

ATTACHMENT 13

REHABILITATION REPORT

PF Formation

2015 Monitoring of revegetation at Hitchcock Road, Maroota

7 December 2015






Document information

Client: PF Formation
Title: 2015 Monitoring of revegetation at
Hitchcock Road, Maroota
Document No: 2267030A-ECO-REP-001 RevA
Date: 7 December 2015

Rev	Date	Details
A	25/11/2015	Draft
B	07/12/2015	Final

Author, Reviewer and Approver details

Prepared by:	Mark Stables	Date: 07/12/2015	Signature: 
Reviewed by:	Alex Cockerill	Date: 07/12/2015	Signature: 
Approved by:	Alex Cockerill	Date: 07/12/2015	Signature: 

Distribution

PF Formation, Parsons Brinckerhoff file, Parsons Brinckerhoff Library

©Parsons Brinckerhoff Australia Pty Limited 2015

Copyright in the drawings, information and data recorded in this document (the information) is the property of Parsons Brinckerhoff. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that for which it was supplied by Parsons Brinckerhoff. Parsons Brinckerhoff makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information.

Document owner

Parsons Brinckerhoff Australia Pty Limited
ABN 80 078 004 798
Level 27 Ernst & Young Centre
680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
www.pbworld.com
Certified to ISO 9001, ISO 14001, OHSAS 18001

Contents

	Page number
1. Introduction	1
1.1 Background	1
1.2 Objectives of revegetation	1
1.3 Aims of report	2
2. Methodology	5
2.1 Nomenclature	5
2.2 Field survey	11
2.3 Criteria to assess rehabilitation success	12
2.4 Results	17
2.5 Species of plant	17
2.6 Assessment against criteria	17
3. Discussion and recommendations	13
4. References	15

List of tables

		Page number
Table 2.1	Quadrat survey locations	6
Table 2.2	Criteria to monitor success of revegetation	7
Table 2.3	Assessment against criteria to monitor success of revegetation	10
Table 3.1	Recommendations to improve revegetation success	14

List of figures

		Page number
Figure 1.1	Revegetation areas and survey sites	3

List of appendices

Appendix A	Revegetation works to date
Appendix B	Photos
Appendix C	Quadrat results



1. Introduction

This report presents the findings of the third monitoring session of a rehabilitation area within PF Formation's sandmining operations at Hitchcock Road, Maroota.

1.1 Background

Expansion of an existing PF Formation sand mine at Hitchcock Road required clearing of 3.7 hectares of Sydney Hinterland Transition Woodland. It was proposed to offset this clearing with revegetation and recreation of this community within a 7.9 hectare area on the western boundary of the site where quarrying has been completed. Revegetation was commenced by PF Formation in 2004. To date an area of 4.2 hectares has been completed. A key condition of the clearing being permitted is that PF Formation establishes at least 3.7 hectares of revegetation, recreating the Sydney Hinterland Transition Woodland community. replanted (approximately 1 hectare in 2004, 2 hectares in 2006 and 1.2 hectares in 2011) with the aim to recreate the vegetation to be cleared from Lot 1 DP 1013943.

Monitoring of the rehabilitation of previously mined areas is a requirement of project approval and environmental reporting is required to provide some certainty that this revegetation will ultimately result in the creation of a naturally regenerating patch of Sydney Hinterland Transition Woodland. This monitoring needs to be undertaken regularly by independent consultants (not those undertaking the revegetation works) and to include assessment against the success criteria developed for rehabilitation within the site, as included in the consent conditions for the project.

Parsons Brinckerhoff undertook monitoring of the site in July 2010 (Parsons Brinckerhoff 2010) with a second monitoring session in October 2012 and a third event in 2013. Based on the monitoring results of 2012 (Parsons Brinckerhoff 2012) and the progress towards the ecological completion criteria, the Department of Planning and Infrastructure approved the clearing of Sydney Hinterland Transition Woodland within the site in March 2013. Continuation of the monitoring of the rehabilitation and offset obligations are required in accordance with the project approval and to provide detailed reporting for inclusion in the next Independent Environmental Audit report for the quarry.

1.2 Objectives of revegetation

The objectives of revegetation within the Hitchcock Road site are to:

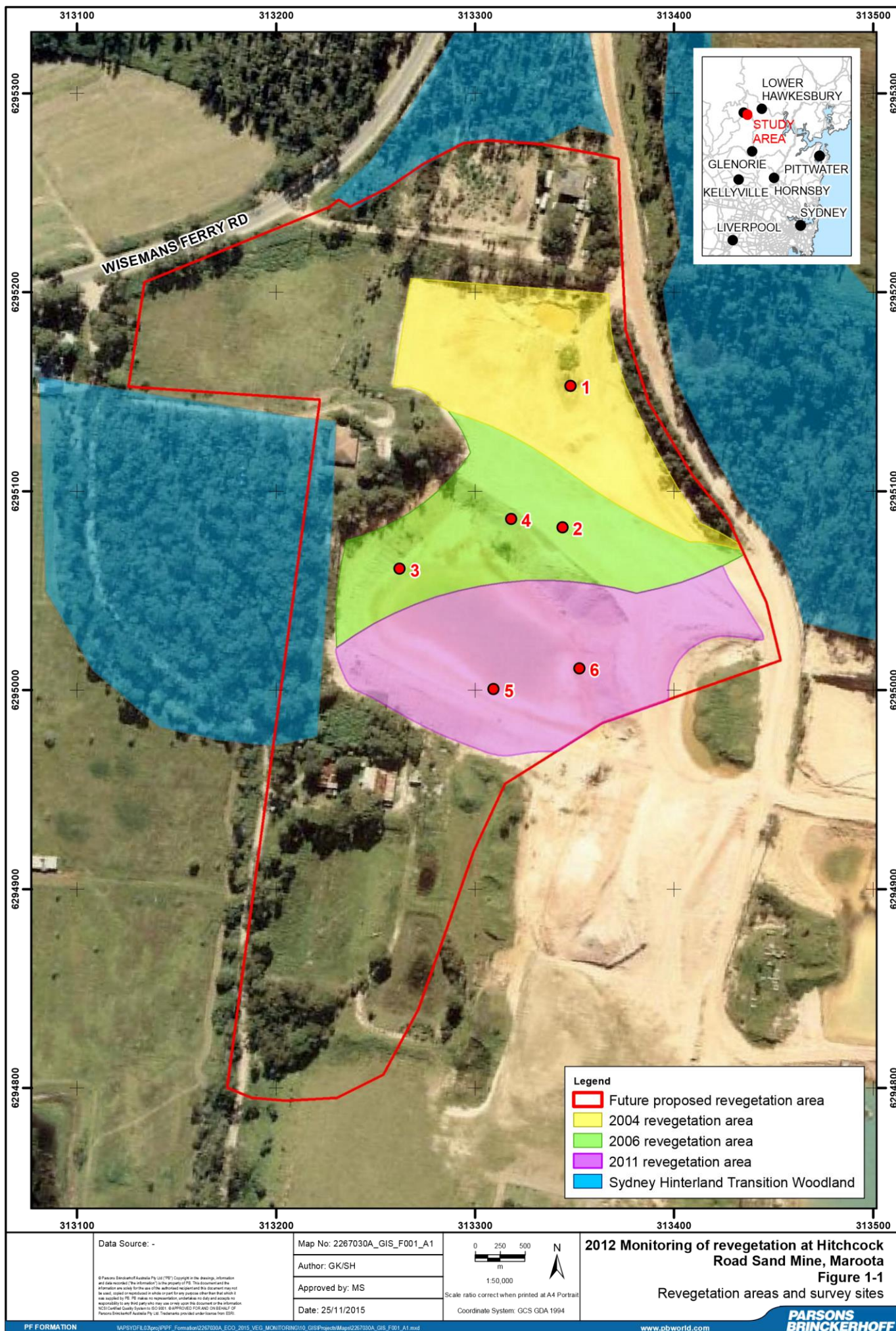
- rehabilitate and revegetate quarried areas
- revegetate with native vegetation characteristic of the community to be removed from Lot 1 DP 1013943, namely Sydney Hinterland Transition Woodland

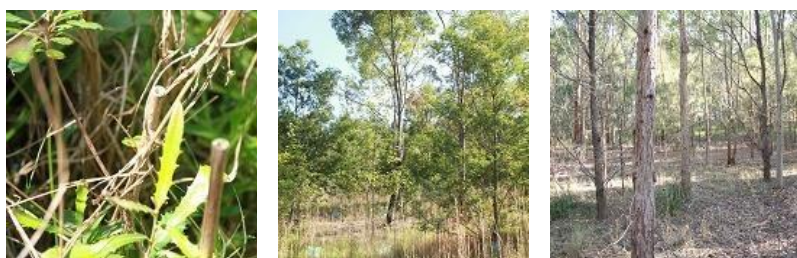
- re-create the existing characteristics of this community, to provide an area suitable for offsetting the clearing of this community at that time.

1.3 Aims of report

The aims of this report are to:

- present the results of the monitoring survey
- analyse the results against the criteria for monitoring the success of rehabilitation and progress towards five, ten and fifteen year targets (see section 2.3)
- provide recommendations on management actions required to assist in successful re-creation of Sydney Hinterland Transition Woodland within the site and to meet the long-term goals
- provide independent monitoring report for inclusion as part of the Independent Environmental Audit for the quarry.





2. Methodology

2.1 Nomenclature

Names of plants used in this document follow Harden (Harden 1992, 1993, 2000, 2002) with updates from PlantNet (Royal Botanic Gardens 2015). Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in plant lists in Appendices A and C. Introduced species are identified within the text with an asterisk following the name, for example *Lantana camara**

2.2 Field survey

This is the fourth monitoring survey of the revegetation areas. The first site inspection was undertaken on 5 July 2010, the second undertaken on 25 October 2012, the third undertaken on 2 December 2013 and this, the fourth undertaken on 15 October 2015. Fixed quadrats (20 x 20 m) were set up with edges running in a north-south, east west direction. Quadrats were marked with stakes at the north western and south western corners of the quadrat.

Within each quadrat, every species of plant present was recorded and its cover abundance estimated using a modified braun blanquet scale:

1. <5%- rare or few individuals
2. <5% common
3. 5–25%
4. 25–50%
5. 50–75%
6. 75–100%.

Additional information recorded at each quadrat site included:

- centre and south western corner of quadrat using GPS
- slope and aspect
- landform
- soil type
- evidence of disturbance, condition
- evidence of canopy recruitment, natural regeneration
- fauna habitat values

- photographs from the south western corner of the quadrat (to the north, north east, east, south and west).

The location of quadrats is summarised in Table 2.1.

Table 2.1 Quadrat survey locations

Stratification	Quadrat identifier	Centre of site ¹		South west corner ²	
		Easting	Northing	Easting	Northing
2004 revegetation area	1	313348	6295163	313335	6295148
2006 revegetation area	2	313343	6295082	313333	6295087
	3	313262	6295061	313253	6295059
	4	313318	6295086	313306	6295077
2011 revegetation area	5	313319	6295008	313309	6295000
	6	313363	6295018	313352	6295011

(1) UTM, WGS 84

(2) Location of monitoring photo point and stake marking the south western corner of quadrat

2.3 Criteria to assess rehabilitation success

Field surveys were undertaken in 2008 of the vegetation to be cleared to provide data on the typical characteristics of the community and provide baseline information against which the revegetation program can be assessed (Parsons Brinckerhoff 2008).

The criteria for assessment and the target values for these goals are provided in Table 2.2 on the following page.

Table 2.2 Criteria to monitor success of revegetation

Category	Criteria	Target			Condition of vegetation to be removed
		5 years	10 years	15 years	
Native species	Native species diversity (average number per 400 m ² quadrat)	20	35	40	46
	Average number of characteristic species for the site occurring within 400 m ²	15	20	27	34.5 (+/-1.5)
	Native species cover (% cover in 400 m ² quadrat)	>50	>85	>95	99
Weeds	Weed abundance (% of vegetation cover in 400 m ² 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, mid-storey and ground cover units	Well structured and includes canopy, mid-storey and ground cover units
Canopy^a	Average canopy height (m)	4	8	12	12-16
	Native canopy cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	5 [3]	5 [3]	5 [3]
Shrub layer^a	Native shrub cover (minimum % cover) [modified braun blanquet scale] ^b	10 [3]	15 [3]	25 [4]	32.5 (+/-7.5) [4]
	Average shrub layer height (m)	0.5	1	1	1.25

Ground cover	Native ground cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	10 [3]	10 [3]	15 (+/-5) [3]
---------------------	---	-------	-----------	-----------	------------------

Parsons Brinckerhoff | 2267030A-ECO-REP-001 RevA 7

PF Formation 2015 Monitoring of revegetation at
Hitchcock Road, Maroota

Category	Criteria	Target			Condition of vegetation to be removed
		5 years	10 years	15 years	
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.	Provides minimal habitat for fauna, however, many woodland birds present. Well structured habitat, 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

2.4 Results

Photos of the vegetation to be cleared within Lot 1 DP 1013943 and the rehabilitation area quadrat sites are provided in Appendix B. Species recorded, vegetation structure and other environmental characteristics of the quadrat sites are summarised in Appendix C.

2.5 Species of plant

A total of 88 species of plant was recorded within the site during this monitoring session, of which 68 (77%) are native. A full list of species recorded within each quadrat and the vegetation structure is provided in Appendix C.

No species listed as noxious under the *Noxious Weeds Act 1993* or Weed of National Significance was recorded.

2.6 Assessment against criteria

The results of the field survey were assessed against the criteria for successful revegetation, using the five, 10 and 15 year targets (Table 2.3).

Table 2.3 Assessment against criteria to monitor success of revegetation

Category	Criteria	Target			Results		
		5 years	10 years	15 years	2004 revegetation area (11 years)	2006 revegetation area (9 years)	2011 revegetation area (4 years)
Native species	Native species diversity (average number per 400 m ² quadrat)	20	35	40	31	25	14
	Average number of characteristic species for the site occurring within 400 m ²	15	20	27	25	15	10
	Native species cover (% of species in 400 m ² quadrat)	>50	>85	>95	97	71	36
Weeds	Weed abundance (% of vegetation cover in 400 m ² quadrat)	<50	<15	<5	3	19	64
	Invasive or Noxious weed species (e.g. Lantana, Blackberry, exotic vines)	Controlled	Controlled	Controlled	Controlled	Controlled	Ground cover generally dominated by invasive species, but no noxious or highly invasive species present

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, shrublayer and groundcover species present. Structure beginning to develop.	Canopy, shrublayer and groundcover species present. However, structure limited, generally consisting of low canopy and ground cover.
-----------------------------	----------------------	--	---	---	---	---	--

10 2267030A-ECO-REP-001 RevA | Parsons Brinckerhoff

PF Formation 2015 Monitoring of revegetation at

Hitchcock Road, Maroota

Category	Criteria	Target			Results		
		5 years	10 years	15 years	2004 revegetation area (11 years)	2006 revegetation area (9 years)	2011 revegetation area (4 years)
Canopy^a	Average canopy height (m)	4	8	12	14	8	0.3
	Native canopy cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	5 [3]	5 [3]	37 [4]	17 [3]	0
Shrub layer^a	Native shrub cover (minimum % cover) [modified braun blanquet scale] ^b	10 [3]	15 [3]	25 [4]	10 [3]	43 [4]	52 [5]
	Average shrub layer height (m)	0.5	1	1	1.5	2	2.5
Ground cover	Native ground cover (minimum % cover) [modified braun blanquet scale] ^b	5 [3]	10 [3]	10 [3]	55 [5]	55 [5]	19 [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 leaf litter and fallen timber.	Woodland birds recorded. Habitat structure continuing to develop, including groundcover such as leaf litter and fallen timber.	Woodland birds recorded. Habitat structure beginning to develop, including a dense native shrub layer. Groundcover such as leaf litter and fallen timber also developing.	Vegetation structure beginning to develop, however, no distinct canopy layer developing yet although Eucalypt seedling recruitment was observed. Leaf litter and fallen timber absent or very sparse.
	Natural regeneration indicating dispersal of seed into site and/or presence of soil seed bank	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Purple font indicates that the 5 year target has been met; black font that the 10 year target has been met, green font that the 15 year criteria has been met. Red font indicates that no target has been met.



3. Discussion and recommendations

There has been a stabilisation or general improvement in the habitat quality and native species diversity cover and vegetation structure since the previous monitoring survey in 2013. Erosion noted in previous years appears to be stable with increasing cover of groundcover vegetation. Weed cover has generally stabilised in the 2004 and 2006 revegetation areas although a general increase in weed cover within the ground layer was observed in the 2011 revegetation area. Key findings include:

- ▶ Has met the 10 and even 15 year targets in the majority of criteria. The only exception is that the:
- After 11 years the 2004 revegetation area:
 - Native species diversity (average number per 400 m² quadrat) is at the 5 year target (31). This is not considered to require active management at this stage, and is likely to continue to develop towards the 10 and 15 year targets.
 - Native shrub cover (minimum % cover) is at the 5 year target (10). This is not considered to require active management at this stage, and is likely to continue to develop towards the 10 and 15 year targets.
- After 9 years, the 2006 revegetation area:
 - ▶ Has met the 5 year targets for all criteria.
 - ▶ Has met the 10 and 15 year targets for a number of criteria relating to vegetation structure (cover and vegetation height).
 - ▶ Has some criteria that will require improvement to reach the 10 year target. However, at this stage no active management is considered necessary for these criteria as they are likely to improve naturally given time. These criteria are:
 - native species cover and diversity –
average number of characteristic
species – decrease in weed cover.
- After 4 years, the 2011 revegetation area:
 - ▶ Was dominated by early colonising Acacia species.
 - ▶ Natural regeneration in the form of Eucalypt seedling recruitment was observed in the ground layer.
 - ▶ Ground cover weed species abundance has nearly doubled since the last monitoring event in 2013.

- ▶ Has met few of the 5 year targets. The exceptions (species cover, native ground cover, shrub cover and height and weed abundance) provide some encouragement that given more time and implementing targeted weeding and supplementary plantings, this area will regenerate well.
- ▶ Requires regular visual assessments to check for spread of weeds that may inhibit germination and growth of native species.

Parsons Brinckerhoff | 2267030A-ECO-REP-001 RevA 13

Given the progress towards the targets, little additional work is considered necessary within the 2004 and 2006 revegetation areas at this stage with natural regeneration considered likely to continue without active management. In contrast, it is recommended that weed control and supplementary plantings are undertaken with the 2011 revegetation areas to assist in progressing towards 5 year targets.

Recommendations for monitoring, weed control and supplementary plantings are summarised in Table 3.1.

Table 3.1 Recommendations to improve revegetation success

Observation	Recommendation
Monitoring	
Monitoring has not been undertaken annually as part of the annual environmental reporting. However, based on the work undertaken and natural regeneration of the area, this has been appropriate.	<p>Given that the rehabilitation has met or exceeded the relevant targets for the 2004 and 2006 revegetation areas, monitoring next year is not considered necessary for these areas. In these areas monitoring in two years' time (i.e. at 13 and 11 years since rehabilitation respectively) would be sufficient.</p> <p>It is recommended that an additional monitoring site is sampled within the 2004 revegetation area during the 13 year monitoring event. Additional sampling will reduce any sample bias from a single monitoring site.</p> <p>The 2011 revegetation area would benefit from regular visual inspections (twice yearly), particularly for weed abundance and cover. Where noxious, highly invasive species or dense weeds smothering native species are noted, these should be controlled. Detailed independent monitoring of this area in two year's</p>
Weeds	
Weed abundance with 2004 and 2006 revegetation has generally stabilised and does not appear to be inhibiting natural regeneration. Weed abundance within the ground layer of the 2011 revegetation area has nearly doubled since the 2013 monitoring event. Exotic grasses were dominant in patches throughout the 2011 revegetation area.	<p>Consider broad spraying exotic grasses where they occur densely, particularly in the 2011 revegetation area. Broad spraying should be followed by:</p> <ul style="list-style-type: none"> ■ slashing and raking or mowing to remove excess debris and stimulate seed germination ■ inspection for regeneration of native plants ■ repeated broad spraying of germinating weeds if native regeneration is minimal ■ spot-spraying and/or hand weeding if substantial germination of native species is recorded.
Supplementary Plantings	
Native species diversity, average number of characteristic species and native species cover were all observed below 5 years targets within the 2011 revegetation area.	<p>Consider undertaking supplementary plantings within the 2011 revegetation area. Supplementary plantings are recommended to be undertaken in the following manner:</p> <ul style="list-style-type: none"> ■ in conjunction with appropriate weed control ■ species selection should include a mixture of canopy, shrub and groundcover species consistent with those previously planted as outlined in Appendix A ■ planting should be undertaken in autumn preferable following rain ■ follow up weed control and planting maintenance is recommended.

The rehabilitation is progressing well and is generally meeting or exceeding the targets set with the exception of 2011. This suggests that given time the 2004 and 2006 revegetation areas are likely to continue to meet and exceed the target criteria. Given the promising results to date and the fact that the 2011 revegetation has been undertaken using similar methods as the 2004 and 2006 areas, with time, this area is likely to have similar success provided appropriate weed control and supplementary plantings are undertaken.

14 2267030A-ECO-REP-001 RevA | Parsons Brinckerhoff



4. References

Council of Heads of Australasian Herbaria 2010, Australian Plant Census, Australian National Botanic Gardens, 22/01/10.

Harden, G 1992, Flora of New South Wales Volume 3, University of New South Wales Press Ltd., Kensington.

Harden, G 1993, Flora of New South Wales Volume 4, University of New South Wales Press Ltd., Kensington.

Harden, G 2000, Flora of New South Wales Volume 1 (Revised Edition), University of New South Wales

Press Ltd., Kensington.

Harden, G 2002, Flora of New South Wales Volume 2 (Revised Edition), 2nd edn, vol. 2, University of New South Wales Press Ltd., Kensington.

Parsons Brinckerhoff 2008, Methodology to assess success of revegetation within Hitchcock Road site, prepared for PF Formation, Sydney.

Parsons Brinckerhoff 2010, Monitoring of revegetation at Hitchcock Road, Maroota, Parsons Brinckerhoff, Sydney.

Parsons Brinckerhoff 2012, 2012 Monitoring of revegetation at Hitchcock Road, Maroota, Parsons Brinckerhoff, Sydney.

Royal Botanic Gardens 2015, 'PlantNet – The Plant Information Network System of Botanic Gardens Trust (version 2.0)'.
<https://www.rbg.org.uk/visit-and-experience/plantnet>

Appendix A

Revegetation works to date



A1. Revegetation works to date

To date an area of 4.2 hectares has been replanted with the aim to recreate the vegetation to be removed from Lot 1 DP 1013943. The revegetation area is on the western boundary of the site (Figure 1.1) and further revegetation scheduled to the south as quarrying is completed. The revegetation area occurs adjacent to remnant vegetation, both within and adjacent to the site. This adjacent vegetation provides a potential seed source for natural seed dispersal into the revegetation area.

Greening Australia were commissioned to propagate tubestock from cuttings and seed from collected vegetation within Lot 1 DP 1013943 to enable the revegetation of quarried areas. The first collection period occurred from late 2000 to February 2002.

Rehabilitation and revegetation has commenced with further revegetation scheduled to the south as quarrying is completed. In 2004 over one hectare of the quarry that had been previously extracted and used as a silt pond was reshaped and prepared for rehabilitation by PF Formation staff. The top soil had been stored from an adjacent area with Sydney Hinterland Transition Woodland and was spread over the site. Further seed collected over the previous 4 years was broadcast over the site in June 2004 to augment the natural soil borne native seed bank.

In 2006 an additional area of approximately two hectares that had been previously mined was prepared for 10,000 seedlings and supervised the planting in September to November 2006. An irrigation system was revegetation. The stored top soil was distributed over the site. Greening Australia then provided over installed to water the plantings over that summer.

In 2011 an additional area of approximately 1.2 hectares was prepared for revegetation and stored top soil was spread over the site.

In 2011, additional work was undertaken as recommended in the 2010 report. This included weed control, erosion control and additional planting (of both seed and tube stock). Seed used for the revegetation was collected locally including from the former trig site. Species used for additional planting are listed in Table A1.1.

No additional work has been undertaken on the site since the 2012 monitoring survey.

Table A1.1 Additional plantings undertaken in 2011

Scientific name	Common name	Previously recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Additional plantings	
				Seed	Tubestock
<i>Acacia decurrens</i>	Black Wattle			Y	Y
<i>Acacia falcata</i>			Y	Y	Y
<i>Acacia fimbriata</i>	Fringed Wattle			Y	
<i>Acacia linifolia</i>	Flax-leaved Wattle	Y	Y		Y
<i>Acacia longifolia</i>			Y	Y	Y

<i>Acacia myrtifolia</i>	Red-stemmed Wattle	Y	Y		Y
<i>Acacia parramattensis</i>	Parramatta Wattle	Y	Y	Y	Y
<i>Acacia suaveolens</i>	Sweet Wattle	Y	Y	Y	Y

Parsons Brinckerhoff | 2267030A-ECO-REP-001 RevA **A-1**

Scientific name	Common name	Previously recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Additional plantings	
				Seed	Tubestock
<i>Acacia terminalis</i>	Sunshine Wattle	Y	Y	Y	
<i>Acacia ulicifolia</i>	Heath Wattle	Y	Y	Y	Y
<i>Allocasuarina littoralis</i>	Black Sheoak	Y	Y	Y	Y
<i>Angophora costata</i>	Sydney Red Gum	Y	Y	Y	Y
<i>Angophora floribunda</i>				Y	
<i>Angophora hispida</i>				Y	
<i>Austrodanthonia tenuior</i>			Y		Y
<i>Banksia ericifolia</i>	Heath Banksia				Y
<i>Banksia integrifolia</i>					Y
<i>Bursaria spinosa</i>	Native Blackthorn				Y
<i>Callistemon pinifolius</i>				Y	
<i>Chloris truncata</i>					Y
<i>Clematis aristata</i>		Y		Y	
<i>Daviesia acicularis</i>			Y		Y
<i>Daviesia ulicifolia</i>					Y
<i>Daviesia virgata</i>					Y
<i>Dianella caerulea</i>		Y	Y		Y
<i>Dichelachne crinita</i>					Y
<i>Dodonaea triquetra</i>			Y	Y	Y
<i>Elaeocarpus reticulatus</i>				Y	
<i>Eragrostis benthamii</i>			Y	Y	
<i>Eragrostis brownii</i>	Brown's Lovegrass		Y	Y	
<i>Eucalyptus crebra</i>			Y	Y	
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark	Y	Y	Y	
<i>Eucalyptus eximia</i>				Y	
<i>Eucalyptus globoidea</i>				Y	
<i>Eucalyptus haemastoma</i>				Y	

<i>Eucalyptus moluccana</i>				Y	
<i>Eucalyptus pilularis</i>			Y	Y	
<i>Eucalyptus piperita</i>				Y	
<i>Eucalyptus punctata</i>	Grey Gum	Y	Y		Y
<i>Eucalyptus robusta</i>				Y	
<i>Eucalyptus saligna</i>					Y

A-2 2267030A-ECO-REP-001 RevA | Parsons Brinckerhoff

Scientific name	Common name	Previously recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Additional plantings	
				Seed	Tubestock
<i>Eucalyptus</i> sp.				Y	
<i>Eucalyptus sparsifolia</i>	Narrow-leaved Stringybark	Y	Y	Y	
<i>Gahnia sieberiana</i>				Y	
<i>Glycine clandestina</i>		Y	Y		Y
<i>Hakea sericea</i>		Y	Y		Y
<i>Imperata cylindrica</i> var. <i>major</i>	Bladey Grass	Y	Y	Y	
<i>Isopogon anemonifolius</i>			Y	Y	
<i>Kunzea ambigua</i>	Tick Bush		Y	Y	Y
<i>Leptospermum polygalifolium</i>				Y	
<i>Leptospermum trinervium</i>			Y	Y	Y
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	Y		Y	Y
<i>Macrozamia spiralis</i>		Y	Y	Y	
<i>Petrophile pulchella</i>			Y	Y	
<i>Pittosporum undulatum</i>	Sweet Pittosporum	Y		Y	
<i>Poa labillardierei</i> var. <i>labillardierei</i>		Y		Y	Y
<i>Pultenaea villosa</i>			Y	Y	Y
<i>Syncarpia glomulifera</i> subsp. <i>glomulifera</i>	Turpentine	Y	Y	Y	
<i>Themeda australis</i>	Kangaroo Grass	Y	Y		Y

Appendix B

Photos















B1. Vegetation within Lot 1 DP 1013943 (2008)



B2. Photomonitoring

Table B2.1 Quadrat 1 – 2004 rehabilitation area

Q1	2010	2012	2013	2015
To north				
To east				
To south				




		2010	2012	2013	2015
To west	North east into centre				
					

Table B2.2 Quadrat 2 – 2006 rehabilitation area

		2010	2012	2013	2015
To north	Q2				

	2010	2012	2013	2015
To east				
To south				
To west				

























	2010	2012	2013	2015
North east into centre				











Table B2.3 Quadrat 3 – 2006 rehabilitation area

Q3	2010	2012	2013	2015
To north				
To east				

	2010	2012	2013	2015
To south				
To west				
North east into centre				

	2010	2012	2013	2015
--	------	------	------	------

Table B2.4 Quadrat 4 – 2006 rehabilitation area

Q4	2010	2012	2013	2015
To north				
To east				
To south				









Q4	2010	2012	2013	2015
To west				
North east into centre				

Table B2.5 Quadrat 5 – 2011 rehabilitation area
























Q5	2012	2013	2015
To north			
To east			
To south			
To west			
North east into centre			

Table B2.6 Quadrat 6 – 2011 rehabilitation area

Q6	2012	2013	2015
To north			
To east			
To south			
To west			
North east into centre			

Appendix C

Quadrat results



C1. Quadrat results

Table C1.1 Vegetation structure

Vegetation layer	Height: range (median) m	% foliage cover	Dominant species
Quadrat 1			
T1	8–16 (14)	35	<i>Acacia parramattensis</i> , <i>Allocasuarina littoralis</i> , <i>Eucalyptus pilularis</i> , <i>Eucalyptus oblonga</i> , <i>Angophora costata</i>
S1	0.5–3 (1.5)	10	<i>Daviesia genistifolia</i> , <i>Bossiaea lenticularis</i> , <i>Ozothamnus diosmifolius</i> , <i>Oxylobium ilicifolium</i> , <i>Acacia parramattensis</i>
G1	0.1–0.8 (0.4)	55	<i>Entolasia stricta</i> , <i>Bossiaea lenticularis</i> , <i>Lomandra longifolia</i> , <i>Panicum simile</i>
Notes:	Good regeneration continuing. Canopy developing. Good layer of leaf litter and some dead grass; Very low cover of weeds, No weedy shrubs, weeds present only in groundcover layer; good soil health - soil lichens and moss; fauna habitat moderate - no hollows or timber, limited groundcover, leaf litter developing; lots of birds present.		
Quadrat 2			
T1	4–12 (10)	15	<i>Angophora costata</i> , <i>Syncarpia glomulifera</i> , <i>Acacia parramattensis</i> ,
S1	0.5–3 (1)	25	<i>Hakea salicifolia</i> , <i>Acacia longifolia</i> , <i>Hakea sericea</i> , <i>Syncarpia glomulifera</i> , <i>Angophora costata</i>
G1	0.1–1.2 (0.5)	70	<i>Themeda australis</i> , <i>Hypochaeris radicata</i> *, <i>Andropogon virginicus</i> *, <i>Briza maxima</i> *
Notes:	Significant planting has been undertaken in the area. Lots of native seedlings, especially of <i>Hakea sericea</i> and <i>Eucalyptus</i> spp. Shrub layer is developing. Soil health developing with cryptograms present, <i>Themeda australis</i> dominant in patches; poor fauna habitat - no hollows, grass is dense, leaf litter developing, some senescent and fallen shrubs. Main weeds are <i>Andropogon virginicus</i> * and <i>Briza maxima</i> *.		
Quadrat 3			
T1	8–11 (9)	15	<i>Eucalyptus eugenioides</i> , <i>Angophora costata</i> , <i>Syncarpia glomulifera</i> , <i>Allocasuarina littoralis</i>
S1	2–5 (3)	50	<i>Acacia linifolia</i> , <i>Leptospermum polygalifolium</i> , <i>Hakea sericea</i> , <i>Persoonia levis</i> , <i>Acacia terminalis</i>
G1	0.1–1 (0.3)	64	<i>Entolasia stricta</i> , <i>Themeda australis</i> , <i>Andropogon virginicus</i> *, <i>Kunzea ambigua</i>
Notes:	Canopy developing and tall shrub layer evident. Few weeds, only occasional introduced grass; good regeneration of natives including seedlings from seedbank and mature plantings; some erosion; good soil health - soil lichens and moss common; fauna habitat poor - no hollows or timber, sparse understory, limited leaf litter, lots of small lizards present.		

Vegetation layer	Height: range (median) m	% foliage cover	Dominant species
Quadrat 4			
T1	1.5–5 (3.5)	10	<i>Banksia ericifolia</i> , <i>Kunzea ambigua</i> , <i>Hakea dactyloides</i>
S1	0.2–1 (0.6)	55	<i>Banksia ericifolia</i> , <i>Acacia longifolia</i> , <i>Acacia myrtifolia</i> , <i>Acacia ulicifolia</i> , <i>Leptospermum polygalifolium</i>
G1	0–0.5 (0.4)	80	<i>Themeda australis</i> , <i>Hakea sericea</i> , <i>Andropogon virginicus</i> *, <i>Leptospermum trinervium</i> , <i>Briza maxima</i> *, <i>Kunzea ambigua</i>
Notes:	Erosion evident from previous surveys has stabilized, no eucalypts present; good recruitment; good native groundcover dominated by <i>Themeda australis</i> ; soil health developing with good cover of cryptograms, fauna habitat poor - no hollows or timber, limited groundcover or leaf litter		
Quadrat 5			
T1	-	-	-
S1	0.3–3.5 (2.5)	45	<i>Acacia parramattensis</i> , <i>Acacia longifolia</i> , <i>Verbena bonariensis</i> *
G1	0–0.5 (0.3)	85	<i>Pennisetum clandestinum</i> *, <i>Andropogon virginicus</i> *, <i>Acacia parramattensis</i> , <i>Trifolium repens</i> *, <i>Conyza bonariensis</i> *, <i>Paspalum dilatatum</i> *
Notes:	Predominantly weedy groundcover, a diversity of <i>Acacia</i> spp. growing and some other native species germinating; leaf litter developing, shrub layer developing. Fauna habitat poor, evidence of kangaroos and rabbits.		
Quadrat 6			
T1	-	-	
S1	0.5–3.5 (2.5)	60	<i>Acacia parramattensis</i> , <i>Acacia longifolia</i> , <i>Acacia myrtifolia</i>
G1	0.1–0.6 (0.3)	80	<i>Pennisetum clandestinum</i> *, <i>Andropogon virginicus</i> *, <i>Acacia parramattensis</i> , <i>Sida rhombifolia</i> *, <i>Conyza bonariensis</i> *, <i>Plantago lanceolata</i> *, <i>Hypochaeris radicata</i> *
Notes:	Shrub layer developing with colonizing <i>Acacia</i> spp., regeneration of canopy species evident in groundcover including <i>Allocasuarina littoralis</i> and <i>Eucalyptus</i> spp., predominantly weedy groundcover of <i>Pennisetum clandestinum</i> *, <i>Andropogon virginicus</i> * although some regeneration of native ground cover species evident; Hard baked soil, with minor leaf litter and some gully erosion evident although exotic grasses are reducing erosion. Fauna habitat relatively poor, evidence of foxes and rabbits.		

Notes: T1= Tree layer; S1= Shrub layer; G1=Groundcover

Table C1.2 Quadrat results: groundcover, vegetation cover, slope and aspect

Characteristic	2010				2012						2013						2015					
	1	2	3	4	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
Ground cover (% cover)																						
Bare soil	5	6	13	33	5	8	15	20	50	80	0	5	10	10	10	80	1	5	8	10	5	15
Litter	57	2	5	0	41	25	5	0	0	0	40	15	15	2	5	0	35	15	16	3	6	3
Timber	1	0	0	0	0	2	0	0	0	0	2	2	0	0	0	0	3	2	4	1	1	0
Rock	5	2	1	5	2	0	0	2	3	2	1	0	0	2	3	2	1	0	0	2	3	2
Cryptogram	2	0	1	2	2	0	10	2	0	0	2	10	10	5	0	0	5	8	8	4	0	0
Vegetation	30	90	80	60	50	65	70	76	47	18	55	68	65	81	82	18	55	70	64	80	85	80
Ground cover vegetation (% cover)																						
Native ground cover - grasses	20	15	70	25	28	10	53	45	1	0	44	25	43	60	15	5	40	22	40	58	12	3
Native ground cover - shrubs	2	2	5	2	3	3	5	5	5	5	3	2	10	10	5	5	5	2	10	10	10	7
Native ground cover - other	1	1	0	2	2	2	2	12	1	1	7	3	2	2	2	2	7	5	6	4	3	2
Exotic	7	72	5	30	10	50	10	20	40	12	1	38	10	9	60	6	3	41	8	8	60	68
Vegetation cover (% cover)																						
Total native groundcover	23	18	75	24	33	15	60	51	7	6	55	30	55	72	22	12	52	29	64	72	25	12
Native overstorey	30	10	10	0	25	15	10	0	0	0	25	15	15	0	0	0	37	15	15	5	0	0
Native midstorey	10	10	20	8	10	8	25	10	0	0	5	10	30	15	30	35	10	25	50	55	45	60
Exotic cover (all layers)	10	72	5	30	10	50	10	20	40	12	1	38	10	9	60	6	3	41	8	8	60	68
Slope (degrees)	3	6	8	6	3	6	8	6	5	4	3	6	8	6	5	4	3	6	8	6	5	4
Aspect	S	S	SE	SE	S	S	SE	SE	SW	S	S	S	SE	SE	SW	S	S	S	SE	SE	SW	S

Table C1.3 Species recorded

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Acacia brownii</i>	Heath Wattle			Y	Y	Y	Y	Y		2	2	2		
<i>Acacia decurrens</i>	Black Wattle				Y		Y	Y		3				
<i>Acacia falcata</i>				Y	Y	Y	Y	Y	1			1		1
<i>Acacia fimbriata</i>	Fringed Wattle				Y	Y	Y	Y					1	2
<i>Acacia hispidula</i>				Y										
<i>Acacia linifolia</i>	Flax-leaved Wattle		Y	Y	Y	Y	Y	Y	1	2	3	3		
<i>Acacia longifolia</i>				Y		Y	Y	Y		3		3	3	2
<i>Acacia myrtifolia</i>	Red-stemmed Wattle		Y	Y	Y	Y	Y	Y				1		1
<i>Acacia parramattensis</i>	Parramatta Wattle		Y	Y	Y	Y	Y	Y	3	3		3	3	4
<i>Acacia parvipinnula</i>				Y			Y	Y					3	3
<i>Acacia saligna</i>	Golden Wreath Wattle	*			Y									
<i>Acacia suaveolens</i>	Sweet Wattle		Y	Y	Y	Y	Y			1				
<i>Acacia terminalis</i>	Sunshine Wattle		Y	Y	Y	Y	Y	Y	1			3		
<i>Acacia trinervata</i>				Y			Y							
<i>Acacia ulicifolia</i>	Heath Wattle		Y	Y	Y	Y	Y	Y		1			1	1
<i>Acetosella vulgaris</i>		*					Y	Y					1	
<i>Acianthus fornicatus</i>	Pixie Caps		Y	Y			Y							
<i>Actinotus helianthi</i>				Y										
<i>Ageratina adenophora</i>	Crofton Weed	*	Y		Y			Y					1	

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Agrostis avenacea</i>						Y	Y	Y					1	
<i>Aira caryophyllea</i>	Silvery Hairgrass	*						Y				1		
<i>Allocasuarina littoralis</i>	Black Sheoak		Y	Y	Y	Y	Y	Y	4	1	2	2	1	2
<i>Anagallis arvensis</i>	Scarlet Pimpernel	*				Y	Y	Y		1			2	1
<i>Andropogon virginicus</i>	Whisky Grass	*			Y	Y	Y	Y	1	3	2	3	3	3
<i>Angophora bakeri</i>	Narrow-leaved Apple		Y	Y	Y	Y	Y							
<i>Angophora costata</i>	Sydney Red Gum		Y	Y	Y	Y	Y	Y	3	4	3	1		
<i>Anisopogon avenaceus</i>				Y										
<i>Araujia sericifera</i>	Moth Vine	*	Y											
<i>Aristida benthamii</i>				Y										
<i>Aristida vagans</i>	Threeawn Speargrass		Y	Y										
<i>Aristida warburgii</i>				Y										
<i>Astroloma humifusum</i>				Y										
<i>Astroloma pinifolium</i>				Y										
<i>Austrodanthonia fulva</i>				Y										
<i>Austrodanthonia tenuior</i> (now <i>Rytidosperma tenuius</i>)				Y			Y	Y					2	
<i>Austrostipa pubescens</i>			Y	Y										

<i>Banksia ericifolia</i>	Heath Banksia				Y	Y	Y	Y		1		4		
<i>Banksia integrifolia</i>					Y	Y	Y	Y		2		1		

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Banksia oblongifolia</i>					Y	Y								
<i>Banksia spinulosa</i> var. <i>spinulosa</i>				Y										
<i>Bidens pilosa</i>		*				Y	Y	Y	1				2	1
<i>Billardiera scandens</i>	Appleberry		Y	Y		Y	Y							
<i>Boronia polygalifolia</i>			Y											
<i>Bossiaea lenticularis</i>			Y	Y	Y	Y	Y	Y	2		1			
<i>Bossiaea obcordata</i>			Y	Y	Y									
<i>Bossiaea rhombifolia</i> subsp. <i>rhombifolia</i>				Y										
<i>Breynia oblongifolia</i>	Coffee Bush		Y											
<i>Briza maxima</i>	Quaking Grass	*				Y	Y	Y	1	2		1		
<i>Briza minor</i>	Shivery Grass	*						Y		1				
<i>Brunoniella pumilio</i>	Dwarf Blue Trumpet		Y	Y	Y	Y	Y	Y	1					
<i>Bursaria spinosa</i>	Native Blackthorn				Y	Y	Y	Y		1				
<i>Caesia parviflora</i>				Y										
<i>Callistemon linearis</i>				Y										

<i>Callistemon rigidus</i>				Y										
<i>Cassytha glabella</i>				Y										
<i>Cassytha pubescens</i>				Y										
<i>Caustis flexuosa</i>				Y										

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Centaurium erythraea</i>		*				Y	Y	Y		2		1	1	
<i>Ceratopetalum apetalum</i>	Coachwood		Y											
<i>Cheilanthes sieberi</i>				Y			Y	Y	1					
<i>Clematis aristata</i>			Y					Y	1					
<i>Comesperma ericinum</i>	Pyramid flower		Y											
<i>Conyza bonariensis</i>	Flaxleaf Fleabane	*	Y		Y	Y	Y	Y					2	2
<i>Corymbia eximia</i>				Y				Y	1					
<i>Corymbia gummifera</i>	Red Bloodwood		Y	Y										
<i>Cyathochaeta diandra</i>				Y										
<i>Cynodon dactylon</i>	Couch						Y	Y		1		1	2	2
<i>Cyperus ?polystachyos</i>						Y	Y							
<i>Daviesia acicularis</i>				Y										
<i>Daviesia corymbosa</i>				Y										
<i>Daviesia genistifolia</i>	Broom Bitter Pea			Y	Y	Y	Y	Y	1	1				

<i>Daviesia squarrosa</i>				Y										
<i>Dianella caerulea</i>			Y	Y		Y	Y	Y		1	1			
<i>Dianella prunina</i>			Y	Y	Y	Y	Y							
<i>Dianella revoluta</i> var. <i>revoluta</i>				Y										
<i>Dichelachne crinite</i>	Long-haired Plume Grass						Y							

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Dillwynia acicularis</i>				Y										
<i>Dillwynia parvifolia</i>				Y										
<i>Dillwynia retorta</i>				Y	Y	Y	Y							
<i>Dodonaea pinnata</i>				Y										
<i>Dodonaea triquetra</i>				Y				Y						1
<i>Drosera auriculata</i>				Y										
<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>				Y										
<i>Einadia hastata</i>	Berry Saltbush		Y											
<i>Entolasia stricta</i>	Wiry Panic		Y	Y	Y	Y	Y	Y	3		3			
<i>Entolasia whiteana</i>				Y										
<i>Epacris pulchella</i>	NSW Coral Heath			Y	Y									

<i>Epacris purpurascens</i> var. <i>purpurascens</i>				Y										
<i>Eragrostis benthamii</i>				Y										
<i>Eragrostis brownii</i>	Brown's Lovegrass			Y	Y	Y	Y	Y	2		2			
<i>Eragrostis leptostachya</i>	Paddock Lovegrass							Y			2			
<i>Eriostemon australasius</i>				Y										
<i>Eucalyptus ?saligna</i>					Y	Y								
<i>Eucalyptus beyeriana</i>				Y										
<i>Eucalyptus crebra</i>				Y										

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark		Y	Y	Y	Y	Y	Y		1	3			
<i>Eucalyptus notabilis</i>				Y	Y									
<i>Eucalyptus oblonga</i>	Stringybark			Y	Y	Y	Y	Y	3					
<i>Eucalyptus pilularis</i>				Y				Y	3					
<i>Eucalyptus punctata</i>	Grey Gum		Y	Y	Y	Y	Y	Y	2					
<i>Eucalyptus resinifera</i> subsp. <i>resinifera</i>				Y										
<i>Eucalyptus scias</i> subsp. <i>scias</i>				Y										
<i>Eucalyptus sclerophylla</i>			Y	Y										
<i>Eucalyptus</i> sp.						Y	Y	Y						2

<i>Eucalyptus sparsifolia</i>	Narrow-leaved Stringybark		Y	Y										
<i>Eucalyptus squamosa</i>				Y										
<i>Exocarpos cupressiformis</i>	Native Cherry				Y	Y	Y	Y	1					
<i>Exocarpos strictus</i>	Dwarf Cherry		Y	Y		Y								
<i>Glycine clandestina</i>			Y	Y	Y	Y	Y	Y	2	2				1
<i>Glycine tabacina</i>			Y	Y		Y	Y	Y	1					
<i>Gnaphalium sp.</i>					Y	Y	Y	Y		2		1	2	
<i>Gompholobium glabratum</i>	Dainty Wedge Pea		Y	Y										

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Gompholobium grandiflorum</i>				Y										
<i>Gompholobium inconspicuum</i>				Y										
<i>Gompholobium minus</i>				Y										
<i>Gompholobium pinnatum</i>				Y										
<i>Gompholobium uncinatum</i>				Y										
<i>Gonocarpus tetragynus</i>				Y										
<i>Gonocarpus teucroides</i>					Y	Y	Y	Y			1			

<i>Goodenia bellidifolia</i> <i>subsp. bellidifolia</i>			Y	Y			Y	Y	1					
<i>Goodenia hederacea</i> <i>subsp. hederacea</i>				Y										
<i>Goodenia heterophylla</i>			Y	Y										
<i>Grevillea buxifolia</i> <i>subsp. buxifolia</i>	Grey Spider Flower		Y	Y										
<i>Grevillea diffusa</i>				Y										
<i>Grevillea longifolia</i>				Y										
<i>Grevillea mucronulata</i>				Y										
<i>Grevillea parviflora</i> <i>subsp. parviflora</i>				Y										
<i>Grevillea phyllicoides</i>				Y										
<i>Grevillea sericea</i>				Y										

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Grevillea sphacelata</i>				Y										
<i>Haemodorum planifolium</i>				Y										
<i>Hakea dactyloides</i>	Broad-leaved Hakea			Y	Y	Y	Y							
<i>Hakea salicifolia</i>	Willow-leaved Hakea							Y		3	3	3		
<i>Hakea sericea</i>			Y	Y	Y	Y	Y	Y		3		2		
<i>Hardenbergia violacea</i>	False Sarsaparilla		Y	Y	Y	Y	Y	Y	1					

<i>Hibbertia aspera</i> subsp. <i>aspera</i>				Y										
<i>Hibbertia bracteata</i>				Y										
<i>Hibbertia diffusa</i>				Y										
<i>Hibbertia serpyllifolia</i>				Y										
<i>Hibbertia</i> sp.					Y	Y								
<i>Hovea linearis</i>			Y	Y										
<i>Hybanthus monopetalus</i>				Y										
<i>Hypochaeris radicata</i>	Catsear	*			Y	Y	Y	Y	1	2		2		
<i>Imperata cylindrica</i> var. <i>major</i>	Bladey Grass		Y	Y	Y	Y	Y	Y	1		2			
<i>Isopogon anemonifolius</i>				Y										
<i>Jacksonia scoparia</i>				Y										
<i>Juncus</i> sp.			Y		Y	Y		Y		1	1		1	1
<i>Kunzea ambigua</i>	Tick Bush			Y	Y	Y	Y	Y	2		4	3		

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area				Quadrat results (2015)					
					2010	2012	2013	2015	1	2	3	4	5	6
<i>Lagenifera gracilis</i>				Y										
<i>Lambertia formosa</i>	Mountain Devil			Y										
<i>Lasiopetalum ferrugineum</i>				Y										
<i>Lasiopetalum rufum</i>				Y										

<i>Laxmannia gracilis</i>				Y										
<i>Lepidosperma latens</i>				Y										
<i>Lepidosperma laterale</i>			Y	Y	Y	Y	Y	Y	2					
<i>Leptomeria acida</i>				Y										
<i>Leptospermum parvifolium</i>				Y										
<i>Leptospermum polygalifolium</i>								Y		2	1	3	1	
<i>Leptospermum trinervium</i>				Y	Y	Y	Y	Y	2					
<i>Leucopogon juniperinus</i>			Y		Y	Y	Y							
<i>Leucopogon lanceolatus</i>	Lance Beard Heath		Y											
<i>Leucopogon muticus</i>				Y										
<i>Leucopogon virgatus</i>				Y										
<i>Lindsaea microphylla</i>				Y										
<i>Lissanthe sapida</i>				Y										
<i>Lissanthe strigosa</i>				Y										
<i>Lobelia gracilis</i>				Y										

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation a			
					2010	2012	2013	
<i>Logania pusilla</i>				Y				
<i>Lomandra confertifolia</i> subsp. <i>rubiginosa</i>				Y				
<i>Lomandra cylindrica</i>				Y				
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>				Y				
<i>Lomandra filiformis</i> subsp. <i>filiformis</i>				Y				
<i>Lomandra glauca</i>				Y				
<i>Lomandra gracilis</i>			Y	Y				
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush		Y		Y	Y	Y	
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>			Y	Y				
<i>Lomandra obliqua</i>			Y	Y				
<i>Lomatia silaifolia</i>	Crinkle Bush		Y	Y				
<i>Macrozamia spiralis</i>			Y	Y				
<i>Medicago</i> sp.		*				Y		
<i>Melaleuca nodosa</i>				Y				
<i>Micrantheum ericoides</i>				Y				
<i>Microtis</i> sp.						Y		
<i>Mirbelia rubiifolia</i>				Y				
<i>Monotoca scoparia</i>				Y				

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation a			
					2010	2012	2013	
<i>Myrsiphyllum asparagoides</i>	Florist's Smilax	*	Y					
<i>Olearia microphylla</i>				Y				
<i>Opercularia diphylla</i>				Y				
<i>Opercularia varia</i>				Y				
<i>Oxalis perennans</i>					Y	Y	Y	
<i>Oxylobium ilicifolium</i>	Prickly Shaggy Pea		Y		Y	Y	Y	

<i>Ozothamnus diosmifolius</i>	White Dogwood		Y	Y	Y	Y	Y
<i>Pandorea pandorana</i>	Wonga Vine		Y				
<i>Panicum simile</i>	Two-colour Panic		Y	Y	Y	Y	Y
<i>Paspalum dilatatum</i>	Paspalum	*			Y	Y	Y
<i>Passiflora sp.</i>	Passionfruit		Y				
<i>Patersonia glabrata</i>				Y			
<i>Patersonia longifolia</i>				Y			
<i>Patersonia sericea</i>				Y			
<i>Pennisetum clandestinum</i>		*				Y	Y
<i>Persicaria decipiens</i>	Pepperweed					Y	
<i>Persoonia hirsuta</i>				Y			
<i>Persoonia lanceolata</i>				Y			
<i>Persoonia laurina</i>				Y			

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area		
					2010	2012	2013
<i>Persoonia levis</i>	Broad-leaved Geebung			Y	Y	Y	Y
<i>Persoonia linearis</i>	Narrow-leaved Geebung		Y	Y			
<i>Persoonia oblongata</i>				Y			
<i>Persoonia pinifolia</i>				Y			
<i>Petrophile pulchella</i>				Y			
<i>Petrophile sessilis</i>				Y			
<i>Philotheca hispidula</i>				Y			
<i>Phyllanthus hirtellus</i>				Y			
<i>Pimelea curviflora</i> var. <i>curviflora</i>				Y			
<i>Pimelea linifolia</i> subsp. <i>linifolia</i>				Y			Y
<i>Pittosporum undulatum</i>	Sweet Pittosporum		Y				
<i>Plantago lanceolata</i>	Lamb's Tongues	*			Y	Y	Y
<i>Platysace ericoides</i>				Y			
<i>Platysace lanceolata</i>			Y				
<i>Platysace linearifolia</i>				Y			

<i>Poa labillardierei</i> var. <i>labillardierei</i>			Y				Y	
<i>Podolobium scandens</i>				Y				
<i>Polyscias sambucifolia</i>	Elderberry Panax		Y					

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area			
					2010	2012	2013	
<i>Pomax umbellata</i>			Y	Y				
<i>Poranthera microphylla</i>			Y					
<i>Pratia purpurascens</i>	Whiteroot		Y	Y				
<i>Prostanthera howelliae</i>				Y				
<i>Pteridium esculentum</i>	Bracken				Y	Y	Y	
<i>Pterostylis acuminata</i>				Y				
<i>Pterostylis longifolia</i>				Y				
<i>Pultenaea ferruginea</i>				Y				
<i>Pultenaea microphylla</i>			Y					
<i>Pultenaea polifolia</i>				Y				
<i>Pultenaea scabra</i>			Y	Y				
<i>Pultenaea tuberculata</i>				Y				
<i>Pultenaea villosa</i>				Y		Y	Y	
<i>Rumex crispus</i>		*						
<i>Scaevola ramosissima</i>			Y	Y				
<i>Schizaea bifida</i>				Y				
<i>Schoenus imberbis</i>				Y				
<i>Senecio madagascariensis</i>	Fireweed	*			Y	Y	Y	
<i>Setaria gracilis</i>	Slender Pigeon Grass	*			Y	Y		
<i>Sida rhombifolia</i>	Paddy's Lucerne	*	Y		Y	Y	Y	

Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation area			
					2010	2012	2013	
<i>Solanum mauritianum</i>	Wild Tobacco Bush	*	Y					
<i>Solanum nigrum</i>	Black-berry Nightshade	*	Y					

<i>Sonchus oleraceus</i>	Common Sowthistle	*	Y					
<i>Stylidium sp.</i>					Y	Y	Y	
<i>Styphelia laeta subsp. laeta</i>				Y				
<i>Syncarpia glomulifera subsp. glomulifera</i>	Turpentine		Y	Y	Y	Y	Y	
<i>Thelymitra pauciflora</i>				Y				
<i>Themeda australis</i>	Kangaroo Grass		Y	Y	Y	Y	Y	
<i>Thysanotus tuberosus subsp. tuberosus</i>				Y				
<i>Trachymene incisa subsp. incisa</i>				Y				
<i>Tricoryne simplex</i>				Y				
<i>Trifolium arvense</i>	Haresfoot clover	*				Y	Y	
<i>Trifolium repens</i>	White Clover	*			Y	Y	Y	
<i>Verbena bonariensis</i>	Purpletop	*			Y	Y	Y	
<i>Veronica plebeia</i>	Trailing Speedwell		Y					
<i>Vicia sativa</i>		*			Y	Y		
<i>Wahlenbergia stricta</i>	Tall Bluebell				Y	Y	Y	
<i>Xanthorrhoea concava</i>				Y				

P H	Scientific name	Common name	Exotic	Recorded within Lot 1 DP 1013943	Species of Sydney Hinterland transition woodland	Recorded in rehabilitation a			
						2010	2012	2013	
	<i>Xanthorrhoea media</i>				Y				
	<i>Xanthorrhoea minor</i> <i>subsp. minor</i>				Y				
	<i>Xanthorrhoea resinifera</i>				Y				
	<i>Xanthorrhoea sp.</i>	Grass tree		Y					
	<i>Xanthosia pilosa</i>				Y				
	<i>Xanthosia tridentata</i>				Y			Y	
	<i>Xylomelum pyriforme</i>	Woody Pear		Y	Y				

Notes:

Cover abundance scores:

- (1) 5% - rare or few individuals
- (2) <5% common
- (3) 5–25%
- (4) 25–50%
- (5) 50–75%
- (6) 75–100%

ATTACHMENT 14

CCC MEETING MINUTES

**Community Consultative Committee
Hitchcock Road and Lot 198 Maroota
Sand Extraction and Rehabilitation Projects**

**Minutes
8 November 2016**

Attendance

Kristine McKenzie – The Hills Shire Council (THSC) – Chairperson

Daniel Giffney – The Hills Shire Council (THSC)

Marianne Sheumack – Resident

Lisa Aylward - Resident

John Graham – PF Formation (PF)

Peter Cummins – PF Formation (PF) Joshua Graham
– PF Formation (PF)

Apologies:

Shaunagh Hitchcock – Resident

Megan Dawson – Department of Planning ('DOP')

Minutes of Previous Meeting

- Accepted

Matters Arising from Minutes

- None

Report on Current Status of Operations by John Graham (PF)

- There have been no complaints in the last 6 months
- The area adjoining the entry road has had soil placed on it to encourage regrowth
- The new water cart has been effective
- A new GPS device was trialed recently. It was used to confirm existing levels and markers. The use of the machine allowed further level markers to be created.
- The Department of Planning (DOP) has setup a new regulatory arm that will expand on its audit and monitoring activities.

Reporting

- PF Formation received approval from the Department of Planning relating to the updated monitoring strategies/plans/programs and reviewed vegetation offset bond sent to the Department last year. These updated Plans are available for viewing on the PF Formation website
 - The summary of the audit findings of the DOP for all sand quarries in the State is available for viewing on the PF Formation website.
-
- The Annual Environmental Management Plan ('AEMR') has largely been completed for the 2016 year. A new environmental planner (& ecologist) has been used and the AEMR should be up on the website in the next week or so. No unusual or significant matters were identified in the AEMR.

Environmental Matters

- The monthly dust deposit results were reviewed and discussed.
- The dust results generally were low but the regular high August figure at the School monitoring station was again considered to be attributable to the annual Maroota School Muster.
- No explanation could be provided for the high August figure at 'Jurd's House'. The sample collected contained high levels of combustible matter and low ash content which would indicate the dust was not from the quarry.
- No new vegetation rehabilitation has occurred recently although soil is stored ready for use. Significant reshaping of the land has been done.

Other Matters Discussed

- At the meeting Lisa asked when the overtaking lane would be constructed on Old Northern Road. Kristine advised she would confirm the time frame and advise.

Following the meeting, Kristine advised that the overtaking lane on Old Northern Road (north of Canoelands Road) is due to be completed by the end of the 2016/2017 financial year.

Department of Planning Matters

- The Department of Planning advised that if issues were raised that warranted it, they may attend a meeting to discuss issues further with the Community Consultative Committee. The Department will be invited to attend the next meeting to discuss the concerns.
- Following the meeting, Marianne provided a list of concerns. These concerns will be forwarded to the Department with the invitation to attend the next meeting.

Site Visit

- A site inspection was conducted.

Next Meeting

- 10.00 am Tuesday 2 May 2017

**Community Consultative Committee
Hitchcock Road and Lot 198 Maroota
Sand Extraction and Rehabilitation Projects**

**Minutes
2 May 2017**

Attendance

Kristine McKenzie – The Hills Shire Council (THSC) – Chairperson

Robert Buckham – The Hills Shire Council (THSC)

Marianne Sheumack – Resident

Shaunagh Hitchcock – Resident

Lisa Aylward - Resident

Stewart Mclachlan – Department of Planning and Environment ('DPE')

Kathleen Withers – Department of Planning and Environment ('DPE')

Peter Cummins – PF Formation (PF)

Joshua Graham – PF Formation (PF)

Minutes of Previous Meeting

- Accepted

Matters Arising from Minutes

- None

Report on Current Status of Operations by Joshua Graham (PF)

- There have been no complaints in the last 6 months
- Whilst there is high demand in the industry PF has been limiting sales. Examples of some of the bigger jobs were discussed.
- Tertiary (Maroota) sand and sandstone differences and locations were discussed.
- Operations have been routine with less tertiary sand and more sandstone being sold.
- Personal dust monitoring has been conducted in the last week on several employees. This was required as part our Mine Safety requirements. Lung testing will also be done on some employees.

Reporting

- The Annual Environmental Management Plan ('AEMR') was completed in December and is on the website. No significant matters were raised.
- No significant reporting matters have occurred in the period.
- PF is continually updating the website with its regular monitoring information.

Environmental Matters

- The monthly dust deposit results were reviewed and discussed.
- The dust results generally were low in the 6 month period but January was higher than usual at Hitchcock Road and Jurd locations. Most of the Insoluble Solids were combustible meaning they could not be quarry sourced.
- PF received no notification of high TEOM results in the period.
- No new vegetation rehabilitation has occurred recently.

Department of Planning and Environment Matters

- The representatives of DPE gave a discussion and provided handouts on Compliance Overview including contact details for complaints
- There has been an increase in the monitoring and enforcing of State Significant developments based on the size of the development and risk factors
- Community members directly raised their issues to DPE in particular to the cumulative impact of trucks, truck movements and car safety.
- DPE advised that they monitor condition requirements regarding movements and times but issues on the road are for Police. More monitoring of driver speeds and behaviour is required but it was questioned as to how this occurs without individuals (community members) following through incidents.
- PF confirmed that any incidents of driver speeding/poor driving is taken seriously by all quarries in the area and the truck involved in any incident should be able to be readily identified and action taken by the quarries.

Other Matters Discussed

- Changes are being drafted by the DPE regarding the conduct and process of CCC meetings. More information should be available over the next 6 months.
- Possible expansion of quarries in the area by a new owner/operator was mentioned

Site Visit

- A site inspection was conducted.

Next Meeting

□ 10.00 am Tuesday 14 November 2017