Travers

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# Vegetation Management Plan

Lot 2 DP 788892
158 Macquarie Road,
Cardiff.

November 2016
(REF: A15069V)

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| | |
|---|---|
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| Date: | 9 November 2016 |
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| File: | A15069V |



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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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# List of abbreviations

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| DEC | NSW Department of Environment and Conservation (superseded by DECC from 4/07) |
| DECC | NSW Department of Environment and Climate Change (superseded by DECCW from 10/09) |
| DECCW | NSW Department of Environment, Climate Change and Water (superseded by OEH from 4/11) |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

| | |
|---|---|
| ROTAP | rare or threatened Australian plants |
| SEPP 44 | *State Environmental Protection Policy No 44 – Koala Habitat Protection* |
| SEWPAC | Federal Department of Sustainability, Environment, Water, Population and Communities (former) |
| SIS | species impact statement |
| SULE | safe useful life expectancy |
| TPO | tree preservation order |
| TPZ | tree preservation zone |
| TRRP | tree retention and removal plan |
| TSC Act | *Threatened Species Conservation Act 1995* |
| VMP | vegetation management plan |

# Introduction 1

*Travers bushfire & ecology* has been engaged to prepare a vegetation management plan (VMP) for 158 Macquarie Road, Cardiff (Lot 2 DP 788892) in support of a proposed development for a residential aged care facility (Figure 1).


**Figure 1** – Subject site - Lot 2 DP 788892
*(Source: NearMap)*

## 1.1 Proposed development

The proposed Stage 1 development proposes a residential aged care facility totalling 99 beds. The proposed administration building will be located at the south-western corner of the site.

A reconstructed drainage swale including new overflow/relief pipe network will replace the current drainage line through the proposed development. This will be revegetated as outlined in Section 3.4.

**Figure 2** - Proposed development
*(Source: Arcadia, September 2016)*

## 1.2 Aims of the VMP

The following objectives for the vegetation management plan include:

- Revegetation of the Riparian zone (approximately 0.34ha) and Native Canopy Protection and Restoration zone (0.18ha) with native species typical of Coastal Plains Stringybark / Apple Forest;
- Protection of trees to be retained;
- Restore more extensive year-round foraging opportunities and cross-site connectivity to surrounding remnants of suitable habitat for squirrel gliders;
- Restore native foraging species habitat and provide amphibian habitat;
- Manage the removal of hollow-bearing trees within the proposed development and enrichment of hollow-bearing resources within conserved areas;
- Weed control targeting noxious and environmental weeds;
- Undertake monitoring, auditing and maintenance activities to ensure an effective and a stable restoration outcome over a three (3) year period; and
- Ensure compliance with the conditions of consent.

Schedule 1 of this VMP provides a plan of works within the affected works area and the performance targets to be achieved by contractors undertaking vegetation works. Schedule 1 has been prepared to be issued to potential contractors undertaking the restoration and drainage line works. The vegetation management plan provides guidelines for how the vegetation management works are to be undertaken and is subject to compliance certification.

*Travers bushfire & ecology* notes that a Landscape plan has been prepared and there may be inconsistencies between the Landscape plan and the Vegetation Management Plan (VMP). Of note is a requirement of this VMP to plant canopy trees for cross site connectivity for wildlife. This VMP contains canopy tree plantings of selected species to enable this objective to be achieved. The species type, size and spread of the tree has been selected to minimise the number of trees to be planted but maximise connectivity.

# Management Context 2

The following sections provide a brief description of 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

| | 158 Macquarie Rd, Cardiff |
|---|---|
| **Size** | 5.25ha |
| **Local government area** | Lake Macquarie |
| **Grid reference** | 374500E 6352900N |
| **Topography** | Situated on a very slight northerly aspect. 30-40m AMSL |
| **Geology and soils** | Geology; Boolaroo Sub-Group – Irregular coal seams, tuff, sandstone, shale.<br>Soils; Warners Bay Soil Landscape – moderately deep and poorly drained soils, undulating to rolling hills on fine-grained sediments of the Newcastle Coal Measures in the Awaba Hills. |
| **Catchment and drainage** | The site drains north into an unnamed tributary coming off Winding Creek, part of the Lake Macquarie catchment. |
| **Vegetation** | Some remnant vegetation remaining on the site but mostly cleared. Remnant vegetation is canopy only. |
| **Existing land use** | Golf range |
| **Clearing** | Previously cleared |

## 2.2 Vegetation description

The *Travers bushfire &* ecology Flora and Fauna Assessment May 2016 notes that te dominant vegetation community on site is Disturbed Open Forest (Smooth-barked Apple / Red Bloodwood / Scribbly Gum). The rest of the site is cleared. Descriptions of the vegetation and cleared lands is provided below.

**Disturbed Open Forest (Smooth-barked Apple / Red Bloodwood / Scribbly Gum)**

This vegetation community describes all bushland remaining within the subject site. Approximately 0.72ha or 14% of the subject site contains remnant bushland, centred on the peripheral edges.

The canopy comprises mostly *Angophora costata* (Smooth-barked Apple), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus signata* (Scribbly Gum) to a height of 17-25m and a projected foliage cover of approximately 35-40%.

The mid-storey is generally absent from all remnant patches and is mown or managed, however, some species are noted. There are no mid-storey species present within the quadrat undertaken in the south eastern corner of the subject site. Where mid-storey species are present, they are considered to be rare with few individuals observed more than once.

The ground layer of vegetation contains a limited number of native herbs, grasses and ferns. Within Quadrat 1, five (5) native grass species are recorded occupying 85% of all native species in the ground layer. Four (4) native small shrub, herb or forb species are recorded, along with four (4) exotic species.

Remnant bushland is considered to be poor to moderate quality with low native species diversity and generally an absent mid-storey. The pressures of current management would limit the regenerative capacity of the remnants and the pressures of edge effects are high, noted by the many non-native species observed.

These remnants are not part of any currently listed endangered ecological community (EEC) and, overall, have limited value ecologically. There is fragmented connectivity north and south of the subject site which has significant barriers such as major roads and transmission infrastructure.

The subject site contains limited remnant bushland which adds very little to the overall connective value within the local area. The remnant vegetation adjacent to the site is 40-50m in width (immediately west) and may provide a sufficient parcel for fauna movement, however, the vegetation is heavily fragmented and would most likely only be utilised by highly mobile species such as birds and bats.

The remnant bushland is of a condition that has a low likelihood of supporting locally important rare or threatened flora species.

*Photo 1* – Remnant managed vegetation within south-eastern portion of site

**Cleared Lands**

The majority of the subject site (86%) has been cleared and is managed grass / turf currently used as a golf driving range. The drainage line running north / south, near the centre of the subject site (Figure 1), contains high levels of exotic species such as *Paspalum dilatatum, Cyperus eragrostis* and *Rumex crispus.*

The cleared areas are intensively managed lawns for the provision of the golf driving range and have no viability for threatened flora species.

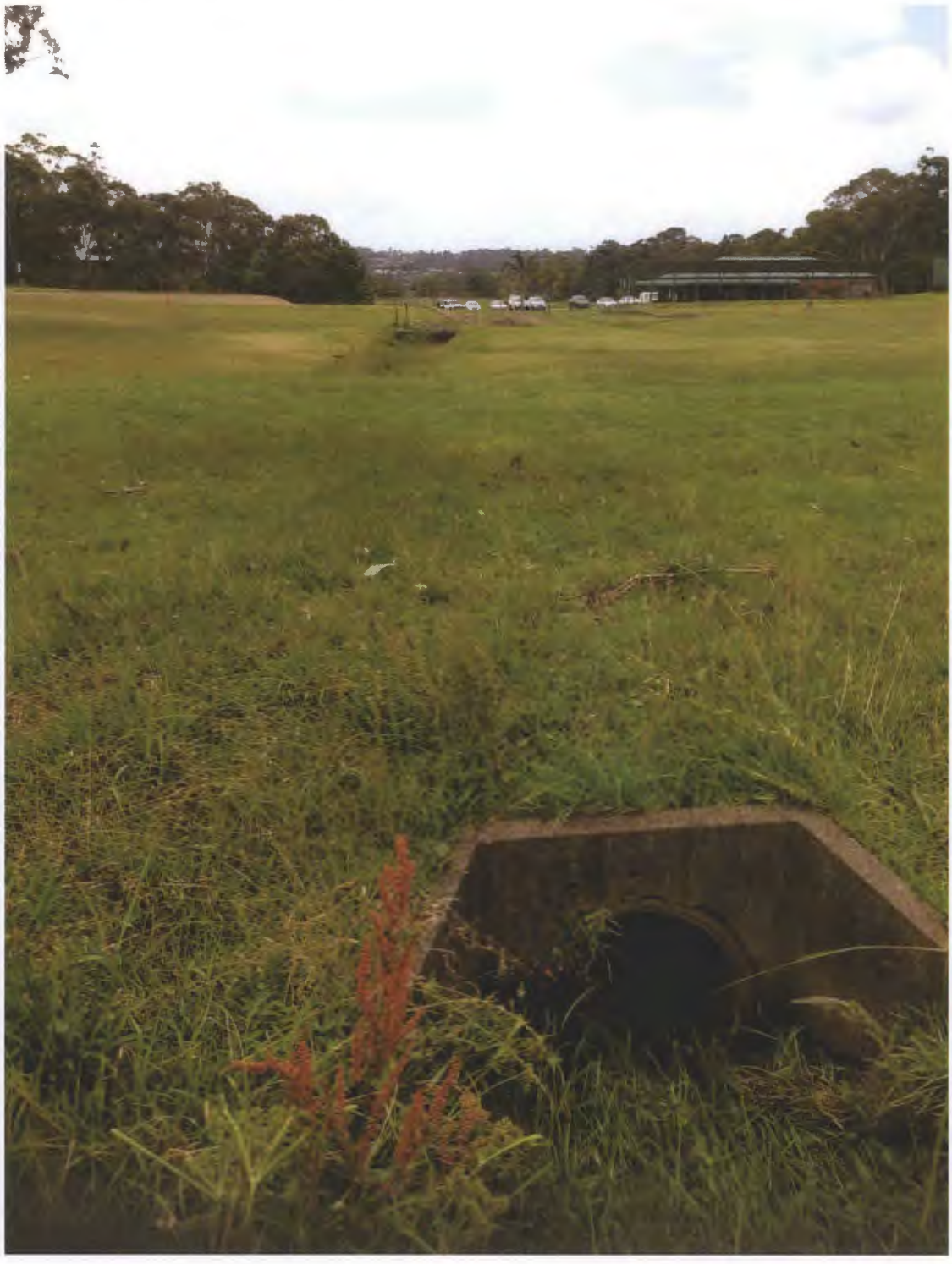


*Photo 2* – Cleared areas in central portion of site & drainage line

## 2.3 Threatened species, EECs and endangered populations

The native tree species present are not commensurate with any listed Endangered Ecological Community (EEC) which is also supported by local vegetation mapping (Bell and Driscoll 2013). The vegetation within the subject site is best described as Map Unit 30e - Coastal Plains Stringybark / Apple Forest as described in Bell and Driscoll (2013).

This vegetation community is not commensurate with any Endangered Ecological Community (EEC) listed within the NSW *TSC Act* (1995) or the Commonwealth *EPBC Act* (1999).

In respect of matters required to be considered under the *Environmental Planning and Assessment Act 1979* and relating to the species / provisions of the *Threatened Species Conservation Act 1995*, three (3) threatened fauna species were recorded on site.

- Eastern Bentwing-bat (*Miniopterus orianae oceanensis*),
- Little Bentwing-bat (*Miniopterus australis*); and
- East-coast Freetail Bat (*Micronomus norfolkensis*).

The following Table 1 summarises the considered varying potential to occur for state and nationally listed threatened fauna species within the subject site.

**Table 2** - Threatened fauna species suitable habitat present

| Common name | *TSC Act* | *EPBC Act* | Potential to occur |
|---|---|---|---|
| Little Bentwing-bat | V | - | Recorded |
| Eastern Bentwing-bat | V | - | Recorded |
| East-coast Freetail Bat | V | - | Recorded (possible) |
| Little Lorikeet | V | - | ✓ |
| Swift Parrot | E | E | ✓ |
| Barking Owl | V | - | ✓ |
| Powerful Owl | V | - | ✓ |
| Masked Owl | V | - | ✓ |
| Squirrel Glider | V | - | ✓ |
| Grey-headed Flying-fox | V | V | ✓ |
| Greater Broad-nosed Bat | V | - | ✓ |
| Spotted Harrier | V | - | Low |
| Little Eagle | V | - | Low |
| Square-tailed Kite | V | - | Low |
| Glossy Black-Cockatoo | V | - | Low |
| Varied Sittella | V | - | Low |
| Eastern Falsistrelle | V | - | Low |
| Eastern Cave Bat | V | - | Low |
| Gang-gang Cockatoo | V | - | Unlikely |
| Scarlet Robin | V | - | Unlikely |
| Yellow-bellied Sheathtail-bat | V | - | Unlikely |

No threatened flora species and no EECs, were recorded within the study area.

## 2.4 Trees retained and removed

Selected trees within the subject site will be removed for the proposed dwelling due to being directly or indirectly impacted by proposed building footprints, access or services. The revised *Travers bushfire & ecology* Tree Assessment November 2016 notes the recommended removal of ninety seven (97) trees, eighty eight (89) of which will be removed

to accommodate the various development footprints, or will be removed on the expectation that the structural root zone would be impacted. Eight (8) trees will be removed due to close proximity to buildings that are considered too dangerous to retain.

74 trees are to be retained within the development site itself.

***Significant trees***

None of the trees present are considered to be significant trees except for the benefits provided as a visual screen, for arboreal connectivity across the landscape and as a foraging landscape for microbat species.

***Habitat trees***

Seven trees containing thirteen (13) small hollows or fissures were observed within the subject site. Three of these habitat trees containing three (3) hollows will be retained. Hollow bearing trees identified for removal require supervision by a fauna ecologist at the time of removal to effectively recover any residing fauna, particularly threatened species, if present.

Twenty two (22) nest boxes are to be installed in within the site as located on Schedule 1 – Vegetation Management Plan as potential habitat to replace loss of hollows. Details are outlined in Section 3.5.

## 2.5 Vegetation condition and connectivity

Remnant bushland is considered to be poor to moderate in quality with low native species diversity, generally an absent mid-storey and with a low likelihood of supporting locally threatened flora species. The pressures of current management would limit the regenerative capacity of the remnants and the pressures of edge effects are high, noted by the many non-native species observed. However it is noted that if mowing was removed from the remnants there is a degree of natural resilience which would allow some native understorey to re-establish.

The subject site contains limited remnant bushland which adds very little to the overall connective value within the local area. The remnant vegetation adjacent to the site is 40-50m in width (immediately west) may provide a sufficient parcel for fauna movement, however, the vegetation is heavily fragmented and would most likely only be utilised by highly mobile species such as birds and bats. There is fragmented connectivity north and south of the subject site which has significant barriers such as major roads and transmission infrastructure.

# Restoration Strategy 3

## 3.1 Site preparation

Initial site preparation includes the surveying of works boundaries, installation of temporary construction proof fencing, installation of sediment and erosion control measures and engagement of bush regeneration contractors.

### 3.1.1 Protection fencing

Temporary tree protection fencing is to be installed for selected trees in accordance with AS4970 and as located on Schedule 1a – Temporary Tree Protection Fences. This will provide necessary protection from construction works.

### 3.1.2 Nest box installation

A habitat tree assessment was conducted within the study area as part of the *Travers bushfire & ecology* Flora and Fauna Assessment (May 2016). Seven trees containing thirteen (13) small hollows or fissures were observed within the subject site. Three of these trees containing three (3) hollows will be retained.

Good quality hollows of habitat value are to be relocated to nearby conservation areas. If these are placed as on ground habitat and are not reattached to a new recipient tree then they are to be replaced with appropriately sized nest boxes.

It is proposed that (11) microbat and eleven (11) Squirrel Glider boxes will be installed to replace lost hollows within the site as shown on Schedule 1 – Vegetation Management Plan.

I) 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. Nest boxes and re-erected limbs are not to be placed near locations where public access is planned.

II) 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.

III) 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.

IV) Nest boxes are to be erected by a qualified arborist under the supervision of the project ecologist or fauna ecologist.

Recommended dimensions for nest boxes are outlined below. For detailed construction we refer to the attached nest box design specifications (Attachment 4).

**Table 3** – Recommended dimensions for nest boxes

| SPECIES | INTERNAL DIAMETER | DEPTH/ LENGTH OF BOX | ENTRY DIAMETER (mm) & Type | VERTICAL (V) or HORIZONTAL (H) SLITS | HIEGHT |
|---|---|---|---|---|---|
| Bat, Chocolate Wattled | 70-100 x 150-240 mm | 200-250 mm | 10 mm slit | V | 6m |
| Bat, Gould's Wattled | 70-100 x 150-240 mm | 200-250 mm | 10 mm slit | V | 6m |
| Bat, Lesser Long-eared | 70-100 x 150-240 mm | 200-250 mm | 10 mm slit | V | 6m |
| Glider, Squirrel | 70-100 x 150-240 mm | 200-250 mm | 60 mm circle | N/A | 6m |

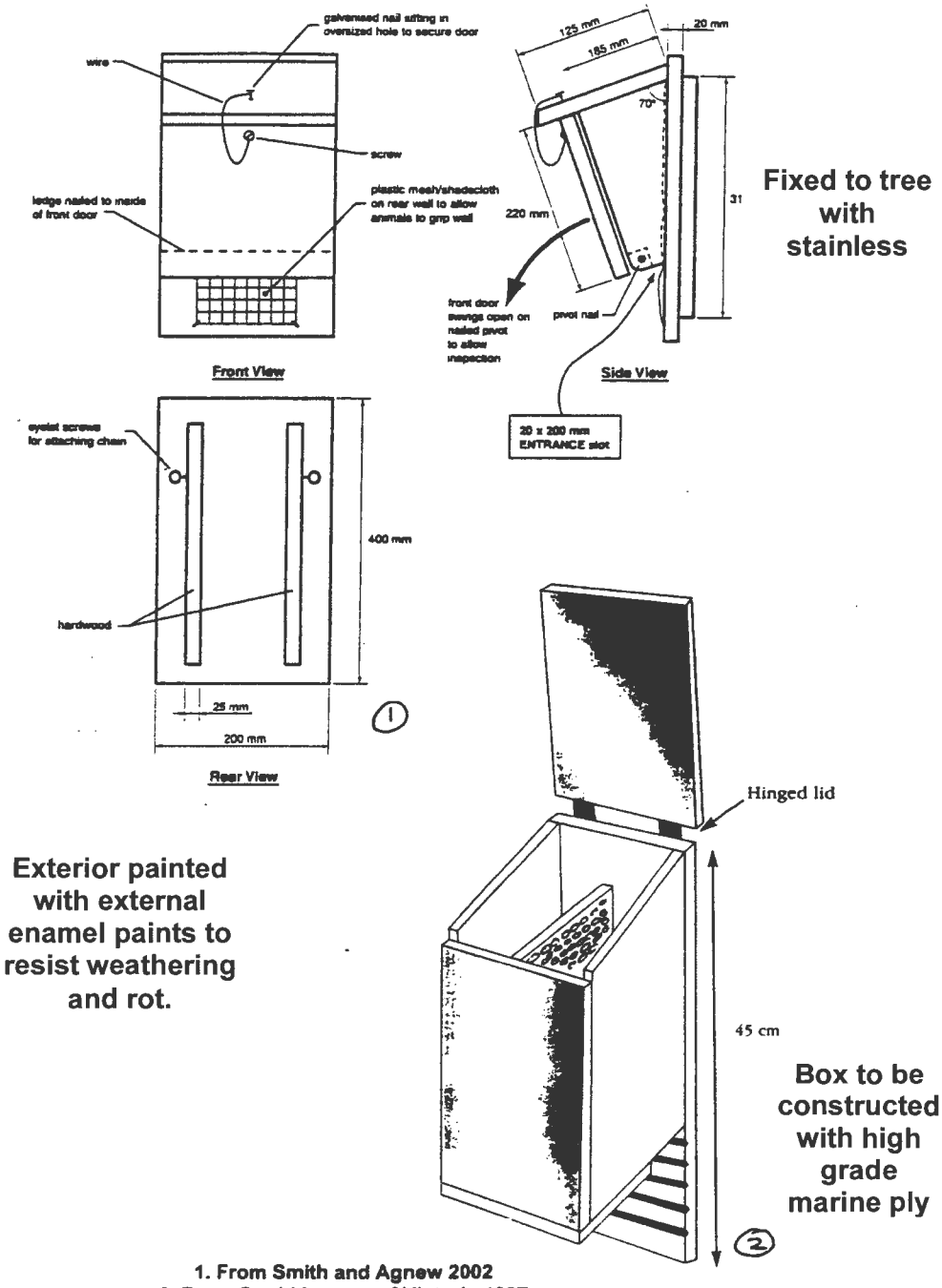
Installation of Nest Boxes.

Nest boxes can be installed on artificial structures that minimise the risk of predation or vandalism. These artificial structures must be accessible for maintenance purposes with an expected life span of 20 years. Micro-chiropteran bats can be installed on one or more of the following structures including:-

1. Attached to an existing tree (2-3 nest boxes per tree);
2. An artificial pole e.g. telephone pole (3-5 micro-chiropteran boxes per pole);
3. A suspended horizontal cable above water-bodies (5-10 'A' frame micro-chiropteran boxes are required); or
4. Concealed on a building that has low light levels and generally free from disturbance (number of boxes subject to building design, access and ability to conceal).

In all four cases the following installation conditions must be met:-

1 The nest boxes must be installed with an east to north east aspect.
2 A minimum of 4 m above ground and no more than 10 m above ground (> 6 m preferred).
3 Accessible for maintenance or replacement purposes.
4 Securely fixed with a minimum 2 stainless steel bolts to withstand strong wind conditions
5 All boxes are to be made of high grade ply.




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

## MICROBAT NEST BOX DETAIL

**Note:** Alternative designs available for alternative mounts

Installation of Squirrel Glider Nest Boxes

- Nest boxes installed on rough barked trees are preferred;
- Require a relatively large nest box so they can all fit in together but with a small entrance hole to protect against the larger cockatoos and Brushtail possums taking over their boxes.

Dimensions of nest boxes are a combination of those required for the Greater Glider and the Common Ringtail Possum:

- Positioned 4m (min) -10m high;
- Height – 43cm;
- Floor – 20x24cm;
- Entrance – 4-6cm;
- Depth below entrance – 30cm;
- Nest-boxes with hinged lids make it easier to clean and also to catch the glider for examination;
- Hollow logs, closed at one end with a piece of wood or tin, may also be used by gliders for sleeping; and
- Peat moss is an ideal base for bedding.

Photo: *Erected Squirrel Glider nest box (Albury Conservation Company – Squirrel Gliders Urban Nest Box Project)*

Photo: *Squirrel Glider nest box (Albury Conservation Company - Squirrel Gliders Urban Nest Box Project)*

### 3.1.3 Removal of hollow-bearing trees

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. There are no ecologically significant hollow-bearing trees affected by this proposal. Re-locating existing hollows or installing nest boxes of similar size in nearby remaining trees can compensate any hollow bearing trees that need to be removed for the proposed development.

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.

II) 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.

The installation of nest boxes in landscapes that lack mature trees is to be avoided where possible for fauna in general.

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

A fauna ecologist is to locate appropriate trees and locations for installing the nest boxes. All hollow-bearing trees shall be identified prior to the removal of vegetation for future residential development and associated services. Those proposed for removal shall be clearly marked with a **'H'** Symbol to indicate removal under supervision by a fauna ecologist.

Hollows of high quality or with fauna recorded residing within should be sectionally dismantled and all hollows should be inspected for occupation, activity and potential for reuse. Re-used hollows or those with likely occupation are to be relocated into nearby conservation areas.

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 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.

All hollow-bearing trees proposed for removal shall be clearly marked with a **'H'** Symbol to indicate removal under supervision by a fauna ecologist. The contractor is to be managed such that all due care is taken to prevent damage to trees to be retained and is not to remove the trees without first receiving instruction from the fauna ecologist. A fauna ecologist is to be present at the removal of each habitat 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. In low risk hollow bearing trees (as determined by the project ecologist) it is permissible to fell hollow trees with an excavator. In this case the blade or bucket of the machinery will be tapped against the base of the tree to disturb any fauna present and provide time to leave the hollow. The tree will then be felled as gently as possible. 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 at a later date. Any fauna injured during clearing will be handed to WIRES for care and rehabilitation.

### *3.1.3 Stormwater works*

All stormwater outlets are to be installed in line with the approved civil plan. Such outlets will be fully stabilised and will be planted with native locally sourced macrophytes and sedges at a density of 5 plants per square metre (see Appendix 1).

Drainage stabilisation works where required to prevent bank erosion, alteration to natural flow regimes or detrimental impacts on water dependant ecosystems will comply with *NSW DPI – Office of Water Guidelines for Controlled Activities on Waterfront Land – Guidelines for Outlet Structures 2012.*

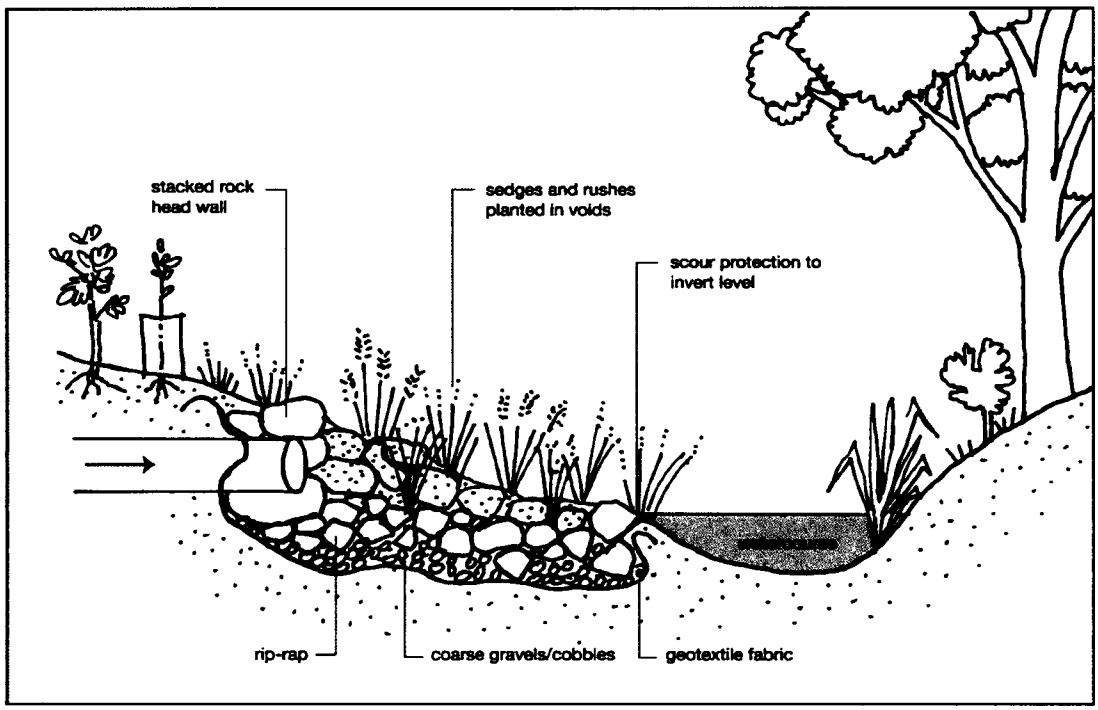



**Figure 3** – Stormwater outlet scour protection

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

## 3.2 Sediment and erosion control

A sediment fence is to be installed to protect the existing drainage line from bulk soil movements and is to be firmly trenched into the soil. During reconstruction of the drainage swale the existing water will be diverted to allow construction to proceed.

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 (see Figure 4). The sediment fence is to be supported by fixed hay bales on 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).* Techniques used for erosion and sediment control on site are to be adequately maintained and monitored at all times, particularly after periods of rain, and shall remain in proper operation until all development activities have been completed and the site is sufficiently stabilised with vegetation.

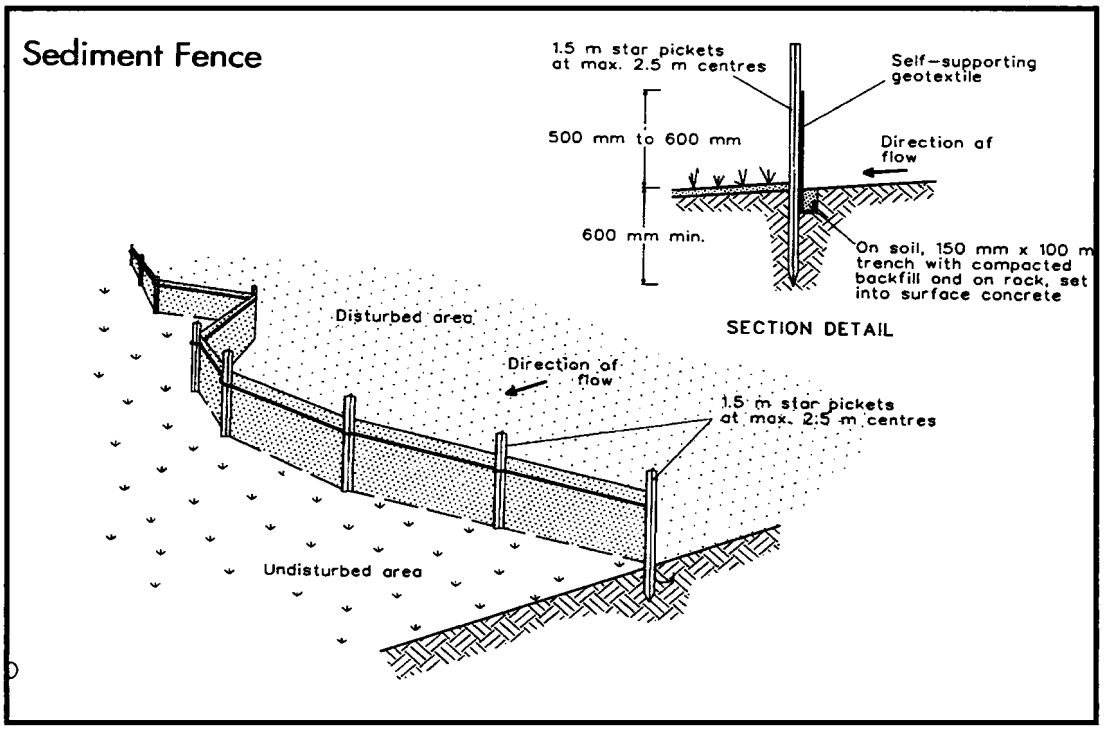



**Figure 4** - Generic installation detail geotextile fence

### 3.3 Weed management

The following weed management and maintenance works are to be undertaken within the retained vegetation along the drainage line and to the south and east of the proposed development as shown on Schedule 1 Vegetation Management Plan.

The objectives of weed management actions are:

- To ensure there is adequate eradication and control of exotic vines and scramblers prior to commencement to works;
- To control and manage the invasion, establishment and spread of Lantana camara and other vines and woody weeds throughout the whole site; and
- To control and manage the invasion of native plant communities by exotic perennial grasses due to the possible incursions of grasses such as *Pennisetum clandestinum* (Kikuyu).
- Removal of all noxious weeds from the site by the end of year 3 maintenance period

This will primarily involve the removal of any weed infestations, bush regeneration, mass planting of suitable native endemic species and the ongoing maintenance of replanted areas. It is recommended that species like Kikuyu are discouraged from gardens and landscaping where they adjoin remnant native vegetation.

In the southern portion of the site, land filling has occurred and the drainage line channel has steeply incised banks and contains many weed species. Highly invasive and persistent weed species found at 158 Macquarie Road include:

- *Cinnamomum camphora* (Camphor Laurel)
- *Cyperus eragrostis* (Umbrella Sedge)
- *Lantana camara* (Lantana)
- *Ligustrum lucidum* l(Large-leaved Privet)
- *Ligustrum sinense* (Small-leaved Privet)
- *Paspalum dilatatum* (Paspalum)

- *Rubus fructicosus* (Blackberry)

Areas dominated by Privet species, Giant Reed and Weeping Willow occur over larger patches and are likely to require some revegetation post removal / treatment.

These weeds have significant implications to the success of revegetation works and are to be targeted to eradicate during the first year of maintenance. Should regrowth occur after the first year of maintenance, they are to be continuously treated to eradicate by the end of the nominated maintenance period. Should the treatment method not be effective within the first year, the method is to be modified to achieve effective eradication. This may include complete removal and revegetation.

### *3.2.1 Weed management strategy*

Given the likely presence of invasive environmental and noxious weeds on site, a combination of selective spraying, hand removal and competitive planting techniques will be used to control weeds. The weed control priorities are listed in Attachment 2.

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

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

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

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

***Primary weeding***

All weeds will be stripped from the riparian corridor 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.

*Timing – 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 months post primary weeding*

***Maintenance weeding***

After primary and secondary weeding and natural regeneration of the bushland, the area should be able to resist most weeds. However, weeds will re-establish on the site from bird, wind, water transport and other seed or propagule dispersal mechanisms within the site.

Maintenance weeding should be undertaken 3-6 times a year until such time as the resistance of the bushland to weeds increases, then only requiring hand weeding on a needs basis. Maintenance weeding is to be conducted for a minimum period of three (3) years.

### *3.2.2 Herbicide use*

The use of herbicides is needed where hand removal of weeds is impractical. The use of *Glyphosate* based herbicides is recommended in accordance with the manufacturers labels. Within 5m of a drainage line only *Roundup Bi-active* ® or equivalent formulations can be used. Travers bushfire and ecology recommend the use of *Roundup Bi-active* ® within this site due to its proximity to a watercourse.

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

## 3.4 Revegetation works

Revegetation works are required to be undertaken within the following areas as shown on Schedule1 Vegetation Management Works:-

- A riparian revegetation zone of approximately 0.34ha will drainage line corridor within the south western portion of the site; and
- Tree protection restoration zone lying on the western portion of the development.

Works will be constrained by the fact that these revegetation areas are located within an Asset Protection Zone (APZ). Contractors are to assume a maximum 20% coverage of all shrub layers and a maximum of 1 tree in every 100m$^2$ within a managed landscape for asset protection purposes.

### *3.4.1 Riparian revegetation zone*

A proposed riparian revegetation corridor will be located along the drainage line to the south-west of the site as shown on Schedule 1 Vegetation Management Works.

Revegetation species are to be locally occurring native species that provide habitat for amphibians and other locally occurring fauna species. Species used in revegetation are to be generally consistent with Coastal Plains Stringybark / Apple Forest, however further native species may be used at the Project Ecologist's discretion to achieve stabilisation and habitat within the drainage corridor at the following planting densities:

Drainage corridor (0.34ha)

- 1 tree per 100m$^2$ (approximately 34 plants);
- 1 shrub per 10m$^2$ to achieve 20% cover (minimum of 340 plants); and
- 5 groundcovers per 1m$^2$ (17,00 plants)

Recommended species for replanting in the drainage corridor are outlined in Appendix 1. Contractors are to assume a minimum 25% replacement of all plantings to be used as contingency revegetation in areas that fail to take.

### *3.4.2 Arboreal protection and restoration zone*

A native revegetation buffer of approximately 0.18ha will be established along the southern, western and northern perimeter of the site to provide a visual buffer, increase extensive year-round foraging opportunities and improve cross-site connectivity to surrounding remnants of suitable habitat for Squirrel Gliders and other locally-occurring species. A minimum of twenty (20) of the existing trees are to be retained in this location.

This zone will be planted with select species of Coastal Plains Stringybark - Apple Forest vegetation at the following densities:

Arboreal protection and restoration zone (0.18ha)

- 1 tree per 100m$^2$ (approximately 18 plants);
- 1 shrub per 10m$^2$ – to achieve 20% cover (minimum of 180 plants); and
- 3 groundcovers per 1m$^2$ (minimum of 5,400 plants).

Appendix 1 provides lists of preferred revegetation species per vegetation type(s). Contractors are to assume a minimum 25% replacement of all plantings to be used as contingency revegetation in areas that fail to take.

The total number of plants to be established may be lower if they are provided by the native species regenerating naturally within the revegetation areas.

### *3.3.3 Mulching*

Mulching is an efficient method to impede the establishment of weed species, soil erosion, compaction and desiccation. It also impedes natural regeneration and therefore should only be used in areas of ground layer that lack any natural resilience or form part of a landscape bed.

Any vegetation requiring removal shall be immediately mulched or chipped and stockpiled on site to be used for the site's restoration at the completion of earth works.

Mulch is to be placed at a depth of 75-100mm 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 Camphor Laurel, Privet, Blackberry, Fireweed, Kikuyu, Paspalum, Ribwort, Umbrella Sedge aquatic or declared noxious weeds are not to be used. The Contractor shall ensure that any mulch used is properly composted before use.

### *3.3.4 Revegetation protection*

Protection of revegetation areas is important to the success of plantings. Protection measures include:

- Mulching – to reduce soil moisture loss
- Plant guards around plants – to minimise loss by grazing animals, frost protection and dehydration
- Baiting of rabbits (quarterly baiting over 5 years) – use of Pindone (1080) to minimise rabbit burrows and grazing.

# Management and Monitoring 4

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.

Monitoring activities will include:

1. Two flora quadrats established in the drainage corridor to measure the growth and density of the revegetation area and to monitor weed densities;
2. Annual, overall vegetation condition map based on standard bush regeneration vegetation condition assessment methodology;
3. Tree monitoring to ensure survival and achievement of canopy connectivity; and
4. Annual performance audit against the VMP.

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

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

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

A regular inspection is to be undertaken by the project ecologist, with the submission of a compliance certificate at the satisfactory completion of revegetation works. The restoration area is to be maintained as an indigenous native vegetation area, supporting Coastal Plains Stringybark - Apple Forest vegetation.

Following the completion of Year 3 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.

This site is completely managed as an artificial landscape. As such, no burns will be undertaken.

### 4.1.1 Compliance certification

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

- Engagement of a bush regeneration company and independent project ecologist;
- Installation of all protective fencing;
- Sediment and erosion control measures;
- Proper and stable construction scour protection, stormwater outlets and drainage line revegetation works;
- Completion of nest box installation
- Completion of revegetation planting works including planting of tree, shrub and ground cover species at the required densities
- Completion of primary weed control works
- Completion of secondary weed control works and revegetation maintenance
- Completion of removal of temporary protection features at the end of year 3
- Satisfactory achievement of restoration works as shown on Schedule 1 – Vegetation Management Works and the Restoration Performance Targets (Section 4.2)

## 4.2 Restoration performance targets

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

1. The total area of canopy revegetation works is to be at least 0.34ha in the Riparian Revegetation Corridor and 0.18ha in the Native Canopy Protection and Restoration zone as marked on Schedule 1 - Vegetation Management Works.
2. Clearing of hollow-bearing trees is to be undertaken in the presence of a fauna ecologist.
3. All protective fencing (temporary and permanent), sediment controls and tree protection zones are to be installed prior to clearance of any vegetation.
4. Installation of 11 microbat and 11 glider nest boxes as marked on Schedule 1 – Vegetation Management Works, under the direction of a fauna ecologist.
5. All stormwater outlets are to be stabilised with geotextile overlain with rock boulders in accordance with N SW DP I - Office of Water's Controlled Activity Guidelines (2012) for storm water outlets. Revegetation around outlets to use locally endemic species.
5. Drainage lines are to be stabilised prior to commencement of vegetation restoration works.
6. Weed control and revegetation works are to be carried out by a qualified bushland regeneration contractor for a minimum period of 3 years. Weed control targets should be a maximum of 15% cover at the end of year 1 progressing to 10% at year 2 and less than 1% at the end of year 3.

7. All highly invasive weed species including Camphor Laurel, Umbrella Sedge, Lantana, Privet, Paspalum and Blackberry are to be continuously suppressed and, if possible, eradicated from the restoration area.

8. All revegetation areas are to be mulched, plants protected by tree guards and rabbit baiting undertaken.

9. It is expected that the success rate of plantings will be at least 95% and contingency planting will be required to ensure the minimum number of plants are established at the end of the maintenance period. Planting densities are to achieve:

   Arboreal protection and restoration zone (0.18ha)
   - 1 tree per 100m$^2$ (approximately 18 plants);
   - 1 shrub per 10m$^2$ – to achieve 20% cover (minimum of 180 plants); and
   - 3 groundcovers per 1m$^2$ (minimum of 5,400 plants).

   Riparian revegetation corridor (0.34ha)
   - 1 tree per 100m$^2$ (approximately 34 plants);
   - 1 shrub per 10m$^2$ to achieve 20% cover (minimum of 340 plants); and
   - 5 groundcovers per 1m$^2$ (17,00 plants)

10. Revegetation is to be undertaken utilising locally collected seed. Appointed bush regeneration contractor may vary number of native plant species to be established provided 80% dominant species is retained (refer Planting Schedule). A minimum number of native plant species are to be utilised as follows:
    - 5 tree species;
    - 8 shrub species; and
    - 10 ground covers.

11. A target of 40% native vegetation cover applies at the end of year 1, 60% native vegetation cover at the end of year 2 and 95% at the end of year 3 in all revegetation areas.

12. Monitoring to occur by project ecologist with compliance certification reported to Council at the successful completion of each major item or group of items.

# Program of Works 5

The program of works (Table 3) is aimed at providing a management framework for enacting revegetation, maintenance, monitoring and review works reasonably required for the conservation of retained bushland and proposed restoration measures. Site rehabilitation, including weed control works is to be undertaken in accordance with the Schedule 1 – Vegetation Management Works.

## 5.1 Program of works

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

Pre-construction Works

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

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

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.

Construction works

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

*Primary restoration works,* as defined under this VMP, include the supervised removal of hollow-bearing trees by the fauna ecologist, installation of nest boxes, completion of primary and secondary weed control, maintenance of protective measures, mulching and planting works.

Practical completion of the primary restoration phase is to be certified 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. The maintenance period commences upon certification of practical completion by the project ecologist.

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 undertaken weeding and revegetation works. All staff are to be supervised by a qualified bush regeneration Supervisors should possess a minimum of a Certificate IV in Conservation and Land Management or a biological science degree, with at least 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 4** – Program of works

| Action | Responsibility |
|---|---|
| ***Stage 1 – Pre-construction works (Site Preparation)*** | |
| • Formation of site management team and establish supervision and consultation processes – minimum project ecologist, and site manager | • Site project manager |
| • Erection of temporary and permanent fencing and erosion control fencing, | • Site manager / bush regenerator contractor / project ecologist |
| • Rabbit baiting | • Contractor |
| • Marking of hollow-bearing trees to be removed and undertake any required survey prior to removal | • Fauna ecologist |
| • Commencement of seed collection and propagation contracts | • Bushland regenerator / project ecologist |
| • Set up monitoring points | • Project ecologist |
| • Identify drainage line flow to creek and scour protection requirements | • Project ecologist / engineering consultant |
| • Provide certificates of compliance | • Project ecologist |
| ***Stage 2 – Construction works (establishment)*** | |
| • Supervision of hollow-bearing tree removal and nest box installation | • Fauna ecologist / tree climber |
| • Complete drainage line works and scour protection | • Contractor / project manager |
| • Commencement of primary weed control | • Suitably qualified bushland regenerator |
| • Monitor erosion control measures (monthly – especially after heavy rain) and replace if required | • Contractor with advice of project manager |
| • Complete revegetation works | • Contractor / project manager |

| | |
|---|---|
| • Commencement of secondary weed control and maintenance weed control | • Contractor / project manager |
| • Maintenance of protective fencing | • Contractor / suitably qualified bushland regenerator |
| • Provide certificates of compliance | • Project ecologist |
| ***Stage 3 – Post Construction Works (Maintenance)*** | |
| • Enrichment planting within revegetation areas if required. | • Contractor with advice of project ecologist |
| • Continuation of regeneration and weed control maintenance. | • Contractor / suitably qualified bushland regenerator |
| • Monitoring of quadrats, revegetation works, weed control works and protection devices | • Project ecologist |
| • Conduct maintenance beyond three (3) years as required | • Site manager with advice of project ecologist |

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

### 5.2 Typical timeline of restoration works

The following typical timeline (Figure 5) 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 certification to be issued.

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

| | TASK NAME | Duration | Year 1 – Primary Restoration Works | | | | | | | | | | | | Year 1 Maintenance | | | | | | | | | | | | Year 2 Maintenance | | | | | | | | | | | | Year 3 Maintenance | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| | **STAGE 1 - PRECOMMENCEMENT** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **1.0** | **PROJECT INITIATION** | 1 month | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1 | Preparation of contract schedules | 1 month | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2 | Submission of fee proposals | 1 month | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3 | Contractor approvals & engagement of project ecologist & bush regeneration contractor | 2 weeks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4 | Compliance certificate - appointment of bush regenerator contractor and project ecologist | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **2.0** | **SITE PREPARATION AND PROPAGATION** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1 | Pre-commencement vegetation condition assessment & installation of monitoring plots | 1 day | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2 | Seed collection | 12 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.3 | Plant propagation (initial & contingency) | 12 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.4 | Installation of protective fencing | 2 weeks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.5 | Install sediment and erosion control measures | 2 weeks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.6 | Mark hollow-bearing trees for removal; undertake survey as required | 2 weeks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.7 | Commence pest control - Pindone baiting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.7 | Issue preconstruction compliance certification | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | **STAGE 2 DURING CONSTRUCTION WORKS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **3.0** | **INVASIVE WEED CONTROL** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.1 | Primary noxious weed control | 3 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.2 | Secondary weed control | 3 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.3 | Specialist weed control of remediation area | 3 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **4.0** | **REVEGETATION AND INITIAL ESTABLISHMENT** | 8 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.1 | Supervise hollow-bearing tree removal | 1 day | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.2 | Installation of irrigation system (as appropriate to site) | 1 week | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.3 | Remediation, regeneration and revegetation works | 3-5 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.4 | Initial watering & maintenance | 4 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.5 | Installation of nest boxes | 1 day | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.6 | Issue construction compliance certification | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | **STAGE 3 - POST CONSTRUCTION WORKS** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **5.0** | **BUSH REGENERATION & REVEGETATION MAINTENANCE** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1 | Watering, maintenance, weed control and repairs | 3 years | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.2 | Pest control - rabbit and fox baiting | 3 years | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.3 | Ongoing bushland regeneration of existing bushland areas | 3 years | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **6.0** | **MANAGEMENT AUDITING AND MONITORING** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.1 | Contractor supervision / monitoring | 10 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.2 | Ongoing supervision/auditing/monitoring | 3 years | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3 | Issue construction compliance certification | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **7.0** | **CONTINGENCY WORKS (Subject to Audits)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.1 | Target noxious weeds | 2 weeks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.2 | Replacement planting | 2 weeks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.3 | Watering & maintenance | 2 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.4 | Medium term maintenance | 6 months | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.5 | Issue maintenance compliance certification | As required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **8.0** | **PRACTICAL COMPLETION (Completion reveg works)** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Contingency

Contingency

**Figure 5** – Typical restoration timeline (3 years maintenance)

# 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 provided that they are recognised as being typical or common species known or demonstrated to occur within Coastal Plains Stringybark - Apple Forest communities.

The appointed bush regeneration contractor may vary the number of plant species subject to project ecologist approval.

**Table A 1.1** - Recommended Planting Lists

| ARBOREAL PROTECTION ZONE | |
|---|---|
| **Trees** | |
| Dominant species 70% | |
| *Angophora costata* | Smooth-barked Apple |
| *Corymbia gummifera* | Red Bloodwood |
| *Eucalyptus resinifera* | Red Mahogany |
| *Eucalyptus punctata* | Grey Gum |
| Supplementary 30% | |
| *Tristaniopsis laurina* | Water Gum |
| *Eucalyptus globoidea* | White Stringybark |
| *Eucalyptus umbra* | Broad-leaved White Mahogany |
| *Eucalyptus piperita* | Sydney Peppermint |
| **Shrubs** | |
| Dominant species 70% | |
| *Acacia terminalis* | Sunshine Wattle |
| *Banksia oblongifolia* | Fern-leaved Banksia |
| *Leptospermum polygalifolium* | Tantoon |
| *Melaleuca sieberi* | - |
| Supplementary 30% | |
| *Acacia longifolia* var. *longifolia* | Sydney Golden Wattle |
| *Acacia ulicifolia* | Prickly Moses |
| *Dillwynia retorta* | Eggs and Bacon |
| *Dodonaea triquetra* | Common hop bush |
| *Trema tomentosa* var. *aspera* | Poison Peach |
| **Groundcovers** | |
| Dominant species 70% | |
| *Dianella caerulea* | Blue Flax Lily |
| *Entolasia stricta* | Wiry Panic |
| *Gahnia sieberiana* | Red-fruit Saw-sedge |
| *Juncus usitatus* | Common Rush |
| *Microlaena stipoides* | Weeping Grass |

| ARBOREAL PROTECTION ZONE | |
|---|---|
| *Hardenbergia violacea* | False Sarsparilla |
| *Kennedia rubicunda* | Dusky Coral Pea |
| | |
| Supplementary 30% | |
| *Centella asiatica* | Swamp Pennywort |
| *Dichondra repens* | Kidney Weed |
| *Imperata cylindrica* | Blady Grass |
| *Lomandra longifolia* | Spiky-headed Mat-rush |
| *Pimelea linifolia* | Slender Rice Flower |
| *Poa labillardierei* | Tussock |
| *Themeda australis (triandra)* | Kangaroo Grass |

| DRAINAGE CORRIDOR | |
|---|---|
| **Trees** | |
| *Angophora costata* | Smooth-barked Apple |
| *Callicoma serratifolia* | Black Wattle |
| *Melaleuca quinquenervia* | Broad-leaved Paperbark |
| *Tristaniopsis laurina* | Water Gum |
| | |
| **Shrubs** | |
| *Melaleuca sieberi* | - |
| *Trema tomentosa* var. *aspera* | Poison Peach |
| | |
| **Groundcovers** | |
| Dominants 70% | |
| *Baumea articulata* | Jointed Twig-rush |
| *Baumea juncea* | - |
| *Dianella caerulea* | Blue Flax Lily |
| *Gahnia clarkei* | Tall Saw-sedge |
| *Gahnia sieberiana* | Red-fruit Saw-sedge |
| *Lomandra longifolia* | Spiky-headed Mat-rush |
| *Microlaena stipoides* | Weeping Grass |
| | |
| Supplementary 30% | |
| *Lepidosperma laterale* | - |
| *Imperata cylindrica* | Blady Grass |
| *Juncus usitatus* | Common Rush |
| *Centella asiatica* | Swamp Pennywort |
| *Ficinia nodosa* | Knobby Club-rush |
| *Oplismenus aemulus* | Australian Basket Grass |
| *Viola hederacea* | Ivy-leaved Violet |
| *Gahnia radula* | Thatch saw-sedge |

# Target Weed Species

# A2

The following weed species may possibly 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 A2.1** - Target weed species for site

| Scientific name | Common name | Priority | Noxious weed class |
|---|---|---|---|
| *Ipomoea cairica* | Blue Morning Glory | Very High | |
| *Ipomoea indica* | Coastal Morning Glory | Very high | |
| *Pennisetum clandestinum* | Kikuyu | Very High | |
| *Plantago lanceolata* | Ribwort | Very High | |
| *Senecio madagascariensis* | Fireweed | Very High | Class 4 |
| *Cinnamomum camphora* | Camphor Laurel | High | |
| *Cyperus eragrostis* | Umbrella Sedge | High | |
| *Lantana camara* | Lantana | High | |
| *Ligustrum lucidum* | Large-leaved Privet | High | |
| *Ligustrum sinense* | Small-leaved Privet | High | |
| *Paspalum dilatatum* | Paspalum | High | |
| *Rubus fructicosus* | Blackberry | High | Class 4 |
| *Asphodelus fistulosus* | Onion Weed | Medium | |
| *Bidens pilosa* | Cobbler's Pegs | Medium | |
| *Canna indica* | Indian Shot | Medium | |
| *Cirsium vulgare* | Spear Thistle | Medium | |
| *Conyza sumatrensis* | Tall Fleabane | Medium | |
| *Crocosmia X crocosmiiflora* | Montbretia | Medium | |
| *Hydrocotyle bonariensis* | Pennywort | Medium | |
| *Hypochaeris radicata* | Flatweed | Medium | |
| *Lolium perrenne* | Perennial Ryegrass | Medium | |
| *Modiola caroliniana* | Red-flowered Mallow | Medium | |
| *Paspalum urvillei* | Vasey Grass | Medium | |
| *Pinus elliotti* | Slash Pine | Medium | |
| *Senna pendula* var. *glabrata* | - | Medium | |
| *Soliva sessilis* | Jojo | Medium | |
| *Stenotaphrum secundatum* | Buffalo Grass | Medium | |
| *Trifolium repens* | White Clover | Medium | |
| *Vicia sativa* | Common Vetch | Medium | |
| *Aira cupaniana* | Silvery Hairgrass | Low | |
| *Aloe sp.* | Aloe | Low | |
| *Anagallis arvensis* | Pimpernel | Low | |
| *Asclepias curassavica* | Redhead Cotton Bush | Low | |
| *Aster subulatus* | Wild Aster | Low | |
| *Briza subaristata* | - | Low | |
| *Bromus cartharticus* | Prairie Grass | Low | |
| *Callistemon* sp. (cultivar) | - | Low | |
| *Cyclospermum leptophyllum* | Slender Celery | Low | |
| *Gamochaeta americana* | Cudweed | Low | |

| Scientific name | Common name | Priority | Noxious weed class |
|---|---|---|---|
| *Plectranthus ciliatus* | Cockspur Flower | Low | |
| *Polycarpon tetraphyllum* | Four-leaved Allseed | Low | |
| *Rumex crispus* | Curled Dock | Low | |
| *Sisyrinchium sp A* | Pigroot | Low | |
| *Solanum chenopoides* | Whitelip Nightshade | Low | |
| *Sonchus oleraceus* | Common Sow-thistle | Low | |
| *Stellaria media* | Common Chickweed | Low | |
| *Verbena bonariensis* | Purpletop | Low | |
| *Veronica persica* | Creeping Speedwell | Low | |
| *Vulpia myuros* | Rat's Tail Fescue | Low | |
| *Yucca aloifolia* | Dagger Plant | Low | |

Noxious needs that commonly occur within Lake Macquarie LGA also need to be targeted if found on site in accordance with their respective noxious weed category and the 'best practice' methods identified for that noxious weed.

**Class 3 -** Class 3 noxious weeds are plants that pose a serious threat to primary production or the environment of an area and are not widely distributed in the area but are likely to spread in the area or to another area.

The Noxious Weed Act 1993 requires for a Class 3 noxious weed, "The weed must be fully and continuously suppressed and destroyed."

The control objective for weed control Class 3 is to reduce the area and impact of those plants in parts of NSW.

**Class 4** - Class 4 noxious weeds are plants that pose a serious threat to primary production, the environment or human health, are widely distributed in an area and are likely to spread in the area or to another area.

The Noxious Weed Act 1993 requires for a Class 4 noxious weed that "The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread". Many listed Class 4 weeds have an extra requirement "that they not be sold, propagated or knowingly distributed."

The control objective for weed control Class 4 is to minimise the negative impact of those plants on the economy, community or environment of NSW.

# Flora and Fauna Species List A3

**Table A3.1** – Flora species recorded

| Family | Scientific name | Common name |
|---|---|---|
| **TREES** | | |
| Mimosoideae | *Acacia irrorata* | Green Wattle |
| Casuarinaceae | *Allocasuarina littoralis* | Black She-oak |
| Myrtaceae | *Angophora costata* | Smooth-barked Apple |
| Lauraceae | *Cinnamomum camphora** | Camphor Laurel |
| Myrtaceae | *Corymbia gummifera* | Red Bloodwood |
| Myrtaceae | *Eucalyptus capitellata* | Brown Stringybark |
| Myrtaceae | *Eucalyptus piperita* | Sydney Peppermint |
| Myrtaceae | *Eucalyptus signata* | Scribbly Gum |
| Myrtaceae | *Eucalyptus umbra* subsp. *umbra* | Broad-leaved White Mahogany |
| Arecaceae | *Livistona australis* | Cabbage Tree Palm |
| Meliaceae | *Melia azedarach* var. *australasica* | White Cedar |
| Pinaceae | *Pinus elliotti** | Slash Pine |
| **SHRUBS** | | |
| Mimosoideae | *Acacia longifolia* var. *longifolia* | Sydney Golden Wattle |
| Mimosoideae | *Acacia terminalis* | Sunshine Wattle |
| Faboideae | *Bossiaea heterophylla* | Variable Bossiaea |
| Myrtaceae | *Callistemon* sp.* (cultivar) | - |
| Verbenaceae | *Lantana camara** | Lantana |
| Oleaceae | *Ligustrum lucidum** | Large-leaved Privet |
| Oleaceae | *Ligustrum sinense** | Small-leaved Privet |
| Myrtaceae | *Melaleuca sieberi* | - |
| Proteaceae | *Persoonia linearis* | Narrow-leaved Geebung |
| Rosaceae | *Rubus anglocandicans** | Blackberry |
| Cesalpinioideae | *Senna pendula* var. *glabrata** | - |
| **GROUNDCOVERS** | | |
| Alliaceae | *Agapanthus praecox** | Agapanthus |
| Poaceae | *Aira cupaniana** | Silvery Hairgrass |
| Asphodelaceae | *Aloe sp.** | Aloe |
| Myrsinaceae | *Anagallis arvensis** | Pimpernel |
| Apocynaceae | *Asclepias curassavica** | Redhead Cotton Bush |
| Asphodelaceae | *Asphodelus fistulosus** | Onion Weed |
| Asteraceae | *Aster subulatus** | Wild Aster |
| Asteraceae | *Bidens pilosa** | Cobbler's Pegs |
| Poaceae | *Briza subaristata** | - |
| Poaceae | *Bromus carthartícus** | Prairie Grass |
| Cannaceae | *Canna indica** | Indian Shot |
| Apiaceae | *Centella asiatica* | Swamp Pennywort |
| Asteraceae | *Cirsium vulgare** | Spear Thistle |
| Asteraceae | *Conyza sumatrensis** | Tall Fleabane |
| Iridaceae | *Crocosmia X crocosmiiflora** | Montbretia |
| Apiaceae | *Cyclospermum leptophyllum** | Slender Celery |

| Family | Scientific name | Common name |
|---|---|---|
| Poaceae | *Cynodon dactylon* | Common Couch |
| Cyperaceae | *Cyperus eragrostis** | Umbrella Sedge |
| Phormiaceae | *Dianella caerulea* | Blue Flax Lily |
| Poaceae | *Entolasia stricta* | Wiry Panic |
| Asteraceae | *Gamochaeta americana** | Cudweed |
| Goodeniaceae | *Goodenia heterophylla* subsp. *heterophylla* | Variable Leaved Goodenia |
| Apiaceae | *Hydrocotyle bonariensis** | Pennywort |
| Asteraceae | *Hypochaeris radicata** | Flatweed |
| Poaceae | *Imperata cylindrica* | Blady Grass |
| Poaceae | *Joycea pallida* | Red Anther Grass |
| Juncaceae | *Juncus subsecundus* | Finger Rush |
| Juncaceae | *Juncus usitatus* | Common Rush |
| Poaceae | *Lolium perrenne** | Perennial Ryegrass |
| Lomandraceae | *Lomandra longifolia* | Spiky-headed Mat-rush |
| Lomandraceae | *Lomandra obliqua* | Twisted Mat-rush |
| Malvaceae | *Modiola caroliniana** | Red-flowered Mallow |
| Poaceae | *Paspalum dilatatum* * | Paspalum |
| Poaceae | *Paspalum urvillei** | Vasey Grass |
| Poaceae | *Pennisetum clandestinum* * | Kikuyu |
| Polygonaceae | *Persicaria hydropiper* | Water Pepper |
| Plantaginaceae | *Plantago lanceolata** | Ribwort |
| Lamiaceae | *Plectranthus ciliatus** | Cockspur Flower |
| Caryophyllaceae | *Polycarpon tetraphyllum** | Four-leaved Allseed |
| Dennstaedtiaceae | *Pteridium esculentum* | Bracken |
| Polygonaceae | *Rumex crispus** | Curled Dock |
| Poaceae | *Rytidosperma (Austrodanthonia) tenuius* | Wallaby Grass |
| Alismataceae | *Sagittaria platyphylla* | Sagittaria |
| Asteraceae | *Senecio madagascariensis** | Fireweed |
| Iridaceae | *Sisyrinchium sp A** | Pigroot |
| Solanaceae | *Solanum chenopoides** | Whitelip Nightshade |
| Asteraceae | *Soliva sessilis** | Jojo |
| Asteraceae | *Sonchus oleraceus** | Common Sow-thistle |
| Caryophyllaceae | *Stellaria media** | Common Chickweed |
| Poaceae | *Stenotaphrum secundatum* * | Buffalo Grass |
| Poaceae | *Themeda australis* | Kangaroo Grass |
| Faboideae | *Trifolium repens** | White Clover |
| Verbenaceae | *Verbena bonariensis** | Purpletop |
| Plantaginaceae | *Veronica persica** | Creeping Speedwell |
| Poaceae | *Vulpia myuros** | Rat's Tail Fescue |
| Agavaceae | *Yucca aloifolia** | Dagger Plant |
| **VINES** | | |
| Convolvulaceae | *Ipomoea cairica** | Blue Morning Glory |
| Convolvulaceae | *Ipomoea indica** | Coastal Morning Glory |
| Faboideae | *Kennedia rubicunda* | Dusky Coral Pea |
| Faboideae | *Vicia sativa* * | Common Vetch |
| * Denotes Exotic Species | | |

# Nest Box Design Guidelines

# A4

# NEST BOX DESIGN SPECIFICATIONS

The following specifications are separated into two parts. Part 1 provides specifications for nest boxes for use by arboreal mammals, diurnal birds and microbats and Part 2 provides specifications for large forest owl nest boxes. Each part provides photographic and design examples of the boxes described.

The end of Part 1 provides size specifications for different target species. Whilst one species may be targeted other species are well capable of utilising the nest box instead.

Part 2 is provided in two sections. The first section provides general design criteria for large forest owls as specified through collaborative advice from owl expert John Young. The second section describes additional design criteria to enhance to insulation and natural look to owl boxes. This is particularly given the low success of Powerful Owl utilising nest boxes and is to be applied for owl nest boxes given previous recordings by Powerful Owl nearby.

## Part 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.

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 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.

**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.

<u>Nest box placement requirements</u>

- 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 no 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, eg. 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.

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.

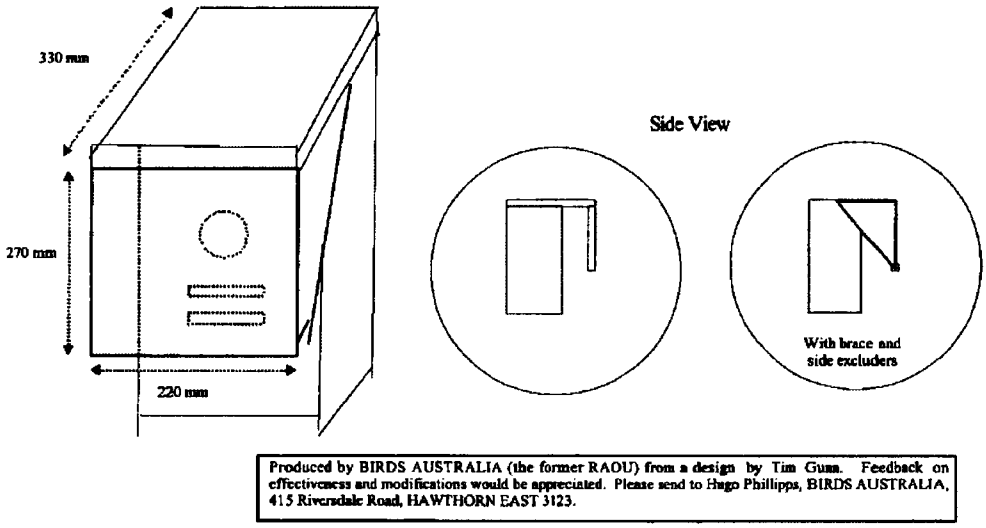
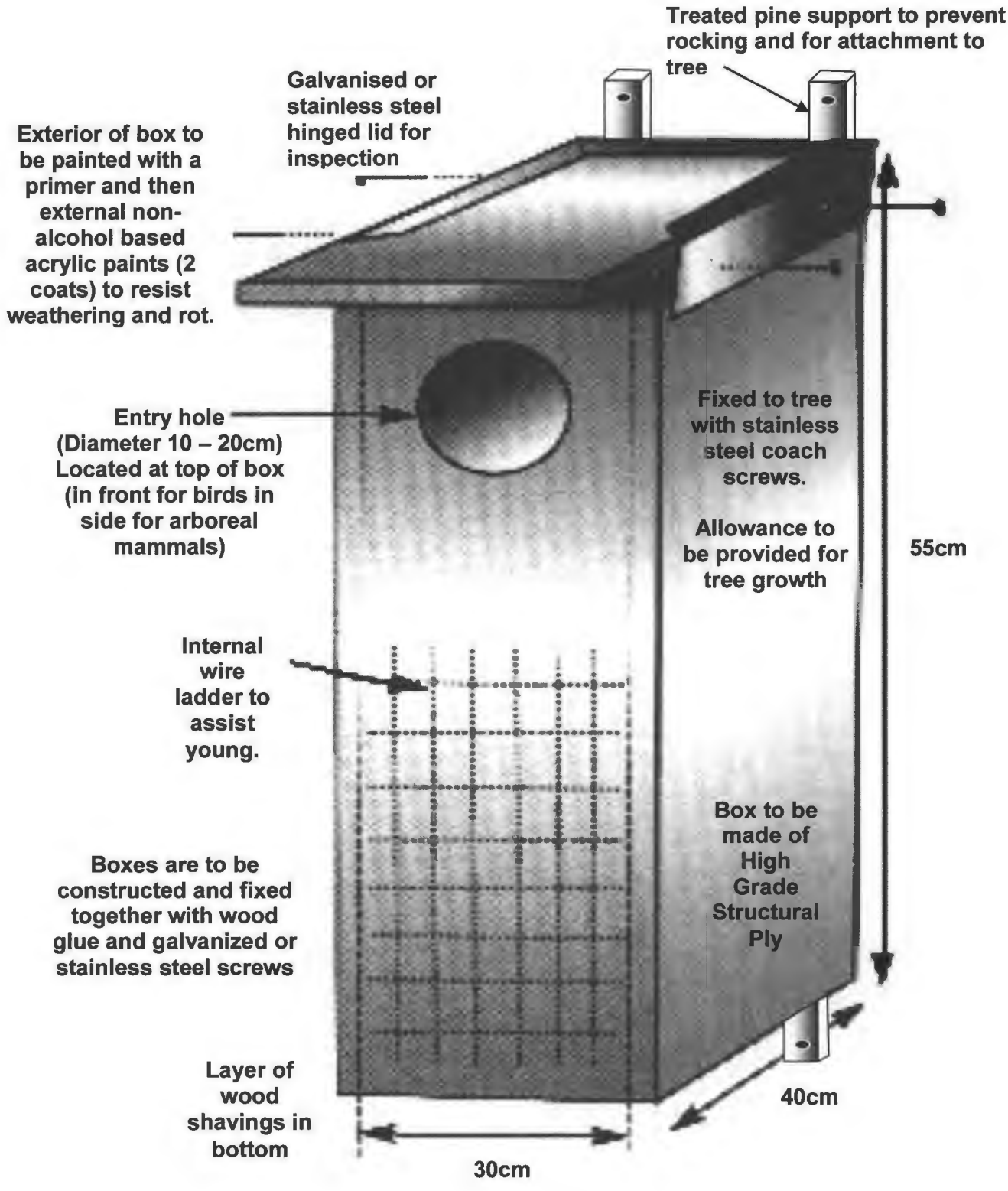


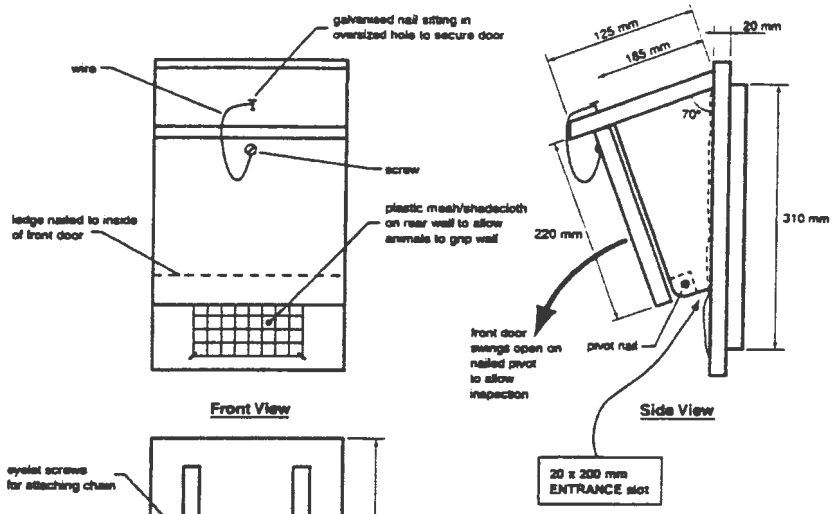

**Diagram 1 - Anti-Myna Baffle**

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




## DESIGN 1 - PARROT & ARBOREAL MAMMAL NEST BOX DETAIL

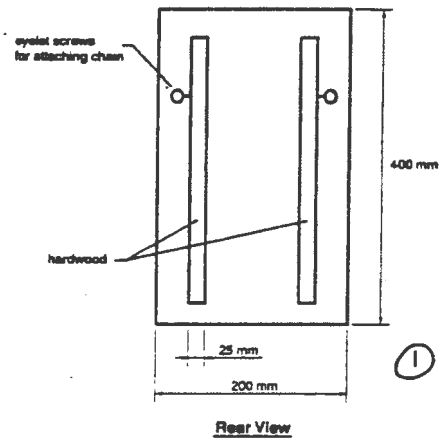
Note: For dimensions of other target species see Table 1.
(Size dimensions applied for a Large Parrot Box)




Fixed to tree with stainless steel coach screws.

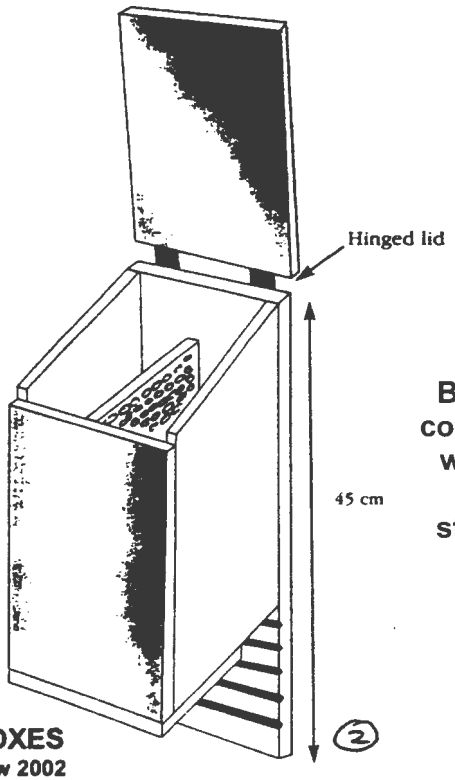
Allowance to be provided for tree growth

**OPTION 1**




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.

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

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.

| 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) |
| Brushtail-Possum sp. | 320 mm | 400 mm | 120-150 mm | v | 4-8 m | Autumn | MZES (n.d.) |
| Brushtail-Possum sp. | 210 x 240 mm | 380 mm | c.120 mm | v | - | - | RSPCA (n.d.) |
| Brushtail-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) |

## Part 2 - Nest boxes for use by Large Forest Owl

The following nest box criteria have been prepared in collaboration with owl behaviour expert, John Young of *John Young Wildlife Enterprises*. The criteria address the need to replicate a large forest owl (eg Powerful Owl) nest hollow with a nest box in the wild.

Where a nesting hollow is required to be provided for a large forest owl (Powerful Owl, Masked Owl or Sooty Owl) the following advice should be considered.

A. In the consideration of a nesting hollow/s for the Large Forest Owlsit is preferable to retain natural hollows insitu for Owls, as opposed to relocating or constructing any new artificial hollow/s.
B. When there is no alternative and the construction of an artificial hollow is required, the design guidelines below should be used.
C. In all cases, formal approval must be gained from the appropriate consent authority before any attempt at hollow resource movement is undertaken. The Large Forest Owls is a threatened species listed under the *NSW Threatened Species Conservation Act* and any *likely impact* upon this species must be fully considered through scientific significance assessment under Part 5 of the *EPA Act.* Failure to undertake that assessment and protocol may result in severe penalties.
D. Where possible high quality hollows are to be relocated in preference to artificial nest boxes due to the preference of hollow dependent species to use natural over artificial hollows.

Specific Design Criteria to of nest boxes for large forest owls

1. The design of artificial nesting boxes for Large Forest Owls should replicate the natural hollow tree shape, design and size to enable a natural amenity for nesting owls.
    - The cross-sectional shape should be octagonal or circular (and not square) depending on construction materials, to prevent hatchlings being pinned into the corner (Figure 1).
    - Internal size dimensions should be 500mm in diameter and 1500mm in height.
    - The entry hole should be on the side at the top end. The opening should be 200mm wide and 300mm high.
    - A landing perch should be placed directly out from the base of the entry hole on the nest box exterior. This perch should a roughened round rod approximately 30mm diameter and 300mm long.
    - An awning over the entry hole to minimise rain entry into the nest box. This should be no larger than 100mm to permit easy approach to the perch.
    - An observation hole or mounting for cameras is not recommended where there will be any movement or light disturbance as seen from within the nest chamber.
    - A maintenance hatch is to be provided to remove any undesirable pests. The maintenance hatch is to remain closed at all times unless accessed for maintenance purposes.
    - Dry termite mud should be placed inside the box at the base as a bedding material for nesting. This should be 150mm thick. This provides good egg incubation properties and drainage.
    - Small holes should be drilled into the base of the nest box to permit water drainage.

- Roughened round horizontal timber rods approximately 30mm in diameter should be attached directly against the internal wall of the box in a ladder type fashion. The rods should be placed approximately 80mm apart from the base of the box to the entry hole, only on the entry side of the box.
- Additional external insulation materials would be beneficial to simulate the cambium properties of a living hollow and the exterior of the box should, where possible, take on a natural appearance to suit the host tree species.
- Construction materials are to mimic natural conditions such as typically dense hard dead timber which provides a level of structural security for long term occupation. Materials should not leak water at joints. Ideally, materials should be constructed using a minimum of 18mm structural grade ply.
- Due to the size and subsequent weight of the box, all timber joints should be sealed to prevent cracking, glued and screwed to ensure impact resilience.
- All fasteners are to be suitable for external use. (e.g. galvanised, stainless steel, brass fixing etc.)
- The fixing method should not cause stress to the host tree such as open wounds or strapping tightly around the cambium restricting nutrient flow.

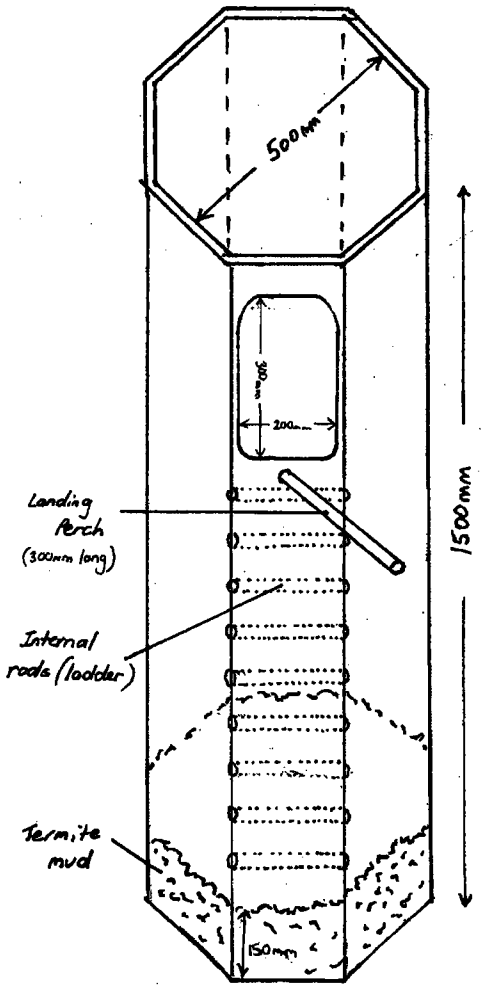
2. The fabrication of the boxes should be sufficiently robust to withstand impacts from fire, wind, rain and vandalism.
   - The structure of the nesting box, as well as the fixing technique to the host tree, should be resilient to falling or swinging branches. The structural integrity can be tested by dropping the box onto a hard surface from above 1m in height without altering the shape. The fixing can be tested by having the full weight of the tree climbing installer on the box without it being dislodged from the tree.
   - External materials should be resilient to excessive heat such as that from a low fire in the understorey.
   - The roof of the nest box should be sloped to prevent pooling of water.
   - A strong lining around the entry hole will reduce potential for Cockatoo damage but should not result in a slippery surface.
   - Boxes must be installed away from existing tracks and roads so as to deter human contact.
   - Boxes should be installed at a height of at least 10m, and preferably 15m above ground level.
   - External materials should be resilient to impacts from projected debris such as rocks.

3. The location of boxes should reflect specific natural conditions whilst the fixing to a host tree should be substantially secure to withstand movement for long term occupation.
   - Boxes should be placed onto stable trees with a DBH of greater than 400mm.
   - The location of nest box placement is best determined by an Owl specialist or suitably experienced ecologist. The location of Large Forest Owls nest boxes should

consider nearby roosting opportunity for the male and proximity to identified habitat features unique to the locality.

- Trees should be selected so that they are not likely to be subject to falling trees and / or substantial branches.
- The box should be placed directly against the trunk and preferably rested on a branch for added structural integrity. Methods of placement to mimic the natural features of the host tree may be investigated further.
- The host tree selected should be of suitable size and condition such that stress would not result from the placement of the nesting box.
- cement of nest boxes before the end of February will allow the Powerful Owls to familiarise themselves with the presence of the nest box prior to the following breeding season which begins in May.
- Boxes should be marked with a reference number for documenting monitoring and reference purposes. The location of the box is to be fixed by GPS and located on a topographic figure for monitoring purposes.

**Exterior Materials:**
Exterior insulation is to be provided that replicates the look and thermal properties of a trunk. This may consist of natural timber offcuts and / or a combination of thermal insulation products.
Exterior needs to be camouflaged to reflect a natural tree preferably using natural bark and timber offcuts e.g. a rough barked species.
Artificial means of camouflage may be used subject to replicating the bark type of the host tree e.g. smooth barked trees.




## DESIGN 3 - LARGE FOREST OWL BOX
**(Internal Construction design)**

Construction materials & external design

These specifications stipulate the construction materials and external design used to meet the above specific design criteria.

Positive Design Aspects:

- This design is made of easily obtainable materials and thus may be replicated.
- Collection of natural coverings would be far more time costly.
- The internal design addresses size and shape specifications provided by John Young of *John Young Wildlife Enterprises*.
- The external robust design addresses strength and resilience specifications set by *Travers bushfire & ecology* against UV radiation, vandalism, weather and excessive heat.
- Insulation aims to replicate thermal properties of a living hollow trunk.
- Other current Large Forest Owls nest box designs have not been proven very effective.
- The colour and shape mimics a smooth-barked tree trunk. In this case, Spotted Gum is the intended recipient tree.
- This same design could also be used for rough barked recipient trees (e.g. Ironbark, Stringybark), which would only require the additional affixing of bark samples of Ironbark / Stringybark to the rounded exterior.
- The nest box is significantly less weight than relocating a natural hollow and does not require the use of a crane to install.

Negative Design Aspects:

- External materials selected to replicate a smooth-barked tree (eg. Spotted Gum) are not natural.
- When attached it takes the appearance of one trunk section (nest box) attached to another trunk (recipient tree) rather than a single tree section. The flat lid and eave also do not mimic natural shape.
- Increased cost over a standard nest box.
- The nest box is moderately heavy and is best installed using a small crane to enable effective placement on a strong branch.

Following the construction of the internal octagonal box, the nest box will be provided with extra insulation by wrapping in *Anti-con* roofing insulation. This is to replicate the insulation properties of a thick walled tree with water that provides a cooling / insulation effect. This product is normally placed below a standard *Colorbond* roof and is made of fibreglass sponge and lined with a heavy duty foil sarking on one side. The foil sarking will be placed on the outside and pulled tightly around the box, then taped secure. The sarking will provide increased waterproofing to the fibreglass foam.

The natural smooth look of a Spotted Gum and strong weather-resistant finish is then achieved by wrapping the box exterior with flat *Colorbond* sheeting.

*Colorbond* is durable, weather resistant, has good resistance to fire and is able to be painted for a natural finished look and therefore both products will suit specifications outlined by *Travers bushfire & ecology*.

*Colorbond* sheeting has the added benefit for fastening using roofing screws and rivets, and it comes in a range of grey colours that may be matched to a Spotted Gum. Both options will require two sheets lapped around the middle due to the size of sheets available. The bottom

sheet will be wrapped first and then the top sheet so that a water resistant lapping will result. Rivets will secure the lapped join. The lapped join of both sheets will be sealed at the rear of the box with a piece of treated pine timber which will protrude higher and lower than the box and used to fasten the box against the tree trunk using bugle screws. A pre-drilled hole in the top of this timber will be used to pull the box up the tree by rope.

A photo of the recipient tree is taken to colour-match the *Colorbond* base as well as the paint used to mimic bark spots and peels.

The roof of the box will be made of plywood on a slope as required and then lined on top with *Colorbond* sheeting to prevent possum entry into the box. Possums will not be able to grapple the smooth surface all around.

The two flat faces of the hexagonal plywood interior on either side of the entry hole face will run longer and protrude below the box. This is so that the box may rest more securely on a branch.

Photos 2 & 3 - Examples of large forest owl nest box design and placement at Wadalba

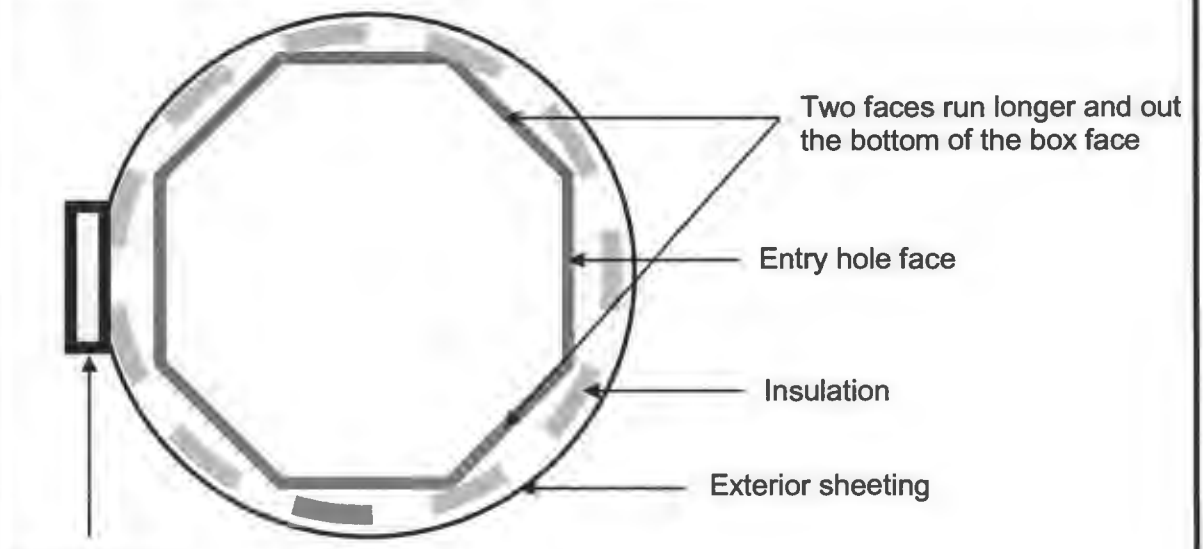



**Diagram 2: Cross-section**

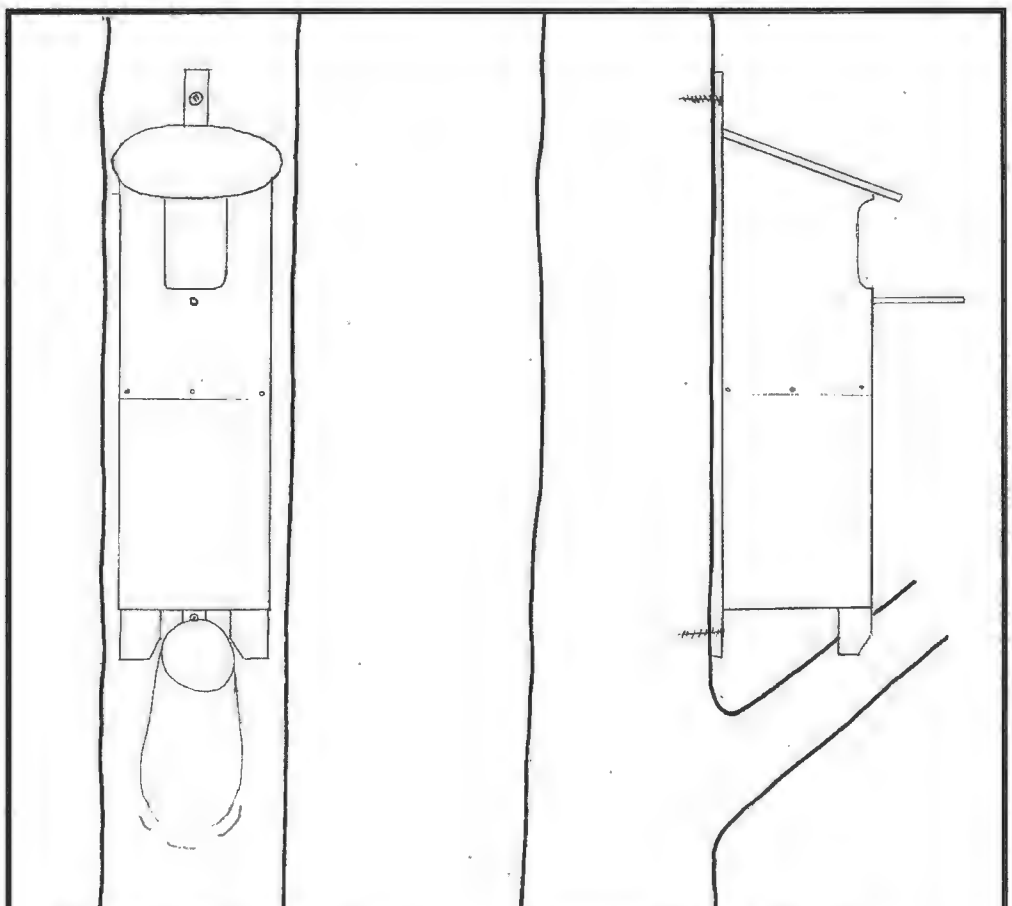


**Diagram 3a: Face on view**

**Diagram 2b: Side View**

# Schedule 1 - Vegetation Management Works S1

## RESTORATION PERFORMANCE TARGETS

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

1. The total area of canopy revegetation works is to be at least 0.34ha in the Riparian Revegetation Corridor and 0.18ha in the Native Canopy Protection and Restoration zone as marked on Schedule 1 - Vegetation Management Works.
2. Clearing of hollow-bearing trees is to be undertaken in the presence of a fauna ecologist.
3. All protective fencing (temporary and permanent), sediment controls and tree protection zones are to be installed prior to clearance of any vegetation.
4. Installation of 11 microbat and 11 glider nest boxes as marked on Schedule 1 – Vegetation Management Works, under the direction of a fauna ecologist.
5. All stormwater outlets are to be stabilised with geotextile overlain with rock boulders in accordance with N SW DP I - Office of Water's Controlled Activity Guidelines (2012) for storm water outlets. Revegetation around outlets to use locally endemic species.
6. Drainage lines are to be stabilised prior to commencement of vegetation restoration works.
7. Weed control and revegetation works are to be carried out by a qualified bushland regeneration contractor for a minimum period of 3 years. Weed control targets should be a maximum of 15% cover at the end of year 1 progressing to 10% at year 2 and less than 1% at the end of year 3.
8. All highly invasive weed species including Camphor Laurel, Umbrella Sedge, Lantana, Privet, Paspalum and Blackberry are to be continuously suppressed and, if possible, eradicated from the restoration area.
9. All revegetation areas are to be mulched, plants protected by tree guards and rabbit baiting undertaken.
10. It is expected that the success rate of plantings will be at least 95% and contingency planting will be required to ensure the minimum number of plants are established at the end of the maintenance period. Planting densities are to achieve:

    Arboreal protection and restoration zone (0.18ha)
    - 1 tree per 100m² (approximately 18 plants);
    - 1 shrub per 10m² – to achieve 20% cover (minimum of 180 plants); and
    - 3 groundcovers per 1m² (minimum of 5,400 plants).

    Riparian revegetation corridor (0.34ha)
    - 1 tree per 100m² (approximately 34 plants);
    - 1 shrub per 10m² to achieve 20% cover (minimum of 340 plants); and
    - 5 groundcovers per 1m² (17,00 plants)

11. Revegetation is to be undertaken utilising locally collected seed. Appointed bush regeneration contractor may vary number of native plant species to be established provided 80% dominant species is retained (refer Planting Schedule). A minimum number of native plant species are to be utilised as follows:
    - 5 tree species;
    - 8 shrub species; and
    - 10 ground covers.
12. A target of 40% native vegetation cover applies at the end of year 1, 60% native vegetation cover at the end of year 2 and 95% at the end of year 3 in all revegetation areas.
13. Monitoring to occur by project ecologist with compliance certification reported to Council at the successful completion of each major item or group of items.

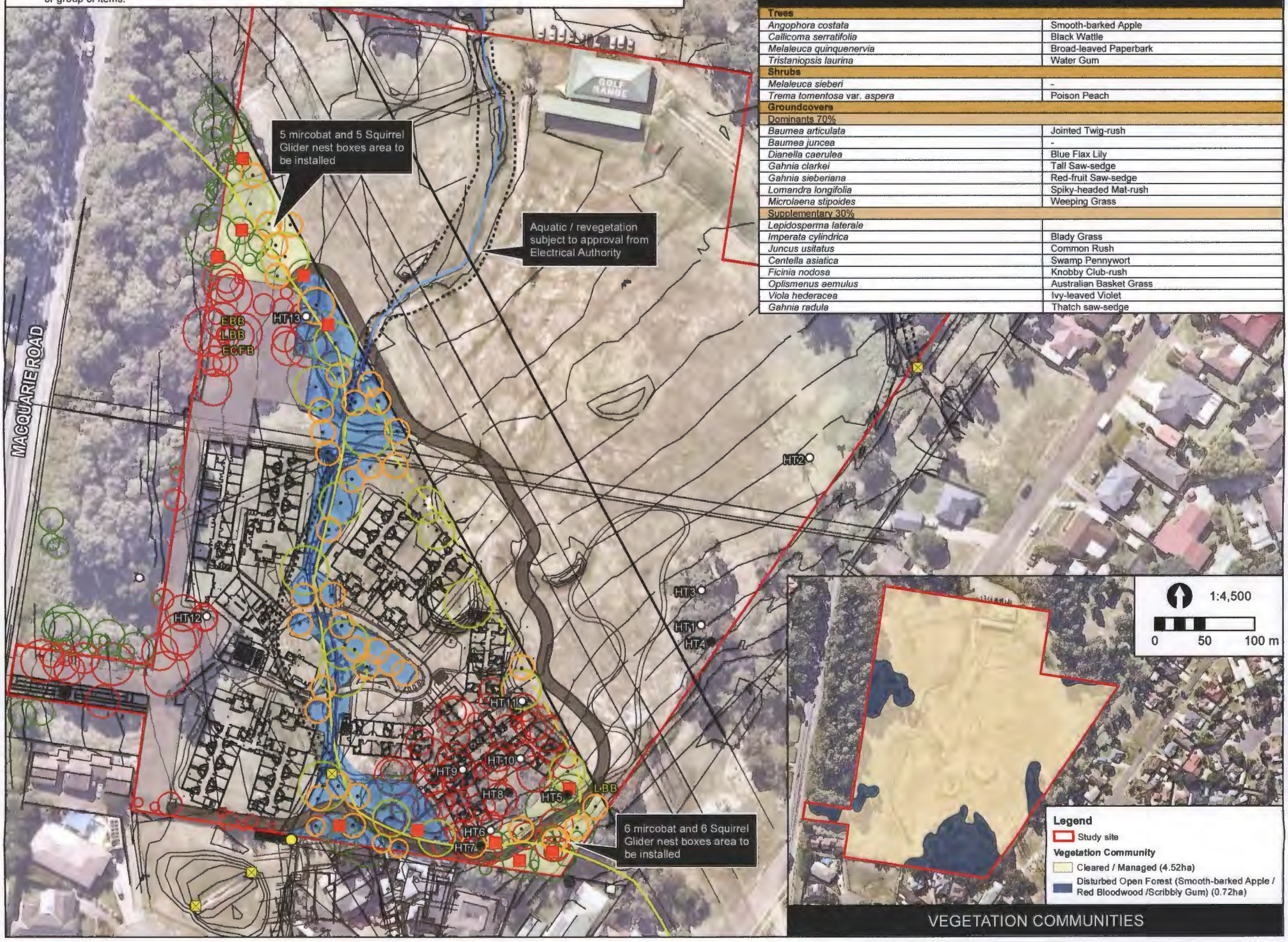
## PLANTING SCHEDULE

### ARBOREAL PROTECTION & RESTORATION ZONE

| | |
|---|---|
| **Trees** | |
| Dominant species 70% | |
| *Angophora costata* | Smooth-barked Apple |
| *Corymbia gummifera* | Red Bloodwood |
| *Eucalyptus resinifera* | Red Mahogany |
| *Eucalyptus punctata* | Grey Gum |
| Supplementary 30% | |
| *Tristaniopsis laurina* | Water Gum |
| *Eucalyptus globoidea* | White Stringybark |
| *Eucalyptus umbra* | Broad-leaved White Mahogany |
| *Eucalyptus piperita* | Sydney Peppermint |
| **Shrubs** | |
| Dominant species 70% | |
| *Acacia terminalis* | Sunshine Wattle |
| *Banksia oblongifolia* | Fern-leaved Banksia |
| *Leptospermum polygalifolium* | Tantoon |
| *Melaleuca sieberi* | - |
| Supplementary 30% | |
| *Acacia longifolia* var. *longifolia* | Sydney Golden Wattle |
| *Acacia ulicifolia* | Prickly Moses |
| *Dillwynia retorta* | Eggs and Bacon |
| *Dodonaea triquetra* | Common hop bush |
| *Trema tomentosa* var. *aspera* | Poison Peach |
| **Groundcovers** | |
| Dominant species 70% | |
| *Dianella caerulea* | Blue Flax Lily |
| *Entolasia stricta* | Wiry Panic |
| *Gahnia sieberiana* | Red-fruit Saw-sedge |
| *Juncus usitatus* | Common Rush |
| *Microlaena stipoides* | Weeping Grass |
| *Hardenbergia violacea* | False Sarsparilla |
| *Kennedia rubicunda* | Dusky Coral Pea |
| Supplementary 30% | |
| *Centella asiatica* | Swamp Pennywort |
| *Dichondra repens* | Kidney Weed |
| *Imperata cylindrica* | Blady Grass |
| *Lomandra longifolia* | Spiky-headed Mat-rush |
| *Pimelea linifolia* | Slender Rice Flower |
| *Poa labillardierei* | Tussock |
| *Themeda australis (triandra)* | Kangaroo Grass |

### DRAINAGE CORRIDOR

| | |
|---|---|
| **Trees** | |
| *Angophora costata* | Smooth-barked Apple |
| *Callicoma serratifolia* | Black Wattle |
| *Melaleuca quinquenervia* | Broad-leaved Paperbark |
| *Tristaniopsis laurina* | Water Gum |
| **Shrubs** | |
| *Melaleuca sieberi* | - |
| *Trema tomentosa* var. *aspera* | Poison Peach |
| **Groundcovers** | |
| Dominants 70% | |
| *Baumea articulata* | Jointed Twig-rush |
| *Baumea juncea* | - |
| *Dianella caerulea* | Blue Flax Lily |
| *Gahnia clarkei* | Tall Saw-sedge |
| *Gahnia sieberiana* | Red-fruit Saw-sedge |
| *Lomandra longifolia* | Spiky-headed Mat-rush |
| *Microlaena stipoides* | Weeping Grass |
| Supplementary 30% | |
| *Lepidosperma laterale* | |
| *Imperata cylindrica* | Blady Grass |
| *Juncus usitatus* | Common Rush |
| *Centella asiatica* | Swamp Pennywort |
| *Ficinia nodosa* | Knobby Club-rush |
| *Oplismenus aemulus* | Australian Basket Grass |
| *Viola hederacea* | Ivy-leaved Violet |
| *Gahnia radula* | Thatch saw-sedge |




**Legend**

- Study site
- Proposed SFPP (aged care dwellings)
- 'Other' development (non aged care)
- Carpark/road
- Maintenance trail (4m wide)
- Open channel
- Derelict stormwater pipes
- Top of bank
- Proposed drainage realignment
- Electrical easement
- Stormwater culvert
- Stormwater inspection pit
- Habitat Tree
- Didn't contain hollows during tree climbing inspection

**Fauna Survey Results**

- EBB Eastern Bentwing Bat
- LBB Little Bentwing Bat
- ECFB East-coast Freetail Bat (possible)

**Tree Retention/Removal/Plantings**

- Tree for retention
- Tree for removal
- *A. costata* (17)
- Mixed dominant and supplementary species (42)

- Native canopy protection and restoration zone (0.18ha)
- Riparian revegetation zone (0.34ha)
- Nest boxes (for Squirrel Gliders and microbats)
- 1° habitat connectivity (1 tree <30m)
- 2° habitat connectivity (1 tree <30m)

Aerial source: Nearmap

Travers bushfire & ecology
www.traversecology.com.au

PROJECT & MXD REFERENCE
Macquarie Rd, Cardiff
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DATE & ISSUE NUMBER
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Issue 1

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

TITLE
**Schedule 1 - Vegetation Management Works**

0 25 50 m

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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