

Our Ref: 18HEN02

12 April 2019

Henroth Group
Suite 604, Eastpoint Tower
Level 6, 180 Ocean Street
EDGECLIFF NSW 2017



Attention: Mr D Maurici

Dear Dan

**Re: Bushland Management Plan at
113 Oxford Falls Road, Frenchs Forest**

Travers bushfire & ecology has been engaged to update the series of ecological and bushfire reports for 1113 Oxford Falls Road, Frenchs Forest, including an updated Bushland Management Plan.

Proposed development

The proposal involves the demolition of the existing dwelling and the development an independent living complex consisting of 41 self-contained units within 10 individual buildings. Car parking will be provided for residents and visitors.

Access to the site will be provided via the existing private access road from Barnes Road in the south.

The implication of any impacts including asset protection zones have not changed since the Bushland Management Plan was updated 7 July 2016. As there are no changes to the impact, the report still remains valid.

Changes to the Bushland Management Plan

The changes since the last 2016 report include minor changes to the following:

- The proposed development as written above
- Figures 2 and 3 of the report was updated to reflect the current proposed development.
- References in the appendices referring to noxious weeds should consider referencing the *Biodiversity Act 2015*

Given the above list of issues is minor and inconsequential to the outcomes of the Bushland Management Plan, this report remains largely unchanged.



Figure 1 – Proposed development – Revision K

(Source: Marchese Partners International Pty Ltd, 08.03.2019)

If you require any further information please do not hesitate to me on (02) 4340 5331 or at info@traverssecology.com.au

Yours faithfully

Michael Sheather-Reid
Managing Director - **Travers bushfire & ecology**

Travers bushfire & ecology employs
Bushfire Planning and Design (BPAD) Accredited
Practitioners

Travers bushfire & ecology employs
Accredited BioBanking and Biodiversity Assessors

A photograph of a possum climbing a tree trunk, positioned vertically on the left side of the cover. The possum is grey with a white face and chest, and a dark tail. It is clinging to the rough, textured bark of the tree.

Travers

bushfire & ecology

Bushland Regeneration and Biodiversity Management Plan

The Falls Estate
Lot 1113 DP 752038
Barnes Road,
Frenchs Forest

April 2019
(REF: A16087Bio)



Bushland Regeneration and Biodiversity Management Plan

The Falls Estate - Barnes Road,
Frenchs Forest

Report Authors:	Michael Sheather-Reid & Lindsay Holmes
Date:	12 th April 2019
Approved by:	Michael Sheather-Reid (Senior Ecologist)
File:	A16087Bio

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This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.

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.

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List of abbreviations

APZ	asset protection zone
BPA	bushfire protection assessment
BMP	bushland regeneration and biodiversity management plan
CLUMP	conservation land use management plan
CPW	Cumberland Plain Woodlands
DCP	Development Control Plan
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)
DoE	Department of Environment (federal)
EEC	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	ecological 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>
RFEF	<i>River-flat Eucalypt Forest</i>
RFS	NSW Rural Fire Service
ROTAP	rare or threatened Australian plants
SEPP 44	<i>State Environmental Protection Policy No 44 – Koala Habitat Protection</i>
SEWPAC	Federal Department of Sustainability, Environment, Water, Population and Communities
SSTF	Shale-Sandstone Transition Forest
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 Bushland Regeneration and Biodiversity Management Plan (BMP) for the proposed residential independent living facility off Barnes Road, Frenchs Forest. Details of the proposed development are in Section 1.1 of the report.

1.1 Purpose of the BMP

The purpose of the BMP is to specify the management requirements to regenerate a 30-50m wide biodiversity corridor along the northern boundary of the site and to define asset protection zone (APZ) management practices that maximise the retention of native vegetation and associated habitat.

The northern biodiversity corridor is to link heath vegetation adjacent to the north-western corner of the site, to riparian and sandstone gully forest vegetation along the Middle Creek tributary in the north-eastern corner of the site. In conjunction with open space areas created by the asset protection zones, this corridor provides potential foraging habitat and connectivity for arboreal mammals, microbats and forest owls.

The BMP is to provide guidelines for the management of APZs, weed control works, riparian zone restoration and protection or enhancement of foraging habitat for local fauna.

The existing site condition is shown on Figure 1.



Figure 1 – Aerial appraisal



Photo 1 – Biodiversity corridor - existing cleared land adjoining the northern boundary

The BMP covers the entire site which includes revegetation works, bushland regeneration works, weed control, APZ management, tree protection and fauna habitat protection and enhancement.

The following objectives for management of the site include:

- Weed control targeting invasive and environmental weeds,
- Revegetation of the 30m wide biodiversity corridor with sandstone gully forest vegetation,
- Restoration and stabilise the riparian zone,
- Hollow-bearing tree protection works, supervision of dismantling and nest box installation,
- Fuel reduction in asset protection zones to be achieved by selective vegetation removal to be mostly achieved through the removal of understorey weeds,
- Undertake monitoring, auditing and maintenance activities to ensure an effective and a stable restoration outcome ensuring compliance with the BMP specifications.

Schedule 1 – Vegetation Management Works of this BMP provides a plan of works within the site and associated APZs, and the performance targets to be achieved by contractors undertaking restoration works. Schedule 1 has been prepared to be issued to potential contractors undertaking the restoration works.

1.2 Proposed development

Proposed development of the site covers the southern portion of the site where much of the existing buildings are currently located. The entire lot is to be managed as an asset protection zone excluding the proposed biodiversity corridor. The southern APZs extend into the Barnes Road corridor as an outer protection area (OPA).

The northern portion of the site is currently a managed pasture with young planted trees along the northern boundary. The far north-eastern corner forms part of a riparian zone with some remnant vegetation. The Barnes Road corridor is in part formed with a gravel access but contains remnant native vegetation with dense understorey weeds.

Existing APZs still apply as there hasn't been any changes to the building footprint. Mapping has followed the current roofline provided.

Development consent for the Residential Care Facility was issued in 2018 - reference no. DA2017/0206. The Rural Fire Service (RFS) issued their consent on the 21st June 2017.

The new proposal involves the demolition of the existing dwelling and the development of an independent living complex consisting of 41 self-contained units within 10 individual buildings. Car parking will be provided for residents and visitors.

Access to the site will be provided via the existing private access road from Barnes Road in the south.

Whilst the building footprint has been slightly amended they are not materially different to the previous approval.

The proposed asset protection zones for the current DA pull back from the adjoining lands and only impact to an outer protection area standard within the Barnes Road corridor. Therefore permission from adjoining land owners is only required from Council.

The revised proposal maintains the APZs (within the development site and adjoining Barnes Road Reserve) to all buildings used for independent living (accommodation / cinema / pool area). Buildings for non-independent living (i.e. kitchen, storage & offices) have been provided with a smaller APZ, as allowable under Planning for Bush Fire Protection (PBP, 2006).

It is proposed that all restoration works shall be undertaken by a qualified bushland regeneration company under the guidance of a project ecologist with audit reporting submitted to Council over a time period of approximately 5-6 years, which includes 1 year for revegetation establishment in the wildlife corridor and APZs, and 5 years of maintenance works.

Approximately 143 new mature trees will be planted within the site in addition to 145 trees specified in the landscape plan for this application.



Figure 2 – Site plan including bushfire protection measures



Management Context

2

The following sections provide a brief description of the site.

2.1 Site description

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

Table 1– Site features

Location	Lots 1113 DP 752038 Barnes Road, Oxford Falls
Local government area	Warringah
Grid reference	337700E and 6264700N
Elevation	Approximately 78-114m AHD
Topography	Situated on flat to undulating land. Gradients are generally 0-15%, with steeper grades of up to approximately 70% in the west.
Geology and soils	Soils; Oxford Falls – Moderate to deep soils in valleys with underlying Sandstone. Lambert – Generally shallow soils over Hawkesbury Sandstone. Hawkesbury – Steep inclines, shallow soils. Geology; Hawkesbury Sandstone.
Catchment and drainage	Surface flows within the subject site flow into an unnamed tributary that cuts within the north eastern portion of the subject site, Middle Creek.
Vegetation	Open Forest, scrub / heath and cleared areas. Refer to Sections 3 & 4.
Existing land use	Residential (rural) and grazing by horses
Clearing	Approximately 75% of the subject site is cleared vegetation for paddocks, landscaping, a tennis court and homestead.

2.2 Vegetation description

Four (4) vegetation communities were identified within the study area through ground truthing. Each of these communities is represented within the subject site with only a very small portion of Community 4 entering the north-west portion of the site.

- Vegetation Community 1 – Peppermint – Angophora Woodland / Open Forest
- Vegetation Community 2 – Exotic Grassland with Scattered Trees
- Vegetation Community 3 – Aquatic Herbfield (Creek line and dams)
- Vegetation Community 4 – Kunzea – Tea-tree Tall Heath

Vegetation Community 1 – Peppermint – Angophora Woodland / Open Forest

This vegetation community may be part of the broadly accepted nomenclature of Sandstone Gully Forest.

Occurrence – This vegetation community occurs in sections of the subject site which do not contain arable soil.

Structure – Woodland or Open Forest with a canopy cover of approximately 10-35% and height of approximately 15-23m. The understorey consists of a variable, but generally moderate, shrub layer to 10m high and sparse to moderate groundcover of herbs, ferns and grasses in drier areas. In the moister areas, where the soil depth is skeletal, the understorey consists mostly of dense fern and sedge species, whilst the overstorey cover is reduced and the mid storey replaced with those species favouring wetter conditions such as *Banksia ericifolia*. The height of the tree species in areas exposed to a high incidence of rock outcropping is reduced, as is the density of trees. This is evident in the central section of the western escarpment area.

Disturbances – This vegetation community has been disturbed by the construction of access roads and moderate to severe incursions of weeds such as Pampas Grass, Senna and Lantana.

This community would have once been equivalent to Sydney Sandstone Gully Forest.



Photo 2 – Peppermint – Angophora Woodland / Open Forest vegetation adjacent to Oxford Falls Road, part of the better condition vegetation.

Common Species

Trees: *Eucalyptus piperita* (Sydney Peppermint), *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood).

Shrubs: *Acacia parramattensis* (Sydney Green Wattle), *Banksia ericifolia* (Heath-leaved Banksia), *Banksia spinulosa* (Hairpin Banksia), *Ceratopetalum gummiiferum*, *Elaeocarpus reticulatus* (Blueberry Ash), *Leptospermum polygalifolium* (Tantoon), *Phyllanthus hirtellus* (Thyme Spurge), *Pittosporum undulatum* (Sweet Pittosporum) and *Platylobium formosum* (Handsome Flat-pea).

Groundcovers: *Cryptostylis erecta* (Bonnet Orchid), *Entolasia marginata* (Bordered Panic), *Gonocarpus teuroides* (Raspwort), *Imperata cylindrica* (Blady Grass), *Lepyrodia scariosa*, *Lomandra longifolia* (Spiky-headed Mat-rush), *Smilax glycyphylla* (Sarsparilla) and *Xanthosia pilosa*.

Weeds: *Ageratina adenophora* (Crofton Weed), *Centaurium erythraea* (Pink Stars), *Conyza albida* (Tall Fleabane), *Cortadeia selloana* (Pampas Grass), *Hedychium gardnerianum* (Ginger Lily), *Hypochaeris radicata* (Flatweed), *Ipomoea indica* (Blue Morning Glory), *Lantana camara* (Lantana), *Ligustrum sinense* (Small-leaved Privet), *Lonicera japonica* (Honeysuckle), *Nephrolepis cordifolia* (Fishbone Fern), *Plantago lanceolata* (Ribwort) and *Senna pendula* var. *glabrata*.



Photo 3 – Peppermint – Angophora Woodland / Open Forest vegetation in the central western portion of the subject site containing a high level of exotic plant disturbance.

Vegetation Community 2 – Exotic Grassland with Scattered Trees

Occurrence – This vegetation community occurs in the sections of the subject site with arable soil. This community is highly disturbed and it is likely that it was previously Peppermint – Angophora Woodland / Open Forest.

Structure – Dense groundcover of herbs and grasses with scattered trees and shrubs.

Disturbances – This vegetation community is the result of agricultural activities.

Common Species

Trees: *Angophora costata* (Smooth-barked Apple), *Casuarina cunninghamiana* (River Oak), *Eucalyptus piperita* (Sydney Peppermint) and *Eucalyptus punctata* (Grey Gum).

Shrubs: *Acacia parramattensis* (Sydney Green Wattle), *Ceratopetalum gummiferum* (Christmas Bush) and *Pittosporum undulatum* (Sweet Pittosporum).

Groundcovers: *Centella asiatica* (Swamp Pennywort) and *Cynodon dactylon* (Common Couch).

Weeds: *Acacia saligna* (Golden Wreath Wattle), *Axonopus fissifolius* (Narrow-leaf Carpet Grass), *Callistemon* sp. Cultivar (Crimson Bottlebrush), *Centaureum erythraea* (Pink Stars), *Conyza sumatrensis* (Tall Fleabane), *Euphorbia peplus*, *Hydrocotyle bonariensis* (Pennywort), *Hypochaeris radicata* (Flatweed), *Ligustrum sinense* (Small-leaved Privet), *Modiola caroliniana* (Red-flowered Mallow), *Nephrolepis cordifolia* (Fishbone Fern), *Pennisetum clandestinum* (Kikuyu), *Plantago lanceolata* (Ribwort), and *Trifolium repens* (White Clover).



Photo 4 – Heavily impacted zone in the middle of the
Peppermint – Angophora Woodland / Open Forest

This community would have once been equivalent to Sydney Sandstone Gully Forest. There are many planted specimens of trees within this community, particularly in the northern portion of the subject site in close proximity to the tennis courts.



Photo 5 – Some scattered trees (mostly planted) in close proximity to one of the existing dwellings.

Vegetation Community 3 – Aquatic Herbfield

Occurrence – This vegetation community occurs along the tributary of Middle Creek including the drainage line and immediate embankments, generally between the top of bank on each side of the drainage line.

Structure – Moderate to dense herbfield to a height of approximately 1-2m, together with occasional exotic shrubs.

Disturbances – This community has been disturbed by modification of sections of the watercourse (more so north of the current study site) and incursions of weeds.



Photo 6 – Riparian vegetation along the drainage line.

Common Species

Native: *Hydrocotyle peduncularis* (Pennywort), *Juncus usitatus* (Common Rush), *Panicum bisulcatum* (Blackseed Panic), *Persicaria hydropiper* (Water Pepper) and *Typha orientalis* (Cumbungi).

Weeds: *Ageratina adenophora* (Crofton Weed), *Erythrina sykesii* (Coral Tree), *Ligustrum* spp. (Small and Broad-leaved Privets), *Colocasia esculenta* (Taro), *Cyperus eragrostis* (Umbrella Sedge), *Hydrocotyle bonariensis* (Pennywort), *Ludwigia peruviana*, *Ranunculus repens* (Creeping Buttercup), *Salix* sp. (Willow), Pampas Grass (*Cortaderia selloana*) and *Tradescantia fluminensis* (Wandering Jew).



Photo 7 – Vegetation surrounding the dam along the western boundary.

Vegetation Community 4 – *Kunzea* – Tea-tree Tall Heath

Occurrence – This vegetation community occurs mostly within Lot 80 to the west of the subject site, with a small portion entering the site.

Structure – Heath or scrub type vegetation with a height of generally 2.5-4m. There are very few emergent trees within this community. The shrublayer is thick and dense to approximately 50-75% foliage cover. The understorey is variable in density but usually sparse with very few grasses but does contain low growing shrubs, herbs and sedges.

Disturbances – This vegetation community has some weed influences but not to the extent of Vegetation Community 1.

Common Species

Shrubs: *Acacia longifolia* (Sydney Golden Wattle), *Banksia ericifolia* (Heath-leaved Banksia), *Epacris crassifolia*, *Epacris microphylla* (Coral Heath), *Grevillea buxifolia* (Grey Spider Flower), *Kunzea ambigua* (Tick Bush) and *Leptospermum polygalifolium* (Tantoon).

Groundcovers: *Dianella caerulea* (Flax Lily), *Empodisma minus*, *Imperata cylindrica* (Blady Grass), *Lepidosperma filiforme* and *Lomandra longifolia* (Spiky-headed Mat-rush).

Weeds: *Agapanthus praecox* (Agapanthus), *Andropogon virginicus* (Whisky Grass), *Aristea ecklonii* (Blue Stars), *Asparagus aethiopicus* (Asparagus Fern), *Cortaderia selloana* (Pampas Grass) and *Ligustrum sinense* (Small-leaved Privet).



Photo 8 – Tall Heath vegetation looking westerly on the eastern edge.

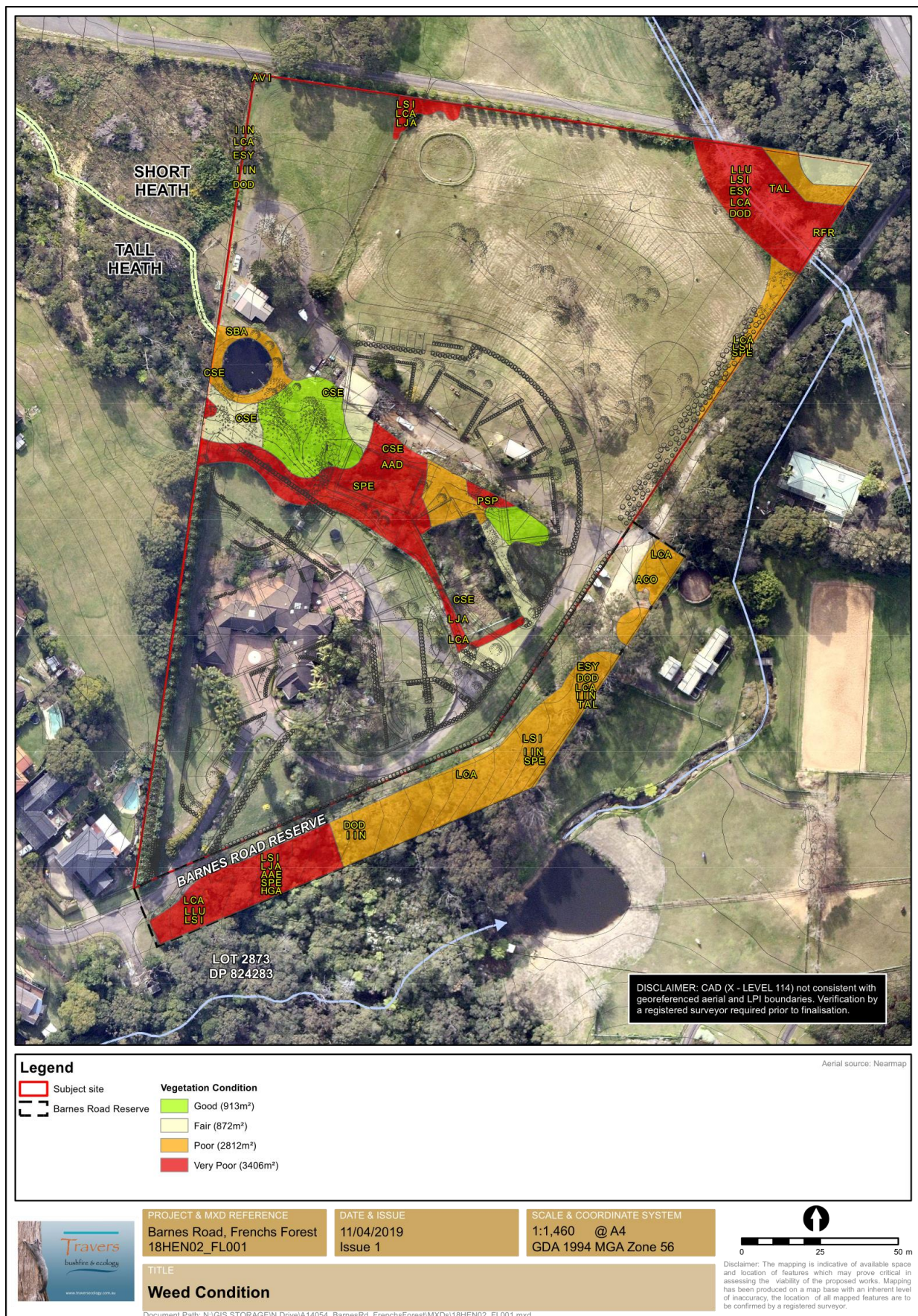
2.3 Baseline weed mapping

A baseline weed condition map was produced in April 2015. It shows the good, fair, poor and very poor areas of remnant bushland across the site. The existing vegetation is classed into the following vegetation condition categories which are in accordance with the Ku-ring-gai Municipal Council weed mapping guidelines (1995);

- Good – up to 10% weed coverage
- Fair – 10-30% weed coverage
- Poor - 30-60% weed coverage
- Very Poor – greater than 60% weed coverage.

Figure 3 shows the vegetation condition and locations of dominant weeds.

It is proposed that all weeds within the site and asset protection zones will be removed as part of the fuel reduction process and regenerated in accordance with those zones objectives (Section 3.1).





Restoration Strategy

3

3.1 Management strategy and zone objectives

The site has been broken into seven (7) distinct zones for the purposes of management, each with its own tasks and objectives. Zoning is shown on Schedule 1 and on Figure 4.

3.1.1 Zone 1 – Northern Biodiversity Corridor

A restored wildlife corridor is to be revegetated that links the heath vegetation at the north-western boundary to the gully forest vegetation at the foot of the Middle Creek tributary in the north-eastern corner of the site.

The zone is currently devoid of natural vegetation and there is a small amount of invasive weeds present (photo 1, photo 9). There is to be a high density of Banksia and other heath species planted within this corridor to encourage foraging for the Eastern Pygmy Possum which are known to occur in the local area.



Photo 9 – Cleared vegetation in zone 1.

The main weeds of concern in this zone include a small patch which contains *Ligustrum sinense*, *Lonicera japonica* and *Lantana camara*. The appropriate methodology for control is described in Attachment 1.

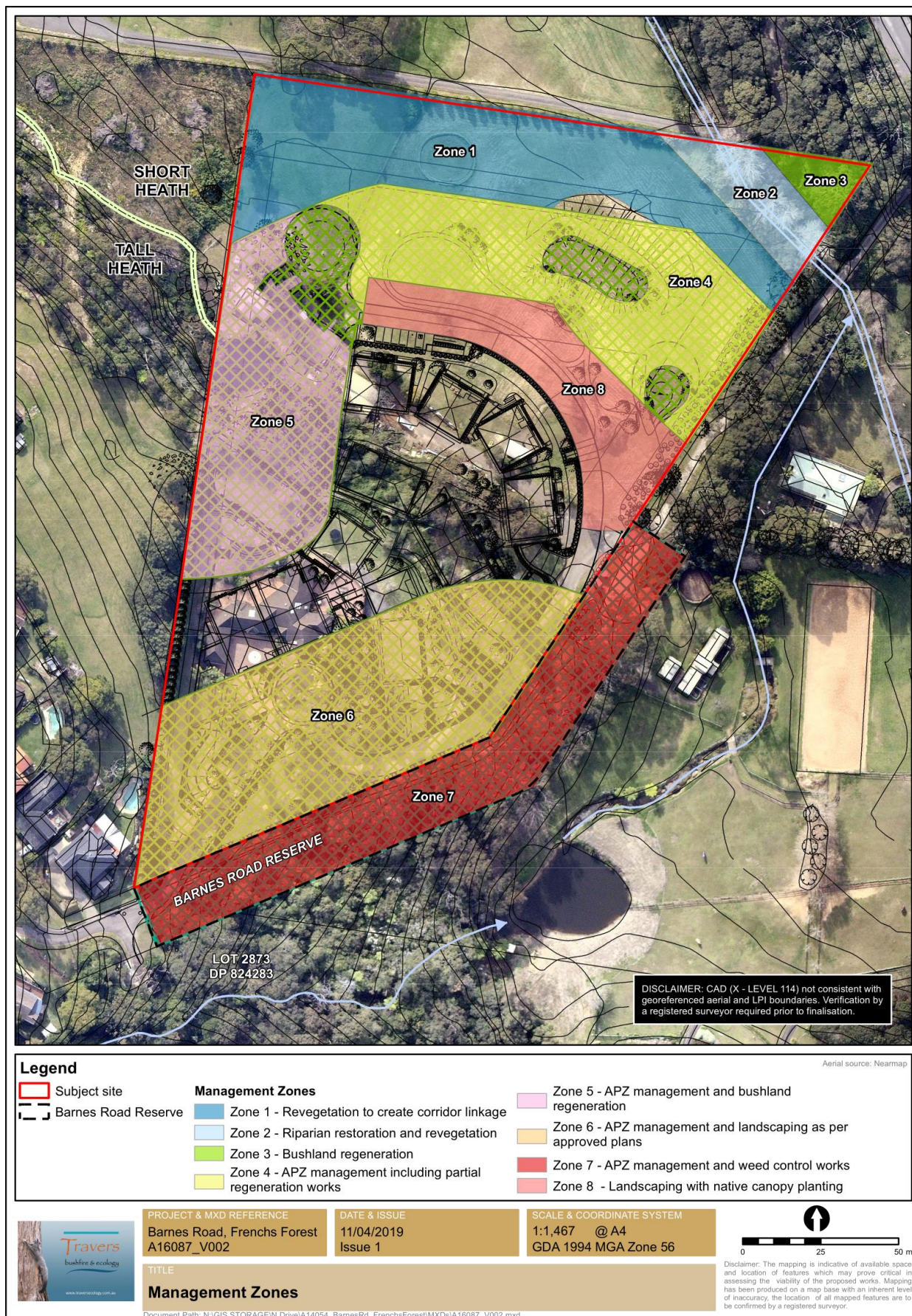


Figure 4 – Vegetation management zones

3.1.2 Zone 2 – Middle Creek Tributary

This zone refers to the core riparian area of the Middle Creek tributary and is to be managed as a fully vegetated riparian zone.

The area is currently almost devoid of any natural vegetation containing planted Eastern Cottonwood (a Poplar species) with an exotic understorey of Coral Trees, Privets, Lantana, Cape Ivy and Wandering Jew.

The objective of the zone is to remove exotic trees, eradicate invasive weeds, embankment stabilisation, and planting of sandstone gully species and macrophytes as appropriate for local watercourses.

There are many weeds of concern in this zone, in particular *Ligustrum* spp., *Erythrina sykesii*, *Lantana camara*, *Tradescantia albiflora* and *Delairea odorata*. *Delairea odorata* is an invasive vine species which is climbing through the weedy shrub layer on the peripheral areas of this zone where more light is available.

Control methods for all species are described in Attachment 1. *Tradescantia albiflora* is an exotic ground cover that typically flourishes on creek embankments and moist sites in shaded areas. It covers a large portion of the existing embankments. Removing the *Tradescantia* increases the risk of bank erosion; therefore jute meshing and replacement vegetation cover will need to be established as soon as practical after the *Tradescantia* is removed.

Jute matting or jute mesh is to be laid over the embankment and then planted with tussock grasses, sedges and shrubs which can tolerate moister soils. Control of *Tradescantia* is variable through hand weeding, raking and application of herbicides. The use of Glyphosate products on this species has a limited success rate but Starane (another suitable herbicide) has a much higher kill rate. Starane is to be applied in accordance with the herbicide label and the Protection of Environment Operations Act (1997).



Photo 10 – Hefty woody and invasive weeds on the periphery of the core riparian area.



Photo 11 – *Ludwigia peruviana* on the other side of the Barnes Road corridor in the drainage line amongst a multitude of other weed species



Photo 12 – Close up of *Ludwigia peruviana* in flower

The invasive aquatic weed *Ludwigia peruviana* occurs on the south-eastern side of Barnes Road in the riparian zone and requires treatment such that it does not spread further along the drainage line. All parts of the plant need to be bagged and disposed of at an approved waste facility. Once established it is a difficult species to control, so therefore requiring targeted attention.

3.1.3 Zone 3 – North-eastern Remnant Bush Regeneration

This area includes the fair-poor quality remnant vegetation in the far north-eastern corner outside of the core riparian area. This area is moderately to heavily affected by exotic and invasive weed species but regeneration needs to be encouraged through bushland regeneration low impact methods.

Weed invasion from the drainage line is extending upslope into this zone. There has also been some minor clearing works which have disturbed the soil and made it more favourable for exotic species, limiting the amount of native species regeneration. Common weed species in this zone include *Ligustrum sinense*, *Ageratina adenophora*, *Senna pendula* and *Lantana camara*.

The objective of the zone is to improve native species diversity and cover through a combination of hand weeding and natural regeneration limiting the need for any revegetation works.



Photo 13 – Remnant vegetation in the far north-eastern corner of the site.

3.1.4 Zone 4 – Northern Asset Protection Zone (Inner Protection Area)

This area contains the northern APZ between the proposed development and the biodiversity corridor which is to be managed in accordance with *Planning for Bush Fire Protection* 2006. The area is currently devoid of any natural vegetation but is to act as an arboreal stepping stone to the proposed corridor along the northern boundary. The ecological value of the APZ landscape is improved by selective planting of canopy species such that an APZ compliant landscape is created. All canopy trees are limited in terms of cover and canopy connectivity to be considered an actively managed asset protection zone.

The APZ is to be planted with canopy vegetation as discontinuous trees to an average density between 1 tree per 200m² to 1 tree per 400m², or may be planted as very small clumps of 2-3 trees with separated canopy between clumps. No shrubs are proposed for planting.

The ground layer of vegetation also needs to be maintained and managed regularly to reduce fuel loads (every 4 weeks in summer and 8 weeks in autumn, winter and spring).

Weeds in this zone largely comprise pasture grasses and occasional annuals.

Revegetation of this zone should contain smooth-barked tree species in preference for rough-barked species. Suitable species may include *Angophora costata*, *Eucalyptus haemastoma*, *Eucalyptus tereticornis*, *Corymbia maculata*, *Eucalyptus punctata* and *Eucalyptus deanei*, although preference of species should be given to those occurring in the adjacent bushland and can be sourced locally.



Photo 14 – Looking south over currently managed lands that will form part of the northern APZ.

3.1.5 Zone 5 – Western Asset Protection Zone (Inner Protection Area)

The objective of Zone 5 is to retain and improve the quality of remnant vegetation, continually suppress invasive species and to ensure compliance with APZ standards.

This area contains the APZ on the western side of the northern most buildings. Where there is existing remnant vegetation, this area is to be managed to remove existing weeds hence reducing the fuel loads. The shrub layer will be largely removed to comply with *Planning for Bush Fire Protection* 2006 and as such, no revegetation works will be undertaken.



Photo 15 – Remnant vegetation within the APZ of Zone 5.

The amount of remnant native and exotic vegetation post development in this zone will be significantly reduced to meet the standards of an inner protection area.

The main weeds requiring control in this zone include *Cortaderia selloana*, *Ligustrum sinense*, *Phyllostachys* sp., *Nephrolepis cordifolia*, *Senna pendula* and *Ageratina adenophora*.

3.1.6 Zone 6 - Southern Asset Protection Zone (Inner Protection Area) and Landscaping as per Landscape Plans

This area contains the APZ to the southern aspect of the proposed buildings. A large portion of the vegetation has been planted and there is limited ecological value for retention of existing vegetation.



Photo 16 – Planted vegetation around the existing dwelling.

The objective of the zone is to reduce the bushfire risk to the southern aspect, minimise spread of invasive weeds and to manage the removal of any affected hollow-bearing trees.

3.1.7 Zone 7 – Southern Asset Protection Zone - Barnes Road Reserve (Outer Protection Area)

The majority of the Barnes Road reserve is heavily infested with a range of woody weeds and invasive vine species. It is intended to be managed as an outer protection area through the removal of weed understorey, retention of canopy and restoration of native ground layer species.

The density of trees throughout the zone is low and requires significant removal of understorey weeds to be APZ (outer protection areas) compliant. The objective of Zone 7 is to remove invasive weeds to be compliant to the standard of an outer protection area, prevent the regeneration of midstorey species to a maximum 50% cover and revegetate or regenerate native groundcover.

The western end of Zone 7 is heavily infested with *Ligustrum* spp., *Lantana camara*, *Senna pendula*, *Lonicera japonica* and *Asparagus aethiopicus*. The central and eastern parts of Zone 7 contain a higher level and diversity of invasive vines including *Ipomoea indica*, *Delairea odorata* and *Anredera cordifolia*, as well as the presence of *Erythrina sykesii* (Coral Tree).



Photo 17 – Invasive vines within the road reserve (eastern end of Zone 7).



Photo 18 – Dense coverage of Privets in the road reserve (western end of Zone 7).

Zone 7 forms part of an existing access to adjoining property, therefore access to that property must be maintained for the transport of stock.

3.1.8 Zone 8 – Landscaping with Native Canopy Planting

Zone 8 is located in the central-northern portion of the site to the immediate north of the proposed development area. This zone is to contain a bound and compacted gravel footpath and landscaped planting as per Landscaping Plans (John Chetham & Associates).

To enhance this area whilst not contributing to changes in asset protection zone management, the Zone is to be planted with native canopy species at no greater than 1 tree per 200m², similar to that prescribed for Zone 4. Tree species should be largely smooth-barked and mown underneath.

3.2 Site preparation

Initial site preparation for the purposes of this BMP includes the installation of protective fencing to restrict access, commence weed removal, removal of waste, delineate the boundary of conservation areas and the extent of APZs. Site preparation also includes the sourcing or growing of local provenance native plant stock for revegetation works.

3.2.1 *Permanent protection fencing*

Permanent protection fencing shall be installed on the perimeter of the proposed wildlife corridor as a 5-strand wire rural strand fence (see Schedule 1), extending for the full length of the corridor. The fencing is to contain a minimum of two locked vehicle access gates to for revegetation, maintenance, weed control and regeneration.

A second permanent protective fence will be installed as a 5-strand wire rural strand fence on the south-eastern road corridor boundary for the full extent of the asset protection zone to delineate the extent of the outer protection area as shown on Schedule 1.

All trees planted within the asset protection zone will be permanently protected by a 2m square x1m high post and rail fence inclusive of a wire mesh with 25mm opening for protection against grazing animals and mechanical damage. The reason is to provide long term protection to the planted trees and to ensure that inadvertent damage is avoided.

3.2.2 *Temporary protection fencing*

Temporary protection fencing in the form of a 1.8 m relocatable construction proof fence will be provided immediately surrounding the affected construction area (Schedule 1) as shown on Schedule 1 – Vegetation Management Works. This will protect any areas from trampling and compaction associated with the construction works. The fence will ensure that all native vegetation within the Barnes Road Corridor is protected from vehicle movements, sediment deposition and free of waste or construction materials. Access to Barnes road corridor is to be provided for weed control purposes prior to during and after construction.

Sediment fencing is to be installed at the base of the temporary protection fencing as a primary sediment collection measure. It is to be installed with 'kickbacks' and maintained to prevent rill erosion along the fence and is to include sediment fence kickbacks on sloped lands to slow water directed along the fence. The sediment fence is to be reinforced at all low drainage points with additional hay bales to support the fence against the weight of trapped sediment.

3.2.3 *Tree protection zones*

Very few trees within the construction area will be retained. All retained trees within the site inclusive but not limited to T662, T705, T406 and T709 will require tree protection to minimise risk damaging of the tree's root system or trunks. A tree protection zone of a minimum 5m radius from the base of the tree is to be set up around each nominated tree (refer to Landscaping plan by John Chetham & Associates). Tree protection zones will use temporary star pickets and plastic bunting that demarcates the tree protection zone.

For development purposes, any encroachment of more than 25% into the tree protection zone will require specialist arborist advice.

3.2.4 Hollow-bearing trees

There are three (3) hollow bearing trees within or adjacent to the construction works area of which one (1) will be retained (HT0036). The remaining hollow bearing trees (HT0030 and HT0042) are to be removed. A tree protection zone of 5m is to be applied to HT0036 (tree tag T406 see Schedule 1 for location). Should any damage be incurred to a tree to be retained then rectification of the damage is to be undertaken in accordance with the advice of an AQ5 qualified tree consultant.

All contractors works are to be managed such that all due care is taken to prevent damage to trees to be retained and is not to remove any hollow bearing tree without first receiving instruction from the fauna ecologist. A fauna ecologist is to be present at the removal of each habitat tree. Refer to section 3.6 for habitat tree management specifications.

3.3 Weed management

Much of the remnant bushland on site is moderately to heavily degraded by weed invasion. Figure 3 shows the weed condition of each patch of remnant vegetation within the site as well as the main invasive species at selected locations.

Some highly invasive and persistent weed species found within the bushland areas of the site include:

Table 2 – Main invasive species on site

Scientific name	Common name
<i>Ageratina adenophora</i>	Crofton Weed
<i>Andropogon virginicus</i>	Whisky Grass
<i>Anredera cordifolia</i>	Madeira Vine
<i>Asparagus aetheopiscus</i>	Asparagus Fern
<i>Canna indica</i>	Indian Shot
<i>Cortaderia selloana</i>	Pampas Grass
<i>Delairea odorata</i>	Cape Ivy
<i>Dipogon lignosus</i>	Dolichos Pea
<i>Erythrina X sykesii</i>	Coral Tree
<i>Hedychium gardnerianum</i>	Ginger Lily
<i>Ipomoea indica</i>	Blue Morning Glory
<i>Lantana camara</i>	Lantana
<i>Ligustrum lucidum</i>	Broad-leaved Privet
<i>Ligustrum sinense</i>	Small-leaved Privet
<i>Lonicera japonica</i>	Honeysuckle
<i>Nephrolepis cordifolia</i>	Fish-bone Fern
<i>Phyllostachys</i> sp.	Bamboo
<i>Rubus fruticosus</i> ssp. agg.	Blackberries
<i>Senna pendula</i> var. <i>glabrata</i>	-
<i>Tradescantia albiflora</i>	Wandering Jew
<i>Zantedeschia aethiopica</i>	Arum Lily

These weeds have significant implications to natural regeneration of the remnant bushland. With regards to the success of revegetation works, these and other common invasive weeds in the locality are a threat and will require targeted weed control and ongoing eradication throughout the planting and maintenance period. Attachment 1 contains a comprehensive list of weed species, the most appropriate control techniques and priority.

3.3.1 Weed management strategy

Given the presence of invasive environmental weeds on site, a combination of selective spraying, hand removal and competitive planting techniques will be used to control weeds. The weed control priorities are listed in Attachment 1.

Weeding works are to be carried out by an appropriately qualified and licensed bushland regeneration company under the direction of or audited by a consulting project ecologist. Supervisors should possess a minimum of a Certificate IV in Conservation and Land Management or a biological science degree, with at least five (5) years of field experience.

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
- Hand removal and mechanical assisted clearing
- 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 (3) components:

Primary weeding

All weeds within the Very Poor areas as shown in Schedule 1 will be removed from the site. 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 herbicide use and hand removal.

Timing – 3-6 months

Secondary or follow-up weeding

Secondary or follow-up weeding involves intensive weeding in areas that have already received primary work. This follow-up weeding is to remove weed regrowth or weeds that were overlooked during the primary weeding.

Timing – 3-6 months post primary weeding

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 3-6 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 five (5) years by the appointed bushland regeneration company. After that time, the community association will manage the lands in perpetuity.

With primary and secondary weed control works expected to last approximately 12 months, and maintenance over five (5) years, the bushland Regeneration Company and independent project ecologist are to be actively managing on site for a minimum of five (5) years.

3.3.2 Herbicide use

The use of herbicides is needed where hand removal of weeds is impractical. The use of *Glyphosate* based herbicides is recommended in accordance with the manufacturers labels. Within 5m of a drainage line only *Roundup Bi-active*® or equivalent formulations can be used.

Other regularly used herbicides include *Garlon*®, *Brushoff*®, *Brush Killer*® and *Starane 200*®. *Starane 200*® may be utilised on *Tradescantia* near the drainage line but must avoid any direct or indirect contamination within the stream.

Grazon DS is not considered a safe chemical to use within high soil moisture zones and that significant off target kill of woody species and aquatic fauna has been tentatively linked to *Grazon DS*. It is recommended that this herbicide is not to be used on site.

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.

The potential for destabilising soils and causing erosion on embankments and slopes as a result of spraying vegetation with herbicide needs to be considered prior to commencement of weed control works, in particular along the drainage line (Zone 2).

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 label and provisions of the *Protection of the Environmental Operations Act (NSW PEO Act 1997)*.

All environmental weeds need to be eradicated and controlled across the entire site. Garden waste and 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

Revegetation is proposed for Zone 1, Zone 2, Zone 4 and Zone 8. Consideration of minor revegetation works in Zone 7 is also possible, dependent upon natural regeneration of native ground layer species following removal of invasive weed species.

All revegetation material is to be:

- tubestock or hiko cells (mature stock may be used in landscape plantings or asset protection zones),
- native species endemic to the locality with a certificate of local provenance, and

- propagated from seed sourced from within the Sydney Basin Bioregion with preference given to northern Sydney sandstone areas.

Zone 1 – Northern Biodiversity Corridor

Revegetation of a fully structured Sandstone Gully Forest will be undertaken within Zone 1 to provide a corridor linkage across the northern perimeter of the site. An embankment from the proposed stormwater treatment basin in part impacts this area. As it is only of minor impact the embankment can be revegetated with shrub and groundcover species that provide foraging habitat and do not impact on the structural integrity of the basin wall.

Native plant species diversity is to be a minimum of twenty five (25) species and includes trees, shrubs and mid-storey species, grasses, creepers and other ground covers. Planting is to focus predominantly on tree and shrub species that will shade out the existing understorey. Ground layer planting will focus on hardy native grass and ground covers that establish good cover from a planting density for 1 groundcovers plant per square meter. All existing exotic species will be eradicated as part of the site preparation works prior to planting.

Recommended species for revegetation of this zone are provided in Attachment 2.

The approximate area of Zone 1 is 5250m². Canopy trees are to be planted at 1 per 50m², shrubs and mid-storey species at 1 per 4m². These densities have been chosen to provide a highly dense vegetation structure similar to the adjoining sandstone heath and gully forest vegetation types. Thus the expected number of plants is:

- Canopy trees – 105
- Shrubs and mid-storey plants – 1300
- Tubestock or hiko planting of 5250 ground covers

Shrub species must include a high proportion of Banksias and other foraging species potential arboreal mammals such as Eastern Pygmy Possum.

The following methodology may be adopted for the ground layer restoration works;

- Eradicate all exotic ground layers species through, herbicide application, physical hand removal and bed preparation for seeding and planting (minimum depth of ameliorated soil is to be 100mm).
- Direct seeding of native grasses and other shrub species at an application rate of 8 tonne per hectare (supplementary panting is required).
- Tubestock or hiko planting of 5250 ground covers (including grasses and other typical endemic native species at a density of 1 per m²).

Direct seeding is to be undertaken over the entire biodiversity corridor to provide a more diverse ground layer, the diversity is to be enriched through tubestock planting of other grass species and ground layer vines. Ground cover plantings should contain a high proportion of hardy species including but not limited to *Lomandra longifolia*, *Dianella* spp., *Hardenbergia violacea* and *Imperata cylindrica*.

Direct seeding of ground layer species

Controlling the regrowth of pasture grass and maximising survival of directly seeded grasses is difficult in the field. The cost savings however can be significant of direct seeding is undertaken with good bed preparation. The diversity of species that can be regenerated is also maximised by combining seeding and tubestock planting of ground layers species.

It is recommended that the grass species utilised are *Microlaena stipiodes* and *Themeda australis*. Other species are appropriate to the locality and should be considered when order

local provenance collected seed for direct seeding projects. *However* by reducing the complexity of species used in direct seeding, selective herbicides can be used to control other exotic weed species without impacting on selected native species. Once the grasses become established, tubestock planting is to supplement species diversity.

The existing pasture grass is to be killed with a repeated series of glyphosate sprays over several months. This will required a period of approximately six (6) months to achieve reasonable control. Once effective kill has been established the soil bed is to be prepared by deep ripping and tilling to a minimum of 100mm in depth. Further soil improvers may be used to improved germination rates. Once effective weed control and bed preparation is achieved, the area is to be direct seeding lightly incorporating seed into the surface. Selective pre-emergent herbicides and or spot spraying is used to control broadleaf weed species or resistant exotic grasses. Hand weeding is recommended for wood weeds.

A minimum of 8kg per hectare of seed using locally occurring native species is to be direct drilled preferably in late winter and early spring. Time to full establishment is variable from 8 weeks to 18 months depending on the timing, bed preparation, weed control and weather conditions.

Zone 2 – Middle Creek Tributary

Zone 2 is heavily infested with woody weeds, exotic vines, Tradescantia and planted Poplar trees.

Revegetation works within this zone should be staged to limit potential erosion issues through exposing bare ground.

Photo 19 provides an example of creek stabilisation and restoration works of a creek line of similar size.

After removal of weeds, the area needs to be stabilised with rock revetment and jute mesh. Jute based Coir logs at the base of the embankment are used to control flows, protect the base of the embankment and to provide a point of purchase for plants. Jute mesh or matting is laid for at least 4m on either side of the channel would is intended to cover most of the embankment to the top of bank.

Native plant species diversity is to be a minimum of twenty (20) species and includes trees, shrubs and mid-storey species, grasses, creepers and other ground covers, as well as macrophytes.

The area of Zone 2 is approximately 1050m². Assuming the creek line is 1.5m wide on average, the planting area is 975m². Canopy trees are to be planted at 1 per 50m², shrubs and mid-storey species at 1 per 4m² and ground covers at 3 per m². Macrophytes are to be planted within the creek line in small clumps of approximately 2m x 0.5m with 5-10 plants per clump, and approximately 10 clumps in total. Thus the expected number of plants is:

- Canopy trees – 20
- Shrubs and mid-storey plants – 250
- Grasses and ground covers – 2925
- Macrophytes - 80



Before creek line treatment



Coir logs along creek edge following removal of weeds, jute mat / jute mesh on embankment to be installed and planted with native plants.

Photo 19 – Creek embankment stabilisation example.

Zone 4 – Northern Asset Protection Zone (Inner Protection Area)

This zone is to be managed as an inner protection area. At present there is no vegetation of significance and is managed.

The APZ is to be planted with canopy vegetation only as indicated on Schedule 1 at a density of 1 tree per 200m² to 1 tree per 400m², the base of trees may also be planted as with native shrubs.

The ground layer of vegetation also needs to be maintained and regularly slashed or mowed to keep to maximum of 100mm in height. To remain APZ compliant the grass areas need to be managed at a minimum every 4 weeks in summer and 8 weeks in winter).

Stormwater basins are to be established in Zone 4 and are planted to specifications as noted in the Landscape Plan (John Chetham & Associates). All plantings must be APZ complaint.

The area of Zone 4 is 5300m². The basin and landscaping areas comprise approximately 30% of Zone 4, therefore the effective revegetation area is approximately 3700m². Canopy trees are to be planted at 1 per 200m², thus the expected number of plants is:

- Canopy trees – 20

The planted species diversity is to be a minimum of three (3) within Zone 4. The planting of canopy species is too restricted to smooth bark species with selected shrub species that are suitable for asset protection zones. The advice of the project ecologist/bushfire consultant should be sought to select specific species for the locality and of foraging value.

Zone 7 – Southern Asset Protection Zone - Barnes Road Reserve (Outer Protection Area)

No specific revegetation works are proposed as there appears to be potential for natural regeneration noted by the presence of native grasses and ground covers amongst the Privet infested area. Enrichment planting is recommended where natural resilience is low. No additional canopy trees are to be planted in the zone as it forms an outer protection area and no additional trees are required to be removed.

Native shrubs may be regenerated or planted to achieve a maximum of 50% by cover. Revegetation of shrub species is to focus on high foraging value species such as banksias and selected Acacias.

Fuel reduction prior to the commencement of the bushfire season is to be undertaken to achieve an effective fuel load of 4 to 8 tonnes per hectare.

As part of site auditing and direction of works, the project ecologist/bushfire consultant is to advise if any supplementary planting or vegetation management works is required to achieve the standards of an Outer Protection Area.

Zone 8 – Landscaping with Native Canopy Planting

Within Zone 8, only canopy revegetation is proposed. It is to be essentially compliant with asset protection requirements described for Zone 4 whereby the maximum planting density is to be 1 tree per 200m². Tree should be planted outside of the landscaping beds as the Landscape Plan already has some trees proposed. All additional trees to be planted in this zone (to the Landscape Plan) are to be native species from Schedule 1. Preference should be given to smooth-barked species so as to limit and bushfire hazard, and mown underneath.

3.4.1 Mulching

Mulching is an efficient method to impede the establishment of weed species, soil erosion, compaction and desiccation. However it is to be only used where natural regeneration will not occur or light soil stabilisation is required.

Incorporating the mulch in to the soil surface will also improve soil structural stability but allow natural regeneration to occur. No mulching is to be laid in areas where direct seeding has been undertaken.

Any native vegetation requiring removal (e.g. within the adjacent development area) shall be immediately mulched or chipped and stockpiled on site to be used for the site's restoration at the completion of works.

Mulch is to be placed at a depth of 75-100mm covering any areas of revegetation (excluding regeneration sites).

Areas surrounding the stems/trunks of plants are to be kept free from mulch, thereby reducing the incidence of collar rot on retained or planted flora.

Mulch from Privet, Camphor Laurel, Coral Tree, Poplar, Willow, Wandering Jew, Bridal Creeper or aquatic weeds is not to be used. The contractor shall ensure that any mulch used is properly composted before use.

3.4.2 Revegetation protection

Protection of revegetation areas is important to the success of plantings, as is the timing and economic benefits in the long term. Protection measures include:

- Protective fencing in the form of a five plain wire strand fence and or a fully installed sediment and erosion control fence reducing access to the revegetation site by grazing animals such as rabbits and native mammals,
- Plant guards around plants – to minimise loss by grazing animals, frost protection and dehydration
- Baiting of rabbits (quarterly baiting over a minimum of 3 years) – use of Pindone (1080) to minimise rabbit burrows and grazing.
- Jute mats or mulching to minimise weed regrowth around the planted stock

3.5 Sediment and erosion control

A temporary sediment fence is to be installed adjoining all conservation and revegetation areas in close proximity to construction works. The creek embankment is to be stabilised and or coir logs are to be installed for bank protection and in-stream plant (section 3.4 – zone 2).

Sediment fencing is to be installed (Figure 4) at the base of the temporary protection fencing as a primary sediment collection measure along the southern edge of Zone 1, the northern edge of Zone 7 and at specified locations in Zone 5 as shown on Schedule 1.

Kick-backs are to be installed along all sections of sediment fencing that run downslope to prevent erosion down the sediment fence. The sediment fence is to be supported by fixed hay bales on low drainage points of the fence where concentrated runoff is directed through the fence.

Sediment and erosion controls throughout the construction area must be installed in accordance with Landcom's 'Managing Urban Stormwater: Soils and Construction' (2004) (see Figures 5 and 6). Techniques used for erosion and sediment control on site are to be adequately maintained and monitored at all times, particularly after periods of rain, and shall remain in proper operation until all development activities have been completed and the site is sufficiently stabilised with vegetation.

All outlets are to be installed and stabilised with a combination of a head wall, rock stabilisation and in channel planting of sedges (Figure 6).

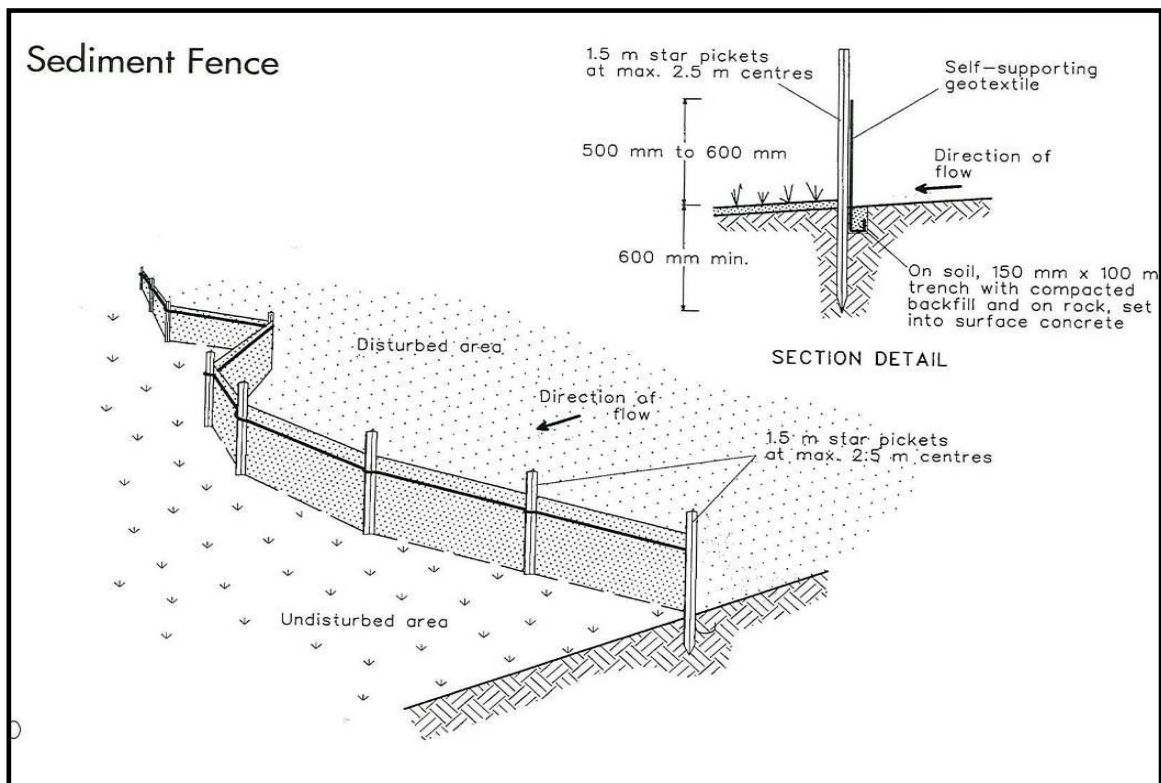


Figure 5 – Generic installation detail of geotextile filter fence

If outlet scour protection is required, it should be installed in accordance with Figure 6. The extent of scour protection is to be determined in consultation with the project ecologist but is to extend to the maximum extent of potential downstream scour. Additional plants are to be installed to assist in stabilisation of moist soils surrounding the outlet. If required, plants are to come from a local source and be typically present in the local area (see Attachment 2).

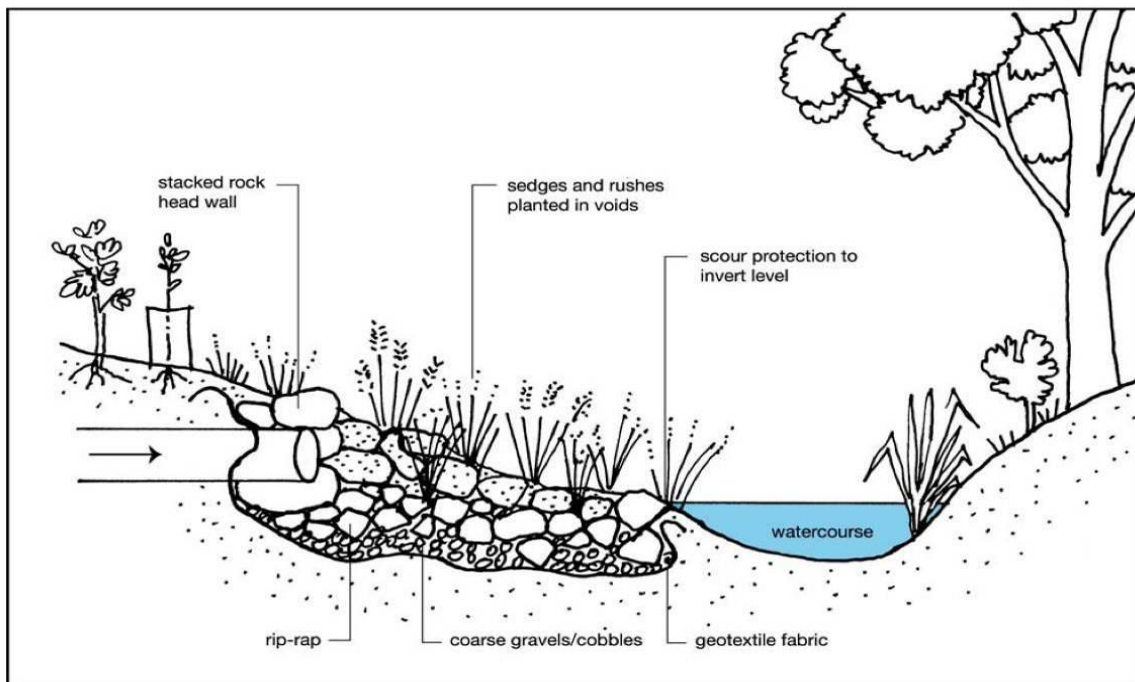


Figure 6 – Outlet scour protection

(Source – NSW DPI - Office of Water Guidelines for Controlled Activities on Waterfront Land – Guidelines for Outlet Structures 2012)

3.6 Hollow-bearing trees and nest box installation

Tree hollows provide critical roosting and overnight shelter for many fauna species. Provided the trees that contain hollows are in a healthy condition, they may be considered as “Ecologically Significant” if they contain breeding fauna or suitable breeding locations for threatened hollow dependent species. Ecologically significant hollow bearing trees should be retained as a high priority. Re-locating existing hollows or installing nest boxes of similar size in nearby remaining trees may assist in providing some compensation for any hollow bearing trees that need to be removed for the proposed development.

It is likely that HT0030 and HT0042 will be required for removal for proposed buildings. It is possible that HT0036 may be retained in close proximity to the proposed buildings and can be given a tree protection zone of 5m.

The three (3) hollow-bearing trees listed above are to be adequately marked in the field prior to the commencement of construction works.

Should hollow-bearing trees be required for removal, the following is dismantling procedure is to be used:-

- I) Where possible and practical, hollow bearing limbs identified for removal should have the hollow sections collected and re-erected. Where this is not feasible, due to unstable decaying timber, artificial nest boxes providing accommodation of similar size to the removed hollows are to be erected in suitable locations.
- II) All replacement nest boxes are to be secured to trees at a minimum height of four (4) metres above ground level facing the east to northeast direction. Nest boxes and re-erected limbs are not to be placed near locations where public access is planned along reserve areas. All nest boxes and re-erected limbs will be inspected annually and any damaged, or in danger of falling, are to be repaired or replaced.

A fauna ecologist is to locate appropriate trees and locations for installing the nest boxes.

On-ground refugia should be retained where possible consisting of rocks, logs, and wherever appropriate dense under-storey native vegetation.

3.6.1 Nest box installation and specifications

The nest boxes shall be of a similar sized aperture as those removed (e.g. 0-5cm or 5-10cm). Boxes should be constructed all of weatherproof timber (marine ply), screw fasteners and external paint. Nest-boxes with hinged lids make it easier to clean and also to catch occupants for examination (If required). The ratio of nest boxes required is 2 boxes per hollow removed. All nest boxes shall be placed in conserved bushland such as in Zone 3, retained trees in Zone 5 or with less preference, Zone 7.

The positioning of the nest box should also consider damage caused by branch fall. The placement of a box under a solid leader branch is recommended to provide a degree of protection to the box.

The type and size of nest boxes to be installed is to consider the type of fauna that occur in the locality to provide shelter and breeding habitat for threatened species and prey species.

A minimum of 10 nest boxes are to be installed including at least two (2) microbat boxes. At least two (2) large boxes are to be installed for forest owl species. All other nest boxes should be of small to medium size for general hollow dependent fauna species such as possums, gliders, parrots and cockatoos.



Program of Works

4

The program of works (Table 3) is aimed at providing a management framework for enacting revegetation, maintenance; monitoring and auditing reasonably required to manage the conservation areas, riparian corridor, biodiversity corridor and sites vegetation.

Site rehabilitation including weed control works is to be undertaken in accordance with the program of works and Schedule 1 – Vegetation Management Works.

Prior to commencement of any works on site, a team of bushland regenerators and an independent project ecologist is to be appointed by the land owner(s) or project manager(s). The bushland regeneration team will be responsible for undertaking most of the ameliorative works on the bushland and establishment of wildlife corridor.

4.1 Program of works

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

Stage 1

Typically Stage 1 involves pre-construction activity works such as the installation of protective fencing (temporary and permanent), tree protection zones and sediment fencing. It also includes the identification of hollow-bearing trees that require removal and any proposed stag-watching or similar (if required) prior to removal.

Preparation of pest fauna management may be undertaken during this phase or prior to revegetation works commencing.

Setting up of monitoring points is vital prior to construction and clearing works to establish baseline data.

Compliance certification shall be issued for the set-up of various protection measures once satisfactorily completed.

Stage 2

This usually describes the works which are undertaken in conjunction with demolition and construction of buildings, roads and services. 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 and secondary weeding works are completed, as well as commencement of revegetation works.

Work during this stage includes the supervised removal of hollow-bearing trees by the fauna ecologist, installation of nest boxes, maintenance of protective measures and mulching.

Practical completion of each task will be determined by the project ecologist at which point maintenance works will commence. During this stage the project ecologist will issue compliance certificates to Council. Should there be a delay in the completion of works for any reason, then the Stage 2 works phase may be extended.

Asset protection zones are also likely to be set-up during this stage.

Stage 3

Stage 3 works are to commence after certification of primary and secondary weed control works, and initial revegetation works, often coinciding with completion of on-site construction works. This stage of works 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 five (5) years post completion of stage 1 and 2.

All bush regeneration crews working on site are required to have at a minimum TAFE Certificate Level II Bush Regeneration qualifications or equivalent to undertaken weeding and revegetation works. All staff are to be supervised by a qualified bush regeneration Supervisors should possess a minimum of a Certificate IV in Conservation and Land Management or a biological science degree, with at least five (5) years of field experience.

Table 3 - Program of works

Action	Responsibility
Stage 1	
• Formation of site management team and establish supervision and consultation processes – minimum project ecologist, and site manager • Erection of temporary and permanent fencing, erosion control fencing, tree protection zones and sediment control fencing • Rabbit baiting • Marking of hollow-bearing trees to be removed and undertake any required survey prior to removal • Commencement of seed collection and propagation contracts • Set up monitoring points and other baseline data • Provide certificates of compliance	• Site project manager • Site manager / bush regenerator contractor / project ecologist • Contractor • Fauna ecologist • Bushland regenerator / project ecologist • Project ecologist • Project ecologist
Stage 2	
• Supervision of hollow-bearing tree removal and nest box installation • Commencement of primary weed control • Monitor fencing and erosion control measures (monthly – especially after heavy rain) and replace if requires • Commencement of secondary weed control • Installation of jute mat / jute mesh as required on creek embankment	• Fauna ecologist / tree climber • Suitably qualified bushland regenerator • Contractor with advice of project manager • Bushland Regenerator • Bushland Regenerator

• Undertake direct seeding and revegetation works • Maintenance of protective fencing • Provide certificates of compliance	• Bushland Regenerator / Contractor • Bushland Regenerator / Contractor • Project ecologist
Stage 3 • Enrichment planting within direct seeded and revegetation areas if required. • Continuation of regeneration and weed control maintenance. • Monitoring of quadrats, revegetation works, weed control works and protection devices • Conduct maintenance beyond five (5) years as required	• Contractor with advice of project ecologist • Contractor / suitably qualified bushland regenerator • Project ecologist • Site manager with advice of project ecologist

Schedule 1 identifies the location of the planned restoration and vegetation management works in relation to the proposed development.

4.2 Monitoring

The project ecologist is responsible for supervision and overseeing of works stipulated in the BMP and monitoring / auditing of works undertaken by the bushland regeneration team.

Monitoring of the progress of weed removal, plant growth, natural regeneration and protection measures is to be undertaken at regular intervals by the appointed project ecologist who will submit compliance statements to Council at the completion of each major item undertaken within the BMP. At the beginning of the contract, the project ecologist shall set up monitoring points at the approximate locations noted on Schedule 1 that include a photographic record prior to works being undertaken, then quadrat sampling to test the success of the works.

4.2.1 Proposed monitoring quadrats and photo points

Proposed quadrat monitoring points are shown on Schedule 1 – vegetation management works. The entire site is however to be monitored using site wide rapid assessment approaches.

4.2.2 Monitoring activities

Monitoring activities shall include the following:

1. A photographic record for comparative purposes taken on an annual basis.
2. Flora quadrats to measure the growth and density of the revegetation area and to monitor weed densities at selected locations.
3. An overall vegetation condition map based on standard bush regeneration vegetation condition assessment methodology.
4. Monitoring of damage caused by rabbits or other grazing animals.
5. Monitoring the condition of permanent and temporary protective fencing.
6. Monitoring of erosion control measures including need for any rectification works.

7. Monitoring of fuel load levels in APZs (Zone 4, 5, 6 and 7).
8. Monitoring of protected trees in APZs and encroachment of any works into the tree protection zones.

Monitoring of the site is required at the commencement of construction 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. The restoration area is to be maintained to a high standard, with no future encroachments of new landscaping beds, tree removal, installed or repaired services, driveways, fences or buildings except for that shown on Schedule 1 - Vegetation Management Works.

Following the completion of Year 1, 2, 3 and year 4 of the maintenance period, the project ecologist is to determine whether any additional contingency works are required to satisfactorily achieve the performance targets. After the completion of 5 years of maintenance, ongoing maintenance activities are to be undertaken by the respective land owners or management.

4.3 Compliance certification

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

- Engagement of a bush regeneration company and independent project ecologist
- Satisfactory installation and maintenance of all protective fencing (permanent and temporary), tree protection zones, as well as sediment and erosion control measures
- Ongoing application of rabbit baiting
- Satisfactory completion of revegetation planting works including planting of tree, shrub and ground cover species at the required densities and direct seeding works
- Satisfactory completion of primary weed control works
- Satisfactory completion of secondary weed control works and revegetation maintenance
- Satisfactory completion of nest box installation at 2:1 for all removed hollows
- Satisfactory completion of removal of temporary protection features
- Satisfactory achievement of restoration performance targets as shown on Schedule 1 – Vegetation Management Works and the restoration performance targets (Section 4.4)

4.4 Restoration performance targets

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

1. All protective fencing (temporary and permanent), sediment controls, and tree protection zones are to be installed prior to clearance of any vegetation.
2. Monitoring points and quadrats are to be installed prior to commencement of restoration works. Seven (7) points in total at approximate locations as marked on Schedule 1.
3. Fauna ecologist to mark hollow-bearing trees around the development and be present when any are required for removal. Nest box replacement in remnant bushland areas with a minimum of 10 nest boxes.
4. Weed control and revegetation works are to be carried out by a qualified bushland regeneration contractor for a minimum period of 1 year of primary and secondary works, and 5 years of maintenance works. Weed control targets should be a maximum of 15% cover at the end of year 1 for each zone progressing to less than 5% at the end of year 5.
5. Effective stabilisation of all lands and embankments.
6. Weed control prioritisation as per Attachment 1, where invasive vines have high or very high priorities.
7. All revegetation areas to be planted at densities specified in section 3 of the report and stabilised. It is expected that a minimum 90% survival rate is to be achieved and contingency planting undertaken if greater losses are experienced.
8. Revegetation is to be undertaken utilising certified local provenance collected seed preferably from sandstone vegetation types. A minimum of 25 native species are to be used across the entire site and specifically within the northern Biodiversity Corridor.
9. All revegetation areas are to be stabilised, plants protected from grazing animals and rabbit baiting continued throughout the entire 5 year maintenance period. Any damaged plants are to be replaced with new stock.
10. Supplementary tubestock planting in all direct seeded areas subject to expected plant establishment rates. A minimum 90% cover to be achieved in all areas
11. Within the Zone 7, a target of 90% groundcover, and a minimum 20% shrub layer shall apply at the end of year 3 (Zone 7). Fuel reduction is to be undertaken annually prior to the bushfire season to be OPA compliant (4-8 tonnes/ha).
12. All stormwater outlets are to be stabilised with geotextile overlain with rock boulders in accordance with NSW DPI - Office of Water's Controlled Activity Guidelines (2012) for stormwater outlets.
13. All works as per this VMP are to be certified compliant by a project ecologist achieving the restoration performance targets. Contingency works undertaken as recommended by the project ecologist to achieve the restoration performance targets.

4.5 Typical timeline of restoration works

The following typical timeline (Figure 7) is provided to indicate the overall timing of restoration works. The commencement of the maintenance period is subject to the completion of primary and secondary weed control works as certified by the project ecologist. A certificate of completion will be required as evidence of satisfactory results. The restoration works by the appointed bushland regeneration company and auditing by the independent project ecologist is to be undertaken for a minimum period of 5 years.

Upon engagement, contractors are expected to meet the following typical schedule of works.

Typical 1 + 5 year maintenance timeline

ID	Task Name	Duration	Primary and Secondary Restoration Works												Year 1 Maintenance												Year 2 Maintenance												Years 3-5		
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	3	4	5
1.0	PROJECT INITIATION	1 month	█	█																																					
1.1	Preparation of contract schedules	1 month	█	█																																					
1.2	Submission of fee proposals	3 weeks	█	█																																					
1.3	Contractor approvals & engagement of project ecologist	1 week	█	█																																					
2.0	SITE PREPARATION AND PROPAGATION				█	█	█	█	█	█	█	█																													
2.1	Install fencing or boundary markers	1 month		█	█																																				
2.2	Updated vegetation condition assessment & installation of monitoring plots	1 week		█	█																																				
2.3	Seed collection	6 months		█	█	█	█	█	█	█																															
2.4	Plant propagation (initial)	6 months				█	█	█	█	█	█	█																													
2.5	Jute meshing of unstable surfaces	1 week									█	█																													
2.6	Install sediment and erosion control measures	2 weeks									█	█																													
2.7	Creek line embankment installation and protection	Ongoing				█	█	█	█	█	█	█	█					█													█										
2.8	Monitor, audit & issue compliance certification	Ongoing				█	█	█	█	█	█	█	█																												
3.0	WEED CONTROL				█	█	█	█	█	█	█	█	█																												
3.1	Primary weed control	6 months			█	█	█	█	█	█																															
3.2	Secondary weed control	6 months						█	█	█	█	█	█																												
4.0	REVEGETATION ESTABLISHMENT	5 months										█	█	█	█	█																									
4.1	Installation of pest control - pindone baiting	2 weeks										█	█																												
4.2	Installation of plants with guards and initial watering	4 months										█	█	█	█																										
4.3	Direct seeding (Zone 1)	1 month										█	█																												
4.4	Additional watering for the first six (6) months	6 months										█	█	█	█	█																									
4.5	Weed control around revegetation areas	6 months										█	█	█	█	█																									
4.6	Issue construction compliance certification	1 week											█																												
5.0	BUSH REGENERATION & REVEGETATION MAINTENANCE																																								
5.1	Watering, maintenance, weed control and repairs	5 years																																							
5.2	Pest control - Pindone baiting	2 years																																							
5.3	Ongoing bushland regeneration of existing bushland areas	4 years																																							
6.0	MAINTENANCE PERIOD MANAGEMENT AUDITING AND MONITORING																																								
6.1	Contractor supervision / monitoring	5 years																																							
6.2	Ongoing supervision / auditing / monitoring	5 years																																							
6.3	Submission of compliance certification	5 years																																							
7.0	CONTINGENCY WORKS (Subject to Audits)	5 years																																							
7.1	Site preparation	2 weeks																																							
7.2	Replacement planting	1 month																			</																				

Figure 7 – Typical restoration timeline



Weed Control Priorities

A1

Table A1.1 – Weed control priorities

Scientific name	Common name	Family	Priority	Treatment techniques
<i>Acer negundo</i>	-	Aceraceae	Medium	Cut and paint with Glyphosate
<i>Acetosa sagittata</i>	Turkey Rhubarb	Polygonaceae	High	Herbicide spray; dig out bulbs
<i>Agapanthus praecox</i>	Agapanthus	Amaryllidaceae	Low	Dig out
<i>Ageratina adenophora</i>	Crofton Weed	Asteraceae	Medium	Hand pull; herbicide spray
<i>Ageratum houstonianum</i>	Blue Billygoat Weed	Asteraceae	Low	Hand pull; herbicide spray
<i>Amaranthus viridis</i>	Green Amaranth	Amaranthaceae	Low	Hand pull; herbicide spray
<i>Anagalis arvensis</i>	Scarlet Pimpernel	Primulaceae	Low	Hand pull; herbicide spray
<i>Andropogon virginicus</i>	Whisky Grass	Poaceae	Medium	Hand pull; herbicide spray
<i>Anredera cordifolia</i>	Madeira Vine	Basellaceae	Very High	Skirt and spray; bag and dispose of tubers. Consider using Starane
<i>Araujia sericifera</i>	Moth Vine	Apocynaceae	High	Hand pull; herbicide spray
<i>Asparagus aetheopicus</i>	Asparagus Fern	Asparagaceae	High	Dig out
<i>Avena sativa</i>	Oats	Poaceae	Low	Hand pull; herbicide spray
<i>Axonopus fissifolius</i>	Narrowleaf Carpet Grass	Poaceae	Low	Herbicide spray
<i>Bidens pilosa</i>	Cobblers Pegs	Asteraceae	Low	Hand pull; herbicide spray
<i>Briza maxima</i>	Quaking Grass	Poaceae	Low	Hand pull; herbicide spray
<i>Canna indica</i>	Indian Shot	Cannaceae	Low	Dig out
<i>Centaurium erythraea</i>	Pink Stars	Gentianaceae	Low	Hand pull; herbicide spray
<i>Centaurium tenuiflorum</i>	-	Gentianaceae	Low	Hand pull; herbicide spray
<i>Cestrum parqui</i>	Chilean Cestrum	Solanaceae	High	Cut and paint with Glyphosate
<i>Cinnamomum camphora</i>	Camphor Laurel	Lauraceae	High	Cut and paint with Glyphosate
<i>Colocasia esculenta</i>	Taro	Araceae	Low	Dig out
<i>Conyza sumatrensis</i>	Tall Fleabane	Asteraceae	Low	Hand pull; herbicide spray
<i>Coreopsis lanceolata</i>	Coreopsis	Asteraceae	Low	Hand pull; herbicide spray
<i>Cortaderia selloana</i>	Pampas Grass	Poaceae	Very High	Dig out; herbicide spray
<i>Cyperus brevifolius</i>	Mullumbimby Couch	Cyperaceae	Low	Hand pull; herbicide spray
<i>Cyperus congestus</i>	-	Cyperaceae	Low	Hand pull; herbicide spray
<i>Cyperus eragrostis</i>	Umbrella Sedge	Cyperaceae	Low	Hand pull; herbicide spray
<i>Delairea odorata</i>	Cape Ivy	Asteraceae	Very High	Skirt and spray
<i>Dipogon lignosus</i>	Dolichos Pea	Fabaceae	High	Skirt and spray
<i>Ehrharta erecta</i>	Panic Veldtgrass	Poaceae	Low	Hand pull; herbicide spray
<i>Epidendrum</i> sp.	Crucifix Orchid	Orchidaceae	Low	Dig out
<i>Erythrina crista-galli</i>	Coskspur Coral Tree	Fabaceae	High	Cut and paint with Glyphosate; dispose of branches

Table A1.1 – Weed control priorities

Scientific name	Common name	Family	Priority	Treatment techniques
<i>Erythrina X sykesii</i>	Coral Tree	Fabaceae	High	Cut and paint with Glyphosate; dispose of branches
<i>Euphorbia peplus</i>	-	Euphorbiaceae	Low	Hand pull; herbicide spray
<i>Gomphocarpus fruticosus</i>	Milkweed	Apocynaceae	Low	Hand pull; herbicide spray
<i>Hedychium gardnerianum</i>	Ginger Lily	Anthericaceae	Medium	Dig out
<i>Heliotropium amplexicaule</i>	Blue Heliotrope	Boraginaceae	Low	Hand pull; herbicide spray
<i>Hydrocotyle bonariensis</i>	Pennywort	Apiaceae	Low	Herbicide spray
<i>Hypochaeris radicata</i>	Flatweed	Asteraceae	Low	Hand pull; herbicide spray
<i>Impatiens walleriana</i>	Busy Lizzie	Balsaminaceae	Low	Hand pull; herbicide spray
<i>Ipomoea indica</i>	Blue Morning Glory	Convolvulaceae	Very High	Skirt and spray
<i>Lantana camara</i>	Lantana	Verbenaceae	High	Cut and paint with Glyphosate; hand pull; herbicide spray
<i>Ligustrum lucidum</i>	Broad-leaved Privet	Oleaceae	High	Cut and paint with Glyphosate; hand pull; herbicide spray
<i>Ligustrum sinense</i>	Small-leaved Privet	Oleaceae	High	Cut and paint with Glyphosate; hand pull; herbicide spray
<i>Lilium formosanum</i>	-	Liliaceae	Low	Dig out; herbicide spray
<i>Lonicera japonica</i>	Honeysuckle	Caprifoliaceae	Very High	Skirt and spray, scrape and paint
<i>Ludwigia peruviana</i>	-	Onagraceae	Very High	Dig out as much of the root system as possible, bag and dispose all material
<i>Modiola caroliniana</i>	Red-flowered Mallow	Malvaceae	Low	Herbicide spray
<i>Monstera deliciosa</i>	-	Araceae	Low	Hand pull; dig out; cut and paint with Glyphosate
<i>Morus alba</i>	Mulberry	Moraceae	Low	Cut and paint with Glyphosate
<i>Musa acuminata</i>	Banana	Musaceae	Low	Cut and paint with Glyphosate
<i>Nephrolepis cordifolia</i>	Fish-bone Fern	Davalliaceae	Medium	Dig out
<i>Paspalum dilatatum</i>	Paspalum	Poaceae	Low	Hand pull; herbicide spray
<i>Paspalum quadrifarium</i>	Tussock Paspalum	Poaceae	High	Hand pull; herbicide spray
<i>Paspalum urvillei</i>	Vasey Grass	Poaceae	Low	Hand pull; herbicide spray
<i>Passiflora edulis</i>	Passionfruit	Passifloraceae	Low	Hand pull; herbicide spray
<i>Pennisetum clandestinum</i>	Kikuyu	Poaceae	Low	Herbicide spray
<i>Phyllostachys</i> sp.	Bamboo	Poaceae	Very High	Cut and paint with herbicide
<i>Phytolacca octandra</i>	Inkweed	Phytolaccaceae	Low	Hand pull; herbicide spray
<i>Plantago lanceolata</i>	Ribwort	Plantaginaceae	Low	Hand pull; herbicide spray
<i>Populus deltoides</i> (or <i>Populus</i> sp.)	Eastern Cottonwood	Salicaceae	Low	Cut and paint with Glyphosate
<i>Ranunculus repens</i>	Creeping Buttercup	Ranunculaceae	Low	Herbicide spray
<i>Ricinis communis</i>	Castor Oil Plant	Euphorbiaceae	High	Cut and paint with Glyphosate; hand pull; herbicide spray
<i>Rubus fruticosus</i> ssp. agg.	Blackberries	Rosaceae	Very High	Herbicide spray; dig out
<i>Rumex crispus</i>	Curled Dock	Polygonaceae	Low	Herbicide spray
<i>Salix babylonica</i>	Weeping Willow	Salicaceae	High	Cut and paint with Glyphosate; stem injection

Table A1.1 – Weed control priorities

Scientific name	Common name	Family	Priority	Treatment techniques
<i>Senecio madagascariensis</i>	Fireweed	Asteraceae	Medium	Hand pull; herbicide spray
<i>Senna pendula</i> var. <i>glabrata</i>	-	Fabaceae	Medium	Cut and paint with Glyphosate; hand pull; herbicide spray
<i>Setaria parvifolia</i>	Slender Pigeon Grass	Poaceae	Low	Herbicide spray
<i>Sida rhombifolia</i>	Paddy's Lucerne	Malvaceae	Low	Herbicide spray
<i>Solanum americanum</i>	Glossy Nightshade	Solanaceae	Low	Hand pull; herbicide spray
<i>Solanum mauritianum</i>	Tobacco Bush	Solanaceae	Low	Cut and paint with Glyphosate; herbicide spray
<i>Solanum nigrum</i>	Blackberry Nightshade	Solanaceae	Low	Hand pull; herbicide spray
<i>Stenotaphrum secundatum</i>	Buffalo Grass	Poaceae	Low	Herbicide spray
<i>Taraxacum officinale</i>	Dandelion	Asteraceae	Low	Hand pull; herbicide spray
<i>Tradescantia albiflora</i>	Wandering Jew	Commelinaceae	High	Rake; herbicide spray with Starane
<i>Trifolium dubium</i>	Yellow Suckling Clover	Fabaceae	Low	Herbicide spray
<i>Trifolium fragiferum</i>	Strawberry Clover	Fabaceae	Low	Herbicide spray
<i>Trifolium repens</i>	White Clover	Fabaceae	Low	Herbicide spray
<i>Verbascum virgatum</i>	Twiggy Mullein	Scrophulariaceae	Low	Hand pull; herbicide spray
<i>Verbena bonariensis</i>	Purple Top	Verbenaceae	Low	Hand pull; herbicide spray
<i>Verbena quadrangularis</i>	Flaxleaf Fleabane	Verbenaceae	Low	Hand pull; herbicide spray
<i>Zantedeschia aethiopica</i>	Arum Lily	Araceae	Low	Dig out; herbicide spray



Revegetation List

A2

Table 2.1 provides a list of recommended species for revegetation works across the site. Approximately 95% of species occur either on site or on adjoining land blocks, with a few additional species added for macrophyte planting.

For the purposes of those species listed below, trees are generally species that are expected to grow to 8m or taller in height and shrubs are typically 0.5-8m in height at maturity.

Table A2.1 – Revegetation list

Scientific name	Common name	Family	Management Zone
Trees			
<i>Allocasuarina littoralis</i>	Black She-oak	Casuarinaceae	1
<i>Angophora costata</i>	Smooth-barked Apple	Myrtaceae	1 2 4
<i>Acacia decurrens</i>	Black Wattle	Mimosaceae	1 2
<i>Acacia parramattensis</i>	Sydney Green Wattle	Mimosaceae	1 2
<i>Banksia serrata</i>	Old Man Banksia	Proteaceae	1 2
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	Sterculiaceae	1 2
<i>Casuarina glauca</i>	Swamp Oak	Casuarinaceae	2
<i>Corymbia gummifera</i>	Red Bloodwood	Myrtaceae	1 2
<i>Corymbia maculata</i>	Spotted Gum	Myrtaceae	1 2 4
<i>Eucalyptus botryoides</i>	Southern Bangalay	Myrtaceae	1 2
<i>Eucalyptus deanei</i>	Mountain Blue Gum	Myrtaceae	1 2 4
<i>Eucalyptus haemastoma</i>	Scribbly Gum	Myrtaceae	1 2 4
<i>Eucalyptus paniculata</i>	Grey Ironbark	Myrtaceae	1 2
<i>Eucalyptus piperita</i>	Sydney Peppermint	Myrtaceae	1 2
<i>Eucalyptus punctata</i>	Grey Gum	Myrtaceae	1 2 4
<i>Eucalyptus robusta</i>	Swamp Mahogany	Myrtaceae	2
<i>Eucalyptus sieberi</i>	Silvertop Ash	Myrtaceae	1
<i>Melaleuca quinquenervia</i>	Broad-leaved Tea Tree	Myrtaceae	2
<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	Myrtaceae	2
Shrubs			
<i>Acacia floribunda</i>	Sally Wattle	Mimosaceae	1 2 4
<i>Acacia linifolia</i>	Flax Wattle	Mimosaceae	1 2 4
<i>Acacia longifolia</i>	Sydney Golden Wattle	Mimosaceae	1 2 4
<i>Acacia suaveolens</i>	Sweet Scented Wattle	Mimosaceae	1 2 4
<i>Acacia terminalis</i>	Sunshine Wattle	Mimosaceae	1 2 4
<i>Acacia ulicifolia</i>	Prickly Moses	Mimosaceae	1 2 4
<i>Banksia ericifolia</i>	Heath-leaved Banksia	Proteaceae	2
<i>Banksia oblongifolia</i>	-	Proteaceae	2
<i>Banksia spinulosa</i>	Hairpin Banksia	Proteaceae	1 2 4
<i>Callicoma serratifolia</i>	Black Wattle	Cunoniaceae	2
<i>Callistemon citrinus</i>	Crimson Bottlebrush	Myrtaceae	1 2 4
<i>Ceratopetalum gummiferum</i>	Christmas Bush	Cunoniaceae	1 2 4
<i>Crocea saligna</i>	Lance-leaf Crocea	Rutaceae	1 4
<i>Dillwynia floribunda</i> var. <i>floribunda</i>	Parrot Pea	Fabaceae	1 2 4
<i>Dillwynia retorta</i>	Eggs and Bacon	Fabaceae	1 2 4

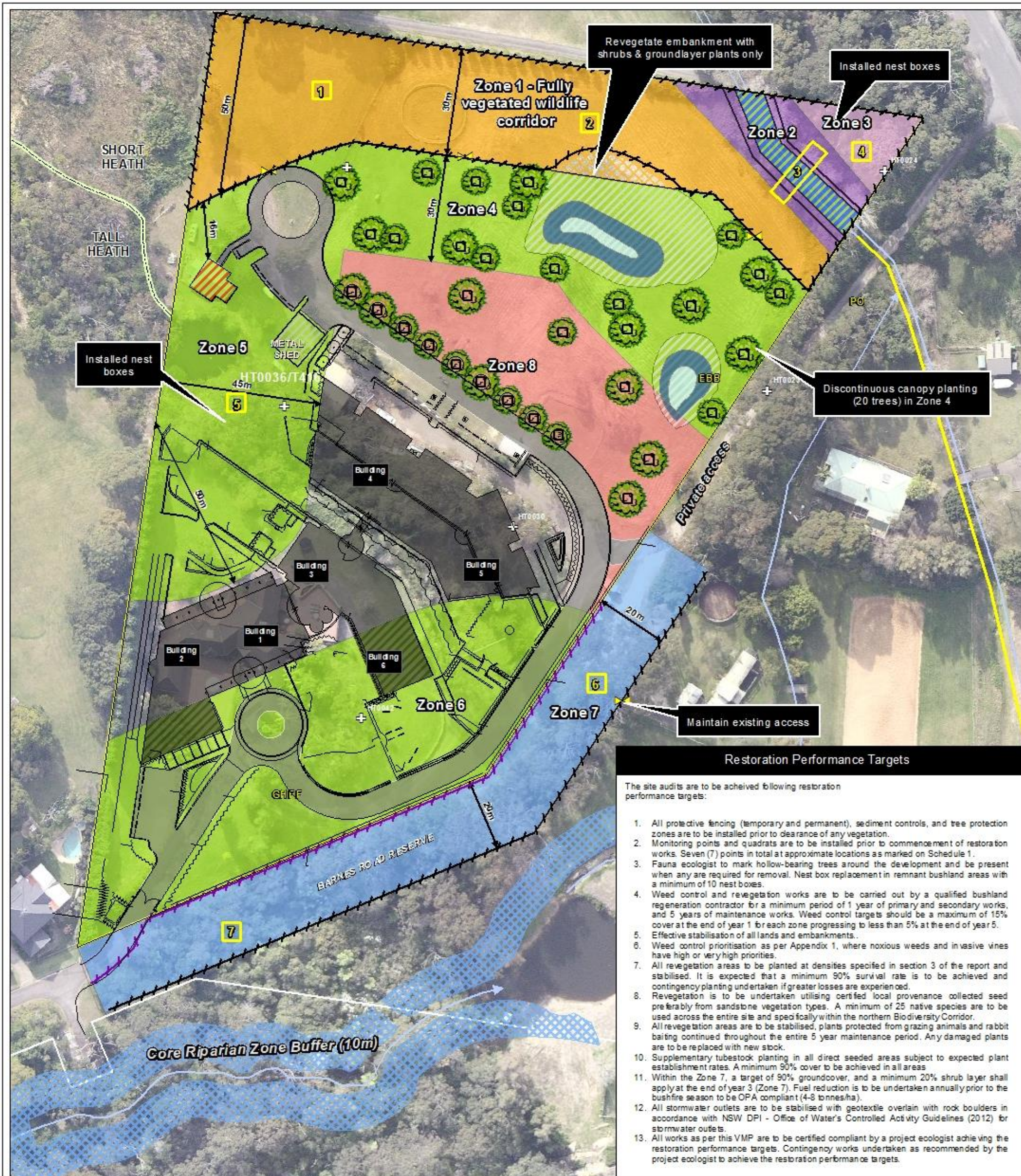
Table A2.1 – Revegetation list

Scientific name	Common name	Family	Management Zone
<i>Dodonaea triquetra</i>	Hop Bush	Sapindaceae	1 2 4
<i>Elaeocarpus reticulatus</i>	Blueberry Ash	Elaeocarpaceae	1 2
<i>Epacris crassifolia</i>	-	Epacridaceae	1 2 4
<i>Eriostemon australasius</i>	Pink Wax Plant	Rutaceae	1 4
<i>Grevillea buxifolia</i>	Grey Spider Flower	Proteaceae	1 4
<i>Grevillea speciosa</i>	Red Spider Flower	Proteaceae	1 4
<i>Hakea sericea</i>	Silky Hakea	Proteaceae	1 2 4
<i>Hakea teretifolia</i>	Dagger Hakea	Proteaceae	1 2 4
<i>Hibbertia aspera</i>	-	Dilleniaceae	1 4
<i>Kunzea ambigua</i>	Tick Bush	Myrtaceae	1 4
<i>Leptospermum polygalifolium</i>	Tantoon	Myrtaceae	1 2 4
<i>Melaleuca ericifolia</i>	Swamp Paperbark	Myrtaceae	2
<i>Ozothamnus diosmifolius</i>	Ball Everlasting	Asteraceae	1 2 4
<i>Persoonia lanceolata</i>	Lance-leaved Geebung	Proteaceae	1 4
<i>Persoonia levis</i>	Broad-leaved Geebung	Proteaceae	1 4
<i>Persoonia pinifolia</i>	Pine-leaved Geebung	Proteaceae	1 4
<i>Phebalium squamulosum</i> subsp. <i>squamulosum</i>	-	Rutaceae	1 4
<i>Pimelea linifolia</i>	Slender Rice Flower	Thymeleaceae	1 4
<i>Platylobium formosum</i>	Handsome Flat-pea	Fabaceae	1 4
<i>Platysace linearifolia</i>	Narrow-leaved Platysace	Apiaceae	1 4
<i>Pultenaea daphnoides</i>	Large-leaf Bush-pea	Fabaceae	1 4
<i>Pultenaea stipularis</i>	-	Fabaceae	1 4
<i>Viminaria juncea</i>	Native Broom	Fabaceae	1 4
Vines			
<i>Billardiera scandens</i>	Apple Dumplings	Pittosporaceae	1
<i>Cayratia clematidea</i>	Slender Grape	Vitaceae	1
<i>Cissus hypoglauca</i>	Water Vine	Vitaceae	2
<i>Hardenbergia violacea</i>	False Sarsaparilla	Fabaceae	1 2
<i>Eustrephus latifolius</i>	Wombat Berry	Luzuriagaceae	1
<i>Kennedia rubicunda</i>	Dusky Coral-pea	Fabaceae	1 2
<i>Smilax glycyphylla</i>	Sarsaparilla	Smilacaceae	1
Herbs and Grasses			
<i>Austrostipa pubescens</i>	Tall Spear Grass	Poaceae	1 2 4
<i>Carex appressa</i>	Tall Sedge	Cyperaceae	2
<i>Centella asiatica</i>	Swamp Pennywort	Apiaceae	1 2 4
<i>Commelina cyanea</i>	Scurvy Weed	Commelinaceae	1 2 4
<i>Dianella caerulea</i>	Flax Lily	Phormiaceae	1 2 4
<i>Dianella prunina</i>	-	Phormiaceae	1 2 4
<i>Dichelachne crinita</i>	Long-hair Plume Grass	Poaceae	1 2 4
<i>Echinopogon caespitosus</i>	Tufted Hedgehog Grass	Poaceae	1 2 4
<i>Eleocharis sphacelata</i>	-	Cyperaceae	2
<i>Entolasia marginata</i>	Bordered Panic	Poaceae	1 2 4
<i>Entolasia stricta</i>	Wiry Panic	Poaceae	1 2 4
<i>Gahnia clarkei</i>	Saw Sedge	Cyperaceae	2
<i>Hydrocotyle peduncularis</i>	Pennywort	Apiaceae	1 2 4
<i>Imperata cylindrica</i>	Blady Grass	Poaceae	1 2 4
<i>Juncus usitatus</i>	Common Rush	Juncaceae	2
<i>Lomandra longifolia</i>	Spiky-headed Mat-rush	Lomandraceae	1 2 4
<i>Microlaena stipoides</i>	Weeping Grass	Poaceae	1 2 4
<i>Oplismenus imbecillis</i>	-	Poaceae	1 2 4
<i>Schoenoplectus validus</i>	-	Cyperaceae	2



Vegetation Management Works

S1



Legend

Subject site	Jute mat/mesh creek line embankments	Zone 2 - Riparian restoration and revegetation (1050m²)	Permanent 2.5m square x 1m high post and rail fence	Tree to be retained with Tree Protection Zone (TPZ)
Lot boundary (Lot 2873 DP 824283)	Basin and embankment planting as per landscaping plans (John Chetham & Associates)	Zone 3 - Remnant Vegetation Bushland regeneration (450m²)	Monitoring quadrat with photopoints (Minimum of 5x5m)	Tree for removal
Access road and carpark	Macrophyte planting	Zone 4 - Northern APZ (IPZA) (5300m²)	Temporary construction proof fence with sediment control fence (1.8m high and relocatable)	Install access gates
Proposed building envelope (SFPP)	Open water	Zone 5 - Western APZ (IPA) (4100m²)	Permanent rural type fence (5 - plain wire rural strand)	Habitat tree
Proposed building envelope (other uses)	Management Zones	Zone 6 - Southern APZ (IPA) and Landscaping as per Landscape Plans (6700m²)		Eastern Bentwing-bat
Stream Order 1	Zone 1a - Northern Biodiversity Corridor (5250m²)	Zone 7 - Southern APZ (OPA) (4250m²)		Powerful Owl
	Zone 1b - Shrub & ground layer planting only (150m²)	Zone 8 - Landscaping with Native Canopy Planting (3300m²)		



PROJECT & M&D REFERENCE
Barnes Road, Frenchs Forest
A16087_V001

DATE & ISSUE NUMBER
6/07/2016
Issue 1

SCALE & COORDINATE SYSTEM
1:1,000 @ A3
GDA 1994 MGA Zone 56

Schedule 1- Vegetation Management Works

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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.