest boxes (6yrs old) = 40% usage. 2018 Install of 95 nest boxes (4yrs old) = 46% usage. 2020 Install of 193 nest boxes (2yrs old) = 46% nest boxes	<ul style="list-style-type: none"> 287 boxes were deemed to be available for use Thirty-two boxes were found to be damaged and unusable boxes due to termite damage or European bee infestation. 108 Glider boxes showed signs of occupation, this included, six boxes occupied by Sugar Gliders (<i>Petaurus breviceps</i>), one box occupied by a Squirrel Glider (<i>Petaurus norfolcensis</i>), one by Brown Antechinus (<i>Antechinus stuartii</i>) and 100 other boxes showing signs of use either from Sugar Gliders, Brown Antechinus (<i>Antechinus stuartii</i>) and Feathertail Gliders (<i>Acrobates pygmaeus</i>). Almost three quarters of all the glider nest boxes have either been utilised by or contain fauna species (usage rate of 70%). None of the Microchiropteran bat boxes exhibited signs of use



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Legend

- Biodiversity Offset Area
- Project Disturbance Area
- Cadastre
- Primary Road

Habitat Resources and Nestbox Locations

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Figure:

7



4. PERFORMANCE CRITERIA EVALUATION

Performance Criteria Evaluation

BOAMP performance criteria and an evaluation of the current status, relevant management actions completed or further works required are detailed below in **Table 8**. It is noted that the BOAMP was endorsed by all consent authorities (i.e. Council, NSW DP&E and Commonwealth DotE) as of March 2016. As such, all Year 1 management actions were due to be completed before March 2017 to ensure compliance with the relevant performance criteria.

Table 8: Current status of BOAMP performance criteria

Action	Performance Criteria	Current Status (2022)
Fencing, Gates and Signage		
Fence mapping	Completed by end of year 1	Baseline fence mapping completed in October 2015.
Boundary fencing, gates and signage installation / repairs	Completed by end of year 1	Outstanding Ongoing installation of boundary fencing, gates and signage required. Mostly restricted due to access (e.g. around uncleared areas of the extraction area).
Redundant fencing removal	Completed by end of year 3	N/A – no redundant fencing identified during baseline fence mapping.
Fencing inspections	Completed annually	Annual inspection completed.
Fencing maintenance	Maintain boundary fencing as direct by annual inspection	Maintenance required following 2022 inspection. Repair of boundary fencing, gates and signage is to be undertaken as required.
Access Tracks		
Access track mapping and assessment	Completed by end of year 1	Baseline track mapping and assessment completed in October 2015.
Access track repairs	Completed by end of year 3 Track repair does not impact on ecological values and is restricted to defined limits	No major track repair requirements identified. Access tracks assessed as being in suitable condition for 4WD access during the 2022 monitoring.
Redundant access track rehabilitation	Completed by end of year 3	Rehabilitation of redundant tracks completed and natural regeneration occurring.
Access track inspections	Completed annually	Annual inspection completed.
Erosion, Sedimentation and Soil Management		
Erosion and sedimentation mapping	Completed by end of year 1	Baseline assessment completed in October 2015.
Erosion repair and management	Completed by end of year 3 Repair of erosion within BOA does not impact on ecological values	The 2022 survey identified areas requiring repair and/or management, these actions should be undertaken immediately.

Action	Performance Criteria	Current Status (2022)
		The effectiveness of erosion and sediment control measures within the Karuah East Quarry project area, such as silt fencing and diversion drains, should be inspected and maintained regularly and after rain events.
Erosion inspections	Completed annually	Annual inspection completed in December 2022.
Existing Dwellings		
Exclusion of existing dwellings from Conservation Agreement	Completed by end of year 1	The survey plan excluded the two existing dwellings.
Fencing and signage installation	Completed by end of year 1	Outstanding - Installation of fencing, gates and signage required.
Inspections	Completed annually	Annual inspection completed in November 2022.
Maintenance and weed control	<p>No noxious weeds present within excised areas.</p> <p>No unauthorised disturbance outside of excised areas in the BOA.</p>	<p>The exotic species, <i>Lantana camara</i> is present within the BOA, identified during 2022 monitoring surveys. This species appears to be increasing in abundance. Control is recommended to prevent the spread of this species and the potential decline of vegetation integrity of the BOA.</p> <p>No unauthorised disturbance observed outside of excised areas in the BOA during 2022 monitoring.</p>
Revegetation and Regeneration*		
Confirm extent of revegetation areas	Completed by end of year 1	Completed. No revegetation works were assessed as being required within the BOA during the 2015, 2016, 2017, 2018, 2019, 2020, 2021 or 2022 monitoring events. The requirement for revegetation works within the BOA will be reassessed each year.
Habitat Augmentation		
Salvage and redistribution of habitat resources	<p>Redistribution of salvaged resources by end of Year 3</p> <p>Redistribution of salvaged resources does not impact on ecological values of BOA, including threatened flora</p>	The 77 salvaged hollows were determined to be unsuitable for reinstallation. The installation of 193 nest boxes in July/August 2020 compensates for the loss of these hollows and recent clearing works undertaken on site.
Nest box installation	<p>30 nest boxes installed in BOA prior to commencement of clearing.</p> <p>Remaining nest boxes installed within three months following completion of clearing.</p>	Completed. A total of 377 nest boxes have been installed within the BOA. This includes Thirty nest boxes installed in the southern part of the BOA in April 2015 prior to commencement of clearing, an additional 95 were installed in February 2018, the installation of 193 nest boxes in July-August 2020 and

Action	Performance Criteria	Current Status (2022)
		58 during November and December 2022. Currently there are no outstanding nest boxes to be installed as of December 2022.
Nest box monitoring and maintenance	Nest boxes inspected every two years. Repairs / maintenance implemented within 6 months of biennial inspection.	Monitoring of nest box 1-30 was carried in April 2018. Monitoring of boxes 1-125 was carried out in June 2020. Monitoring of all (1-319) boxes occurred during November and December 2022.
Threatened Flora Translocation		
Tetratheca juncea translocation	Translocation completed by end of year 1 Maintenance and monitoring undertaken in accordance with the TjMP	Refer to Tj Translocation Monitoring Report (Firebird 2018).
Weed Control		
Baseline weed mapping	Completed by end of year 1	Baseline assessment completed in October 2015 (Kleinfelder 2015).
Delineation of threatened flora prior to weed control works	No impacts on threatened flora populations within BOA from weed control activities.	N/A – no weed control works undertaken surrounding threatened species locations to date.
Weed control	20% reduction in extent or density (cover) of target weeds per year compared to baseline mapping by end of Year 3. Weed control activities do not impact on ecological values.	Outstanding There has been little change in weed density over the Lot 5 area since the 2018 monitoring round. Small area of Lantana along the creek line in Lot 14 was sprayed in September 2018. Substantial amount of dieback in this area has occurred by February 2019. Additional weed control was undertaken in February 2019. Further dieback was recorded in November 2019, so that only scattered individuals now occur. Weed control has been undertaken along the boundary fence of Lot 12 in February 2019, and along the entire perimeter of Lot 12 in November 2019. Further weed control is recommended to prevent the establishment of Lantana (low density areas) or control established patches (medium/high density areas).
Weed monitoring	Completed biennially (every two years) (for BOA). Completed annually (KEQ, 50 m buffer and Yalimbah Creek).	Weed mapping revisited for KEQ project area, adjoining vegetation within 50 m of the project area boundary on Lots 12 and 13, along Yalimbah Creek (Lot 12) and BOA in November 2022.
Vertebrate Pest Management		

Action	Performance Criteria	Current Status (2022)
Baseline vertebrate pest assessment	Completed by end of year 1	Baseline assessment completed in October 2015 (Kleinfelder 2015).
Vertebrate pest control	No non-target species affected by control works. Reduction in abundance of target species across BOA compared to baseline assessment.	Feral animal control was undertaken in February 2019.
Monitoring	Completed biennially (every two years).	Outstanding 2017 biennially vertebrate pest monitoring required. 1080 baiting was undertaken within Lot 5 during December 2020.
Fire Management		
Fire management strategy	Completed by end of year 1	Outstanding A fire management strategy is to be prepared for the BOA.
Bushfire mitigation	Bushfire mitigation measures in the L&RMP adhered to at all times	Refer to KEQ Annual Environmental Report.
Aerial Fauna Crossing		
Installation of aerial fauna crossings	Installed upon completion of Haul Road. A 12-month monitoring program of the two aerial fauna crossings will be undertaken using remote motion sensing cameras mounted on each pole (four cameras in total) once the crossings have been installed.	Completed Aerial fauna crossings installed at Karuah Hardrock Quarry in 2019, and KEQ in 2020. Remote Camera monitoring programmes for both crossings are proposed, requiring installation of cameras.
Ecological Monitoring		
Additional baseline surveys	Completed prior to clearing	Baseline surveys completed (refer to Kleinfelder 2016).
Vegetation and threatened flora monitoring	Baseline ecological monitoring undertaken prior to clearing in year 1. Less than 10% decline in <i>Tetratheca juncea</i> , <i>Grevillea parviflora</i> subsp. <i>parviflora</i> and <i>Asperula asthenes</i> population sizes (at monitoring sites) compared to baseline assessment. No major changes in vegetation health or condition across BOA.	Baseline ecological monitoring completed (refer to Kleinfelder 2016). No major changes in vegetation health or condition were observed in the BOA in 2022. An small decline in threatened flora species at monitoring sites was observed during 2022 survey.

*Criteria relating to revegetation within the project area is outlined in the Landscape and Rehabilitation Management Plan (L&RMP).

5. CONCLUSION

Results from the 2022 KEQ BOA annual monitoring indicate that the vegetation and fauna habitats within the Karuah East Biodiversity Offset Area (BOA) and Lot 12 are in good condition and have remained relatively stable since the previous monitoring event in 2021.

The 2022 monitoring programme has identified several key management actions that are required to be completed, which have been highlighted in **Section 3.2.1** of this report. Key results from the 2022 monitoring programme include:

- *Asperula asthenes*, *Tetratheca juncea* and *Grevillea parviflora* subsp. *parviflora* populations are in good condition. Several populations have seen small decreases in size since annual monitoring in 2021, likely due to recent unfavourable weather conditions (flooding). Others have experienced a small increase but have overall remained relatively stable to the baseline results.
- Key disturbances recorded within the KEQ BOA and Lot 12 include minor sedimentation due to overtopping of a small number of sediment fences, the occurrence of dust on foliage within close proximity to quarry operations, and the runoff of excavated rock into the BOA from the eastern boundary and western boundary along the haul road of the quarry operations.
- Weed coverage across the KEQ BOA and Lot 12 has increased – management is required to reduce *Lantana* cover, especially within the northern portion of the site, adjacent to the powerline easement.
- Maintenance required to repair fencing, sediment fencing and minor localised erosion at a track to the south of the stockpile area.
- No feral pigs, or evidence thereof, were observed during the 2022 monitoring event, however this species was identified near the powerline easement in 2020. Despite not having been identified, it is likely this species persists within the BOA and therefore continued control programmes be carried out.
- A total of 377 nest boxes have been installed to date across the KEQ BOA. Monitoring of nest boxes have been carried out in 2018, 2020 and 2022. No further nest boxes need to be installed until further clearing of hollow bearing trees occurs.

6. REFERENCES

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APPENDIX A. VEGETATION CONDITION ASSESSMENT RESULTS

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP1	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> Observed increase in ground cover following drier conditions between 2019-2020 Midstorey regeneration present. Moderate cover of fallen logs / timber. Moderate to dense ground cover. Low rock cover. <p>Conclusion: This years monitoring identified similar results in comparison to the previous survey (2021). Groundcover is likely to still be recovering in response to favourable weather conditions following drier conditions between 2019-2020.</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. No signs of recent fire. <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2020).</p>	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP2	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> Minor dieback of mid-storey species, <i>Bursaria spinosa</i> observed in 2021. Increase in ground cover in both 'grass' and 'other' categories within monitoring site: predominantly <i>Themeda triandra</i> since 2020. Moderate cover of fallen logs / timber. Rocky areas present. Hollow-bearing trees and one stag present within vicinity of monitoring site. <p>Conclusion: No significant changes in 'grass' and 'other' groundcover, suggesting that the site has recovered from drier conditions experienced on site during 2019-2020. No other significant changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. No signs of recent fire. Small increase in weed cover within monitoring plot. Heavy <i>Lantana</i> infestation in the gully south west of MP2 remains. <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2020).</p>	N/A
MP3	Brush Box – Turpentine shrubby open forest	<ul style="list-style-type: none"> All vegetation strata within the monitoring site in healthy condition. Canopy and midstory remain stable. High structural complexity of vegetation. High fallen timber. Light-Moderate cover of fallen timber. Weed cover (<i>Lantana</i> and <i>Tradescantia</i>) within the monitoring site has increased, potentially in response to high rainfall in 2022. <p>Conclusion: Excluding an increase in the abundance of exotic plants, no significant or notable changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. No signs of recent fire. <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2020).</p>	<ul style="list-style-type: none"> There was an decrease in number of <i>Asperula asthenes</i> individuals within the monitoring site from 18 in 2021 to 14 in 2022. One new <i>Asperula asthenes</i> plants were recorded in 2022. Eleven <i>Asperula asthenes</i> plants were recorded flowering during monitoring. All <i>Asperula asthenes</i> plants within the monitoring site were observed to be in healthy condition. The population at MP 3 remains stable since 2015 baseline (16 individuals recorded).

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP4	Brush Box – Turpentine shrubby open forest	<ul style="list-style-type: none"> Large increase in <i>Doodia aspera</i> abundance within the understorey of the monitoring plot. Decrease in overall shrub cover, potentially due to vine smothering. Apart from the minor shrub dieback all vegetation strata within the monitoring site in healthy condition. Canopy and midstory remain stable. High structural complexity of vegetation. High fallen timber. Weed cover (<i>Lantana</i> and <i>Tradescantia</i>) within the monitoring site remain stable. <p>Conclusion: A notable increase in the abundance of ferns in the understorey, and a reduction in overall shrub cover since 2020. No other significant or notable changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. No recent evidence of disturbance from grazing, rubbish dumping, rock / timber removal, or dust. No signs of recent fire. Weed abundance remains stable. Flow of water from heavy rain has washed away leaf litter and possible some <i>Asperula asthenes</i> individuals. <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2021). Only change is heavy rainfall has washed away leaf litter and some timber.</p>	<ul style="list-style-type: none"> There was a decrease in number of <i>Asperula asthenes</i> individuals recorded within the monitoring site, from 40 in 2020 to 32 in 2021 then to 15 in 2022. No new <i>Asperula asthenes</i> individuals were recorded in 2022. One <i>Asperula asthenes</i> plant was recorded flowering during monitoring. All <i>Asperula asthenes</i> plants within the monitoring site were observed to be in healthy condition. The population at MP 4 remains stable since 2015 baseline (15 individuals recorded) with recent large decrease in population likely the result of heavy rainfall and flow of water through the monitoring point removing some individuals.
MP5	Blackbutt – Turpentine – Tallowwood shrubby open forest	<ul style="list-style-type: none"> No evidence of foliage die-back was observed in the canopy or ground layer Midstory regeneration present: decrease in shrub abundance. Moderate fallen logs / timber. Moderate/dense ground cover. <p>Conclusion: No significant changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. No signs of recent fire. <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2021).</p>	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP6	Blackbutt – Turpentine – Tallowwood shrubby open forest	<ul style="list-style-type: none"> • Increase in abundance of midstorey species, particularly <i>Callistemon salignus</i>. • Canopy remains in healthy condition. • Canopy and midstory regeneration present. • Moderate level of fallen logs / timber. • Ground cover is moderate. • Lantana has established in low abundance within the monitoring point. <p>Conclusion: No significant changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> • No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal was observed. • Dust cover observed on foliage. • No signs of recent fire. • Runoff observed within creek dirty water present <p>Conclusion: Dust cover on foliage has been observed within the monitoring site from 2020 to 2022.</p>	N/A
MP7	Smooth-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> • Regeneration of foliage in canopy and midstory. • All vegetation strata in healthy condition. • Regrowth vegetation to the north and east (previously cleared). • Moderate litter cover within monitoring site, fallen timber present. • Increase in groundcover recorded within the monitoring site since 2020 (see Appendix B). increase in <i>Gahnia radula</i> and grasses. <p>Conclusion: The monitoring point remains stable with signs of regeneration and increasing abundance in several stratum since the previous survey (2021).</p>	<ul style="list-style-type: none"> • No evidence of erosion and sedimentation. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. • Dust cover observed on foliage. • No signs of recent fire. <p>Conclusion: Dust cover on foliage has been observed within the monitoring site from 2020 to 2022.</p>	<ul style="list-style-type: none"> • There was a decrease in the number of <i>Tetratheca juncea</i> clumps recorded within the monitoring site, from 15 in 2021 to 10 in 2022. • No new <i>Tetratheca juncea</i> clumps were recorded in 2022. • Seven <i>Tetratheca juncea</i> plants were recorded flowering during monitoring. • Two <i>Tetratheca juncea</i> plants were recorded with fruits during monitoring. • All <i>Tetratheca juncea</i> plants within the monitoring site were observed to be in healthy condition. • The <i>Tetratheca juncea</i> population at MP 7 remains stable since 2015 baseline (14 individuals recorded)

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP8	Smooth-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> Changes to groundcover composition, with a decrease in grass groundcover and an increase in 'other' with <i>Ptilotrix deusta</i> recorded higher than in previous years (Appendix B). No exotic species identified within this plot. No dieback of canopy stratum was observed. Canopy and midstorey regeneration present Moderate fallen timber Dense ground cover and midstory <p>Conclusion: Minor changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust No signs of recent fire Old track to north-east <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2021).</p>	<ul style="list-style-type: none"> There was a decrease in the number of <i>Tetratheca juncea</i> clumps recorded within the monitoring site, from 13 in 2021 to 9 in 2022. No new <i>Tetratheca juncea</i> clump was recorded in 2021. Seven <i>Tetratheca juncea</i> plants were recorded flowering during monitoring. One <i>Tetratheca juncea</i> plant was recorded with fruits during monitoring. All <i>Tetratheca juncea</i> plants within the monitoring site were observed to be in healthy condition. The <i>Tetratheca juncea</i> population at MP 8 has decreased slightly since 2015 baseline (10 individuals recorded) in 2022. The one <i>Grevillea parviflora</i> subsp. <i>parviflora</i> individual occurring within MP 8 in 2020 was absent during the 2022 monitoring surveys.
MP9	Smooth-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> Recovering from dieback and subsequent increase in canopy cover. There was no sign of foliage die-back in the understory. Dead wood was observed throughout the canopy. Moderate fallen timber. High ground cover present in 2022. <p>Conclusion: Minor changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rock / timber removal, or dust. No signs of recent fire. Old track to south. <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2022).</p>	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP10	Sydney Peppermint - Smooth-barked Apple shrubby open forest	<ul style="list-style-type: none"> Same PFC in midstorey from <i>Allocasuarina littoralis</i> growth as 2021. All vegetation strata in healthy condition. Canopy and midstory regeneration present. Low-moderate fallen timber and moderate litter coverage.. Moderate to dense ground cover. <p>Conclusion: No major changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. No signs of recent fire. Three old dead stags present. <p>Conclusion: No new disturbance or changes in existing disturbance severity were observed since the previous survey (2020).</p>	N/A
MP11	Sydney Peppermint - Smooth-barked Apple shrubby open forest	<ul style="list-style-type: none"> No evidence of foliage die-back. All vegetation strata in healthy condition. Canopy and midstory regeneration present. Low fallen timber. Moderate ground cover. <p>Conclusion: No significant or notable changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. No signs of recent fire. <p>Conclusion: No recent disturbance was observed since the previous survey (2021).</p>	<ul style="list-style-type: none"> There was a small decrease in the number of <i>Grevillea parviflora</i> subsp. <i>parviflora</i> plants recorded within the monitoring site, from 11 in 2021 to 10 in 2022. No new <i>Grevillea parviflora</i> subsp. <i>parviflora</i> plants were recorded in 2021. The majority of <i>Grevillea parviflora</i> subsp. <i>parviflora</i> plants within the monitoring site were observed to be in healthy condition. The <i>Grevillea parviflora</i> subsp. <i>parviflora</i> population at MP 11 has declined since 2015 baseline (16 individuals recorded). The one <i>Tetratheca juncea</i> clump recorded at MP 11 in 2020 continues to be in a healthy condition with 37 flowers and no fruit.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP12	Smooth-barked Apple – Red Bloodwood open forest	<ul style="list-style-type: none"> Midstorey reduced compared to surroundings. Very high levels of fallen timber (from clearing). Moderate ground cover. Evidence of regeneration in understorey and midstorey. <p>Conclusion: Felled timber remains (from previous impact due to fence maintenance), however, no significant changes have occurred to vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from pest animals, rubbish dumping, rock / timber removal or dust, however area has been previously subject to clearing due to fence line maintenance. No signs of recent fire. Clearing and log stockpiling in order to maintain an adjacent access track has impacted some of the vegetation including at least three <i>Grevillea parviflora</i> individuals. <p>Conclusion: Excluding the maintenance of an adjacent accessway, no evidence of new disturbance was observed since the previous survey (2021).</p>	<ul style="list-style-type: none"> There was a same number of <i>Grevillea parviflora</i> subsp. <i>parviflora</i> plants recorded within the monitoring site, 2021 to 2022 (7). All <i>Grevillea parviflora</i> subsp. <i>parviflora</i> plants within the monitoring site were observed to be in healthy condition. Five <i>Grevillea parviflora</i> subsp. <i>parviflora</i> plants were recorded with flowers in 2022 with one individual fruting. The <i>Grevillea parviflora</i> subsp. <i>parviflora</i> population at MP 11 remains stable with surveys completed in 2015 (seven individuals recorded).
MP13	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> Some dieback in mature <i>Allocasuarina torulosa</i> individuals. Regeneration observed within the canopy and mid-storey due to previous dieback. Low level of fallen logs / timber. Dense ground cover. Low rock cover. Substantial dieback in canopy directly adjacent to the monitoring point. Eucalypt and Midstory seedlings present. <p>Conclusion: Regeneration is occurring within the monitoring point with still some dieback of <i>A.torulosa</i>.</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. Significant dust settlement recorded here in 2021. No signs of recent fire. <p>Conclusion: No evidence of new disturbance was observed since the previous survey (2021).</p>	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP14	Smooth-barked Apple - Red Bloodwood open forest	<ul style="list-style-type: none"> Two individuals of <i>Setaria sphacelata</i>. All vegetation strata in healthy condition. Canopy and midstorey regeneration present. Low fallen/ timber. Dense ground cover. <p>Conclusion: No significant or notable changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion. Evidence of sedimentation of quarry rock material adjacent to monitoring plot from haul road into the nearby dam. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. No signs of recent fire. Dust accumulation on foliage from Quarry. Light cover of exotic grasses around dam to south and along access track. <p>Conclusion: New evidence of sedimentation was observed since the previous survey (2021).</p>	N/A

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP15	Blackbutt - Turpentine - Tallowood shrubby open forest	<ul style="list-style-type: none"> • Increase in Canopy cover since the 2021 survey. • All vegetation strata in moderately healthy condition. • Moderate fallen timber. • Dense ground cover and leaf litter. • Rocky areas present. <p>Conclusion: Only minor changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> • No evidence of erosion and sedimentation. • There are some edge effects from adjacent clearing. • No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. • No signs of recent fire. • Thick dust coating on foliage. <p>Conclusion: Dust cover on foliage was observed within the monitoring site in 2021 and again in 2022 seemingly becoming thicker.</p>	<ul style="list-style-type: none"> • There was an decrease in the number of <i>Tetratheca juncea</i> clumps recorded within the monitoring site, from 12 in 2021 to 7 in 2021. • One new <i>Tetratheca juncea</i> clump was recorded in 2022. • Six <i>Tetratheca juncea</i> plants were recorded flowering during monitoring. • No <i>Tetratheca juncea</i> plants were recorded with fruits during monitoring. • All <i>Tetratheca juncea</i> plants within the monitoring site were observed to be in healthy condition. • The <i>Tetratheca juncea</i> population at MP 15 has declined since 2015 baseline (30 individuals recorded). This decline in the <i>T. juncea</i> at MP 15 is most likely due to the lower than average rainfall during 2019, exacerbated by the location of the monitoring point; upper slopes of exposed hill side.

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP16	Spotted Gum – Grey Ironbark open forest	<ul style="list-style-type: none"> Increased non-grass groundcover in response to increased <i>Doodia aspera</i> abundance. All vegetation strata in healthy condition. Canopy and midstory regeneration present. Moderate fallen timber. Dense leaf litter and moderate ground cover. Low rock cover. <p>Conclusion: Minor changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> No evidence of erosion and sedimentation. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. No signs of recent fire. Several old dead stags present. <p>Conclusion: No evidence of new disturbance was observed since the previous survey (2021).</p>	<ul style="list-style-type: none"> <i>Asperula asthenes</i> detected within monitoring plot for first time (2021). Six individual plants identified in 2022. All six <i>Asperula asthenes</i> plants were recorded flowering during monitoring. Two <i>Asperula asthenes</i> plants were recorded fruiting during monitoring. All <i>Asperula asthenes</i> plants within the monitoring site were observed to be in healthy condition
MP17	Brush Box - Turpentine shrubby open forest	<ul style="list-style-type: none"> No evidence of foliage die-back, evidence of midstorey and canopy regeneration. All vegetation strata in healthy condition. Abundance of juvenile <i>Backhousia myrtifolia</i> in midstorey, subsequently increasing mid-storey cover. <i>Lantana camara</i> abundance remains stable. Moderate fallen timber. Dense ground cover. Rocky areas along ephemeral creek. <p>Conclusion: No significant or notable changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> Very minor scouring along creek bank. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, rock / timber removal, or dust. Stable exotic plant community (<i>Lantana camara</i>). No signs of recent fire. Dirty water running within the creek after recent rainfall. <p>Conclusion: Evidence of new disturbance was observed since the previous survey (2021) with dirty water running within the creek.</p>	<ul style="list-style-type: none"> There was a decrease in number of <i>Asperula asthenes</i> individuals within the monitoring site from 10 in 2021 to 6 in 2022. Six <i>Asperula asthenes</i> plants were recorded flowering during monitoring. All <i>Asperula asthenes</i> plants within the monitoring site were observed to be in healthy condition. The population at MP 17 has decreased since 2015 baseline (11 individuals recorded).

Site	Vegetation Community	Vegetation and Habitat Condition	Evidence of Disturbance	Threatened Flora Monitoring
MP18	Brush Box - Turpentine shrubby open forest	<ul style="list-style-type: none"> All vegetation strata in healthy condition Canopy and midstorey regeneration present Low fallen timber High level of leaf litter present. Moderate ground cover Rocky areas along ephemeral creek. <p>Conclusion: No significant or notable changes in vegetation and habitat condition since the previous survey (2021).</p>	<ul style="list-style-type: none"> Very minor scouring along creek bank. No recent evidence of disturbance from grazing, pest animals, rubbish dumping, or rock / timber removal. Minor dust coverage on foliage. No signs of recent fire. <p>Conclusion: No evidence of new disturbance was observed since the previous survey (2020).</p>	<ul style="list-style-type: none"> There was a small increase in number of <i>Asperula asthenes</i> individuals within the monitoring site from 9 in 2021 to 10 in 2022. One new <i>Asperula asthenes</i> plants was recorded in 2022. Two <i>Asperula asthenes</i> plant was recorded flowering during monitoring. All <i>Asperula asthenes</i> plants within the monitoring site were observed to be in healthy condition. The population at MP 18 has declined slightly since 2015 baseline (13 individuals recorded). Previous years of below average rainfall have likely impacted this population, however with signs of plants reshooting and flowering, as well as plants sighted outside the monitoring point, this population has potential to recover.

APPENDIX B. VEGETATION MONITORING DATA

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
MP 1	Canopy	<i>Eucalyptus propinqua</i> (Small-fruited Grey Gum), <i>E. microcorys</i> (Tallowwood), <i>E. acmenoides</i> (White Mahogany) and <i>Corymbia maculata</i> (Spotted Gum)	50%	50%	50%	50%	50%	40%	40%	35%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak) and <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree)	40%	40%	40%	40%	40%	15%	20%	15%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath), <i>Hibbertia aspera</i> (Rough Guinea Flower) and <i>Breynia oblongifolia</i> (Coffee Bush)	5%	5%	5%	5%	5%	5%	5%	5%
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Oplismenus imbecillis</i> (Creeping Beard Grass), <i>Poa labillardierei</i> (Tussock) and <i>Themeda triandra</i> (Kangaroo Grass)	60%	60%	60%	60%	40%	20%	35%	35%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Gonocarpus teucroides</i> (Raspwort), <i>Carex longibrachiata</i> and <i>Adiantum aethiopicum</i> (Common Maidenhair)	50%	50%	50%	50%	50%	20%	30%	30%
	Exotic	<i>Lantana camara</i> (Lantana)	30%	30%	25%	25%	20%	10%	15%	15%
MP 2	Canopy	<i>Corymbia maculata</i> (Spotted Gum), <i>Eucalyptus microcorys</i> (Tallowwood), <i>E. canaliculata</i> (Grey Gum) and <i>E. paniculata</i> subsp. <i>paniculata</i> (Grey Ironbark)	40%	40%	40%	40%	40%	40%	35%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Bursaria spinosa</i> (Blackthorn) and <i>Exocarpos cupressiformis</i> (Cherry Ballart)	40%	35%	35%	35%	35%	30%	20%	20%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath) and <i>Acacia ulicifolia</i> (Prickly Moses)	5%	5%	5%	5%	5%	10%	5%	5%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass) and <i>Poa labillardierei</i> (Tussock)	50%	50%	50%	50%	40%	25%	40%	40%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Gonocarpus tetragynus</i> and <i>Eustrephus latifolius</i> (Wombat Berry)	20%	20%	20%	20%	40%	5%	30%	35%
	Exotic	<i>Lantana camara</i> (Lantana)	5%	5%	1%	1%	1%	0%	2%	5%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
MP 3	Canopy	<i>Lophostemon confertus</i> (Brush Box), <i>Syncarpia glomulifera</i> (Turpentine), <i>Eucalyptus propinqua</i> (Small-fruited Grey Gum) and <i>E. microcorys</i> (Tallowwood)	40%	40%	40%	40%	40%	35%	35%	45%
	Midstorey	<i>Melaleuca styphelioides</i> (Prickly-leaved Tea Tree), <i>Livistona australis</i> (Cabbage Palm), <i>Allocasuarina torulosa</i> (Forest Oak) and <i>Elaeocarpus obovatus</i> (Hard Quandong)	60%	60%	60%	60%	60%	40%	40%	40%
	Shrub	<i>Pittosporum multiflorum</i> (Orange Thorn), <i>Diospyros australis</i> (Black Plum) and <i>Bursaria spinosa</i> (Boxthorn)	40%	40%	50%	50%	60%	60%	55%	60%
	Ground (grass)	<i>Oplismenus aemulus</i> (Australian Basket Grass)	<5%	<5%	<5%	<5%	<5%	<5%	<5%	5%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Carex longibrachiata</i> , <i>Adiantum hispidulum</i> (Rough Maidenhair Fern) and <i>Cissus antarctica</i> (Kangaroo Vine)	90%	90%	90%	90%	90%	65%	70%	70%
	Exotic	<i>Lantana camara</i> (Lantana) and <i>Ageratina riparia</i> (Mistflower)	50%	50%	50%	50%	40%	20%	30%	30%
MP 4	Canopy	<i>Lophostemon confertus</i> (Brush Box), <i>Syncarpia glomulifera</i> (Turpentine), and <i>Eucalyptus propinqua</i> (Small-fruited Grey Gum)	30%	30%	30%	30%	40%	25%	30%	30%
	Midstorey	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree), <i>Livistona australis</i> (Cabbage-tree Palm), <i>Melaleuca styphelioides</i> (Prickly-leaved Tea Tree), <i>Acmena smithii</i> (Lilly Pilly) and <i>Elaeocarpus obovatus</i> (Hard Quandong)	60%	60%	60%	60%	60%	60%	60%	60%
	Shrub	<i>Pittosporum multiflorum</i> (Orange Thorn)	5%	5%	3%	3%	3%	20%	3%	3%
	Ground (grass)	<i>Oplismenus aemulus</i> (Australian Basket Grass)	5%	5%	5%	5%	5%	15%	5%	5%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Morinda jasminoides</i> (Sweet Morinda) and <i>Carex longibrachiata</i>	90%	90%	90%	90%	90%	20%	70%	70%
	Exotic	<i>Lantana camara</i> (Lantana), <i>Asparagus aethiopicus</i> (Ground Asparagus) and <i>Tradescantia fluminensis</i> (Wandering Jew)	35%	35%	25%	30%	30%	30%	30%	20%
MP 5	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>E. microcorys</i> (Tallowwood), <i>Angophora costata</i> (Smooth-barked Apple) and <i>E. globoidea</i> (White Stringybark)	40%	40%	40%	40%	40%	40%	40%	40%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree), <i>Persoonia linearis</i> (Narrow-leaved Geebung) and <i>Melaleuca linariifolia</i> (Flax-leaved Paperbark)	60%	60%	60%	60%	60%	40%	40%	40%
	Shrub	<i>Leptospermum polygalifolium</i> (Tantoon), <i>Hibbertia aspera</i> (Rough Guinea Flower), <i>Breynia oblongifolia</i> (Coffee Bush) and <i>Phyllanthus hirtellus</i> (Thyme Spurge)	5%	5%	10%	10%	10%	10%	25%	15%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic) and <i>Oplismenus imbecillis</i> (Creeping Beard Grass)	60%	60%	60%	60%	60%	40%	35%	15%
	Ground (other)	<i>Doryanthes excelsa</i> (Gynea Lily), <i>Pteridium esculentum</i> (Common Bracken), <i>Ptilothrix deusta</i> and <i>Lomandra longifolia</i> (Spiny-headed Mat-rush)	50%	50%	50%	50%	50%	50%	50%	60%
	Exotic	<i>Lantana camara</i> (Lantana)	-	-	-	-	-	-	-	1%
MP 6	Canopy	<i>Eucalyptus microcorys</i> (Tallowwood), <i>E. propinqua</i> (Small-fruited Grey Gum), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>Eucalyptus pilularis</i> (Blackbutt)	50%	50%	50%	50%	50%	45%	45%	45%
	Midstorey	<i>Melaleuca styphelioides</i> (Prickly-leaved Tea Tree), <i>Allocasuarina torulosa</i> (Forest Oak), <i>Acmena smithii</i> (Lilly Pilly), <i>Callistemon salignus</i> (Willow Bottlebrush) and <i>Backhousia myrtifolia</i> (Grey Myrtle), <i>Acacia</i> sp.	60%	60%	50%	55%	30%	20%	35%	45%
	Shrub	<i>Hibbertia aspera</i> (Rough Guinea Flower), <i>Breynia oblongifolia</i> (Coffee Bush) and <i>Zieria smithii</i> (Sandfly Zieria)	<5%	<5%	<5%	5%	1%	5%	10%	15%
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Calochlaena dubia</i> (Rainbow Fern), <i>Oplismenus imbecillis</i> (Creeping Beard Grass) and <i>Poa labillardierei</i> (Tussock)	20%	20%	20%	20%	20%	20%	20%	20%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Doryanthes excelsa</i> (Gynea Lily), <i>Adiantum aethiopicum</i> (Common Maidenhair) and <i>Morinda jasminoides</i> (Sweet Morinda)	30%	30%	30%	30%	30%	30%	30%	40%
	Exotic	<i>Lantana camara</i> (Lantana)	-	-	-	-	-	-	2%	2%
MP 7	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark) and <i>Corymbia gummifera</i> (Red Bloodwood)	35%	35%	35%	35%	35%	40%	40%	40%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Allocasuarina torulosa</i> (Forest Oak)	40%	40%	40%	40%	40%	40%	40%	40%
	Shrub	<i>Pultenaea euchila</i> (Orange Pultenaea)	5%	5%	5%	5%	5%	5%	10%	10%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass) and <i>Entolasia stricta</i> (Wiry Panic)	50%	50%	50%	50%	40%	25%	25%	35%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Ptilothrix deusta</i> and <i>Gahnia radula</i>	70%	60%	60%	60%	60%	35%	40%	45%
	Exotic	<i>Setaria sphacelata</i> (South African Pigeon Grass)	5%	5%	5%	5%	2%	2%	1%	1%
MP 8	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark) and <i>Corymbia gummifera</i> (Red Bloodwood)	30%	30%	30%	30%	30%	30%	30%	30%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Acacia longifolia</i> (Sydney Golden Wattle)	50%	50%	50%	50%	30%	40%	40%	40%
	Shrub	<i>Pultenaea paleacea</i> (Chaffy Bush-pea), <i>Pultenaea euchila</i> (Orange Pultenaea), <i>Phyllanthus hirtellus</i> (Thyme Spurge), <i>Hibbertia riparia</i> (Erect Guinea-flower) and <i>Hibbertia aspera</i> (Rough Guinea Flower)	20%	20%	20%	20%	15%	15%	15%	10%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic) and <i>Themeda triandra</i> (Kangaroo Grass)	50%	50%	50%	50%	40%	40%	15%	20%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Ptilothrix deusta</i> , <i>Patersonia sericea</i> (Silky Purple-flag) and <i>Lomandra obliqua</i>	50%	50%	50%	50%	50%	40%	50%	55%
	Exotic	Nil	-	-	-	-	-	-	-	-
MP 9	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood), <i>Eucalyptus microcorys</i> (Tallowwood) and <i>E. eugenioides</i> (Thin-leaved Stringybark)	40%	40%	40%	40%	40%	40%	35%	40%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Dodonaea triquetra</i> (Large-leaf Hop-bush) and <i>Persoonia linearis</i> (Narrow-leaved Geebung).	50%	50%	50%	50%	50%	40%	40%	40%
	Shrub	<i>Leptospermum polygalifolium</i> (Tantoon), <i>Pultenaea euchila</i> (Orange Pultenaea), <i>Logania albiflora</i> and <i>Polyscias sambucifolia</i> (Elderberry Panax)	10%	10%	10%	10%	7%	7%	10%	20%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Rhytidosperma pallidum</i> (Red-anther Wallaby Grass), <i>Entolasia stricta</i> (Wiry Panic) and <i>Themeda triandra</i> (Kangaroo Grass)	30%	30%	40%	40%	40%	30%	30%	30%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Pteridium esculentum</i> (Common Bracken) and <i>Ptilothrix deusta</i>	60%	60%	60%	50%	40%	40%	40%	40%
	Exotic	Nil	-	-	-	-	-	-	-	-
MP 10	Canopy	<i>Eucalyptus piperita</i> (Sydney Peppermint), <i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>Eucalyptus microcorys</i> (Tallowwood)	40%	40%	40%	35%	35%	40%	40%	40%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Persoonia linearis</i> (Narrow-leaved Geebung) and <i>A. torulosa</i> (Forest Oak)	10%	10%	10%	10%	10%	10%	15%	15%
	Shrub	<i>Pultenaea euchila</i> (Orange Pultenaea), <i>Leptospermum polygalifolium</i> (Tantoon), <i>Pultenaea paleacea</i> (Chaffy Bush-pea) <i>Polyscias sambucifolia</i> (Elderberry Panax) and <i>Acacia ulicifolia</i> (Prickly Moses)	5%	5%	5%	5%	5%	3%	5%	3%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic), <i>Themeda triandra</i> (Kangaroo Grass) and <i>Imperata cylindrica</i> (Blady Grass)	40%	40%	40%	40%	30%	40%	30%	40%
	Ground (other)	<i>Gahnia radula</i> , <i>Doryanthes excelsa</i> (Gynea Lily), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Ptilothrix deusta</i>	60%	60%	60%	60%	50%	40%	50%	50%
	Exotic	Nil	-	-	-	-	-	-	-	-
MP 11	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>Eucalyptus capitellata</i> (Brown Stringybark)	35%	35%	35%	35%	35%	35%	35%	40%
	Midstorey	<i>Allocasuarina littoralis</i> (Black She-oak), <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Banksia spinulosa</i> (Hairpin Banksia)	40%	40%	40%	40%	40%	40%	45%	45%
	Shrub	<i>Pultenaea euchila</i> (Orange Pultenaea) and <i>Boronia pinnata</i>	5%	5%	5%	5%	5%	5%	5%	5%
	Ground (grass)	<i>Entolasia stricta</i> (Wiry Panic), <i>Imperata cylindrica</i> (Blady Grass) and <i>Themeda triandra</i> (Kangaroo Grass)	35%	35%	40%	40%	30%	25%	25%	30%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
	Ground (other)	<i>Xanthorrhoea latifolia</i> , <i>Pteridium esculentum</i> (Common Bracken) and <i>Ptilothrix deusta</i> , <i>Doryanthes excelsa</i> (Gynea Lily)	60%	60%	60%	60%	50%	40%	40%	25%
	Exotic	Nil	-	-	-	-	-	-	-	-
MP 12	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>Angophora costata</i> (Smooth-barked Apple), <i>E. globoidea</i> (White Stringybark), <i>Corymbia gummifera</i> (Red Bloodwood), <i>E. microcorys</i> (Tallowwood) and <i>E. piperita</i> (Sydney Peppermint)	40%	40%	40%	40%	40%	35%	30%	30%
	Midstorey	<i>Leptospermum polygalifolium</i> (Tantoon), <i>Allocasuarina littoralis</i> (Black She-oak), <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree) and <i>Exocarpos cupressiformis</i> (Cherry Ballart)	30%	30%	30%	30%	30%	15%	15%	15%
	Shrub	<i>Pultenaea euchila</i> (Orange Pultenaea), <i>Boronia pinnata</i> and <i>Banksia spinulosa</i> (Hairpin Banksia)	10%	10%	10%	5%	10%	5%	5%	10%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass), <i>Entolasia stricta</i> (Wiry Panic), and <i>Austrostipa</i> sp.	40%	40%	40%	30%	30%	20%	20%	20%
	Ground (other)	<i>Xanthorrhoea latifolia</i> and <i>Ptilothrix deusta</i>	40%	40%	40%	30%	30%	10%	15%	15%
	Exotic	<i>Senecio madagascariensis</i> (Fireweed)	-	-	-	-	-	-	0.5%	50%
MP 13	Canopy	<i>Eucalyptus sparsifolia</i> (Narrow-leaved Stringybark), <i>Corymbia maculata</i> (Spotted Gum), <i>E. paniculata</i> (Grey Ironbark) and <i>E. microcorys</i> (Tallowwood)	40%	40%	40%	40%	50%	25%	25%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Syncarpia glomulifera</i> (Turpentine) and <i>Callistemon salignus</i> (Willow Bottlebrush)	40%	40%	40%	40%	40%	10%	10%	10%
	Shrub	<i>Hibbertia aspera</i> (Rough Guinea Flower), <i>Pultenaea euchila</i> (Orange Pultenaea), <i>Breynia oblongifolia</i> (Coffee Bush) and <i>Leptospermum polygalifolium</i> (Tantoon)	5%	5%	5%	5%	5%	2%	3%	3%
	Ground (grass)	<i>Imperata cylindrica</i> (Blady Grass), <i>Poa labillardierei</i> (Tussock), <i>Themeda triandra</i> (Kangaroo Grass) and <i>Oplismenus imbecillis</i> (Creeping Beard Grass).	60%	60%	60%	70%	70%	60%	60%	70%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Doryanthes excelsa</i> (Gynea Lily), <i>Lepidosperma laterale</i> , <i>Patersonia sericea</i> and <i>Lomandra multiflora</i> (Many-flowered Mat-rush)	30%	30%	40%	40%	40%	30%	30%	40%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
	Exotic	Nil	-	-	-	-	-	-	-	-
MP 14	Canopy	<i>Angophora costata</i> (Smooth-barked Apple), <i>Eucalyptus eugenioides</i> (Thin-leaved Stringybark), <i>E. microcorys</i> (Tallowwood), and <i>E. paniculata</i> subsp. <i>paniculata</i> (Grey Ironbark)	35%	40%	40%	40%	40%	40%	40%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Callistemon salignus</i> (Willow Bottlebrush) and <i>Glochidion ferdinandi</i> (Cheese Tree)	25%	25%	25%	25%	25%	25%	25%	25%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath), <i>Pultenaea villosa</i> (Hairy Bush-pea), <i>Leptospermum polygalifolium</i> (Tantoon) and <i>Hibbertia aspera</i> (Rough Guinea Flower)	10%	15%	15%	15%	15%	15%	15%	15%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass), <i>Poa labillardierei</i> (Tussock) and <i>Entolasia stricta</i> (Wiry Panic)	80%	80%	80%	80%	80%	80%	75%	75%
	Ground (other)	<i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Doryanthes excelsa</i> (Gynea Lily) and <i>Brunoniella pumilio</i> (Dwarf Blue Trumpet)	30%	30%	30%	30%	30%	30%	30%	30%
	Exotic	<i>Setaria sphacelata</i> (South African Pigeon Grass)	5%	5%	5%	5%	2%	2%	1%	1%
MP 15	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>Angophora costata</i> (Smooth-barked Apple), <i>Corymbia gummifera</i> (Red Bloodwood) and <i>E. microcorys</i> (Tallowwood)	45%	45%	45%	45%	45%	45%	40%	40%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest She-oak) and <i>Acacia irrorata</i> (Green Wattle)	20%	20%	15%	15%	15%	15%	10%	10%
	Shrub	<i>Hibbertia vestita</i> (Hairy Guinea Flower), <i>Breynia oblongifolia</i> (Coffee Bush) and <i>Phyllanthus gunnii</i> (Scrubby Spurge)	10%	10%	10%	10%	10%	10%	15%	15%
	Ground (grass)	<i>Themeda triandra</i> (Kangaroo Grass), <i>Entolasia stricta</i> (Wiry Panic) and <i>Imperata cylindrica</i> (Blady Grass)	30%	30%	30%	30%	25%	25%	25%	25%
	Ground (other)	<i>Doryanthes excelsa</i> (Gynea Lily), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Pteridium esculentum</i> (Common Bracken), <i>Lepidosperma laterale</i> and <i>Xanthorrhoea macronema</i>	60%	60%	60%	60%	50%	50%	55%	55%
	Exotic	<i>Lantana camara</i> (Lantana)	5%	5%	1%	1%	1%	1%	1%	1%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
MP 16	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>E. propinqua</i> (Small-fruited Grey Gum), <i>E. microcorys</i> (Tallowwood) and <i>Angophora costata</i> (Smooth-barked Apple)	50%	50%	50%	50%	50%	50%	50%	50%
	Midstorey	<i>Allocasuarina torulosa</i> (Forest Oak), <i>Syncarpia glomulifera</i> (Turpentine) and <i>Glochidion ferdinandi</i> var. <i>ferdinandi</i> (Cheese Tree)	30%	30%	30%	30%	30%	30%	35%	30%
	Shrub	<i>Leucopogon juniperinus</i> (Prickly Beard-heath) and <i>Acacia floribunda</i> (White Sally Wattle)	10%	10%	10%	10%	10%	10%	10%	10%
	Ground (grass)	<i>Poa labillardierei</i> (Tussock), <i>Imperata cylindrica</i> (Blady Grass), and <i>Oplismenus imbecillis</i> (Creeping Beard Grass)	50%	50%	40%	40%	30%	25%	25%	25%
	Ground (other)	<i>Carex appressa</i> (Tall Sedge), <i>Doodia aspera</i> (Prickly Rasp Fern), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Calochlaena dubia</i> (Rainbow Fern)	30%	30%	40%	40%	30%	20%	35%	25%
	Exotic	<i>Lantana camara</i> (Lantana)	30%	30%	30%	40%	30%	30%	30%	30%
MP 17	Canopy	<i>Eucalyptus pilularis</i> (Blackbutt), <i>E. microcorys</i> (Tallowwood), <i>Syncarpia glomulifera</i> (Turpentine), <i>E. acmenoides</i> (White Mahogany) and <i>E. propinqua</i> (Small-fruited Grey Gum)	40%	40%	40%	40%	40%	45%	45%	45%
	Midstorey	<i>Backhousia myrtifolia</i> (Grey Myrtle), <i>Lophostemon confertus</i> (Brush Box), <i>Livistona australis</i> (Cabbage Palm), <i>Acmena smithii</i> (Lilly Pilly) and <i>Allocasuarina torulosa</i> (Forest Oak)	50%	50%	50%	50%	50%	50%	55%	55%
	Shrub	<i>Wilkiea huegeliana</i> (Veiny Wilkiea), <i>Acacia maidenii</i> (Maiden's Wattle), <i>Eupomatia laurina</i> (Bolwarra) and <i>Pittosporum multiflorum</i> (Orange Thorn)	5%	5%	5%	5%	5%	5%	5%	5%
	Ground (grass)	<i>Poa labillardierei</i> (Tussock), <i>Themeda triandra</i> (Kangaroo Grass) <i>Entolasia marginata</i> (Bordered Panic) and <i>Oplismenus imbecillis</i> (Creeping Beard Grass).	40%	40%	40%	40%	40%	25%	20%	20%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush), <i>Gymnostachys anceps</i> (Settlers' Twine) and <i>Calochlaena dubia</i> (Rainbow Fern)	50%	50%	50%	50%	50%	65%	65%	60%
	Exotic	<i>Lantana camara</i> (Lantana)	10%	15%	15%	15%	15%	15%	15%	5%
MP 18	Canopy	<i>Eucalyptus saligna</i> (Sydney Blue Gum), <i>E. microcorys</i> (Tallowwood), <i>Syncarpia glomulifera</i> (Turpentine), and <i>E. acmenoides</i> (White Mahogany)	45%	45%	45%	45%	45%	45%	45%	45%

Monitoring Site	Dominant Floristics		Projected Foliage Cover (%)							
			2015	2016	2017	2018	2019	2020	2021	2022
	Midstorey	<i>Lophostemon confertus</i> (Brush Box), <i>Backhousia myrtifolia</i> (Grey Myrtle), <i>Cryptocarya glaucescens</i> (Jackwood), <i>Allocasuarina torulosa</i> (Forest Oak) and <i>Acacia irrorata</i> (Green Wattle)	25%	25%	25%	25%	25%	25%	25%	30%
	Shrub	<i>Acacia maidenii</i> (Maiden's Wattle) and <i>Denhamia silvestris</i> (Narrow-leaved Orangebark), <i>Persoonia linearis</i> (Narrow-leaved Geebung)	5%	5%	5%	5%	5%	5%	5%	5%
	Ground (grass)	<i>Poa labillardierei</i> (Tussock), <i>Imperata cylindrica</i> (Blady Grass), and <i>Oplismenus imbecillis</i> (Creeping Beard Grass)	50%	50%	50%	50%	40%	15%	20%	20%
	Ground (other)	<i>Doodia aspera</i> (Prickly Rasp Fern), <i>Lomandra longifolia</i> (Spiny-headed Mat-rush) and <i>Gymnostachys anceps</i> (Settlers' Twine)	50%	50%	50%	50%	40%	30%	35%	50%
	Exotic	<i>Lantana camara</i> (Lantana)	10%	15%	15%	15%	15%	15%	15%	10%



APPENDIX C. THREATENED FLORA MONITORING RESULTS

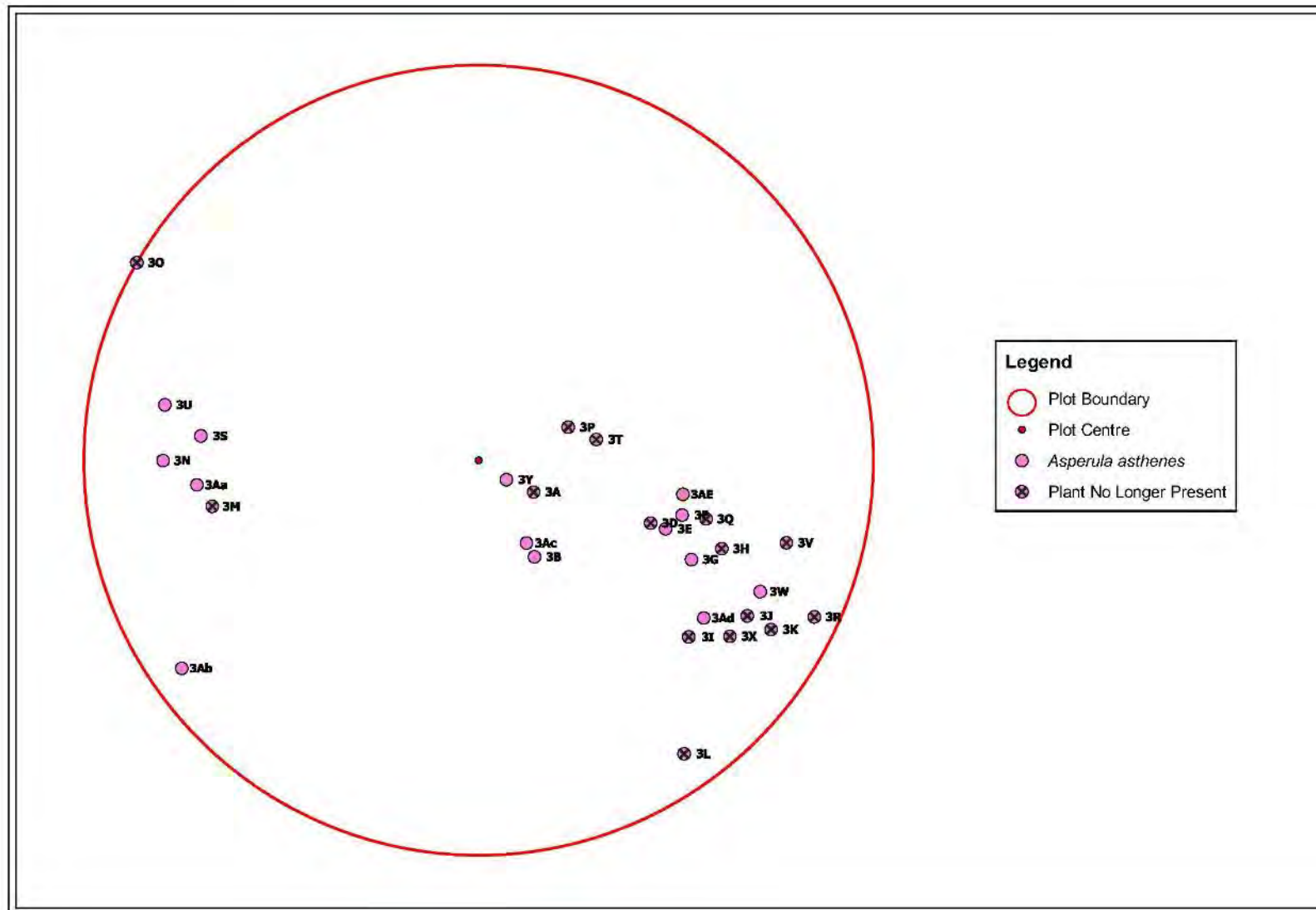
Biodiversity Offset Area Monitoring Sites

Monitoring Point 3 *Asperula asthenes* monitoring results

ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
3A	160	140	30 x 25	70 x 40	10 x 5	30 x 10	-	-	-	-		
3B	280	150	20 x 25	-	5 x 5	-	-	-	60 x 60	70x70	Flowers	
3C	160	120	40 x 30	40 x 30	170 x 90	200 x 50	110 x 110	110x110	130 x 100	-		
3D	460	110	50 x 20	30 x 20	-	-	-	-	10 x 20	-		
3E	500	110	55 x 30	30 x 30	45 x 40	5 x 5	-	-	10 x 10	40x40	Flowers	
3F	530	105	50 x 10	30 x 30	60 x 20	60 x 20	80 x 60	100x60	100 x 60	100x60	Flowers	
3G	590	115	25 x 35	25 x 40	170 x 80	-	10 x 5	10x5	20 x 20	20x20	Flowers	
3H	650	110	20 x 20	40 x 20	-	100 x 100	60 x 40	20x40	60 x 40	-		
3I	690	130	40 x 25	30 x 20	-	-	-	-	-	-		
3J	780	120	35 x 20	20 x 20	-	80 x 50	-	-	-	-		
3K	850	120	30 x 30	30 x 30	60 x 15	-	10 x 5	-	30 x 10	-		
3L	900	145	35 x 45	20 x 10	-	-	-	10x10	-	-		
3M	680	260	40 x 35	40 x 35	25 x 30	40 x 20	60 x 40	40x2	20 x 5	-		Absent
3N	790	270	30 x 25	30 x 20	-	-	120 x 50	20x6	10 x 10	10x10		
3O	990	300	55 x 25	-	-	20 x 5	-	50x30	-	-		
3P	240	90	40 x 20	40 x 15	40 x 15	40 x 20	150 x 90	-	-	-		
3Q	590	105	-	40 x 10	-	-	-	50x30	40 x 10	-		
3R	930	115	-	30 x 30	-	-	-	-	-	-		



ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
3S	700	275	-	20 x 30	5 x 5	-	-	-	20 x 20	30x40	Flowers	
3T	300	80	-	-	5 x 25	-	-	-	-	-		
3U	800	280	-	-	30 x 20	50 x 20	30 x 30	30x30	50 x 20	100x30	Flowers	
3V	800	105	-	-	-	5 x 5	-	-	-	-		
3W	780	115	-	-	-	80 x 50	80 x 30	40x30	10 x 40	10x10		
3X	770	125	-	-	-	5 x 5	-	-	-	-		
3Y	85	125	-	-	-	-	40 x 60	30x10	-	100x70		
3Z	780	280	-	-	-	-	-	20x20	-	-		
3AA	710	265	-	-	-	-	-	10x10	30 x 30	25x10	Flowers	
3AB	910	235	-	-	-	-	-	30x30	60 x 30	100x80	Flowers	
3AC	910	235	-	-	-	-	-	-	30 x 30	30x30	Flowers	
3AD	910	235	-	-	-	-	-	-	40 x 40	40x40	Flowers	
3AE	520	100	-	-	-	-	-	-	-	5x5	Flowers	New



Karuah East Quarry



Monitoring Point 4 *Asperula asthenes* monitoring results

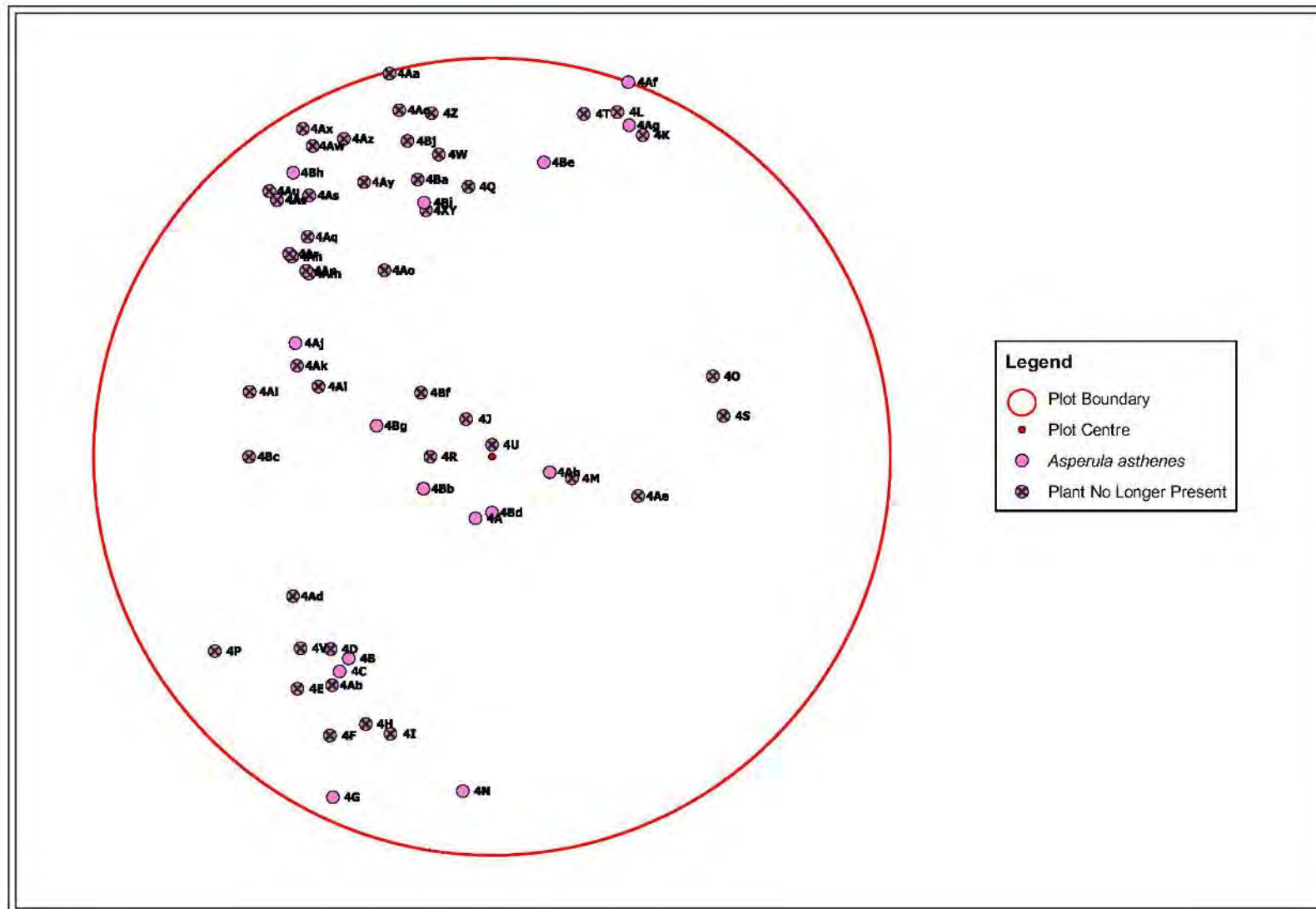
ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
4A	160	195	30 x 20	30 x 20	5 x 5	-	-	-	30 x 20	25x 5		
4B	620	215	55 x 20	45 x 25	-	20 x 10	-	-	30 x 30	30 x 20		
4C	660	215	30 x 15	30 x 30	-	5 x 5	-	10x5	100 x 30	100 x 40		
4D	630	220	20 x 20	20 x 20	-	20 x 10	45 x 45	45x45	-			
4E	760	220	65 x 20	40 x 20	10 x 5	-	10 x 5	10x5	-			
4F	810	210	70 x 45	70 x 40	10 x 5	-	-	-	-			
4G	940	205	40 x 15	50 x 10	30 x 10	5 x 10	70 x 50	40x40	20 x 20	15 x 15		
4H	740	205	50 x 30	50 x 30	20 x 10	40 x 30	50 x 40	50x40	10 x 10			Absent
4I	740	200	80 x 15	60 x 40	-	5 x 10	-	-	-			
4J	110	325	80 x 30	60 x 30	70 x 10	10 x 70	100 x 80	40x20	-			
4K	890	25	30 x 30	40 x 30	60 x 60	-	-	-	-			
4L	920	20	55 x 35	50 x 25	50 x 30	5 x 3	-	-	-			
4M	210	105	115 x 30	90 x 40	90 x 10	-	-	-	10 x 10			Absent
4N	840	185	110 x 30	100 x 40	50 x 10	40 x 30	40 x 25	15x10	5 x 5	20 x 30		
4O	590	70	40 x 25	50 x 50	80 x 5	-	-	-	-			
4P	850	235	-	20 x 20	40 x 2	-	-	-	-			
4Q	680	355	-	20 x 30	180 x 80	60 x 20	50 x 20	5x5	-			
4R	155	270	-	-	20 x 5	50 x 10	100 x 40	20x10	-			
4S	590	80	-	-	10 x 15	-	-	-	-			
4T	890	15	-	-	10 x 5	-	10 x 5	10x5	20 x 5			
4U	30	0	-	-	20 x 10	-	-		-			



ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
4V	680	225	-	-	80 x 50	-	-		10 x 10			
4W	770	350	-	-	-	20 x 5	50 x 40	20x5	30 x 50			
4X	640	345	-	-	-	50 x 20	80 x 60	15x5	30 x 15			
4Y	600	345	-	-	-	50 x 20	-	30x15	-			
4Z	875	350	-	-	-	30 x 5	70 x 30	30x10	-			
4Aa	995	345	-	-	-	10 x 10	80 x 50	10x10	30 x 10			
4Ab	700	215	-	-	-	10 x 5	-	-	-			
4Ac	900	345	-	-	-	-	10 x 5	10x5	20 x 20			
4Ad	610	235	-	-	-	-	35 x 20	-	-			
4Ae	380	105	-	-	-	-	10 x 5	-	-			
4Af	1000	20	-	-	-	-	55 x 30	5x10	50 x 60	120 x 70		Flowers
4AG	900	22.5	-	-	-	-	-	20x5	-	50 x 40		
4AH	150	105	-	-	-	-	-	20x20	20 x 20	50 x 40	Flowers	
4AI	470	292	-	-	-	-	-	55x30	-			Absent
4AJ	570	300	-	-	-	-	-	20x20	5 x 5	5 x 5		New Shoot
4AK	540	295	-	-	-	-	-	45x45	-			Absent
4AL	630	285	-	-	-	-	-	50x30	-			
4AM	650	315	-	-	-	-	-	45x15	-			
4AN	710	315	-	-	-	-	-	210x15	-			
4AO	540	330	-	-	-	-	-	5x5	-			
4AP	660	315	-	-	-	-	-	30x30	-			
4AQ	720	320	-	-	-	-	-	10x5	-			



ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
4AR	720	315	-	-	-	-	-	15x10	-			
4AS	800	325	-	-	-	-	-	5X10	-			
4AT	840	320	-	-	-	-	-	50X30	10 x 20			Absent
4AU	870	320	-	-	-	-	-	30X45	10 x 10			Absent
4AV	840	320	-	-	-	-	-	60X60	40 x 40			Absent
4AW	900	330	-	-	-	-	-	5X5	5 x 5			
4AX	950	330	-	-	-	-	-	30X10	-			
4AY	760	335	-	-	-	-	-	40X30	40 x 40			
4AZ	880	335	-	-	-	-	-	40x20	20 x20			
4BA	720	345	-	-	-	-	-	10X10	-			
4BB	190	245	-	-	-	-	-	10X10	40 x 15	40 x 15		new growth
4BC	610	270	-	-	-	-	-	50X10	-			
4BD	140	180	-	-	-	-	-	-	10 x 10	10 x 10		
4BE	750	10	-	-	-	-	-	-	10 x 30	40 x 10		
4BF	240	312	-	-	-	-	-	-	20 x 20			Absent
4BG	285	295	-	-	-	-	-	-	10 x 5	10 x 10		
4BH	300	285	-	-	-	-	-	-	5 x 5	5 x 5		
4BI	790	325	-	-	-	-	-	-	20 x 10	30 x 30	Flower	
4BJ	870	325	-	-	-	-	-	-	10 x 15			Absent
4BK	660	345	-	-	-	-	-	-	10 x 20			Absent
4BL	820	345	-	-	-	-	-	-	10 x 10			Absent



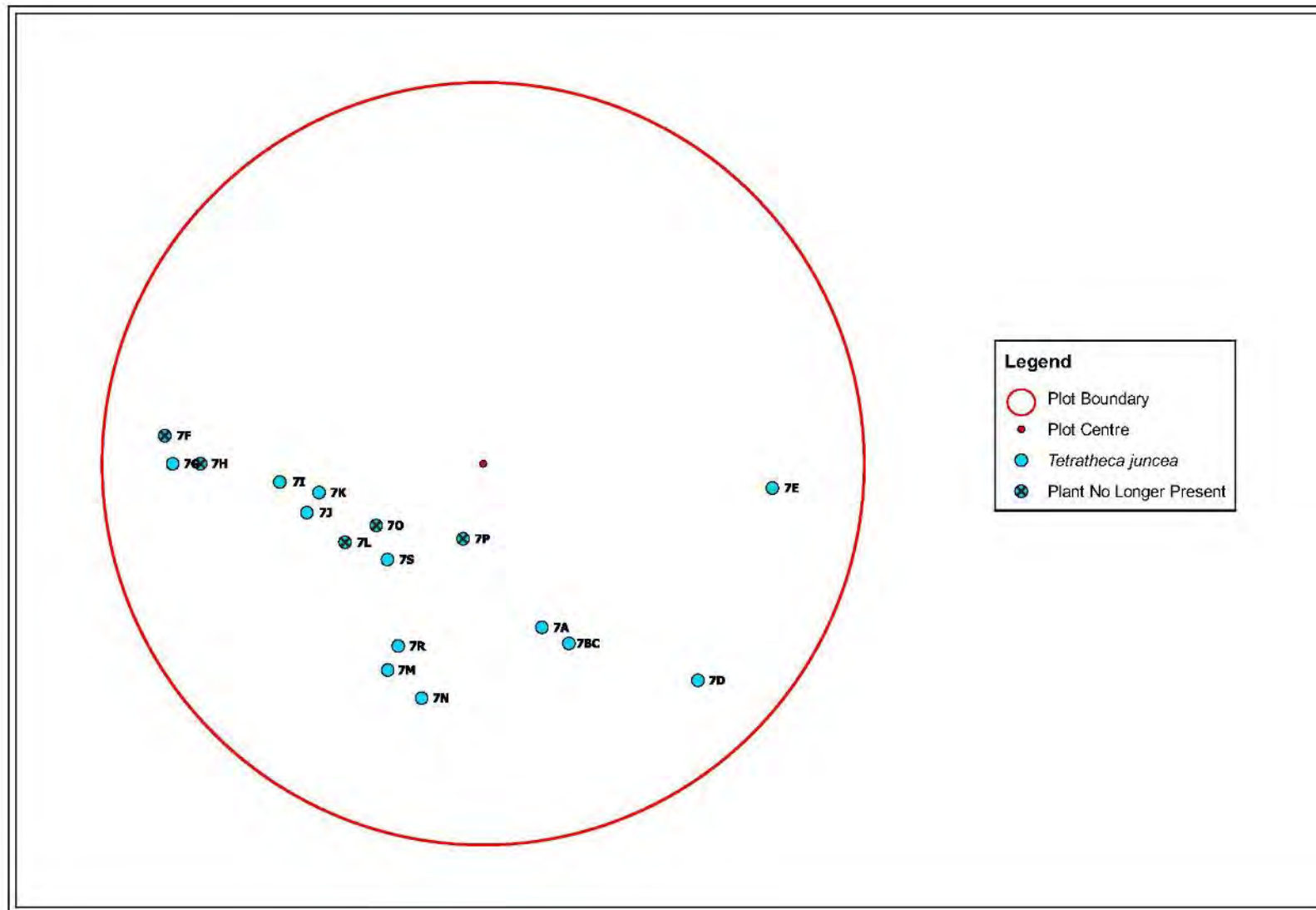
Monitoring Point 4

Asperula asthenes monitoring results



Monitoring Point 7 - *Tetradlea juncea* monitoring results

ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present		Comments
			2015	2016	2017	2018	2019	2020	2021	2022	Flowers	Fruits	
7A	480	160	70x40	60x40	60x50	10x60	70x40	20x30	25 x 30	80x40	43	0	New Growth
7B	470	155	5x 5	10x5	-	10x10	30x20	30x20	-				BC Combined
7C	500	155	35x15	40x15	70x30	60x30	50x20	70x40	55 x 40	100x55	59	0	
7D	800	135	50x20	60x40	90x50	70x40	10x10	10x10	45 x 30	50x30	12	0	
7E	730	95	60x50	90x40	100x70	100x50	110x80	30x60	30 x 60	45x10	1	0	Dense Vegetation
7F	800	275	60x10	70x20	20x5	-	40x30	40x20	20 x 20				
7G	780	270	40x40	40x40	60x20	-	130x80	100x65	60 x 15	105x30	12	1	
7H	710	270	50x10	50x10	90x20	100x50	70x80	50x20	60 x 5				
7I	510	265	30x10	30x10	20x5	-	20x5	20x5	20 x 25	40x10	0	0	
7J	460	255	40x20	40x30	90x30	100x50	90x60	80x60	70 x 40	55x20	0	1	New Growth
7K	420	260	70x45	80x40	70x70	100x80	120x85	120x60	60 x 40	90x90	35	0	
7L	400	240	45x10	50x10	55x10	20x10	25x10	25x10	-				
7M	570	205	110x70	110x70	110x80	60x20	80x130	30x10	15 x 5	40x15	1	0	New Growth
7N	610	195	45x35	45x35	35x50	80x30	40x25	20x10	25 x 20	40x10	0	0	New Growth
7O	310	240	-	20x20	20x15	-	-	-	-				
7P	700	195	-	-	-	-	80x60	60x20	50 x 5				Absent
7R	505	205	-	-	-	-	30x40	30x40	35 x 20	45x10	0	0	New Growth
7S	340	225	-	-	-	-	-	-	5 x 5	20x5	0	0	New Growth

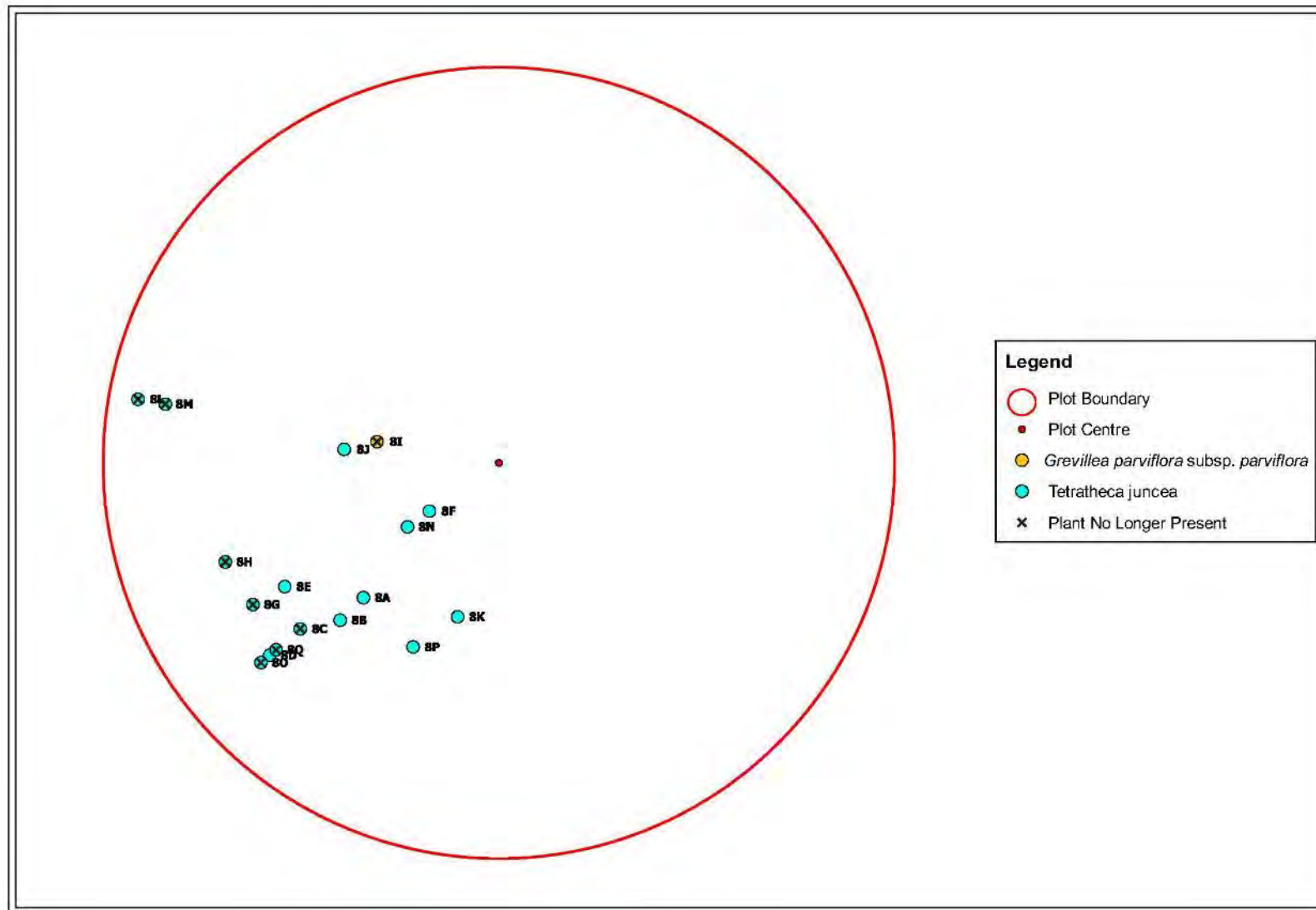


Monitoring Point 7 - *Tetratheca juncea* monitoring results



Monitoring Point 8 – *Tetradlea juncea* and *Grevillea parviflora* monitoring results

ID	Species	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	Flowers	Fruits	
8A	<i>Tetradlea juncea</i>	210	235	110x70	110x80	130x80	80x110	110x50	60x30	30 x 30	90x50	21	4	
8B	<i>Tetradlea juncea</i>	480	225	40x 30	60x 30	90x 20	80x 20	50x 50	60x60	-	80x10	1	0	
8C	<i>Tetradlea juncea</i>	560	225	120x110	120x100	-	-	-	-	-				
8D	<i>Tetradlea juncea</i>	650	230	110x110	110x110	120x60	45x 10	30x5	60x60	45 x 30	60x45	6	0	
8E	<i>Tetradlea juncea</i>	750	230	65x30	65x30	40x80	60x30	50x 20	40x20	25 x 5	60x40	4	0	
8F	<i>Tetradlea juncea</i>	620	240	80x30	90x30	120x50	120x40	60x 30	20x10	30 x 10	65x55		0	
8G	<i>Tetradlea juncea</i>	710	240	100x50	100x50	80x50	100x50	-	-	5 x 5		30	0	Absent
8H	<i>Tetradlea juncea</i>	730	250	60x50	60x50	100x40	-	90x 30	90x30	-				Absent
8I	<i>Grevillea parviflora subsp. parviflora</i>	310	280	30	30	30	70	60	60x70	-				Absent
8J	<i>Tetradlea juncea</i>	390	275	50x 10	50x 10	65x 10	60x 20	60x20	30x20	25 x 15	30x10		0	
8K	<i>Tetradlea juncea</i>	400	195	60x20	60x20	90x90	170x50	130x60	130x100	75 x 40	105x120	5	0	
8L	<i>Tetradlea juncea</i>	920	280	-	-	70x 70	70x 80	100x90	100x30	40 x 5			0	Absent
8M	<i>Tetradlea juncea</i>	850	280	-	-	-	40x20	-	20x10	20 x 5			0	Absent
8N	<i>Tetradlea juncea</i>	280	235	-	-	-	-	50x 20	20x10	20 x 5	40x5	0	0	
8O	<i>Tetradlea juncea</i>	780	230	-	-	-	-	-	50x40	25 x 15			0	Absent
8P	<i>Tetradlea juncea</i>	510	205	-	-	-	-	-	100x40	60 x 40	90x70	7	0	New Growth
8Q	<i>Tetradlea juncea</i>	730	230	-	-	-	-	-	-	5 x 10				Absent



Monitoring Point 8 – *Tetratheca juncea* and *Grevillea parviflora* monitoring results

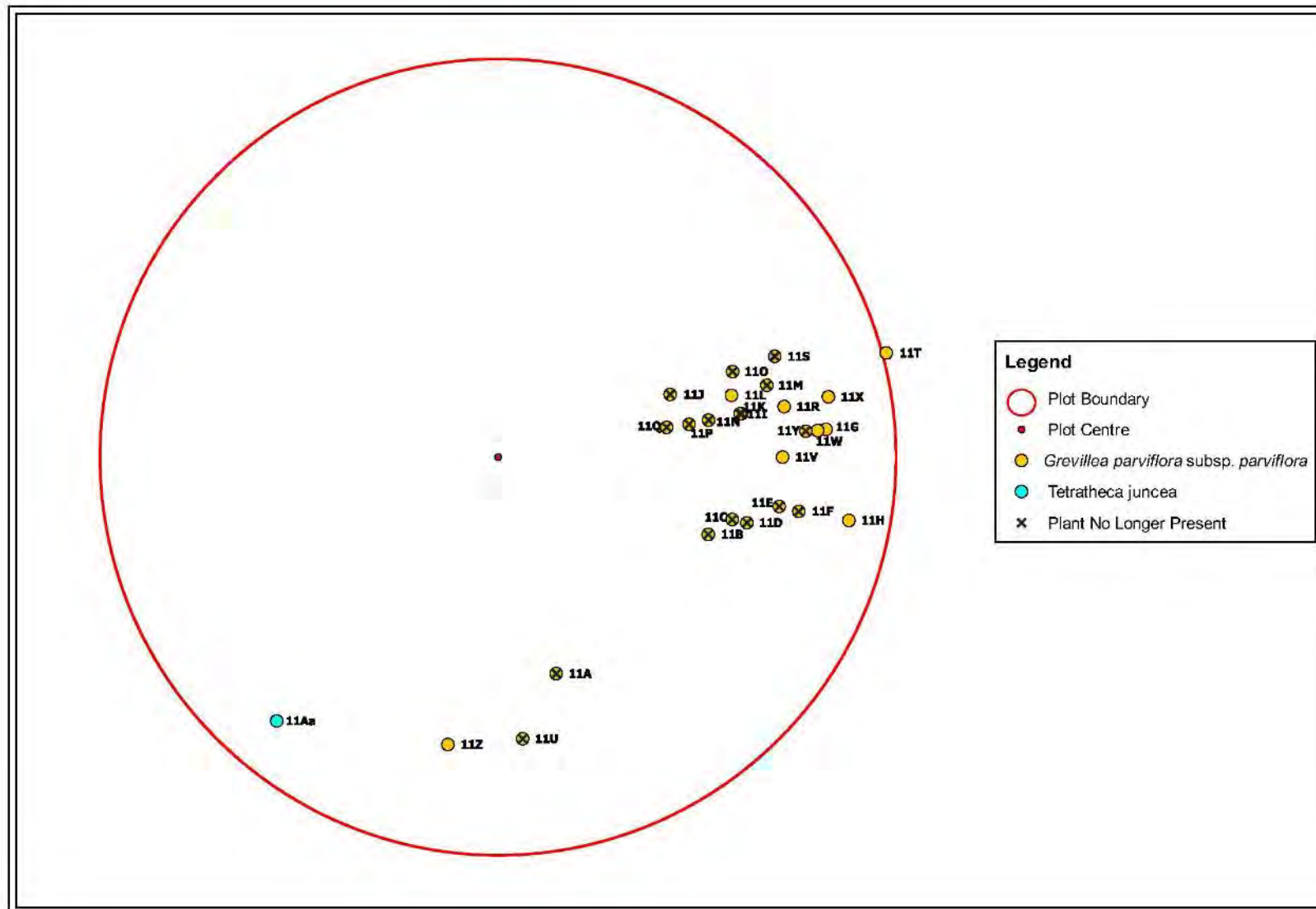


Monitoring Point 11 - *Grevillea parviflora* monitoring results

ID	Species	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	Flowers	Fruits	
11A	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	560	165	90	90	50	45	60	60	-				Absent
11B	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	565	110	20	45	-	-	-	18	-				
11C	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	610	105	55	-	-	-	-	-	-				
11D	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	650	105	100	65	-	-	-	-	-				
11E	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	720	100	75	75	41	-	-	-	-				
11F	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	770	100	20	10	-	-	-	-	-				
11G	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	830	85	110	110	80	100	90	95	90	91	0	0	
11H	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	900	100	60	60	30	65	70	80	70	60	0	0	
11I	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	620	80	50	50	60	60	55	55	-				
11J	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	460	70	45	35	40	-	-	-	-				
11K	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	620	80	40	40	40	40	-	-	-				
11L	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	610	75	45	55	55	65	65	70	70	62	0	0	
11M	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	700	75	65	70	65	75	80	-	-				
11N	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	540	80	35	40	45	45	40	-	-				
11O	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	630	70	20	30	-	-	-	-	-				
11P	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	490	80	45	70	50	30	30	30	-				
11Q	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	430	80	-	20	60	-	-	-	-				
11R	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	730	80	-	-	-	65	65	40	30	62	0	0	
11S	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	740	70	-	-	-	-	20	20	-				
11T	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	1010	75	-	-	-	-	80	95	95	77	0	0	
11U	<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	710	175	-	-	-	-	40	37	-				



ID	Species	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present		Comments
				2015	2016	2017	2018	2019	2020	2021	2022	Flowers	Fruits	
11V	<i>Grevillea parviflora subsp. parviflora</i>	715	90	-	-	-	-	-	55	60	80	0	0	
11W	<i>Grevillea parviflora subsp. parviflora</i>	800	85	-	-	-	-	-	65	60	62	0	0	
11X	<i>Grevillea parviflora subsp. parviflora</i>	840	80	-	-	-	-	-	60	85	91	1	0	
11Y	<i>Grevillea parviflora subsp. parviflora</i>	770	85	-	-	-	-	-	25	55				Absent
11Z	<i>Grevillea parviflora subsp. parviflora</i>	720	190	-	-	-	-	-	55	55	65	0	0	
11AA	<i>Tetradlea juncea</i>	865	220	-	-	-	-	-	75x50	80 x 50	110x80	37	0	New Growth

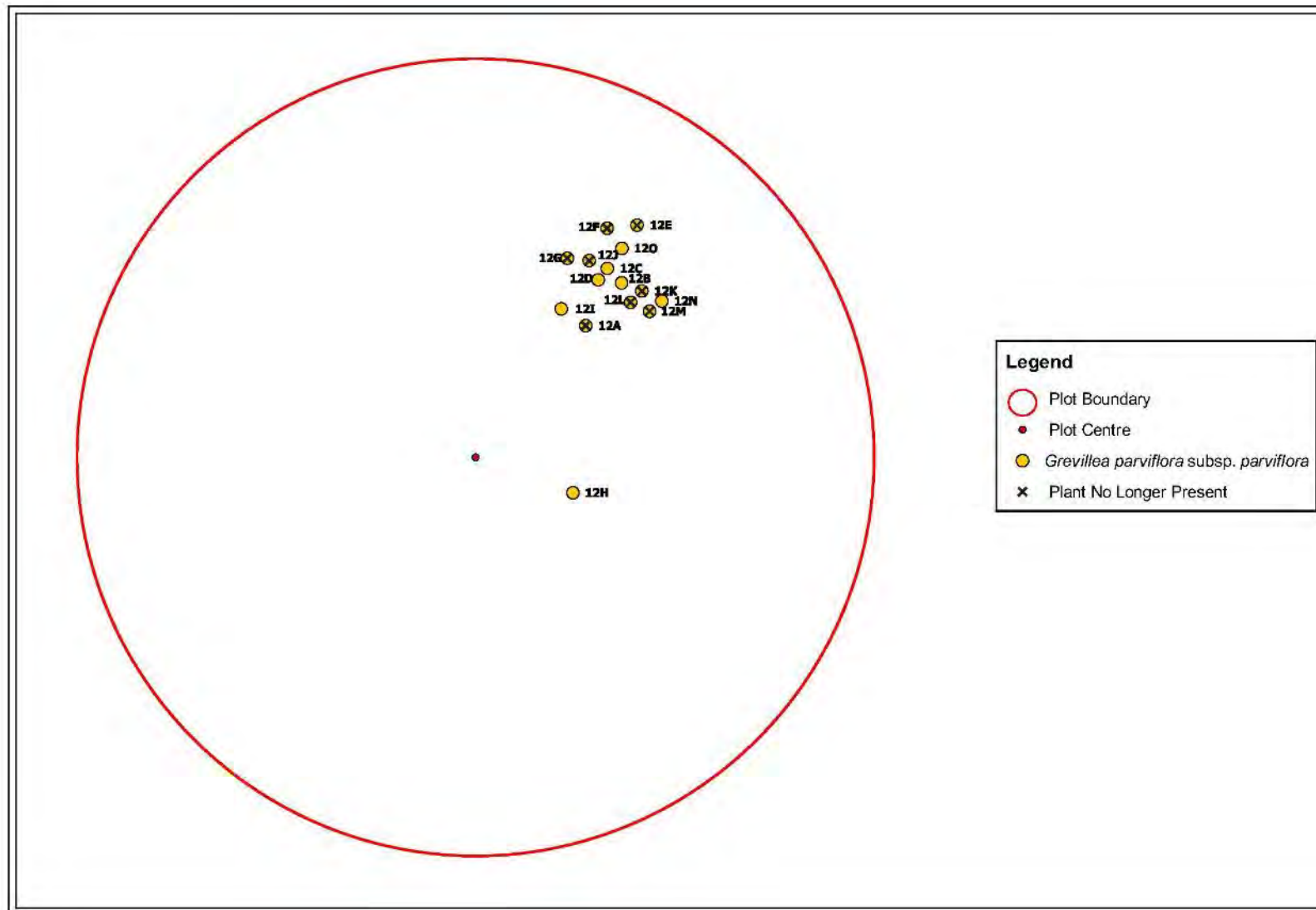


Monitoring Point 11 - *Grevillea parviflora* and *Tetratheca juncea* monitoring results



Monitoring Point 12 - *Grevillea parviflora* monitoring results

ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
12A	430	40	80	80	80	50	-	-	-		-	not found
12B	570	40	80	90	60	25	50	55	75	93	48/0	-
12C	580	35	65	70	-	50	45	55	50	50	1/0	-
12D	540	35	20	25	40	30	-	70	100	113	61/1	-
12E	710	35	25	30	-	-	-	-	-		-	not found
12F	660	30	25	25	-	-	-	-	-		-	not found
12G	550	25	50	50	40	10	-	-	-		-	not found
12H	260	110	-	25	55	70	78	78	30	53	13/0	Brach over plant, very long stem
12I	430	30	-	-	-	50	60	60	70	88	20/0	Healthy
12J	570	30	-	-	-	25	-	-	-			not found
12K	590	45	-	-	-	60	50	70	-			Spent Flowers
12L	550	45	-	-	-	30	50	60	-			-
12M	570	50	-	-	-	55	65	75	-			-
12N	610	50	-	-	-	-	40	60	15	42	0/0	-
12O	640	35	-	-	-	-	-	-	20	30	0/0	Two stems, 25cm apart



Monitoring Point 12 - *Grevillea parviflora* monitoring results

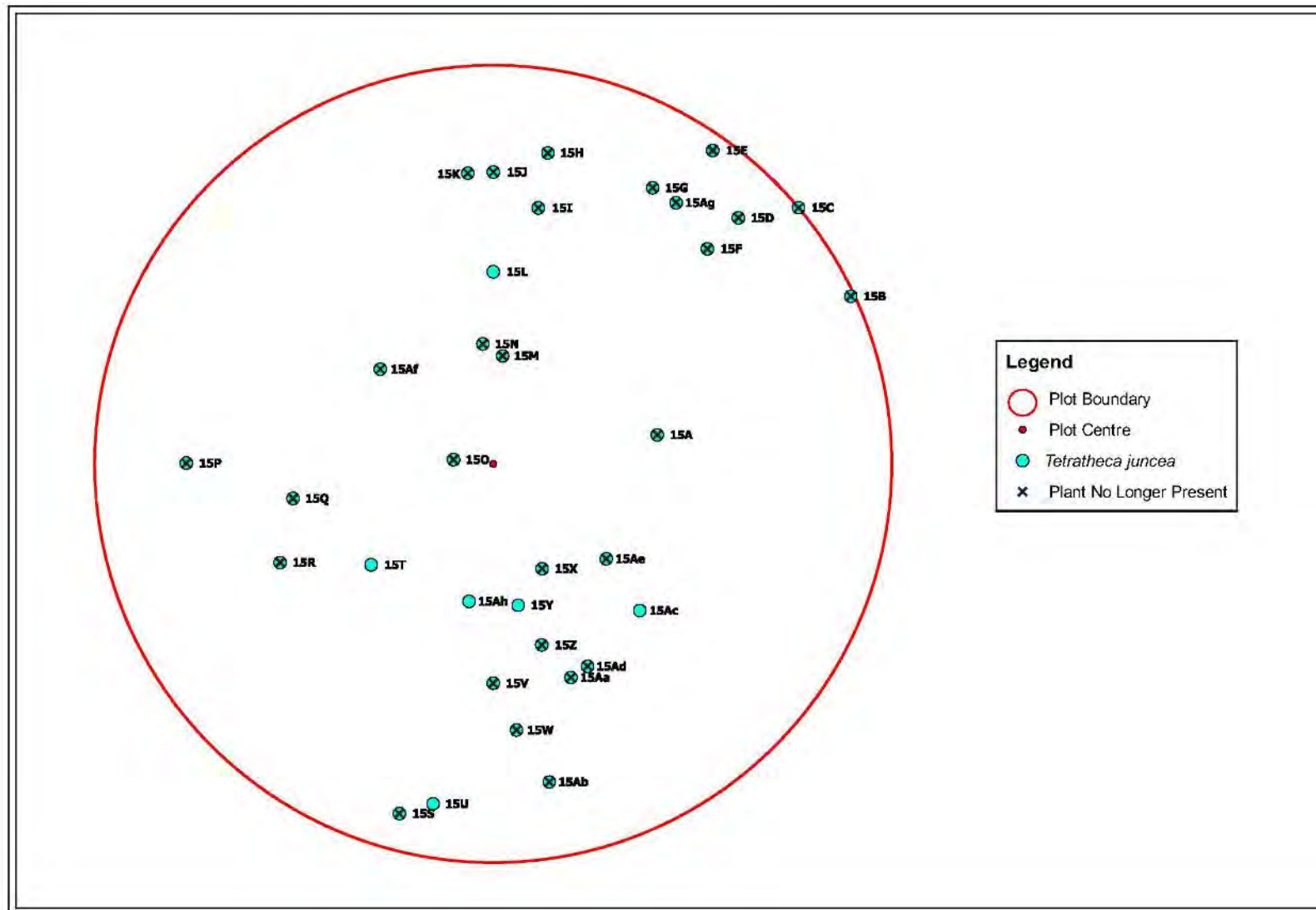


Monitoring Point 15 - *Tetradlea juncea* monitoring results

ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present		Comments
			2015	2016	2017	2018	2019	2020	2021	2022	Flowers	Fruits	
15A	420	80	20 x 10	30 x 10	-	-	-	-	-				
15B	990	65	5 x 5	10 x 5	-	-	-	-	-				
15C	1000	50	50 x 50	60 x 40	100 x 30	-	-	-	50x30				Absent
15D	870	45	40 x 40	40 x 40	65 x 20	-	-	-	-				
15E	960	40	75 x 20	80 x 20	90 x 20	-	40x20	40x30	30x30				Absent
15F	780	45	30 x 15	40 x 15	40 x 15	30x40	30x20	-	-				
15G	800	35	40 x 25	50 x 25	40 x 20	-	-	-	-				
15H	790	10	5 x 5	10 x 5	-	-	-	-	-				
15I	620	10	60 x 30	60 x 30	-	-	-	-	-				
15J	730	0	20 x 30	40 x 20	40 x 10	-	-	-	-				
15K	730	355	50 x 20	40 x 20	-	-	-	-	-				
15L	480	0	30 x 10	30 x 10	15 x 10	30x20	40x20	30x20	20x30	60x10	3	0	New Growth
15M	270	5	40 x 10	50 x 10	-	50x20	40x30	-	-				
15N	300	355	40 x 10	40 x 10	50 x 10	-	-	-	-				
15O	100	275	20 x 5	20 x 40	-	-	-	-	-				
15P	770	270	60 x 20	50 x 30	50 x 30	40x10	40x10	40x20	40x10				Absent
15Q	510	260	60 x 50	70 x 50	90 x 50	90x30	50x40	80x50	40x30				Absent
15R	590	245	70 x 50	70 x 50	80 x 15	-	10x10	-	-				
15S	910	195	20 x 10	20 x 10	-	-	-	-	-				
15T	400	230	30 x 10	30 x 10	-	-	-	-	-	30x10	1	0	New Plant at 15T Location
15U	870	190	10 x 10	30 x 10	30 x 5	70x20	100x30	90x70	60x60	65x75	10	0	New Growth



ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present		Comments
			2015	2016	2017	2018	2019	2020	2021	2022	Flowers	Fruits	
15V	550	180	30 x 15	40 x 20	40 x 10	-	-	-	-				
15W	670	175	5 x 5	10 x 5	-	-	-	-	-				
15X	290	155	40 x 10	40 x 10	30 x 5	-	-	-	-				
15Y	360	170	5 x 5	30 x 5	-	20x5	-	-	15x5	20x10	0	0	New Growth
15Z	470	165	30 x 40	50 x 30	60 x 70	60x20	40x20	-	-				
15AA	570	170	25 x 20	50 x 20	20 x 50	80x20	40x40	-	-				
15AB	810	170	5 x 5	10 x 5	-	-	-	-	-				
15AC	520	135	40 x 10	50 x 15	15 x 50	40x30	60x10	50x30	30x20	50x30	6		
15AD	560	160	20 x 30	20 x 30	-	-	40x30	50x30	50x30				Absent
15AE	370	130	-	20 x 10	-	-	-	-	-				
15AF	370	310	-	-	-	10x10	50x30	60x40	30x40				Absent
15AG	800	35	-	-	-	-	-	20x20	2010				Absent
15AH	350	190	-	-	-	-	-	-	50x40	75x80	13		
15AI	510	165	-	-	-	-	-	-	-	45x10			

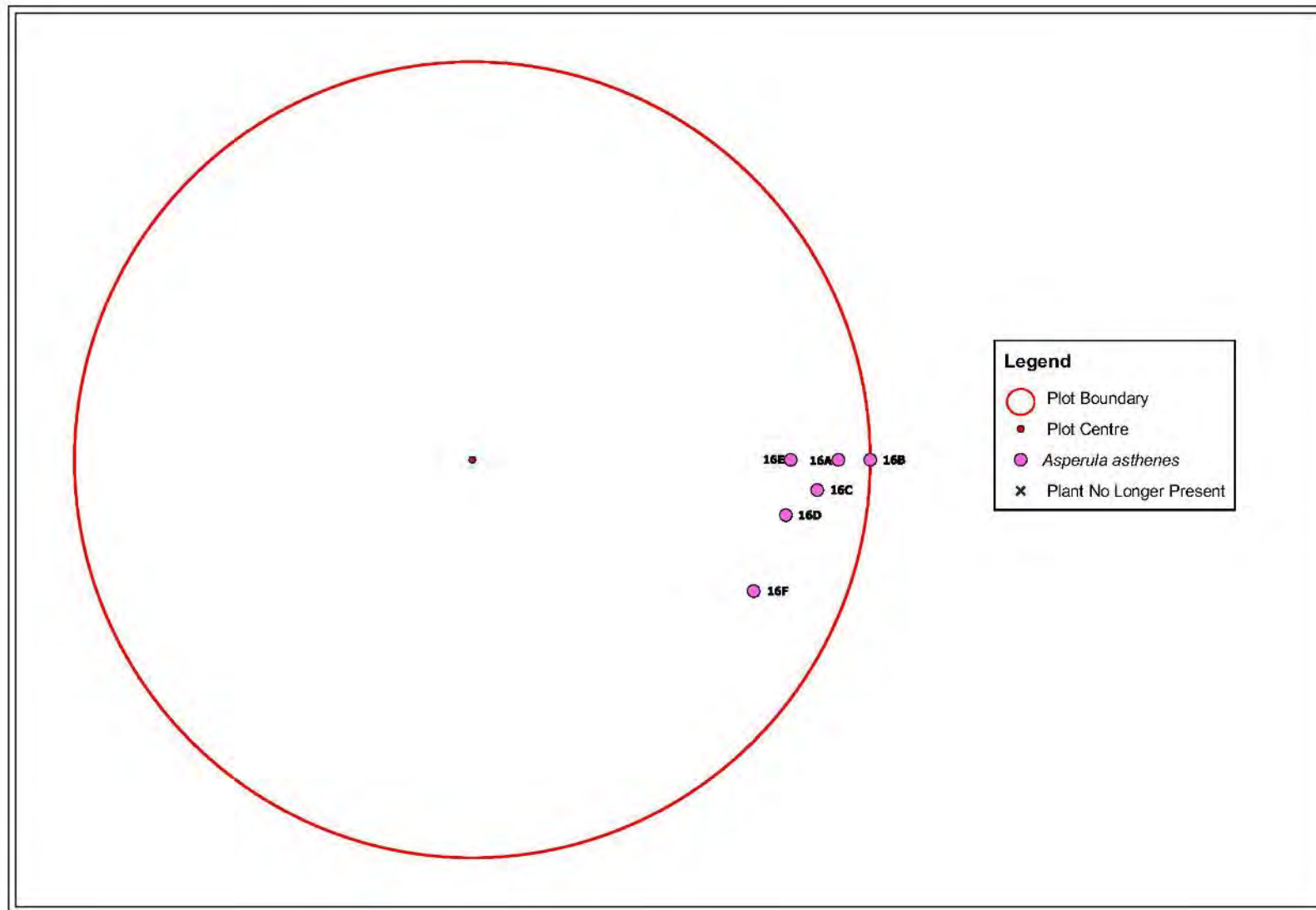


Monitoring Point 15 - *Tetratheca juncea* monitoring results



Monitoring Point 16 - *Asperula asthenes* monitoring results

ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
16A	920	90	-	-	-	-	-	-	50 x 40	40x100	Flowers	
16B	1000	90	-	-	-	-	-	-	60 x 50	60x50	Flowers	
16C	870	95	-	-	-	-	-	-	30 x 60	40x50	Flowers	
16D	920	100	-	-	-	-	-	-	40 x 40	30x30	Flowers	
16E	800	90	-	-	-	-	-	-	20 x 30	50x30	Flowers	
16F	780	115	-	-	-	-	-	-	60 x 50	70x60	Flowers	



Monitoring Point 16 - *Asperula asthenes* monitoring results

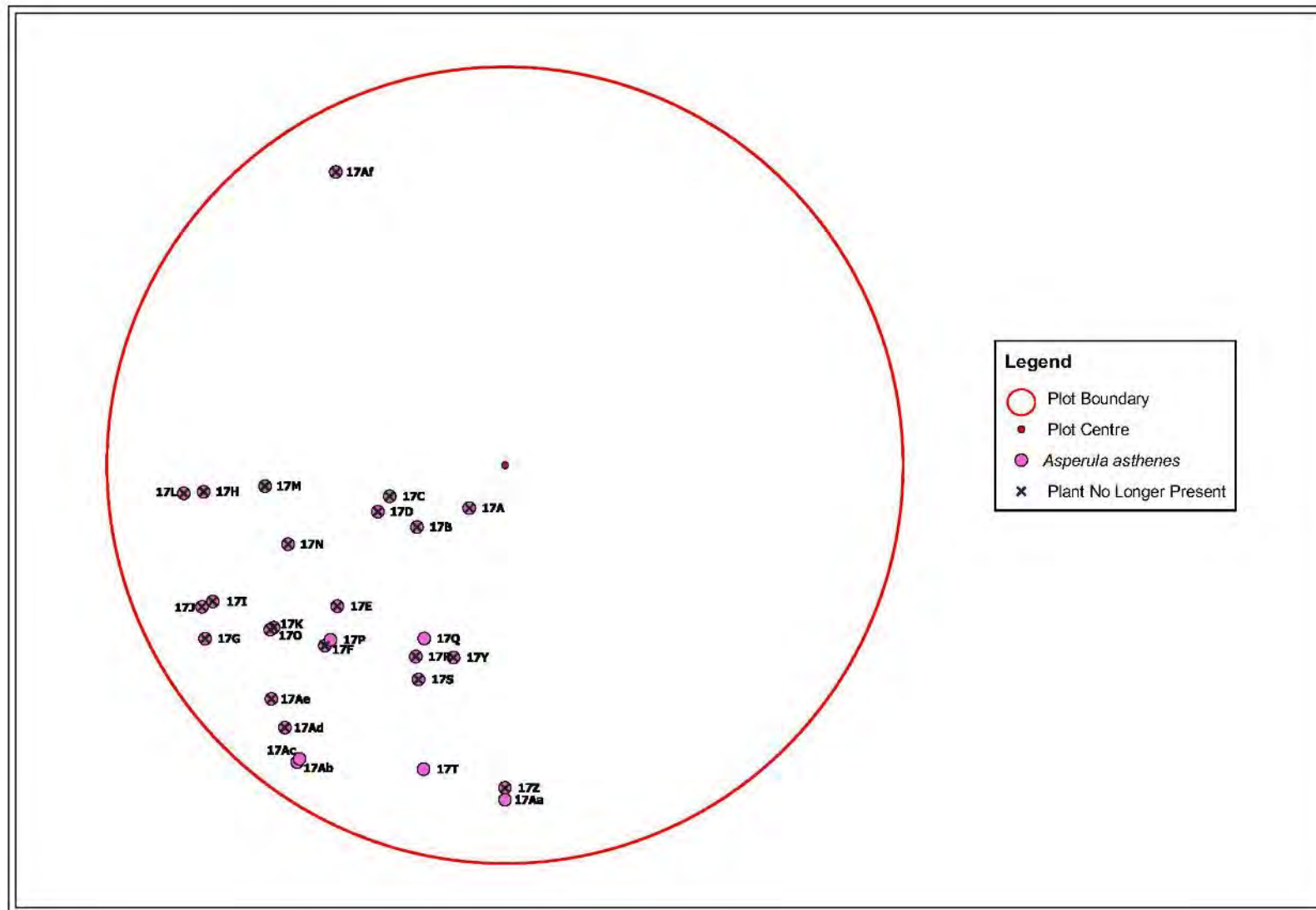


Monitoring Point 17 - *Asperula asthenes* monitoring results

ID	Distance	Bearing	Clump Size (cm)							2022	Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021			
17A	140	220	20 x 5	20 x 5		-	-	-	-			
17B	270	235	35 x 15	20 x 10	-	-	-	-	40 x 40			Absent
17C	300	255	40 x 5	30 x 5	-	-	-	-	-			
17D	340	250	5 x 5	10 x 5	-	-	-	-	-			
17E	550	230	80 x 80	80 x 80	-	70x90	70x30	50x50	25 x 10			Absent
17F	640	225	20 x 25	20 x 25	30 x 5	30x60	20x10	20x10	-			
17G	870	240	20 x 10	20 x 10	-	-	-	-	-			
17H	760	265	90 x 35	90 x 35	-	-	-	-	-			
17I	810	245	35 x 20	25 x 10	-	-	-	-	5 x 5			Absent
17J	840	245	40 x 60	40 x 50	-	-	-	-	-			
17K	710	235	20 x 5	20 x 10	30 x 10	130x55	20x10	-	-			
17L	810	265	-	-	-	10x5	-	-	-			
17M	605	265	-	-	-	5x5	15x15	-	-			
17N	580	250	-	-	-	10x5	10x5	-	-			
17O	720	235	-	-	-	-	10x5	-	-			
17P	620	225	-	-	-	-	20x10	-	10 x 10	40x15	Flowers	
17Q	480	205	-	-	-	-	-	35x10	15 x 10	20x20	Flowers	
17R	530	205	-	-	-	-	-	30x20	-			
17S	580	220	-	-	-	-	-	30x10	-			
17T	490	195	-	-	-	-	-	40x30	30 x 20	30x20	Flowers	
17V	500	195	-	-	-	-	-	5x5	-			



ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
17W	760	215	-	-	-	-	-	5x10	-			
17X	740	210	-	-	-	-	-	20x20	-			
17Y	740	195	-	-	-	-	-	5x5	-			
17Z	810	180	-	-	-	-	-	10x10	50 x 40			Absent
17AA	840	180	-	-	-	-	-	20x10	20 x 10	80x20	Flowers	
17AB	910	215	-	-	-	-	-	10x5	40 x 30	40x30	Flowers	
17AC	215	900	-	-	-	-	-	5x5	5 x 10	20x10	Flowers	
17AD	220	860	-	-	-	-	-	10x5	-			
17AE	225	830	-	-	-	-	-	10x10	-			
17AF	330	850	-	-	-	-	-	10x5	-			



Monitoring Point 17 - *Asperula asthenes* monitoring results

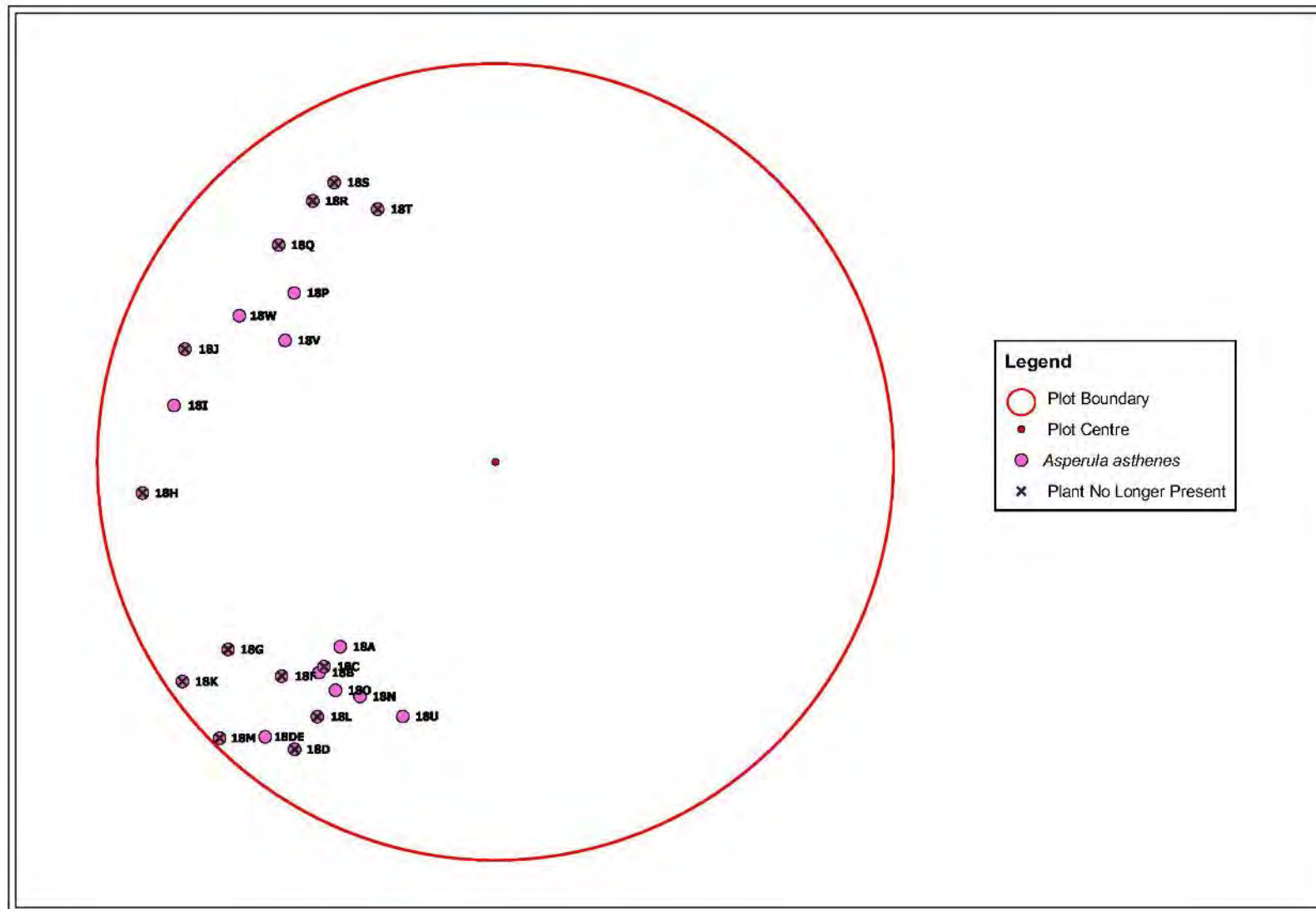


Monitoring point 18 - *Asperula asthenes* monitoring results

ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
18A	610	220	40 x 30	40 x 30	-	-	-		30 x 10	40x20		
18B	690	220	100 x 60	100 x 50	-	-	-		15 x 15	15x15		
18C	670	225	30 x 20	30 x 20	-	-	-		-			
18D	880	215	20 x 40	20 x 40	-	-	-		-			
18E	900	220	100 x 90	90 x 90	10 x 5	-	10 x 5	10 x 5	5 x 10	20x20		
18F	760	225	70 x 80	70 x 90	-	-	-		-			
18G	820	235	70 x 30	70 x 40	10 x 5	-	-		-			
18H	890	265	5 x 10	20 x 10	-	-	-		-			
18I	820	280	30 x 40	30 x 30	-	-	-		-	45x20		Flowers
18J	830	290	55 x 30	50 x 30	5 x 5	-	5 x 5	1x1	-			
18K	960	235	50 x 10	40 x 15	-	-	-	5x5	-			
18L	780	215	10 x 10	20 x 20	-	-	-		-			
18M	980	225	30 x 10	20 x 10	-	-	-		-			
18N	680	210	-	-	40 x 10	60x10	75x50	70x70	60 x 50	40x40		
18O	700	215	-	-	-	70x16	30x20	30x30	25 x 40	40x20		Flower
18P	660	310	-	-	-	10x26	45x15	10x10	10 x 10	50x10		
18Q	770	315	-	-	-	60x21	-	25x10	-			
18R	800	325	-	-	-	-	-	10x10	-			
18S	810	330	-	-	-	-	-	10x15	-			
18T	700	335	-	-	-	-	-	10x10	-			
18U	680	200	-	-	-	-	-	-	30 x 30	30x20		



ID	Distance	Bearing	Clump Size (cm)								Flowers/Fruit Present	Comments
			2015	2016	2017	2018	2019	2020	2021	2022		
18V	610	300	-	-	-	-	-	-	10 x 10	60x20		
18W	740	300	-	-	-	-	-	-	10 x15	40x10		



Monitoring point 18 - *Asperula asthenes* monitoring results

APPENDIX D. PHOTO MONITORING

Monitoring Point 1 (MP 1)

MP 1 2015



MP 1 2017



MP 1 2018



MP 1 2019



MP 1 2020



MP 1 2021



MP 1 2022



Monitoring Point 2 (MP 2)

MP 2 2015



MP 2 2017



MP 2 2018



MP 2 2019



MP 2

2020



MP 2

2021





MP 2

2022



Monitoring Point 3 (MP 3)

MP 3 2015



MP 3 2017



MP 3 2018



MP 3 2019



MP 3

2020



MP 3

2021





MP 3

2022



Monitoring Point 4 (MP 4)

MP 4 2015



MP 4 2017



MP 4 2018



MP 4 2019



MP 4 2020



MP 4 2021





MP 4

2022



Monitoring Point 5 (MP 5)

MP 5 2015



MP 5 2017



MP 5 2018



MP 5 2019



MP 5 2020



MP 5 2021





MP 5

2022



Monitoring Point 6 (MP 6)

MP 6 2015



MP 6 2017



MP 6

2018



MP 6

2019



MP 6 2020



MP 6 2021





MP 6

2022



Monitoring Point 7 (MP 7)

MP 7 2015



MP 7 2017



MP 7 2018



MP 7 2019



MP 7 2020



MP 7 2021





MP 7

2022



Monitoring Point 8 (MP 8)

MP 8 2015



MP 8 2017



MP 8 2018



MP 8 2019



MP 8 2020



MP 8 2021





MP 8

2022



Monitoring Point 9 (MP 9)

MP 9 2015



MP 9 2017



MP 9 2018



MP 9 2019



MP 9

2020



MP 9

2021





MP 9

2022



Monitoring Point 10 (MP 10)

MP 10 2015



MP 10 2017



MP 10 2018



MP 10 2019



MP 10 2020



MP 10 2021





MP 10

2022



Monitoring Point 11 (MP 11)

MP 11 2016



MP 11 2017



MP 11 2018



MP 11 2019



MP 11 2020



MP 11 2021





MP 11

2022



Monitoring Point 12 (MP 12)

MP 12 2015



MP 12 2017



MP 12 2018



MP 12 2019



MP 12 2021



MP 12 2022





Monitoring Point 13 (MP 13)

MP 13 2015



MP 13 2017



MP 13 2018



MP 13 2019



MP 13 2021



MP 13 2022



Monitoring Point 14 (MP 14)

MP 14 2015



MP 14 2017



MP 14 2018



MP 14 2019



MP 14 2021



MP 14 2022



Monitoring Point 15 (MP 15)

MP 15 2015



MP 15 2017



MP 15 2018



MP 15 2019



MP 15 2021



MP 15 2022



Monitoring Point 16 (MP 16)

MP 16 2015



MP 16 2017



MP 16 2018



MP 16 2019



MP 16 2021



MP 16 2022



Monitoring Point 17 (MP 17)

MP 17 2015



MP 17 2017



MP 17 2018



MP 17 2019



MP 17 2021



MP 17 2022



Monitoring Point 18 (MP 18)

MP 18 2015



MP 18 2016



MP 18 2017



MP 18 2019



MP 18 2021



MP 18 2022





APPENDIX F. STAFF CONTRIBUTIONS

The following staff were involved in the project:

Name	Qualification	Title	Contribution
Isaac Blundell	Conservation and Land Management Traineeship	Trainee Ecologist	Field surveys – flora surveys and next box monitoring
Kane Blundell	Grad Dip Spatial Sc (in progress)	Ecologist	GIS Figures
Mark Dean	BEnvSc	Ecologist	Field surveys – flora surveys, site inspection and next box monitoring
Samara Schulz	BEnvSc & Mgt (Hons) Accredited BAM Assessor	Principal Botanist	Report review



APPENDIX G. LICENSING

Wedgetail employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL102506, Expiry: 28 February 2024) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.