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DoP ref: SSD 9741
NSW RFS ref: D18/8341

6 September 2019

A W Edwards Pty Ltd
Level 1, 131 Sailors Bay Road
Northbridge NSW 2063

Attention: Mr D DiPaolo

Dear Dino



**Re: Lane Cove Data Centre – summary of changes for resubmission
Addendum Bushfire Protection Assessment, Vegetation Management Plan,
Watercourse Assessment Report
1 Sirius Road, Lane Cove West**

Travers bushfire & ecology (TBE) has been requested to provide a summary of the changes undertaken to the following reports since the previous July issue of the reports;

- Watercourse Assessment Report – dated July 2019
- Vegetation Management Plan – dated August 2019
- Tree Assessment Report – dated August 2019
- Bushfire Protection Assessment Report (addendum) – dated August 2019

The changes to these reports were a result of the revised scheme and layout of the proposed Lane Cove Data Centre as summarised below;

- reduced data hall footprint to increase the building setbacks from the western and eastern boundaries;
- increased building height (i.e. increase from five (5) stories to six (6) stories);
- diesel fuel storage has been moved from the basement level and the generators have been deleted from the roof and are now located on multiple storey platforms on the western, northern and eastern sides of the building; and
- modifications to the fire trail and access roads.

A summary of the changes to each of these reports is provided below:

Bushfire Protection Assessment Report (Addendum)

The most recent addendum bushfire report prepared in August provided a Table within the executive summary outlining the revised schemes compliance with the conditions of consent issued by the NSW RFS. The changes within the August report since the issue of the bushfire review undertaken by this firm via the 2 July 2019 letter include:

Asset Protection Zones

The revised scheme has resulted in a decrease to the building footprint and therefore provides for a larger 36m APZ to the west (previously 10m). This coupled with a BAL FZ construction to the western building façade will reduce the bushfire risk posed to the building and generators on this aspect.

There are no substantial changes to the APZ in the north, east or south-west.

It is understood that the revised scheme has been amended (in part) to address Lane Cove Council's response to consider the existing environment and to seek a better balance between site analysis, building design and environmental response. In particular Council raised concerns regarding the unacceptable loss of tree canopy and requested a larger proportion of the associated trees to be retained.

The revised scheme has reduced the extent of tree removal by amending the location of the substation to below the roadway deck, reconfiguring the fire trail and rearrangement of the car parking layout. The amended data centre location has resulted in the retention of a 10m strip of land along the western boundary (i.e. outside of the APZ). This will allow the retention / replanting of further trees along this boundary.

Water, Electricity and Gas

The revised scheme will maintain compliance with the requirements for water, electricity and gas. No substantial changes to these aspects of the design have been made since the issue of the bushfire review undertaken by this firm via the 2 July 2019.

Property Access

Changes to the driveway include the provision of property access road around the southern, western and northern perimeter of the data centre building. The previous design depicted an access road through the centre of the site between the office and the data centre (refer Figure 1 – access in grey)

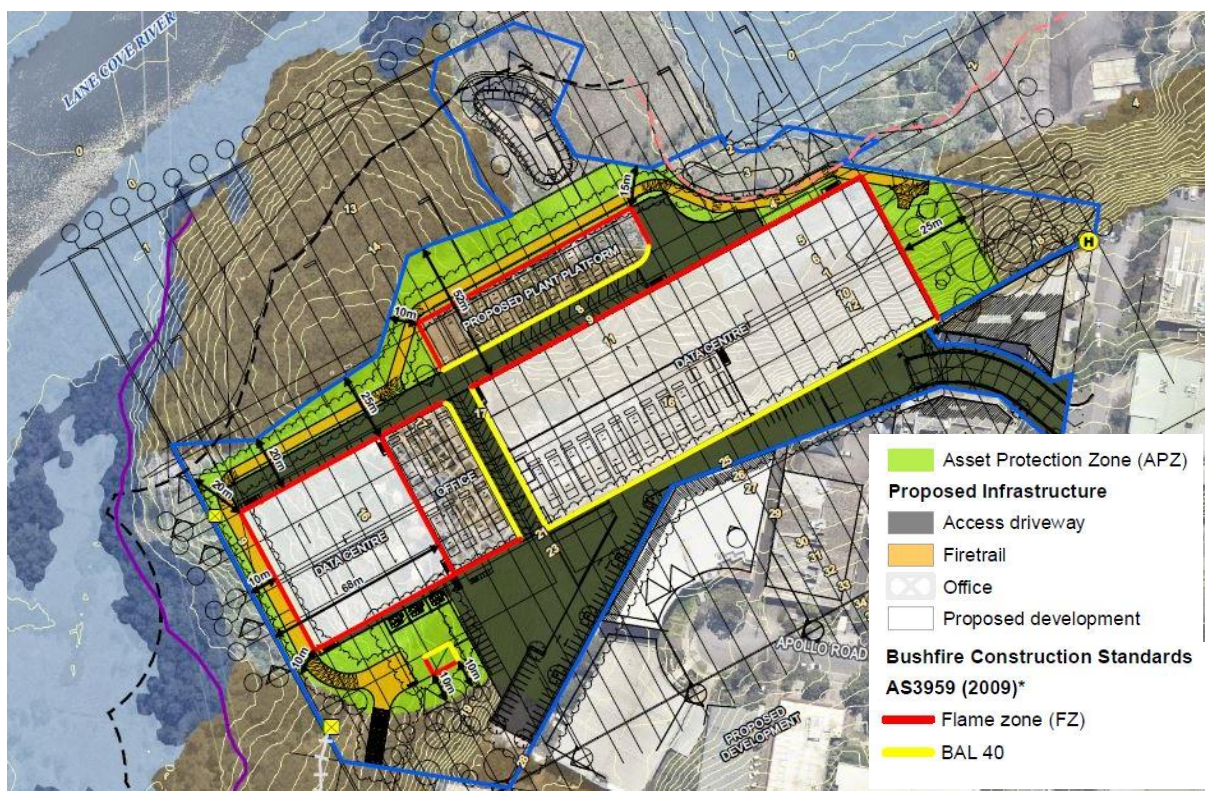


Figure 1 – Access design (July scheme)

(Source: Lane Cove Data Centre – bushfire review prepared by Travers bushfire & ecology, dated 2nd July 2019)

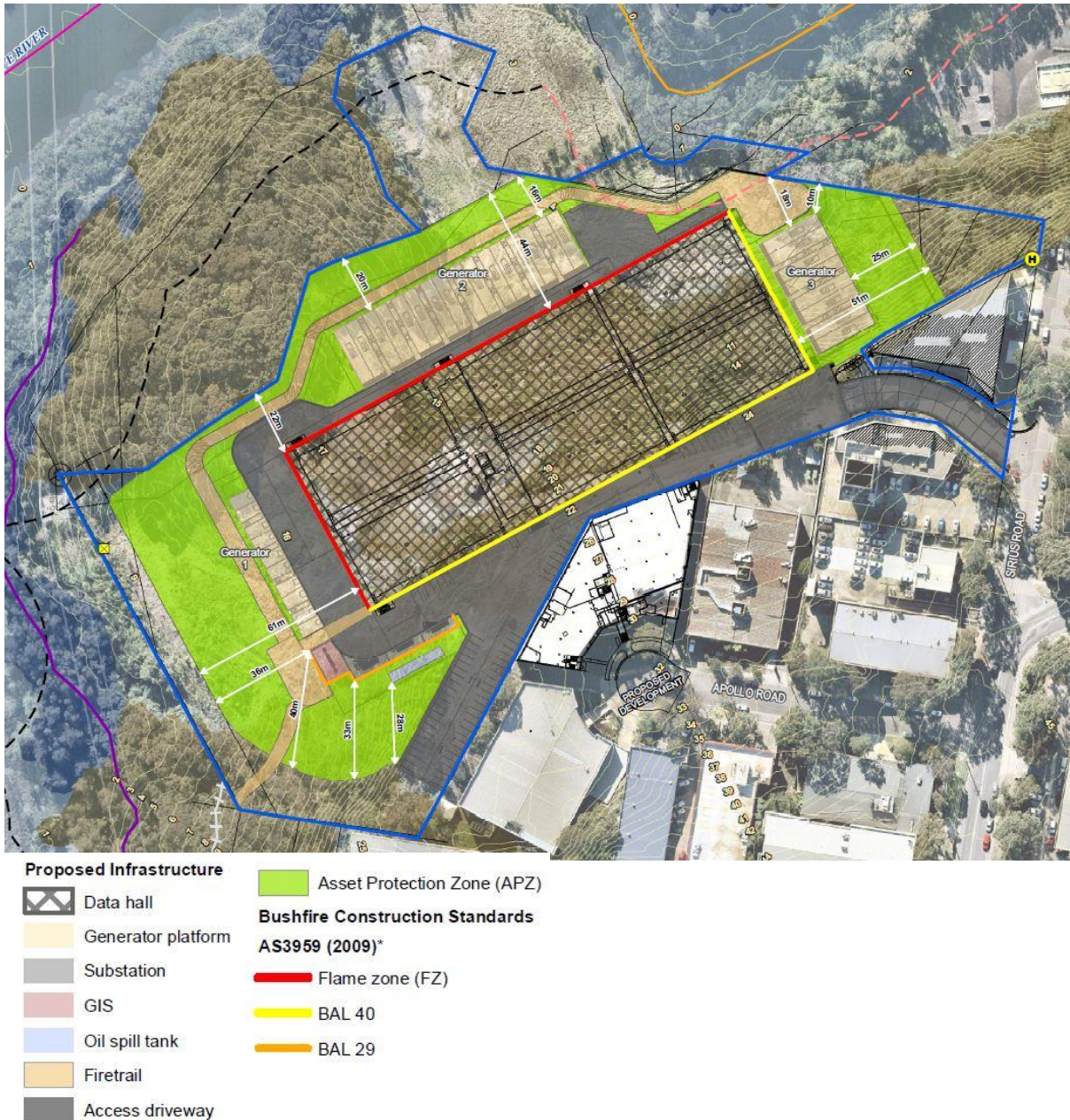


Figure 2 – Access design (new August scheme)

(Source: Bushfire Protection Assessment (addendum) prepared by Travers bushfire & ecology, dated August 2019)

As outlined in the addendum bushfire report the revised scheme maintains compliance with the NSW RFS conditions for private roads. The revised scheme provides additional firefighting access and increased defendable space around the perimeter of the building therefore improving the bushfire protection measures afforded to the development.

Fire Trails

The changes to the fire trail design are outlined in Figure 1 & 2 above. The general alignment of the fire trail in the north remains the same. The fire trail in the west now runs adjacent to the generator platform and not adjacent to the western boundary therefore allowing for the retention / regeneration of trees within the western site boundary.

As outlined in the bushfire protection assessment report the revised scheme will comply with the RFS condition to include the following:

- A minimum vertical clearance of 4 metres is provided to any overhanging obstructions (tree branches or the building itself).
- A passing bay passing bay will be provided every 200m (20m long by 3m wide (making a minimum trafficable width of seven metres).
- Turning heads will be designed to ensure Category 1 fire tankers can undertake a three (3) point maneuver.

It is noted that Council recommend a non-hard surface option to include polymer-based grass pavers, grids and geocell with inclusion of native grass species. These options can be considered and will take into account fire tanker capacity (15 tonnes) in order to comply with this condition and to take into consideration Councils request.

Emergency and Evacuation

The revised scheme will maintain compliance with the requirements for emergency evacuation. As outlined in the bushfire protection assessment report a bushfire evacuation plan will be prepared prior to occupation.

Building construction standards

Data centre

Changes in terms of building construction standards are highlighted in Figures 1 & 2. Based on the amended simplified design the roof, northern and western building facades of the data centre are to comply with BAL FZ. The remaining facades can step down to BAL 40. This is consistent with the recommendations from the NSW RFS.

Generator platforms

The location of the proposed generators and diesel fuel tanks have been amended in the new scheme. The previous scheme allowed for this infrastructure to be located on the roof. The proposed new scheme provides for three (3) separated generator platforms located on the outer extremities of the building (north, east and west). Based on the new locations these platforms will be constructed using non-combustible materials and will be housed within a non-combustible structure. In addition, radiant heat shields will be provided to prevent flame contact and reduce radiant heat exposure on the structures / machinery.

Substation

The revised scheme has resulted in a relocation of the substation to below the suspended roadway deck. The substation will be open with blast walls between each transformer. The blast walls, suspended roadway deck and asset protection zone will provide the required shielding to prevent flame zone contact and reduce radiant heat impact to the non-enclosed substation elements.

The GIS switch gear will be within a roofed enclosure, whilst the asset protection zone extent has not changed the amended location of the GIS switch gear has increased the setback afforded to the structure and it can therefore comply with a BAL 29 construction standard (as opposed to BAL FZ as per previous design).

Vegetation Management Plan

The following changes have been made to the document that was previously submitted 4 July 2019:

- Figure 2 updated plan
- No notable changes in section 1 or 2
- Changes made in section 3.1.4 regarding numbers of hollow-bearing trees to be consistent throughout the document. Numbers listed in July report in this section were incorrect.
- Section 3.3.1 updated to include more revegetation and restoration areas. New planting area in the south-western APZ to provide a managed bushland interface with vegetation offsite that will filter any development impacts to that bushland. A screen planting of canopy trees to be planted along north-western side of the development area to provide some partial screening to the development from residences near to Pittwater Road and Magdala Road. The screen planting will also assist in mitigating the loss of trees for the development proposal that will provide an overall replacement surplus. Areas of stormwater works at the peripheral edges of the site (south-west and north) to be mitigated through rock dissipaters and macrophyte planting to limit sediment and erosion impacts and contain them to the site.
- Section 3.3.3 updated. The fully-structured revegetation area has effectively been doubled in size. The density of planting remains the same however the number of plants has been increased to match the area of planting.
- Section 3.3.4 updated. The area of contaminated lands has been revised slightly and is slightly smaller. Numbers of plants revised to reflect the area change. The density of plantings is the same.
- APZ planting on western edge of site, screen planting in north-western APZ and macrophyte planting sections have been added to the report, detailing the type of plants, areas, densities and numbers. The number of trees being removed for the development was revised at 114. The proposed increase in revegetation works sees the planting of 120 trees, therefore essentially replacing those lost at a 1:1 ratio. The previous submission only had 43 trees to be planted. This provides a much more balanced outcome to the proposal. The overall number of plants to be re-established has increased from 14,610 to 29,818.
- Section 3.5 on hollow-bearing trees has been revised to match 3.1.4. Inconsistencies in the July report were noted.
- 1 additional paragraph added to section 4.2 (3rd last in section) regarding monitoring of stormwater outlet areas.
- Section 4.5 restoration performance targets updated to align with new planting numbers and to account for stormwater outlet areas.
- Table A1 updated planting densities and added macrophyte planting. Added species to the Swamp Oak Floodplain Forest & Ecotonal Species list.
- Schedule 1 - modifications based on CAD changes, outlet areas, updated APZs and additional planting areas.

Arborist Report

The following updates have been made to the tree report submitted 4 July 2019:

- In the executive summary, the number of trees being removed or retained has been altered to accommodate the change in development. There are 2 additional trees being retained than previous. The number of visually significant trees being removed has been reduced from 22 to 18.
- Figure 1 updated to show new layout of the development.
- The number of hollow-bearing trees being removed has changed from 9 to 8. The number of nest boxes proposed is at a ratio of 1:1 not 2:1. There will not be sufficient room to place more on site. This matches the proposed measures in the VMP.
- Section 4.1, 4.2 and 4.3 numbers updated.

- Section 6.1 numbers in conclusion updated.
- Schedule 1 trees removed vs retained updated to reflect the CAD and APZ. T-G026, T-G027 and T-G069 SRZ calculation added.
- Schedule 2 plan updated to show locations of trees removed / retained and the changed CAD and APZ.

Watercourse Assessment

The following updates have been made to the watercourse report submitted 17 July 2019:

- The table on the second page of the executive summary updated to show a larger gain in the riparian zone.
- Figures 2-8 showing new CAD.
- Figure 13-14 updated with new CAD and stormwater lines.
- Final paragraph in section 4.4.1 has the area of gain in riparian area noted.
- Page 34 setback numbers altered.
- Figure 15 updated with new CAD.
- Table 3 updated with riparian gain.
- Review the impacts in light of question from Council (please refer to attachment 1).

Should you require further assistance please contact the undersigned on 02 4340 5331 or at info@traverseecology.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

ATTACHMENT 1 - COUNCIL RESPONSE

Agency Issue	Response – Amended Scheme
<p><u>Lane Cove Council</u></p> <p>Reduction of Porous Surfaces:</p> <p>The proposed development would significantly reduce the amount of porous surfaces on the site which would significantly affect groundwater flows. The application proposes that 26% of total site area be retained as landscaped area. Although the proposal complies with the minimum 20% landscape requirements of Part E9 of the Lane Cove DCP, the proposal is not considered acceptable in this instance given the local landscape and environmental constraints.</p> <p>The site is unique in terms of its close proximity to adjoining Endangered Ecological Communities including Coastal Freshwater Swamp, Estuarine Swamp Oak Forest, and Estuarine Saltmarsh. These areas are downhill of the proposed Data Centre development. The topography and the reduction of approximately 74% of porous areas would result in significant increases of stormwater flowing directly into these sensitive areas.</p> <p>There does not appear to be an adequate or completed study on the overall impacts of the collecting, piping and redirecting a large percentage of the catchment area. An in-depth study needs to be carried out to determine the potential risks to the Ecologically Endangered and Sensitive Vegetation in close proximity.</p> <p>The proposal in its presentation is considered to be contrary to the objectives of Clause 6.3 Riparian Land in the Lane Cove LEP 2009 and Part H 4 (a) IV Bushland Protection of the Lane Cove DCP 2010. It would adversely impact the adjoining riparian land. The proposed drainage and hydraulics plan would see an unacceptable alteration to the water shed and the ground water recharge as well as putting a high volume of water into Stringybark Creek at times of heavy</p>	<p>In response to the concerns raised by Council, the proposed development has been reduced in size and the stormwater management system has been redesigned. This has resulted in a number of improvements.</p> <ul style="list-style-type: none"> • The buffer setback to the adjoining wetland to the west has been increased to 88m to the building wall and 57m to the proposed fire trail. In the July concept plan the separation distance was 27m to the proposed building wall and 21 m to the fire trail. • The proposed northern stormwater basin has been removed and incorporated into the design of the building in accordance with WSUD principles. These are in the form of OSD basins underneath the proposed building. • A stormwater outlet has been provided to the western aspect of the site to deliver stormwater from the site and delivered through a level spreader stormwater outlet system. • The northern outlet to Stringybark Creek has been retained, with an expected reduction in flows and two 2 outlets are delivered to Stringybark Creek at one point. <p>We make reference to the updated vegetation management plan (VMP) which illustrated concept stormwater outlets into Stringybark Creek and the western wetland areas such that the erosion is minimised at the discharge point.</p> <p>As a consequence of these design changes the porous area within the site has been increased to 38%, in addition, stormwater is internally managed and delivered to both Stringybark Creek and the adjoining western wetlands subject to the detailed design of the outlet structures as illustrated in the VMP, the impacts on both will be minimised.</p>

rains which would likely be detrimental to the local water quality and ecology.

At the moment rain falling on the site drains to the south and southwest feeding the wetland areas in Ventemans Reach Reserve. This must be preserved with any development. Some of the stormwater should continue to be directed towards south and southwest to the wetland areas in Ventemans Reach Reserve and controlled in its discharge by an Onsite Stormwater Detention (OSD) as well as subsurface drainage trenches so that the water is slowly released to the wetland and its vegetation. Stormwater directed to the north and Stringybark Creek must also be controlled by OSD and dissipation so that there is no scouring of the creek with the rush of large volumes of water in times of heavy rain.

It is recommended water sensitive urban design measures in the form of raingardens and other approved biofiltration measures be incorporated into the Hydraulic Engineering drawings to allow for enough volume of rainwater to continue to hydrate the Coastal Freshwater Swamp following best horticultural practices.

Council calls for a more considered approach which is more environmentally sophisticated and responsive to the collection and treatment of water. The environmentally sensitive areas such as the salt marsh, freshwater swamp forest and swamp oak forest and the riparian corridor require specialized treatment and design solutions that have not been demonstrated in the current submission.

The northern outlet is placed in an existing disturbed area which is to be discharged at an appropriate invert level (I.L) to minimise the risk of erosion within the adjoining mangrove areas.

The western outlet is also to be designed to deliver stormwater at an appropriate invert level (I.L) to minimise the risk channelisation and erosion within the wetland.



Travers

bushfire & ecology

Vegetation Management Plan

Lot 1, DP1151370
1 Sirius Road
Lane Cove West

August 2019
(REF: 18AWE02V)



Vegetation Management Plan

Lot 1, DP1151370
1 Sirius Road
Lane Cove West

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Date:	28 August 2019
File:	18AWE02V

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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.

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Attachments

Attachment 1	Recommended Planting List
Attachment 2	Target Weed Species
Attachment 3	Nest Box Specifications

Schedules

Schedule 1	Vegetation Management Works
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List of abbreviations

APZ	asset protection zone
BPA	bushfire protection assessment
BC Act	<i>Biodiversity Conservation Act 2016</i>
DCP	Development Control Plan
DEC	NSW Department of Environment and Conservation
DECC	NSW Department of Environment and Climate Change
DECCW	NSW Department of Environment, Climate Change and Water
DoEE	Federal Department of Environment and Energy(formerly SEWPAC)
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>
FF	flora and fauna assessment
FM Act	<i>Fisheries Management Act 1994</i>
FMP	fuel management plan
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
OPA	outer protection area
PBP	<i>Planning for Bush Fire Protection 2006: A Guide for Councils, Planners, Fire Authorities</i>
POEO	<i>Protection of the Environmental Operations Act 1997</i>
POM	plan of management
RF Act	<i>Rural Fires Act</i>
RFS	NSW Rural Fire Service
SIS	species impact statement
SOFF	Swamp Oak Floodplain Forest
VMP	vegetation management plan



Introduction

1

Travers bushfire & ecology has been engaged to prepare a vegetation management plan (VMP) for the lands located within Lot 1, DP1151370, 1 Sirius Road, Lane Cove West in the Lane Cove local government area (LGA).

Existing vegetation within the lot is composed of remnant native forest and exotic vegetation. This VMP has been prepared to enable the restoration of retained native vegetation within the site and to identify additional revegetation works appropriate to the site.

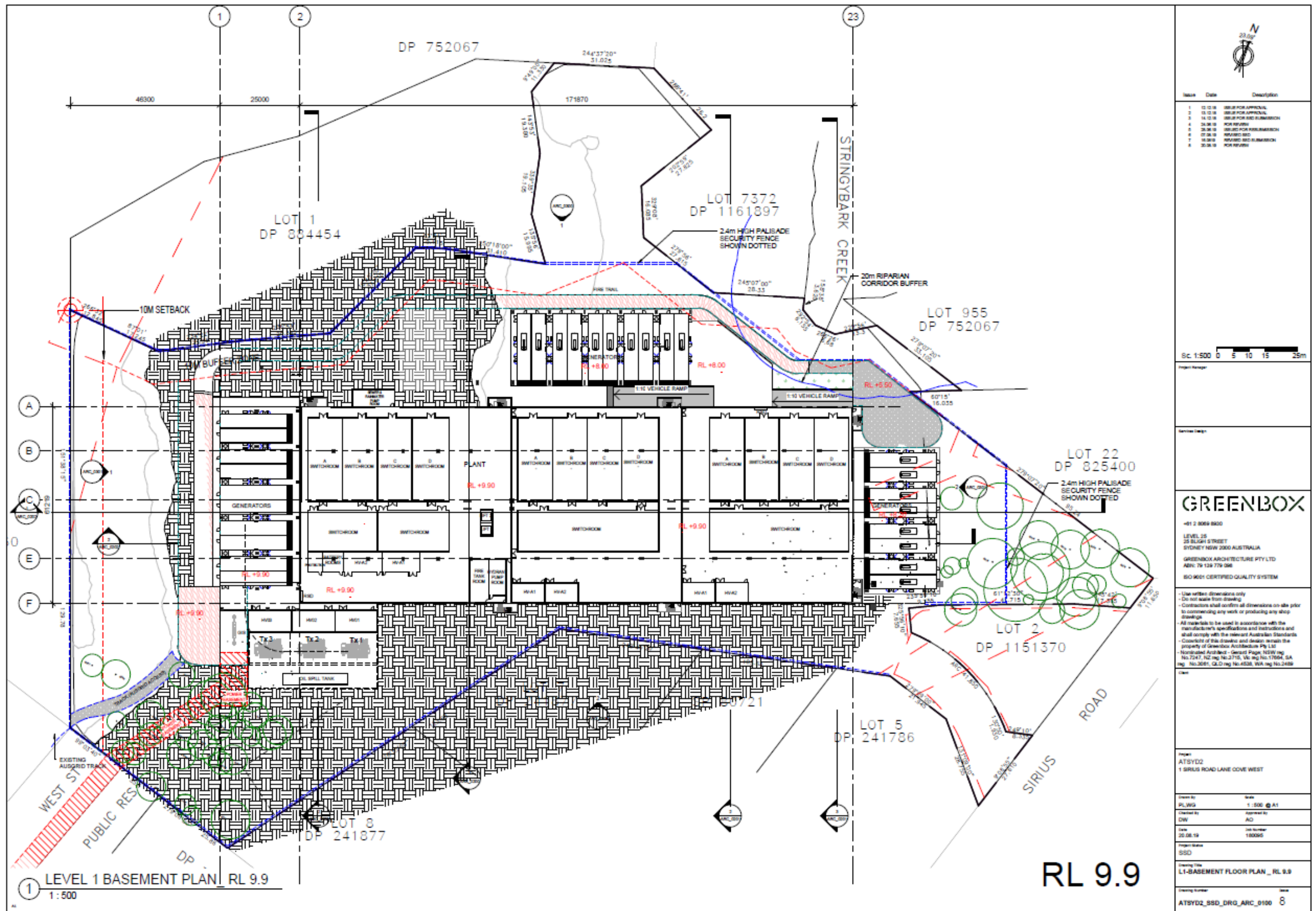
1.1 Proposed development

The proposal is for a Data Centre for cloud computing services. The proposed development would service development of the Metropolitan Sydney Region, ultimately providing an advanced facility to support the growth and development of IT infrastructure.

The proposed facility is a commercial venture and will be operated 24/7. The proposed development and surrounding landscape areas / APZ is shown in Figure 2.



Figure 1 – Study area
(Source: SIX Maps)



Issue	Date	Description
1	12/12/18	ISSUE FOR APPROVAL
2	13/12/18	ISSUE FOR APPROVAL
3	14/12/18	ISSUE FOR APPROVAL
4	24/01/19	FOR REVIEW
5	28/01/19	ISSUE FOR APPROVAL
6	07/08/19	ISSUED FOR APPROVAL
7	16/08/19	ISSUED FOR APPROVAL
8	20/08/19	FOR REVIEW

Scale: 1:500 0 5 10 15 25m

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- Contractors shall confirm all dimensions on-site prior to commencing any work or producing any shop drawings
- All materials to be used in accordance with the manufacturer's specifications and instructions and shall comply with the relevant Australian Standards
- Copyright of this drawing and design remain the property of Greenbox Architecture Pty Ltd
- Nominated Architect - Ground Page NSW reg No 7247, NZ reg No 3715, Vic reg No 17664, SA reg No 2091, QLD reg No 4538, WA reg No 2468

Project:
 ATSYD2
 1 SIRIUS ROAD LANE COVE WEST

Drawn by	Scale
PLW/G	1:500 @ A1
Checked by	Approved by
DW	AO
Date	Job Number
20/08/19	180095
Project Status	Sheet Number
SSD	8
Drawing Title	Sheet
L1-BASEMENT FLOOR PLAN, RL 9.9	8
Drawing Number	Sheet
ATSYD2_SSD_DRG_ARC_0100	8

Figure 2 – Detailed master plan (Source: Greenbox Architecture Pty Ltd, 16/08/2019)

1.2 Aims of the vegetation management plan

The following objectives for the VMP include:

- To protect, restore and maintain retained native vegetation.
- To revegetate selected areas with appropriate native vegetation of local provenance.
- Maximise native vegetation cover and species diversity within the restoration areas.
- Minimise weed cover to ensure long term establishment of native vegetation
- Undertake monitoring, auditing and maintenance activities to ensure an effective and a resilient restoration outcome.
- Ensure compliance with the development consent and this VMP.

Schedule 1 of this VMP provides a layout of VMP works and the performance targets to be achieved by contractors undertaking restoration works. The VMP provides guidelines for how the restoration works are to be undertaken and is subject to compliance certification.



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	Lot 1, DP1151370, 1 Sirius Road, Lane Cove West
Size	Approximately 3.957 ha
Grid reference	328287E 6257617N
Elevation	Approximately 2–25m AHD
Topography	Situated in a moderate to very steep slope with a north-western aspect.
Geology and soils	<p>Geology: Hawkesbury Sandstone – Medium to coarse grained quartz sandstone, very minor shale and laminate lenses.</p> <p>Soils: GyMEA – shallow to moderately deep (30-100 cm) Yellow Earths (Gn2.24) and Earthy Sands (Uc5.11, Uc5.23) on crests and inside of benches; shallow (<20 cm) Siliceous Sands (Uc1.21) on leading edges of benches; localised Gleyed Podzolic Soils (Dg4.21) and Yellow Podzolic Soils (Dy4.11, Dy5.11, Dy5.41) on shale lenses; shallow to moderately deep (<100 cm) Siliceous Sands (Uc1.21) and Leached Sands (Uc2.21) along drainage lines.</p>
Catchment and drainage	Parramatta river catchment. Overland flow into Stringybark Creek in the north and Lane Cove River in the west which discharges into Parramatta River. No streams or waterbodies occur the study area.
Vegetation	Remnant forest and exotic vegetation.
Existing land use	Vacant. Zoned IN2 - light industrial.
Clearing	>80% of the original vegetation has been cleared.

2.2 Vegetation descriptions

Vegetation communities observed within the study site include:

- Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (PCT 1776)
- Disturbed land / exotics

Smooth-barked Apple - Red Bloodwood open forest on enriched sandstone slopes around Sydney and the Central Coast (PCT 1776)

This vegetation community is located in the north eastern and south western corners of the study site.

Canopy – Dominated by *Angophora costata*, *Eucalyptus piperita* and *Eucalyptus resinifera* with occasional *Corymbia gummifera* and *Eucalyptus pilularis* to a height of 30m and with a projected foliage cover (PFC) of 35–45%.

Midstorey – *Acacia parramattensis*, *Acacia suaveolens*, *Allocasuarina littoralis*, *Dodonaea triquetra*, *Grevillea buxifolia*, *Micrantheum ericoides*, *Notelaea longifolia*, *Woollsia pungens*, *Zieria pilosa*, *Elaeocarpus reticulatus* and *Glochidion ferdinandi* with a PFC of 5–25%.

Groundlayer – The groundlayer contained a high cover and species richness of native grasses, forbs and sedges including *Austrostipa pubescens*, *Entolasia stricta*, *Gonocarpus teucroides*, *Imperata cylindrica*, *Lepidosperma laterale*, *Lomandra longifolia* and *Lomandra multiflora* subsp. *multiflora* with a PFC of up to 40%. Portions of the vegetation community have been underscrubbed, resulting in the thinning, and in some instances the complete removal, of the midstorey.

The condition of this vegetation community is variable with some areas in a relatively undisturbed condition with low levels of exotic species, particularly woody weeds, while other areas have been disturbed, resulting in a high cover of woody weeds, such as *Cinnamomum camphora*, *Ligustrum lucidum*, *Ligustrum sinense*, *Robinia pseudoacacia* and *Ochna serrulata*.



Photo 1 – Smooth-barked Apple - Red Bloodwood open forest (PCT 1776) in the north-eastern corner of the site.



Photo 2 – Smooth-barked Apple - Red Bloodwood open forest (PCT 1776) in the southern corner of the site.



Photo 3 – Smooth-barked Apple - Red Bloodwood open forest (PCT 1776) with shrub layer dominated by exotic shrubs *Ligustrum sinense* and *Lantana camara*.

Disturbed land / exotics

This vegetation community covers the majority of the entire site and is dominated by exotic trees, shrubs and groundcovers including *Ligustrum sinense*, *Ligustrum lucidum*, *Cinnamomum camphora*, *Robinia pseudoacacia*, *Lantana camara*, *Rubus fruticosus* spp. agg., *Ageratina adenophora*, *Asparagus aethiopicus*, *Cenchrus clandestinus*, *Cirsium vulgare*, *Ochna serrulata*, *Ehrharta erecta* and *Eragrostis curvula*.



Photo 4 – Disturbed land / exotics in the south-west of the site looking south-west.



Photo 5 – Disturbed land / exotics in the centre of the site looking east.



Photo 6 – Disturbed land / exotics in the centre of the site looking north.

2.3 Vegetation condition and connectivity

There are two (2) main patches of native vegetation within, and extending off, the site in the north-east and south of the lot. The north-eastern patch contributes to a connective corridor running east to west parallel to Stringy Bark Creek, which links vegetation further upstream with riparian vegetation along the eastern bank of Lane Cove River. The condition of this vegetation is variable, with some areas in a relatively undisturbed condition, while other areas have been disturbed, resulting in a high or dense cover of woody weeds. The remainder of the site is in poor to very poor condition with vegetation comprised of exotic species.

Ultimately, the proposal will reduce the width of the corridor but will not break any local vegetative connectivity attributes, nor isolate any remnant patches of vegetation worthy of conservation for local flora or fauna.

2.4 Riparian features

Stringybark Creek (2nd order stream) occurs just to the north of the lot and outside the restoration areas (see Schedule 1). A 20m riparian buffer from the top of bank extends into the study area (see Schedule 1) and is to be revegetated as specified in this VMP.

Lane Cove River is to the north-western aspect of the site and as a high order stream it attracts a 40m riparian buffer from top of bank. This buffer impacts the north-western portion and the western corner of the lot.

The Lane Cove Local Environment Plan (LEP) mapping (2009) identifies a portion in the north of the site as Riparian Land.

Regarding “riparian land”, Lane Cove LEP states:

Development consent must not be granted for development on land to which this clause applies unless the consent authority has considered the impact of the proposed development on the land and any opportunities for rehabilitation of aquatic and riparian vegetation and habitat on that land.



Figure 3 – Riparian land mapping (Lane Cove LEP mapping 2009)



Photo 7 – Edge of Stringybark Creek just outside the northern boundary of the lot.

2.5 Contaminated land

A current contaminated lands notice applies to an area the north-east of the lot (formerly Lot 2 DP 884454 and Lot 1 DP 546860 before that). This notice states that:

- (a) *The recipient must obtain the prior written approval of the EPA to any works that are to be carried out on the land, whether or not the works are carried out by the recipient, for the purposes of:*
 - (i) *Covering, dispersing or reducing the contamination of the land; or*

- (ii) Restoring or rehabilitating the land; or
 - (iii) Removing or disposing of any soil, sand, rock, water, or any other solid or liquid material of any kind from the land; and
- (b) The recipient must maintain the land in a manner that maintains the integrity and impermeability of the clay capping which is on the land, including selection of vegetation with root systems that do not grow into the clay capping layer; and
- (c) The recipient must not undertake any work, or cause, permit or allow the undertaking of any work which would result in any disturbance to, or modification of the clay capping layer unless the prior written approval of the undertaking has been obtained from the EPA and the work is undertaken in accordance with any conditions of that approval.

A remediation action plan is to be prepared by *Sinversa* that sets out strategies to contain and manage the contaminated soil within the contaminated lands. These remediation works are to be completed before the implementation of any restoration works specified in this VMP within the contaminated lands.

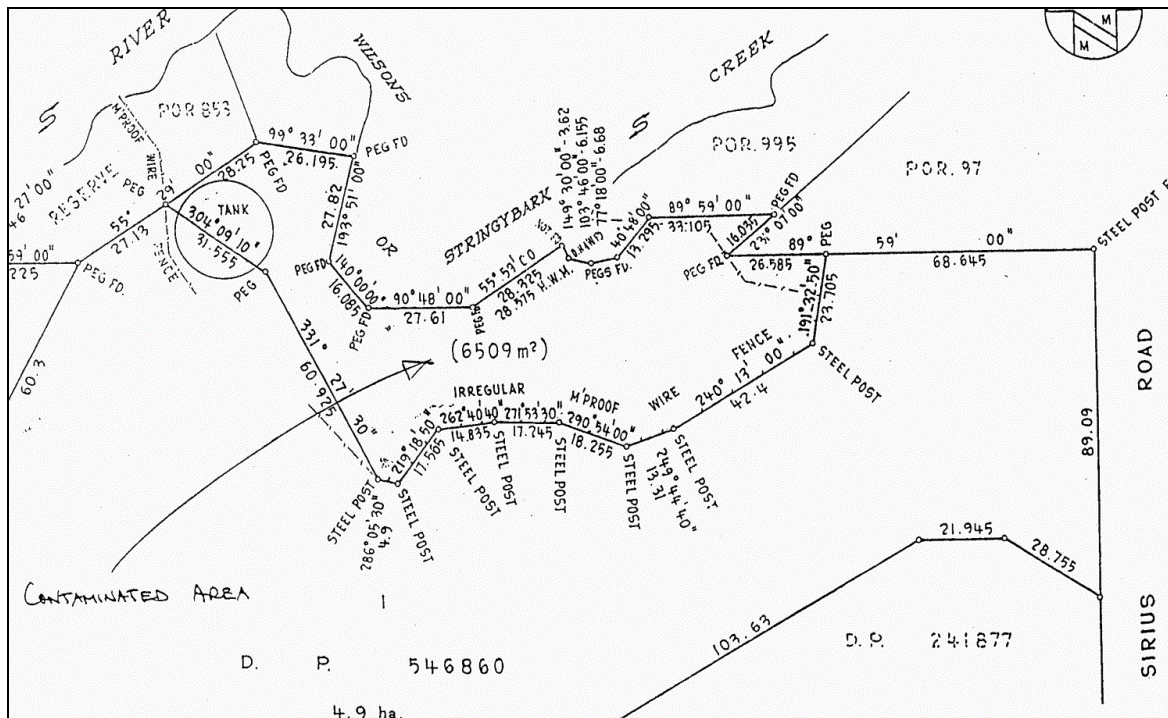


Figure 4 – Contaminated area in the north-east of the lot



Restoration Strategy

3

3.1 Site preparation

Initial site preparation includes the placement of fencing to restrict access, delineate riparian areas and to minimise damage to retained items.

3.1.1 *Temporary protection fencing*

Temporary protection fencing in the form of a 1.8m high relocatable construction proof fence will be provided around the restoration areas as shown on Schedule 1 – Vegetation Management Works. This fencing shall remain in place until all construction and surrounding road works are completed. Construction personnel are to be inducted and notified of the sensitivity of the restoration areas which is to be treated as a 'No Go Zone'.

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 and maintained to prevent 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 points with additional hay bales to support the fence against the weight of trapped sediment.

3.1.2 *Permanent protection fencing*

Following completion of earthworks, and installation of stormwater outlets and riparian structures, permanent protection fencing in the form of a 1.2m high chainlink fence is to be installed around the restoration areas as shown on Schedule 1 – Vegetation Management Works. This is to replace the temporary protection fencing.

3.1.3 *Signage*

Signage is to be placed every 50m on the permanent fence around the edge of the restoration areas. This signage is to advise that the area is undergoing bushland rehabilitation works. An example of what may be suitable is provided in Figure 5.



Figure 5 – Signage example

3.1.4 Hollow-bearing trees

The proposal will require the removal of eight (8) hollow-bearing trees which collectively have twenty four (24) hollows of varying sizes. Twenty four (24) compensatory nest boxes are to be installed at least 1 month prior to the commencement of tree removal works to ensure replacement roosting habitat is available at a ratio of 1:1. These nest boxes can be comprised of re-used hollows from felled trees with the remainder made up by constructed nest boxes

A total of twenty four (24) nest boxes are to be installed within the bushland regeneration area in the eastern corner of the lot as shown on Schedule 1 – Vegetation Management Works. These will comprise:

- Ten (10) nest boxes suitable for small birds and mammals
- Four (4) nest box suitable for large mammals / possums
- Ten (10) microbat boxes

See section 3.5 and Attachment 3 for specifications.

3.1.5 Contaminated lands remediation

Remediation works within the contaminated area are to be completed before the implementation of any restoration works within that area. The contaminated area to be revegetated is to be capped with a suitable topsoil to a depth of 1m. Only shrubs and groundcovers with a shallow mature root system are to be planted.

3.2 Weed management

Weed control works are to be undertaken within the restoration areas in perpetuity and are to specifically target invasive environmental weeds known to occur. Weed control works are

to be monitored and audited by an appointed project ecologist to achieve the landscape management performance targets.

Invasive and persistent weed or environmental pest species have been observed within or in proximity to the site and include:

- *Ageratina adenophora* (Crofton Weed)
- *Arundo donax* (Giant Reed)
- *Asparagus aethiopicus* (Ground Asparagus)
- *Cenchrus clandestinus* (Kikuyu Grass)
- *Cinnamomum camphora* (Camphor Laurel)
- *Cortaderia* sp. (Pampas Grass)
- *Ehrharta erecta* (Panic Veldtgrass)
- *Eragrostis curvula* (African Lovegrass)
- *Festuca* sp.
- *Genista monspessulana* (Montpellier Broom)
- *Lantana camara* (Lantana)
- *Ligustrum lucidum* (Large-leaved Privet)
- *Ligustrum sinense* (Small-leaved Privet)
- *Melinis repens* (Red Natal Grass)
- *Nephrolepis cordifolia* (Fishbone Fern)
- *Ochna serrulata* (Mickey Mouse Plant)
- *Olea europaea* subsp. *cuspidata* (African Olive)
- *Paspalum dilatatum* (Paspalum)
- *Paspalum urvillei* (Vasey Grass)
- *Passiflora suberosa* (Cork Passionflower)
- *Robinia pseudoacacia* (Black Locust)
- *Rubus fruticosus* (Blackberry)
- *Senna pendula* var. *glabrata*
- *Sporobolus africanus* (Parramatta Grass)
- *Sporobolus fertilis* (Giant Parramatta Grass)
- *Stenotaphrum secundatum* (Buffalo Grass)

These weeds have significant implications to the success of revegetation works and will require intensive targeted weed control and ongoing eradication throughout the planting and maintenance period. Refer to Appendix 2 for more information about which weeds occur on site and the weed control priority.

3.2.1 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 for potential weed species or weeds known to occur within the site are listed in Attachment 2.

Weeding efforts will also be focussed within the restoration areas as shown in Schedule 1 – Vegetation Management Works. These efforts will provide a buffer against weed incursions from adjoining land uses and provide a sheltered internal habitat for the insitu native flora and fauna. Riparian restoration is to be undertaken in a manner that does not destabilise or further destabilise stream banks. The management aims will be to:

- Manage weeds;
- Increase diversity of native plant species; and
- Increase density of native plant species.

Weeding works are to be carried out by an appropriately qualified and licensed bushland regeneration company under the direction of a consulting project ecologist. Bushland regeneration supervisors should possess a minimum of a Certificate IV in Conservation and Land Management or a biological science degree, with at least three (3) years of field experience and previous experience managing similar vegetation types in northern Sydney.

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

Pile burns are not recommended due to pollution issues, while biological controls are only suited to particular species which do not occur within the subject site.

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 will be removed from the native vegetation areas within 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.

Stabilisation of the riparian buffer to reduce erosion and support plantings is to be used in accordance with Figure 7. Mulch to a depth of 75-100mm is to be laid under secured open-weave jute mesh.

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 to remove weed regrowth or overlooked weeds.

Timing – 6–12 months post commencement of primary weeding

Maintenance weeding

After primary and secondary weeding, and restoration, 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 4–6 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 three (3) years. In the event that insufficient weed control is achieved, then contingency works are to be completed for auditing purposes.

The use of herbicides may be 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*®. These non-*Glyphosate* based herbicides are not to be used adjacent to water bodies.

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 steep slopes as a result of spraying vegetation with herbicide needs to be considered prior to commencement of weed control works.

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 POEO Act)*.

All environmental and invasive 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.

3.3 Restoration works

3.3.1 Overview restoration and revegetation

Restoration works are to be undertaken in areas outside of the APZ. This is to involve weed control, bush regeneration and fully-structured revegetation plantings.

The following separate restoration areas are to be implemented:

- *Regeneration area* – Bush regeneration of Smooth-barked Apple - Red Bloodwood open forest involving weed control and natural recruitment of native plants.
- *Revegetation area: Smooth-barked Apple - Red Bloodwood open forest* – Revegetation of disturbed and cleared areas involving weed control and fully-structured plantings of Smooth-barked Apple - Red Bloodwood open forest species. Revegetation is to achieve fully-structured, healthy and diverse native vegetation.
- *Revegetation area: contaminated lands* – Revegetation of contaminated lands involving weed control and shrub and groundcover plantings of Swamp Oak

Floodplain Forest species and additional species from adjacent vegetation types. Revegetation is to achieve a healthy and diverse native vegetation of small shrubs and groundcovers.

- *APZ planting on western edge of the site* - Partial revegetation of Smooth-barked Apple - Red Bloodwood open forest to APZ compliant standards along the western site boundary in the outer 10m portion of the APZ.
- *Screening planting in north-western APZ* - Planting of canopy species to provide some additional Smooth-barked Apple - Red Bloodwood open forest species for screening purposes to the building.
- *Macrophyte planting* - To be undertaken in the two (2) outlet areas on site, planted with sedges, rushes and macrophytes amongst the rocks.

Revegetation and direct seeding will utilise local provenance collected seed, including species found within Smooth-barked Apple - Red Bloodwood open forest. A minimum of twenty five (25) species is to be used in each community. The final plant installation list is to be approved by the project ecologist. A further five (5) species minimum are to be planted in the outlet protection areas.

Native species from Appendix 1 – Table A1 are to be used for revegetation purposes. Alternatives to this list may be used as approved by the project ecologist. The location of the planted species will be determined by the revegetation contractors under the direction of the project ecologist considering existing vegetation communities, any native regeneration present and suitable topographical and bed conditions.

Stabilisation of the riparian buffer to reduce erosion and support plantings is to be used in accordance with Figure 7. Mulch to a depth of 75-100mm is to be laid under secured open-weave jute mesh.

3.3.2 Bushland regeneration area

Regeneration within this vegetation will primarily involve weed control. Bush regeneration is likely to proceed naturally through recruitment of native plants from the existing seedbank and enrichment planting will not likely be necessary.

3.3.3 Revegetation area: Fully-structured Smooth-barked Apple - Red Bloodwood open forest

Fully-structured revegetation plantings of Smooth-barked Apple - Red Bloodwood open forest are to be undertaken using a minimum of twenty five (25) species. The total area of revegetation is to be at least 0.18ha as marked on Schedule 1. Species to be used in the restoration are listed within Attachment 1 and are to be locally-sourced native stock.

Primary planting (Stage 1) is to achieve the following densities of native plants:

- Canopy trees – 1 per 50m² (total area of 1700m² = 34 units)
- Sub-canopy trees – 1 per 30m² (total area of 1700m² = 57 units)
- Shrubs – 1 per 5m² (total area of 1700m² = 340 units)
- Grasses and groundcovers – 4 per 1m² (total area of 1700m² = 6800 units)
- Vines / climbers – 1 per 20m² (total area of 1700m² = 85 units)

Contingency planting (Stage 2) is to be achieved at a rate of 15% of the primary planting:

- Canopy trees – 5 units
- Sub-canopy trees – 9 units
- Shrubs – 51 units
- Grasses and groundcovers – 1020 units

- Vines / climbers – 13 units

3.3.4 Revegetation area: contaminated lands

Revegetation within the contaminated lands, including the riparian buffer, is to follow remediation works involving capping with topsoil to a depth of 1m. Revegetation will involve plantings of small shrubs and groundcovers with a mature root system that is shallow and will not grow into the contaminated soil below. Species typical of Swamp Oak Floodplain Forest (SOFF) and other small shrubs from adjacent communities as listed within Attachment 1 are to be used and are to be locally-sourced native stock.

Primary planting (Stage 1) is to achieve the following densities of native plants:

- Shrubs – 1 per 3m² (total area of 2600 m² = 867 units)
- Grasses and groundcovers – 6 per 1m² (total area of 2500m² = 15600 units)

Contingency planting (Stage 2) is to be achieved at a rate of 15% of the primary planting:

- Shrubs – 130 units
- Grasses and groundcover species – 2340 units

3.3.5 APZ planting on western edge of site

Planting of this zone is to be APZ compliant and will consist of a 10m wide planting of sparse trees and shrubs with a dense ground layer, managed regularly to 100m in height.

Primary planting (Stage 1) is to achieve the following densities of native plants:

- Canopy trees – 1 per 150m² (total area of 1,400m² = 9 units)
- Shrubs – 1 per 25m² (total area of 1,400m² = 56 units)
- Grasses and groundcovers – 3 per 1m² (total area of 1,400m² = 4,200 units)

Contingency planting (Stage 2) is to be achieved at a rate of 15% of the primary planting:

- Canopy trees – 2 units
- Shrubs – 8 units
- Grasses and groundcovers – 630 units

3.3.6 Screening planting in north-western APZ

To reduce visual impacts of the building, canopy and sub-canopy species of Smooth-barked Apple - Bloodwood Open Forest is to be planted adjacent to the firetrail. The approximate length of planting is 100m. There will be canopy trees at 10m spacings and sub-canopy trees at 10m spacings. Tree plantings will be in a near-linear line.

Primary planting (Stage 1) is to achieve the following densities of native plants:

- Canopy trees - 10 units
- Sub-canopy trees - 10 units

Contingency planting (Stage 2) is to be achieved at a rate of 15% of the primary planting:

- Canopy trees – 2 units
- Sub-canopy trees – 2 units

3.3.7 Planting of stormwater outlet areas

There are two (2) areas on site that contain outlets that will require dissipation and treatment before heading to the wetland areas. One location is near the north-eastern corner of the building, and the other is along the western edge. These areas amount to approximately 350m² that shall be designed and constructed to be consistent with Schedule 1A and 1B (see end of document). The base is to contain a geotextile fabric overlaid with rock scour. The incised embankment wall is to be protected with large stacked rocks or sandstone boulders to minimise any undercutting from the water and to dissipate the water gently. Sedges, rushes and other macrophytes are to be planted amongst the rip-rap to absorb the water and to assist in mitigating the flow. A minimum of five (5) species are to be utilised in these areas.

Beyond the immediate outlet area at the furthest edge will be a level spreader constructed with large rocks or boulders with a 100mm gap between each that allows the pooled water to trickle through. This is an erosion control device designed to reduce channel formation within the wetland, limiting high velocity stormwater surface runoff.

Primary planting (Stage 1) is to achieve the following densities of native plants:

- Sedges, rushes and macrophytes – 5 per 1m² (total area of 350m² = 1750 units)

Contingency planting (Stage 2) is to be achieved at a rate of 15% of the primary planting:

- Sedges, rushes and macrophytes – 263 units)

Monitoring of the adjacent wetland will be undertaken by the project ecologist. Additional planting or fixing of the rocks may be required after heavy storm events if there is any destruction to the outlet area.

Estimated total number of plants

The total number of plants for the primary plantings (Stage 1) of within the bushland area is approximately:

- Trees - 120 units
- Shrubs – 1263 units
- Grasses and groundcovers – 26600 units
- Vines – 85 units
- Water plants - 1750 units

The total number of plants for contingency planting (Stage 2) of 15% within the bushland area is approximately:

- Trees - 20 units
- Shrubs – 189 units
- Grass and groundcovers – 3990 units
- Vines – 13 units
- Water plants - 263

The final number of plants is to be confirmed tender and approved by the project ecologist.

3.3.8 Mulching

Mulching is an efficient method to impede the establishment of weed species, soil erosion, compaction and desiccation.

To protect waterways, loose mulch should not be placed within 10m of the top of bank. Mulch under a covering of biodegradable erosion protection, such as pegged and overlapped open-weave jute mesh, is to be used for revegetation areas within 10m of the top of bank (see Figures 6 and 7).

Any native vegetation requiring removal for adjoining developments shall be immediately mulched or chipped and stockpiled on site and can be used in restoration areas beyond 10m of the top of bank, as determined by the bushland regeneration contractor. In these areas, mulch is to be placed at a depth of 75-100 mm covering any areas of replanting.

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 exotic species such as Asparagus Fern, Bitou Bush, Privet, Camphor Laurel, Coral Tree, Honey Locust, Lantana, Spider Plant, or other invasive environmental weeds are not to be used. The contractor shall ensure that any mulch used is properly composted before use and sufficient time has elapsed to allow nitrogen drawdown (up to 6 months).



Figure 6 – Example of open weave jute mesh

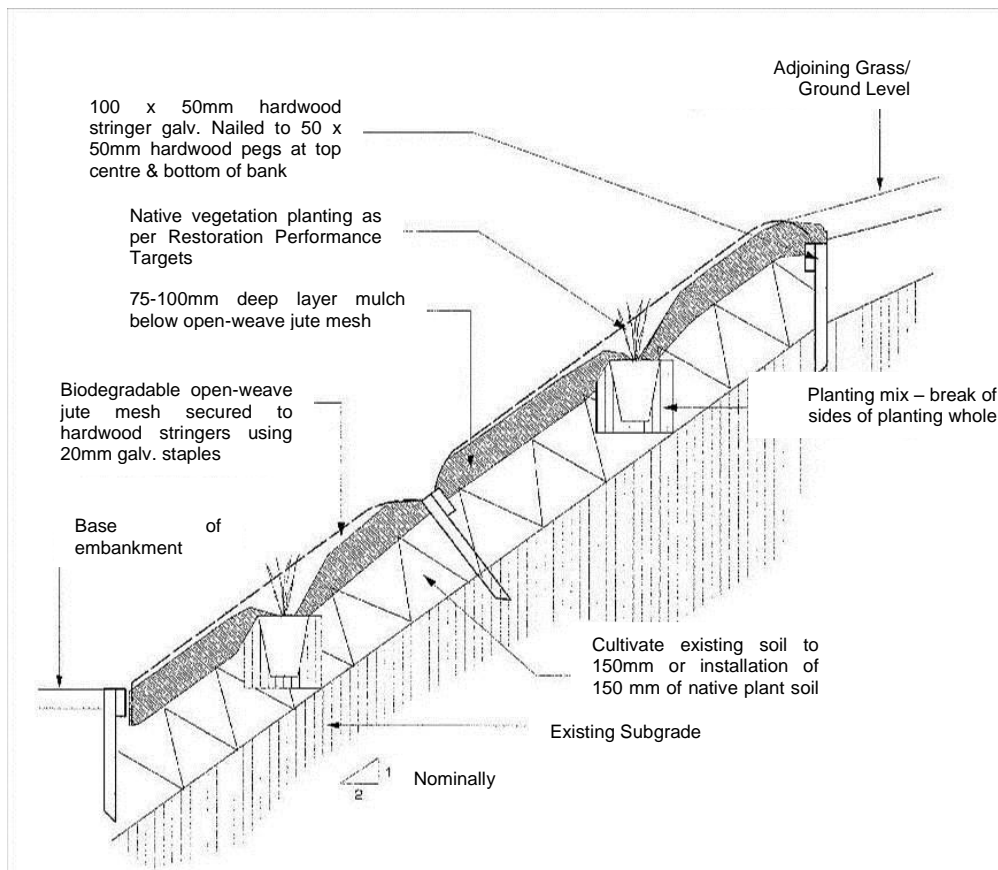


Figure 7 – Generic riparian bank stabilisation

3.3.9 Revegetation protection

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

- Biodegradable erosion protection (e.g. pegged and overlapped open-weave jute mesh) over mulch within 10m of the top of bank – to stabilise bank and reduce soil moisture loss
- Mulching beyond 10m of the top of bank – to reduce soil moisture loss (to be avoided in areas of medium to high resilience)
- Plant guards around plants – to minimise loss by grazing animals and dehydration, and provide frost protection
- Baiting of rabbits subject to discretion of appointed project ecologist (quarterly baiting over 3 years) – use of *Pindone (1080)* to minimise rabbit burrows and grazing.

3.4 Sediment and erosion control

A sediment fence is to be installed surrounding the proposed construction areas in accordance with Landcom's *Managing Urban Stormwater: Soils and Construction* (2004). This fence is to be installed within the construction areas and not within the restoration areas. The sediment and erosion control fence is to be firmly trenched into the soil and is to assist with the minimisation of the spread of exotic plant seed into the restoration areas.

Kick-backs are to be installed along all sections of sediment fencing that run downslope to slow down any waters being directed down the fence line. The sediment fence is to be supported by fixed hay bales in low sections 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 8 and 9). Techniques and permanent or temporary infrastructure 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.

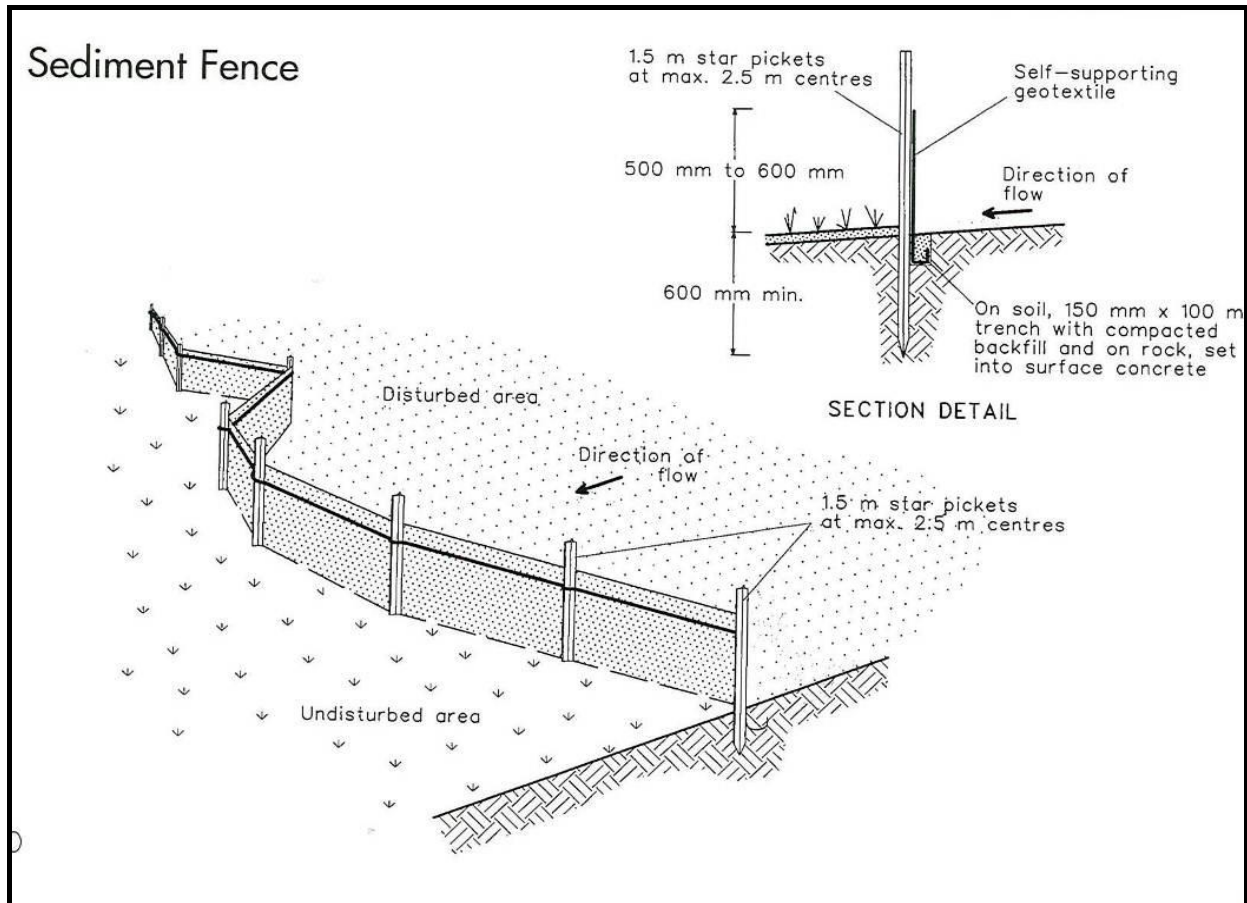


Figure 8 – Generic installation detail of geotextile filter fence

If outlet scour protection is required, it should be installed in accordance with Figure 9. 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 within the surrounding vegetation.

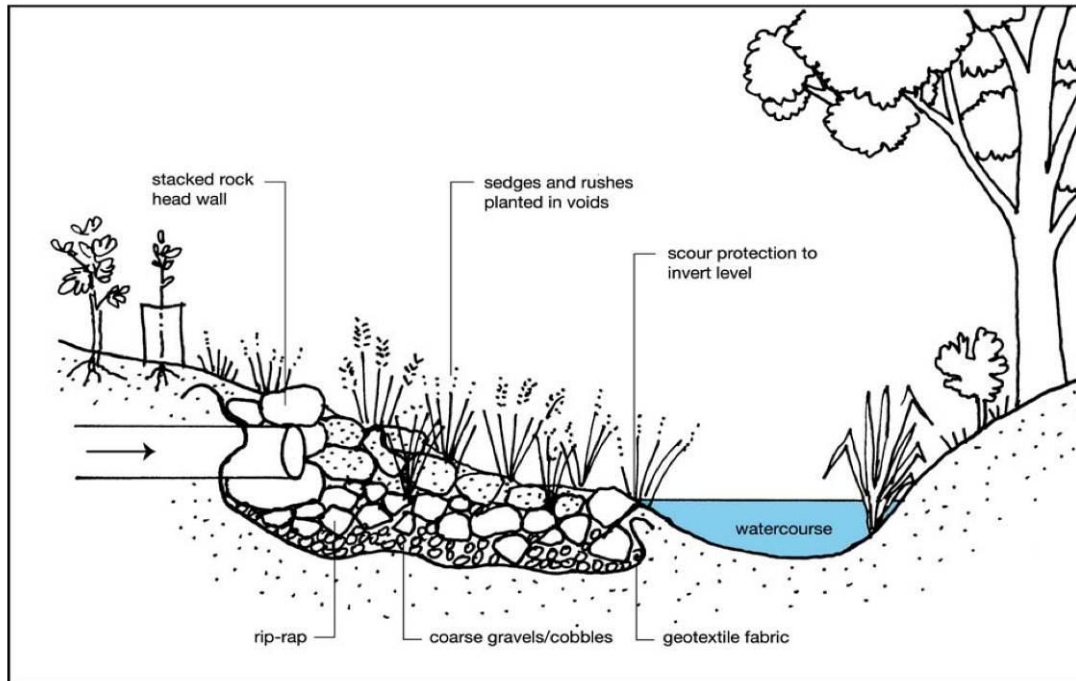


Figure 9 – Outlet scour protection

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

3.5 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” and should be retained as a high priority.

Re-locating existing hollows or installing nest boxes of similar size in nearby remaining trees can compensate for any hollow bearing trees that need to be removed for the proposed development.

A total of twenty four (24) nest boxes are to be installed within the bushland regeneration area in the eastern corner of the lot as shown on Schedule 1 – Vegetation Management Works. These will comprise:

- Ten (10) nest boxes suitable for small birds and mammals
- Four (4) nest box suitable for large mammals / possums
- Ten (10) microbat boxes

Nest boxes should be constructed of weatherproof timber (marine ply), fasteners and external paint and appropriately affixed to a recipient tree under the guidance of a fauna ecologist. These nest boxes may be supplemented with relocated hollows.

Nest boxes are to be installed at least 1 month prior to the commencement of tree removal works to ensure replacement roosting habitat is available.

If required, guidelines for ameliorating the loss of nesting hollows are as follows:

- I) Where possible and practical, hollow bearing limbs identified for removal should have the hollow sections collected and re-erected or installed into retained trees. 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 or collected hollow limbs are to be secured to trees at a minimum height of four 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 or collected hollow limbs.

A report will be supplied to Council following the completion of clearing and erection of nest boxes. This will include a plan showing the location of nest boxes and details on any fauna displaced or relocated during clearing.

At the end of the maintenance period an audit report will be provided to Council. If any of the boxes are found to be in a poor condition, these boxes will be replaced on a contingency basis.

The following guidelines are provided in the event of a hollow bearing tree that requires removal within the proposed development area.

Pre Clearing

At least one (1) weeks' notice will be needed prior to the planned date for clearing of any hollow-bearing trees. This is require to allow for suitable daytime and night time inspections of hollow-bearing trees for use by fauna and to plan for the safe felling of the tree/removal of fauna if present.

Removal of all hollow-bearing trees will be under the supervision of a suitably qualified fauna ecologist to enable effective recovery and relocation of any residing fauna. Hollow-bearing trees identified for removal are to be are to be dismantled by an arborist prior to felling the entire tree.

All hollow-bearing trees proposed for removal shall be clearly marked with an 'H' Symbol to indicate removal under supervision by a suitably qualified fauna ecologist. The contractor is to be managed such that all due care is taken to prevent damage to any trees to be retained and is not to remove the hollow-bearing trees without first receiving instruction from the fauna ecologist. A fauna ecologist is to be present at the felling or removal of each hollow-bearing tree.

After notice is given of the planned removal of trees a fauna ecologist will inspect the trees for use by fauna. This may include inspection of trees at sunset (stag watching) that allows for the detection of diurnal fauna returning to hollows or nocturnal fauna leaving for the night.

In some cases physical inspections of hollows by climbing trees may be required. This will be carried out by suitably qualified arborists under the direction and supervision of the fauna ecologist.

During Clearing

Where fauna is identified within a hollow and the risk of death or injury as a result of machine felling of the tree is high, the tree may need to be felled in sections. This will involve the removal of hollow limbs or sections by chainsaw with the hollow limb lowered to the ground

for removal/relocation of fauna. These works are to be carried out by a suitably qualified arborist under the direction of the fauna ecologist.

In those trees that contain hollows and no fauna has been observed, the tree will be machine felled. Where machinery is required to fell hollow trees, the blade or bucket of the machinery will be tapped against the trunk of the tree to disturb any fauna present and provide time to leave the hollow. Several taps on the trunk and waiting periods between each set of taps may be required at the discretion of the fauna ecologist. The tree will then be felled as gently as possible. All hollow limbs will be inspected by the fauna ecologist after felling for occupation by fauna. Any fauna will be removed and relocated to adjoining bushland.

Where young fauna are identified within a hollow whose survival will be at risk as a result of the removal of the hollow or the felling of the tree, then clearing will not be carried out until those young are old enough to leave the hollow and the care of the parents. It is suggested therefore that clearing is not carried out during breeding times when young are likely to be present within hollows (spring-early summer).

Where possible, hollow limbs removed from trees will be collected by the fauna ecologist for re-erection at a later date. Any fauna injured during clearing will be handed to WIRES for care and rehabilitation, taken to a local vet for appropriate treatment, or euthanased in accordance with Animal Ethics licencing held by the fauna ecologist.

Nest box considerations are further outlined in Attachment 3.

3.5.1 Retention of hollow-bearing trees

An assessment of the location of hollow-bearing trees and the size of hollows within, was undertaken as part of the *Arboricultural Impact Assessment (Travers bushfire & ecology 2018)*. Table 2 below provides hollow-bearing tree data and Schedule 1 – Vegetation Management Works shows locations of habitat trees.

No large hollows suitable for threatened owls or cockatoos were recorded present within the study area. Some hollows recorded are considered suitable for use by threatened gliders, parrots and microbats, however no hollow-dependent threatened fauna species were recorded present during survey by *Ecoplanning*.

Table 2 – Summary of hollow-bearing trees

Tree No	Scientific name	DBH (cm)	Spread (m)	Height (m)	Vigour (%)	Habitat tree category	Hollows & other habitat features recorded
T-G008	<i>Angophora costata</i>	21	4	10	70	Cat-3	1x 0–5cm
T-G026	Dead Stag	45,45	8	15	0	Cat-3	5x 0–5cm trunk cracks
T-G038	Dead Stag	44	3	12	0	Cat-2	2x 0–5cm branch spouts
T-G040	<i>Eucalyptus sclerophylla</i>	61	12	24	75	Cat-3	1x 5–10cm trunk hollow
T-G041	<i>Eucalyptus sclerophylla</i>	87	20	28	75	Cat-3	2x 0–5cm branch spouts
T-G057	<i>Eucalyptus piperita</i>	120,38	24	28	75	Cat-3	2x 0–5cm trunk & broken branch 1x 5–10cm broken branch

Tree No	Scientific name	DBH (cm)	Spread (m)	Height (m)	Vigour (%)	Habitat tree category	Hollows & other habitat features recorded
T-G066	Dead Stag	81	8	12	0	Cat-1	2x 0–5cm broken branch, 2x 5–10cm broken branch, 1x 10–15cm broken branch 2x 15–20cm broken branch
T-G084	Dead Stag	47	6	18	0	Cat-3	3x 0–5cm broken branches 1x 5–10cm branch hollow
T-G088	<i>Eucalyptus piperita</i>	110,47	20	24	70	Cat-1	2x 0–5cm branch spouts 1x 5–10cm trunk hollow 1x 15–20cm broken branch
T-G123	Dead Stag	55	12	22	0	Cat-2	1x 0–5cm broken branch, 2x 5–10cm broken branch, 1x 10–15cm broken branch
T-L001	<i>Eucalyptus pilularis</i>	88	17	27	60	Cat-2	2x 5–10cm broken branch, 2x 10–15cm broken branch
T-L018	<i>Eucalyptus umbra</i>	94	26	32	65	Cat-3	1x 5–10cm branch hollow

The habitat trees recorded within the study area fall under one of three categories with respect to significance:

Category 1: Significant habitat trees (high):

- Large hollow suitable for cockatoos or large forest owls >30cm and/or
- Trees containing two (2) or more good quality medium hollows 10-30cm and/or
- >8 small hollows

Category 2: Significant habitat trees (moderate):

- Trees containing one medium hollow 10-30cm and/or
- 3-8 small hollows

Category 3: Remaining hollow bearing trees generally containing small or low numbers of hollows



Monitoring

4

4.1 Management of restoration works

The project manager of the site must ensure that the:

- Restoration areas are managed in accordance with this VMP, under the direction of a project restoration ecologist,
- Long term arrangements are made to ensure continuing management and maintenance of the restoration areas,
- A project restoration ecologist is engaged to independently advise and audit all vegetation management and restoration works to achieve the nominated performance targets,
- Contingency works are undertaken throughout the maintenance period to achieve the performance targets as directed by the project restoration ecologist,
- Adequate funding is provided to undertake the primary restoration works and maintenance for a minimum of three (3) years, and
- In the event of 'handover' of the restoration areas to a local authority, the reserve is handed over in a condition that would only require long term maintenance actions.

Long term arrangements for the management of the restoration areas are to be confirmed with Council.

4.2 Monitoring

Monitoring of the progress of weed removal, plant growth and natural regeneration 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 VMP. 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.

Contractors undertaking the revegetation and restoration works are to submit a monthly progress report to the project Ecologist along with claims for payment.

A minimum of eight (8) quadrats are to be placed within the restoration areas to objectively measure the growth, diversity and density of revegetation works, and monitor weed control.

Monitoring activities will include:

1. A photographic record for comparative purposes taken on an annual basis from the same point with the same view.
2. Flora quadrats (5m x 5m) to measure the growth and density of the various revegetation areas and to monitor weed densities at selected locations within the restoration areas.
3. An overall site vegetation condition map based on standard bush regeneration vegetation condition assessment methodology.

Monitoring of the site is required to be set up prior to the commencement of revegetation 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; progress, success, structural integrity and floristic diversity of the revegetation; and monitoring of any sediment fencing or protective fencing.

Inspections of the site by the project ecologist are to be undertaken prior to, during and post restoration works to ensure that vegetated areas designated for retention and exclusion zones are adequately marked and that other appropriate protection procedures are being maintained.

Additional monitoring measures are to be undertaken to ensure the efficiency of the outlet areas and level spreader to certify that there are no erosion problems, and no impacts to adjacent wetland areas.

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 primary and secondary weed control and 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. The restoration areas is to be maintained as an indigenous native vegetation area.

Following the completion of Years 1 and 2 of the maintenance 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.

4.3 Compliance certification

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

- Engagement of a bush regeneration contractor and independent project ecologist (at commencement);
- Installation of all protective fencing and sediment and erosion control measures (prior to commencement of vegetation clearance works);
- Completion of revegetation planting works at the required densities (immediately after completion of bulk earthworks);
- Completion of primary weed control works (at the end of year 1);
- Completion of secondary weed control works and revegetation maintenance (annually);
- Satisfactory achievement of restoration works as shown on Schedule 1 – Vegetation Management Works and the restoration performance targets (Section 4.5).

4.4 Funding

The proponent is to ensure sufficient funding is made available in order to cover primary restoration and maintenance costs for three (3) years in accordance with this VMP for the restoration areas. The staging of works associated with development applications are to proportionally split the costs for each stage to ensure restoration works within each stage meet the performance targets of this VMP. The funding is to include a 15% contingency for rectification works as identified by the project ecologist.

4.5 Restoration performance targets

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

1. All protective fencing and sediment controls are to be installed prior to the commencement of construction works.
2. Weed control and revegetation works are to be carried out by a qualified bushland regenerator to achieve the following weed control targets: maximum 10% weed coverage at the end of year 1, progressively reducing to less than 5% at the end of year 3.
3. Remediation works within the contaminated area are to be completed before the implementation of any restoration works within that area.
4. The restoration works are to achieve the following native cover performance targets of 60% at the end of year 1, 70% at the end of year 2, and 95% at the end of year 3.
5. Improved diversity and density of native vegetation over time is to be achieved.
6. Plantings are to utilise a minimum of thirty (30) locally-sourced species from the list as shown in Attachment 1. The quantity of species planted is to achieve a fully naturalised vegetation structure approved by the project ecologist.

The following densities and numbers are to be achieved:

Fully-structured revegetation area

- Canopy trees – 1 per 50m² (total area of 1700m² = 34 units)
- Sub-canopy trees – 1 per 30m² (total area of 1700m² = 57 units)
- Shrubs – 1 per 5m² (total area of 1700m² = 340 units)
- Grasses and groundcovers – 4 per 1m² (total area of 1700m² = 6800 units)
- Vines / climbers – 1 per 20m² (total area of 1700m² = 85 units)

Contaminated lands

- Shrubs – 1 per 3m² (total area of 2600m² = 867 units)
- Grasses and groundcovers – 6 per 1m² (total area of 2600m² = 15600 units)

APZ plantings

- Canopy trees – 1 per 150m² (total area of 1,400m² = 9 units)
- Shrubs – 1 per 25m² (total area of 1,400m² = 56 units)
- Grasses and groundcovers – 3 per 1m² (total area of 1,400m² = 4,200 units)

Screen plantings

- Canopy trees - 10 units
- Sub-canopy trees - 10 units

Outlet protection areas

- Sedges, rushes and macrophytes - 5 per (total area of 350m² = 1750 units)

7. Plants are to be sourced from collected native seed of local provenance. Recommended species are shown in Attachment 1.
8. Contingency restoration works estimated at 15% of the restoration works cost, is to be undertaken at the direction of the project ecologist until the performance targets are achieved.

9. Monitoring of the outlet areas will be undertaken regularly to ensure that there are no detrimental impacts to the adjoining wetland or Stringybark Creek.
10. Pest control including, but not limited to, rabbit baiting is to be undertaken throughout the restoration and maintenance period prior to, and after, planting until directed by the project ecologist to discontinue.
11. All revegetation areas are to be stabilised; tree and shrub plants protected by cardboard boxes (2L boxes for tube stock plants) and rabbit baiting (or alternative) as approved by the project ecologist.
12. Monitoring to be undertaken by the project ecologist with compliance certification reported to Council annually for a minimum of 3 years post primary restoration works (Section 4 of this VMP).



Program of Works

5

The program of works (Table 3) is aimed at providing a management framework for enacting revegetation, regeneration, maintenance, monitoring and review works reasonably required for the proposed restoration measures. Site rehabilitation, including weed control works is to be undertaken in accordance with 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 any clearing or construction works on site and generally excludes any landscaping and planting works.

This stage will include the installation of protection fencing (temporary and permanent) and sediment fencing. It also includes the identification of hollow-bearing trees that may require removal and any proposed stag-watching or similar (if required), or protection if the hollow-bearing trees are to be retained.

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.

During construction works

Construction works refers to the period during which clearing, earthworks and construction of buildings, as well as roads and services 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, maintenance of protective measures, mulching and 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 crews working on site are required to have at a minimum TAFE Certificate Level II Bush Regeneration qualifications or equivalent to undertake weeding and revegetation works. All staff are to be supervised by a qualified bush regeneration supervisor who should possess a minimum of a Certificate IV in Conservation and Land Management, or a biological science degree, with at least three (3) years of field experience.

Prior to the release of the construction certificate, all protective measures must be completed, as well as primary weed control and initial revegetation works.

Table 3 – Program of works

Action	Responsibility
Stage 1 – Pre-construction works	
<ul style="list-style-type: none"> • Formation of site management team and establish supervision and consultation processes – minimum project ecologist, and site manager 	<ul style="list-style-type: none"> • Site project manager
<ul style="list-style-type: none"> • Erection of temporary and permanent fencing, erosion control fencing 	<ul style="list-style-type: none"> • Site manager / bush regenerator contractor / project ecologist
<ul style="list-style-type: none"> • Rabbit baiting 	<ul style="list-style-type: none"> • Contractor
<ul style="list-style-type: none"> • Commencement of seed collection and propagation contracts 	<ul style="list-style-type: none"> • Bushland regenerator / project ecologist
<ul style="list-style-type: none"> • Set up monitoring points 	<ul style="list-style-type: none"> • Project ecologist
<ul style="list-style-type: none"> • Provide certificates of compliance 	<ul style="list-style-type: none"> • Project ecologist
Stage 2 – Construction works	
<ul style="list-style-type: none"> • Supervision of hollow-bearing tree removal and nest box installation 	<ul style="list-style-type: none"> • Fauna ecologist / tree climber
<ul style="list-style-type: none"> • Commencement of primary weed control 	<ul style="list-style-type: none"> • Suitably qualified bushland regenerator
<ul style="list-style-type: none"> • Monitor erosion control measures (monthly – especially after heavy rain) and replace if required 	<ul style="list-style-type: none"> • Contractor with advice of project manager
<ul style="list-style-type: none"> • Complete revegetation works 	<ul style="list-style-type: none"> • Contractor / project manager
<ul style="list-style-type: none"> • Commencement of secondary weed control and maintenance weed control 	<ul style="list-style-type: none"> • Contractor / project manager
<ul style="list-style-type: none"> • Maintenance of protective fencing 	<ul style="list-style-type: none"> • Contractor / suitably qualified bushland regenerator
<ul style="list-style-type: none"> • Provide certificates of compliance 	<ul style="list-style-type: none"> • Project ecologist
Stage 3 – Post-construction works	

<ul style="list-style-type: none"> • Enrichment planting within 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 three (3) years as required • Provide certificates of compliance 	<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 • Project ecologist
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Schedule 1 identifies the location of the planned restoration and regeneration works in relation to the proposed development.

5.2 Typical timeline of restoration works

The following typical timeline (Figure 10) is provided to indicate the overall timing of restoration 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 results.

The successful implementation of restoration works may affect the release of the occupation certificate or the release of any required bonds as required under the development consent. Therefore contingency restoration works may be required in order for a compliance certificate to be issued.

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



Recommended Planting List

A1

The following locally occurring native plant species are to be established within the revegetation area. Further species will also be suitable as approved by the project ecologist provided that they are recognised as being typical or common species known or demonstrated to occur within Smooth-barked Apple - Red Bloodwood open forest and Swamp Oak Floodplain Forest including ecotonal species to the adjoining community. The appointed bush regeneration contractor may vary the number of plant species to be established provided 80% dominant species is retained as per this Attachment 1.

For the purposes of those species listed below, when fully grown, trees are generally 8m or taller in height, shrubs are typically 1-8m in height and ground covers, which include grasses, herbs, small shrubs and vines, are up to 1m in height.

Table A1 – Recommended planting list for restoration zone

SMOOTH-BARKED APPLE - RED BLOODWOOD OPEN FOREST		
Canopy trees: 1 per 50m² in fully structured vegetation or 1 per 150m² in APZ planting area		
<i>Angophora costata</i>	<i>Eucalyptus globoidea</i>	<i>Eucalyptus resinifera</i>
<i>Corymbia gummifera</i>	<i>Eucalyptus pilularis</i>	<i>Syncarpia glomulifera</i>
<i>Eucalyptus sclerophylla</i>	<i>Eucalyptus piperita</i>	
Sub-canopy trees: 1 per 30m² in fully structured vegetation or 1 per 150m² in APZ planting area		
<i>Acacia parramattensis</i>	<i>Elaeocarpus reticulatus</i>	<i>Xylomelum pyriforme</i>
<i>Allocasuarina littoralis</i>	<i>Melaleuca linariifolia</i>	
Shrubs: 1 per 5m² in fully structured vegetation or 1 per 25m² in APZ planting area		
<i>Acacia linifolia</i>	<i>Dodonaea triquetra</i>	<i>Persoonia pinifolia</i>
<i>Acacia longifolia</i>	<i>Grevillea buxifolia</i>	<i>Persoonia linearis</i>
<i>Acacia suaveolens</i>	<i>Grevillea sericea</i>	<i>Persoonia levis</i>
<i>Acacia ulicifolia</i>	<i>Kunzea ambigua</i>	<i>Polyscias sambucifolia</i>
<i>Bossiaea obcordata</i>	<i>Leptospermum trinervium</i>	<i>Pultenaea flexilis</i>
<i>Breynia oblongifolia</i>	<i>Leptospermum polygalifolium</i>	<i>Woolfsia pungens</i>
<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	<i>Ozothamnus diosmifolius</i>	<i>Zieria pilosa</i>
Ground covers: 4 per 1m² in fully structured vegetation or 3 per 1m² in APZ planting area		
<i>Aristida vagans</i>	<i>Dipodium variegatum</i>	<i>Microlaena stipoides</i>
<i>Austrostipa pubescens</i>	<i>Entolasia marginata</i>	<i>Oplismenus aemulus</i>
<i>Blechnum cartilagineum</i>	<i>Entolasia stricta</i>	<i>Oplismenus imbecillis</i>
<i>Centella asiatica</i>	<i>Imperata cylindrica</i>	<i>Themeda triandra</i>
<i>Dianella caerulea</i>	<i>Lomandra longifolia</i>	
Vines / climbers: 1 per 20m² in fully structured vegetation only		
<i>Hardenbergia violacea</i>	<i>Pandorea pandorana</i>	<i>Smilax glyciophylla</i>
SWAMP OAK FLOODPLAIN FOREST & ECOTONAL SPECIES		
Shrubs: 1 per 3m²		
<i>Acacia linifolia</i>	<i>Dodonaea triquetra</i>	<i>Polyscias sambucifolia</i>
<i>Acacia longifolia</i>	<i>Kunzea ambigua</i>	<i>Trema tomentosa</i>
<i>Acacia suaveolens</i>	<i>Leptospermum trinervium</i>	<i>Woolfsia pungens</i>
<i>Acacia ulicifolia</i>	<i>Melaleuca thymifolia</i>	<i>Zieria pilosa</i>

<i>Breynia oblongifolia</i>	<i>Myoporum acuminatum</i>	
<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	<i>Ozothamnus diosmifolius</i>	
Ground covers: 6 per 1m²		
<i>Aristida vagans</i>	<i>Echinopogon caespitosus</i>	<i>Lomandra longifolia</i>
<i>Austrostipa pubescens</i>	<i>Entolasia marginata</i>	<i>Microlaena stipoides</i>
<i>Blechnum indicum</i>	<i>Ficinia nodosa</i>	<i>Oplismenus imbecillis</i>
<i>Centella asiatica</i>	<i>Gahnia clarkei</i>	<i>Themeda triandra</i>
<i>Commelina cyanea</i>	<i>Imperata cylindrica</i>	
<i>Dianella caerulea</i>	<i>Juncus usitatus</i>	
MACROPHYTE PLANTING		
Ground covers: 6 per 1m² in pooling area and 3 per 1m² elsewhere		
<i>Baloskion tetraphyllum</i>	<i>Ficinia nodosa</i>	<i>Juncus usitatus</i>
<i>Carex appressa</i>	<i>Gahnia sieberiana</i>	<i>Lomandra fluviatilis</i>
<i>Dianella caerulea</i>	<i>Juncus krausii</i>	<i>Philydrum lanuginosum</i>



Target Weed Species

A2

The following weed species occur on site and are to be targeted on a priority basis subject to degree of invasiveness and implications for regeneration of native flora.

Table A2 – Target weed species for the site

Species	Common name	Priority
<i>Asparagus aethiopicus</i>	Ground Asparagus	Very High
<i>Cinnamomum camphora</i>	Camphor Laurel	Very High
<i>Cortaderia</i> sp.	Pampas Grass	Very High
<i>Lantana camara</i>	Lantana	Very High
<i>Ligustrum lucidum</i>	Large-leaved Privet	Very High
<i>Ligustrum sinense</i>	Small-leaved Privet	Very High
<i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	Very High
<i>Robinia pseudoacacia</i>	Black Locust	Very High
<i>Rubus fruticosus</i>	Blackberry	Very High
<i>Sporobolus fertilis</i>	Giant Parramatta Grass	Very High
<i>Ageratina adenophora</i>	Crofton Weed	High
<i>Arundo donax</i>	Giant Reed	High
<i>Cenchrus clandestinus</i>	Kikuyu Grass	High
<i>Ehrharta erecta</i>	Panic Veldtgrass	High
<i>Eragrostis curvula</i>	African Lovegrass	High
<i>Festuca</i> sp.		High
<i>Genista monspessulana</i>	Montpellier Broom	High
<i>Melinis repens</i>	Red Natal Grass	High
<i>Nephrolepis cordifolia</i>	Fishbone Fern	High
<i>Ochna serrulata</i>	Mickey Mouse Plant	High
<i>Paspalum dilatatum</i>	Paspalum	High
<i>Paspalum urvillei</i>	Vasey Grass	High
<i>Passiflora suberosa</i>	Cork Passionflower	High
<i>Senna pendula</i> var. <i>glabrata</i>		High
<i>Sporobolus africanus</i>	Parramatta Grass	High
<i>Stenotaphrum secundatum</i>	Buffalo Grass	High
<i>Acacia saligna</i>	Golden Wreath Wattle	Moderate
<i>Axonopus fissifolius</i>	Narrow-leaved Carpet Grass	Moderate
<i>Chloris gayana</i>	Rhodes Grass	Moderate
<i>Chlorophytum comosum</i>	Spider Plant	Moderate
<i>Cotoneaster</i> sp.		Moderate
<i>Melilotus officinalis</i>	Common Melilot	Moderate
<i>Ricinus communis</i>	Castor Oil Plant	Moderate
<i>Senecio madagascariensis</i>	Fireweed	Moderate
<i>Setaria parviflora</i>		Moderate
<i>Sida rhombifolia</i>	Paddy's Lucerne	Moderate
<i>Solanum mauritianum</i>	Wild Tobacco	Moderate
<i>Trifolium repens</i>	White Clover	Moderate
<i>Verbena bonariensis</i>	Purpletop	Moderate
<i>Verbena officinalis</i>	Common Verbena	Moderate
<i>Acetosa sagittata</i>	Turkey Rhubarb	Low

Species	Common name	Priority
<i>Arenaria serpyllifolia</i>	Lesser Thyme-leaved Sandwort	Low
<i>Bidens pilosa</i>	Cobblers Pegs	Low
<i>Briza</i> spp.	Quaking Grass	Low
<i>Bromus catharticus</i>	Prairie Grass	Low
<i>Centaureum erythraea</i>	Common Centaury	Low
<i>Chenopodium album</i>	Fat Hen	Low
<i>Cirsium vulgare</i>	Spear Thistle	Low
<i>Conyza bonariensis</i>		Low
<i>Digitaria sanguinalis</i>	Summer Grass	Low
<i>Euphorbia peplus</i>	Petty Spurge	Low
<i>Foeniculum vulgare</i>	Fennel	Low
<i>Gamochaeta</i> sp.		Low
<i>Gomphocarpus fruticosus</i>	Narrow-leaved Cotton Bush	Low
<i>Hirschfeldia incana</i>	Hairy Brassica	Low
<i>Hypochaeris radicata</i>	Catsear	Low
<i>Lactuca serriola</i>	Prickly Lettuce	Low
<i>Lolium</i> sp.		Low
<i>Lotus</i> sp.		Low
<i>Lysimachia arvensis</i>	Scarlet Pimpernel	Low
<i>Malva parviflora</i>	Small-flowered Mallow	Low
<i>Modiola caroliniana</i>	Red-flowered Mallow	Low
<i>Morus alba</i>	White Mulberry	Low
<i>Nothoscordum gracile</i>	Onion Weed	Low
<i>Oenothera stricta</i>		Low
<i>Plantago lanceolata</i>	Lamb's Tongue	Low
<i>Solanum nigrum</i>	Black-berry Nightshade	Low
<i>Sonchus oleraceus</i>		Low
<i>Taraxacum officinale</i>	Dandelion	Low
<i>Trifolium campestre</i>	Hop Clover	Low
<i>Verbascum thapsus</i>	Great Mullein	Low
<i>Vicia sativa</i>		Low



Nest Box Specifications

A3

1 Nest boxes for use by arboreal mammals, diurnal birds and microbats

The following nest box designs are provided by *Travers bushfire & ecology* as a guide for construction of nest boxes for arboreal mammals, diurnal birds and microbats. It is based on a variety of information sources and current project experience in the construction and installation of nest boxes.

The following design parameters are important to ensure the design is robust, the attachment to trees remains secure and use by wildlife is appropriate all for the long-term. These specifications will incur subsequent additional costs to ensure the longevity of the box, this expense will be more cost effective in the long-term as boxes (if built correctly) can be built to last for more than three times longer.

1.1 Minimum design requirements

The nest boxes are to be built in the following manner:

- Timber is to be of high grade ply 15 mm thick – MDF, particle board and low grade ply are not acceptable.
- The lid is to be hinged at the rear side of the box that is affixed to the tree to allow internal inspections from the front side. Lids are to be well sloped to the front to allow runoff by rain. Hinges are to be robust (not small) and made of brass, stainless steel or galvanised. Lids are to be larger than the overall cross sectional size of the box and placed so that a small eave exists on all sides to prevent entry of rain.
- Two vertical timber supports (approximately 30x30mm timber strips 150 mm apart) are to be attached down the rear face of the box so that there are two points of attachment to the trunk on a curved surface and the box does not rock in the wind. This will also provide easy attachment points to the trees without having to screw through the inside of the box. These are to be made of treated pine and any screws into this (for hinges etc.) should be treated pine or stainless. Holes at both ends of both supports are to be predrilled for easy attachment to trees. Timber supports should not be placed directly onto the box but with small timber spacers so that an eave is permissible along this side of the roof.
- Boxes to be constructed for a target species. Recommended dimensions of nest boxes for select fauna species are supplied in Table 1 below. Entry holes are best placed in the front for birds or the sides for arboreal mammals.
- For bird boxes, an anti-myna baffle (illustrated below) or steeply sloped roof with side excluders should be placed to prevent direct front access to the entry hole. This is to prevent use and dominance by the exotic Common Myna or Starlings.
- Bird boxes should allow the wall to be climbed from the entry hole down to the base. This may be achieved by depth controlled saw cuts, robust matting or a ladder.

Boxes with anti-myna baffle may require the same placed below the hole on the external front.

- Joints are to be glued and screwed for strength. Glue should be labelled as non-toxic wood glue.
- All fasteners used are to be weather resistant stainless steel, galvanised or other. Screws into the treated pine supports are to be stainless steel or treated pine screws.
- All fasteners for tree attachment are to be supplied (stainless steel or treated pine coach screws). These are to be a suitable gauge depending the size of box and suitable length to pass through the vertical timber supports, through the bark and cambium, and into a sufficient extent of heartwood. Heartwood penetration will depend on the size of the box. Screws for small boxes should extend a minimum of 20mm into the heartwood of hardwood eucalypts and medium boxes ~40mm. All boxes are to be screwed so that a small distance for growth exists between the timber supports and the trunk. This can be achieved with a small stainless sleeve over the screw.
- 5 mm drainage holes are to be drilled in each corner at the base.
- Exterior of the boxes (including treated pine supports) are to be painted with a primer and then a minimum of two coats of external non-alcohol based acrylic paint. The colour selected should be consistent with the colour of the recipient trunk and therefore recipient trees should ideally be prior selected.

Note: Different methods of attachment to the tree are available. *Travers bushfire & ecology* generally recommends that the boxes should be fixed with robust stainless steel or treated pine coach screws that penetrate through the cambium and into the heartwood of the tree to ensure a very secure attachment. Provided that any cambium damage to a tree is not left as an open wound then the chance of fungal infection or insect attack is significantly reduced and the tree will grow around the screw. Any other method of attachment selected should also ensure the box is secured to prevent movement or fall and allows for the future growth of the tree without any cambium constriction over the complete life of the box.

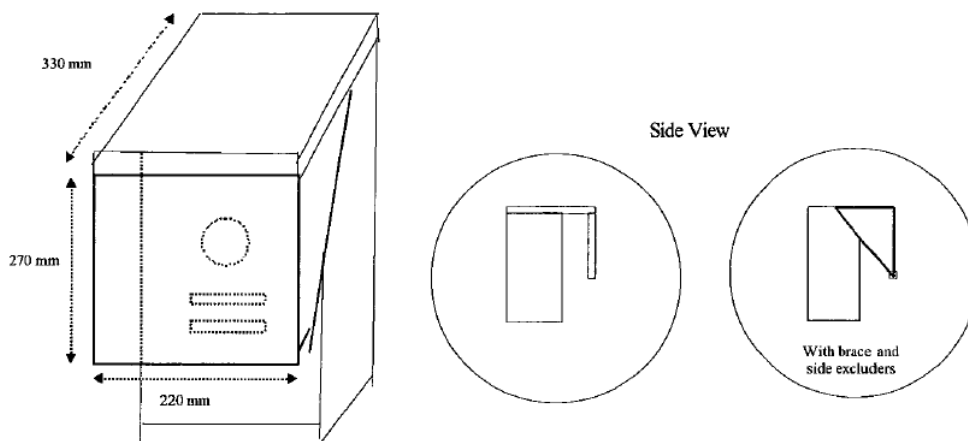
1.2 Nest box placement requirements

- The larger and more mature the recipient tree are to be selected where available. This will comparatively reduce the weighted stress on the tree, make the box less visible and result in less change in growth ratio affecting the selected attachment method.
- Nest box is preferably to be placed on the trunk for structural stability and protection from falling branches.
- Place nest boxes are high as physically possible within a tree preferably using a cherry picker or tree climber. This is certainly the case for birds (including owls) but not so much necessary for gliders. Microbat species vary but generally the higher the better for consideration to most species.
- Place nest boxes away from continual direct mid-day summer sun (on the edge of clearings) and preferably on the southern side of the trunk.
- Place nest boxes with large entry holes away from any prevailing winds when close to open water-bodies. E.g. protect from strong southerly winds close to the ocean and contrastingly cool-hot westerly winds in different seasons.

- Attached nest boxes securely so that they do not shift or shake in response to strong winds or being knocked by the movements of heavier animals, e.g. Possums and goannas.
- To ensure nest boxes are inaccessible to cats and rats or to also assist target species by exclusion of possums, the base of trunk or branches may also installation of tree guards or exclusion collars.
- Nest boxes should ideally be placed accessible for management but concealed from interference.

1.3 Management of installed boxes

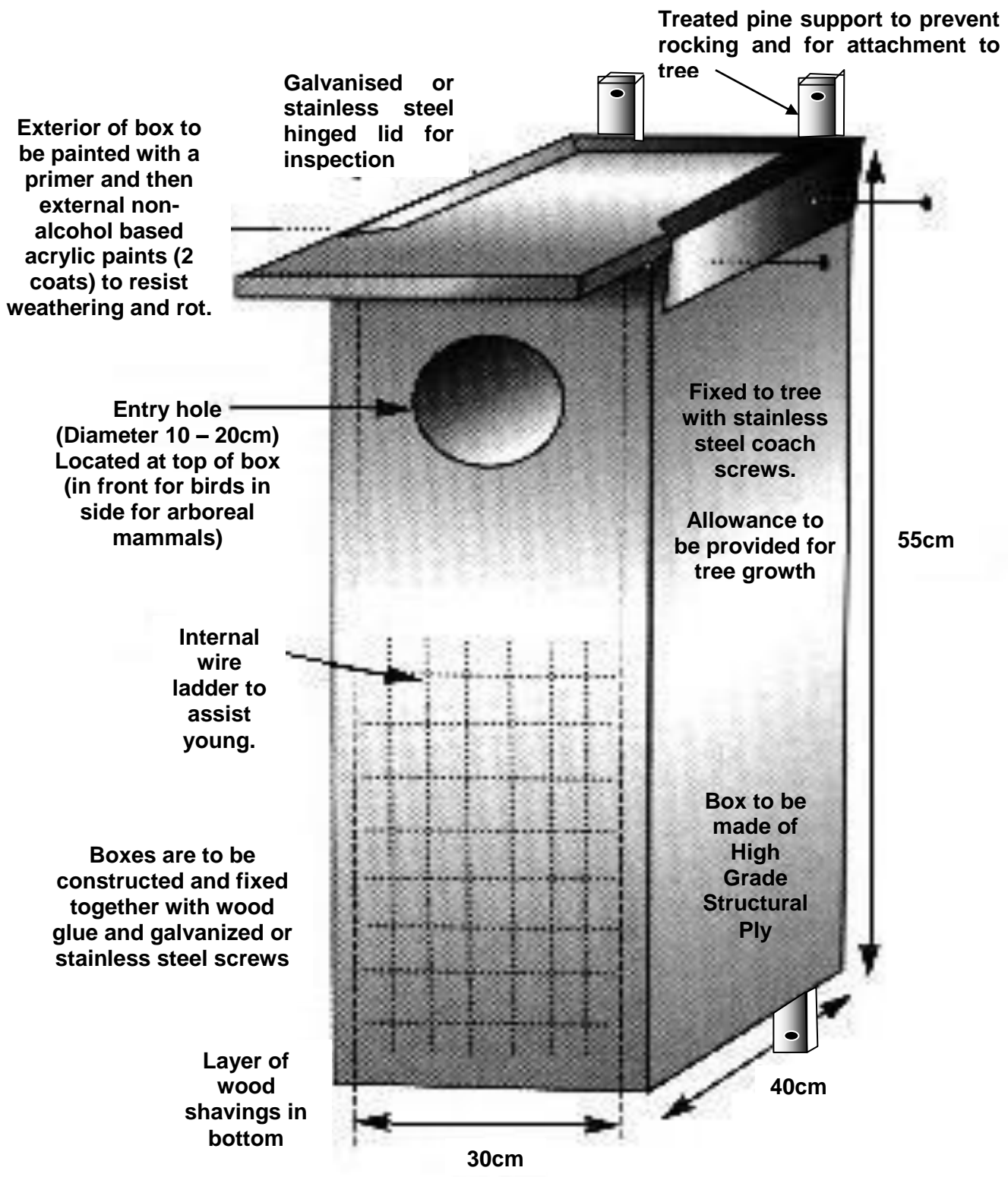
- Deterring Mynas and Starlings from re-nesting is not easy; these pests are very persistent, and constant vigilance is necessary. This also means that you must have convenient regular access to the nest-box, and that you must be aware of what creatures are using it for what purposes.
- Nest boxes found to be utilised by threatened or otherwise significant fauna may be prioritised for ongoing management to ensure their longevity and replicate their design/placement characteristics.



Produced by BIRDS AUSTRALIA (the former RAOU) from a design by Tim Gunn. Feedback on effectiveness and modifications would be appreciated. Please send to Hugo Philipps, BIRDS AUSTRALIA, 415 Riversdale Road, HAWTHORN EAST 3123.

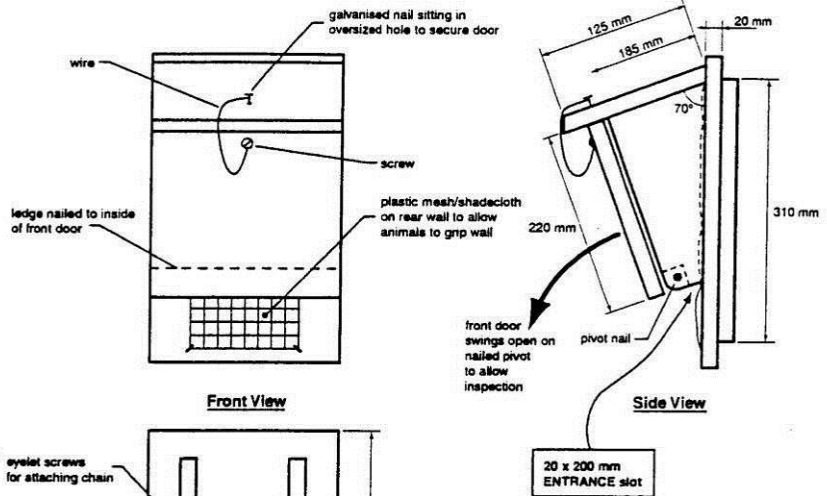
Diagram 1 - Anti-Myna Baffle

(Sourced from *Birds Australia Information Sheet No.5 – 30 July 2001*).



DESIGN 1 - PARROT & ARBOREAL MAMMAL NEST BOX DETAIL

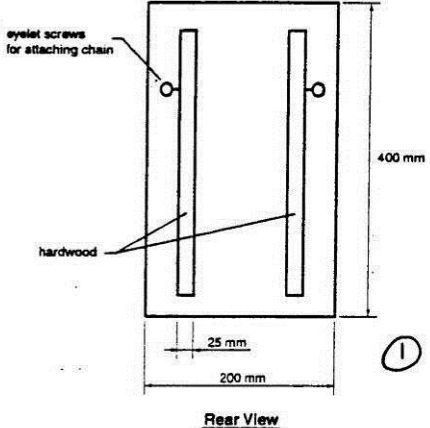
Note: For dimensions of other target species see Table 1.
 (Size dimensions applied for a Large Parrot Box)



Fixed to tree with stainless steel coach screws.

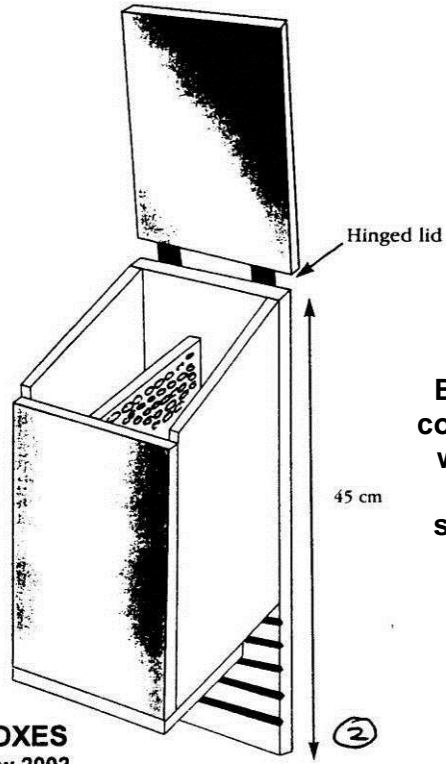
Allowance to be provided for tree growth

OPTION



Exterior of box to be painted with a primer and then 2 coats of external non-alcohol based acrylic paint to resist weathering and rot.

OPTION 2



Box to be constructed with high grade structural ply

BAT ROOSTING BOXES
 1. From Smith and Agnew 2002
 2. From Gould League of Victoria 1997

DESIGN 2 - MICROBAT NEST BOX DETAIL (Option 1 & 2)
 Note: Alternative designs available for alternative mounts



Photo 1 - Example of microbat design. Note: these boxes are not painted or appropriately affixed to the tree.

The following internal and external dimensions are recommended for the list of species. In choosing the ideal size boxes and openings the advice of an experienced Restoration Ecologist is to be sought.

Table 1 - Recommended Nest Box Dimensions for typical fauna
(Source: *Birds Australia Supplement No. 5 – Nest Boxes for Natives*)

SPECIES	INT DIAM	DEPTH/LENGTH	ENT DIAM	VERT/HOR	HEIGHT	SEASON	REF
Antechinus, Yellow-footed	-	-	20-25 mm	-	-	-	Trainor (1995)
Bat sp.	70-100 x 150-240 mm	200-250 mm	15-20 mm slit	v	-	-	BFNC (n.d.)
Bat, Chocolate Wattled	-	-	10 mm slit	-	-	-	Trainor (1995)
Bat, Gould's Wattled	-	-	10 mm slit	-	-	-	Trainor (1995)
Bat, Lesser Long-eared	-	-	10 mm slit	-	-	-	Trainor (1995)
Black-Cockatoo, Glossy	300 mm	870-1000 mm	160 x 200 mm	v	-	-	Pedler (1996)
Boobook, Southern	-	-	150 mm	h	-	-	Trainor (1995)
Brush-tail-Possum sp.	320 mm	400 mm	120-150 mm	v	4-8 m	Autumn	MZES (n.d.)
Brush-tail-Possum sp.	210 x 240 mm	380 mm	c.120 mm	v	-	-	RSPCA (n.d.)
Brush-tail-Possum sp.	-	-	90 mm	-	-	-	Trainor (1995)
Cockatoo, Sulphur-crested	-	-	150 mm	v	-	-	Trainor (1995)
Corella, Little	-	-	150 mm	-	-	-	Trainor (1995)
Corella, Long-billed	-	-	150 mm	-	-	-	Trainor (1995)
Duck, Australian Wood	200 mm	500 mm	120 mm	v	-	-	Trainor (1995)
Duck, Pacific Black	450 x 300 mm	-	120 mm	-	-	-	Elliot (1994)
Duck, Pacific Black	-	-	120 mm	h	-	-	Trainor (1995)
Duck, Pink-eared	-	-	-	-	-	-	Elliot (1994)
Galah	200 mm	650 mm	120 mm	v	6 m	Aug-Nov	Adams (1980)
Galah	200 mm	650 mm	120 mm	v	6 m	Sep-Jan	MZES (n.d.)
Galah	-	-	150 mm	-	-	-	Trainor (1995)
Glider, Feather-tailed	-	-	20-25 mm	-	-	-	Trainor (1995)
Glider, Squirrel	-	-	60 mm	-	-	-	Trainor (1995)
Glider, Sugar	250 mm	300 mm	50 mm	v	4-8 m	Jun-Dec	MZES (n.d.)
Glider, Sugar	200 mm	450 mm	35-40 mm	v	-	-	BFNC (n.d.)
Glider, Sugar	-	-	25-30 mm	-	-	-	Trainor (1995)
Kestrel, Nankeen	400 mm	750 mm	100 mm	v	5 m	Aug-Nov	Adams (1980)
Kingfisher, Sacred	130 mm	600-900 mm	75 mm	h	5-10 m	Sep-Mar	Adams (1980)
Kookaburra sp.	300 mm	500 mm	>130 mm	h	5-10 m	Sep-Jan	Adams (1980)
Kookaburra sp.	400 mm	-	130 mm	h	5-10 m	Sep-Jan	MZES (n.d.)
Kookaburra sp.	300 x 150-200 mm	600 mm	open	h	-	-	BFNC (n.d.)
Kookaburra, Laughing	150-300 mm	>400 mm	80-120 mm	h	-	-	Elliot (1994)
Kookaburra, Laughing	-	-	120 mm	h	-	-	Trainor (1995)
Lorikeet sp.	120 mm	600 mm	60 mm	h	5 m	Aug-Jan	Adams (1980)
Lorikeet, Little	-	-	25-30 mm	-	-	-	Trainor (1995)
Lorikeet, Musk	-	-	25-30 mm	-	-	-	Trainor (1995)
Lorikeet, Purple-crowned	-	-	25-30 mm	-	-	-	Trainor (1995)
Owl, Barn	400 mm	750 mm	open	h	5 m	Aut-Spr	Adams (1980)
Owl, Barn	-	-	150 mm	h	-	-	Trainor (1995)
Owlet-nightjar, Australian	100-150 mm	300-350 mm	60-80 mm	v	5 m	Sep-Dec	Adams (1980)
Owlet-nightjar, Australian	150 mm	>150 mm	70-120 mm	v	-	-	Elliot (1994)
Owlet-nightjar, Australian	150 mm	400 mm	50 mm	v	-	Sep-Dec	BFNC (n.d.)
Owlet-nightjar, Australian	-	-	40 mm	-	>5 m	-	Trainor (1995)
Owlet-nightjar, Australian	-	-	25-30 mm	-	-	-	Trainor (1995)
Pardalote sp.	120 mm	400-500 mm	30-45 mm	h	5 m	Jul-Jan	Adams (1980)
Pardalote sp.	120 mm	450 mm	30-45 mm	h	5 m	Jul-Jan	MZES (n.d.)
Pardalote, Striated	200 x 120-150 mm	-	25-35 mm	v/h	-	-	Elliot (1994)
Pardalote, Striated	90 x 120-140 mm	200 mm	30 mm	h	-	Aug-Feb	BFNC (n.d.)
Parrot, Red-rumped	100 mm	600 mm	75 mm	v/h	5 m	Aug-Jan	Adams (1980)
Parrot, Red-rumped	100-150 mm	400 mm	70-120 mm	h	-	-	Elliot (1994)
Parrot, Red-rumped	200-240 mm	400 mm	60-70 mm	v	-	-	BFNC (n.d.)
Parrot, Red-rumped	-	-	25-30 mm	-	-	-	Trainor (1995)
Phascogale, Brush-tailed	-	-	25-30 mm	-	-	-	Trainor (1995)
Ringtail-Possum sp.	250 mm	350 mm	80 mm	v	4-8 m	Apr-Nov	MZES (n.d.)
Ringtail-Possum sp.	250 mm	400 mm	60-80 mm	v	-	Mar-Nov	BFNC (n.d.)
Ringtail-Possum sp.	-	-	90 mm	-	-	-	Trainor (1995)
Rosella sp.	120-150 mm	>400 mm	70-120 mm	-	-	-	Elliot (1994)
Rosella sp.	150-200 mm	350-800 mm	75-100 mm	v/h	5 m	Aug-Jan	MZES (n.d.)
Rosella sp.	c.130 x 180 mm	c.400 mm	80 mm	v	-	-	Morrison (1996)
Rosella, Crimson	150-200 mm	350-800 mm	75-100 mm	v/h	5-6 m	Sep-Jan	Adams (1980)
Rosella, Eastern	135-150 mm	350-800 mm	75-100 mm	v/h	5-6 m	Aug-Jan	Adams (1980)
Rosella, Eastern	240 mm	400 mm	70 mm	v	-	-	BFNC (n.d.)
Rosella, Eastern	-	>500 mm	60 mm	-	>5 m	-	Trainor (1995)
Shrike-thrush, Grey	150-200 mm	200-300 mm	150 mm	-	-	-	Elliot (1994)
Shrike-thrush, Grey	150-200 x 200-300 mm	150-200 mm	open	h	-	-	BFNC (n.d.)
Swallow, Welcome	130 mm	-	open	h	3 m	Aug-Dec	Adams (1980)
Teal, Chestnut	200-400 mm	450-750 mm	100-120 mm	v	1.5 m	Sep-Dec	Adams (1980)
Teal, Chestnut	450 x 300 mm	-	80-100 mm	-	-	-	Elliot (1994)
Teal, Grey	200-400 mm	450-750 mm	100-120 mm	v	1.5 m	All year	Adams (1980)
Teal, Grey	450 x 300 mm	-	80-100 mm	-	-	-	Elliot (1994)
Teal, Grey	-	-	90 mm	-	-	-	Trainor (1995)
Treecreeper sp.	90-150 mm	100-150 mm	50-80 mm	v	-	-	Elliot (1994)
Treecreeper sp.	150 mm	400 mm	50 mm	v	-	-	BFNC (n.d.)
Treecreeper, White-throated	75-100 mm	300-400 mm	50-70 mm	v	5 m	Aug-Jan	Adams (1980)

2.0 Pest Fauna Control

Typical pests of nest boxes include Starlings, Indian minors and the common honey bee. In all cases the pest fauna competes with available roosting sites and may alter the boxes to meet their own requirements.

All nest boxes are to be erected at a minimum height of 4m above ground height to minimise the risk of damage and predation by exotic and pest fauna.

All nest boxes are to be checked on a quarterly basis for pest fauna during maintenance runs and removed if present. The removal of bees is to be handled by an experienced apiarist or registered pest control officer. No residual chemicals are to be used and a fully operational nest box is to be re-installed.

Hinged inspection hatches are to be provided for all nest boxes allow the boxes to be checked for occupation. The method of attachment is to allow removal of the nest box for maintenance or replacement as required.

3.0 Maintenance and Replacement Nest Boxes

Maintenance of nest boxes should be undertaken on a 6 monthly basis. Any nest boxes that are damaged (as identified by visual inspection) will be replaced and or immediately repaired. The removal or replacement of the box will be delayed if nesting fauna are present until the young have left the nest. Nest Boxes that are at risk of detachment are to be secured immediately.

Replacement boxes are to be installed if the existing box is permanently damaged or beyond repair. An equivalent quality or better will be installed as a replacement. The design specifications are to be adhered to strictly unless a qualified fauna ecologist approves an alternative design of better performance.

Maintenance inspections are undertaken to check the condition of nest boxes and their support structures. During inspection runs, damaged boxes must be removed, a replacement box immediately installed and the damaged box retained for minor repairs.

Other additional maintenance tasks may include re securing boxes, restocking with wood shavings and the removal of pest fauna species.



Vegetation Management Works

S1

SMOOTH-BARKED APPLE - RED BLOODWOOD OPEN FOREST			
Canopy trees: 1 per 50m ² in fully structured vegetation or 1 per 150m ² in APZ planting area			
<i>Angophora costata</i>	<i>Eucalyptus globoidea</i>	<i>Eucalyptus pilularis</i>	<i>Eucalyptus resinifera</i>
<i>Corymbia gummifera</i>	<i>Eucalyptus sclerophylla</i>	<i>Eucalyptus piparita</i>	<i>Syncarpia glomulifera</i>
Sub-canopy trees: 1 per 30m ² in fully structured vegetation or 1 per 150m ² in APZ planting area			
<i>Acacia parramattensis</i>	<i>Elaeocarpus reticulatus</i>	<i>Xylomelum pyriforme</i>	
<i>Allocasuarina littoralis</i>	<i>Melaleuca linarifolia</i>		
Shrubs: 1 per 5m ² in fully structured vegetation or 1 per 25m ² in APZ planting area			
<i>Acacia linifolia</i>	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	<i>Leptospermum polygalifolium</i>	<i>Pultenaea flexilis</i>
<i>Acacia longifolia</i>	<i>Dodonaea triquetra</i>	<i>Ozothamnus diosmifolius</i>	<i>Woolisia pungens</i>
<i>Acacia suaveolens</i>	<i>Grevillea buxifolia</i>	<i>Persoonia pinifolia</i>	<i>Zieria pilosa</i>
<i>Acacia ulicifolia</i>	<i>Grevillea sericea</i>	<i>Persoonia linearis</i>	
<i>Bossiaea obcordata</i>	<i>Kunzea ambigua</i>	<i>Persoonia levis</i>	
<i>Breynea oblongifolia</i>	<i>Leptospermum trinervium</i>	<i>Polyscias sambucifolia</i>	
Ground covers: 4 per 1m ² in fully structured vegetation or 3 per 1m ² in APZ planting area			
<i>Aristida vagans</i>	<i>Dianella caerulea</i>	<i>Imperata cylindrica</i>	<i>Opismenus imbecillis</i>
<i>Austrostipa pubescens</i>	<i>Dipodium variegatum</i>	<i>Lomandra longifolia</i>	<i>Themeda triandra</i>
<i>Blechnum cartilagineum</i>	<i>Entolasia marginata</i>	<i>Microlaena stipoides</i>	
<i>Centella asiatica</i>	<i>Entolasia stricta</i>	<i>Opismenus aemulus</i>	
Vines / climbers: 1 per 20m ² in fully structured vegetation only			
<i>Hardenbergia violacea</i>	<i>Pandorea pandorana</i>	<i>Smilax glycyphylla</i>	
SWAMP OAK FLOODPLAIN FOREST & ECOTONAL SPECIES			
Shrubs: 1 per 3m ²			
<i>Acacia linifolia</i>	<i>Breynea oblongifolia</i>	<i>Leptospermum trinervium</i>	<i>Polyscias sambucifolia</i>
<i>Acacia longifolia</i>	<i>Bursaria spinosa</i> subsp. <i>spinosa</i>	<i>Melaleuca thymifolia</i>	<i>Trema tomentosa</i>
<i>Acacia suaveolens</i>	<i>Dodonaea triquetra</i>	<i>Myoporum acuminatum</i>	<i>Woolisia pungens</i>
<i>Acacia ulicifolia</i>	<i>Kunzea ambigua</i>	<i>Ozothamnus diosmifolius</i>	<i>Zieria pilosa</i>
Ground covers: 6 per 1m ²			
<i>Aristida vagans</i>	<i>Commelina cyanea</i>	<i>Ficinia nodosa</i>	<i>Lomandra longifolia</i>
<i>Austrostipa pubescens</i>	<i>Dianella caerulea</i>	<i>Gahnia clarkei</i>	<i>Microlaena stipoides</i>
<i>Blechnum indicum</i>	<i>Echinopogon caespitosus</i>	<i>Imperata cylindrica</i>	<i>Opismenus imbecillis</i>
<i>Centella asiatica</i>	<i>Entolasia marginata</i>	<i>Juncus usitatus</i>	<i>Themeda triandra</i>
MACROPHYTE PLANTING			
Ground covers: 5 per 1m ²			
<i>Baloskion tetraphyllum</i>	<i>Dianella caerulea</i>	<i>Gahnia sieberiana</i>	<i>Juncus usitatus</i>
<i>Carex appressa</i>	<i>Ficinia nodosa</i>	<i>Juncus kraussii</i>	<i>Lomandra fluviatilis</i>
<i>Philydrium lanuginosum</i>			

Restoration performance targets

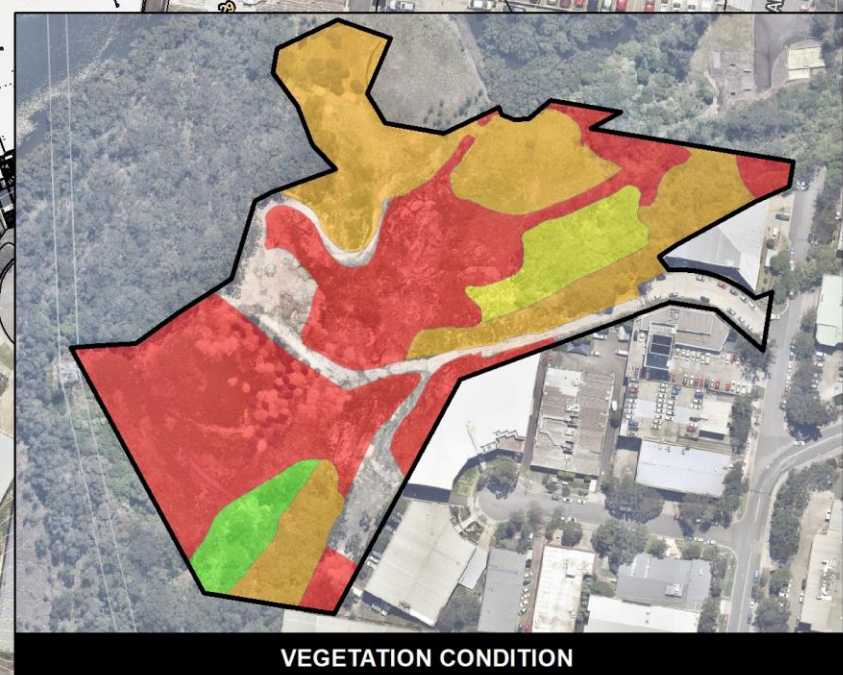
The site audits are to assess the achievement of the following restoration performance targets:

- All protective fencing and sediment controls are to be installed prior to the commencement of construction works.
 - Weed control and revegetation works are to be carried out by a qualified bushland regenerator to achieve the following weed control targets: maximum 10% weed coverage at the end of year 1, progressively reducing to less than 5% at the end of year 3.
 - Remediation works within the contaminated area are to be completed before the implementation of any restoration works within that area.
 - The restoration works are to achieve the following native cover performance targets of 60% at the end of year 1, 70% at the end of year 2, and 95% at the end of year 3.
 - Improved diversity and density of native vegetation over time is to be achieved.
 - Plantings are to utilise a minimum of thirty (30) locally-sourced species from the list as shown in Attachment 1. The quantity of species planted is to achieve a fully naturalised vegetation structure approved by the project ecologist.
- The following densities and numbers are to be achieved:
- Fully-structured revegetation area**
 - Canopy trees - 1 per 50m² (total area of 1700m² = 34 units)
 - Sub-canopy trees - 1 per 30m² (total area of 1700m² = 57 units)
 - Shrubs - 1 per 5m² (total area of 1700m² = 340 units)
 - Grasses and groundcovers - 4 per 1m² (total area of 1700m² = 6800 units)
 - Vines / climbers - 1 per 20m² (total area of 1700m² = 85 units)
 - Contaminated lands**
 - Shrubs - 1 per 3m² (total area of 2600m² = 867 units)
 - Grasses and groundcovers - 6 per 1m² (total area of 2600m² = 15600 units)
 - APZ plantings**
 - Canopy trees - 1 per 150m² (total area of 1,400m² = 9 units)
 - Shrubs - 1 per 25m² (total area of 1,400m² = 56 units)
 - Grasses and groundcovers - 3 per 1m² (total area of 1,400m² = 4,200 units)
 - Screen plantings**
 - Canopy trees - 10 units
 - Sub-canopy trees - 10 units
 - Outlet protection areas**
 - Sedges, rushes and macrophytes - 5 per (total area of 350m² = 1750 units)
- Plants are to be sourced from collected native seed of local provenance. Recommended species are shown in Attachment 1.
 - Contingency restoration works estimated at 15% of the restoration works cost, is to be undertaken in the direction of the project ecologist until the performance targets are achieved.
 - Monitoring of the outlet areas will be undertaken regularly to ensure that there are no detrimental impacts to the adjoining wetland or Stingsbark Creek.
 - Pest control including, but not limited to, rabbit baiting is to be undertaken throughout the restoration and maintenance period prior to, and after, planting until directed by the project ecologist to discontinue.
 - All revegetation areas are to be stabilised, trees and shrub plants protected by cardboard boxes (2L boxes for tube stock plants) and rabbit baiting (or alternative) as approved by the project ecologist.
 - Monitoring to be undertaken by the project ecologist with compliance certification reported to Council annually for a minimum of 3 years post primary restoration works (Section 4 of this VMP).

Legend	Proposed Infrastructure	Stream Order (source : LPI)	Restoration Works	Macrophyte Planting (0.035/ha)
Asset Protection Zone (APZ)	Data hall	Second order	Bush regeneration (0.20 ha)	Aerial Source: Nearmap
Monitoring quadrat (5x5m)(8)	Generator platform	Fifth order	Smooth-barked Apple - Red Bloodwood Open Forest	
Hollow-bearing tree	Substation	Vegetation Condition	Fully structured revegetation (0.17 ha)	
Nest box	Oil spill tank	Good (<10% weeds)	Smooth-barked Apple - Red Bloodwood Open Forest	
Permanent protection/ sediment fencing (209m)	Firetrail	Fair (10 - 30% weeds)	Shrub & groundcover plantings only (0.26ha)	
Top of bank	Riparian corridor	Poor (30 - 60% weeds)	Swamp Oak Floodplain Forest & Ecotonal Species	
	20m buffer	Very Poor (>60% weeds)	Screen Tree Planting (100 linear m)	
	40m buffer		Smooth Barked Apple - Red Bloodwood Open Forest	
			APZ compliant plantings (0.14ha)	



DISCLAIMER
 ARC_0104-LEVEL 5 FLOOR PLAN_RL31.8_CAD.dwg
 Group Layer 5 is not georeferenced. It has been aligned to other, georeferenced CAD linework relating to this project. Verification by a registered surveyor is required prior to finalisation.

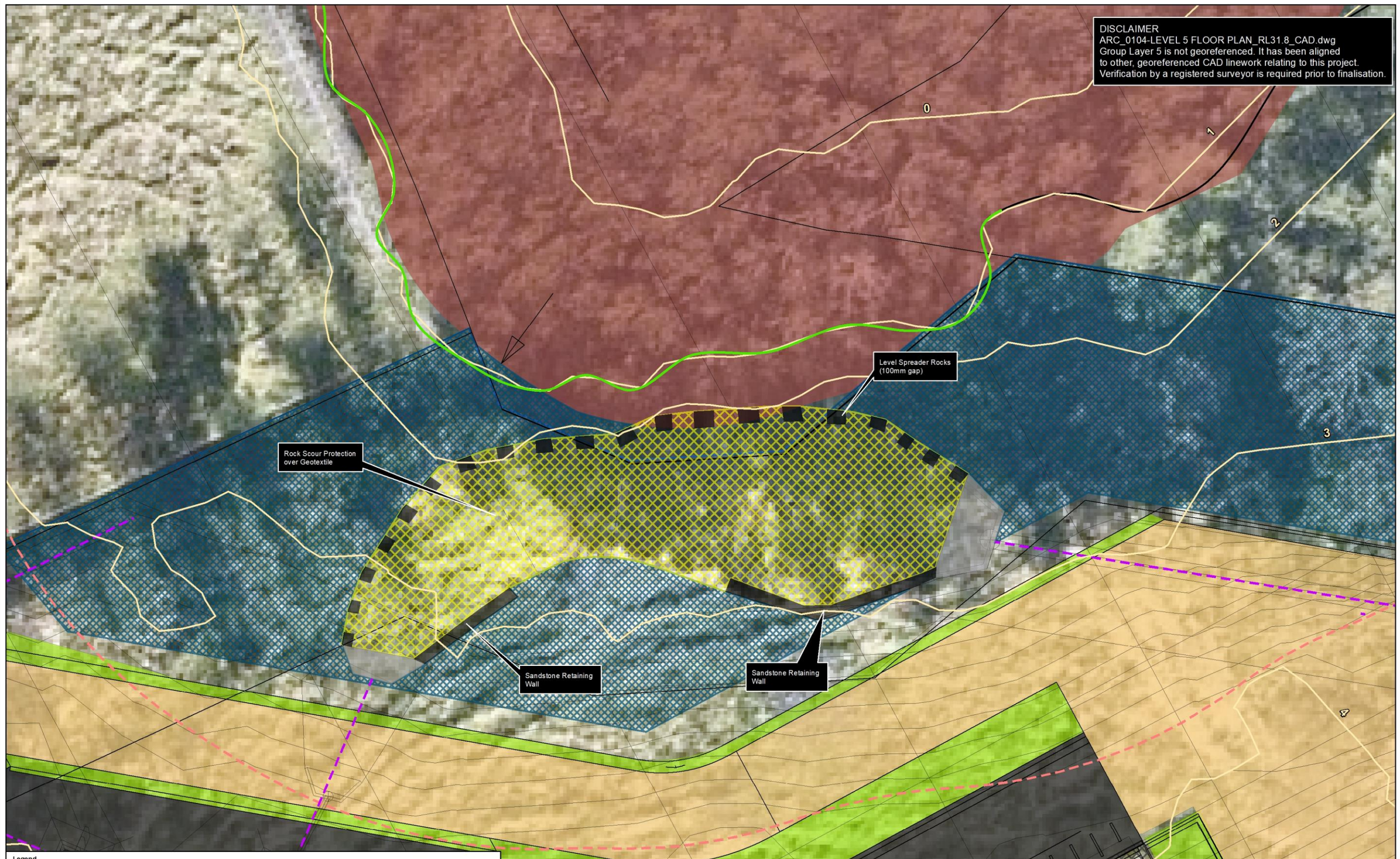


PROJECT & MXD REFERENCE 1 Sirius Road, Lane Cove West 18AWE02_VMP001	DATE & ISSUE NUMBER 28/08/2019 Issue 1	SCALE & COORDINATE SYSTEM 1:1,200 @A3 GDA 1994 MGA Zone 56
TITLE Schedule 1 - Vegetation Management Works Plan (Overview)		



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.

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Legend

- Contour (1m) (source: LIDAR)
- Top of bank
- Riparian corridor
 - 20m buffer
 - 40m buffer
- Edge of wetland
- Stormwater drain
- Headwall - East
- Sandstone rocks
- Rock Scour Protection (0.02ha)

Restoration Works

- Shrub & groundcover plantings only (0.26ha)
- Swamp Oak Floodplain Forest & Ecotonal Species

Plant Community Type

- Mangrove Forests in estuaries of the Sydney Basin Bioregion and South East Corner Bioregion

Aerial source: Nearmap

0 5 10 m

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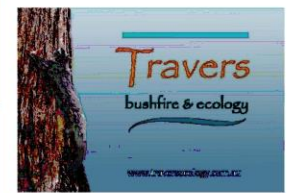
Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered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

PROJECT & MXD REFERENCE
 1 Sirius Road, Lane Cove West
 18AWE02_VMP002

DATE & ISSUE NUMBER
 28/08/2019
 Issue 1
 AW

SCALE & COORDINATE SYSTEM
 1:150 @A3
 GDA 1994 MGA Zone 56

TITLE
 Schedule 1a - Drainage Revegetation Detail (North Eastern outlet)





Legend

- Contour (1m) (source: LIDAR)
- Edge of wetland
- Stomwater drain
- Subject site (source: CAD)
- Headwall - West
- Sandstone rocks
- Rock scour protection (0.02ha)

Restoration Works

- Fully structured revegetation (0.17 ha)
- Smooth-barked Apple - Red Bloodwood Open Forest
- APZ compliant plantings (0.14ha)

Plant Community Type

- Exotic
- Flax-leaved Paperbark open to closed mesic forest on alluvial riverflats in the Sydney region
- Smooth-barked Apple - Coast Banksia / Cheese Tree open forest on sandstone slopes on the foreshores of the drowned river valleys of Sydney
- Swamp Oak swamp forest fringing estuaries, Sydney Basin Bioregion and South East Corner Bioregion

Aerial source: Nearmap

0 2.5 5 m

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PROJECT & MXD REFERENCE
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SCALE & COORDINATE SYSTEM
 1:100 @A3
 GDA 1994 MGA Zone 56

TITLE
 Schedule 1b - Drainage Restoration Detail (Western outlet)

