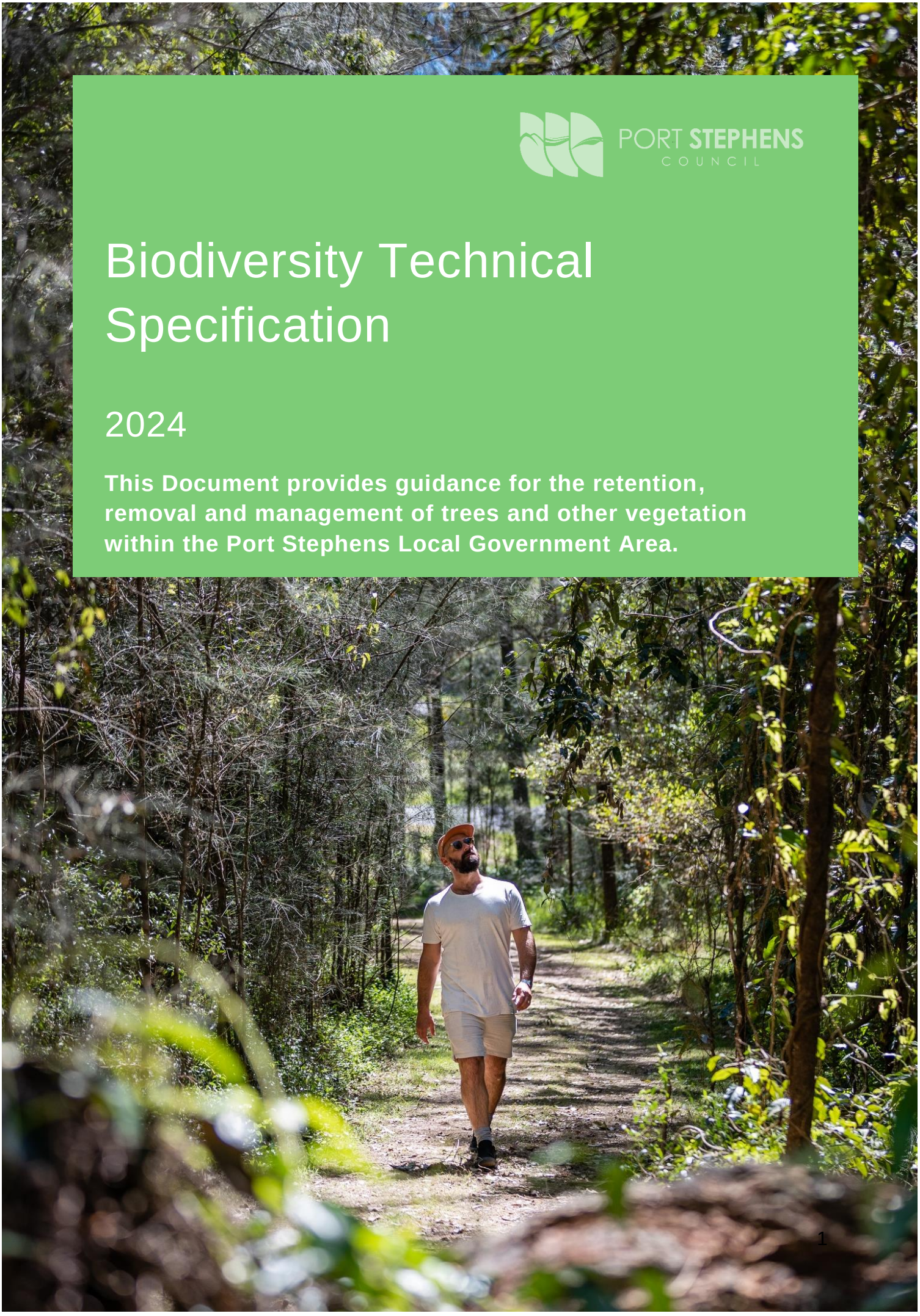

PORT STEPHENS COUNCIL

Biodiversity Technical Specification

2024

This Document provides guidance for the retention, removal and management of trees and other vegetation within the Port Stephens Local Government Area.

Contents

Version History

Version No.	Date	Author	Details
1	February 2024	Port Stephens Council	The Biodiversity Technical Specification replaces the Tree Technical Specification, Vegetation Technical Specification and Nest Box Technical Specification.

About this document

This technical specification provides guidance for the management, retention and removal of trees, vegetation and valuable habitat features within the Port Stephens Local Government Area (LGA). The technical specification is designed to provide clarity and assistance to both Council staff and applicants who seek to fulfill their management obligations under adopted policies and development consent conditions.

These technical specifications have been developed with particular reference to:

- Port Stephens Council Local Environment Plan 2013 (LEP)
- Port Stephens Council Development Control Plan 2014 (DCP)
- Local Government Act 1993
- Trees (Disputes between Neighbours) Act 2006
- Environmental Planning and Assessment Act 1979 (EP&A Act)
- Biodiversity Conservation Act 2016 (BC Act)
- State Environmental Planning Policy (Biodiversity and Conservation) 2021

1. Tree Assessment

To ensure consistent practice for all tree assessment matters in the LGA the following tests will be applied for trees on public, private or institutional land. All tree assessments and accompanying reports must be carried out by a suitably qualified person employed by Council or AQF level 5 arborist.

1.1. Tree Retention Value

Tree Retention Value is derived from a weighted combination of tree sustainability and landscape significance. Sustainability and Significance must be assessed independently as they have a relationship with one another such that the health, condition and longevity of a tree increases or diminishes depending on its level of intactness, quality and potential longevity. Retention value should be assessed by a suitably qualified person employed by Council or an AQF 5 arborist and reported to Council in a format that meet requirements for arborist reports (see Section 3).

The four steps used to determine the retention value of trees are outlined below.

STEP 1: ASSESS THE SUSTAINABILITY OF THE TREE IN ITS LOCATION

Assessment of sustainability is to be calculated using the safe useful life expectancy (SULE) framework. This framework considers the age of the tree and its expected life expectancy in its specific location and then factors in an assessment of health and vigour, condition, and suitability indicators, as presented in Figure 1, and records SULE as either:

- Long SULE: Greater than 40 years.
- Medium SULE: From 15 – 40 years.
- Short SULE: From 5 to 15 years.
- Dead, Declining or Hazardous: Less than 5 years.

Sustainability must be assessed by a suitably qualified person employed by Council or who has the minimum qualification of AQF level 5 in arboriculture. Trees identified as Dead, Declining or Hazardous (also known as dead, dying or dangerous) with a SULE of less than 5 years may require removal. The tree assessment methods outlined in Section 1.2 below give further details regarding the considerations used to determine tree sustainability.

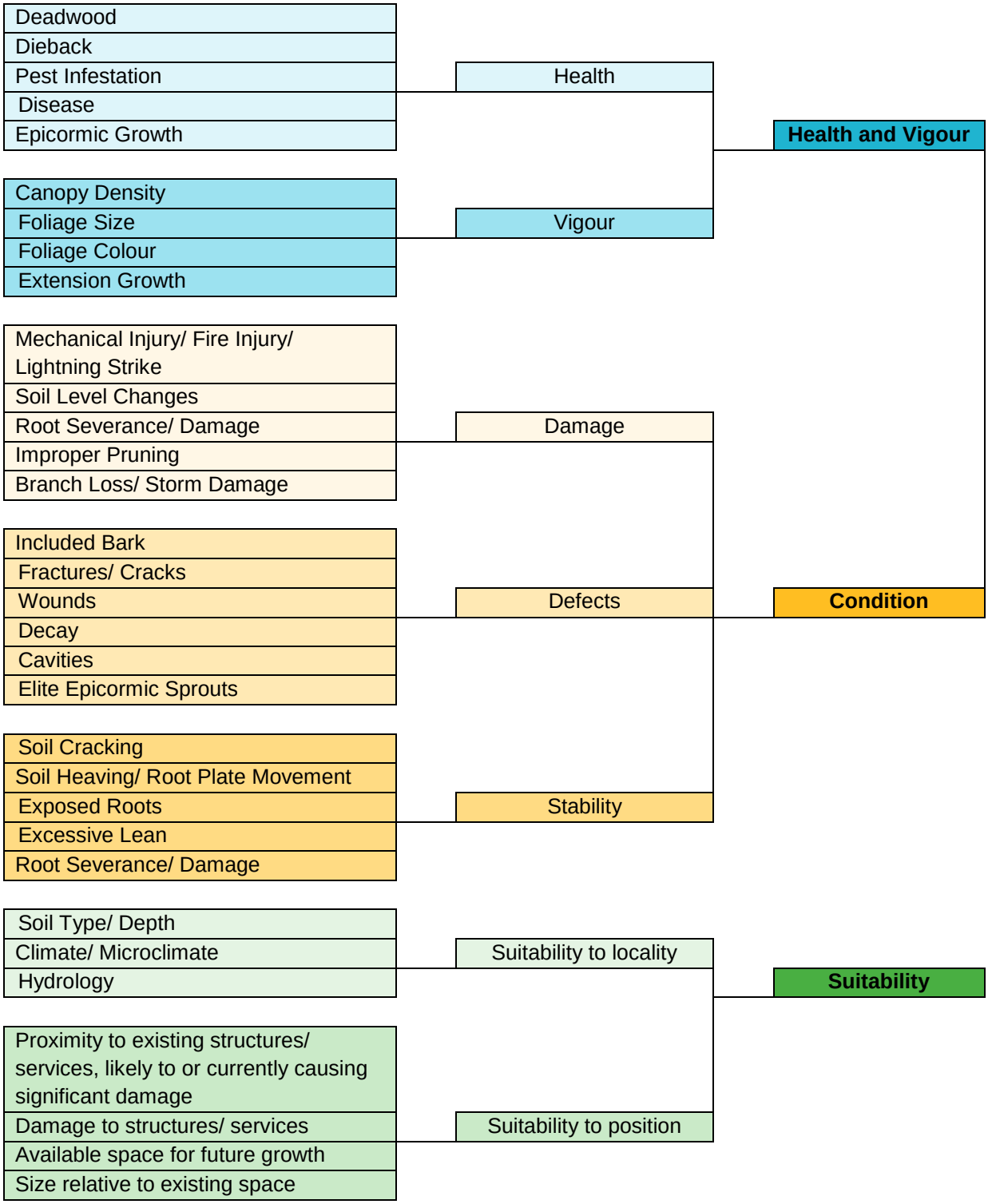

Figure 1: Biological and biochemical indicators for assessing sustainability of trees and calculating SULE (**Source**: adapted from Morton, University of NSW).

STEP 2: DETERMINE LANDSCAPE SIGNIFICANCE

Make a considered evaluation of the tree's amenity and other values to determine the landscape significance. Landscape significance is divided into 7 categories (Very High, High, Moderate, Low, Very Low, Insignificant and Undesirable) and assessed using the criteria outlined in Table 1 below. Landscape significance is recorded as the level determined by the highest criteria that applies to any given tree.

Table 1: Criteria for assessment of landscape significance (**Source:** adapted from Morton, University of NSW).

	1. Very High
A	The tree is listed as a Heritage Item under the LEP with a local, state or national level; or
B	The tree forms part of the curtilage of a Heritage Item (building/structure/artefact as defined in LEP and has a known or documented association with that item; or
C	The tree is a Commemorative Planting or to commemorate an important historical event; or
D	The tree is scheduled as a Threatened Species or is a canopy species of an Endangered Ecological Community as defined under the Biodiversity Conservation Act 2016 or the Environmental Protection and Biodiversity Conversation Act 1999; or
E	The tree is known as an important food, shelter or nesting tree for endangered or threatened fauna species listed under the Biodiversity Conservation Act 2016; or
F	Tree provides shade over infrastructure 80% of the time during daylight hours in summer; or
G	The tree has a very large live crown size exceeding 300m2 with normal to dense foliage cover, is located in a visually prominent in the landscape, exhibits very good form and habit typical of the species and makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity; or
H	The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance; or
I	The tree is listed on Council's Significant Tree Register; or
J	The tree is protected under clause 7.3(3) of the Biodiversity Conservation Regulation 2017.
	2. High
A	The tree has a strong historical association with a heritage item (building/structure/artefact/garden etc.) within or adjacent the property and/or

	exemplifies a particular era or style of landscape design associated with the original development of the site; or
B	The tree is a Remnant Tree, being a tree in existence prior to development of the area; or
C	The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor; or
D	The tree has a very large live crown size exceeding 200m2, a crown density exceeding 70% Crown Cover (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area; or
E	Tree provides shade over infrastructure 60% of the time during daylight hours in summer.
	3. Moderate
A	The tree is a locally-indigenous species and representative of the original vegetation of the area; or
B	The tree has a large live crown size exceeding 100m2, and the tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (eg crown distortion / suppression) with a crown density of at least 70% Crown Cover (normal); and The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area; or
C	Tree provides shade over infrastructure 40% of the time during daylight hours in summer.
	4. Low
A	The tree has a medium live crown size exceeding 40m2, and the tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% Crown Cover (thinning to normal); and the tree makes a fair contribution to the visual character and amenity of the area; and the tree is visible from surrounding properties, but is not visually prominent - view may be partially obscured by other vegetation or built forms, or
B	The tree has no known or suspected historical association.
	5. Very Low
A	The tree has a small live crown size of less than 40m2 and can be replaced within the short term with new tree planting; or

B	The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% Crown Cover (sparse); and The tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area.
	6. Insignificant
A	The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or a nuisance species.
B	The subject tree is scheduled as exempt (not protected) under the provisions of the local Councils' DCP due to its species, nuisance or position relative to buildings or other structures.
	7. Undesirable
A	The tree poses a risk under the Biosecurity Act 2015 or is listed as undesirable under the DCP.

STEP 3: DETERMINE RETENTION VALUE

Retention value is calculated by inputting the results from Step 1 (Sustainability) and Step 2 (Significance) into the Tree Retention Value Matrix (Figure 2).

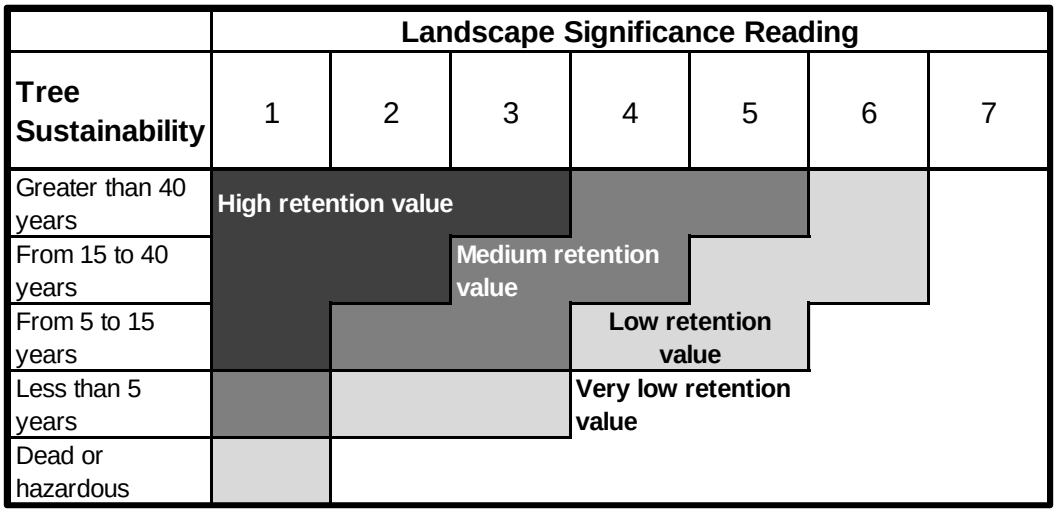

Figure 2: Tree Retention Value Matrix – Assessment Methodology (**Source:** Morton, University of NSW).

1.2. Tree Assessment Methods

1.2.1. UNACCEPTABLE RISK

The tree poses an unacceptable risk that cannot be adequately or appropriately managed by arboricultural treatment, fencing, signage or other risk management measures the level of risk must be assessed and reported by a suitably qualified person employed by Council or AQF level 5 arborist. Options for managing risk other than by tree removal are to be considered.

1.2.2. DISEASED CONDITION

The tree is in a diseased condition that cannot be corrected by pruning or other arboricultural treatment. The diseased condition must be confirmed in a report prepared by a suitably qualified person employed by Council or AQF 5 arborist. Options for managing the disease condition other than by tree removal are to be considered.

1.2.3. REMAINING LIFE EXPECTANCY

The tree has a remaining life expectancy of less than 5 years and it can be shown that replacement or relocation of the tree would be beneficial having regard to streetscape appearance, pedestrian and traffic circulation, site access and provision of utility services. The tree's remaining life expectancy must be determined and confirmed in a report by a suitably qualified person employed by Council or AQF level 5 arborist.

1.2.4. PROPERTY DAMAGE

Public or private 'property' (including utility services, footpaths, driveways, retaining walls and buildings) is being significantly affected by the presence / location or growth of a tree, and it is shown that tree removal is the only reasonable means to avoid further conflict, having regard to all other abatement options. Assessment of the damage is to be carried out and reported by a suitably qualified person (eg. Road/civil engineer) in consultation with a suitably qualified arborist.

1.2.5. PUBLIC INFRASTRUCTURE WORKS

The tree is likely to succumb to major injury as a result of public infrastructure works, and it is impractical to relocate or reconfigure those works so as to avoid such injury. This assessment and any statement/reporting is to be made by a suitably qualified person (eg. Infrastructure designer/public works staff) in consultation with a suitably qualified arborist. Major injury is injury likely to result in death, or in the tree posing an unacceptable risk, or to reducing the remaining life expectancy of the tree to less than 5 years. The likelihood of major injury must be confirmed in a report prepared by a suitably qualified arborist, to determine the impact of the infrastructure on the tree.

1.2.6. SUPPRESSED GROWTH TEST

The tree is part of a group of trees the spacing of which is such as to prevent each of the trees within the group from attaining their desired full potential. It will need to be confirmed in a report prepared by a suitably qualified person employed by Council or AQF level 5 arborist that the tree in question is the one that would be most beneficial to remove.

Note: this test does not apply to traditional avenue planting in an evenly spaced group.

1.2.7. PROPOSED DRIVEWAY CROSSING, PRIVATE STRUCTURES OR WORKS AFFECTING PUBLIC LAND

The tree would prevent the installation and essential function of a proposed driveway crossing, street awning, street balcony, and it is demonstrated that there is no reasonable alternative to removing the tree, all possible alternative design configurations for the works having been considered in order to maximize the public benefits, and Council is satisfied that the proposal would not have any adverse heritage, streetscape, pedestrian or traffic impacts.

1.2.8. REMOVAL OF TREES FOR THE INSTALLATION AND MAINTENANCE OF PHOTOVOLTAIC ARRAYS AND SOLAR HOT WATER SYSTEMS

Any application for the removal of a tree for the installation and maintenance of a photovoltaic array or solar hot water system will need careful appraisal. The applicant will need to demonstrate that there is no reasonable alternative to removing the tree, including increasing house hold efficiency, all possible alternative design configurations for the works having been considered. The proponent must be able to demonstrate that they have considered alternative renewable energy methods to generate electricity, and or hot water, is not applicable to the site.

A report using appropriate software for the assessment of the efficiency of the renewable energy technology must be provided as part of the assessment documentation. This report will need to demonstrate that the solar electricity output efficiency is less than 50% of maximum output across the year as a direct result of shading from the tree.

1.2.9. POSSIBLE TERMITE/PEST ACTIVITY IN TREES

Council will not always undertake the treatment of termites/pests in trees within parks, road or bushland reserves as they are considered a natural part of the environment and the treatment of termites/pests in trees will not stop them invading from other sources or properties. It is the landowner’s responsibility to take the appropriate action to adequately protect their property from the invasion of termites/pests. Council may consider the treatment of termites/pests in trees in some circumstances based on a risk assessment and at the discretion of the Council’s relevant officer. Factors to be considered include the Location of the tree, the target area under the tree and the Significance of the tree.

1.2.10. PRUNING TO ENHANCE VIEWS

Council will not approve the removal of otherwise healthy and safe trees for the enhancement of views. Lopping is an unacceptable practice according to the Australian Standard for the Pruning of Amenity Trees, and will not normally be approved.

1.3. Nuisance Trees

Provided that no significant hazard or other safety issues are relevant, Council is unlikely to support an application for the removal of a tree for any of the following reasons:

- Leaf/bark/cones/twigs drop (into gutters/downpipes/pools/lawns and the like).
- To increase natural light into a dwelling which does not have a passive solar design.
- To improve street lighting or private property.
- To enhance views.
- To reduce bird or bat droppings.
- Minor lifting of, or damage to, driveways, paths, fences, retaining walls and other minor infrastructure.
- To erect a fence.
- Bush fire hazard reduction works which has not been approved by the NSW Rural Fire Service.
- To prevent future potential damage to sewer mains.
- To alleviate termite activity.
- To facilitate routine maintenance of turf areas.

1.4. Works to Public Trees

Where works have been proposed for the benefit of the individual and there is no benefit to the Community, Council will organise quotes and all costs will be incurred by the individual.

Once assessed by Council all works will be prioritised in relation to the hazard assessment assigned to the particular tree. Works will be scheduled as either:

- Very High Priority – Within 7 working Days
- High Priority – Within 28 Working Days
- Medium Priority – Reassessed annually or within budget limits
- Low Priority – Reassessed every two years

2. Tree Permit Reviews

Where it is in the opinion of the Council that a tree removal or pruning is not warranted the Council will issue an 'Intend to refuse' determination. The applicant may request a review of the original assessment under division 8.2 of the EP&A Act, and should specify in writing the grounds upon which they consider the determination should be amended. The applicant has the right of appeal on either technical or social grounds. A fee will be applied as per Part 7 of the Environmental Planning and Assessment (EP&A) Regulation 2021, or as subsequently amended.

2.1 Application Reassessment

Council may require a report from an independent, qualified arborist prior to reassessing the application as detailed in the Port Stephens Council Development Control Plan 2014, or as subsequently amended. Reassessment of an application on a social basis includes medical complaints. Medical complaints must be accompanied by a medical certificate.

The Councils staff, that are not subordinate to the first determining officer, shall assess the review, and where they are satisfied that the application should be approved shall make that determination. However prior to making any determination council staff will inform the applicant in writing of their assessment and recommendations, and must receive a written response from the applicant that they are satisfied with any conditions or restrictions intended to be imposed.

2.2 Land and Environment Court

The applicant will be advised of right of appeal to the Land and Environment Court under section 8.7 of the EP&A Act.

3. Arborist Reports

Council has a number of minimum requirements for Arborists reports relating both the qualifications for the Arborists and the details included in the reports themselves.

3.1 Minimum Qualifications

Arborist reports must be prepared and signed by an arborist with minimum AQF 5 qualifications. Council will only recognise reports from suitably qualified arborists that conform to the International Society of Arboriculture Basic Tree Risk Assessment Form. Reports must be accompanied by supporting photographs and the CV of the arborist who prepared the report.

3.2 Minimum Requirements

All arborist assessment reports must include:

- The address of the site.
- The date of the inspection and the date the report was prepared.
- The detailed methodology of the techniques used to undertake the assessment.
- Any limitations of the report.
- A site plan clearly depicting the following:
    - Number and location of all trees identified in tree inventory.
    - Location of proposed new building/development with outline of existing building/development on site.
    - Existing and proposed driveways, private access roads, parking areas.
    - Existing and proposed drainage and services including, stormwater drains, flow paths, drainage, easements, watercourses and channels.
    - Location of existing service poles, street trees, kerb crossovers, footpaths, pedestrian crossings, street furniture, bus stops.
    - Bushfire asset protection zones for proposed developments
    - Substantial excavation or land filling for any other reason including retaining walls
    - Existing and proposed infrastructure including excavation for power, water or gas services, sewerage, transpiration area
    - Proposed replacement plantings, landscaping and soil remediation
- A tree inventory table depicting the following information for trees proposed to be removed and trees that are to be retained:
    - Tree identification number
    - Scientific and common name
    - Age class
    - Trunk diameter at breast height (DBH) at 1.4m and at ground (DGL)
    - Estimated tree height

    - Canopy spread
    - Tree Useful Life Expectancy (ULE)
    - Landscape significance
    - Retention value
    - Compensatory planting requirements (as per Table 4)
    - Structural Root Zone (SRZ)
    - Tree Protection Zone (TPZ)
    - Tree Canopy Assessment
    - Tree hollows present
    - Tree Hazard Assessment
- Discussion and conclusion of information collected, options available, implications of proposal, etc. Include supporting evidence and literature (such as photograph's, literature cited, laboratory results if relevant, etc)
- A list of recommendations, options and the reasons for their adoption

Tree protection measures and a post-construction tree maintenance program which can be used as conditions, should the application be approved (if applicable)

Council reserves the right to reject inadequate arborist reports where:

- The variation to designs or layout has occurred irrespective of conditions set by the original arborist report.
- Inaccurate and or insufficient information.
- The modification or planned changes are detrimental to the long-term viability of vegetation on the site.
- Trees or vegetation communities are incorrectly located or referenced following a site inspection.
- Effects on adjacent trees on other properties and reserves are not considered as part of the arborist report.

3.3 Supporting Evidence

Where appropriate, supporting evidence may be required to be submitted in conjunction with an arborist report. Supporting evidence for the report may include:

- Safe Useful Life Expectancy (SULE).
- Laboratory results for the identification of pathogens or identification of species through root analysis.
- Tree valuations using the Peter Thyer valuation method.
- Tree remediation including pruning, root pruning and mulching works.
- Resistograph measurements or similar diagnostic equipment readings.
- Root mapping procedures.
- Vegetation Management Plan.
- Solar panel shading report.
- Landscape Plan.
- Tree removal retention plan.

4. Tree or Vegetation Removal

Any tree or vegetation removal or major tree pruning undertaken in accorande with the DCP is to be undertaken by a suitably qualified arborist. Where a tree is identified as habitat tree, works need to be supervised by a qualified ecologist.

4.1 Waste minimisation

Wherever practicable timber, including hollow logs, should be salvaged for reuse. Opportunities for waste minimisation and re-purposing of felled trees and branches should be considered prior to removal. Opportunities can be environmental, such as repurposing logs for habitat or conservation, community focussed, such as repurposing logs for community infrastructure e.g. park benches or nature play, or as a sustainable resource, such as timber for building or fencing or mulch for open space. Suitability of opportunities will be guided by the quality and size of the timber, however to maximise outcomes, 'highest and best use' of the tree should be considered to ensure options for habitat provision and milling for public and community use are explored before mulch is considered. Consult with your arborist for more details on salvaging the timber.

4.2 Tree Protection Zones

Tree Protection Zones (TPZ) are to be established and maintained for the duration of any works near a retained tree with the following requirements:

- The size of a TPZ is calculated by multiplying the retained tree's diameter at breast height (DBH) by 12 i.e. a tree with 40cm DBH requires a TPZ radius of 4.8 metres. TPZ areas are measured from the centre of the trunk at ground level.
- The boundary of the active works area must be clearly marked with high visibility tape, bunting or flagging to minimise risk of damage to the retained tree's structural root zone.

No works are to occur within any TPZs for the duration of the project (i.e. excavations, traffic accesses (existing access ways are permitted), stockpiling and material storage areas, alterations to soil levels, and severing tree roots with a diameter greater than >30cm). See Figure 3 for an explanatory diagram of a TPZ.

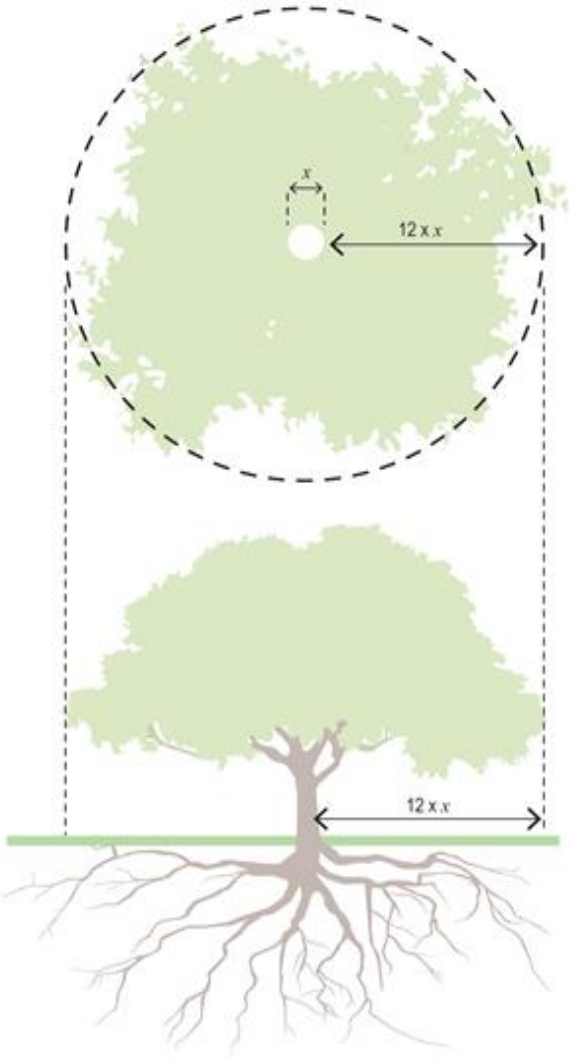

Figure 3: Tree Protection Zone explanatory diagram (**Source:** Alpine Shire Council).

4.3 Tree Removal and Retention Plan and Schedule

Where a tree removal and retention plan is required, it must be accompanied by a Tree Schedule. The Tree Schedule must be prepared by a suitable qualified person and display the following:

- Tree number
- GPS Location
- Scientific name
- Common name
- Diameter at breast height (DBH)
- Canopy spread
- Safe Useful Life Expectancy (SULE) values
- Age class
- Significance
- Comments
- Habitat Features
    - Number and size class of hollows
    - Nests
- Recommendations

4.4 Vegetation Clearing Protocols

Clearing protocols apply to all works which involve the removal of native vegetation in the Port Stephens Local Government Area.

- The clearing of native vegetation on site shall not occur within key breeding periods of species identified on site.
- Felling techniques are to be sensitive to arboreal mammals and bird species identified on site. Sectional dismantling will be an option where habitat hollows are to reused.
- The identification and marking of all habitat trees on site prior to removal.
- The underscrubing of vegetation less than 3m in height will occur prior to tree removal
- The retention of habitat trees for a period of 3 nights after the removal of non habitat trees have been felled.
- Clearing must then be carried out moving from the fringe of the habitat trees towards the surrounding vegetation.
- Trees should be ‘soft felled’ and inspected immediately by a licensed wildlife carers or ecologist for displaced fauna which are to be relocated as close as possible to the development site.
- All trees must be left for a minimum of two nights prior to being moved to a stockpile to allow resident fauna to vacate tree hollows.

- The removal of hollows/nesting sites from felled trees and the re-establishment as per the Port Stephens Council Tree Technical Specification.
- The felling of trees away from any joining retained habitats.

4.5 Clearing Method Statement

Where a Clearing Method Statement (CMS) is requested this will include details on:

- Size and type of any machinery to be used
- Under scrubbing – this work should be carried out to minimise the establishment of degradation processes and leave a layer of mulch to aid in soil retention in the event of adverse weather
- Disposal - Proposed means for disposal of cleared materials in this regard the sale of millable timber, chipping or tub grinding of plant materials for reuse on site as mulch to rehabilitate retained.
- Millable timber - Proposed means of timber to be jinked offsite and any certification required
- Timing of proposed works – Works will not occur during key breading season of fauna species identified on site
- Transplanting and the rescue of appropriate species
- Seed bank should be utilised to revegetate on and off site
- Tree Removal and Retention Plan and Schedule
- Staggered clearing
- Personnel - Prior and during the removal of habitat trees, licensed wildlife carers or consultants shall be employed on site by the proponent to undertake the removal and relocation of fauna species

4.6 Unexpected Finds: Fauna and Threatened Species Procedure

In the event that fauna is identified on site and is likely to be impacted by the works or works will be within 100m of the fauna, works must stop and the following procedure be followed:

1. Stop works and establish a 100m buffer around the fauna.
2. Determine if the fauna is passing through the site. Allow fauna to move through the site without undue duress or harassment.
3. If the fauna is not passing through the site, notify Project Ecologist and Council, establish if the fauna is a threatened species and follow the appropriate steps in **Table 2**.
4. Record all findings and email to Council Natural Systems team before resuming works.

If any injured fauna are present, they must be cared for by a suitably qualified wildlife carer. Injured fauna should be taken to the veterinary clinic by a Project Ecologist or wildlife carer.

Table 2: Procedure for presence of unexpected fauna during tree or vegetation works.

Non-threatened Species	Threatened Species
1. Clear approved nearby trees or vegetation first.	1. Stop work for a 48 hour period or until the animal has relocated. Establish a 100m buffer and allow fauna to vacate. Notify Council Natural Systems Team.
2. Agitate tree or nearby vegetation to encourage fauna to vacate (if fauna poses no threat to human safety) and then wait 15 minutes to allow fauna to vacate.	2. If not vacated within 48 hours contact NSW Biodiversity Conservation Division for further advice and/or Council Natural Systems Team.
3. If not vacating, leave site for 24hrs or engage suitably qualified fauna ecologist or contact a native wildlife carer to relocate fauna (contact native wildlife carer for juveniles. The ability for the parents to continue to care for the juvenile fauna should be considered). Hunter Wildlife Rescue 24 hour emergency hotline 0418 628 483.	3. Implement actions in accordance with advice of NSW Biodiversity Conservation Division and/or Council Natural Systems Team.
4. Relocate fauna captured and not requiring treatment into the same habitat near the point of rescue at dusk or leave inside the removed hollow outside the works area.	

5. Compensatory Habitat

Council may require the planting or installation of compensatory habitat to offset tree or vegetation removals. Offset measures and planting ratios are provided below.

5.1 Tree Planting and Replacement Trees

Any native tree (other than a Koala Feed Tree species) with a height of greater than 3m and a diameter greater than 300mm (measured 1.3m from the ground) that is to be removed as a result of development or the issue of a Tree Permit is to be replaced at a ratio of 1:2, unless Council imposes an amended requirement in consideration of specific and unique site factors.

Any street tree that is to be removed as a result of a development or the issue of a Tree Permit is to be replaced at a ratio of 1:1 along the same street frontage, unless Council imposes an amended requirement in consideration of specific and unique site factors.

5.1.1. PREFERRED KOALA FEED TREES

Any Preferred Koala Feed Tree species listed in Council's CKPoM that is to be removed as a result of a development consent or the issue of a Tree Permit must be replaced in accordance with the compensatory planting ratios detailed in **Table 3**, unless Council imposes an amended requirement in consideration of specific and unique site factors.

Preferred Koala feed tree species listed in Councils CKPoM include:

- Forest Red Gum (*Eucalyptus tereticornis*);
- Swamp Mahogany (*Eucalyptus robusta*); and
- Parramatta Red Gum (*Eucalyptus parramattensis*)

Table 3: Compensatory Koala Feed Tree planting ratios for preferred Koala feed trees.

Preferred Koala Food Tree Species Size Class (Diameter at Breast Height (DBH))	Replacement Ratio (Loss:Gain)
<100 mm	1:6
100-300 mm	1:8
>300 mm	1:10

5.1.2. TREE PLANTING GUIDELINES

Compensatory trees are to be native species and planted in accordance with the following guidelines.

Tree Selection

Suitable tree species are to be selected from **Table 9** in **Appendix 2** or a suitable tree species approved by Council's Natural Systems Team.

Tree selection is to be consistent with an assessment of the site's most important characteristics and is to preference non-weedy, local indigenous species and plant material of local provenance. Where a flora and fauna assessment has been submitted to accompany a development proposal, the approved list of native species is to be used.

Undesirable species listed in the Port Stephens DCP are not to be selected. Species which produce fruit and attract Queensland fruit fly are to be avoided (owners or custodians of the land on which the plant is growing have a legal obligation to treat this pest or remove the tree). In some instances, where natural heritage and local character is a primary consideration, non-native, non-weedy species such as Jacarandas may be appropriate for selection.

Tree planting Specifications

Trees for planting are to meet the minimum requirements presented in **Table 4.** Council has discretion to change the minimum pot size depending on the site and development constraints. Where the minimum pot size is not available, a smaller pot size may be utilised at the discretion of council with a greater replacement ratio.

Table 4: Tree supply (not street trees) specifications regarding general plant and tree form.

Specification	Minimum Requirements
True to Type	Plants should be true to type.
Pot size	15 to 20 litre pot size
Health and vigour	Foliage size, texture and colour is consistent with healthy vigorous specimens of the species, and cultivar (if applicable)
Pests and diseases	At least 90% of foliage free of pest or disease attack
Root system	Fibrous roots showing repeated and frequent root division
Root direction	Plants are free of root circling or girdling
Rootball occupancy	At least 90% of the soil volume stays intact when the unsupported rootball is shaken or handled
Apical dominance	Trees have a defined central leader and intact apical bud
Balance of crown	Trees have a balanced crown and a maximum variation in crown bulk on opposite sides of the stem axis of ±20%
Stability	Trees are self-supporting, i.e. do not need stakes

Watering

To ensure adequate moisture level is received during tree establishment and tree survival and longevity is increased, a watering regime is to be implemented. Water requirements listed in **Table 5** are to be used as a guide. Responsibility to maintain the watering regime outlined below is borne by whoever is undertaking the planting.

Table 5: Guide for Watering requirements for new trees.

Container size	Tree height	Ave. trunk diameter	Litres of water/week
15-20 litres	1.5-2.0m	30mm	5
40-50 litres	2.1-3.0m	50mm	8
75-100 litres	3.1-4.0m	75mm	12

5.2 Compensatory Hollows

Where the removal of a hollow or a hollow-bearing tree is required, compensatory hollows are to be provided. The compensatory hollow size and type must be appropriate for the species being managed on the site or the hollow being removed. Design and installation requirements for all compensatory hollows are provided in **Appendix 3**. The number of compensatory arboreal hollows must meet the relevant ratios identified in **Table 6**, unless Council imposes an amended requirement in consideration of specific and unique site factors.

Table 6: Compensatory hollow types and ratios**.**

Preference of use	Compensatory Hollow Type	Replacement Ratio (Loss:Gain)
1st	Natural hollow salvaged from felled hollow-bearing tree and installed within retained trees on site	1:1 hollow replacement
2nd	Artificial Hollows (including Hollowhog hollows, branch stub hollows, pole-top hollows, vertical trench cavity, microbat chambers and box hollows)	1:2 hollow replacement
3rd	Nest Boxes	1:2 hollow replacement

5.2.2. MONITORING

Artificial compensatory hollows must be monitored annually by a suitably qualified ecologist. Monitoring should occur for a minimum of four (4) years, or the nominated monitoring period, and reported to Council in a monitoring report.

Monitoring of artificial nest boxes must be undertaken via photographic imaging, either using a camera on an extendable pole, drone imaging, or a low-disturbance alternative.

5.2.3. MAINTENANCE

Maintenance works include repairing artificial hollows, repositioning, re-installing or relocating damaged artificial hollows, ensuring hollows and boxes are not holding water or leaking, repairing damaged face plates, clearing entrance obstacles, and removing pests (including bees and pest species).

Artificial nest boxes are to be maintained for a minimum of four (4) years after the last subdivision certificate or occupation certificate is issued on private lands, unless otherwise identified by Council.

5.3 Compensatory Fauna Connectivity Structures

Where habitat connectivity is severed, or where an opportunity to improve fauna corridors/habitat connectivity is identified, the following compensatory fauna connectivity structures may be used:

GLIDER POLES

Glider poles are to be installed in accordance with Table 8 and the following specifications:

Cross bars should be provided at various heights. Highest cross bar is to be at least 11 m above the ground. Other cross bars should be placed at heights that reflect an average glide angle of 30.5º with a one metre loss in height for every 1-2 metres in glide length. Spacing of poles must allow for an average of 1.8 metres flying distance with a one metre loss in elevation.

Figure 4: Glider Poles (**Source:** Department of Transport and Main Roads, 2010).

Target Species	Average glide length	Minimum crossbeam (launch) height	Spacing between structures	Height of structure
Sugar glider (Petaurus breviceps)	48m with a launch height of 25m[1].	11.96 m (average) [1].	Maximum distance 60 m[3].	Dependent upon length required to glide (ie distance between structures). Use Trigonometry to determine
Squirrel glider (Petaurus norfolcensis)	80m with a launch height of 45m[1]. Average glide of 30-40 m[2] Average glide length is one meter with one meter decrease in height.	11.96m (average) [1.]	Maximum distance 60 m[3].	
Yellow-bellied glider (Petaurus australis)	Maximum 30m glide[4].	11.96m (average) [1.]	No more than 30m.	
Mahogany glider (Petaurus gracillis)	Glide length unknown	11.96m (average) [1.]		
Greater glider (Petauroides Volans)	25-35 m with a launch height of 20-25 m[1].	11.96m (average) [1.]	Maximum distance 60m [3].	
Feathertail glider (Acrobates pygmaeus)	Maximum glide of 30-40m [1].	11.96m (average) [1.]	No more than 30m.	
General	Most species can glide 1.8m with a one meter loss in altitude [1]. Average glide angle is 30.5 degrees.		All Australian gliders (except feathertail and yellow-bellied gliders with a maximum glide of 20-30m [1]) can glide at least 60m [3]	

[1] Australian Museum Business Services 2001

[2] van de Ree, 2006

[3] Weston

[4] Strahan 1995

Figure 5: Species specific glider pole dimensions (**Source:** Department of Transport and Main Roads, 2010).

REFUGE POLES FOR KOALAS

Where connectivity is being severed by tree removal, the connectivity structures are to be installed prior to the tree removal to ensure connectivity for resident fauna.

A dual purpose Glider Pole and Koala Refuge pole design is acceptable and is encouraged to be used where feasible. Once installed the poles are to be managed as a “very high value landscape tree”.

Koala refuge poles are to be designed and installed in accordance with the following specifications:

- Design: Must include a fork in log to allow for a Koala to rest on (**Figure 6**)
- Pole size: Between 200 mm diameter and 500 mm in diameter, with 200mm being the optimal size
- Pole height: Between 3 to 6 metres, with height of fork no less than 3 metres to provide refuge from predators such as dogs
- Minimum spacing: One pole every 200 metres along identified rehabilitation corridor

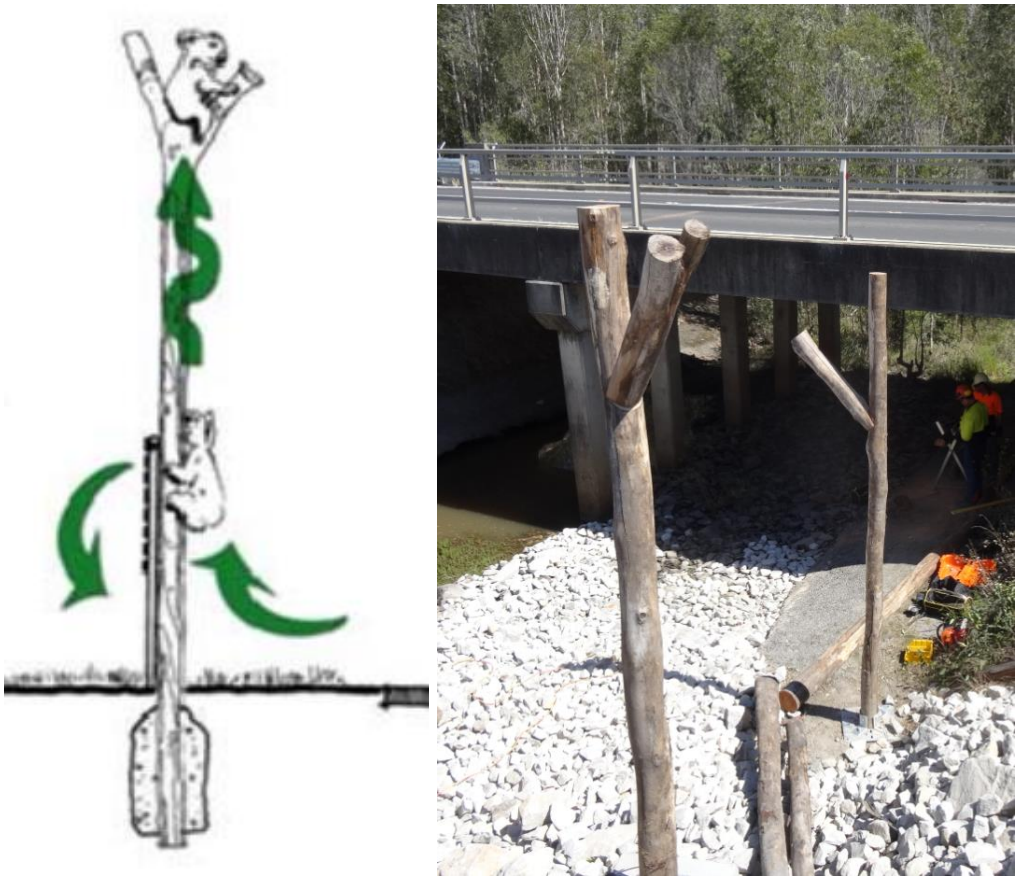

Figure 6: Koala Refuge Pole design (**Source:** Department of Transport and Main Roads, 2010 and Fall Arrest Systems (Fauna Crossings) 2020).

6. Fauna Friendly Designs

Inclusion of fauna friendly designs can enhance the persistence and safe movement of fauna through human altered landscapes. The following sections 6.1, 6.2 and 6.3 are extracts from the Queensland Government Koala-Sensitive Design Guideline, for further details please refer to the full guideline (link in Schedule 1).

6.1 Koala Friendly Fencing

Koala-friendly fencing can allow unimpeded movement of koalas between areas of habitat and can be built within properties or on lot boundaries. Koalas are skilful climbers but readily take a path of least resistance and prefer to push under or through a structure before climbing it. With this in mind, koala-friendly fencing achieves permeability by allowing koalas to climb over, under or through the fencing and ensures koalas are not entrapped by the placement and design of fencing materials (such as barbed wire or narrow palings).

6.2 Koala Exclusion Fencing

The use of koala exclusion fencing may be appropriate to prevent koalas from entering an area that poses an unacceptable degree of risk, such as a road corridor, sewage sediment pond, or a construction site. Koala exclusion fencing limits landscape permeability and should only be used where there is a direct threat to koala safety and used in conjunction with associated infrastructure to provide locations of safe movement opportunities.

6.3 Safe Road Crossing Infrastructure (Culverts)

Roads can be fitted with a range of measures to reduce fauna and vehicle collisions and facilitate safe and unimpeded movement across roads, particularly at identified or potential koala crossing points where roads intersect or fragment koala habitat and major habitat linkages. Structures should be incorporated into road design and layout and can take the form of land bridges or overpasses over roads or underpasses beneath roads, taking the form of natural crossing points under bridges, or culverts.

While large, fauna specific box culverts are best practice, there is a range of underpass designs and dimensions that are also suitable for use as fauna crossing structures. The number, type and positioning of fauna structures is a balance between ecological, engineering, and budgetary considerations.

6.4 Fauna Friendly Lighting

Artificial lighting is known to adversely affect many species and ecological communities. It can change behaviour and/or physiology, reducing survivorship or reproductive output, indirectly effect the availability of habitat or food resources and attract predators and invasive pests. For further details on fauna friendly lighting design please refer to the National Light Pollution Guidelines for Wildlife from the Department of Climate Change, Energy, the Environment and Water (link in Schedule 1) which provide extensive detail for mitigation of the potential impacts to fauna from artificial lighting. Best practice lighting design is recommended as a minimum whenever artificial lighting is externally visible.

7. Vegetation Management Plans

Where a Vegetation Management Plan (VMP) is required or submitted it must detail the proposed rehabilitation including, but not limited to: species to be planted, density, establishment period, maintenance details, weed control techniques for primary and secondary weeding, and monitoring timeframes. The checklist provided in **Appendix 4** should be used to ensure the VMP meets all necessary requirements.

Areas to be rehabilitated should be highlighted on a map contained in the vegetation management plan and the vegetation analysis plans. Any native species is to be restricted to endemic plants, regenerated using local topsoil and locally collected seed stock.

Unless otherwise approved by Council VMPs shall be implemented over a 5 year period with annual monitoring. Monitoring targets shall be set for percentage cover of each vegetation stratum and for weeds.

7.1 Vegetation Map

A Vegetation Map is to describes the existing vegetation onsite and is to include:

- Existing vegetation is to be clearly shown and labelled on a scaled map.
- Vulnerable Ecological Communities, known vegetation corridors, and wetlands
- Trees and vegetation to be retained.
- Details for protecting remnant trees and vegetation from damage during clearing works construction and on completion. This should include site preparation and location of protective fences. All information must be in accordance with Australian Standards 4970 Protection of Tree on Development Site 2009.
- Details and locations of Asset Protection Zones.
- Details of the site Layout (Concept Plan) including location of future buildings, storage areas, drainage controls, pollution controls and surface treatments infrastructure and internal fences.

The mapped vegetation data from the Vegetation Map is to be provided to Port Stephens Council in an electronic format compatible with Councils GIS system and include a license for its future use.

7.2 Maintenance and Monitoring Requirements

Monitoring observations will be recorded in a report format and submitted in digital format. The report should include details and evidence of actions.

8. Installation of Street Trees

Street trees must be established and installed in accordance with the following technical drawings in Figure 7, Figure 8 and Figure 9.

Note: The minimum recommended pot size for planting of infill street trees is 45 litres. This increases to 75L for sites with clay or sandy soils.

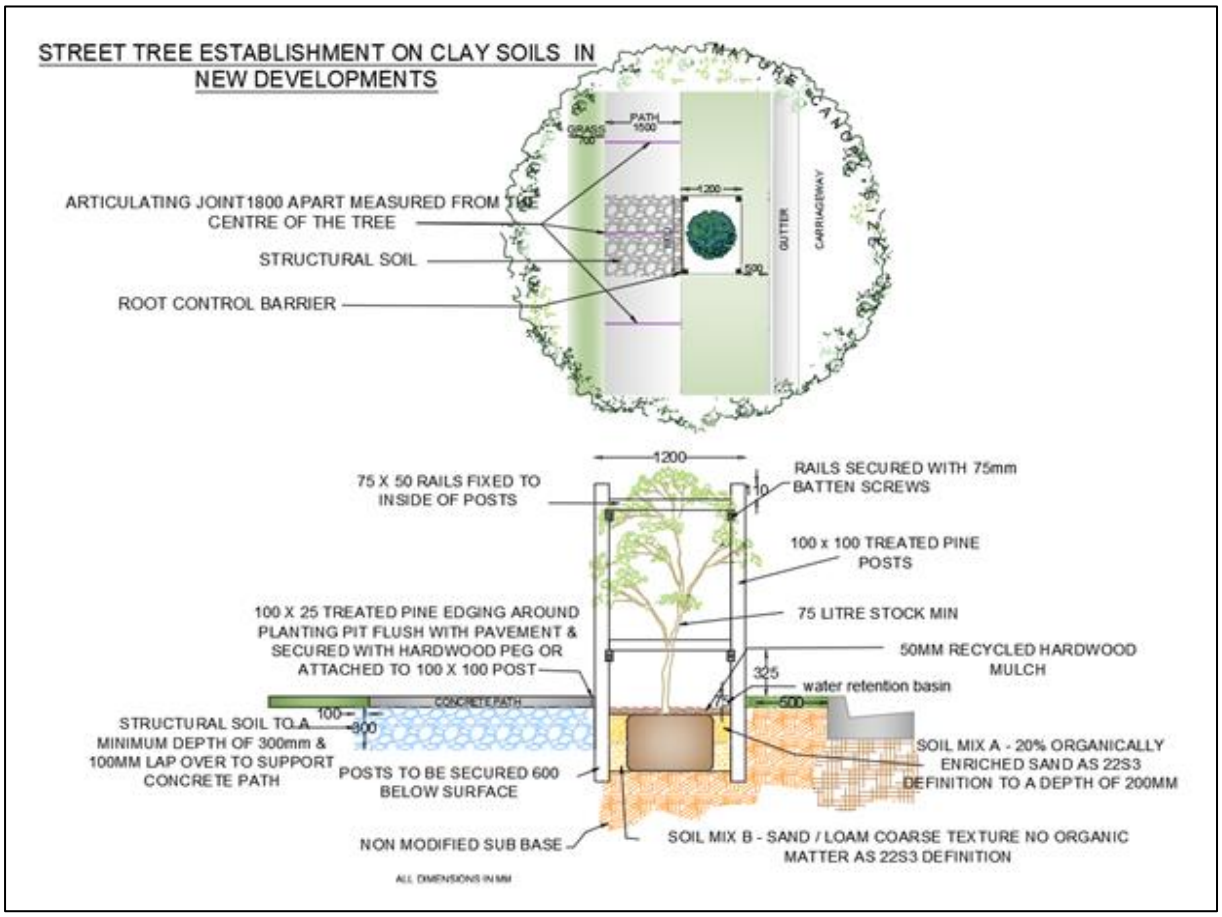

Figure 7: New development street tree specification on clay soils (**Source:** McElroy, Port Stephens Council).

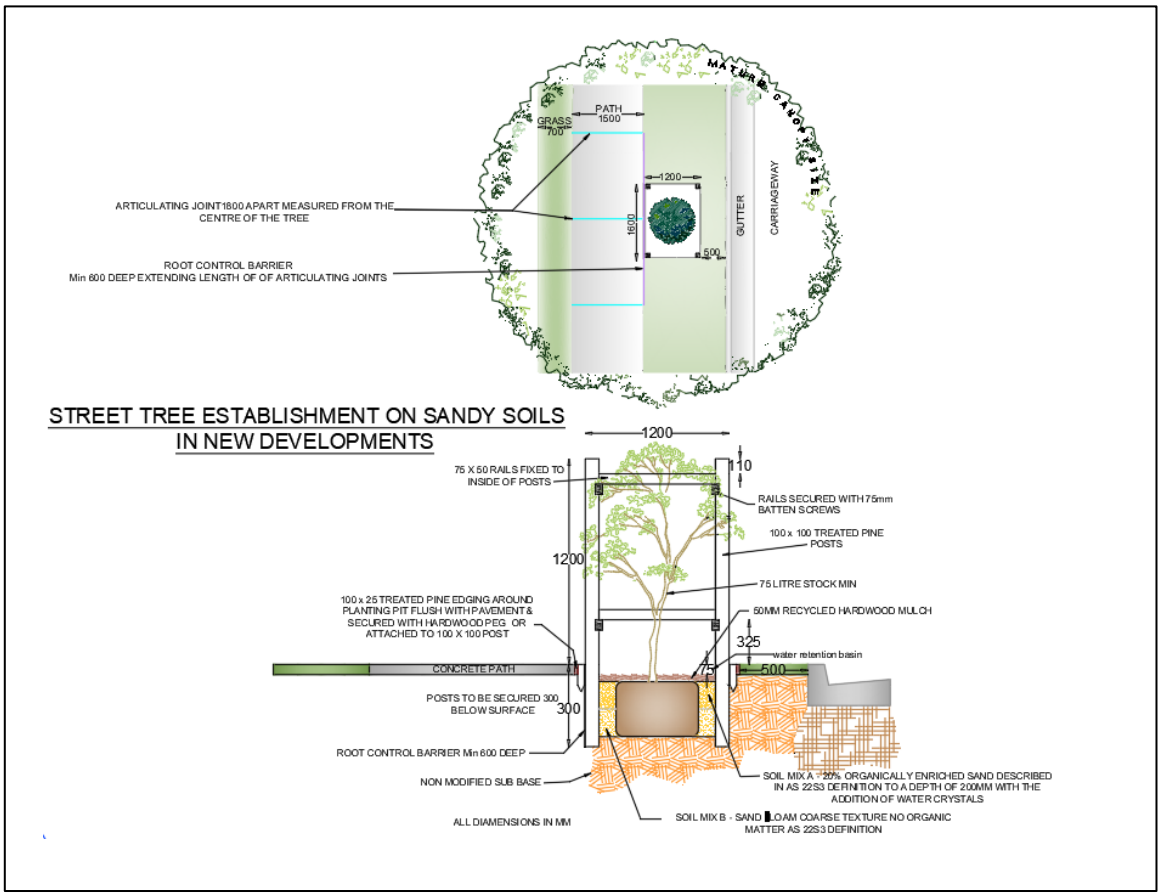

Figure 8: New development street tree specification on sandy soils (**Source:** McElroy, Port Stephens Council).

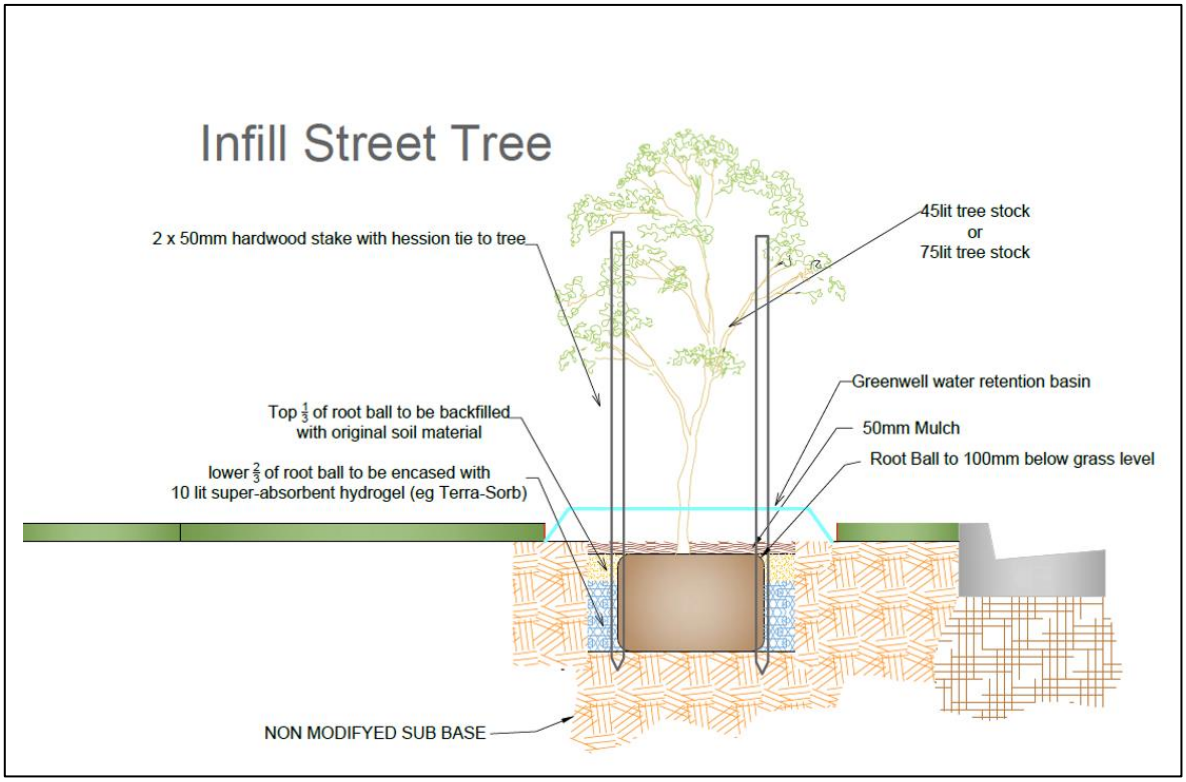

Figure 9: Infill street tree specification (**Source:** McElroy, Port Stephens Council).

8.1 Street Tree Spacing

Street tree must be spaced according to the nominal clearances presented in **Table 7**. See **Appendix 1** for control strategies for tree planting and management and **Appendix 2** for tree species lists and definitions of constraint zones.

Table 7: Layout guidelines for street trees (**Source:** Statewide Mutual Best Practice Manual).

Constraint	Nominal Clearance
Constraint zone A	Maximum of 7 meter spacing
Constraint zone B	Maximum of 8 meter spacing
Constraint zone C	Maximum 12 meter spacing
Street intersection	10m from intersection curb line
Power or light pole	5m from center of pole
Storm water inlet	3m from edge of inlet
Major underground service junction	3m from edge of junction box
Bus Stops	No trees planted along length of stop
Traffic lights	10m from pole of traffic lights
Driveway.	3m from edge of driveway
Fire hydrants.	3m from center of hydrants
Visibility	Trees trunks to be free of branches 2.4m above ground height

9. Significant Trees

Council maintains a significant tree register to facilitate preservation of trees which have recognised significance as identified by the community or legislation.

Significant trees are those which are or exhibit;

- Historical value
- Contribution to landscape / townscape
- Commemorative tree
- Exceptionally old or fine specimen
- Curious growth habit or physical appearance
- Horticultural / scientific value
- Unusually large size
- Rare to the area
- Outstanding aesthetic quality
- Valuable corridor or habitat
- Cultural value for past, present or future generations

Council's Natural Systems Team will;

- Manage the Significant Tree Register (STR).
- Identify and examine issues relating to the significant tree register.
- Make recommendations to Council for the inclusion of trees onto the register.
- Make recommendations to Council for the removal of trees from the register.
- Make recommendations for consideration by Council.

9.1 Nomination

Any person may nominate a tree(s) to be included or removed from the STR with the land owner's consent. Comprehensive assessment of the tree must be completed prior to placement on the STR using the methods for assessing Tree Retention Value in Section 1.1. Trees assessed as having Very High or High Landscape Significance may be suitable for nomination to the register. The Council's Natural Systems Team will review the nomination and then make a recommendation to the General Manager for inclusion or removal from the STR.

Inclusion of tree(s) on the STR shall not preclude removal but flag the need for careful appraisal of any proposal to prune or remove them. All proposed works on or affecting a Significant Tree will require approval of Council.

Appendix 1: Control Strategies for Tree Planting and Management

The control strategies listed below can be utilised to abate and manage potential risks between trees and infrastructure.

Table 8: Control strategies to manage risks associated with tree planting and management.

Control strategy	Description
Soil Cell systems	Systems which increase the soil required for tree growth which reduces the potential impact on infrastructure
Root barriers	Installation of root barriers to manufacturer's specification at the time of planting will assist tree roots to develop away from services, pavements and other structures. NOTE OF CAUTION: Tree root barriers do require periodic monitoring as roots deflected downwards will return to the surface if soil oxygen levels are not sufficient to support growth at depth. Roots can also grow over the barrier in some situations
Soil compaction	Proper compaction of the soil when back filling trenches or around utility easements and house footings will direct tree roots away from these areas. Achieving and maintaining compaction to 95% can inhibit root growth through the deprivation of oxygen
Soil Modification	Where soils constraints are identified, the use of structural soil can be utilised
Pseudo street trees	Residents could be encouraged to plant trees within their boundaries in preference to street tree planting. This might allow larger species to be used, and reduce pressure on pavements and services
Design of new roads and pathways	The design of new roads and footpaths should be undertaken with consideration for tree planting on the nature strip or in the road pavement to ensure appropriate allocation of space
Provision of aeration and irrigation	Where there is to be continuous paving around a tree, the installation of an aeration and irrigation system should be considered. Where irrigation is installed and properly operating, a tree root system will be proportionally smaller than without irrigation

Pavement Openings	Pavement openings at the base of the tree should be as large as possible to reduce the future impact of buttressing roots on pavements.
Insulated (ABC) cabling	Replacement of uninsulated overhead powerlines with insulated & bundled cables will reduce both the clearance needed and the pruning costs and severity
Flexible pathways	Use of flexible material such as bitumen, paving, or rubber compounds for footpaths and tree surrounds, will reduce the occurrence of trip points and is less expensive and easier than concrete to maintain or replace when necessary
Underground power & communications cables	The initial high cost of installing power underground may in fact be a practical option when compared with the projected cost of repeated pruning, the risk that this work involves to operators, the negative impact on trees, and the loss of public amenity and of urban forest economic contributions
Enlarging root zone	Where space allows, a designated area above the root zone of the tree should be enlarged/created to accommodate surface roots. Rather than turf, this area could be formed into a garden bed, mulched or covered with a suitable tree grate
PVC welded piping	Replacement of old porous clay pipe mains with PVC or polyurethane mainlines will significantly reduce the potential for tree root entry
Articulating pavement joint	Articulating paving joint to be used in pathway adjacent to tree planting area as per the design guidelines in Figure 7
Australian Standards 4970 Protection of Trees on Development Site 2009	The Australian Standards 4970 Protection of Trees on Development Site 2009 should be followed to protect remnant trees and vegetation from damage during clearing works.

Appendix 2: Tree Species Planting List

Tree selection must have regard to site constraints (**Table 11**). Only trees that meet the requirements of the constraint zone should be planted, unless relevant control strategies **Table 8** are implemented.

Tree selection should:

- Respond to aesthetic and amenity issues e.g. visual impact when fully mature, scenic assessment issues, shading, appropriateness to landscape setting, screening, over- shadowing, dust control, solar access, drainage issues, etc.
- Maximise the potential for healthy and vigorous plant growth by responding to specific site conditions (e.g. wind, soil types, solar-exposure, drainage, microclimate, etc).
- Select plants with relevance to water-sensitive urban design principles (eg. Trees to maximise uptake of excess water, drought-tolerant species to minimise reliance on watering.

Table 9: **Tree species characteristics list (see**

Table 10 and **Table 11** for explanatory notes).

Species	Common name	Origin	Constraint zone	Soil	Powerline suitability	Other characteristic
Acacia irrorata	Green Wattle	E	A	ALL	S	DWBP
Acacia elata	Cedar Wattle	E	A	ALL	U	D
Acacia binervia	Myall Wattle	E	A	ALL	S	SDA
Acacia implexa	Hickory Wattle	E	A	ALL	S	WBA
Acer negundo 'sensation'	Box Elder	I	C	ALL	U	I
Acer palmatum	Japanese Maple	I	A	ALL	S	
Acronychia oblongifolia	Lemon Aspen	E	B	ALL	SP	WBAF
Agonis flexuosa	Willow Myrtle	A	B	S	S	Weeping Canopy
Alnus jorullensis	Evergreen Alder	I	B	ALL	SP	S2
Alphitonia excelsa	Red Ash	E	B	ALL	SP	WBAFS3
Angophora costata	Smooth Bark Apple	E	C	ALL	U	BWH
Angophora floribunda	Rough Bark Apple	E	B	ALL	U	BWAM
Araucaria heterophylla	Norfolk Island Pine	A	C	all	U	S1
Aracaucaria cunninghamii	Hoop Pine	A	C	ALL	U	
Arbutus unedo	Strawberry Tree	I	B	S	SP	S3
Banksia integrifolia	Coastal Banksia	E	C	ALL	U	SBAW
Banksia serrata	Old Man Banksia	E	C	ALL	U	SB
Brachychiton populneus	Kurrajong	E	B	ALL	U	DF
Backhousia citridora	Lemon Scented Myrtle	A	B	S	SP	Scented Foliage
Backhousia myrtifolia	Brown Myrtle	E	B	C	U	DW
Brachychiton acerifolius	Illawarra Flame Tree	A	C	ALL	U	BWAF
Buckhamia celsissima	Ivory Curl Flower	A	B	ALL	S	BWA

Species	Common name	Origin	Constraint zone	Soil	Powerline suitability	Other characteristic
Callitris macleayana	Stringy bark Pine	E	B	ALL	U	DW Screen Hedge
Callistemon citrinus	Crimson Bottle Brush	E	A	ALL	S	BWA
Callistemon 'Candy pink'		A	A	ALL	S	BWA
Callistemon 'Captain cook'		A	A	ALL	S	BWA
Callistemon citrinus 'endeavour'	Bottle Brush 'endeavour'	A	A	ALL	S	BWA
Callistemon 'Hannah ray'		A	A	ALL	S	BWA
Callistemon 'Reeves Pink'		A	A	ALL	S	BWA
Callistemon salignus	Salignus	A	B	ALL	U	BM
Callistemon viminalis	Weeping Bottle Brush	A	A	ALL	S	BM
Calodendrum capense	Cape Chesnut	I	B	ALL	U	A Heritage Tree
Ceratopetulum apetalum	Coach Wood	A	B	c	U	MA
Ceratopetulum gummiferum	NSW Christmass Bush	E	B	S	S	Difficult to Establish
Choricarpia leptopetala	Never Break	E	B	C	U	DW
Corymbia gummifera	Red Bloodwood	E	C	ALL	U	B & WA
Corymbia maculata	Spotted Gum	E	C	ALL	U	DB
Delonix regia	poinciana	I	B	ALL	SP	Spreading Canopy
Dysoxlum fraserianum	Rosewood	E	B	ALL	U	
Cupaniopsis anacardioides	Tuckeroo	E	A	ALL	SP	WS1B
Cupaniopsis pavifolia	Small Leaf tuckeroo	E	B	ALL	SP	BF
Elaeocarpus eumudii	Quandong	E	B	ALL	SP	BF

Species	Common name	Origin	Constraint zone	Soil	Powerline suitability	Other characteristic
Elaeocarpus reticulatus	Blue Berry Ash	E	B	ALL	SP	F / BF
Elaeocarpus obovatus	Hard Quandong	E	C	S	U	WBAF
Elaeodendron australe	Red Olive Plumb	E	B	ALL	S	DWBS4
Endiandra sieberi	Cork Wood	E	B	S	N	BFS4
Eucalyptus racemosa	Scribbly Gum	E	C	C	U	B & W
Eucalyptus crebra	narrow leaf Iron Bark	E	C	ALL	U	B & W
Eucalyptus molucanna	Grey Box	E	C	C	U	B & W
Eucalyptus nicholii		A	C	ALL	U	Koala Feed Tree
Eucalyptus parramattensis		E	B	ALL	SP	Koala Feed Tree
Eucalyptus pilularis	Blackbutt	E	C	ALL	U	BWH X
Eucalyptus piperita	Sydney Peppermint Gum	E	C	ALL	U	BW
Eucalyptus punctata	Grey Gum	E	C	ALL	U	Koala Feed Tree
Eucalyptus robusta	Swamp Mahogany	E	C	ALL	U	Koala Feed Tree
Eucalyptus saligna	Sydney Blue Gum	A	C	ALL	U	BW
Eucalyptus sideroxylon 'rosea'	Red Flower Ironbark	A	b	ALL	U	BW
Eucalyptus signata	Scribbly Gum	E	B	ALL	sp	WBM
Eucalyptus scoparia	Willow Gum	A	B	ALL	U	Koala Feed Tree
Eucalyptus tereticornis	Forest Red Gum	E	C	ALL	U	Koala Feed Tree
Fraxinus excelsia	European Ash	I	B	ALL		
Ficus rubiginosa	Port Jackson Fig	E	C	ALL	U	

Species	Common name	Origin	Constraint zone	Soil	Powerline suitability	Other characteristic
Ficus microcarpa 'Hillii'	Hills Weeping Fig	A	C	ALL	U	
Ficus obliqua	Small Leaf Fig	E	C	ALL	U	
Ficus supbera	decidious Fig	E	C	ALL	U	
Flindersia australis	Austrlian teak	A	B	ALL	U	BP
Fraxinus oxycarpa 'Raywoodii'	Claret Ash	I	B	ALL	SP	
Geijera salicifolia	Brush Wilga	E	B	ALL	U	WAB
Glochidion ferdinandi	Cheese tree	E	B	ALL	SP	Slow Growing S1
Gmelina leichardtii	White Beach	E	B	ALL	U	WABF
Gleditisia Shademaster		I	B	ALL	SP	
Gleditsia 'Sunburst'		I	B	ALL	SP	
Gordonia axillaris	Gordonia	I	B	ALL	S	A
Grevillea banksii	Grevillea banksii	A	A	S	S	BWA
Grevillea honeygem	Grevillea honeygem	A	A	S	S	BWA
Grevillea moonlight	Grevillea moonlight	A	A	S	S	BWA
Grevillea robusta	silky oak	A	A	ALL	U	BWA
Hibiscus splendens	Pink Hibiscus	E	A	ALL	S	WABS3
Hibiscus tilliacae		A	A	ALL	S	S2A
Hymenosporum flavum	Native Frangipani	A	A	ALL	S	
Jacaranda mimosifolia	Jacaranda	I	A	ALL	SP	F Heritage Tree
Lagastrobus franklii	Huon pine	A	B	ALL		Slow Growing
Litsea reticultat	Bolywood	E	B	C	U	WAB

Species	Common name	Origin	Constraint zone	Soil	Powerline suitability	Other characteristic
Lophostemon confertus	QLD Box Brush	E	A	ALL	SP	
Magnolia grandiflora	Magnolia	I	A	ALL	SP	A
Livistonia australia	Cabbage Tree Palm	E	A	ALL	U	
Melia azedarach	White Cedar	I	A	ALL	S	
Melaleuca decora	White Feather Myrtle	E	B	C	S	WABM
Melaleuca leucadendra	Weeping Paperbark	A	B	ALL	U	WAB
Melaleuca liniarifolia	snow in summer	E	B	ALL	S	WABM
Melaleuca sieberi	Sieberi Paperbark	E	B	ALL	S	WABM
Melaleuca stypheloides	Prickly paper bark	E	B	ALL	S	M
Melaleuca quinquinervia	Broad Leaf Paperbark	E	A	ALL	U	Koala Feed Tree
Metrosideros excelsa	New Zealand Christmas	I	A	ALL	SP	S
Omalanthus populifolius	Bleeding heart	E	A	ALL	S	
Nyssa sylvatica	Black Tupelo	I		ALL	U	
Pistachio chinensis	Chinese Pistache	I	A	ALL	S	
Platanus orientalis	Oriental plane tree	I	C	ALL	U	
Prunus cerasifera 'Nigra'	Ornamental plum	I	A	ALL	S	
Quercus palustris	Common\English oak	I	A	ALL	U	
Robina psuedo acacia 'Frisia'	Golden Robina	I	A	ALL	S	
Sapium sabiferum	Chinese Tallow	I	A	ALL	S	
Schinus ariera	Peppercorn tree	I	A	ALL	SP	D
Syzigium australe	Lilly Pilly	A	A	ALL	S	

Species	Common name	Origin	Constraint zone	Soil	Powerline suitability	Other characteristic
Syzigium leuhmanii	Lilly Pilly	A	A	ALL	S	
Syzigium paniculatum	Lilly Pilly	A	A	ALL	SP	
Syzigium 'Minor'	Lilly Pilly	A	A	ALL	S	
Acmena smithii	Lilly Pilly	A	C	ALL	U	BWF
Tristaniopsis laurina	Watergum	A	A	ALL	SP	
Ulmus parvifolia	Chinese elm	I	A	ALL	SP	
Ulmus glabra	Wych elm	I	A	ALL	S	

Table 10: Explanatory table for Tree species characteristics.

Abbreviation	Definition
Origin	
A	Australian Native
E	Occurs in Port Stephens
I	Introduced
Other characteristics	
D	Drought resistant
W	Wildlife Attracting
B	Bird Attracting
M	Requires Wet conditions
F	Fruit drop a problem on hard surfaces
A	Attractive flowers
H	Hollow forming
S1	Front line salt tolerant
S2	Hind dune salt tolerant
S3	Mildly salt tolerant
*****	Unsuitable as street tree
Powerline Suitability	
U	Unsuitable
S	Suitable
SP	Suitable with pruning

Table 11: Tree Planting Constraint Zones (**Source:** Statewide Mutual Best Practice Manual).

	ZONE A Most constraints (Greatest risk)	ZONE B Moderate constraints (Moderate risk)	ZONE C Fewest constraints (Minimum risk)
Electrical & telecommunications	Un-insulated low and high voltage wires	Bundled cables (ABC) Insulated cables	No power lines
Paved areas	Area entirely paved Surface entirely sealed Brick pavers laid on sand	Partially paved areas Non reinforced concrete	Grass up to 6m
Verge width	Less than 3.0m	From 3m to 4m	4m or wider
Building set back	None	Less than 6m	6m or greater
Street lighting	Over pedestrian crossings Traffic intersections	Street lighting other than crossings and intersections	No street lighting
Safety signage; ie traffic signs	Dual carriageways Arterial roads	Medium density residential streets Arterial roads in rural zones	Low density rural/residential streets
Traffic	Heavy vehicles Public transport in heavy volumes	Public transport in moderate volume Heavy vehicles in moderate volumes	Public transport in low volume Residential traffic in low volume Cul-de-sacs.
Soil Volume per tree	5-15 m^3	20-40 m^3	50-80 m^3
Wind Exposure	Frontline salt wind exposure Prevailing wind exposure	Second line coastal salt influence Moderate wind exposure	Minimum salt influence Minimal wind exposure

Appendix 3: Compensatory Hollow Installation and Design Requirements

Design Requirements

SALVAGED NATURAL HOLLOWS

The salvage and relocation of branches and trunks containing high quality natural hollows onto retained trees should be considered as the preferred compensatory offset for hollow-bearing trees.

Felled branches and trunks are to be cut to size around the hollow, and treated with lanolin to prevent decay before being bolted to a retained tree. Where required, the base of the hollow is to be protected by a metal plate prior to relocation.

Salvaged natural hollows are not to be installed in areas where they may pose a risk to public safety i.e. in areas of high pedestrian traffic, recreational areas, residential backyards, etc.

Figure 10: Relocated natural hollow installed with a low impact attachment (Robert Payne, 2016).

ARTIFICAL HOLLOWS

Where salvaged hollows are not available or suitable, artificial hollows are to be considered as the next preferred compensatory offset for hollow-bearing trees.

Hollow augmentation is to be undertaken by an appropriately skilled AQF Level 3 arborist to the specifications provided in “Environmental Arboriculture – Maintaining and Promoting the Ecological Role and Value of Trees, (document ID MIS312)”, prepared by Arboriculture Australia Ltd (2019), or similar.

Augmented hollows are created using a wide range of methods and designs depending on the target species and available host vegetation and include Hollowhog hollows, branch stub hollows, pole-top hollows, vertical trench cavity, microbat chambers and box hollows. Hollow dimensions for augmented hollows must be appropriate for the target species and in accordance with the specifications provided in **Table 12.**

Acceptable designs for augmented hollows are provided in **Table 13.** Alternative designs based on best practices may be discussed with Council prior to construction and installation. Further information on artificial hollows can also be found in the Biodiversity Conservation Trust (BCT) Guidelines for Artificial Hollows, August 2020.

Table 12: Artificial Hollow dimensions (adapted from FauNature 2011 and Greater Western Sydney LLS 2015).

Hollow Type	Orientation ❖ *	Height (cm)	Width (cm)	Depth (cm)	Entrance Hole (cm)	Above Ground (m)	Wildlife Species & Notes
Small birds	-	12	85	40	3	1+	Pardalotes
	-	25	18	18	9x9	2+	Grey Shrike-thrush
Microbats	V	20	25	15	1.2-1.5	4+	Clear flight path required
Small Mammals	V	20	15	15	2.5	1.5 - 5	Feathertail Glider/ Antechinus/ Pygmy Possums
Small Parrots	V/H	40	20	15	4.5-6	4+	Small Parrots/ Treecreeper/ Owlet-nightjars
Medium Parrots	V/H	55	20	20	7	4+	Medium Parrots
Medium Mammals	V/H	45	20	20	3/4	4+	Sugar Glider/ Squirrel Glider
Brushtail Possum	V/H	45	30	25	10	4+	Brushtail Possum
Small Forest Owls	H	40	40	90	25x15	6+	Barn Owl
Cockatoos	V	100	40	30	18	10+	Black Cockatoos
Large Forest Owls	N/A	80 back; 70 front (to provide runoff)	55	55	20	15 to 20	Powerful Owl Add ladder and blocks of wood to allow easy egress

Bees: will potentially invade hollows of this size. Other invasive species (e.g. Indian Mynas & Starlings) may also invade any mid-size boxes.

The *Hollow Types* in bold cover many of the more common species and are recommended as good hollows to start on.

Created hollows in habitat trees require inspection and maintenance, as does any artificial nesting/ roosting site.

❖ H = Horizontal & V = Vertical

N.B *The above species list and associated measurements are an initial guide to the dimensions required by a range of hollow dependent wildlife found across southern and eastern Australia.*

Table 13: Hollow augmentation designs (Source: Mosman Council and Hollowhog).

Hollow Type	Design Details	Example
Hollow-hog Hollows	Hollowhog hollows are artificial hollows with large internal cavities and small entry holes used by a range of species. A Hollowhog wood carving tool is used to safely and efficiently create a 50mm entry hole and then progressively carve a larger internal hollow of any dimensions up to about 600mm wide and long by 600mm deep with little disruption to the tree's growth.	
	The entry hole size and shape can be modified to any fauna species and the hollow shape should be adapted to the size and shape of the tree limb or trunk that it is being carved. The size of the hollow should be determined with professional advice from an arborist to avoid compromising the structural stability of the tree or limb.	
	Entry modifiers can be used to reduce the size back down to as small as needed or to provide weather protection on vertical trunks, the tree will readily lock in the attached modifier after about a year's growth.	
Micro Bat Chamber	Design must allow for more than one species of micro bat to occupy the same habitat stag. Chambers must measure approximately 40mm wide x 40mm deep x 200mm long. No sharp edges or splinters must remain as these can tear the membranous wings of the micro bat.	
	A piece of damp proof coursing (DPC) must be fixed to the front of the chamber in order to keep the chambers warm, dry and dark in the event of the face plate cracking.	
	A face plate is removed, and then the center of the stub is bored out using a chainsaw and chisel, creating a cavernous hollow and meeting up with the previously made entrance hole. The face plate is then fixed in place with stainless steel screws and the hollow is ready for occupation The entrance to the chamber must be a diagonal hole of 12-15mm.	

Hollow Type	Design Details	Example
Bird – Branch Stub Hollow	The stub end must first cut on a downward angle to limit rain water entering the cavity. The Entrance opening must be bored from the stub end into a hollowed out chamber close to the branch and trunk union. The entrance hole must be cut into the stub end by making the entrance hole angled slightly upward in order to prevent water filling the chamber making it unusable for birds.	
Pole-top Hollow	Top of the pole is cut on an angle away from the intended location of the entrance to prevent rain water running into the cavity. Approximately 150mm from the angled cut the top piece is removed with a level cut. The top plate must be at least this thick or it will split and make the hollow unusable. Top plate is set aside. Use a chainsaw for several bore cuts made in the centre of the remaining pole top to remove a square block.	
	Entrance hole is created with three cuts into the face of the pole. The lowest horizontal cut goes as deep as the back wall of the cavity so as to remove the centre block. Care must be taken so as not to cut deeper than the intended hollow. A small hole at the bottom of the hollow must be drilled for drainage. The top plate is then glued in place using water resistant construction adhesive.	
Bird or possum "Box-hollow"	Used to target birds and possums depending on the size of the entrance hole.	
	Width and depth of the cavity created is limited by the diameter of the trunk however the length of the cavity can be any size from 200mm to 1000mm.	

Hollow Type	Design Details	Example
Vertical Trench Cavity	Created with long vertical bore cuts approximately 100mm into the trunk in an inverted V shape as an entrance. Bottom of the vertical slit is a chamber fashioned with numerous chainsaw cuts and a chisel to create a circular cavity deeper into the trunk than the vertical entrance slit.	
	Created on a vertical part of the stag, and ideally positioned on the underside of a limb that is on a slight angle to help prevent rain water filling the cavity. The bottom internal cut is at a slight angle and a small drainage hole cut at the lowest point to drain any water that does trickle in. Base of the hollow is to be lined with a few leaves to create a soft roost.	

NEST BOXES

Where salvaged hollows and augmented hollows are not available of suitable, artificial nest boxes are to be used to offset the removal of hollow-bearing trees.

Nest boxes must be either purchased from a reputable nest box manufacturer or constructed in accordance with the NSW Government Local Land Services Greater Sydney “Build your own wildlife nest box” or similar (e.g. Gould Group 2008, "The Nestbox Book", Wilkinson Publishing Pty Ltd) and must:

- Be of hardwood construction (minimum 18mm thickness).
- Be affixed to dead trees via screws using stainless steel or galvanised screws (not nails).
- Be affixed to live trees using the Habisure System (refer to figure 3) or similar to minimise damage, and allow for tree growth.
- Avoid the use of toxic substances.

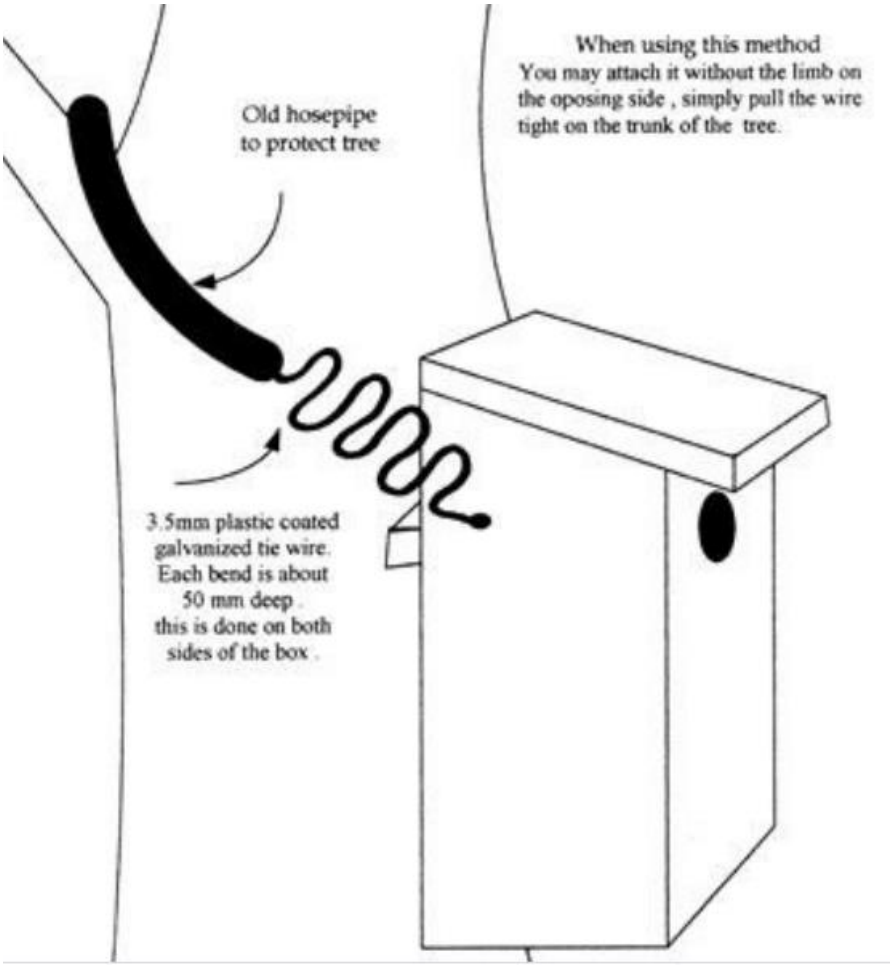

Figure 11: The Habisure nest box attachment system.

Installation Requirements

A suitably qualified and experienced ecologist or arborist must be on-site during the installation of any compensatory arboreal habitat, including artificial nest boxes and hollow augmentation. Installation of compensatory arboreal hollows must be completed in accordance with the following requirements:

- 70% (minimum) of compensatory hollow installation must be completed prior to clearing; and 100% of compensatory hollow installation must be completed prior to completion of clearing.
- Compensatory nesting offsets are to be located within retained vegetation as close as possible to the location of the removed hollows.
- All compensatory hollows are to be mounted at a height appropriate for the target species (refer to Error! Reference source not found.) and entrances orientated to avoid exposure to night-time light sources and in a suitable direction for the target species (refer to **Figure 12**).
- Compensatory hollows are not be fixed to or created in trees of cultural significance. The State Government's Aboriginal Heritage Information Management System must be consulted and utilised where appropriate.
- Where possible, only one augmented hollow or artificial nest box is to be installed per tree. Multiple augmentation hollows or nest boxes are permitted with Council's approval.
- Where possible, augmented hollows and nest boxes are to be installed on non-hollow trees.
- Preferred Koala feed tree species - Parramatta red gum (*Eucalyptus parramattensis subsp. Decadens*), Swamp mahogany (*Eucalyptus robusta*) and Forest red gum (*Eucalyptus tereticornis*) – are to be avoided.
- Following completion of installation, a Compensatory Arboreal Habitat Report must be prepared in accordance with requirements of Schedule 3 and provided to Council.

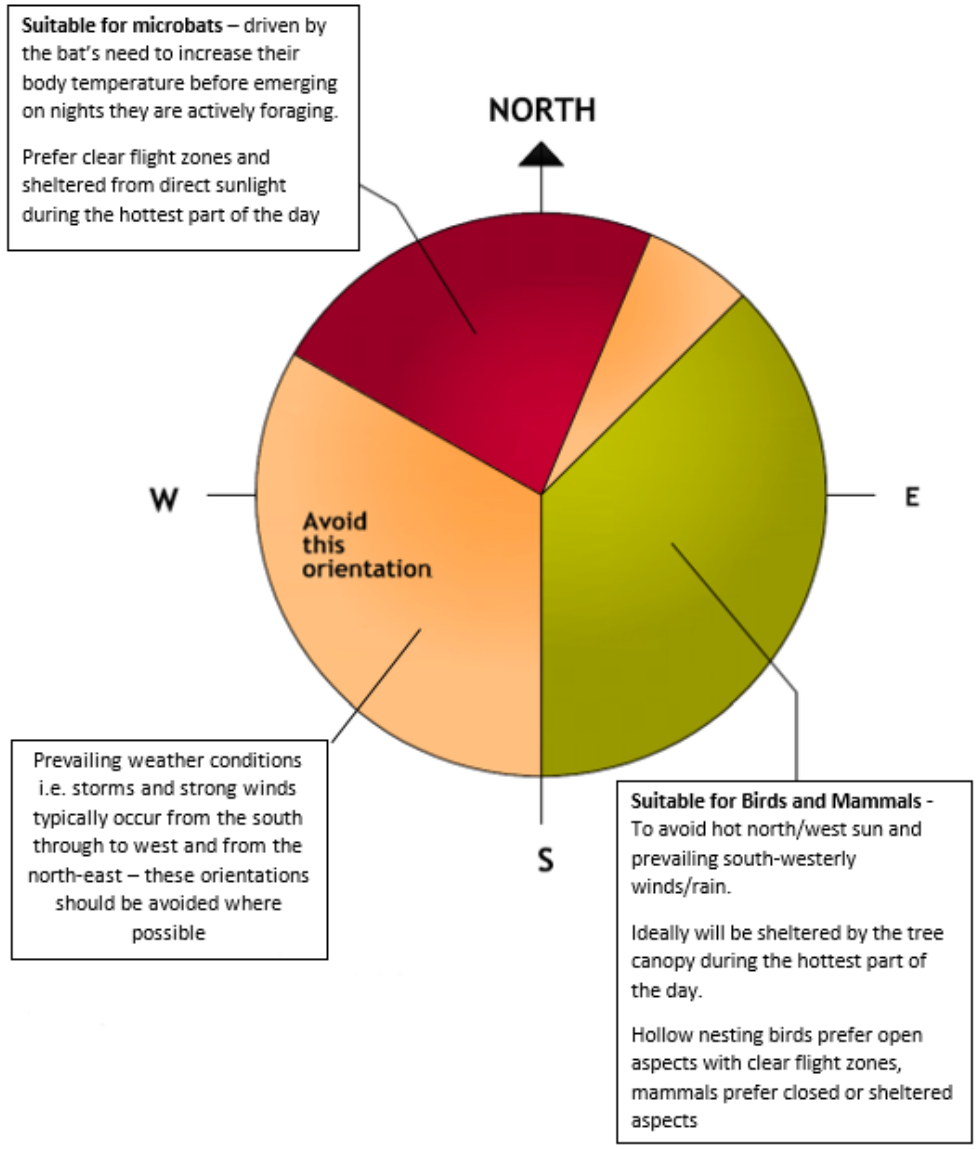

Figure 12: Hollow Entrance Orientation (Image source: adapted from FauNature 2011).

Appendix 4: Checklist for VMP Preparation

The following checklist can be used to ensure all the VMP meets all necessary requirements.

Table 14: Checklist for VMP Preparation (**Source:** Campbelltown City Council)

VMP component	Information recommended to be included	Addressed (✓)
1. Site assessment **Please refer to the relevant flora and fauna assessment (where undertaken) for details on existing native flora and fauna and weeds present, and any restrictions this may have on actions under the plan.**		
1.1 General details	• scheduled date for implementation to commence • proposed date for plan completion • details of persons preparing plan, including qualifications • details of persons implementing plan, including qualifications	
1.2 Site description	• site location (street name, suburb) • site description (total area, perimeter, length, width) • land use zoning • waterways • riparian corridors • topography– slope, aspect, erosion and safety risks • substrate, geology, soil structure • contamination • drainage • any environmental constraints • any significant or sensitive environmental features of the subject site, including threatened species sightings and hollow-bearing trees	
1.3 Existing infrastructure	• Buildings • fencing • lawn • paths • taps • access gates • health and safety • identify public risks • actions to mitigate public risk	
1.4 Site access	• licence, lease or land use agreement (all property owners must agree to all aspects of the plan) • site access for vehicles • restrictions/consideration to any existing plans of management, other reports or conditions affecting the site	

VMP component	Information recommended to be included	Addressed (✓)
1.5 Flora and fauna	• details of flora and fauna assessment (if undertaken), including date and name of consultant • existing native vegetation types, diversity, health and resilience • presence or evidence of endangered species and/or ecological communities • weed species present • access for fauna • pest species • presence of biodiversity corridors on site	
1.6 APZ	• widths required under Planning for Bushfire Protection • any clearing proposed under 10/50 code of practice	
1.7 Site map	• legend, scale bar and north arrow • site boundaries • land use • topography • waterways • existing vegetation and natural features, their type and condition • environmental constraints • development footprint and/or impact being ameliorated • location, type and extent of weed infestation • 'dial before you dig' information, if relevant • APZs– existing or proposed • areas of clearing proposed under the 10/50 code of practice • location of photo reference points, for monitoring and evaluation purposes	
2. Guiding principles and legislative requirements		
2.1 Legislation and policy	• a list of requirements under government legislation and policy	
2.2 Aims and objectives	• overall aim of the VMP • list of management issues on site • objectives to address each of the management issues	
2.2 Licences	• licences that are required to undertake the actions in the VMP a (eg. Section 132C scientific licence)	
3. Action Plan		
3.1 Management zones	• identify management zones such as riparian corridor, weed infestation • map of management zones	
3.2 Site preparation	• soil testing and remediation, if the area is on contaminated land or to identify suitability of substrate for planting • application of herbicide • details of other surface preparation such as levelling • soil remediation techniques and/or surface preparation and/or stabilisation of disturbed areas	

VMP component	Information recommended to be included	Addressed (✓)
3.3 Site management	• fencing specifications and locations • staging of works and decommissioning of areas • erosion and sedimentation controls location and description • protection of existing vegetation and key habitat features • educational and deterrent signage	
3.4 Weed treatment	• identify areas of weed infestation to be treated and managed • outline methodology and frequency, staging of works • specify follow-up treatments	
3.5 Stormwater, wastewater and hydrological function	• On-site effluent disposal infrastructure and wastewater disposal areas • stormwater management devices such as water tanks, detention basins, water sensitive urban design • irrigation systems	
3.6 Bushfire management	• extent and location of APZ • details of any proposed clearing under 10/50 code of practice	
3.7 Planting program	• species, density, number and areas for revegetation • type of revegetation to be undertaken (eg tube stock planting, direct seeding) • source of plants/seeds • methodology and staging of works • plant protection devices (such as tree guards and weed mats)	
4. Site maintenance **A minimum of five years maintenance for sites is required or until such time as a minimum 95 per cent survival rate of each species planted and a maximum five per cent weed cover is established**		
4.1 Maintenance schedule	• details of weed follow up treatments • sediment and erosion control • watering • replacement of plant losses • disease and insect control • replenishment of mulch (where present)	
5. Monitoring, evaluation and reporting		
5.1 Monitoring and evaluation	• identify how the success of the plan will be measured • comparison with baseline data established in the planning phase • specify the methods, frequency and responsibility for assessing • progress against performance criteria	
5.2 Reporting	• include a reporting schedule, a minimum of annually • records for reporting purposes are identified • 'before and after' photographs and/or maps or vegetation quadrat descriptions.	
5.3 Timeframe	• prepare a works schedule (Gantt chart), reflecting timing and staging of works for all the tasks in the project	
5.4 Budget	• costing for the implementation of all components and stages of the work including materials, labour, watering,	

VMP component	Information recommended to be included	Addressed (✓)
	maintenance (including plant replacement), monitoring and reporting	

Schedule 1: Definitions and Quick Links

Term	Definition
Adjacent areas	Areas of suitable habitat as close as reasonably possible adjoining the development footprint or impact area. Where future works are not proposed and land-owner's consent has been given.
Augmenting/ Augmentation	The action or process of making or becoming greater in size or amount. Bore cut; a deep incision into timber made by using the tip of a chainsaw bar.
Augmented hollows	A technique used to mechanically create artificial cavities in standing trees or stags to replicate that of a natural hollow.
Branch collar	A swelling around the base of a branch containing defensive chemicals formed by overlapping stem and branch tissue.
Branch-stub	A section of a branch remaining beyond the branch collar.
Cavity	A smaller void often localised initiated by a wound.
Compensatory hollows	The provision arboreal hollows and habitat to offset the loss of hollows from trees approved for felling. Examples include: • hollow augmentation (preferred) • artificial nest boxes • re-use of salvaged arboreal habitat and hollows
Consulting Arborist	A professional trained in the science of tree management and the detection of ailments and structural defects in trees.
Council managed land	Any land that is under the care, control and management of Port Stephens Council.
Crown	The portion of the tree consisting of branches and leaves and any part of the stem from which branches arise.
Crown lifting	The removal of the lower branches of a tree.
Crown thinning	The selective removal of branches that does not alter the overall size of the tree.
DBH	Diameter at breast height at 1.4m above ground level.
Deadwood	Dead branches with a trees crown.
Deadwooding	The removal of dead branches from a tree.
Exotic	A plant introduced to or not originating from Australia.
Face plate	A flat normally rectangular piece of trunk or branch cut out during the creation of an artificial hollow.
Fauna	The animals of a particular region.
Flush cut	A cut that damages or removes the branch collar or removes the branch and stem tissue and is inconsistent with branch attachment as indicated by the branch bark ridge.
Formative pruning	The pruning of young or establishing trees with the aim of directing growth and/or developing a sound structure.
Habitat	The home or environment of an animal, or other organism.

Habitat tree	A tree identified as having significant ecological significance for fauna habitat. For the purposes of this technical specification, all habitat trees will be treated as hollow bearing trees as per the definition above.
Hat Rack	See Stag Tree.
Hollow	A large void initiated by a wound forming a cavity in the trunk or branches.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (c) the hollow is at least 1m above the ground. Trees must be examined from all angles.
Hold point	A defined position in the construction/approval stages beyond which work shall not proceed without mandatory verification and acceptance by Council.
Hollow augmentation	The creation of artificial hollows in standing dead or alive trees using hole-saw and/or chainsaw to bore-out limbs and create a nesting hollow.
Lion's tailing	The practice of removing branches from the interior of the crown leaving most of the foliage at the ends of branches. This may lead to structural hazards.
Live crown size	The living branches and foliage of a tree. It is expressed in m^2 and calculated by $\pi \times r^2$ (where r= the average distance to canopy dripline. To work out the average distance to the canopy line add (+) the radial distance of the canopy at four (4) cardinal points and divide (÷) by four (4)).
Local indigenous species	The natural inhabitants of a region that naturally occurred in a particular area of Australia before the arrival of the Europeans. (Also called local native species)
Lopping	The cutting branches or stems between branch unions or internodes.
Maturity	Has obtained a minimum of 40% of its average life span.
Native	All plant species indigenous to Australia including all plant species locally indigenous to the City of Ryde.
Nest boxes	Artificially constructed nest boxes created from processed materials (e.g. plywood) and hung in a tree to create a nesting hollow.
Project Arborist	An arborist qualified in accordance with section 1.1 who is retained by a property owner or development applicant to carry out the responsibilities.
Reduction pruning	The removal of ends of branches to lower internal lateral branches or stems in order to reduce the height and/or spread of the tree.
Remedial (restorative) pruning	The removal of damaged, diseased or lopped branches back to undamaged tissue in order to induce the production of shoots from latent or adventitious buds, from which a new crown will be established.
Salvaged arboreal habitat	Hollows and hollow limbs from dead or alive trees removed from within the development footprint as a result of clearing operations.
Snags	Tree branches caught up and tangled on river or wetland edges.
Stag Tree	A tree with all live branches removed leaving branch stubs and trunk only.

Stem	The part of the tree which supports branches, leaves, flowers and fruit and is also called “the trunk”.
Structural Root Zone (SRZ)	An area around the base of a tree required for the tree to be stable. The tree’s woody roots and soil cohesion in this area are necessary to hold the tree upright. It is a radial distance from the stem calculated in accordance with *AS 4970 -2009 Protection of trees on development sites*.
Suitably qualified and experienced Arborist	A professionally experienced, licenced and TAFE (or equivalent) qualified Arborist.
Suitably Qualified Ecologist	A professionally experienced and University or TAFE qualified Ecologist who holds appropriate licencing and permits required under State and Commonwealth legislation.
Suitably Qualified Wildlife Carer	A suitably licenced and experienced person, who is directly affiliated with/a member of a licenced wildlife care group for the handling, transport and care of native wildlife including threatened fauna species.
Topping	Reducing the height of a tree by lopping.
Tree Protection Zone (TPZ)	An area above and below ground calculated in accordance with AS 4970 - 2009 Protection of trees on development sites. It is a radial distance from the stem set aside for the protection of a tree’s roots and crown to provide for the viability and stability of the tree.
Tree vandalism	The intentional and unlawful destruction, damage or injury to trees and/or vegetation on Council managed land. Examples include poisoning, mowing, pruning, removal and ringbarking.
Urban Bushland	Land designated as Urban Bushland within the City as shown on maps and in documents commissioned by the City of Ryde from time to time.
Urban heat island effect	When a city experiences much warmer temperatures than nearby rural areas due to sealed surfaces absorbing and retaining heat.
Utility Arborist	A professional trained in chainsaw operation, the use of tree care equipment and machinery, the pruning of trees, and tree removal.
Water-sensitive urban design (WSUD) principles	Created urban environments to capture, treat and re-use stormwater before it has the chance to pollute and degrade watercourses. Trees use maximises uptake of excess water with a preference of drought-tolerant species to minimise reliance on watering.
Witness point	A nominated position in the construction stages where the option of attendance may be exercised by Council, after notification of the requirement.
Quick Links	
Artificial Hollows	https://www.bct.nsw.gov.au/sites/default/files/2020-08/BCT_Artificial%20Hollow%20Guidelines_Final%20for%20publication.pdf
Koala sensitive design guidelines	https://www.des.qld.gov.au/policies?a=272936:policy_registry/koala-sensitive-design-guideline.pdf
Fauna friendly Lighting	https://www.dcceew.gov.au/environment/biodiversity/publications/national-light-pollution-guidelines-wildlife

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