

A koala is shown climbing a tree trunk, clinging to the bark with its claws. The koala is grey and has a white chest. The tree trunk is brown and has a rough, textured bark. The background is a solid blue color.

Travers

bushfire & ecology

Vegetation Management Plan

327-335 Burley Road
Horsley Park

June 2016
(REF: A16094V)



Vegetation Management Plan **Lot 1 DP 106143 Burley Road,** **Horsley Park**

Report Authors: Michael Sheather-Reid B. Nat. Res. (Hons.)
Kathy Maguire M. Env. Man.
Approved by: Michael Sheather-Reid
Date: June 2016
File: A16094V

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The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

ABN 64 083 086 677
PO Box 7138
Kariong NSW 2250

38A The Avenue
Mt Penang Parklands
Central Coast Highway
Kariong NSW 2250

t: 02 4340 5331
f: 02 4340 2151
e: info@traversecology.com.au

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List of abbreviations

APZ	asset protection zone
BPA	bushfire protection assessment
DCP	Development Control Plan
CPW	Cumberland Plain Woodlands
DEC	NSW Department of Environment and Conservation (superseded by DECC from 4/07)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from 10/09)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from 4/11)
EEC	endangered ecological community
CEEC	critically endangered ecological community
EPA	Environmental Protection Agency
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESMP	environmental site management plan
FF	flora and fauna assessment
FM Act	<i>Fisheries Management Act 1994</i>
FMP	fuel management plan
HTA	habitat tree assessment
IPA	inner protection area
LEP	Local Environment Plan
LGA	local government area
NES	national environmental significance
NPWS	NSW National Parks and Wildlife Service
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage (Part of the NSW Department of Premier and Cabinet)
OPA	outer protection area
PBP	<i>Planning for Bush Fire Protection 2006: A Guide for Councils, Planners, Fire Authorities and Developers</i>
POM	plan of management
RF Act	<i>Rural Fires Act</i>
RFS	NSW Rural Fire Service
SIS	species impact statement

SULE	safe useful life expectancy
TPO	tree preservation order
TPZ	tree preservation zone
TRRP	tree retention and removal plan
TSC Act	<i>Threatened Species Conservation Act 1995</i>
VMP	vegetation management plan



Introduction

1

Travers bushfire & ecology has been engaged to prepare a Vegetation Management Plan (VMP) for Lot 205, 327-335 Burley Road, Horsley Park in connection with an industrial subdivision.

This VMP has been prepared in accordance with the *Approved Conservation Advice for Cumberland Shale Woodlands and Shale-Gravel Transition Forest ecological community*.

1.1 Development overview

Lot 205 is one of 15 lots within an approved, three-staged subdivision site which has created 14 industrial lots and one lot (Lot 205) for environmental conservation land. The total site area is 72.3 hectares with lots ranging in size from 1.5 hectares to 13 hectares. The site is zoned IN1 General Industrial and E2 Environmental Conservation under the State Environmental Planning Policy (Western Sydney Employment Area) 2009. Since the site is zoned under the SEPP there is no applicable LEP or DCP. However, under the SEPP comment is required on matters (Schedule 4) that would substitute for a DCP.

The site is a brick manufacturing location with associated quarries and dams which constitutes partly industrial, extractive and rural landscapes that have been dramatically altered from their original state. The former brick-making factory is located in the northern portion of the site with dams to the south and west of the factory.

The Vegetation Management Plan is for Lot 205 environmental conservation land encompassing approximately 11.51 hectares in size, which runs north-south within the eastern portion of the site. This lot contains the last remaining area of the critically endangered ecological community (CEEC), Cumberland Plain Woodland (CPW) on the site. The location of Lot 205 is shown in Figure 1.

The VMP also requires recovery of native hardwood logs from the affected subdivision area to create Cumberland Plain Land Snail Habitat within the conservation area.

1.2 Background information

CSR Building Products Pty Ltd lodged development application 893.1/2013 with Fairfield City Council on 19 December 2013 seeking consent for an industrial subdivision in three stages to create a total of 14 lots for industrial use, a conservation lot, new public roads and associated drainage. Council refused the application and CSR appealed in the NSW Land and Environment Court (L&EC) of NSW.

Fairfield City Council draft conditions of approval require that a landscaped setback be established along the southern boundary of the property. The specifications for this have been dealt with as part of the deferred conditions of approval handed down in *CSR Building Products Ltd v Fairfield City Council* and are outside the scope of the Vegetation Management Plan.

Deferred conditions of the L&EC approval imposed by Justice Morris in *CSR Building Products Ltd v Fairfield City Council*, Land & Environment Court (L&EC), 30.7.2015 are incorporated as key recommendations in this VMP.



Figure 1 - Site Overview

Recommendations adopted by L&EC

From the *Travers bushfire & ecology Flora and Fauna Assessment Report, 10 March 2014*, a key recommendation was the requirement for a referral to the *Department of Environment* due to the removal of CPW vegetation equivalent to four and a half (4.50) hectares within the main site to facilitate the subdivision. Subsequently, this was held as a condition of approval by Morris, C. in *CSR Building Products Ltd v Fairfield City Council*, Land & Environment Court, 30.7.2015.

Deferred approval conditions include:

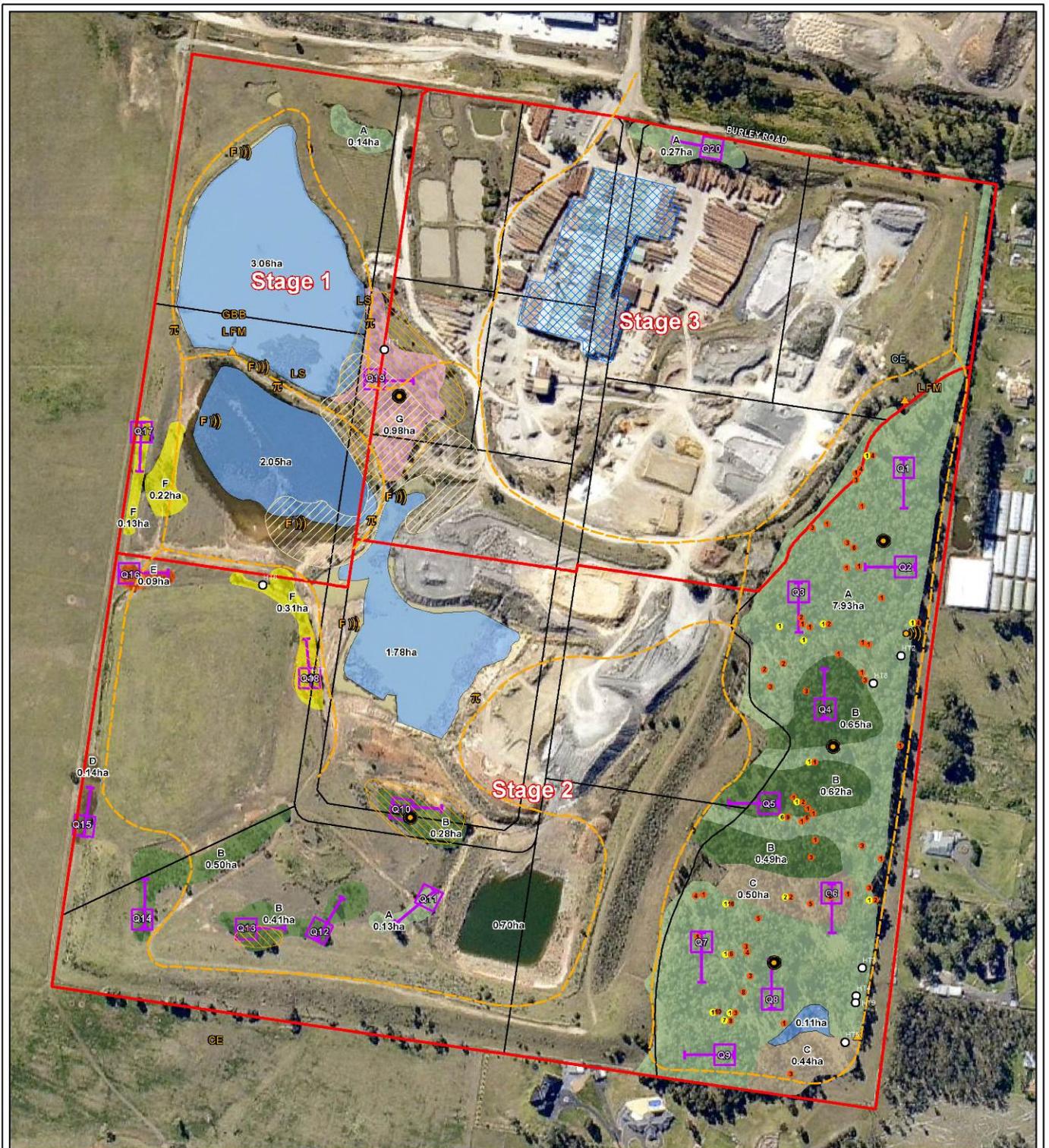
1. Creation of a Positive Covenant over the site including Lot 205;
2. Lot 205 shall be managed in accordance with a VMP in line with recommendations made by *Travers bushfire & ecology Flora and Fauna Assessment Report, 10 March 2014*.

1.3 Objectives

Objectives for the VMP are as follows

1. To ensure the long term protection of the Cumberland Plain Woodland reserve.
2. Habitat enrichment including but not limited to the Recovery/harvest native logs for habitat enrichment within the reserve for Cumberland Plain Land Snail
3. Restore and maintain the reserve such that the habitats are resilient and its biodiversity values are maintained or improved.

Schedule 1 of this VMP provides a plan of works within the affected works area and the performance targets to be achieved by contractors undertaking restoration works.



Legend		Flora Survey Effort (August / November 2013)		Fauna Survey Effort (December 2013 & February 2014)		Fauna Survey Results (December 2013)	
[Red outline]	Stage boundary	[Purple line]	Flora transect (50m)	[Green box]	D - Spotted Gum / Ironbark Woodland	[Black circle]	Migratory Species
[Black outline]	Subdivision boundary	[Pink box]	Flora quadrat (20x20m)	[Orange box]	E - Rough-barked Apple Woodland	[Black circle with dot]	Cattle Egret
[White circle]	Habitat Trees	[Blue box]	Dam	[Yellow box]	F - Spotted Gum / Stringybark / Grey Box Woodland	[Black circle with dot]	Latham's Snipe
[Yellow dot]	CPLS Survey Results (August 2013) - Snail location - Living (with count)	[Green box]	Cumberland Plain Woodland - EEC	[Pink box]	G - Paperbark Woodland	[Black circle with dot]	Threatened Species
[Red dot]	CPLS Survey Results (August 2013) - Snail location - Dead (with count)	[Light green box]	A - Forest Red Gum / Grey Box Woodland	[Black triangle]	Anabat station	[Black circle with dot]	Great Broad-nosed Bat
[Black circle with dot]	Fauna Survey Results (August 2013) - Migratory Species	[Dark green box]	B - Ironbark Woodland	[Black circle with dot]	Diurnal bird census (>20 minutes)	[Black circle with dot]	Large-footed Myotis
[Black circle with dot]	Fauna Survey Results (August 2013) - Migratory Species	[Light brown box]	C - Stringybark - Ironbark Woodland	[Black circle with dot]	Spotting scope outlook station	[Black circle with dot]	
[Black circle with dot]	Fauna Survey Results (August 2013) - Migratory Species			[Black circle with dot]	Spotlighting transect	[Black circle with dot]	
				[Black circle with dot]	CPLS search area	[Black circle with dot]	
				[Black circle with dot]	GGBF habitat search area	[Black circle with dot]	
				[Black circle with dot]	Microbat roost habitat search area	[Black circle with dot]	
				[Black circle with dot]	Green and Golden Bell Frog call-playback	[Black circle with dot]	
				[Black circle with dot]	Nocturnal bird call-playback	[Black circle with dot]	
				[Black circle with dot]		[Black circle with dot]	



PROJECT & MXD REFERENCE
Burley Road, Horsley Park
A13140_FF001

DATE & ISSUE NUMBER
8/06/2016
Issue 1

SCALE & COORDINATE SYSTEM
1:3,500 @ A3
GDA 1994 MGA Zone 56



Figure 2 - Ecological Survey Effort and Results

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy; the location of all mapped features are to be confirmed by a registered surveyor.

Figure 2 - Ecological Survey Effort



Management Context

2

2.1 Site Description

The site is bound to the north by existing industrial development and a narrow strip of remnant degraded forest vegetation. The land to the south and east consists of rural residential lands with a large expanse of unmanaged grassland vegetation in the west. It is noted that the land to the south and west is zoned for future industrial development

Table 1 provides a summary of the planning, cadastral, topographical, and disturbance details of the site including Lot 205.

Table 1 - Lot features

Location of conservation lot	Subdivision Lot 205 within Parent Lot 1 DP 106143, 327-335 Burley Road, Horsley Park
Size	Approximately 10.63ha.
Local government area	Fairfield
Grid reference	299000E 6254230N
Elevation	70-90m AMSL approximately
Topography	Situated on slightly undulating landscape with constructed mounds and excavations outside of the woodland area to the west.
Geology and soils	Geology; Wianamatta Group – Shale, carbonaceous claystone, claystone, laminite, fine to medium-grained lithic sandstone, rare coal and tuff. Soils; Blacktown – gently undulating rises on Wianamatta Group shales.
Catchment and drainage	Dams within the north western portions of the site drain north along an unnamed drainage into Ropes Creek which flows into South Creek and eventually the Windsor Reach of the Hawkesbury River.
Vegetation	The native vegetation present in the eastern confines of the site is mature regrowth Cumberland plain woodland. Trees are around 15-25m tall in most areas, with a dense shrub layer in some areas within. The vegetation outside of the eastern woodland remnant is highly modified throughout the study area due to previous clearing, brick works and continued grazing.
Existing land use	The woodland area outside of the brick pit areas is currently utilised for cattle grazing.
Clearing	Small areas and trails within the woodland area of the study area have been previously subject to small scale clearing and the remaining southern portions of the study area have been extensively cleared with removal of topsoil.

The Environmental Conservation Lot 205 is 10.63 hectares in size. A small dam of approximately 0.11 hectares lies in the south-eastern portion of the lot and electrical transmission easement runs north/south parallel to the eastern boundary.

2.2 Vegetation description

The *Travers bushfire & ecology Flora and Fauna Assessment 2014*, notes the following vegetation communities within the site:

- Forest Red Gum / Grey Box Woodland.
- Ironbark Woodland;

- Stringybark – Ironbark Woodland;
- Paperbark Woodland;
- Spotted Gum / Ironbark Woodland;
- Rough-barked Apple Woodland; and
- Spotted Gum / Stringybark / Grey Box Woodland.

2.2.1 Cumberland Plain Woodland

The primary vegetation community on site, Cumberland Plain Woodland (CPW), is a critically endangered ecological community under the provisions of the *Threatened Species Conservation Act* (TSC Act); and a critically endangered community as listed by Commonwealth legislation under the *Environmental Protection and Biodiversity Conservation Act* (EPBC Act).

The total area of CPW within the site is 14.23 hectares comprising of 10.63 hectares of high quality CPW within lot 205 and 3.60 hectares of highly fragmented and degraded CPW throughout the remainder of site. Total CPW proposed for removal is 4.49 hectares. The total CPW to be protected within Lot 205 is 9.74 hectares.

CPW is inclusive of EPBC Act Listed community - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest and CPW comprises three (3) sub-communities. These are based upon the dominant canopy cover present. In some locations, Forest Red Gum with Grey Box dominate, whilst the canopy might be dominated by *Melaleuca decora* within another patch.

CPW within the lot is characterised as mainly mature regrowth with a number of scattered old remnant trees as indicated by their large diameter trunk and constituent hollows. The principal CPW sub-vegetation communities constitute Forest Red Gum / Grey Box Woodland (approximately 7.93 hectares), three patches of Ironbark Woodland (totalling approximately 1.56 hectares) and Stringybark – Ironbark Woodland (approximately 0.94 hectares).

Canopy trees on the lot are generally to a height of between 15-25m with a projected foliage cover of 20-35%, dependent upon the age of the trees and the level of previous impacts, particularly within the small remnants. Some of these trees are old remnant trees as indicated by their large diameter trunk and constituent hollows however, most of the site appears as mature regrowth given evidence of previous disturbances, including tree clearing and grazing (which continues to the present).

The shrub layer is largely dominated by *Bursaria spinosa* var. *spinosa*, *Acacia decurrens*, *Dillwynia sieberi*, *Daviesia ulicifolia*, *Acacia fimbriata* and *Exocarpus cupressiformis*. The shrub layer is one to eight metres tall and accounts for between 30-65% coverage.

The ground layer is less than 1 meter tall and accounts for between 75-95% coverage. Dominant native species recorded included *Aristida vagans*, *Aristida ramosa*, *Austrostipa pubescens*, *Microlaena stipoides*, *Themeda australis*, *Brunoniella pumilio*, *Chloris ventricosa*, *Dichondra repens*, *Cheilanthes sieberi*, *Eragrostis brownii*, *Glycine clandestina*, *Glycine tabacina*, *Hardenbergia violacea* and *Solanum prinophyllum*.



Photo 1 – Mature CPW in the northern portion of the CPW remnant looking west with a moderately dense layer of Bursaria spinosa



Photo 2 – High quality CPW vegetation (regrowth)

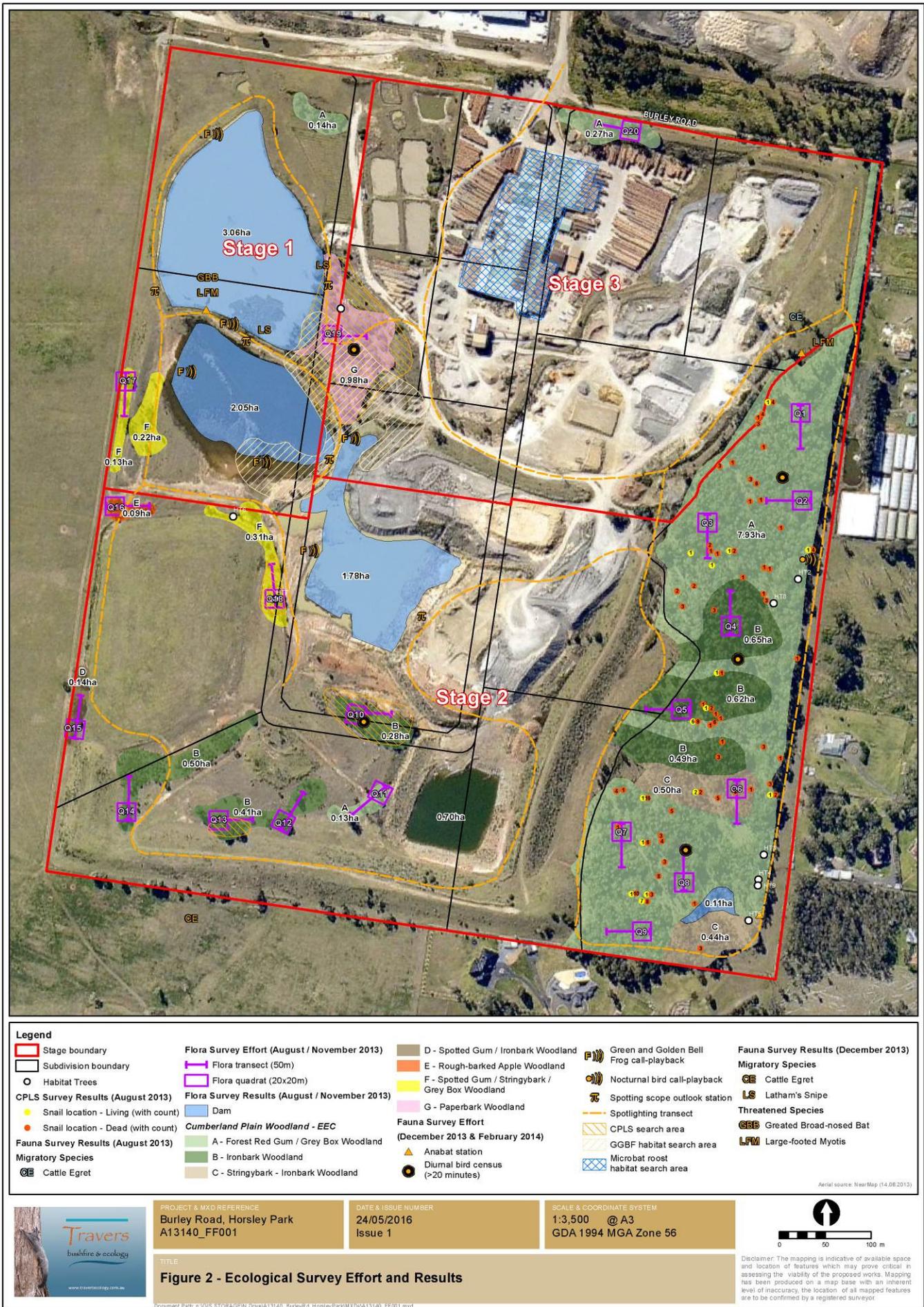


Figure 3 - Flora & Fauna Survey Effort

2.3 Observed flora species

The observed flora species within the site are shown in Attachment 2. No threatened flora species were observed in the *Travers bushfire & ecology Flora & Fauna Assessment 2014*.

Table 2 - State listed threatened flora with suitable habitat present

Scientific name	TSC Act	Potential to occur	Survey period
<i>Acacia pubescens</i>	V	✓	any time of year
<i>Dillwynia tenuifolia</i>	V	✓	spring
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	V	✓	spring-early summer
<i>Pimelea spicata</i>	E1	✓	summer
<i>Pultenaea parviflora</i>	E1	✓	spring

2.4 Important habitat features

Important habitat features are outlined in Table 3 below.

Table 3 - Habitat Features

Topography				
Flat ✓	Gentle ✓	Moderate ✓	Steep ✓	Drop-offs
Vegetation structure				
Closed Forest	Open Forest	Woodland ✓	Heath	Grassland ✓
Disturbance History				
Fire	Under-scrubbing ✓	Cut and fill works ✓		
Tree clearing ✓	Grazing ✓			
Soil Landscape				
DEPTH:	Deep ✓	Moderate ✓	Shallow	Skeletal
TYPE:	Clay ✓	Loam ✓	Sand	Organic
VALUE:	Surface foraging ✓	Sub-surface foraging ✓	Denning/burrowing ✓	
WATER RETENTION:	Well Drained ✓	Damp / Moist	Water logged	Swamp / Soak
Rock Habitat				
CAVES:	Large	Small	Deep	Shallow
CREVICES:	Large	Small	Deep	Shallow
ESCARPMENTS:	Winter / late sunny aspects		Shaded winter / late aspects	
OUTCROPS:	High Surface Area Hides	Med. Surface Area Hides	Low Surface Area Hides	
SCATTERED / ISOLATED:	High Surface Area Hides	Med. Surface Area Hides	Low Surface Area Hides ✓	
Feed Resources				
FLOWERING TREES:	Eucalypts ✓	Corymbias	Melaleucas ✓	
	Banksias	Acacias ✓		
SEEDING TREES:	Allocasuarinas	Conifers		
WINTER FLOWERING EUCALYPTS:	<i>C. maculata</i>	<i>E. crebra</i> ✓	<i>E. globoidea</i>	<i>E. sideroxylon</i>
	<i>E. squamosa</i>	<i>E. grandis</i>	<i>E. multicaulis</i>	<i>E. scias</i>
	<i>E. robusta</i>	<i>E. tereticornis</i> ✓	<i>E. agglomerata</i>	<i>E. siderophloia</i>
FLOWERING PERIODS:	Autumn	Winter ✓	Spring ✓	Summer ✓
OTHER:	Mistletoe ✓	Figs / Fruit	Sap / Manna	Termites ✓

Habitat trees

A complete assessment of the location of habitat trees and the size of hollows within was undertaken as part of surveys. The hollows were found to be generally small and at very low density, likely the result of previous selective logging or other previous clearance disturbance. There were no large hollows observed present within the site and therefore no suitable nesting or hollow roosting habitat for owls is present.

Two hollow-dependent threatened fauna species including the Large-footed Myotis and Greater Broad-nosed Bat were recorded during survey. It is recommended that hollow-bearing trees identified within the subdivision landscape are recovered and used as on ground snail habitat or reinstalled within existing trees within the CPW reserve. Any removal of hollows is to be undertaken under the supervision of a fauna ecologist so that residing fauna may be effectively recovered, particularly threatened species.

Habitat tree data for the whole site is shown in Table 4.

Table 4 - Habitat Tree Data

Tree No	Scientific Name	Common Name	DBH (cm)	Spread (m)	Height (m)	Vigour (%)	Hollows & Other Habitat Features Recorded
HT1	<i>Melaleuca decora</i>	Paperbark	40	8	9	75	1x 10-15cm low trunk (good quality with nesting material)
HT2	<i>Eucalyptus tereticornis</i>	Forest Red Gum	40/90	9	22	70	1x 0-5cm broken trunk
HT3		stag	45	9	19	0	2x 0-5cm branch
HT4	<i>Eucalyptus tereticornis</i>	Forest Red Gum	75	14	22	85	1x 5-10cm trunk (good quality with wear around entry)
HT5	<i>Eucalyptus tereticornis</i>	Forest Red Gum	60	13	21	80	1x 10-15cm trunk split
HT6		stag	35	10	18	0	1x 0-5cm branch
HT7		stag	55	12	19	0	1x 0-5cm branch (good quality)
HT8	<i>Eucalyptus tereticornis</i>	Forest Red Gum	75	14	23	80	1x 0- 5cm branch
HT9	<i>Eucalyptus tereticornis</i>	Forest Red Gum	40	12	24	80	White-faces Heron's nest

2.5 Vegetation condition

Condition assessment has been determined using the Biometric Field Assessment Method used for biobanking applications. Since the 2014 *Flora and Fauna Report 2014*, it is noted that while the CPW shrub layer, with the exception of the southern portion, is regenerating and thickening out. The vegetation condition assessment by *Travers bushfire & ecology* in May 2016 notes that vegetation is in medium to high condition (Figure 4).

The eastern boundary exhibits a roughly 20 meter wide band of African Olive of approximately 0.6 hectares while Kikuyu (0.14 ha.), Mickey Mouse plant, Lantana and African Olive are present on the western boundary of the lot.

Weeds identified on the lot are:

- Mothvine (*Araujia sericifera*);
- African olive (*Olea europaea* subsp. *Cuspidate*);
- Kikuyu (*Pennisetum clandestinum*)
- Mickey mouse plant (*Ochna serrulata*); and
- Lantana (*Lantana camara*).

Isolated pieces of concrete, reinforcing steel, remnant mining equipment and 3x6 m. tractor tyres are evident in an easily accessible location on the eastern boundary. These should be carefully removed following a check for existence of Cumberland Plain Land Snail and prior to installation of protective fencing.



Figure 4 - Vegetation Condition

2.6 Asset protection zones (APZs)

All APZs are external to the conservation area as shown in Figure 5. A fire trail access is provided within the reserve on the southern and western boundary which is currently access on the northern western peak and the south-western corner the conservation area.

Fire management within the reserve is to only be undertaken as an environmental burn for the regeneration of Cumberland plain woodland that protects the existing Cumberland Plain land Snail population from burning programs (Section 3.5).

In the event a burn is proposed, then all snails are to be collected and relocated into snail refuges within the site. This is due to the high risk of completely destroying the population in the event of a fire. The installation of addition old refuges as part of the VMP is intended to provide a shelter in the event of a wildfire.

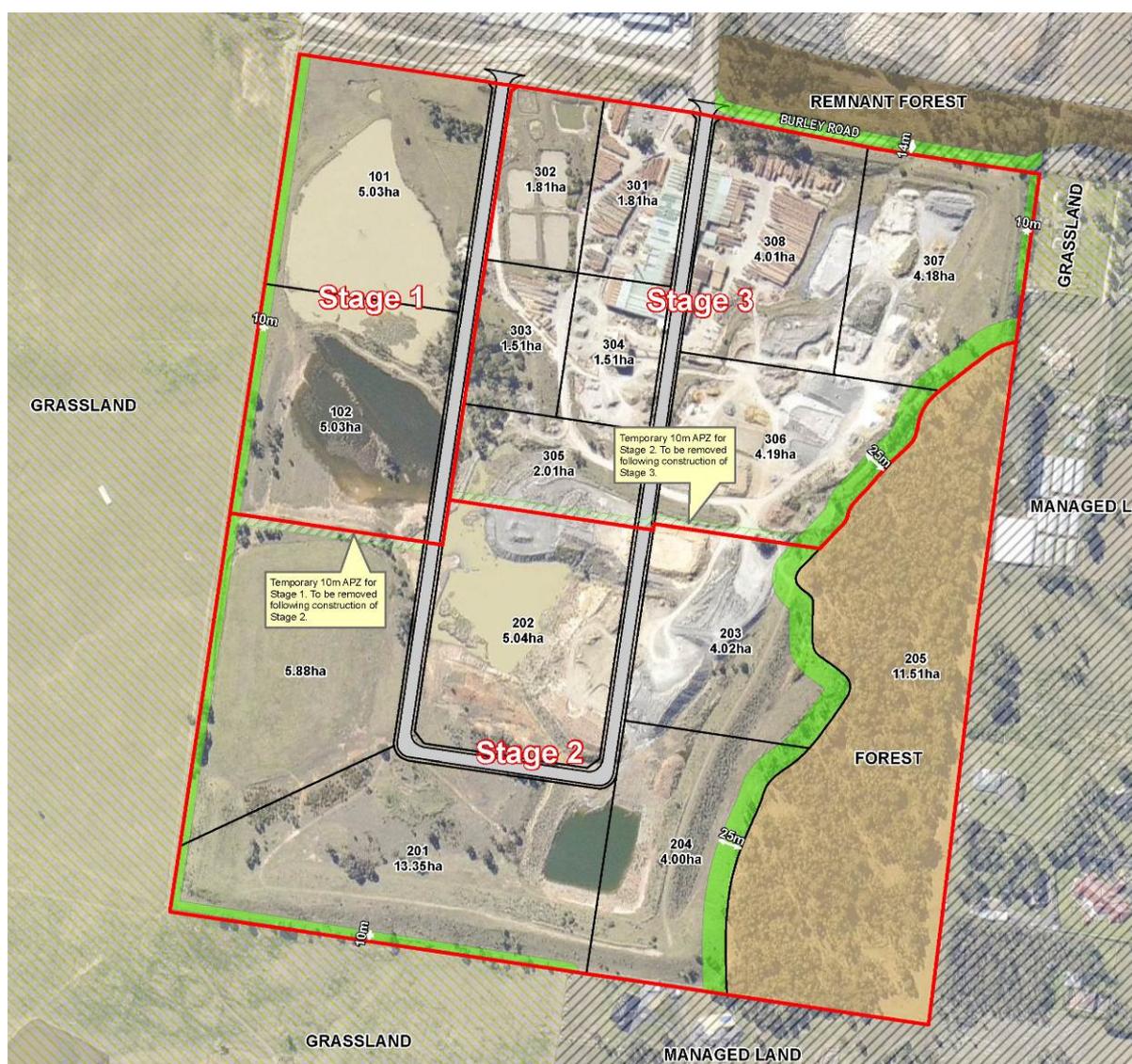


Figure 5 - Bushfire Protection Measures



Management Strategy

3

The VMP management strategy is as follows:

- Reduction of edge effects via establishment of a Priority bushland interface weed control zone and the provision of a 25m managed ecological buffer between the industrial subdivision and conservation lot.
- Shrub enrichment planting within the CPSW&SGTF to improve natural resilience against weed invasions;
- Revegetation of cleared and under-scrubbed areas within the Conservation Area;
- Weed management;
- Habitat enhancement for the endangered Cumberland Plains Snail; and
- Hollows and nest box enhancement program.

3.1 Management in accordance with Approved Conservation Advice

This VMP has been prepared in accordance with the (DoE) *Approved Conservation Advice for Cumberland Shale Woodlands and Shale-Gravel Transition Forest ecological community*.

The information below is paraphrased from the Approved Conservation Advice for CPSW&SGTF

3.1.1 Threats

Clearing for development – The proposed Conservation Area will be conserved and managed in perpetuity such that it will retain its biodiversity and will remain true to the traits of CPSW&SGTF. Areas that are depauperate or disturbed with regard to species commensurate with CPSW&SGTF will be restored to a fully structured and diverse vegetation community corresponding to CPSW&SGTF.

Fragmentation – The conservation area is 10.63 ha in size. It is located within an existing disturbed (rural / industrial / residential) environment which is already fragmented with regard to vegetation connectivity. There are other patches of similar vegetation located approximately 3 km to the WNW, 2 km to the WSW and 1.5 km to the SE. In summary, this patch of CPSW&SGTF is already isolated or will become isolated further with future road works from any connecting vegetation of the same type.

Inappropriate grazing – The conservation area will be completely fenced with access only for bush regeneration and ecological monitoring and management personnel. No grazing livestock or feral rabbits will be allowed. Control of rabbits will be undertaken if required.

Inappropriate fire regimes – The conservation area will be completely fenced with no access by the public. This will decrease the likelihood of unauthorised fires. NSW Rural Fire Service has Bushfire Environmental Code (RFS 2013) for the management of CPSW&SGTF (under Cumberland Plain Woodland in the Sydney Basin Bioregion) which state “no fire more than once every 7 years” and “no slashing, trittering or tree removal” as stated in the Threatened Species Hazard Reduction List – Part 3 – Threatened Ecological Communities (RFS 2013). This frequency is the absolute minimum and it is expected that any (low intensity and managed) hazard reduction or ecological burn would be at much longer intervals within the conservation area. Further information regarding fire regimes is provided in Section 3.6 of this VMP.

Weed Invasion – Section 3.3 of this VMP specifies the strategies and methods that will be used to remove existing weed species and to maintain low levels of weeds within the conservation area.

Vegetation Clearance – removal of vegetation commensurate within the conservation lot is prohibited. Removal of weeds or exotic vegetation will be permitted and will be undertaken by suitably qualified bush regeneration and maintenance contractors.

3.1.2 Strategic Priority

Strategic priorities for the conservation of CPSW&SGTF have been taken into consideration and have resulted in the proposed establishment of the conservation area within Lot 205.

3.1.3 Research Priorities

The proposed conservation area was identified as a remnant of CPSW&SGTF early in the ecological assessment process. The proposed conservation area was then subject to detailed surveys from flora diversity, threatened flora and fauna, ecological community, quality, weed and other disturbance perspectives. This enabled the production of this VMP which has been tailored specifically to conserve and manage the CPSW&SGTF within the site.

Ongoing monitoring of the reserve will provide additional information on the restoration or recovery of vegetation of the Cumberland Plain.

3.1.4 Regional Priority Actions

The following regional priority recovery and threat abatement actions can be done to support the recovery of the CPSW&SGTF ecological community within the subject site.

Habitat Loss, Disturbance and Modification

- Monitor known sites to identify key threats.

Monitoring points are an integral part of the management strategy within this VMP (see Section 4). The monitoring will be undertaken at 6 monthly intervals for three (3) years with annual progress reports for the remaining 7 years of the maintenance program (total 10 years) to be submitted to Fairfield Council.

Monitoring of performance targets for revegetation works, weeds, vegetation condition, the presence of the (Endangered) Cumberland Plains Land Snail, rubbish, exclusion fencing, sediment fencing, pest species (rabbits) and the condition of the Cumberland Plain Woodland Managed Ecological Buffer (located 25m externally to the conservation area) and the Bushland Interface Zone (located internally 0-10 metres from the protective fence within the conservation area).

All of this monitoring is to be undertaken to identify key threats and to facilitate management strategies and works to ameliorate, rectify or remove these threats.

- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

As stated above, monitoring will be undertaken as specified in Section 4 of this document. This monitoring will provide feedback and is also adaptable to allow for modifications that may be required to address unforeseen impacts.

- Identify sites of high conservation priority.

The proposed conservation area is 10.63 ha in size and is generally in moderate to good condition. It contains CPSW&SGTF which is listed as critically endangered and is of a high conservation priority containing threatened species habitat.

In addition, the proposed industrial subdivision will allow conservation of this area with a minimum of difficulty and will avoid the very high levels of impacts associated with residential developments.

The ongoing expansion of all types of development within the locality adds some urgency to the retention, protection and management of this remnant of CPSW&SGTF.

- Implement appropriate management regimes to maintain the biodiversity, including threatened species, of the ecological community.

Appropriate management regimes to retain and habitat enrichment to enhance the presence and habitat specific for the Cumberland Plains Land Snail have been provided in Section 3.5 and in Schedule 1 within this document.

Known or potential habitat is to be retained and managed for other state or commonwealth threatened flora and fauna species such as *Acacia pubescens*, *Dillwynia tenuifolia*, *Grevillea juniperina* subsp. *juniperina*, *Pimelea spicata*, *Pultenaea parviflora*, Grey-headed Flying-fox, Large-footed Myotis, Greater Broad-nosed Bat, Cumberland Plain Land Snail, Little Eagle, Square-tailed Kite, Little Lorikeet, Swift Parrot, Speckled Warbler, Varied Sittella, Dusky Woodswallow, Diamond Firetail, Yellow-bellied Sheath-tail-bat, East-coast Freetail Bat, Eastern Falsistrelle, Little Bentwing-bat, Eastern Bentwing-bat, Green and Golden Bell Frog, Powerful Owl, Masked Owl, Black-chinned Honeyeater, Scarlet Robin, Regent Honeyeater and Flame Robin.

Four (4) state listed threatened fauna species – Grey-headed Flying-fox (*Pteropus poliocephalus*), Large-footed Myotis (*Myotis macropus*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Cumberland Plain Land Snail (*Meridolum corneovirens*) – were recorded within the study area during surveys.

Areas that are depauperate or disturbed with regard to species commensurate with CPSW&SGTF will be restored to a fully structured and diverse vegetation community corresponding to CPSW&SGTF using propagules of local provenance.

- Develop and implement best practice standards for management of remnants on private and public lands.

This VMP has been compiled using current best practice standards, strategies and work methods for conservation and long-term management of this patch of CPSW&SGTF.

- Liaise with planning authorities to ensure that planning for growth zones in urban and peri-urban areas takes the protection remnants into account, with due regard to principles for long-term conservation.

Liaison with local, state and commonwealth government planning authorities has been instigated and will be ongoing over the 10 year tenure of this Vegetation Management Plan.

Liaison will take the form of applications and approvals of the proposed works as well as annual reporting on the works undertaken, the progress of the works, any additional works required and the outcomes.

- Liaise with local councils and State authorities to ensure new development, road widening, maintenance activities or other activities involving substrate or vegetation disturbance in areas where the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community occurs do not adversely impact on known remnants.

The proposal is for an industrial subdivision. This includes roads and services that are designed for the purpose and are expected to be long-term installations. No development of any kind is proposed within the conservation area.

- Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate inclusion in reserve tenure if possible. This is particularly important for areas that link remnants and create wildlife corridors.

Formal conservation agreements using a variety of mechanisms are currently being investigated.

- Manage any changes to hydrology that may result in changes to water table levels. In addition, develop and implement urban stormwater management guidelines that address risks of urban run-off to the ecological community.

The hydrology of the proposed conservation area will remain unchanged from its current status.

All stormwater from the industrial development will be channelled into infrastructure which will transport the stormwater to the north-west.

All other aspects from the proposed conservation area are downhill to the east and south-west (see 1 metre LIDAR contours provided on Schedule 1).

Invasive Weeds

- Ensure chemicals or other mechanisms used to manage weeds do not have a significant adverse impact on Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community.

Weed control using chemicals will be undertaken in accordance with Section 3.3.2 of this VMP.

The use of *Roundup Bi-active*® or equivalent formulations is recommended for weed infestations which may require spraying within Lot 205.

All herbicides must be applied according to the herbicide usage label and provisions of the *Protection of the Environmental Operations Act (NSW PEO Act)*.

Only operators with *Chemcert* or equivalent training must undertake the spraying of weeds. The operator must evaluate the success of each treatment after a set period of time, according to the labelled effective treatment of each species for each herbicide. Care must be taken when applying herbicides near water bodies due to the sensitivity of the waterways and resident flora and fauna to runoff containing these herbicides.

- Manage sites to prevent introduction or further spread of invasive weeds, which become a threat to the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community, using appropriate methods.

The introduction or further spread of invasive weeds will be prevented by the use of several strategies such as a combined APZ / CPW Managed Ecological Buffer 25 metres wide that is located externally from the conservation area protective fence (see Schedule 1). In addition, there is a 20 metre wide Bushland Interface Zone located internally from the protective fence along the Conservation Area boundary (See Schedule 1).

These Managed Ecological Buffer and Bushland Interface Zones will be inspected for weeds on a regular basis and will also undergo regular weed control works. This will prevent any invasion or incursions of weeds into the interior of the Conservation Area within proposed Lot 205.

It is also noted that weeds can be transported by other means such as birds and wind, therefore, weed control inspections and works will be undertaken across the whole of the Conservation Area on a regular basis

- Develop and implement a management plan for the control of African Olive (*Olea europea* subsp. *cuspidata*) in the region.

This (and many other) weed species were observed within the larger study area. General weed control strategies are described in Section 3.3 of this VMP.

In addition, specific information on the control of this species is available on the web at: <http://weeds.dpi.nsw.gov.au/Weeds/Details/4#profile>

Trampling, Browsing or Grazing

The proposed conservation area will be fenced around the entire perimeter. Gates will be provided for Bush Regenerators / Ecological Monitoring teams to access the site. No grazing livestock will be permitted within the conservation area. Grazing feral pests such as rabbits will be controlled if detected within the Conservation Area.

Fire

- Identify circumstances under which an ecological burn may be required for the conservation of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community, and develop and implement suitable ecological fire management strategies.

An ecological burn may be required to remove dense shrubbery or to promote seeding of certain species that require a fire to set or disperse seed.

Ecological burns are usually managed as low to moderate intensity so that they do not kill the majority of the vegetation and in general are rarely used as an ecological tool.

The NSW Rural Fire Service has guidelines for the management of CPSW&SGTF (under Cumberland Plain Woodland in the Sydney Basin Bioregion) which state “no fire more than once every 7 years” and “no slashing, trittering or tree removal” as stated in the Threatened Species Hazard Reduction List – Part 3 – Threatened Ecological Communities (RFS 2013).

Fire management relating to the lot 205 Conservation Area is provided in Section 3.6 of this VMP.

- Where appropriate provide maps of known occurrences to local and state Rural Fire Services and seek inclusion of mitigation measures in bush fire risk management plan(s), risk register and/or operation maps.

It is unknown if the CPSW&SGTF patch within Lot 205 has been provided as a map to NSW RFS. Mitigation measures and minimum fire frequency are stipulated in the *Bushfire Environmental Assessment Code* (NSW RFS 2013) and the *Threatened Species Hazard reduction List Part 3 – Threatened Ecological Communities* (NSW RFS 2013).

- Negotiate appropriate standing procedures with local fire brigades.

Appropriate standing procedures have not yet been defined or negotiated with local fire brigades.

Conservation Information

- Raise awareness of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community within the local community e.g. through active Conservation Management Networks, Landcare groups and other groups.

Awareness of the ecological status of the CPSW&SGTF will be promoted by signage at regular intervals along the protective boundary fence surrounding Lot 205.

In addition it is expected that this VMP will be distributed to new landholders within the development in order to educate owners on the value of the CPSW&SGTF conservation area and ways to assist in its conservation.

- Maintain liaisons with private landholders and land managers of land on which remnants of the ecological community occur.

Liaison with the current and future landholders will be maintained in order to undertake the conservation, management and monitoring of the CPSW&SGTF within the Conservation Area during the 10 year management period.

Enable Recovery of Additional Sites and/or Populations

- Investigate options to maintain and improve connectivity of remnants, including the protection of paddock trees and replanting of key canopy tree species in derived grasslands and shrublands, where possible.

The proposed Lot 205 Conservation Area containing the CPSW&SGTF is already isolated as described in the 'Fragmentation' heading in Section 3.1.1.

The Lot 205 Conservation Area is very tenuously connected to other vegetation to the north by creekline vegetation which is not of the same vegetation type. In addition, there are remnant trees commensurate with CPSW&SGTF sparsely scattered within the locality.

These connectivity values are very low due to the differing vegetation type, extent or small width of the creekline corridor, and the low value of single remnant trees within developed rural or industrial landscapes.

3.2 Reserve interface management

3.2.1 Bushland Interface Zone

Areas with small habitat fragments often exhibit especially pronounced edge effects, i.e. the effect of an abrupt transition between two quite different adjoining ecological communities on the numbers and kinds of organisms in the marginal habitat. The *Cumberland Plain Recovery Plan* notes that active management of CPW recovery efforts include the need to focus on management of 'edge effects'.

A 20 m wide Bushland Interface Zone will be established as shown on Schedule 1 Vegetation Management Works (VMW). Management details for this zone are discussed in Section 3.4.1.

The management aim for this zone will be to:

- Manage weeds;
- Increase floral diversity; and
- Increase floral density.

These efforts will provide a buffer against weed incursions from adjoining land uses and provide a sheltered internal habitat for the insitu fauna.

3.3 Weed management

The objective of weed management actions is to remove weed threats from the reserve and to achieve a resilient vegetation community.

Whilst the conservation lot is characterised by good quality regenerating vegetation, it also has relatively few weed infestations. The vegetation condition assessment noted the presence of African Olive, Moth vine, Mickey Mouse plant, Kikuyu and Lantana as the key invasive species within the reserve.

African Olive invasion is recognised as the greatest invasive threat to CPW, and is listed under the NSW TSC Act as a Key Threatening Process. The surrounding landscape contains several highly invasive and persistent weed species.

Noxious weeds observed within the lot and adjoining lands include *Sagittaria platyphylla*, Green Cestrum, Large-leaved privet, African boxthorn, Castor oil plant, Pampas grass and Fireweed. Given their proximity to the reserve, they represent an immediate noxious weed threat to the vegetation and ongoing monitoring and removal of these species will be required

The *Noxious Weeds (Weed Control) Order 2014* details various classes of noxious weeds and the control requirements which apply to such classes. Relevant noxious weeds and their classes are outlined in Table 5.

Table 5 - Noxious Weeds

Family	Scientific name	Common name	Class
Poaceae	<i>Cortaderia selloana</i>	Pampas Grass	3
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum	4
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved privet	4
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	4
Euphorbiaceae	<i>Ricinus communis</i>	Castor Oil Plant	4
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	4
Alismataceae	<i>Sagittaria platyphylla</i>		4

Class 3 - Plants that pose a potentially serious threat to primary production, the environment or the environment of a region to which the order applies, are not widely distributed in the

area and are likely to spread in the area or to another area. Such plants must be fully and continuously suppressed and destroyed and must not be propagated.

Class 4 - Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area. The growth of these plants must be managed in a manner that continuously inhibits the ability of such plants to spread.

These weeds will require targeted weed control and ongoing management throughout the maintenance period.

A list of weeds identified in the *Travers bushfire & ecology Flora Survey* are shown in Table 6.

Table 2 – Observed Weeds

Family	Scientific name	Common name
Shrubs		
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow Leaf Cotton Bush
Verbenaceae	<i>Lantana camara</i>	Lantana
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn
Berberidaceae	<i>Nandina domestica</i>	Sacred Bamboo
Ochnaceae	<i>Ochna serrulata</i>	Mickey Mouse Plant
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive
Euphorbiaceae	<i>Ricinus communis</i>	Castor Oil Plant
Rosaceae	<i>Rosa rubignosa</i>	Sweet Briar
Asteraceae	<i>Senecio pterophorus</i>	African Daisy
Solanaceae	<i>Solanum sisymbirifolium</i>	-
Groundcovers		
Myrsinaceae	<i>Anagallis arvensis</i>	Scarlet Pimpernel
Poaceae	<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs
Brassicaceae	<i>Brassica fruticulosa</i>	Twiggy Turnip
Brassicaceae	<i>Cardamine hirsuta</i>	Hairy Bittercress
Poaceae	<i>Chloris gayana</i>	Rhodes Grass
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle
Brassicaceae	<i>Coronopus didymus</i>	Lesser Swine-cress
Poaceae	<i>Cortaderia selloana</i>	Pampas Grass
Apiaceae	<i>Cycloperum leptophyllum</i>	Slender Celery
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass
Asteraceae	<i>Erechtites valerianifolia</i>	Brazilian Fireweed
Apiaceae	<i>Foeniculum vulgare</i>	Fennel
Asteraceae	<i>Hypochaeris radicata</i>	Flatweed
Juncaceae	<i>Juncus acutus</i>	Sharp Rush
Fabaceae	<i>Lotus suaveolens</i>	Hairy Bird's Foot Trefoil
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow
Poaceae	<i>Paspalum dilatatum</i>	Paspalum
Malvaceae	<i>Pavonia hastata</i>	-
Poaceae	<i>Pennisetum clandestinum</i>	Kikuyu
Plantaginaceae	<i>Plantago lanceolata</i>	Ribwort
Iridaceae	<i>Romulea rosea</i> var. <i>australis</i>	Onion Grass
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed
Poaceae	<i>Setaria parviflora</i>	-
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne
Solanaceae	<i>Solanum pseudocapsicum</i>	-

Family	Scientific name	Common name
Asteraceae	<i>Sonchus oleraceus</i>	Common Sow-thistle
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass
Lamiaceae	<i>Stachys arvensis</i>	Stagger Weed
Asteraceae	<i>Taraxacum officinale</i>	Dandelion
Commelinaceae	<i>Tradescantia fluminensis</i>	Wandering Jew
Fabaceae	<i>Trifolium repens</i>	White Clover
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop
Vines		
Apocnyaceae	<i>Araujia sericifera</i>	Mothvine
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal Morning Glory
Convolvulaceae	<i>Ipomoea indica</i>	Blue Morning Glory
Fabaceae	<i>Vicia sativa</i> subsp. <i>sativa</i>	Common Vetch
Water plants		
Juncaceae	<i>Juncus cognatus</i>	-

Environmental weeds such as Wandering Jew (*Tradescantia fluminensis*) are also a threat to natural bushland as they are fast growing and multiply quickly due to fact that they are prolific seeders.

3.3.1 Weed management strategy

Primary and secondary weed control measures will focus on the target weed control zones which have been identified within the lot and are shown in Schedule 1 (VMW). These highlight the following weed infestations:

- African Olive;
- Kikuyu; and
- Aquatic weeds.

Bush regeneration zones as shown in Schedule 1 (VMW) will provide ongoing weed suppression including those for lantana.

The following weed management and maintenance works will primarily involve the removal of any weed infestations, bush regeneration, mass planting of suitable native endemic species in small identified areas and the ongoing maintenance of remnant vegetation and disturbed areas.

No plant species other than those native species associated with the vegetation communities present will be planted or used in revegetation works.

Weed control is to extend ongoing for ten years.

Given that the CPW is characterised by relatively few patches of weeds, weed control should be predominantly via hand removal and competitive planting techniques. The weed control priorities are listed in Attachment 3.

There are currently a number of low impact bush regeneration techniques used in bushland management for the removal of weeds. The bush regeneration process (Buchanan, 1989) involves:

- The *Bradley Method* of minimal soil disturbance during weed removal
- Clearing and stabilising techniques
- The use of herbicides
- The use of fire (pile burns)

- Biological controls

Employing the *Bradley Method* for regeneration requires the removal of weeds in phases. Stages of weed removal can be broken into three components:

Primary weeding

It is noted that all vegetation, including weeds, will be stripped from the road construction corridor. All weed materials need to be selectively isolated from native vegetation and disposed of separately to native brush which can be mulched.

This involves removal of weeds through targeted hand removal within 10 meters of the dam.

Secondary or follow-up weeding

Secondary or follow-up weeding involves intensive weeding in areas that have already received primary work to remove weed regrowth or overlooked weeds. It is recommended that secondary weeding be conducted in the following 3-6 months after primary weeding. Secondary weeding of the site may take up to three (3) months over several sessions.

Maintenance weeding

After primary and secondary weeding and natural regeneration of the bushland, the area should be able to resist most weeds. However, weeds will re-establish on the site from bird, wind, water transport and other seed or propagule dispersal mechanisms within the site. Maintenance weeding should be undertaken 6-12 times a year until such time as the resistance of the bushland to weeds increases, then only requiring hand weeding on a needs basis. Maintenance weeding is to be conducted for a minimum period of three (3) years within the riparian zone, after construction works have been completed.

Weeding works are to be carried out by an appropriately qualified and licensed bushland regeneration company under the direction of a consulting project ecologist.

3.3.2 Herbicide use

The use of *Roundup Bi-active*® or equivalent formulations is recommended for weed infestations which may require spraying within Lot 205.

An advantage of herbicide use is the low time taken to spray weeds as compared to physically removing them, particularly for large infestations of weeds. The disadvantage is that no single herbicide is effective on all weed species, thus the herbicide used needs to achieve an effective kill.

In general, *Travers bushfire & ecology* supports that the use of herbicides in non-ecologically sensitive areas can be undertaken if:

- There are small areas of dense weeds with few or no native plants to protect;
- There are large areas of predominantly weed coverage;
- Application can be undertaken without the risk of spray drift or off target kills, and
- Weeds are growing too rapidly for physical removal.

Only operators with *Chemcert* or equivalent training must undertake the spraying of weeds. The operator must evaluate the success of each treatment after a set period of time, according to the labelled effective treatment of each species for each herbicide. Care must be taken when applying herbicides near water bodies due to the sensitivity of the waterways and resident flora and fauna to runoff containing these herbicides.

All herbicides must be applied according to the herbicide usage label and provisions of the *Protection of the Environmental Operations Act (NSW PEO Act)*.

All noxious and environmental weeds need to be eradicated and controlled across the entire site. Weed propagules (seeds, tubers etc.) need to be periodically collected and disposed of at an approved waste transfer facility and shall not be dumped on adjacent bushland or allowed to be washed downstream.

3.4 Revegetation Works

3.4.1 Bushland Interface Zone

A 20 m wide Bushland Interface Zone will be established as shown on Schedule 1 (VMW). Enrichment planting of shrub species only will be planted to create a dense shrub layer to minimise weeds. A minimum of seven (7) shrub species for revegetation will be selected from Table 4 Revegetation Species List, however may be supplemented from species which typically occur in Cumberland Plain Woodland. Shrub planting densities are to on average, establish one (1) shrub every 12 m².

3.4.2 Revegetation elsewhere within lot

Revegetation will also be undertaken in disturbed areas as indicated in Schedule 1 (VMW). A minimum of three (3) tree species, seven (7) shrub species and 14 groundcover species for revegetation will be selected from Table 4 Revegetation Species List, however may be supplemented from species which typically occur in Cumberland Plain Woodland. These are highlighted in Appendix 1. Plantings will achieve the following densities:

- Trees – one (1) tree every 50 m²
- Shrubs - one (1) shrub every 12 m²
- Groundcovers – three (3) groundcover every 1 m²

3.4.3 Revegetation of the managed ecological buffer

Revegetation will utilise native species locally endemic with the EPBC Act Listed community - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Schedule 1 & 1 A). A minimum of three (3) tree species, seven (7) shrub species and 14 groundcover species for revegetation will be selected from Table 6 Revegetation Species List, but are to consist of high value foraging and habitat species. Plantings will achieve the following densities:

- Trees – one (1) tree every 50 m²
- Shrubs - one (1) shrub every 12 m²
- Groundcovers – three (3) groundcover every 1 m² (Conservation area) & 6 units per m² (Managed Ecological Buffer)

3.4.4 General

All installed plantings are to be protected with a 2L cardboard box or plastic guards to protect from grazing animals. Pindone rabbit baiting is to be undertaken throughout the entire maintenance period.

Watering of all revegetated areas is to be undertaken once a week for the first six to eight weeks post planting in the event of a dry spell.

It is expected that at least 85% of plantings will survive. If the success rate is less than this, supplementary planting will be required. All plant maintenance is to be undertaken over a 10 year period.

Table 3 - Revegetation Species List

Family	Scientific Name	Common Name
Trees		
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Fabaceae	<i>Acacia implexa</i>	Hickory wattle
Shrubs		
Pittosporaceae	<i>Bursaria spinosa</i> var. <i>spinosa</i>	Blackthorn
Fabaceae	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea
Fabaceae	<i>Dillwynia sieberi</i>	Prickly Parrot-pea
Sapindaceae	<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>	Wedge-leaf Hop-bush
Fabaceae	<i>Indigofera australis</i>	Native Indigo
Myrtaceae	<i>Melaleuca nodosa</i>	Ball Honey Myrtle
Fabaceae	<i>Pultenaea microphylla</i>	-
Groundcovers		
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Cyperaceae	<i>Carex inversa</i>	Knob Sedge
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff
Poaceae	<i>Aristida vagans</i>	Threeawn Speargrass
Poaceae	<i>Dichelachne micrantha</i>	Shorthair Plumegrass
Poaceae	<i>Paspalidium distans</i>	Shotgrass
Asparagaceae	<i>Lomandra multiflora</i> subsp. <i>Multiflora</i>	Many-flowered Mat-rush
Poaceae	<i>Entolasia stricta</i>	Wiry Panic
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
Poaceae	<i>Eragrostis leptostachya</i>	Paddock Lovegrass
Lomandraceae	<i>Lomandra filiformis</i> subsp. <i>Filiformis</i>	Wattle Matt-rush
Phormiaceae	<i>Dianella longifolia</i>	Blueberry Lily
Poaceae	<i>Cymbopogon refractus</i>	Barbed Wire Grass
Poaceae	<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	Hedgehog Grass

Suitable key trees, shrubs and groundcover species for revegetation are shown in Attachment 1. Native species from typical of CPW can also be used to supplement restoration works in cases where such recommended species are unavailable.

Planting densities should achieve a quick vegetative cover and root mass to maximise bed and bank stability along the subject watercourse. In the absence of any other vegetation, including grass layers the following densities of native plants are to be planted:

- Trees - one (1) tree every 50m²
- Shrubs - one (1) shrub every 5 m²
- Grasses and groundcovers - four (4) plants every 1 m²

This planting density will generally create a fully structured woodland. Whilst the ground layer species generally stays across communities, the tree and shrub planting densities can be varied to reflect the natural vegetation community in the locality.

3.4.5 Revegetation in vicinity of dam

Relevant species suitable for revegetation in the vicinity of the small dam in the south-east portion of the lot are outlined in Table 7. These will also support the frog species evident here.

More moisture loving species can be planted immediately surrounding the dam upon completion of initial weeding activities. The location of the planted species will be determined by the revegetation contractors to maximise plant survival.

Table 4 - Dam revegetation species

Family	Scientific Name	Common Name
Cyperaceae	<i>Baumea articulata</i>	Jointed Twig-rush
Cyperaceae	<i>Carex appressa</i>	Tall Sedge
Cyperaceae	<i>Carex inversa</i>	Knob Sedge
Cyperaceae	<i>Eleocharis sphacelata</i>	Tall Spike Rush
Cyperaceae	<i>Schoenoplectus validus</i>	-
Juncaceae	<i>Juncus usitatus</i>	-
Philydraceae	<i>Philydrum lanuginosum</i>	Frogsmouth

3.5 Species habitat enhancement

3.5.1 Cumberland Plain Land Snail

Travers bushfire & ecology Flora and Fauna Report 10 March 2014, identifies the presence of state and nationally endangered Cumberland Plain Land Snail (*Meridolum corneovirens*) within the site. The strategies to improve and maintain habitat for Cumberland Plain Land Snail include (Cumberland Plain Land Snail – Profile, OEH 2016):-

- Retain large woody debris and other material (stones) on the ground that provides habitat. Ensure it is dispersed across occupied sites to allow movement of individuals.
- Manage frequency, intensity and timing of fire over an occupied site (may include use of finer-scale mosaic burns) to reduce loss of large amounts of cover and individuals in one burn. Fires should be no more frequently applied to one part of the site than once every 5 years and low fire intensity with reduce damage to large woody debris that provides shelter. Ideally target fire to dry season when snails may be dormant underground.
- Exclude the presence of stock to reduce, minimise or eliminate trampling and eating of habitat.
- Manage weed presence, density and diversity at occupied sites, maintaining low density of weeds that are identified as habitat engineers (e.g. dense shrubs) or otherwise strongly affect structure and composition of the grassy woodland habitat. Where possible, also manage adjacent source areas for weed seeds and propagules.
- Reduce or exclude slashing from areas that are or may be occupied by snails such as around woody debris and near the trunks of trees to ensure habitat and cover are retained.

In accordance with the above strategies, the following habitat enhancement works will be undertaken for the Cumberland Plain Land Snail:

- Hand-removal of exotic weeds;
- Non-disturbance of native groundcovers and native shrub layer;
- Placement of a minimum of 30 x 3 m length hardwood logs harvested from the adjoining affected vegetation remnants;
- Restriction of vehicular access to mapped access routes.
- Collection and removal of European land snail from the reserve to minimise competition with the Cumberland Plain land snail and other locally occurring native mollusc species (minimum 4 searches per year).

3.5.2 Habitat enhancement for arboreal species

Travers bushfire & ecology Flora and Fauna Assessment March 2014, identified a small number of hollow-bearing trees containing small (0-10cm) sized hollows within the subdivision development landscape.

Threatened species with suitable habitat within the site and dependant on hollows of this nature include Eastern Falsistrelle, East-coast Freetail Bat, Greater Broad-nosed Bat, Large-footed Myotis and Little Lorikeet. 20 of these species were recorded during surveys undertaken. The replacement of hollows with nest boxes is recommended to supplement the loss of natural hollows.

Removal of habitat trees within industrial areas

Where possible, identified hollow-bearing trees should be retained in-situ. Where the felling of hollow-bearing trees is required, this should be conducted under the supervision of a fauna ecologist to ensure appropriate animal welfare procedures are taken. Hollows of high quality or with fauna recorded residing within should be sectionally dismantled and all hollows should be inspected for occupation, activity and potential for reuse. In the instance of recording the presence of threatened microbats during tree removal, maximum effort should ensure safe relocation of the roosting colony.

Re-used hollows or those with likely occupation are to be relocated to selected locations in Lot 205 or to conservation areas within close proximity to the site. All other hollows removed should be replaced with nest boxes. Every second box should be a design suitable for microbat species. Boxes should be constructed all of weatherproof timber (marine ply), fasteners and external paint.

The demolition process is often long and therefore in the event that microbats are found roosting within structures at any time through this process work should cease immediately and a fauna ecologist contacted. The fauna ecologist is to recover the roosting colony by best practice measures to prevent or minimise impacts on this colony.

3.6 Fire management

3.6.1 Fire management overview

Under the *Cumberland Plain Recovery Plan (OEH 2011)*, an important component in improving management practices and responses for Cumberland Plain Woodland CPW is further refining appropriate fire management regimes to maintain ecological integrity of CPW threatened ecological community remnants, investigating the relationship between fire frequency and exotic weeds in CPW and investigating the impact of fire on the fauna values, for example, determining an appropriate fire frequency for Cumberland Plain Land Snail.

Due to the sites industrial/rural setting, fire arson is a major problem in the bushland remnants.

The key factors in fire regimes are the fire's frequency, intensity and season of occurrence. High fire frequency leads to a reduction in shrub diversity and abundance, particularly legumes (e.g. *Dillwynia* and *Pultenaea* sp). However, low fire frequency often leads to dominance of one shrub species, such as Blackthorn (*Bursaria spinosa*) or Prickly Leaved Paperbark (*Melaleuca nodosa*). Given the fragmented nature of Cumberland Plain remnants, an inappropriate fire regime can lead to local extinctions of species because re-colonization or perpetuation of the population elsewhere in the landscape may not be possible.

Key fire-related threats to the endangered Cumberland Plain Land Snail are:

- Inappropriate fire regimes as the species does not appear to possess sheltering behaviours which provide protections from the impacts of fire. Due to the reduced number of individuals and increased fragmentation of the species habitat, the species' is less likely to repopulate areas partially destroyed by fire;
- Habitat modification for bushfire asset protection, for example slashing and thinning of ground woody debris; and
- The burning of composted pile material (pile burning) as burn piles (left insitu) attract snails into moist layers which are subsequently killed by the burn.

OEH 2016 identified critical fire-related action recommendations for Cumberland Plain Land Snail are:

- Manage frequency, intensity and timing of fire over an occupied site (may include use of finer-scale mosaic burns) to reduce loss of large amounts of cover and individuals in one burn.
- Fires should be no more frequently applied to one part of the site than once every 5 years and low fire intensity with reduce damage to large woody debris that provides shelter.
- Ideally target fire to dry season when snails may be dormant underground.

Recent survey undertaken by *Travers bushfire & ecology* in Cumberland Plain Land Snail habitat after recent burns has seen greater than 90% loss of an active population. Whilst it is expected that a population will recover after a burn after many years, the loss of such a significant proportion on an existing restricted population is of major concern and should be avoided.

Hence not only should the burn be restricted to no more than 25% of the reserve at any one burn. The relocation of Cumberland Plain Land Snail into adjoining protected areas or temporary refuges is highly recommended.

A requirement prior to any burns within the site will be to identify debris or logs that may be habitat for the Cumberland Land Snail. These will be wet down to prevent being burnt during the hazard reduction burn. Any individuals seen during the burn will be temporarily relocated into other suitable habitat within the lot.

Guidance on the appropriate fire regimes under the 2011 Recovery Plan for Cumberland Plain vegetation is provided in Table 8. It is important to note that when applying inter-fire intervals in planning, actual intervals, seasonality and fire intensity experienced at a site should be variable to ensure the greatest species diversity. Burns are to be planned and implemented in accordance with the *Bushfire Environmental Assessment Code 2006* (FRS), and a certification of the proposed burn is to be given by the appointed project ecologist.

Table 8 - EECs/Threatened Species Fire Regimes

EEC / Species	Suggested min fire interval (years)	Suggested max fire interval (years)
Cumberland Plain Woodland	5	12
Juniper-leaved Grevillea (<i>Grevillea juniperina</i>)	7	25

Fire-regime figures are indicative and their implementation should be accompanied by ongoing monitoring of the effects on species richness and community structure. Site-specific plans should be adopted that take into consideration the overall management aims and the use of fire in the local context.

3.6.2 Management measures for the APZ

To achieve the RFS APZ management targets the following planting specifications are recommended for this site within the APZ. In this case we have denoted the APZ as a Managed Ecological Zone (MEZ). The following planting and maintenance specifications apply to the MEZ.

To maximise the biological diversity of the plantings a clumped species planting strategy is to be adopted.

Within each tree planting location of 1 canopy and 1 sub-canopy species is to be established. The species selected should aim to provide two species that provide summer and winter foraging, a dense foliage for shelter and an open canopy species for filtered shade. Examples include *Eucalyptus tereticornis* and *Melaleuca stypheloides*. The species used in each location may be varied to increase diversity of the canopy species.

For the shrub layer 2-3 native species are to be established at the same location planted within 1m diameter planting circle. The shrub species selected should aim to provide a shelter plant and two (2) foraging plants. Examples include *Bursaria spinosa*, *Dodonaea viscosa subsp. cuneate*, *Acacia implexa* and *Daviesia ulicifolia*.

Trees are to be planted and maintained to ensure:

- 76 multi-species trees shall be established at 15% of total foliage cover to a maximum density planting of 1 tree every 25m (25m centres). This may include two tree species one canopy and one sub-canopy planted in the same location. If tree density falls below 1 tree every 30m then additional planting will be undertaken to achieve the density of 1 tree every 25m;
- Trees (at maturity) do not touch or overhang the building –avoid planting against the building, minimum separation of 5-10m is to be established between the trunk centre and the building edge;
- Tree canopies (at maturity) shall not form a continuous canopy path towards the buildings – this target is generally met by point 1, however future management of the trees may require selective pruning to minimise a continuous canopy. Multi-species clump planting of several species is permissible; and
- Lower limbs will be removed if they are less than a height of 2m above ground – selective pruning or “undercutting” of lower limbs may be required.

Shrubs are to be planted and maintained to ensure:

- Large gaps in shrubs are to be created – therefore multispecies clump planting of shrubs (2-3 plants) are to be planted at 25-30m centres;
- Shrubs shall not be located under trees – as above;
- 115 shrubs shall be planted to achieve 15% of total cover consisting of discontinuous small clump plantings to a density of 2-3 shrubs at every 25-30m centres. If total shrubs surviving falls below 115 plants then additional planting will be required; and

- Maintain a 10 m litter free managed area around the openings of the building and avoid planting or remove regrowth vegetation within 10m of the building openings.

Grasses and groundcovers are to be planted and maintained to ensure:

- A height of 10cm or less – by regular slashing of the planted native grass layer;
- If within any nominated areas, groundcovers are less than 70% total cover then planting or seeding will be undertaken to enhance groundcover to 85% cover;
- Leaves and debris is removed – to be achieved by regular landscape maintenance; and
- A minimum of 5 grasses/groundcovers per m² are to be planted or established.

These specifications result in a managed open woodland canopy (50% of natural density) with densely planted native grasses and sparsely planted shrubs within the first 15m of the nominated asset protection zones adjoining any future building and slightly denser shrubs in the outer portion of the APZ adjacent to the conservation area. The presence of the managed canopy assists in providing shade and is the transition zone into the conservation lot.

A condition of the EPBC approval should include the preparation of a planting plan for the managed ecological zone (MEZ) adjoining the conservation lot to achieve the above specifications and certified as being APZ compliant.



Monitoring

4

4.1 Monitoring actions

Monitoring of the progress of weed removal, plant growth and natural regeneration is to be undertaken every six (6) months for three (3) years with annual progress reports for the remaining 7 years of the maintenance program to be submitted to Fairfield Council.

Monitoring activities will include:

1. A photographic record for comparative purposes taken on an annual basis at marked photographic points;
2. A minimum of four (4) nested flora quadrats are to be established to assess the achievement of the performance targets. The quadrats are to be placed in representative locations and are to be a minimum outer dimension of 5x5m with a 1m² internal nested quadrat; and
3. An overall vegetation condition map reviewed every 12 months based on standard bush regeneration vegetation condition assessment methodology.
4. Survey for Cumberland Plain Snail to confirm ongoing presence of a live snail population

Monitoring of the site is required to be set up at the commencement of restoration works. This will allow the determination of pre and post condition of the vegetation and its habitat, and may include identification of any areas suffering from disturbance, sedimentation or in need of contingency rehabilitation, weed control, stabilisation or maintenance of rehabilitated or regenerating areas.

The monitoring and review process will focus on the presence / absence of exotic species, floristic diversity of the bushland, structural integrity of the bushland, revegetation progress and success, and monitoring of any sediment fencing or protective fencing.

Inspections of the site by the project ecologist should be undertaken prior to, during and post operations to ensure that vegetated areas designated for retention and exclusion zones are adequately marked and that other appropriate protection procedures are being maintained. An inspection is to be undertaken by the project ecologist every month during primary restoration works, with the submission of a compliance certificate at the completion of the revegetation works. An annual site audit is to be undertaken by the project ecologist detailing any restoration works required to be achieved following restoration performance targets (Section 4.3).

The restoration area is to be maintained to a high standard and is to be maintained as an indigenous native vegetation area that is commensurate with Cumberland Plains Woodland.

Following the completion of Year 2 of the maintenance (weed control) period, the project ecologist is to determine whether any additional contingency works are required to satisfactorily achieve the performance targets. These works are to be managed by land owners or under the supervision of the project ecologist.

4.2 Compliance certificates

A site restoration audit will be undertaken every two (2) years until the completion of the 10 year maintenance period by an independent project ecologist assessing achievements and recommended mitigation measures.

Compliance certificates will be issued by the project ecologist for the following items:

- Engagement of a bush regeneration company and independent project ecologist
- Installation of all protective fencing
- Completion of primary restoration works including planting of tree and shrub species at the required densities
- Completion of all required restoration maintenance tasks including successful revegetation of CPW
- Achievement of all remaining restoration performance targets as stipulated within Section 4 and mirrored on Schedule 1 – Vegetation Management Works.

4.3 Restoration performance targets

The site audits are to assess the achievement of the following restoration performance targets:

1. A permanent, five strand, plain wire protective fence is to be installed to the west of the site as located on Schedule 1 - Vegetation Management Works. Two gates will be installed for maintenance access as located on Schedule 1 – Vegetation Management Works. Existing fences to west and south to be repaired and upgraded.
2. Weed control and revegetation works are to be carried out by a qualified bushland regenerator to achieve the following weed control targets. The presence, abundance and cover of noxious and environmental weed species (maximum 10% weed coverage at the end of Year 1, progressively reducing to less than 1% at the end of Year 10).
3. A target 60% native vegetation cover applies at the end of Year 1, 75% native vegetation cover at the end of Year 3, and 95% native vegetation cover at the end of Year 10.
4. All highly invasive weed species are to be continuously suppressed and, if possible, eradicated from the restoration area in accordance with noxious weed control guidelines and permits issued by NSW Office of Water.
5. A 20 m wide Bushland Interface Zone will be established as shown on Schedule 1 – Vegetation Management Works. Enrichment planting of shrub species only will be planted to create a dense shrub layer to minimise weeds. A minimum of seven (7) shrub species for revegetation will be selected from Table 4 Revegetation Species List, however may be supplemented from species which typically occur in Cumberland Plain Woodland. Shrub planting densities are to on average, establish one (1) shrub every 12 m²
6. Revegetation will also be undertaken in disturbed areas as indicated in Schedule 1. A minimum of three (3) tree species, seven (7) shrub species and 14 groundcover species for revegetation will be selected from Table 4 Revegetation Species List, however may be supplemented from species which typically occur in Cumberland Plain Woodland. Plantings will achieve the following densities:
 - Trees – one (1) tree every 50 m²

- Shrubs - one (1) shrub every 12 m²
 - Groundcovers – three (3) groundcover every 1 m² (Conservation area) & 6 units per m² (Managed Ecological Buffer)
7. Habitat enhancement for the Cumberland Plain Land Snail completed including:
 - Placement of a minimum of 30 x 3 m length hardwood logs harvested from the adjoining affected vegetation remnants; and
 - Search, removal and euthanasia of exotic snails (minimum 4 searches per year).
 8. Monitoring will be undertaken every two (2) years. A condition assessment and review of works will be undertaken every 12 months and a report will be produced by the site bush regeneration contractors. A site restoration audit will be undertaken every two (2) years until the completion of the 10 year maintenance period by an independent project ecologist assessing achievements and recommended mitigation measures.
 9. A compliance statement is to be issued by the project ecologist at the completion of all fencing and primary revegetation works and upon completion of the maintenance period.
 10. No greater than 25% of the Cumberland Plain woodland reserve is burnt in any one year and all snails within the proposed burn areas to be relocated into refuge shelters within the site.



Program of Works

5

The program of works (Table 9) is aimed at providing a management framework for enacting undertaking revegetation, maintenance, monitoring and review works reasonably required for the conservation of the CPW. Site rehabilitation, including weed control works is to be undertaken in accordance with the Schedule 1 – Vegetation Management Works.

5.1 Program of works

For the purposes of the program of works, the listed tasks are divided into the following stages.

Pre-construction Works

Pre-construction works refers to all site preparation activities prior to the commencement of construction works on site and generally excludes any landscaping and planting works.

Construction works

Construction works refers to the period during which earthworks and construction of buildings, roads and other facilities and services are being installed. It is during this period that the protection of remnant vegetation is critical to minimising accidental loss of trees or associated vegetation. It is also during this phase that primary restoration works are completed.

Primary restoration works, as defined under this VMP, include the completion of primary and secondary weed control, protective fencing, pathways, mulching and any planting works. Practical completion of the primary restoration phase is determined by the project ecologist at which point all primary restoration actions need to have been completed and the installed plants are well established only requiring periodic maintenance or watering. Should there be a delay in the completion of works, for any reason, then the construction works phase may be extended.

Post construction works

Post construction works essentially consist of maintenance activities, unless further contingency works are identified by the project ecologist for auditing purposes. Maintenance will be undertaken by a fully qualified bush regeneration crew for a minimum of three (3) years post completion of primary restoration works.

All bush regeneration or landscape crews working within the site are required to have at a minimum TAFE Certificate Level II Bush Regeneration qualifications or equivalent to work within the bush regeneration zone. All staff are to be supervised by a qualified bush regeneration supervisor with a minimum five (5) years full time experience and a minimum TAFE Certificate Level II Bush Regeneration qualifications and / or a degree in Natural Areas Management or the equivalent.

Prior to the release of the construction certificate primary weed control works and the installation of protective fencing is to be completed.

Table 9 - Table of Works

Action	Responsibility
<p>Stage 1 – Pre-construction works</p> <ul style="list-style-type: none"> • Formation of site management team and establish supervision and consultation processes – minimum Project Ecologist, and site manager • Erection of protective control fencing • Commencement of <i>primary weed control</i> • Provide certificates of compliance 	<ul style="list-style-type: none"> • Site project manager • Site manager • Suitably qualified bushland regenerator • Project ecologist
<p>Stage 2 – Construction works</p> <ul style="list-style-type: none"> • Supervision of any vegetation and tree removal and management works • Waste removal and soil amelioration works to control weed infestations and provide suitable restoration soil base. • Complete revegetation works • Commencement of secondary weed control and maintenance weed control • Maintenance of fencing and signage around protected vegetation • Continuation of primary restoration and revegetation works • Provide certificates of compliance 	<ul style="list-style-type: none"> • Site project manager in association with the project ecologist • Earthworks contractor / suitably qualified bushland regenerator • Contractor / project manager • Contractor / project manager • Contractor / suitably qualified bushland regenerator • Contractor / suitably qualified bushland regenerator • Project ecologist
<p>Stage 3 – Post Construction Works</p> <ul style="list-style-type: none"> • Enrichment planting within revegetation areas if required. • Continuation of regeneration and weed control maintenance. • Monitoring of retained vegetation at six (6) months, twelve (12) months, two (2) and three (3) years post construction stage. • Conduct maintenance beyond three (3) years as required 	<ul style="list-style-type: none"> • Contractor with advice of project ecologist • Contractor / suitably qualified bushland regenerator • Project ecologist • Site manager with advice of project ecologist

5.2 Typical timeline of restoration works

The following typical timeline (Figure 6) is provided to indicate the overall timing of site works. The commencement of the maintenance period of three (3) years is subject to the completion of primary restoration works as certified by the project ecologist. A certificate of completion will be required as evidence of satisfactory completion. Upon engagement, contractors are expected to meet the following typical schedule of works

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Recommended Planting List

A1

The following locally occurring native plant species are to be established for revegetation purposes. Further species will also be suitable provided that they are recognised as being typical or common species known or demonstrated to occur within CPW.

Table 5 - FCPW Revegetation Species List

Trees	
<i>Eucalyptus moluccana</i>	<i>Eucalyptus tereticornis</i>
Shrubs	
<i>Acacia implexa</i>	<i>Rhamnus alaternus</i>
<i>Bursaria spinosa</i>	
Groundcovers	
<i>Dichondra repens</i>	<i>Aristida vagans</i>
<i>Brunoniella australis</i>	<i>Brunoniella australis</i>
<i>Aristida ramosa</i>	<i>Desmodium varians</i>
<i>Desmodium varians</i>	<i>Opercularia diphylla</i>
<i>Carex inversa</i>	<i>Wahlenbergia gracilis</i>
<i>Asperula conferta</i>	<i>Dichelachne micrantha</i>
<i>Dichelachne micrantha</i>	<i>Paspalidium distans</i>
<i>Oxalis perennans</i>	<i>Eragrostis leptostachya</i>
<i>Capillipedium spicigerum</i>	<i>Lomandra filiformis</i> subsp. <i>Filiformis</i>
<i>Portulaca oleracea</i>	<i>Dianella longifolia</i>
<i>Alternanthera species</i>	<i>Oxalis perennans</i>
<i>Chamaesyce dallachyana</i>	<i>Gnaphalium sphaericum</i>
<i>Chloris divaricata</i>	<i>Goodenia hederacea</i> subsp. <i>Hederacea</i>
<i>Cyperus fulvus</i>	<i>Aristida ramosa</i>
<i>Dactyloctenium radulans</i>	<i>Arthropodium milleflorum</i>
<i>Danthonia racemosa</i> var. <i>obtusata</i>	<i>Danthonia tenuior</i>
<i>Oxalis rubens</i>	<i>Cymbopogon refractus</i>
<i>Sisymbrium irio</i>	<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>
<i>Veronica brownii</i>	<i>Dichopogon strictus</i>
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	<i>Ranunculus lappaceus</i>
<i>Aristida vagans</i>	<i>Brachycome multifida</i>
<i>Entolasia stricta</i>	<i>Calandrinia pickeringii</i>
<i>Microlaena stipoides</i> var. <i>stipoides</i>	<i>Danthonia setacea</i>
<i>Themeda australis</i>	<i>Pimelea curviflora</i> var. <i>subglabrata</i>
<i>Cheilanthes sieberi</i> subsp. <i>Sieberi</i>	<i>Rorippa laciniata</i>
<i>Glycine tabacina</i>	<i>Wurmbea biglandulosa</i>
	<i>Dipodium punctatum</i>
	<i>Cheilanthes sieberi</i> subsp. <i>Sieberi</i>
	<i>Microlaena stipoides</i> var. <i>stipoides</i>
	<i>Themeda australis</i>
	<i>Glycine tabacina</i>
	<i>Glycine clandestine</i>



Observed flora species

A2

Table A2.1 - Observed Flora Species

Family	Scientific name	Common name
Trees		
Mimosaceae	<i>Acacia decurrens</i>	Black Wattle
Myrtaceae	<i>Angophora floribunda</i>	Rough-barked Apple
Myrtaceae	<i>Corymbia maculata</i>	Spotted Gum
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
Myrtaceae	<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark
Myrtaceae	<i>Eucalyptus moluccana</i>	Grey Box
Myrtaceae	<i>Eucalyptus tereticornis</i>	Forest Red Gum
Santalaceae	<i>Exocarpos cupressiformis</i>	Native Cherry
Moraceae	<i>Ficus spp.</i>	Fig
Myrtaceae	<i>Melaleuca decora</i>	-
Myrtaceae	<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree
Myrtaceae	<i>Syncarpia glomulifera</i>	Turpentine
Shrubs		
Mimosaceae	<i>Acacia falcata</i>	Sickle Wattle
Mimosaceae	<i>Acacia fimbriata</i>	Fringed Wattle
Mimosaceae	<i>Acacia implexa</i>	Hickory
Mimosaceae	<i>Acacia longifolia</i> var. <i>longifolia</i>	Sydney Golden Wattle
Mimosaceae	<i>Acacia saligna</i> *	Orange Wattle
Mimosaceae	<i>Acacia ulicifolia</i>	Prickly Moses
Pittosporaceae	<i>Bursaria spinosa</i> var. <i>spinosa</i>	Native Blackthorn
Asteraceae	<i>Cassinia</i> sp.	-
Solanaceae	<i>Cestrum parqui</i> *	Chilean Cestrum
Fabaceae	<i>Daviesia ulicifolia</i>	Gorse Bitter Pea
Fabaceae	<i>Dillwynia sieberi</i>	Prickly Parrot-pea
Apocynaceae	<i>Gomphocarpus fruticosus</i> *	Narrow Leaf Cotton Bush
Proteaceae	<i>Hakea salicifolia</i>	Willow Hakea
Fabaceae	<i>Indigofera australis</i>	Native Indigo
Verbenaceae	<i>Lantana camara</i> *	Lantana
Oleaceae	<i>Ligustrum lucidum</i> *	Large-leaved Privet
Solanaceae	<i>Lycium ferocissimum</i> *	African Boxthorn
Berberidaceae	<i>Nandina domestica</i> *	Sacred Bamboo
Ochnaceae	<i>Ochna serrulata</i> *	Mickey Mouse Plant
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i> *	African Olive
Fabaceae	<i>Pultenaea microphylla</i>	-
Euphorbiaceae	<i>Ricinus communis</i> *	Castor Oil Plant
Rosaceae	<i>Rosa rubignosa</i> *	Sweet Briar
Asteraceae	<i>Senecio pterophorus</i> *	African Daisy
Solanaceae	<i>Solanum linnaeanum</i> *	Apple-of-Sodom
Groundcovers		
Myrsinaceae	<i>Anagallis arvensis</i> *	Scarlet Pimpernel
Poaceae	<i>Aristida ramosa</i>	Wire Grass
Poaceae	<i>Aristida vagans</i>	Three-awn Speargrass
Poaceae	<i>Aristida warburgii</i>	Wire Grass

Family	Scientific name	Common name
Anthericaceae	<i>Arthropodium milleflorum</i>	Pale Vanilla Lily
Rubiaceae	<i>Asperula conferta</i>	Common Woodruff
Poaceae	<i>Austrostipa pubescens</i>	Tall Speargrass
Poaceae	<i>Axonopus fissifolius</i> *	Narrow-leaved Carpet Grass
Asteraceae	<i>Bidens pilosa</i> *	Cobbler's Pegs
Brassicaceae	<i>Brassica fruticulosa</i> *	Twiggy Turnip
Acanthaceae	<i>Brunoniella pumilio</i>	Dwarf Blue Trumpet
Brassicaceae	<i>Cardamine hirsuta</i> *	Hairy Bittercress
Apiaceae	<i>Centella asiatica</i>	Indian Pennywort
Sinopteridaceae	<i>Cheilanthes sieberi</i>	Rock Fern
Poaceae	<i>Chloris gayana</i> *	Rhodes Grass
Poaceae	<i>Chloris ventricosa</i>	Tall Chloris
Asteraceae	<i>Cirsium vulgare</i> *	Spear Thistle
Brassicaceae	<i>Coronpus didymus</i> *	Lesser Swine-cress
Poaceae	<i>Cortaderia selloana</i> *	Pampas Grass
Apiaceae	<i>Cyclospermum leptophyllum</i> *	Slender Celery
Poaceae	<i>Cynodon dactylon</i>	Common Couch
Cyperaceae	<i>Cyperus eragrostis</i> *	Umbrella Sedge
Poaceae	<i>Dichelachne micrantha</i>	Short-hair Plume Grass
Convolvulaceae	<i>Dichondra repens</i>	Kidney Weed
Poaceae	<i>Ehrharta erecta</i> *	Panic Veldtgrass
Chenopodiaceae	<i>Einadia hastata</i>	Berry Saltbush
Poaceae	<i>Entolasia marginata</i>	Bordered Panic
Poaceae	<i>Eragrostis brownii</i>	Brown's Lovegrass
Poaceae	<i>Eragrostis curvula</i> *	African Lovegrass
Asteraceae	<i>Erechtites valerianifolia</i> *	Brazilian Fireweed
Apiaceae	<i>Foeniculum vulgare</i> *	Fennel
Geraniaceae	<i>Geranium solanderi</i>	Cutleaf Cranesbill
Clusiaceae	<i>Hypericum gramineum</i>	Small St Johns Wort
Asteraceae	<i>Hypochaeris radicata</i> *	Flatweed
Juncaceae	<i>Juncus acutus</i> *	Sharp Rush
Juncaceae	<i>Juncus continuus</i>	-
Juncaceae	<i>Juncus usitatus</i>	Common Rush
Poaceae	<i>Lachnagrostis filiformis</i>	Blown Grass
Lomandraceae	<i>Lomandra longifolia</i>	Spiky-headed Mat-rush
Fabaceae	<i>Lotus suaveolans</i> *	Hairy Bird's Foot Trefoil
Poaceae	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
Malvaceae	<i>Modiola caroliniana</i> *	Red-flowered Mallow
Oxalidaceae	<i>Oxalis perennans</i>	-
Poaceae	<i>Panicum effusum</i>	Hairy Panic
Poaceae	<i>Paspalum dilatatum</i> *	Paspalum
Malvaceae	<i>Pavonia hastata</i> *	-
Poaceae	<i>Pennisetum clandestinum</i> *	Kikuyu
Polygonaceae	<i>Persicaria decipiens</i>	Slender Knotweed
Plantaginaceae	<i>Plantago lanceolata</i> *	Ribwort
Acanthaceae	<i>Pseuderanthemum variabile</i>	Pastel Flower
Fabaceae	<i>Pultenaea microphylla</i>	Spreading Bush-pea
Iridaceae	<i>Romulea rosea</i> var. <i>australis</i> *	Onion Grass
Asteraceae	<i>Senecio madagascariensis</i> *	Fireweed
Poaceae	<i>Setaria parviflora</i> *	-
Malvaceae	<i>Sida rhombifolia</i> *	Paddy's Lucerne
Solanaceae	<i>Solanum prinophyllum</i>	Forest Nightshade
Solanaceae	<i>Solanum pseudocapsicum</i> *	-
Asteraceae	<i>Sonchus oleraceus</i> *	Common Sow-thistle
Poaceae	<i>Sporobolus africanus</i> *	Parramatta Grass
Poaceae	<i>Sporobolus creber</i>	Slender Rat's Tail Grass

Family	Scientific name	Common name
Lamiaceae	<i>Stachys arvensis</i> *	Stagger Weed
Asteraceae	<i>Taraxacum officinale</i> *	Dandelion
Poaceae	<i>Themeda australis</i>	Kangaroo Grass
Commelinaceae	<i>Tradescantis fluminensis</i> *	Wandering Jew
Fabaceae	<i>Trifolium repens</i> *	White Clover
Verbenaceae	<i>Verbena bonariensis</i> *	Purpletop
Vines		
Apocnyaceae	<i>Araujia sericifera</i> *	Mothvine
Fabaceae	<i>Desmodium varians</i>	-
Chenopodiaceae	<i>Einadia nutans</i> subsp. <i>linifolia</i>	Climbing Saltbush
Fabaceae	<i>Glycine clandestina</i>	Twining Glycine
Fabaceae	<i>Glycine tabacina</i>	Variable Glycine
Fabaceae	<i>Hardenbergia violacea</i>	False Sarsparilla
Convolvulaceae	<i>Ipomoea cairica</i> *	Coastal Morning Glory
Convolvulaceae	<i>Ipomoea indica</i> *	Blue Morning Glory
Apocynaceae	<i>Parsonsia straminea</i>	Common Silkpod
Fabaceae	<i>Vicia sativa</i> subsp. <i>sativa</i> *	Common Vetch
Water plants		
Juncaceae	<i>Juncus cognatus</i> *	-
Onagraceae	<i>Ludwigia peploides</i> subsp. <i>montevidensis</i>	Water Primrose
Juncaginaceae	<i>Triglochin microtuberosum</i>	Water Ribbons
Typhaceae	<i>Typha orientalis</i>	Broadleaf Cumbungi
* denotes exotic species		



Target Weed Species

A3

The following weed species were recorded on site and are to be targeted on a priority basis subject to degree of invasiveness and implications for regeneration of native flora. The overall high to very high weed control status levels in Table A2.1 below is indicative of the high levels of noxious weeds present on site.

Table A3.1 - Target Weed Species

Family	Scientific name	Common name	Priority
Shrubs			
Oleaceae	<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	Very High
Euphorbiaceae	<i>Ricinus communis</i>	Castor Oil Plant	Very High
Verbenaceae	<i>Lantana camara</i>	Lantana	High
Oleaceae	<i>Ligustrum lucidum</i>	Large-leaved Privet	High
Solanaceae	<i>Lycium ferocissimum</i>	African Boxthorn	High
Berberidaceae	<i>Nandina domestica</i>	Sacred Bamboo	High
Rosaceae	<i>Rosa rubignosa</i>	Sweet Briar	High
Solanaceae	<i>Cestrum parqui</i>	Green Cestrum	Medium
Apocynaceae	<i>Gomphocarpus fruticosus</i>	Narrow Leaf Cotton Bush	Medium
Ochnaceae	<i>Ochna serrulata</i>	Mickey Mouse Plant	Medium
Asteraceae	<i>Senecio pterophorus</i>	African Daisy	Medium
Solanaceae	<i>Solanum sisymbiifolium</i>	-	Medium
Groundcovers			
Poaceae	<i>Cortaderia selloana</i>	Pampas Grass	Very High
Poaceae	<i>Eragrostis curvula</i>	African Lovegrass	Very High
Poaceae	<i>Paspalum dilatatum</i>	Paspalum	Very High
Poaceae	<i>Pennisetum clandestinum</i>	Kikuyu	Very High
Poaceae	<i>Chloris gayana</i>	Rhodes Grass	High
Cyperaceae	<i>Cyperus eragrostis</i>	Umbrella Sedge	High
Poaceae	<i>Ehrharta erecta</i>	Panic Veldtgrass	High
Apiaceae	<i>Foeniculum vulgare</i>	Fennel	High
Juncaceae	<i>Juncus acutus</i>	Sharp Rush	High
Asteraceae	<i>Senecio madagascariensis</i>	Fireweed	High
Malvaceae	<i>Sida rhombifolia</i>	Paddy's Lucerne	High
Asteraceae	<i>Sonchus oleraceus</i>	Common Sow-thistle	High
Poaceae	<i>Sporobolus africanus</i>	Parramatta Grass	High
Commelinaceae	<i>Tradescantis fluminensis</i>	Wandering Jew	High
Asteraceae	<i>Bidens pilosa</i>	Cobbler's Pegs	Medium
Asteraceae	<i>Cirsium vulgare</i>	Spear Thistle	Medium
Asteraceae	<i>Hypochaeris radicata</i>	Flatweed	Medium
Malvaceae	<i>Modiola caroliniana</i>	Red-flowered Mallow	Medium
Malvaceae	<i>Pavonia hastata</i>	-	Medium
Plantaginaceae	<i>Plantago lanceolata</i>	Ribwort	Medium

Family	Scientific name	Common name	Priority
Iridaceae	<i>Romulea rosea</i> var. <i>australis</i>	Onion Grass	Medium
Solanaceae	<i>Solanum pseudocapsicum</i>	-	Medium
Lamiaceae	<i>Stachys arvensis</i>	Stagger Weed	Medium
Fabaceae	<i>Trifolium repens</i>	White Clover	Medium
Verbenaceae	<i>Verbena bonariensis</i>	Purpletop	Medium
Myrsinaceae	<i>Anagallis arvensis</i>	Scarlet Pimpernel	Low
Poaceae	<i>Axonopus fissifolius</i>	Narrow-leafed Carpet Grass	Low
Brassicaceae	<i>Brassica fruticulosa</i>	Twiggy Turnip	Low
Brassicaceae	<i>Cardamine hirsuta</i>	Hairy Bittercress	Low
Brassicaceae	<i>Coronpus didymus</i>	Lesser Swine-cress	Low
Apiaceae	<i>Cyclospermum leptophyllum</i>	Slender Celery	Low
Asteraceae	<i>Erechtites valerianifolia</i>	Brazilian Fireweed	Low
Fabaceae	<i>Lotus suaveolans</i>	Hairy Bird's Foot Trefoil	Low
Poaceae	<i>Setaria parviflora</i>	-	Low
Asteraceae	<i>Taraxacum officinale</i>	Dandelion	Low
Vines			
Apocnyaceae	<i>Araujia sericifera</i>	Mothvine	Very High
Convolvulaceae	<i>Ipomoea indica</i>	Blue Morning Glory	Very High
Convolvulaceae	<i>Ipomoea cairica</i>	Coastal Morning Glory	High
Fabaceae	<i>Vicia sativa</i> subsp. <i>sativa</i>	Common Vetch	Medium
Water plants			
Juncaceae	<i>Juncus cognatus</i>	-	Medium



Schedule 1 -Vegetation Management Works

A4

RESTORATION PERFORMANCE TARGETS - CPW RESERVE

The site audits are to assess the achievement of the following restoration performance targets:

1. A permanent, five strand, plain wire protective fence is to be installed to the west of the site as located on Schedule 1 - Vegetation Management Works. Two gates will be installed for maintenance access as located on Schedule 1 - Vegetation Management Works. Existing fences to west and south to be repaired and upgraded.
2. Weed control and revegetation works are to be carried out by a qualified bushland regenerator to achieve the following weed control targets. The presence, abundance and cover of noxious and environmental weed species (maximum 10% weed coverage at the end of Year 1, progressively reducing to less than 1% at the end of Year 10).
3. A target 60% native vegetation cover applies at the end of Year 1, 75% native vegetation cover at the end of Year 3, and 95% native vegetation cover at the end of Year 10.
4. All highly invasive weed species are to be continuously suppressed and, if possible, eradicated from the restoration area in accordance with noxious weed control guidelines and permits issued by NSW Office of Water.
5. A 20 m wide Bushland Interface Zone will be established as shown on Schedule 1 - Vegetation Management Works. Enrichment planting of shrub species only will be planted to create a dense shrub layer to minimise weeds. A minimum of seven (7) shrub species for revegetation will be selected from Table 4 Revegetation Species List, however may be supplemented from species which typically occur in Cumberland Plain Woodland. Shrub planting densities are to on average, establish one (1) shrub every 12 m².
6. Revegetation will also be undertaken in disturbed areas as indicated in Schedule 1. A minimum of twenty four (24) species for revegetation will be selected from Table 4 -Revegetation Species List. The species used in revegetation may be supplemented by locally occurring native plant species which typically occur in Cumberland Plain Woodland. Plantings will achieve the following densities:
 - Trees – one (1) tree every 50 m²
 - Shrubs - one (1) shrub every 12 m²
 - Groundcovers – three (3) groundcover every 1 m² (Conservation area) & 6 units per m² (Managed Ecological Buffer)
7. Habitat enhancement for the Cumberland Plain Land Snail completed including:
 - Placement of a minimum of 30 x 3 m length hardwood logs harvested from the adjoining affected vegetation remnants; and
 - Search, removal and euthanasia of exotic snails (minimum 4 searches per year).
8. A search for Cumberland Plain Land Snail and relocation into the CPW Reserve is to be undertaken two weeks prior to bulk earthworks at the reserve interface within any CPW remnants outside of the CPW reserve.
9. Monitoring will be undertaken every two (2) years. A condition assessment and review of works will be undertaken every 12 months and a report will be produced by the site bush regeneration contractors. A site restoration audit will be undertaken every two (2) years until the completion of the 10 year maintenance period by an independent project ecologist assessing achievements and recommended mitigation measures.
10. A compliance statement is to be issued by the project ecologist at the completion of all fencing and primary revegetation works and upon completion of the maintenance period.
11. No greater than 25% of the Cumberland Plain woodland reserve is burnt in any one year and all snails within the proposed burn areas to be relocated into refuge shelters within the site.

ASSET PROTECTION ZONE PERFORMANCE TARGETS

The following planting and maintenance specifications apply to the APZ.

Trees are to be planted and maintained to ensure;

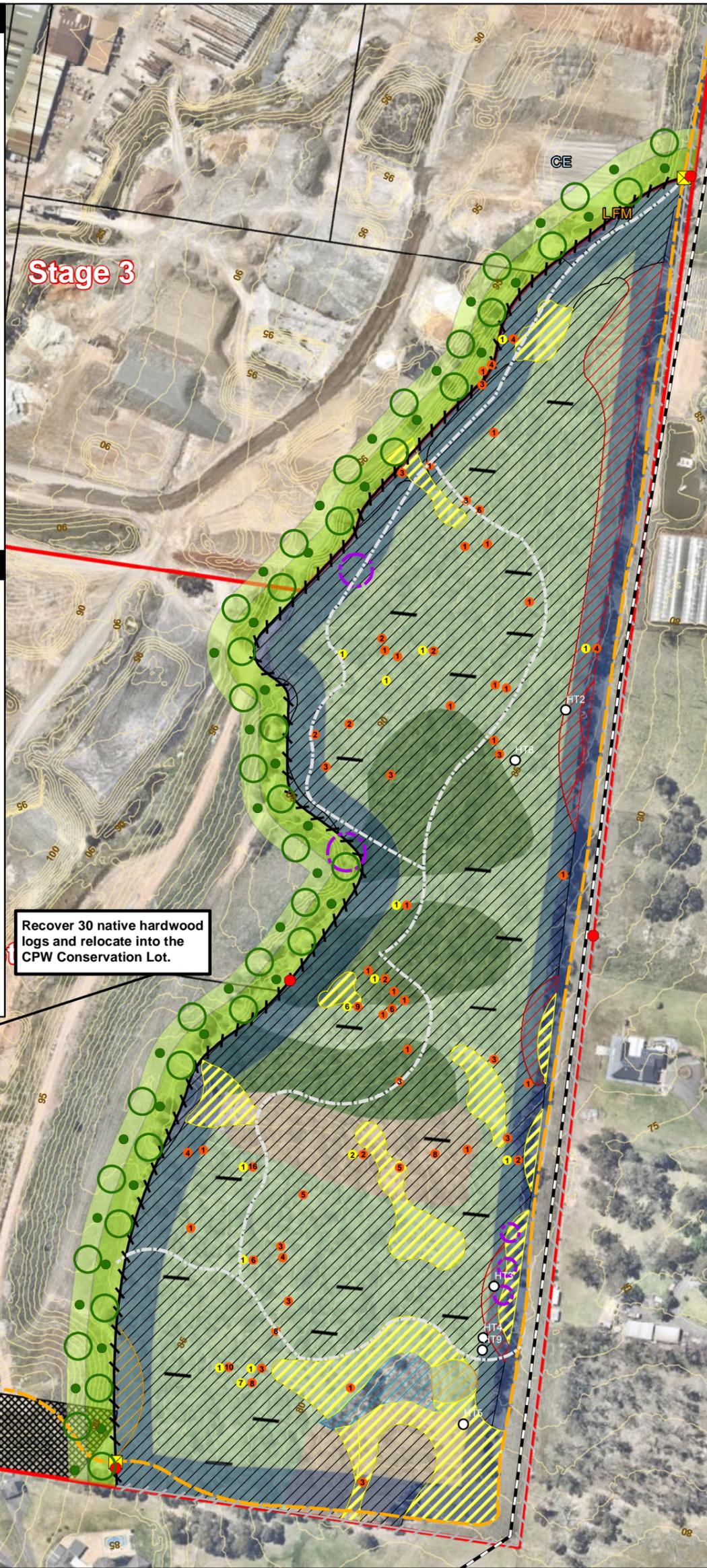
- 76 multi-species trees shall be established at 15% of total foliage cover to a maximum density planting of 2 trees every 25m (two plants planted in same location). This may include two tree species one canopy and one subcanopy planted in the same location. If tree density falls below 1 tree every 30m then additional planting will be undertaken to achieve the density of 1 tree every 25m.
- Trees (at maturity) do not touch or overhang the building –avoid planting against the building, minimum separation of 5-10m is to be established between the trunk centre and the building edge.
- Tree canopies (at maturity) shall not form a continuous canopy path towards the buildings – this target is generally met by point 1, however future management of the trees may require selective pruning to minimise a continuous canopy. Clump planting of several species is permissible.
- Lower limbs will be removed if they are less than a height of 2m above ground – selective pruning or "undercutting" of lower limbs may be required.

Shrubs are to be planted and maintained to ensure;

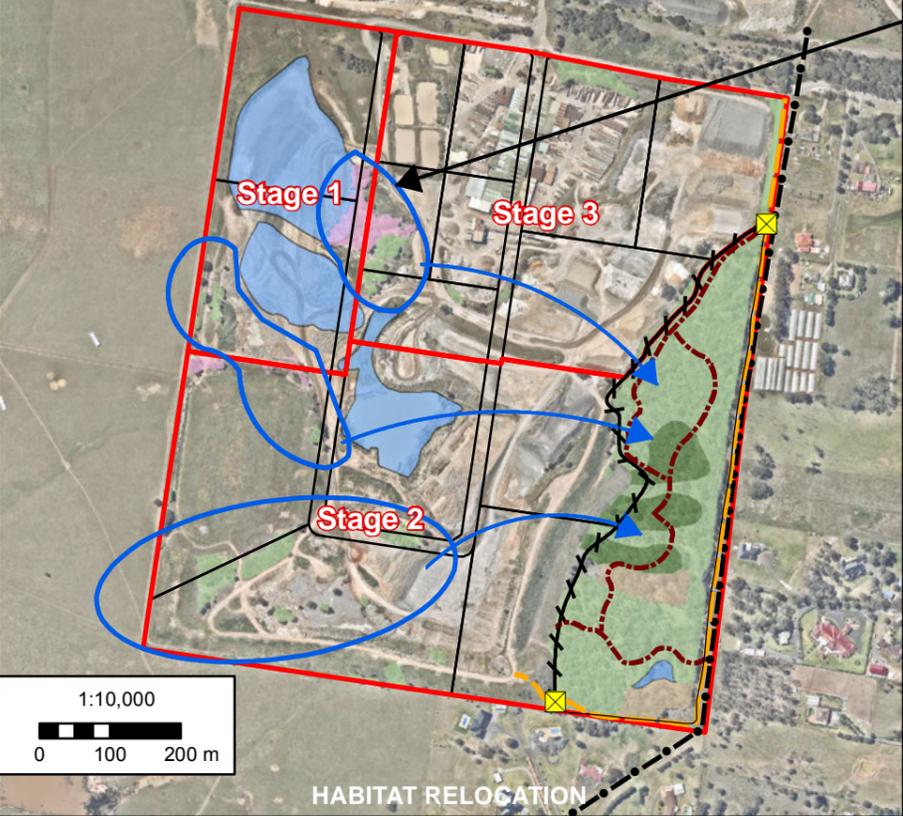
- Large gaps in shrubs are to be created – therefore clump planting of shrubs (2-3 plants) are to be planted at 25-30m centres.
- Shrubs shall not be located under trees – as above;
- 114 shrubs shall be planted to achieve 15% of total cover consisting of discontinuous small clump plantings to a density of 2-3 shrubs at every 25-30m centres. If total shrubs surviving falls below 114 plants then additional planting will be required to achieve 15% total cover; and
- Maintain a 10 m litter free managed area around the openings of the building and avoid planting or remove regrowth vegetation within 10m of the building openings.

Grasses and groundcovers are to be planted and maintained to ensure;

- A height of 10cm or less – by regular slashing of the planted native grass layer;
- If within any nominated areas, groundcovers are less than 70% total cover then planting or seeding will be undertaken to enhance groundcover to 85% cover; and
- Leaves and debris is removed – to be achieved by regular landscape maintenance.
- A minimum of 5 grasses/groundcovers per m² are to be planted or established.



Recover 30 native hardwood logs and relocate into the CPW Conservation Lot.



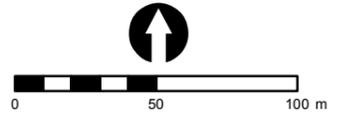
Legend		Fauna Survey Results (Aug 2013)		Cumberland Plain Woodland - EEC		CPW Conservation Area Revegetation		Target Weed Control	
[Red outline] Stage boundary	[Black line] Existing fence (upgrade/maintain)	[Green circle] Migratory Species	[Green box] A - Forest Red Gum / Grey Box Woodland	[Yellow hatched] Proposed Revegetation Areas (1.04 ha)	[Red hatched] Target weed (African Olive) (0.57ha)	[Green hatched] Asset Protection Zone - within 10m of building (0.88ha)	[Blue hatched] Target weed (Kikuyu) (0.14ha)	[Blue hatched] Target weed (Aquatic Weeds) (0.11ha)	[Blue hatched] Bush regeneration zones (whole site 10.63ha)
[Black outline] Subdivision boundary	[Black line] Proposed fence	[Green circle] Cattle Egret	[Green box] B - Ironbark Woodland	[Green hatched] Asset Protection Zone - within 10-25m of building (1.30ha)	[Blue hatched] Bushland Interface Zone (20m) (3.35 ha)	[Green circle] Planting of 2-3 multi-species shrubs	[Blue hatched] Hardwood logs (3m lengths) (snail habitat)		
[Black line] Contour - 1m	[Black line] Electricity transmission line	[Green circle] Greater Broad-nosed Bat	[Green box] C - Stringybark - Ironbark Woodland	[Green circle] Planting of 1 canopy and 1 subcanopy tree species					
[Purple outline] Waste Piles	[Black circle] Habitat Trees	[Green circle] Large-footed Myotis	[Green box] D - Spotted Gum / Ironbark Woodland						
[Yellow X] 4WD access gate	[Green circle] CPLS Survey Results (Aug 2013)	[Green circle] Cattle Egret	[Green box] E - Rough-barked Apple Woodland						
[Red dot] Signage	[Green circle] Snail location - Living (with count)	[Green circle] Latham's Snipe	[Green box] F - Spotted Gum / Stringybark / Grey Box Woodland						
[Black line] Existing 4WD Trails	[Green circle] Snail location - Dead (with count)		[Green box] G - Paperbark Woodland						
[Black line] Existing Walking Trails									



PROJECT & MXD REFERENCE
Burley Road, Horsley Park
A16094_VMP001

DATE & ISSUE NUMBER
17/07/2017
Issue 1

SCALE & COORDINATE SYSTEM
1:2,500 @ A3
GDA 1994 MGA Zone 56



Schedule 1 - Vegetation Management Works

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.



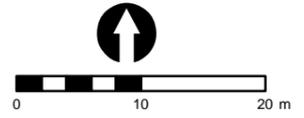
Legend		Cumberland Plain Woodland - EEC		CPW Conservation Area Revegetation		Target Weed Control	
Stage boundary	Existing fence (upgrade/maintain)	A - Forest Red Gum / Grey Box Woodland	Proposed Revegetation Areas (1.04 ha)	Planting of 1 canopy and 1 subcanopy tree species	Target weed (African Olive) (0.57ha)	Target weed (Kikuyu) (0.14ha)	Target weed (Aquatic Weeds) (0.11ha)
Subdivision boundary	Proposed fence	B - Ironbark Woodland	Asset Protection Zone - within 10m of building (0.88ha)	Planting of 2-3 multi-species shrubs	Bush regeneration zones (whole site 10.63ha)	Bushland Interface Zone (20m) (3.35 ha)	
Contour - 1m	Electricity transmission line	C - Stringybark / Ironbark Woodland	Asset Protection Zone - within 10-25m of building (1.30ha)	Native grasses			
Waste Piles	CPLS Survey Results (Aug 2013)	D - Spotted Gum / Ironbark Woodland					
4WD access gate	Snail location - Living (with count)	E - Rough-barked Apple Woodland					
Signage	Snail location - Dead (with count)	F - Spotted Gum / Stringybark / Grey Box Woodland					
Existing 4WD Trails		G - Paperbark Woodland					
Existing Walking Trails							



PROJECT & MXD REFERENCE
 Burley Road, Horsley Park
 A16094_VMP001a

DATE & ISSUE NUMBER
 17/07/2017
 Issue 1

SCALE & COORDINATE SYSTEM
 1:568 @ A3
 GDA 1994 MGA Zone 56



TITLE
Schedule 1A - Planting Plan Detail (Typical Section)

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.