Attachment 15

BI-ANNUAL REHABILITATION MONITORING REPORT

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Hitchcock Road Sand Project

2021

Prepared for PF Formation

December 2021 V.1

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Bi-Annual Rehabilitation Monitoring Report Hitchcock Road Sand Project 2021

PF Formation

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This assessment has been prepared by

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Abbreviations

Abbreviation	Description
BC Act	*Biodiversity Conservation Act 2016*
BRMR	Bi-Annual Rehabilitation Monitoring Report
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
HTW	High Threat Weed
KPI	Key Performance Indicators
KTP	Key Threatening Processes
LEP	Local Environmental Plan
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
THSC	The Hills Shire Council
VIS	Vegetation Information System
WoNS	Weeds of National Significance

1 INTRODUCTION

This Bi-Annual Rehabilitation Monitoring Report (BRMR) presents the findings of the rehabilitation effort within the Hitchcock Road Sand Project undertaken by PF Formation at Maroota.

1.1 BACKGROUND

PF Formation operates a sand extraction and processing operation on a 60 hectare site on Wisemans Ferry Road, Old Northern Road and Hitchcocks Road Maroota. The quarry operates in compliance to Project Approval number 06_0104 issued by the Minister for Planning in 2009.

In 2010 an extension of the quarry into 3.7 hectares of Sydney Hinterland Transition Woodland (SHTW) was granted with an obligation of 7.9 hectares of rehabilitation of SHTW to take place along the western boundary of the quarry where extraction operations were already complete.

1.2 OBJECTIVES

The objectives of this BRMR is to describe the current condition of the vegetation found throughout the rehabilitation area and to advise PF Formation on the appropriate management measures that should be implemented to meet the expectations of the 'Methodology to assess success of revegetation within Hitchcock Road site' (2008) prepared by Parsons Brinckerhoff.

This report will:

- identify native flora and fauna species, populations and ecological communities known to or likely to occur within the site;
- describe the native vegetation and habitats within the site;
- determine the legislative and conservation significance of species, populations and ecological communities known or likely to occur within the site with reference to the Commonwealth *EPBC Act 1999* and the *NSW BC Act 2016*;
- recommend appropriate biodiversity and environmental management measures that should be implemented to reach criteria for monitoring success set by Parsons Brinckerhoff (2008);
- provide an independent monitoring report for inclusion as part of the external reporting for the quarry Annual Review.

2 METHODOLOGY

2.1 SITE HISTORY

2.1.1 Remnant native vegetation

The remnant vegetation immediately north, east and west of the rehabilitation area was identified as SHTW during the 2010 survey undertaken by Parsons Brinckerhoff. It is highly likely any vegetation, which may have occurred within the rehabilitation area, was also this plant community type (PCT). The remnant vegetation to the east was removed in 2019 as per the quarry expansion

approval. The remnant vegetation to the north and west is still present with the rehabilitation area now providing direct linkage between these areas.

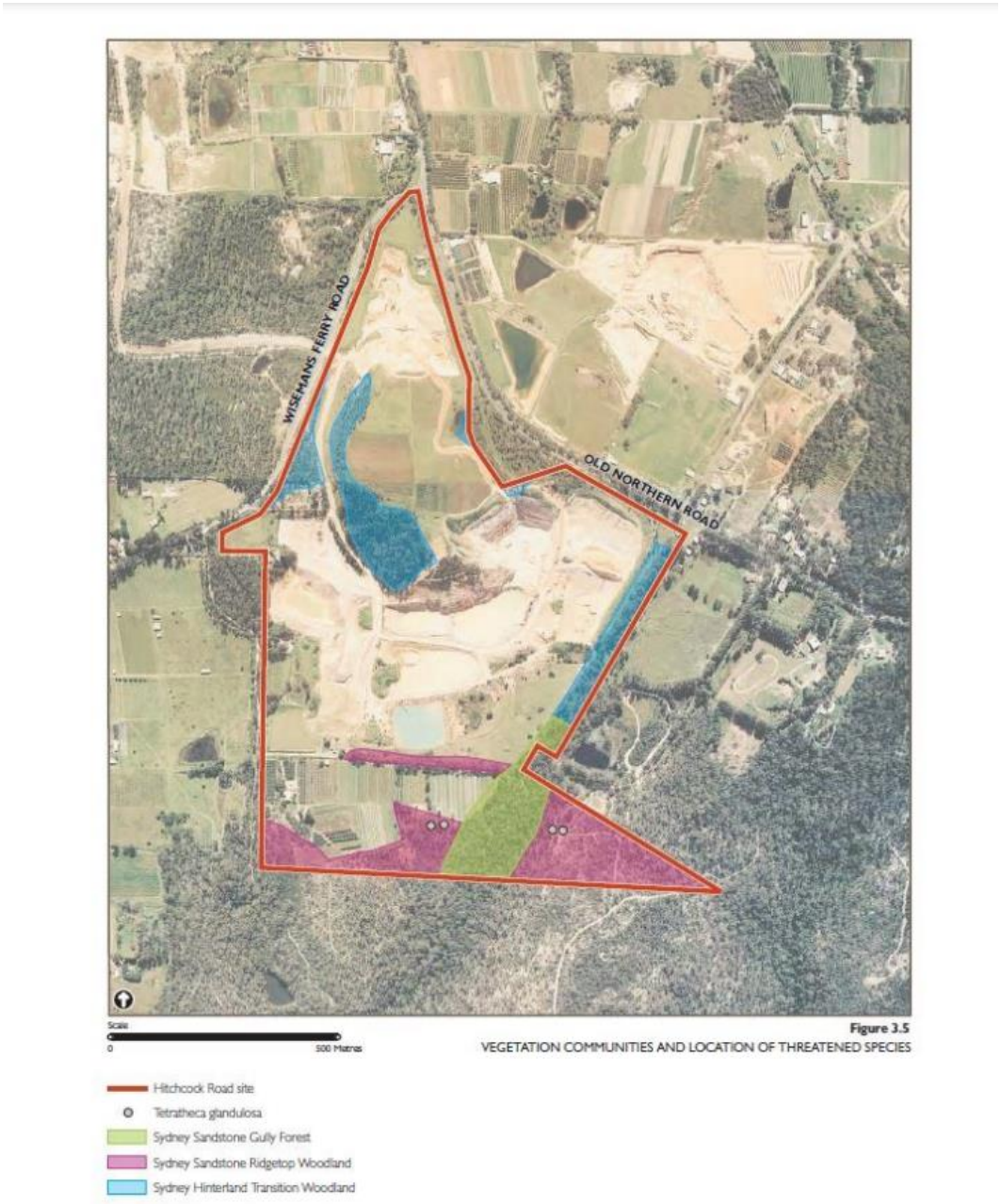

Figure 1. Native vegetation identified within the Hitchcock Road Sand Quarry Project (2008)

2.2 FIELD SURVEY

Botanical surveys of the study area were conducted during December 2021. The survey consisted of a 20 x 20m survey plot in each of the locations previously surveyed by WSP.

Opportunistic sightings were also undertaken for indirect evidence of native fauna, including scratches, scats, nests, hollows in use, camps, roosts, den sites etc. Opportunistic sightings of all fauna species were recorded throughout the survey period.

2.3 CRITERIA TO MONITOR SUCCESS

Parsons Brinckerhoff (2008) have outlined the Key Performance Indicators (KPI) to measure success of the biodiversity and rehabilitation effort of the Hitchcock Road Sand Quarry Project. The measurement criteria has been demonstrated in Table 1.

2.4 SURVEY LIMITATIONS

The survey was conducted within a short timeframe during summer. Therefore some plant species may not have been identified due to the survey being performed when not in flower, or when dormant. It is noted that some flora species are seasonal, and may not have been visible at the time of the surveys. In addition to this, extreme dry weather conditions have been persistent for more than 18 months leading up to the survey period. Some species may therefore appear to be dead or dormant when they otherwise would not.

The survey limitations have been addressed through:

- consideration of flora and fauna species known to occur in the locality (including number of records from BioNet);
- consideration of habitat suitability present within the study areas and connectivity to other areas of habitat in the local landscape;
- consideration of current weather conditions;
- A conservative approach in assuming the presence of a species that could potentially be present in the study areas.

Where the study area contains potential habitat for threatened fauna species known to occur in the locality, and where survey areas support a likelihood of occurrence, it has been assumed on a conservative approach that such species may occur in the study area.

Table 1. Criteria to monitor success of the rehabilitation area

Category	Criteria	Target			Condition of vegetation to be removed
		Year 5	Year 10	Year 15	
Native Vegetation species	Native species diversity (average number per 400m² quadrat)	20	35	40	46
	Average number of characteristic species for the site occurring within 400m²	15	20	27	34.5 (+/- 1.5)
	Native species cover % (% cover within 400m² quadrat)	>50	>85	>95	99
Weeds	Weed abundance (% of vegetation cover in 400m² quadrat)	<50	<15	<5	<1
	Invasive or noxious weed species (e.g. Lantana, Blackberry, exotic vines)	Controlled	Controlled	Controlled	Restricted
Vegetation structure	Vegetation Structure	Canopy, shrublayer and groundcover species present. However, structure limited, generally consisting of low canopy and ground cover.	Canopy, shrublayer and groundcover species present. Structure beginning to develop.	Well-structured and includes canopy, midstorey and ground cover units	Well-structured and includes canopy, midstorey and ground cover units
Canopy	Average canopy height (m)	4	8	12	12-16
	Native canopy cover (minimum % cover) [modified braun blanquet scale]	5 [3]	5 [3]	5 [3]	5 [3]
Shrub layer	Native shrub cover (minimum % cover) [modified braun blanquet scale]	10 [3]	15 [3]	25 [4]	32.5 (+/- 7.5) [4]
	Average shrub cover height (m)	0.5	1	1	1.25
Ground cover	Native ground cover (minimum % cover) [modified braun blanquet scale]	5 [3]	10 [3]	10 [3]	15 (+/- 5) [3]
Ecosystem function	Habitat values	Vegetation structure beginning to develop.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as leaf litter and fallen timber.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as	Provides minimal habitat for fauna, however, many woodland birds present. Well-structured habitat,

				leaf litter and fallen timber.	includes moderate levels of leaf litter and fallen timber.
	Natural regeneration indicating dispersal of seed into site and/or presence of soil seed bank	Yes	Yes	Yes	Yes

3 RESULTS

Results from the field surveys conducted over December 2021 have been separated into three distinct areas to enable quantification of condition for each specific location and its monitoring objectives.

3.1 2004 REHABILITATION AREA

The 2004 rehabilitation area is doing exceptionally well against the criteria.

The criteria for the 15 year target of average species diversity has now been met based on the December 2021 vegetation survey. The return to average rainfall conditions over the past two years have increased the diversity of native ground cover species such as forbs and ferns.

All other criteria has been met with the addition of woodland birds being present throughout the site. Several species were recorded during the December 2021 survey which has been documented in Appendix B. Leaf litter and fallen timber has remained present in this location providing microhabitats for invertebrates, reptiles and small mammals.

Active weed management is the only ongoing action required within this area to meet the KPI as set by Parsons Brinckerhoff in Table 1. The return to average rainfall has seen an increase in weed species diversity and density however management of these areas has been undertaken.

3.2 2006 REHABILITATION AREA

The 2006 rehabilitation area has shown an increase in overall species diversity and density following the return to average rainfall conditions. The average species diversity across the three quadrats is still less than the expected criteria however the characteristic species is greater than the 10 year criteria. It is expected the species diversity will continue to increase providing the climatic conditions remain stable for the next growing season.

All other criteria has been met for the 15 year target.

Active weed management is the only ongoing action required within this area to meet the KPI as set by Parsons Brinckerhoff in Table 1. The return to average rainfall has seen an increase in weed species diversity and density however management of these areas has been undertaken.

3.3 2011 REHABILITATION AREA

The 2011 rehabilitation area is still struggling with exotic ground cover species, in particular pasture grass. The average species diversity and characteristic species has met the 5 year target along with the overall native species cover. Many of the fast growing Acacia species have perished, most likely due to the drought conditions of 2017-2019, with many remaining as standing dead. Over time these small trees are expected to fall adding to the course woody debris available at ground level.

There is evidence of natural regeneration occurring within both quadrat locations. The area which has a ground cover stratum dominated by Kikuyu Grass would benefit from assisted planting of canopy species to shade out the fast growing grass species allowing for further regeneration of native species.

Assisted planting of canopy species is recommended after the return to average rainfall patterns. Ongoing weed management, particularly of exotic grass species, is essential to reach KPI for this area.

3.4 THREATENED FLORA

No threatened flora species have been identified within the rehabilitation area, however, several species within the Maroota area are known to respond and occur in disturbed environments. In particular, Bynoe's Wattle *Acacia bynoeana* is particularly responsive to disturbed areas and is likely to occur along the edge of establishing rehabilitation areas. *Pimelea curviflora var. curviflora* is another likely species which may appear, almost randomly, within the rehabilitation area over time.

Bush regeneration staff should be familiar with local threatened species so mis-identification does not occur. Bi-annual flora survey should include sweeps for local threatened flora species including:

- *Acacia bynoeana*
- *Pimelea curviflora var. curviflora*
- *Tetratheca glandulosa*
- *Grevillea parviflora subsp. supplicans*

3.5 NATIVE FAUNA

There was no dedicated native fauna survey undertaken for this report. No threatened fauna species have been previously identified within the rehabilitation area and limited resources would suggest there is a low possibility of resident threatened fauna species occurring.

During the botanical survey in December 2021 opportunistic sightings of native fauna were recorded. In total 15 native species were recorded onsite and one nest, most likely that of an Eastern Yellow Robin. No threatened fauna species were identified or recorded. Complete list of fauna observed can be found in Appendix B.

Overall the condition of habitat for native fauna species within the property is considered to be low to moderate in its current state. The 2004 and 2006 rehabilitation areas currently have the most habitat value to support a range of native fauna species with the 2011 rehabilitation area still building habitat values over time.

Table 2. Results of December 2021 field survey against monitoring success criteria

Category	Criteria	Target			Results		
		Year 5	Year 10	Year 15	2004 (18yrs)	2006 (16yrs)	2011 (11yrs)
Native Vegetation species	Native species diversity (average number per 400m² quadrat)	20	35	40	46	37	27
	Average number of characteristic species for the site occurring within 400m²	15	20	27	33.5	31	24.5
	Native species cover % (% cover within 400m² quadrat)	>50	>85	>95	>95%	>90%	>50%
Weeds	Weed abundance (% of vegetation cover in 400m² quadrat)	<50	<15	<5	<5	<5	<30
	Invasive or noxious weed species (e.g. Lantana, Blackberry, exotic vines)	Controlled	Controlled	Controlled	Controlled	Controlled	Mostly controlled. Grass species dominate some areas.
Vegetation structure	Vegetation Structure	Canopy, shrublayer and groundcover species present. However, structure limited, generally consisting of low canopy and ground cover.	Canopy, shrublayer and groundcover species present. Structure beginning to develop.	Well-structured and includes canopy, midstorey and ground cover units	Well structured with canopy, shrublayer and groundcover present.	Well structured with canopy, shrublayer and groundcover present.	Structure limited in some areas. Other areas have canopy, shrublayer and groundcover present.
Canopy	Average canopy height (m)	4	8	12	10-15	10	6
	Native canopy cover (minimum % cover)	5 [3]	5 [3]	5 [3]	50-75% (5)	50-75% (5)	5-25% (3)

	[modified braun blanquet scale]						
Shrub layer	Native shrub cover (minimum % cover) [modified braun blanquet scale]	10 [3]	15 [3]	25 [4]	25-50% (4)	25-50% (4)	5-25% (3)
	Average shrub cover height (m)	0.5	1	1	1	1	0.5
Ground cover	Native ground cover (minimum % cover) [modified braun blanquet scale]	5 [3]	10 [3]	10 [3]	5-25% (3)	5-25% (3)	<5% (2)
Ecosystem function	Habitat values	Vegetation structure beginning to develop.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as leaf litter and fallen timber.	Woodland birds recorded. Habitat structure beginning to develop, including groundcover such as leaf litter and fallen timber.	Woodland birds present. Course woody debris present. Leaf litter present.	Woodland birds present. Course woody debris beginning to develop. Leaf litter present.	Structure beginning to develop. Some course woody debris. Some leaf litter.
	Natural regeneration indicating dispersal of seed into site and/or presence of soil seed bank	Yes	Yes	Yes	YES	YES	SOME

4 DISCUSSION AND RECOMMENDATIONS

This is the seventh Bi-Annual Rehabilitation Monitoring Report produced for PF Formation Hitchcock Road Sand Project. Rehabilitation work is in the mid-stages and will continue with management actions in the years that follow, particularly as the quarry operations come to an end.

Due to the dry weather conditions which occurred from mid 2017 to 2019 a reduction in ground cover herbaceous flora is thought likely to have occurred throughout all native vegetation sites monitored. Forbs, grasses and ferns have recovered somewhat with a return to average rainfall conditions throughout 2020 and 2021 however recovery has been slow due to excessive exotic species growth also occurring and competing for resources.

Weeds are present within all rehabilitation zones with WoNS occurring in very low density. High Threat Weeds (HTW), as determined by the DPIE, are also present although most of these weeds can be found within the 2011 rehabilitation area. Weed management has continued on a monthly or fortnightly schedule throughout the monitoring period which has resulted in an improvement of weed reduction in some areas.

The overall condition of the rehabilitation area at the Hitchcock Road Sand Project site can be considered as Good. The rehabilitation is progressing well and is generally meeting or exceeding the targets set by the 'Methodology to assess success of revegetation within Hitchcock Road site' prepared by Parsons Brinckerhoff in 2008.

5 LIMITATIONS AND ASSUMPTIONS

This study was limited by the timing and frequency of the survey. At the time of field survey for this particular report the local region was enduring through 18 months of continual dry weather conditions. Bushfires were ongoing in surrounding districts. It is highly possible there may be flora and/or fauna species present at the site that were not recorded due to their seasonal, territorial or cryptic nature, or species may have become dormant during the drought conditions.

It can never be proven that threatened species have not, do not or will not use the site as habitat. The conclusions drawn in this report are a result of testing, observation and experience.

This report describes the habitat and vegetation of the site at the time of the field survey. Vegetation and habitat will change over time and therefore the findings of this report are only relevant for the current reporting period.

6 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR AND FIELD ECOLOGIST

The Author and Field Ecologist, Melissa Mass, has formal qualifications including a Bachelor of Applied Science (B. App. Sc.), majoring in Ecology, and a Certificate 3 in Horticulture. Her current Scientific Licence number issued from the NSW OEH is SL101441 with expiry date 31st Oct 2020. Furthermore an Animal Research Authority issued by the NSW Animal Care and Ethics Committee is current to

undertake general survey work in THSC local government area with expiry date 23rd Mar 2021. Melissa is an accredited Biodiversity Assessor conforming to the requirements as imposed by OEH with Accreditation number being BAAS18053.

Melissa has been working as an Ecologist for 11 years. Her work has included targeted threatened species assessment and management, reviews of environmental factors, bush regeneration, environmental impact assessments, and environmental survey and monitoring.

Melissa has a strong focus on threatened species ecology and has actively contributed to the Long-nosed Potoroo National Recovery Plan.

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8 APPENDIX

Appendix A – Native Flora identified and recorded as present onsite December 2021

Status	Botanical Name	Common Name	Recorded onsite	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
	Acacia brownii	Heath Wattle	Y			2				
	Acacia decurrens	Black Wattle	Y		1	1	2			1
	Acacia falcata	Sickle Wattle	Y					1		1
	Acacia linifolia	White Wattle	Y		2	2	3	2	2	
	Acacia longifolia	Sydney Golden Wattle	Y		2		2	3	1	
	Acacia myrtifolia	Red Stemmed Wattle	Y						1	
	Acacia parramattensis	Parramatta Wattle	Y	2	1	1	2	2	2	2
	Acacia suaveolens	Sweet Wattle	Y		1		1			
	Acacia terminalis	Sunshine Wattle	Y			2	2			
	Acacia ulicifolia	Prickly Moses	Y		1					
	Acianthus fornicatus	Pixie Caps	Y							
E	*Ageratina adenophora*	Crofton Weed	Y							
E	*Aira caryophyllea*	Silvery Hairgrass	Y							
	Allocasuarina littoralis	Black She-oak	Y	3	1			2	1	3
E	*Anagallis arvensis*	Scarlet Pimpernel	Y	1					1	
E	*Andropogon virginicus*	Whiskey Grass	Y						1	1
	Angophora costata	Smooth Barked Apple	Y	2	4	1	3	1	1	
	Angophora hispida	Dwarf Apple	Y						1	1
E	*Araujia sericifera*	Moth Vine	Y	1						
	Banksia ericifolia	Heath-leaved Banksia	Y		1	2	3	2		
	Banksia integrifolia	Coast Banksia	Y		1		1			
	Banksia serrata	Old Man Banksia	Y							
	Banksia spinulosa	Hairpin Banksia	Y							
	Bidens pilosa	Cobblers Pegs	Y	1					1	
	Billardiera scandens	Hairy Apple Berry	Y	1			1	1		
	Blechnum cartilagineum	Gristle Fern	Y	1			1			
	Boronia floribunda	Pale Pink Boronia	Y				1			
	Boronia ledifolia	Sydney Boronia	Y							
	Bossiaea lenticularis	Bossiaea	Y							
	Bossiaea obcordata	Spiny Bossiaea	Y							
	Breynia oblongifolia	Coffee Bush	Y	1		1				1

E	*Briza maxima*	Quaking Grass	Y				1		1	1
	Brunoniella pumilio	Dwarf Blue Trumpet	Y	1						
	Bursaria spinosa	Native Blackthorn	Y		1		1			
	Cassytha glabella	Slender Devils Twine	Y	1		1				1
	Caustis flexuosa	Curly Wig	Y							
	Ceratopetalum gummiferum	NSW Christmas Bush	Y							
	Cheilanthes seiberi	Mulga Fern	Y	2		2	1	1		1
	Clematis aristata	Old Man's Beard	Y	1						
E	*Conzya bonariensis*	Flaxleaf Fleabane	Y	1			1		2	
	Corymbia eximia	Yellow Bloodwood	Y	3						3
	Cynodon dactylon	Couch Grass	Y			1	1		2	1
	Cyperus rotundus	Nut Grass	Y						1	
	Daviesia genistifolia	Broom Bitter Pea	Y							
	Dianella caerulea var. producta	Blue Flax Lily	Y	1	1	1	1	1		1
	Dianella prunina		y							
	Dichelachne crinite	Long-haired Plume Grass	Y							
	Dodonaea triquetra	Large Leaf Hop Bush	Y				1		1	
	Drosera auriculata	Sundew	Y							
	Echinopogon caespitosus var. caespitosus	Tufted Hedgehog Grass	Y	1				1	1	1
	Ehrharta erecta	Panic Veldtgrass	Y	1						
	Einadia hastata	Berry Saltbush	Y	1	1				1	
	Entolasia stricta	Wiry Panic	Y	3	1	4	1	1	1	1
	Eragrostis brownii	Brown's Lovegrass	Y	1	1	1		1	1	2
	Eragrostis curvula	African Lovegrass	Y						1	
	Eucalyptus euginioides	Thin-leaved Stringybark	Y			1				
	Eucalyptus oblonga	Stringybark	Y					1		2
	Eucalyptus pilularis	Blackbutt	Y		3		1			3
	Eucalyptus punctata	Grey Gum	Y	2			1			

	Exocarpus cupressiformis	Native Cherry	Y	1						
	Gahnia sieberiana	Red-fruit Saw-sedge	Y							
	Glycine clandestina	Twining Glycine	Y	1	1	1	1	1	1	1
	Gompholobium glabratum	Dainty Wedge Pea	Y			1				
	Gonocarpus teucrioides	Raspwort	Y							
	Goodenia bellidifolia	Daisy Goodenia	Y	1						
	Goodenia hederacea	Forest Goodenia	Y	1		1		1		
	Grevillea buxifolia	Grey Spider Flower	Y							
	Grevillea speciosa	Red Spider-flower	Y							
	Hakea dactyloides	Broad-leaved Hakea	Y							
	Hakea salicifolia	Willow-leaved Hakea	Y		3	3	2			
	Hakea sericea	Needlebush	Y		1		1	1		
	Herdenbergia violacea	False Sarsaparilla	Y	1		1				1
	Hibbertia diffusa	Wedge Guinea Flower	Y			1				
	Hypochaeris radicata	Catsear	Y		2		1		1	1
	Imperata cylindrica	Blady Grass	Y	2	1		1	5	1	4
	Jacksonia scoparia	Dogwood	Y							
	Kunzea ambigua	Tickbush	Y	2	1	4	2	5	1	2
E	*Lantana camera*	Lantana	Y							
	Lepidosperma laterale	Variable Swordsedge	Y	1						
	Leptospermum polygalifolium	Tantoon	Y			2		1	1	
	Leptospermum trinervium	Flaky-barked Tea-tree	Y	1						
	Leucopogon lanceolatus	Lance Beard Heath	Y			1				
	Lindsaea microphylla	Lacy Wedge Fern	Y			1				
	Lomandra gracilis	Small Lomandra	Y							
	Lomandra longifolia	Spiny-headed Mat-rush	Y	2		2	1	2		2
	Lomandra multiflora	Many Flowered Mat-rush	Y	1		1		1		1
	Lomandra obliqua	Fish Bones	Y	1		1				

	Microlaena stipoides	Weeping Grass	Y	2		2				2
	Mirbelia rubiifolia	Heath Mirbelia	Y							
	Oxalis perennans	Grasslands Wood-sorrel	Y	1			1			
	Ozothamnus diosmifolius	White Dogwood	Y	3		1		1	1	
	Panicum simile	Two-colour Panic	Y	1		1				1
E	*Paspalum diatatum*	Paspalum	Y	1					1	1
	Patersonia sericea	Purple Flag Flower	Y	1						
E	*Pennisetum clandestinum*	Kikuyu Grass	Y						4	
	Persoonia lanceolate	Lance Leaf Geebung	Y						1	
	Persoonia levis	Broad Leaved Geebung	Y							
	Persoonia pinifolia	Pine-leaved Geebung	Y							
	Phyllanthus hirtellus	Thyme Spurge	Y	1						
	Pittosporum undulatum	Sweet Pittosporum	Y	1	1	2	1	1	1	1
E	*Plantago lanceolata*	Ribwort Plantain	Y							
	Platysace linearifolia	Carrot Tops	Y	1	1		1			
	Podolobium ilicifolium	Prickly Shaggy Pea	Y		2					
	Polyscias sambucifolia	Elderberry Panax	Y			1				
	Pomax umbellata	Pomax	Y							
	Pratia purpurascens	Whiteroot	Y	1		1	1	1		
	Pteridium esculentum	Bracken Fern	Y			1				
	Rytidosperma tenuius	Wallaby Grass	Y							
	Scaevola ramosissima	Purple Fan-flower	Y							
	Senecio linearifolius	Fireweed Groundsel	Y					1	1	
WoNS	*Senecio madagascariensis*	Fireweed	Y	1					1	1
E	*Setaria gracilis*	Slender Pigeon Grass	Y	1		1	1		1	
E	*Sida rhombifolia*	Paddy's Lucerne	Y	1			1	1	2	
E	*Solanum nigrum*	Black-berry Nightshade	Y							1
E	*Sonchus oleraceus*	Common Sow Thistle	Y	1					1	
	Stylidium lineare	Narrow-leaf Trigger Plant	Y							
	Syncarpia glomulifera	Turpentine	Y	1	1	3	1	1	1	1
	Themeda australis	Kangaroo Grass	Y		1	1				1

E	*Taraxacum officinale*	Common Dandelion	Y	1						
	Trema tomentosa var. aspera	Poison Peach	Y					1	1	
E	*Trifolium repens*	White Clover	Y						1	
E	*Verbena bonariensis*	Purple Top	Y						1	
	Veronica plebeia	Trailing Speedwell	Y							

E – Exotic species WoNS – Weed of National Significance

Appendix B – Fauna identified and recorded as present onsite December 2019

Scientific Name	Common Name	Observation Type
Bird		
Alectura lathami	Brush Turkey	Observed
Anthochaera chrysoptera	Little Wattlebird	Observed
Chenonetta jubata	Australian Wood Duck	Observed
Colluricincla harmonica	Grey Shrike-thrush	Observed
Cracticus tibicen	Australian Magpie	Observed
Dacelo novaeguineae	Laughing Kookaburra	Observed
Eopsaltria australis	Eastern Yellow Robin	Observed
Falco cenchroides	Australian Kestrel	Observed
Lichenostomus leucotis	White-eared Honeyeater	Observed
Malurus cyaneus	Superb Fairy Wren	Observed
**Manorina melanocephala*	Noisy Minor	Observed
Meliphaga lewinii	Lewin's Honeyeater	Observed
Pachycephala pectoralis	Golden Whistler	Observed
Pachycephala rufiventris	Rufus Whistler	Observed
Rhipidura albiscapa	Grey Fantail	Observed
Sericornis frontalis	White-browed scrubwren	Observed
Strepera graculina	Pied Currawong	Observed
Mammal		
**Oryctolagus cuniculus*	European Rabbit	Scat and digs
Perameles nasuta	Long-nosed Bandicoot	Digs
Trichosurus vulpecula	Brush-tailed Possum	Scat
Wallabia bicolor	Swamp Wallaby	Scat
Reptile		
Lampropholis guichenoti	Common Skink	Observed
Amphibian		
Crinia signifera	Common Eastern Toadlet	Heard call

*Pest species

Appendix C – Dominant vegetation structure in December 2019

Vegetation Layer	Height Range (m)	Dominant Species (Native only)
Plot 1		
Trees	15-25	*Corymbia eximia, Eucalyptus punctata, Angophora costata, Allocasuarina littoralis, Syncarpia glomulifera*
Shrubs	0.5-3	*Ozothamnus diosmifolius, Acacia parramattensis, Kunzea ambigua*
Ground cover	0.1-0.5	*Lomandra longifolia, Panicum simile, Entolasia stricta*
Plot 2		
Trees	5-15	*Eucalyptus pilularis, Angophora costata, Syncarpia glomulifera, Allocasuarina littoralis*
Shrubs	0.5-3	*Hakea salicifolia, Acacia linifolia, Bursaria spinosa, Kunzea ambigua*
Groundcover	0.1-0.8	*Themeda australis, Dianella caerulea var. producta, Entolasia stricta, Microleana stipoides*
Plot 3		
Trees	15-20	*Eucalyptus euginioides, Angophora costata, Syncarpia glomulifera*
Shrubs	0.5-3	*Acacia terminalis, Banksia ericifolia, Hakea salicifolia, Kunzea ambigua, Leptospermum polygalifolium*
Ground cover	0.1-1	*Entolasia stricta, Themeda australis, Panicum simile, Lomandra longifolia*
Plot 4		
Trees	15-20	*Eucalyptus punctata, Eucalyptus pilularis, Angophora costata, Syncarpia glomulifera*
Shrubs	0.5-2	*Banksia ericifolia, Hakea salicifolia, Acacia parramattensis, Kunzea ambigua*
Ground cover	0.1-0.8	*Lomandra longifolia, Entolasia stricta, Glycine clandestine, Imperata cylindrica, Microleana stipoides*
Plot 5		
Trees	10-15	*Angophora costata, Syncarpia glomulifera, Eucalyptus oblonga, Allocasuarina littoralis*
Shrubs	0.5-3	*Kunzea ambigua, Leptospermum polygalifolium, Acacia longifolia, Banksia ericifolia*
Ground cover	0.1-0.8	*Imperata cylindrica, Lomandra longifolia, Eragrostis brownii, Echinopogon caespitosus var. caespitosus*
Plot 6		

Trees	5-10	*Angophora hispida, Angophora costata, Allocasuarina littoralis, Syncarpia glomulifera*
Shrubs	0.5-2	*Acacia linifolia, Acacia parramattensis, Kunzea ambigua, Dodonaea triquetra, Leptospermum polygalifolium*
Ground cover	0.1-1	*Glycine clandestina, Eragrostis brownii, Imperata cylindrica*
Plot 7		
Trees	15-20	*Corymbia eximia, Eucalyptus pilularis, Allocasuarina littoralis, Eucalyptus oblonga, Syncarpia glomulifera*
Shrubs	0.5-3	*Acacia parramattensis, Acacia decurrens, Kunzea ambigua, Breynia oblongifolia*
Groundcover	0.1-0.8	*Entolasia stricta, Lomandra longifolia, Imperata cylindrica, Eragrostis brownii*

Appendix D – Vegetation and ecosystem function attributes December 2019

Stem class			Hollows	
Plot 1				
Dbh	Eucalyptus	Non-Eucalypt	<20cm	>20cm
80cm+				
50-79cm				
30-49cm	✓			
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Length of logs in total	20m	Litter cover	50%	
Plot 2				
Dbh	Eucalyptus	Non-Eucalypt	<20cm	>20cm
80cm+				
50-79cm				
30-49cm				
20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Length of logs in total	12m	Litter cover	70%	
Plot 3				
Dbh	Eucalyptus	Non-Eucalypt	<20cm	>20cm
80cm+				
50-79cm				
30-49cm				
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Length of logs in total	20m	Litter cover	50%	
Plot 4				
Dbh	Eucalyptus	Non-Eucalypt	<20cm	>20cm
80cm+				
50-79cm				
30-49cm	✓			
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Length of logs in total	20m	Litter cover	70%	
Plot 5				
Dbh	Eucalyptus	Non-Eucalypt	<20cm	>20cm
80cm+				
50-79cm				
30-49cm				

20-29cm	✓			
10-19cm	✓			
5-9cm	✓	✓		
<5cm	✓	✓		
Length of logs in total	10m	Litter cover	40%	
Plot 6				
Dbh	Eucalyptus	Non-Eucalypt	<20cm	>20cm
80cm+				
50-79cm				
30-49cm				
20-29cm				
10-19cm	✓			
5-9cm	✓			
<5cm	✓	✓		
Length of logs in total	5m	Litter cover	10%	
Plot 7				
Dbh	Eucalyptus	Non-Eucalypt	<20cm	>20cm
80cm+				
50-79cm				
30-49cm				
20-29cm	✓			
10-19cm	✓	✓		
5-9cm	✓	✓		
<5cm	✓	✓		
Length of logs in total	5m	Litter cover	80%	

Appendix E – Vegetation composition and structure December 2019

Composition and structure		
Plot 1		
Attribute	Class	Value
Composition Count	Trees	6
	Shrubs	10
	Grasses etc	10
	Forbs	7
	Ferns	2
	Other	5
	Weeds	8
Plot 2		
Composition Count	Trees	4
	Shrubs	14
	Grasses etc	3
	Forbs	2
	Ferns	1
	Other	1
	Weeds	1
Plot 3		
Composition Count	Trees	4
	Shrubs	15
	Grasses etc	10
	Forbs	2
	Ferns	3
	Other	3
	weeds	0
Plot 4		
Composition Count	Trees	4
	Shrubs	14
	Grasses etc	5
	Forbs	3
	Ferns	2
	Other	2
	Weeds	3
Plot 5		
Composition Count	Trees	5
	Shrubs	10
	Grasses etc	7
	Forbs	3
	Ferns	1
	Other	2
	Weeds	0
Plot 6		
Composition	Trees	5
	Shrubs	14
	Grasses etc	5

Count	Forbs	2
	Ferns	1
	Other	1
	Weeds	12
Plot 7		
Composition Count	Trees	7
	Shrubs	5
	Grasses etc	10
	Forbs	1
	Ferns	1
	Other	3
	Weeds	5
Plot 1		
Structure Cover %	Trees	25
	Shrubs	40
	Grasses etc	50
	Forbs	2
	Ferns	0.1
	Other	2
	Weeds	0.5
Plot 2		
Structure Cover %	Trees	40
	Shrubs	30
	Grasses etc	20
	Forbs	0.1
	Ferns	0.1
	Other	0.5
	Weeds	0.1
Plot 3		
Structure Cover %	Trees	25
	Shrubs	80
	Grasses etc	40
	Forbs	1
	Ferns	0.1
	Other	1
	Weeds	0.1
Plot 4		
Structure Cover %	Trees	40
	Shrubs	50
	Grasses etc	20
	Forbs	1
	Ferns	0.1
	Other	1
	High Threat Weeds	0.1
Plot 5		
Structure	Trees	15
	Shrubs	90
	Grasses etc	20

Cover %	Forbs	1
	Ferns	0.1
	Other	0.1
	High Threat Weeds	0.1
Plot 6		
Structure Cover %	Trees	10
	Shrubs	30
	Grasses etc	80
	Forbs	0.1
	Ferns	0.1
	Other	0.1
	High Threat Weeds	5
Plot 7		
Structure Cover %	Trees	40
	Shrubs	25
	Grasses etc	25
	Forbs	1
	Ferns	0.1
	Other	1
	High Threat Weeds	0.1

Appendix F – Photos of each quadrat 1-7

Quadrat 1

Quadrat 2

Quadrat 3

Quadrat 4

uadrat 5

Quadrat 6

Quadrat 7

Appendix G – Recommended weed control for each month of the year (WoNS and HTW only)

	Jan	Feb	Mar	Apr	May	Jun	JuL	Aug	Sep	Oct	Nov	Dec
African Lovegrass	Herbicide	Herbicide	Brush-cut	Brush-cut	Brush-cut				Herbicide	Herbicide	Herbicide	Herbicide
Blackberry	Herbicide	Herbicide	Herbicide						Herbicide	Herbicide	Herbicide	Herbicide
Cobblers Pegs	Hand removal	Hand removal	Hand removal	Hand removal					Herbicide	Herbicide	Herbicide	Hand removal
Crofton Weed	Brush-cut	Herbicide	Herbicide	Herbicide	Herbicide				Brush-cut	Brush-cut	Brush-cut	Brush-cut
Fireweed	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal
Green Cestrum									Herbicide*			
Lantana	Herbicide	Herbicide	Herbicide	Herbicide	Herbicide				Herbicide	Herbicide	Herbicide	Herbicide
Moth Vine									Herbicide^			
Paspalum	Brush-cut	Brush-cut	Brush-cut	Herbicide	Herbicide	Herbicide			Brush-cut	Brush-cut	Brush-cut	Brush-cut
Whiskey Grass	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Hand removal	Herbicide	Herbicide	Herbicide	Hand removal

Herbicide – Foliar spray with an appropriate product as per the instructions on the label. Foliar spray should be carried out during active growing season.
Slashing - Slashing within agricultural land areas only. Slashing is only effective if the targeted species has not yet reached flowering maturity.
Hand removal – Necessary when targeted species have reached flowering maturity. Entire plant can be removed or flowering heads may be cut. Removed material should be immediately bagged to prevent spread of seed and appropriately disposed of.
Herbicide* – Treatment via either cut and paint or drill and inject methods.
Herbicide^ - Treatment via scrape and paste or cut and paint method.

This table should be considered a guide for appropriate treatment during different months of the year. It does not indicate a specified work schedule.