

Proposed Cemetery,
Lot 1 DP 776645
1290 Greendale Road,
Wallacia

Vegetation Management Plan

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This Vegetation Management Plan (VMP) has been produced to accompany a Development Application for the proposed cemetery.

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Figure 1 - Site location (Source: SIX Maps)

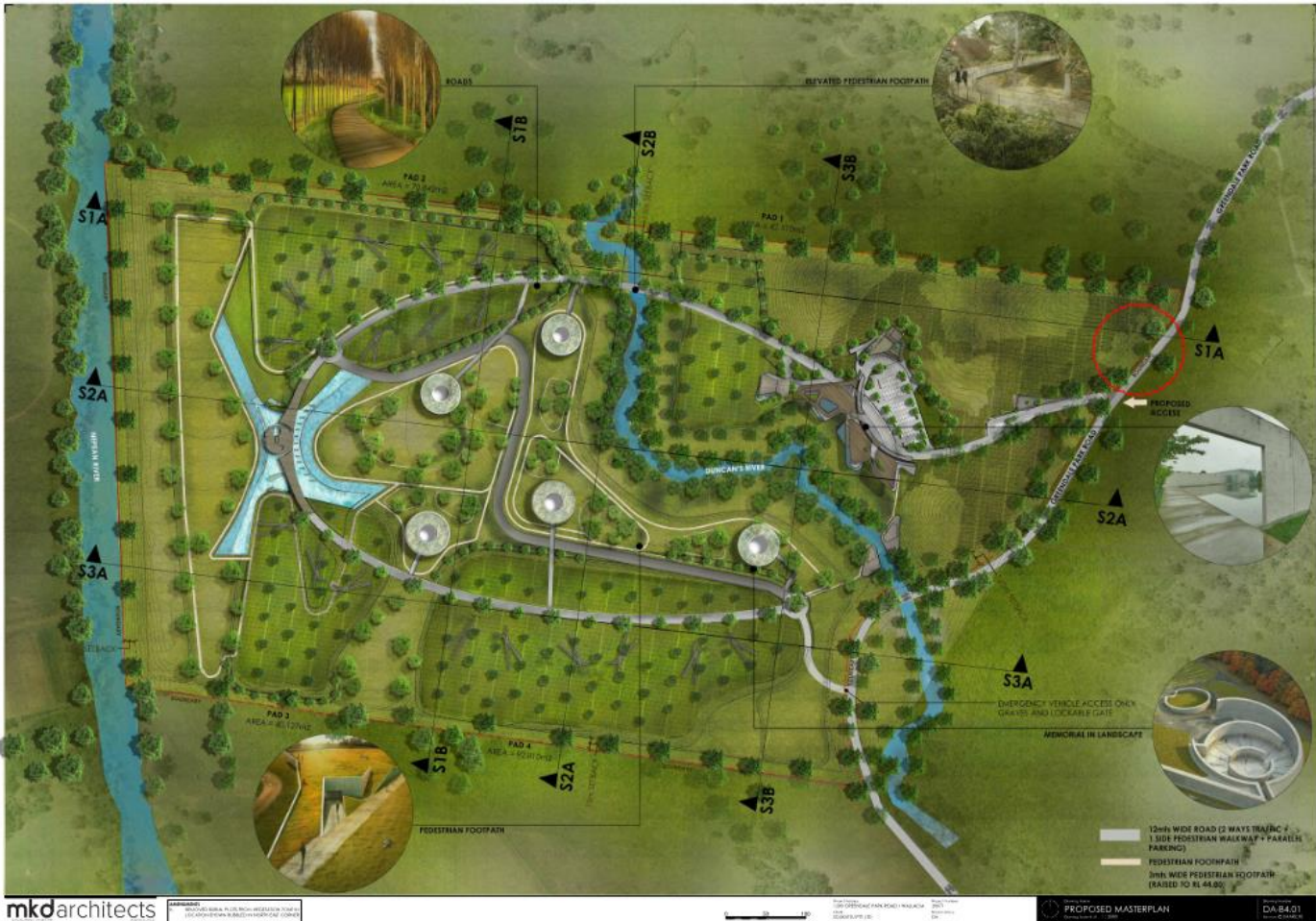


Figure 2 - Proposed Cemetery Masterplan

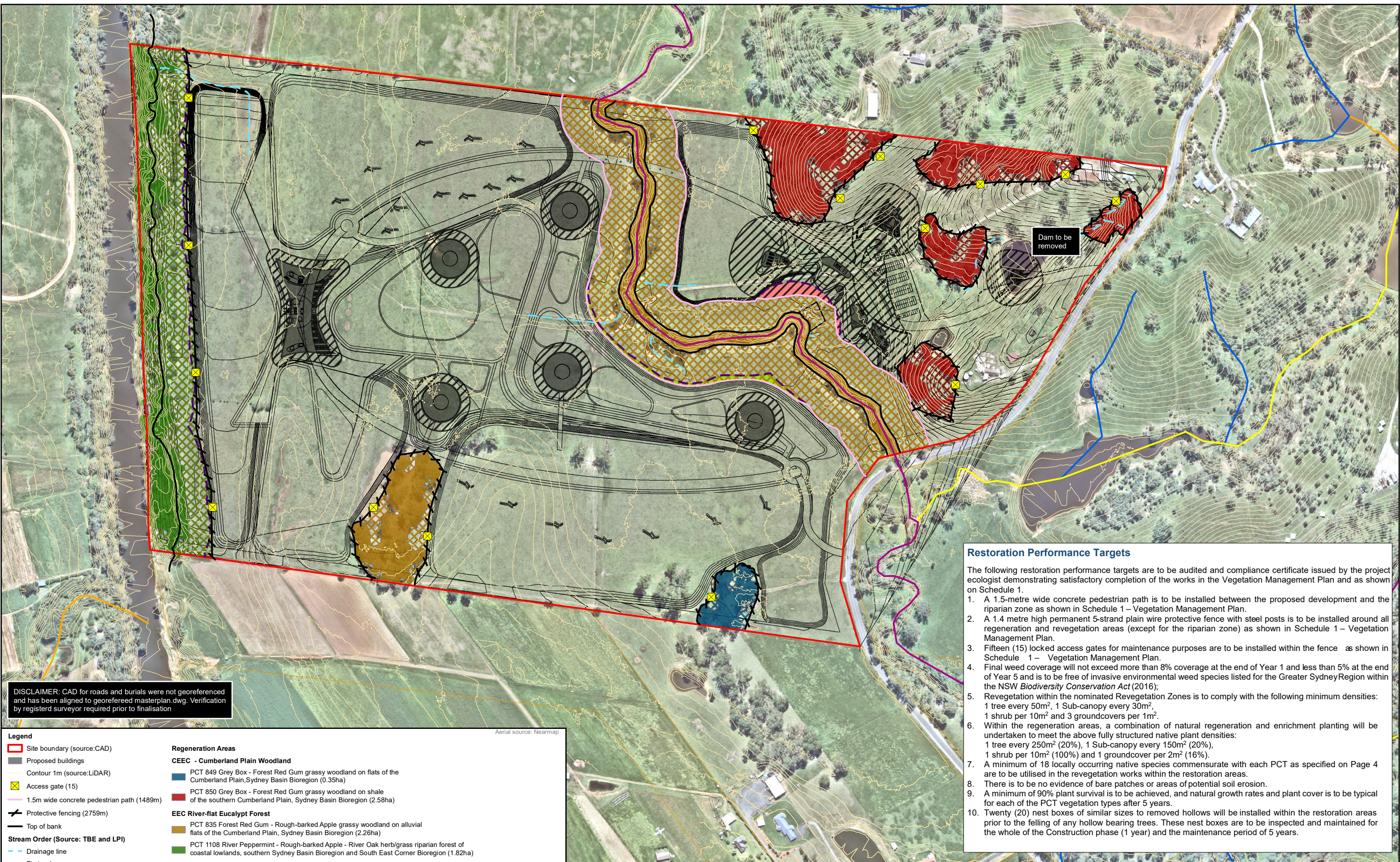


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Vegetation Management Plan



DISCLAIMER: CAD for roads and buildings were not georeferenced and has been aligned to georeferenced masterplan dwg. Verification by registered surveyor required prior to finalisation

Legend

- Site boundary (source:CAD)
- Proposed buildings
- Contour 1m (source:LIDAR)
- Access gate (15)
- 1.5m wide concrete pedestrian path (1489m)
- Protective fencing (2759m)
- Top of bank
- Stream Order (Source: TBE and LPI)
 - Drainage line
 - First order
 - Second order
 - Third order
 - Fourth order
- 40m riparian buffer
- Riparian gain (0.17ha)
- Riparian loss (0.15ha)
- Asset Protection Zone (APZ)

Regeneration Areas

CEEC - Cumberland Plain Woodland

- PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (0.35ha)
- PCT 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (2.58ha)

EEC River-flat Eucalypt Forest

- PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (2.26ha)
- PCT 1108 River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion (1.82ha)

Full revegetation areas

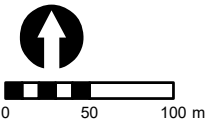
CEEC - Cumberland Plain Woodland

- PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion (0.12ha)
- PCT 850 Grey Box - Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion (1.1ha)

EEC River-flat Eucalypt Forest

- PCT 835 Forest Red Gum - Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion (6.53ha)
- PCT 1108 River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion (2.89ha)

Aerial source: Nearmap



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.

Restoration Performance Targets

The following restoration performance targets are to be audited and compliance certificate issued by the project ecologist demonstrating satisfactory completion of the works in the Vegetation Management Plan and as shown on Schedule 1.

- A 1.5-metre wide concrete pedestrian path is to be installed between the proposed development and the riparian zone as shown in Schedule 1 – Vegetation Management Plan.
- A 1.4 metre high permanent 5-strand plain wire protective fence with steel posts is to be installed around all regeneration and revegetation areas (except for the riparian zone) as shown in Schedule 1 – Vegetation Management Plan.
- Fifteen (15) locked access gates for maintenance purposes are to be installed within the fence as shown in Schedule 1 – Vegetation Management Plan.
- Final weed coverage will not exceed more than 8% coverage at the end of Year 1 and less than 5% at the end of Year 5 and is to be free of invasive environmental weed species listed for the Greater Sydney Region within the NSW Biodiversity Conservation Act (2016);
- Revegetation within the nominated Revegetation Zones is to comply with the following minimum densities: 1 tree every 50m², 1 Sub-canopy every 30m², 1 shrub per 10m² and 3 groundcovers per 1m².
- Within the regeneration areas, a combination of natural regeneration and enrichment planting will be undertaken to meet the above fully structured native plant densities: 1 tree every 250m² (20%), 1 Sub-canopy every 150m² (20%), 1 shrub per 10m² (100%) and 1 groundcover per 2m² (16%).
- A minimum of 18 locally occurring native species commensurate with each PCT as specified on Page 4 are to be utilised in the revegetation works within the restoration areas.
- There is to be no evidence of bare patches or areas of potential soil erosion.
- A minimum of 90% plant survival is to be achieved, and natural growth rates and plant cover is to be typical for each of the PCT vegetation types after 5 years.
- Twenty (20) nest boxes of similar sizes to removed hollows will be installed within the restoration areas prior to the felling of any hollow bearing trees. These nest boxes are to be inspected and maintained for the whole of the Construction phase (1 year) and the maintenance period of 5 years.

PROJECT & MXD REFERENCE

1290 Greendale Rd, Wallacia
20MKD03_VMP001

DATE & ISSUE NUMBER

27/11/2020
Issue 1

SCALE & COORDINATE SYSTEM

1:4,500 @A3
GDA 1994 MGA Zone 56

TITLE

Schedule 1: Vegetation Management Plan

Document Path: N:\GIS STORAGE\N Drive\20MKD03_GreendaleRd_Wallacia\MXD\20MKD03_VMP001.mxd



Vegetation Management Specifications

The purpose of this Vegetation Management Plan, is to define and document the actions required to restore or enrich areas of the following Plant Community Types (PCTs):

- PCT 835 - Forest Red Gum, Rough-barked Apple, grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion;
- PCT 849 - Grey Box, Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion;
- PCT 850 - Grey Box, Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin Bioregion; and
- PCT 1108 - River Peppermint, Rough-barked Apple, River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion.

Plant Community Types (PCTs) 849 and 850 are both commensurate with *Cumberland Plain Woodland in the Sydney Basin Bioregion* which is listed as a Critically Endangered Ecological Community (CEEC) within the NSW *Biodiversity Conservation Act* (2016) and as *Cumberland Plain Shale Woodlands and Shale Gravel Transition Forest* under the Commonwealth *Environmental Protection and Biodiversity Conservation Act* (1999).

Plant Community Types (PCTs) 835 and 1108 are both commensurate with *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* which is listed as an Endangered Ecological Community (EEC) within the NSW *Biodiversity Conservation Act* (2016) and part of the endangered community *Coastal Floodplain Eucalypt Forest of Eastern Australia* under the *EPBC Act*.

The aims of this VMP include:

- Protection, restoration and long-term management of riparian corridors within the allotment;
- Installation of permanent protection fencing and erosion control fencing;
- Erect bollards approximately 10m apart along the central watercourse corridor instead of fencing;
- Engagement of a Project Ecologist to undertake ongoing monitoring, compliance inspections and certifications
- Engagement of a suitably qualified bushland regeneration team.
- Weed control and maintenance of replanted or regeneration areas for a period of not less than 5 years;
- Restoration and enrichment of PCTs 835 and 1108 vegetation within the planting zones to create 13.50 ha of fully structured and diverse Riparian vegetation communities;
- Restoration and enrichment of PCTs 849 and 850 vegetation within the planting zones to create 4.13 ha of fully structured and diverse Cumberland Plain Woodland vegetation communities;
- Management of the restored vegetation, protective fencing, bollards and 20x installed nest boxes for a period of 5 years, with regular inspections by the Project Ecologist and compliance certificates sent to Council.

Site Preparation & Protection of Native Vegetation

The following site preparation must be undertaken:

- Install permanent protection fencing with fifteen (15) locked access gates and twenty (20) nest boxes as instructed by the Project Ecologist. 1.5 metre wide concrete pedestrian path to be installed along the boundaries of the central riparian area.
- Sediment fencing is to be installed immediately adjacent or in conjunction with the permanent protection fencing for the duration of the construction and subsequent 5-year maintenance period;
- Commence weed control within the whole of the revegetation, enrichment planting and existing vegetation management areas prior to commencing planting / enrichment works.
- Pre-clearance checks of potential habitat trees by fauna ecologist are to be undertaken to identify use by native fauna and relocate fauna in accordance with the Biodiversity Assessment Report

Fencing

Permanent fencing is to be installed on the boundaries of the restoration areas (except the riparian zone) and is to consist of a minimum of 1.4-metre-high 5 strand plain wire fencing with steel posts and shall contain 15 locked gates for maintenance purposes as shown in Schedule 1. Alternative fencing styles may be used subject to approval by the Project Ecologist that the new design functions as a permanent exclusion fence. A 1.5 metre wide concrete pedestrian path is to be installed between the proposed development and the riparian zone as shown in Schedule 1.

Weed Control

Primary (initial) weed control is to be undertaken prior to any site works to remove highly invasive weed propagules and the bulk of exotic ground layer grasses. All ground and shrub layer weed control works are to be undertaken by qualified personnel (minimum: Certificate IV in Conservation and Land Management) from an experienced bushland regeneration company utilising best practice restoration, revegetation and regeneration methods.

Herbicide Use

The use of low residue and low toxicity herbicides is recommended in accordance with the manufacturer's labels. 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 method of treatment of each species for each herbicide. Care must be taken when applying herbicides near water bodies due to the sensitivity of waterways and resident flora and fauna. All herbicides must be applied according to the herbicide usage label and provisions of the Protection of the Environmental Operations Act (NSW). Weeding within the restoration areas is to be undertaken by hand or via spot spraying and without the use of heavy machinery.

Revegetation Specifications

Page 4 provides recommended revegetation species lists for PCTs 835, 849, 850 and 1108. Only plant species typically occurring within these PCTs are to be utilised for revegetation purposes, any variation from these revegetation species lists is to be approved by the project ecologist. All plants utilised for restoration are to be sourced from the local area, preferably within the Liverpool City Council area. A minimum of 18 native species from each PCT shall be used as part of the revegetation works.

Jute matting should be used for planting in areas that may be subject to water flow. Mulch should be used in other areas. Mulch shall be native mulch with a known provenance and certified that it is free of weed propagules.

Revegetation planting is to be undertaken preferably in March / April or September / October to avoid mid-summer heat and potential frosts. Revegetation works shall include the planting of native tree, sub-canopy, shrub and groundcover species commensurate with PCTs 835, 849, 850 and 1108 as indicated on Page 4. The following densities are to be achieved within the fully structured revegetation zones:

- Trees – 1 tree per 50m²
- Sub-Canopy – 1 per 30m²
- Shrubs – 1 shrub per 10 m²
- Groundcovers – 3 groundcovers per 1 m²
- Vines – 1 vine per 30m²

NOTE: the above densities are for full restoration planting areas. The enrichment planting areas are at a lower density. Numbers of plants required are calculated within the tables on Page 4. As a minimum, holes for tree planting are to be twice the depth and twice the width of the pot size of the plant.

Maintenance:

All installed plantings are to be protected with a 2L cardboard box or corflute guards with small supporting stakes to protect from frost and grazing animals such as rabbits. Pindone rabbit baiting is to be undertaken 4 weeks prior to revegetation and throughout the entire maintenance period, (subject to Local Government guidelines).

Weed control works, bush regeneration and restoration are to be undertaken over a minimum maintenance period of five (5) years post construction. Weed control and restoration works are to be monitored and audited by an appointed Project Ecologist to achieve the restoration performance targets.

It is expected that at least 90% of plantings will survive and will be progressively replaced if any plants are observed to die or be destroyed. If the success rate is less than this, contingency planting is to be undertaken to establish the performance targets required. Enrichment planting may be required in selected areas to achieve the performance targets. Revegetation maintenance including weed control and replacement planting is to be undertaken over a 5-year minimum period. Watering of all revegetated areas is to be undertaken a minimum of once a week for the first six to eight weeks post planting, or as required in the event of a dry spell. A contingency revegetation component is to be undertaken equivalent to 15% losses of all installed plants.

Project Management, Reporting and Auditing

The following project management tasks are to be undertaken:

1. Engagement of qualified and experienced bushland regeneration contractors (minimum: Certificate IV in Conservation and Land Management) to undertake all restoration works;
2. All plant stock is to be certified as local provenance from the supplier, with preference for seeds collected from similar community types
3. Engagement of a project ecologist to undertake auditing, compliance reporting and certification;
4. Photo points and monitoring quadrats are to be set up at the beginning of contract work to be monitored at least annually for 5 years; and
5. A compliance statement is to be submitted to Council upon completion of the revegetation works (practical completion) and at the end of each year for 5 years maintenance period assessing compliance with the stipulated restoration performance targets.

Restoration Performance Targets

The following restoration performance targets are to be audited and compliance certificate issued by the project ecologist demonstrating satisfactory completion of the works in the Vegetation Management Plan and as shown on Schedule 1.

1. A 1.5-metre wide concrete pedestrian path is to be installed between the proposed development and the riparian zone as shown in Schedule 1 – Vegetation Management Plan.
2. A 1.4 metre high permanent 5-strand plain wire protective fence with steel posts is to be installed around all regeneration and revegetation areas (except for the riparian zone) as shown in Schedule 1 – Vegetation Management Plan.
3. Fifteen (15) locked access gates for maintenance purposes are to be installed within the fence as shown in Schedule 1 – Vegetation Management Plan.
4. Final weed coverage will not exceed more than 8% coverage at the end of Year 1 and less than 5% at the end of Year 5 and is to be free of invasive environmental weed species listed for the Greater Sydney Region within the NSW *Biodiversity Conservation Act* (2016);
5. Revegetation within the nominated Revegetation Zones is to comply with the following minimum densities:
1 tree every 50m², 1 Sub-canopy every 30m²,
1 shrub per 10m² and 3 groundcovers per 1m².
6. Within the regeneration areas, a combination of natural regeneration and enrichment planting will be undertaken to meet the above fully structured native plant densities:
1 tree every 250m² (20%), 1 Sub-canopy every 150m² (20%),
1 shrub per 10m² (100%) and 1 groundcover per 2m² (16%).
7. A minimum of 18 locally occurring native species commensurate with each PCT as specified on Page 4 are to be utilised in the revegetation works within the restoration areas.
8. There is to be no evidence of bare patches or areas of potential soil erosion.
9. A minimum of 90% plant survival is to be achieved, and natural growth rates and plant cover is to be typical for each of the PCT vegetation types after 5 years.
10. Twenty (20) nest boxes of similar sizes to removed hollows will be installed within the restoration areas prior to the felling of any hollow bearing trees. These nest boxes are to be inspected and maintained for the whole of the Construction phase (1 year) and the maintenance period of 5 years.



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Vegetation Management Specifications

Restoration Species Lists

PCT 850			
Canopy Tree species Full Restoration 1.1 ha at 1 per 50m ² = 11,000m ²	220		
Canopy Tree species Enrichment Planting 2.58 ha at 1 per 250m ² = 25,800m ²	104	324	
<i>Eucalyptus moluccana</i> Grey Box	162		
<i>Eucalyptus tereticornis</i> Forest Red Gum	162		
Sub-canopy species Full Revegetation 1.1 ha at 1 per 30m ²	368		
Sub-canopy species Enrichment Planting 2.58 ha at 1 per 150m ²	172	540	
<i>Acacia implexa</i> Hickory Wattle	540		
Shrubs Full Revegetation 1.1 ha at 1 per 10m ²	1,100		
Shrubs Enrichment Planting 2.58 ha at 1 per 10m ²	2,580	3,680	
<i>Bursaria spinosa</i> Native Blackthorn	1,840		
<i>Rubus parvifolius</i> Native Raspberry	1,840		
Groundcovers Full Revegetation 1.1 ha at 3 per 1m ²	33,000		
Groundcovers Enrichment Planting 2.58 ha at 1 per 2m ²	12,900	45,900	
<i>Aristida ramosa</i> Purple Wiregrass	4,500		
<i>Brunoniella australis</i> Blue Trumpet	3,000		
<i>Carex inversa</i> Knob Sedge	3,500		
<i>Cheilanthes sieberi</i> Rock Fern	2,500		
<i>Cotula australis</i> Common Cotula	2,500		
<i>Dichondra repens</i> Kidney Weed	4,500		
<i>Einadia polygonoides</i> -	3,500		
<i>Microlaena stipoides</i> Weeping Grass	5,000		
<i>Oplismenus aemulus</i> Basket Grass	3,000		
<i>Rumex brownii</i> Swamp Dock	3,000		
<i>Sporobolus creber</i> Slender Rat's Tail Grass	3,400		
<i>Themeda triandra</i> Kangaroo Grass	4,500		
<i>Solanum prinophyllum</i> Forest Nightshade	3,000		
Vines Full Revegetation 1.1 ha at 1 per 30m ²	368		
Vines Enrichment Planting 2.58 ha at 1 per 150m ²	172	540	
<i>Desmodium gunnii</i> Slender Tick-trefoil	270		
<i>Desmodium varians</i> Slender Tick-trefoil	270		
Total No. of plants = 50,984			

PCT 835			
TREES Full Restoration 6.53ha at 1 per 50m ² = 65,300m ²	1306		
Enrichment Planting 2.26ha at 1 per 250m ² = 22,600m ²	91	1397	
<i>Angophora subvelutina</i> Broad-leaved Apple	279		
<i>Casuarina cunninghamiana</i> River Oak	279		
<i>Eucalyptus amplifolia</i> Cabbage Gum	280		
<i>Eucalyptus baueriana</i> Blue Box	279		
<i>Eucalyptus tereticornis</i> Forest Red Gum	280		
SUB CANOPY Full Restoration 6.53ha at 1 per 30m ² =	2177		
Enrichment Planting 2.26ha at 1 per 150m ² =	151	2328	
<i>Acacia parramattensis</i> Sydney Green Wattle	582		
<i>Callistemon salignus</i> Willow Bottlebrush	582		
<i>Melaleuca linearifolia</i> Snow in Summer	582		
<i>Melaleuca styphelioides</i> Prickly-leaved Tea Tree	582		
SHRUBS Full Restoration 6.53ha at 1 per 10m ² =	6530		
Enrichment Planting 2.26ha at 1 per 10m ² =	2260	8790	
<i>Bursaria spinosa</i> Native Blackthorn	8790		
GROUNDCOVERS Full Restoration 6.53ha at 3 per 1m ² =	0		
Enrichment Planting 2.26ha at 1 per 2m ² =	11,300	207,200	
<i>Einadia trigonos</i> Fishweed	18,836		
<i>Geranium homeanum</i> Northern Cranesbill	18,836		
<i>Juncus usitatus</i> Common Rush	18,836		
<i>Marseilia hirsuta</i> Short-fruited Nardoo	18,836		
<i>Microlaena stipoides</i> Weeping Grass	18,840		
<i>Oplismenus aemulus</i> Basket Grass	18,836		
<i>Oxalis perennans</i> Yellow-flowered Wood Sorrel	18,836		
<i>Rumex brownii</i> Swamp Dock	18,836		
<i>Sigesbeckia orientalis</i> Indian Weed	18,836		
<i>Solanum americanum</i> Glossy Nightshade	18,836		
<i>Urtica incisa</i> Stinging Nettle	18,836		
TOTAL		219,715	

PCT 849			
TREES Full Restoration 0.12ha at 1 per 50m ² = 1,200m ²	24		
Enrichment Planting 0.35ha at 1 per 250m ² = 3,500m ²	14	38	
<i>Eucalyptus moluccana</i> Grey Box	16		
<i>Eucalyptus tereticornis</i> River Red Gum	16		
<i>Eucalyptus crebra</i> Narrow-leaved Ironbark	15		
<i>Eucalyptus fibrosa</i> Broad-leaved Ironbark	15		
SUB-CANOPY Full Restoration 0.12ha at 1 per 30m ² =	40		
Enrichment Planting 0.35ha at 1 per 150m ² =	23	63	
<i>Acacia parramattensis</i> Sydney Green Wattle	35		
<i>Exocarpus cupressiformis</i> Native Cherry	34		
<i>Acacia decurrens</i> Black Wattle	34		
SHRUBS Full Restoration 0.12ha at 1 per 10m ² =	120		
Enrichment Planting 0.35ha at 1 per 10m ² =	350	470	
<i>Bursaria spinosa</i> Native Blackthorn	550		
GROUNDCOVERS Full Restoration 0.12ha at 3 per 1m ² =	3600		
Enrichment Planting 0.35ha at 1 per 2m ² =	1750	5350	
<i>Cotula australis</i> Common Cotula	750		
<i>Dichondra repens</i> Kidney Weed	750		
<i>Cheilanthes sieberi</i> Poison Rock Fern	750		
<i>Aristida vagans</i> Three-awn Speargrass	750		
<i>Microlaena stipoides</i> Weeping Grass	750		
<i>Wahlenbergia gracilis</i> Australian Bluebell	750		
<i>Themeda triandra</i> Kangaroo Grass	750		
<i>Lomandra filiformis</i> Wattle Mat-rush	750		
<i>Lomandra multiflora</i> Many-flowered Mat-rush	750		
<i>Dianella longifolia</i> Blue Flax Lily	750		
<i>Aristida ramosa</i> Purple Wiregrass	750		
<i>Oxalis perennans</i> Yellow-flowered Wood Sorrel	750		
VINES Full Restoration 0.12ha at 1 per 30m ² =	40		
Enrichment Planting 0.35ha at 1 per 30m ² =	117	157	
<i>Desmodium varians</i> Slender Tick-trefoil	183		
TOTAL		6078	

Costing

This VMP has been prepared for a Development Application submission. A security deposit may be required for the purposes of guaranteeing the implementation of the vegetation management works. The amount of the security deposit is usually based on costings to be provided by a qualified bushland regenerator prior to the issuance of a Construction Certificate.



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Species Planting Lists

PCT 1108			
TREES Full Restoration 2.89ha at 1 per 50m2 = 28,900m2		578	
Enrichment Planting 1.82ha at 1 per 250m2 = 18,200m2		73	651
<i>Casuarina cunninghamiana</i>	River Oak	217	
<i>Eucalyptus elata</i>	River Peppermint	217	
<i>Eucalyptus benthamii</i>	Camden White Gum	217	
SUB-CANOPY Full Restoration 2.89ha at 1 per 30m2 =		963	
Enrichment Planting 1.82ha at 1 per 150m2 =		121	1084
<i>Backhousia myrtifolia</i>	Grey Myrtle	542	
<i>Melia azedarach</i>	White Cedar	542	
SHRUBS Full Restoration 2.89ha at 1 per 10m2 =		2890	
Enrichment Planting 1.82ha at 1 per 10m2 =		1820	4710
<i>Bursaria spinosa</i>	Native Blackthorn	1570	
<i>Acacia binervia</i>	Coast Myall	1570	
<i>Maytenus sylvestris</i>	Orange Bush	1570	
GROUNDCOVERS Full Restoration 2.89ha at 3 per 1m2 =		86700	
Enrichment Planting 1.82ha at 1 per 2m2 =		9100	95,800
<i>Microlaena stipoides</i>	Weeping Grass	7987	
<i>Cynodon dactylon</i>	Common Couch	7983	
<i>Austrostipa ramosissima</i>	Stout Bamboo Grass	7983	
<i>Themeda triandra</i>	Kangaroo Grass	7983	
<i>Rumex brownii</i>	Swamp Dock	7983	
<i>Oplismenus aemulus</i>	Basket Grass	7983	
<i>Dichondra repens</i>	Kidney Weed	7983	
<i>Lobelia purpurascens</i>	Whiteroot	7983	
<i>Cheilanthes sieberi</i>	Rock Fern	7983	
<i>Juncus usitatus</i>	Common Rush	7983	
<i>Oxalis perennans</i>	Yellow-flowered Wood Sorrel	7983	
<i>Hydrocotyle tripartita</i>	Pennywort	7983	
VINES Full Restoration 2.89ha at 1 per 30m2 =		963	
Enrichment Planting 1.82ha at 1 per 30m2 =		607	1570
<i>Desmodium varians</i>	Slender Tick-trefoil	1570	
TOTAL			103,815

Photos



Photo 1 – PCT 1108 within plot 1 in the north-west of the study area.



Photo 3 – PCT 835 within plot 3 in the south-west of the study area.



Photo 5 – PCT 849 within plot 7 in the south-east of the study area.



Photo 2 – PCT 1108 within plot 2 in the south-west of the study area.



Photo 4 – PCT 835 within plot 5 in the riparian area along Duncan's Creek



Photo 6 – PCT 850 within plot 4 in the north-east of the study area.

Photos (Cont.)



Photo 7 – PCT 850 within plot 6 in the north-east of the study area.



Photo 9 - Exotic vegetation near Duncan’s Creek in location of proposed bridge, showing gap between native eucalypt trees.



Photo 8 - Exotic vegetation near Duncan’s Ck. in location of proposed bridge.



Program of Works

The program of works (Table 2) is aimed at providing a management framework for enacting works such as undertaking revegetation, maintenance, monitoring and review works required for the site. Site rehabilitation, including weed control works is to be undertaken in accordance with the Schedule 1 – Vegetation Management Works. A typical timeline of works is shown on Figure 1. For the purposes of the program of works, the listed tasks are divided into the following stages.

Pre-restoration Works (prior to vegetation restoration works) - All site preparation activities prior to the commencement of vegetation restoration works on site and generally excludes any landscaping and planting works.

Restoration Works - Period during which primary restoration works are completed. *Primary Restoration Works*, as defined under this VMP, include the completion of primary and secondary weed control, protective fencing 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 vegetation restoration works phase may be extended.

Post Restoration Works - Consist of maintenance activities, unless further contingency works are identified by the project ecologist for auditing, fulfilment of the performance targets, or other purposes. Maintenance will be undertaken by a fully qualified bush regeneration crew for a minimum of five (5) years post completion of primary restoration works.

Table 2 - Program of Works

Action	Responsibility
Stage 1 – Pre-restoration works	
- Formation of site management team and establish supervision and consultation processes – minimum Project Ecologist, qualified bushland restoration contractor and site manager - Erection of erosion control fencing - Installation of primary exclusion / protection fencing and access gates - Commencement of <i>primary weed control</i> - Commencement of seed collection and propagation contracts - Provide certificates of compliance	- Site project manager - Site manager / project ecologist - Project manager - Suitably qualified bushland restoration contractor - Bushland restoration contractor / project ecologist - Project ecologist
Stage 2 – Restoration works	
- Supervision of any vegetation and management works - Monitor erosion control measures (monthly – especially after heavy rain) and replace if required - Waste removal and soil amelioration works to control weed infestations and provide suitable restoration soil base. - Complete revegetation works - Commencement of secondary weed control and maintenance weed control - Maintenance of fencing and signage around protected vegetation - Continuation of primary restoration and revegetation works - Provide certificates of compliance at practical completion	- Site project manager in association with the project ecologist - Contractor with advice of project manager - suitably qualified bushland restoration contractor - Bushland restoration contractor / project manager - Contractor / suitably qualified bushland restoration contractor - Contractor - Contractor / suitably qualified bushland regenerator - Project ecologist
Stage 3 – Post Restoration Works	
- Enrichment planting within revegetation areas if required. - Continuation of regeneration and weed control maintenance - Monitoring of retained vegetation at six (6) months, twelve (12) months and annually for five (5) years post construction stage. - Conduct maintenance beyond five (5) years as required - Provide certificates of compliance at end of each year during the 5-year maintenance period	- Qualified bushland restoration contractor with advice of project ecologist - Contractor / suitably qualified bushland regenerator - Project ecologist - Site manager with advice of project ecologist - Project ecologist

The following typical timeline (Figure 1) is provided to indicate the overall timing of restoration works. The commencement of the maintenance period of five (5) years is subject to the completion of primary restoration works as certified by the project ecologist. A certificate of practical completion will be required as evidence of satisfactory completion prior to the commencement of the maintenance period.

The successful implementation of restoration works may affect the release of any required bonds as required. Upon engagement, contractors are expected to meet the following typical schedule of works.

Figure 1 – Typical Restoration Works Timeline (5 years maintenance)

[illegible]

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Program of Works

Hollow-bearing trees

Three (3) trees containing four (4) small (5-10cm) hollows, one (1) medium (15-20cm) and three (3) large (50-60cm) hollows are located within the development area and will be removed (*Travers bushfire & ecology*, Biodiversity Development Assessment Report, October 2020). These hollows will be replaced within retained vegetation onsite by salvaging and re-using existing hollows or via the installation of appropriately sized nest boxes prior to tree felling (see Nest Boxes section)

Tree removal & hollow relocation strategy

The aim of the hollow relocation strategy is to protect and provide habitat for hollow-dependent threatened fauna species with most potential to occur. Where the felling of hollow-bearing trees is required, this is to be conducted under the supervision of a fauna ecologist to ensure appropriate animal welfare procedures are taken, particularly for threatened species.

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 required so as to allow for suitable time for inspections of trees for use by fauna and to plan for the safe felling of the tree/removal of fauna if present. 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. Inspections may also require camera probe inspection. All hollow-bearing trees proposed for removal shall be clearly marked with a 'H' Symbol to indicate removal under supervision by a fauna ecologist. A fauna ecologist is to be present at the removal of each habitat tree.

Hollows of high quality or with fauna recorded residing within are to be sectionally dismantled for relocation and all hollows are to be inspected for occupation, signs of previous activity and potential for reuse.

Subsequent hollows of retention value are to be relocated within remaining bushland areas within the study area. After modification for reinstallation the hollow section is to be reattached to a recipient tree within the nearby conservation areas as selected and directed by the fauna ecologist. The welfare and temporary holding of the residing animal(s) is at the discretion of the fauna ecologist. The hollow section should be well secured in the recipient tree in a manner that will not compromise the current or future health of that tree.

Where retained hollows are placed as on ground habitat and are not reattached to a new recipient tree then they are to be replaced with appropriately sized, high quality, long-life nest boxes.

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.

All hollow limbs will be inspected 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 in retained bushland on site. Any fauna injured during clearing will be handed to WIRES or veterinarian for care and rehabilitation.

Nest boxes

Twenty (20) nest boxes will be installed within the site under the guidance of a fauna ecologist. These nest boxes will replace hollows removed. Nest boxes should be designed as follows:

- Twelve (12) nest boxes with 5-10cm sized entry, suitable for small sized Fauna;
- Five (5) nest boxes with 10-15cm sized entry, suitable for medium sized fauna;
- Three (3) large nest boxes with 15-25cm sized entry for large sized fauna

Nest box design

- Timber is to be of high-grade ply 17+ 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.
- 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 bow 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.

Nest box placement

- Nest boxes are to be erected by a qualified arborist under the supervision of the project ecologist or fauna ecologist. A fauna ecologist is to locate appropriate trees and locations for installing the nest boxes. The specific locations of nest boxes within the locality are to be determined by the Project Ecologist within each of the designated locations.
- All replacement nest boxes are to be secured to trees at a minimum height of four metres above ground level facing the east to northeast direction. Place nest boxes as high as physically possible within a tree preferably using a cherry picker or tree climber - generally the higher the better for consideration to most species.
- Nest boxes and re-erected limbs are not to be placed near locations where public access is planned.
- 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. Boxes are preferably to be placed on the trunk for structural stability and protection from falling branches.
- Place nest boxes away from continual direct mid-day summer sun.
- 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.



- Attach 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 the trunk or branches may also require the installation of tree guards or exclusion collars.
- Nest boxes should ideally be placed in such a way that they are accessible for management but concealed from interference.

These artificial structures must be accessible for maintenance purposes with an expected life span of 20 years.

Nest box attachment

Nest boxes are to be appropriately affixed to a recipient tree under the guidance of a fauna ecologist. 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 nest box.

Nest box maintenance

- All nest boxes and re-erected limbs will be inspected annually for a minimum of five (5) years and any damaged, or in danger of falling, are to be repaired or replaced.
- 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.

Recommended dimensions for nest boxes						
SPECIES	INT DIAM	DEPTH/ LENGTH	ENT DIAM	VERT/ HOR	HEIGHT	REF
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	v	-	Trainor (1995)
Bat, Gould's Wattled	-	-	10 mm slit	v	-	Trainor (1995)
Bat, Lesser Long-eared	-	-	10 mm slit	v	-	Trainor (1995)
Little Lorikeet	120 mm	600 mm	60 mm	h	5m	
Squirrel Glider	200 mm	650 mm	60 mm	v	6 m	

Hollow modification for relocation

Hollows that have been selected for relocation are to be modified to provide a dry, enclosed nest. Modifications include:

- Attaching a 17+ millimetre thick marine ply/structural ply at the base which has been cut to provide a good seal and fixing with construction glue and galvanised screws.
- Attaching metal brackets or hardwood timber support batten to allow hollows to be screwed into a suitable branch or trunk
- Entrance hollows to be positioned on installation to minimise water entry, located as per the 'nest box specifications'
- Hollow to be painted externally with a non-toxic wood preservative or external paint.

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Hollow relocation or nest box strategy		