


Appendix K

Tree Species and Planting Principles

Author: UDLA



PLANTING PRINCIPLES AND RECOMMENDED TREE AND PLANT SPECIES FOR ALKIMOS CENTRAL

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Image 1. Site image. Source: UDLA.



1.0 INTRODUCTION

20,000 Trees Vision is recognised and valued as a critical asset and landscape infrastructure that provides multiple benefits to the community, creating a healthier, greener, cooler place, and improves liveability including climate resilience.

The 20,000 Trees vision should not be considered as a final design, rather it is conceived as a vision or strategy for the ongoing development of the public and private realm and external spaces now and into the future.

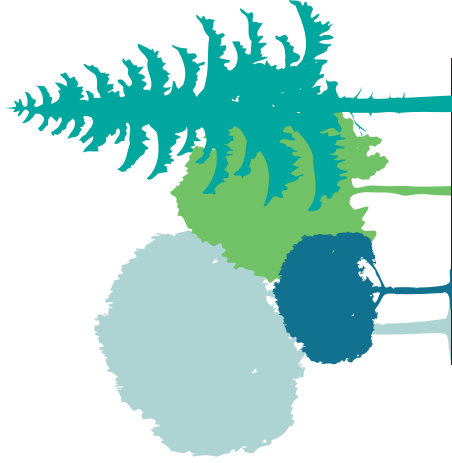
As is the case with all natural environments, they are dynamic, flexible, and ever changing. The 20,000 Trees is structured around a flexible grid that can be pushed, pulled, and adapted to allow change, but ensures the identity and essence of a 'forest' is retained on the site.



Image 2. Aerial site photograph. Source: UDLA.

2.0 PLANTING PRINCIPLES

1. DIVERSITY OF SPECIES



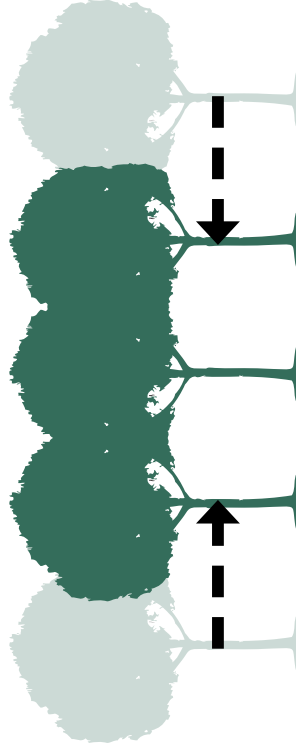
Plant a diversity of tree species to provide a resilient urban forest, and a range of different trees for different conditions.

2. HABITAT & BIODIVERSITY



Promote the use of appropriate endemic and native tree species that offer biodiversity and habitat benefits, and utilise species that are a food source for Carnaby's Cockatoo's.

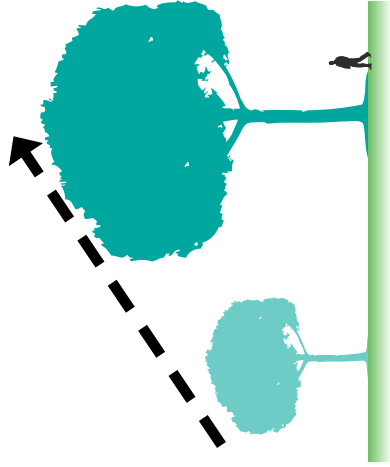
3. CLOSE SPACING



Planting trees with a close spacing to provide a quick increase in canopy cover and a continuous and connected canopy cover.
Trees planted closely will develop more upright forms, and be less susceptible to wind damage.

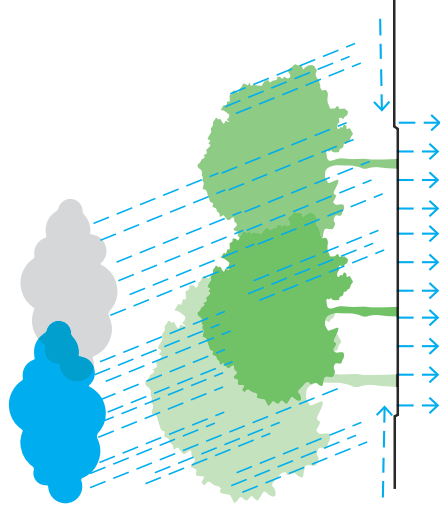
Figure 1. Planting Principles

4. PREFERENCE LARGE TREES



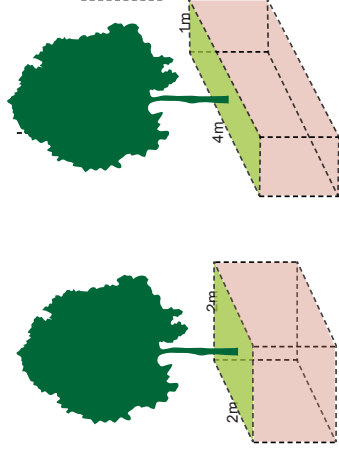
Large, broad canopied trees to provide significantly greater benefits when compared to smaller trees. These include greater shade and cooling, reduction in stormwater flows and reducing air pollution.

5. WATER SENSITIVE URBAN DESIGN



Utilising best practice WSUD to reduce and treat storm water flows, and promote sustainable water management.

6. MAXIMISE SOIL WIDTH & VOLUME



To enable proposed trees to thrive into the future, maximising the deep soil area is essential.

In the public realm, where urban infrastructure may prevent ideal deep soil area provision, a minimum surface area of 4sqm should be sought to be achieved with a minimum dimension of 1m and where less constraints exist (ie. POS) more expansive deep soil areas should prevail.

In the private realm more specific planting principles including minimum deep soil areas are anticipated to be guided via an applicable PLDP/LDP(s).

3.0 TREE SELECTION CRITERIA

TREES & PLANTING

The site lies on the Quindalup dune system and is typified by white sand with a high concentration of lime that is high pH with low levels of fertility.

The Quindalup dune system is also exposed to salt laden winds, which when combined with the low soil fertility displays few large endemic trees and is dominated by Acacias (e.g. *Acacia rostellifera*), *Banksia*'s (e.g. *Banksia attenuata*) and occasionally Tuarts (*Eucalyptus gomphocephala*) and Peppermint trees (*Agonis flexuosa*).

Trees should be selected utilising the 'Planting Principles', to ensure the right tree for the right location is used. This will ensure healthy growth and lower maintenance and replacement of trees over the long term. Tree selection criteria shall include:

1. Tree species and performance in an urban environment;
2. Site specific analysis (soils, pH, verge width);
3. Projected future climate conditions (reduced rainfall and increased temperatures);
4. Desired ecosystem services; i.e. urban shade/cooling, stormwater mitigation, biodiversity, feature planting etc.
5. Functions and uses of the space;

The City of Wanneroos 'Street Tree Masterplan' should be referenced when selecting and locating tree species.



Image 3. Monash University Caulfield Campus Green, by T.C.L. Source: Landzine website.

3.1 COMPACT CORE

TREES & PLANTING

It should be recognised that urban sites are radically different to the natural spaces where many endemic and native trees have evolved. Developing an urban forest within an area such as Alkimos has a number of challenges, such as:

- Higher average temperatures from hardstand and buildings;
- Higher wind speeds from funnelling and down drafts from buildings;
- Less permeable surfaces and compacted soils;
- Root disturbance from excavation and underground services;
- Overshadowing from buildings and structures;
- Air and water pollution; and;
- Damage from vehicles and people.

Tree species selection should consider the above challenges and respond appropriately. The following tree matrix includes a range of species which have shown to be urban tolerant and able to survive and thrive in the above mentioned conditions.

Placement and selection is critical to the success of tree planting within the public and private realm. Whilst these Guidelines provide general advice it is recommended that for any major redevelopment that detailed planting design is undertaken and an urban forest strategy be developed.



Image 4. Macquarie University Central Courtyard, by Hassel. Source: Landzine website.

3.2 TREE MATRIX FOR ALKIMOS PUBLIC AND PRIVATE REALM

| Genus | Species | Common Name | Deciduous (D) Evergreen (E) | Endemic (E), Native (N), Exotic (X) | Carpark Planting | Feature Planting | Avenue Planting | Urban Streetscape | Dune Revegetation | Public Open Space | WSUD |
|----------------------|-----------------------|----------------------|--------------------------------|---|---------------------|---------------------|--------------------|----------------------|----------------------|----------------------|------|
| <i>Agonis</i> | <i>flexuosa</i> | Native Peppermint | E | E | | | X | X | X | X | X |
| <i>Allocasuarina</i> | <i>fraseriana</i> | Fraser's Sheoak | E | E | | | | X | | X | X |
| <i>Angophora</i> | <i>costata</i> | Sydney Red Gum | E | N | | | | X | | X | |
| <i>Araucaria</i> | <i>columnaris</i> | Cook Pine | E | N | | X | X | | | | |
| <i>Araucaria</i> | <i>heterophylla</i> | Norfolk Island Pine | E | N | | X | X | | | | |
| <i>Banksia</i> | <i>attenuata</i> | Candle Banksia | E | E | | | | | X | X | |
| <i>Banksia</i> | <i>grandis</i> | Bull Banksia | E | E | | | | | | X | |
| <i>Banksia</i> | <i>illicifolia</i> | Holy Leaf Banksia | E | E | | | | | X | X | X |
| <i>Banksia</i> | <i>menziesii</i> | Firewood Banksia | E | E | | | | | X | X | |
| <i>Banksia</i> | <i>prionotes</i> | Acorn Banksia | E | E | | | | | X | X | |
| <i>Brachychiton</i> | <i>populenus</i> | Kurrajong | E | N | | X | | X | | | |
| <i>Callitris</i> | <i>preissii</i> | Rottnest Island Pine | E | E | | | | X | X | X | |
| <i>Casuarina</i> | <i>cunninghamiana</i> | River Sheoak | E | N | | | | X | | | X |
| <i>Casuarina</i> | <i>equisetifolia</i> | Coast Sheoak | E | N | X | | X | X | | | |
| <i>Casuarina</i> | <i>obesa</i> | Swamp Sheoak | E | E | | | | | | X | X |
| <i>Ceratonia</i> | <i>siliqua</i> | Carob | E | X | | X | | X | | | |
| <i>Corymbia</i> | <i>citriodora</i> | Lemon Scented Gum | E | N | | | X | | | | |
| <i>Corymbia</i> | <i>maculata</i> | Spotted Gum | E | N | | | X | | | | |
| <i>Eucalyptus</i> | <i>botryoides</i> | Swamp Mahogany | E | N | | | | X | | | |
| <i>Eucalyptus</i> | <i>decipiens</i> | Limestone Marlock | E | E | | | | X | | | |
| <i>Eucalyptus</i> | <i>erythrocorys</i> | Red Cap Gum | E | E | X | X | | X | X | X | |
| <i>Eucalyptus</i> | <i>gomphocephala</i> | Tuart | E | E | X | X | X | X | X | X | |
| <i>Eucalyptus</i> | <i>leucoxylon</i> | White Ironbark | E | N | X | | | X | | | |
| <i>Eucalyptus</i> | <i>spathulata</i> | Swamp Mallett | E | N | X | | | X | | | |

Figure 2. Tree Matrix for Alkimos Public and Private Realm

TREE MATRIX FOR ALKIMOS PUBLIC AND PRIVATE REALM, CONTINUED...

| Genus | Species | Common Name | Deciduous (D) Evergreen (E) | Endemic (E), Native (N), Exotic (X) | Carpark Planting | Feature Planting | Avenue Planting | Urban Streetscape | Dune Revegetation | Public Open Space | WSUD |
|---------------------|---|-------------------------------|--------------------------------|---|---------------------|---------------------|--------------------|----------------------|----------------------|-------------------------|------|
| <i>Eucalyptus</i> | <i>sideroxylon</i> | Ironbark | E | N | X | X | | X | | X | |
| <i>Eucalyptus</i> | <i>utilis</i> | Coastal Moort | E | E | | | | X | | X | |
| <i>Erythrina</i> | <i>skii</i> | Coral Tree | E | X | | X | X | X | | X | |
| <i>Ficus</i> | <i>macrophylla</i> | Moreton Bay Fig | E | N | | X | X | | | X | |
| <i>Ficus</i> | <i>microcarpa</i> var. <i>hillii</i> | Hills Fig | E | N | | X | X | | | X | |
| <i>Fraxinus</i> | <i>angustifolia</i> | Claret Ash | D | X | | | X | X | | | |
| <i>Melaleuca</i> | <i>cuticularis</i> | Saltwater Paperbark | E | E | X | | | | | | X |
| <i>Melaleuca</i> | <i>lanceolata</i> | Rottnest Tea Tree | E | E | X | | | X | X | X | |
| <i>Melaleuca</i> | <i>leucodendra</i> | Weeping Paperbark | E | N | | | | X | | X | X |
| <i>Melaleuca</i> | <i>quinquervia</i> | Broad Leaved Paperbark | E | N | X | | | X | | X | X |
| <i>Metrosideros</i> | <i>excelsa</i> | New Zealand Christmas Tree | E | X | X | | | X | | | |
| <i>Olea</i> | <i>europaea</i> | Common Olive Tree | E | X | | | | X | | X | |
| <i>Olea</i> | <i>europaea</i> | Swan Hill (non- fruiting) | E | X | | | | X | | X | |
| <i>Pistachia</i> | <i>chinensis</i> | Chinese Pistachio | D | X | | | X | X | | | |
| <i>Pyrus</i> | <i>calleryana</i> 'Bradford' | Ornamental Pear | D | X | | | X | X | | | |
| <i>Sapium</i> | <i>sebiferum</i> | Chinese Tallow | D | X | | | | X | | | |
| <i>Schinus</i> | <i>molle</i> | Pepper Tree | E | X | | | | X | | | |
| <i>Tipuana</i> | <i>tipu</i> | Pride of Bolivia | D | X | | | | X | | | |
| <i>Ulmus</i> | <i>parvifolia</i> | Chinese Elm | D | X | | | | X | | | |

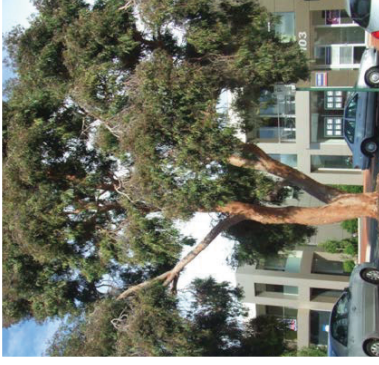
4.0 TREE SPECIES



Agonis flexuosa,
Native Peppermint
Height: 10m Width: 5m
Evergreen



Allocasuarina fraseriana
Fraser's Sheoak
Height: 12m Width: 4m
Evergreen



Angophora costata,
Sydney Red Gum
Height: 18m Width: 10m
Evergreen



Araucaria columnaris,
Cook Pine
Height: 15m Width: 4m
Evergreen



Araucaria heterophylla,
Norfolk Island Pine
Height: 18m Width: 8m
Evergreen



Banksia attenuata,
Candle Banksia
Height: 4-6m Width: 4-5m
Evergreen



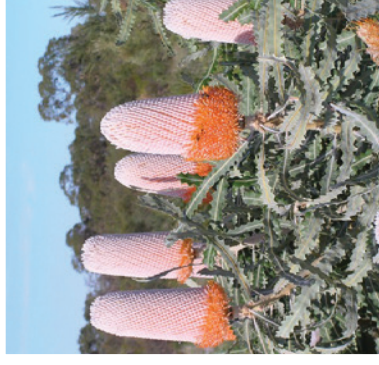
Banksia grandis,
Candle Banksia
Height: 6m Width: 4-5m
Evergreen



Banksia ilicifolia,
Holy Leafed Banksia
Height: 6-8m Width: 4-5m
Evergreen

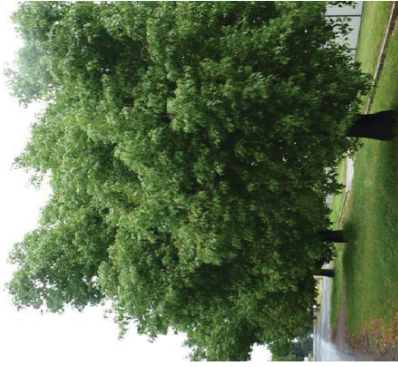


Banksia menziesii,
Firewood Banksia
Height: 4-6m Width: 4-5m
Evergreen



Banksia prionotes,
Acorn Banksia
Height: 4-6m Width: 4-5m
Evergreen

TREE SPECIES, CONTINUED...



Brachychiton populineus,
Kurrajong
Height: 10m Width: 8m
Evergreen



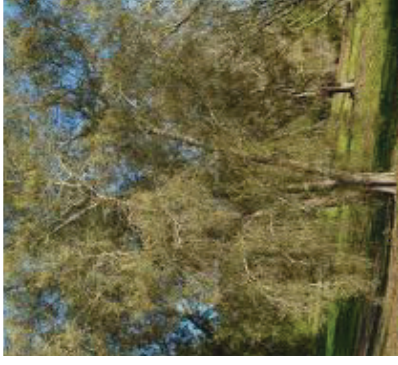
Callitris preissii,
Rottneest Island Pine
Height: 9m Width: 4m
Evergreen



Casuarina cunninghamiana,
River Sheoak
Height: 20m Width: 6m
Evergreen



Casuarina equisetifolia,
Coast Sheoak
Height: 15m Width: 6m
Evergreen



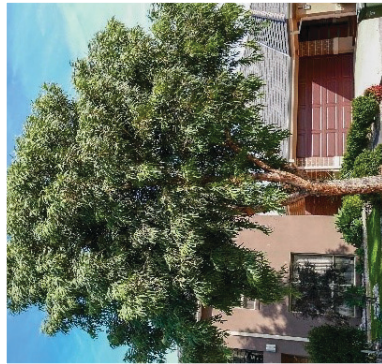
Casuarina obesa,
Swamp Sheoak
Height: 9m Width: 5m
Evergreen



Ceratonia siliqua,
Carob
Height: 10m Width: 5m
Evergreen



Corymbia citriodora
Lemon Scented Gum
Height: 20-30m Width: 15m
Evergreen



Corymbia maculata,
Spotted Gum
Height: 20m Width: 15m
Evergreen



Eucalyptus botryoides
Swamp Mahogany
Height: 15-20m Width: 8-12m
Evergreen



Eucalyptus decipiens,
Limestone Mallett
Height: 18m Width: 10m
Evergreen

TREE SPECIES, CONTINUED...



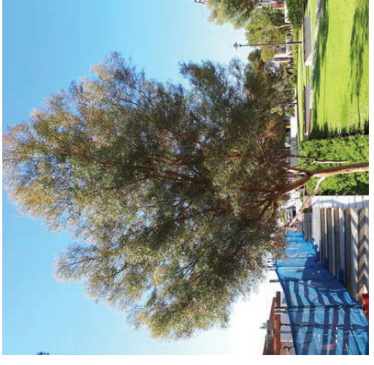
Eucalyptus erythrocorys,
Red Cap Gum
Height: 8m Width: 4m
Evergreen



Eucalyptus gomphocephala,
Tuart
Height: 18m Width: 10m
Evergreen



Eucalyptus leucoxylon,
White Ironbark
Height: 12m Width: 5m
Evergreen



Eucalyptus spathulata,
Swamp Mallet
Height: 8m Width: 5m
Evergreen



Eucalyptus sideroxylon,
Ironbark
Height: 15m Width: 8m
Evergreen



Eucalyptus utilis,
Moort
Width: 8m
Evergreen



Erythrina skii,
Coral Tree
Height: 10m Width: 8m
Deciduous



Ficus macrophylla,
Moreton Bay Fig
Height: 15m Width: 18m
Evergreen

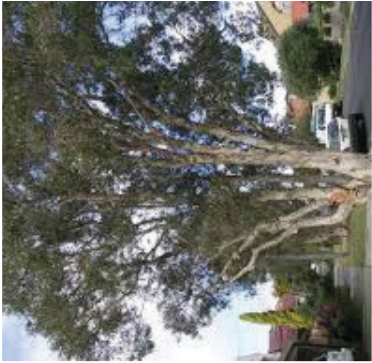


Ficus microcarpa, var. *hillii*,
Hills Fig
Height: 15m Width: 15m
Evergreen

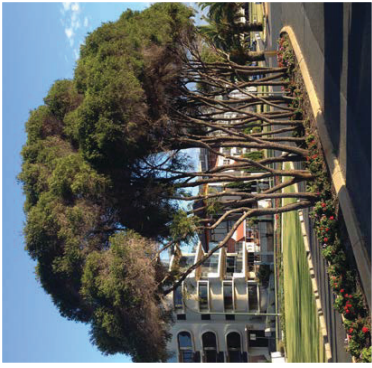


Fraxinus angustifolia,
Claret Ash
Height: 18m Width: 10m
Deciduous

TREE SPECIES, CONTINUED...



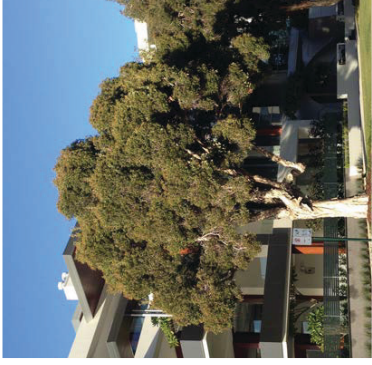
Melaleuca cuticularis,
'Salt Water Paperbark'
Height: 10m Width: 6m
Evergreen



Melaleuca lanceolata,
Rottneest Tea Tree
Height: 10m Width: 6m
Evergreen



Melaleuca leucodendra,
Weeping Paperbark
Height: 15m Width: 4m
Evergreen



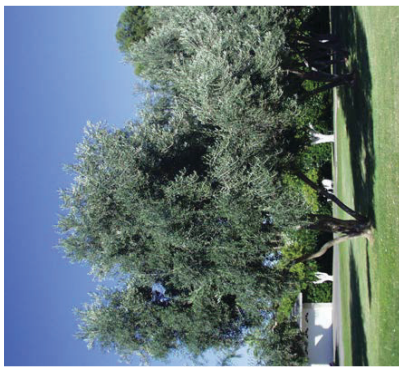
Melaleuca quinquenervia,
Paperbark
Height: 12m Width: 5m
Evergreen



Metrosideros excelsa
New Zealand Christmas Tree
Height: 15m Width: 12m
Evergreen



Olea europaea,
Common Olive
Height: 10m Width: 6m
Evergreen



Olea europaea 'Swan Hill',
Low Fruiting Olive
Height: 10m Width: 6m
Evergreen



Pistachia chinensis,
Chinese Pistacio
Height: 15m Width: 10m
Deciduous



Pyrus calleryana 'Bradford',
Ornamental Pear
Height: 8m Width: 6m
Deciduous



Sapium sebiferum,
Chinese Tallow
Height: 8m Width: 8m
Deciduous

TREE SPECIES, CONTINUED...



Schinus molle,
Pepper Tree
Height: 10m Width: 8m
Evergreen



Tipuana tipu,
Bolivia
14m
Width: 12m
Semi-deciduous



Ulmus parvifolia,
Elm
Width: 12m
Deciduous
Chinese
Height: 12m

4.1 CARPARK PLANTING TREE SPECIES



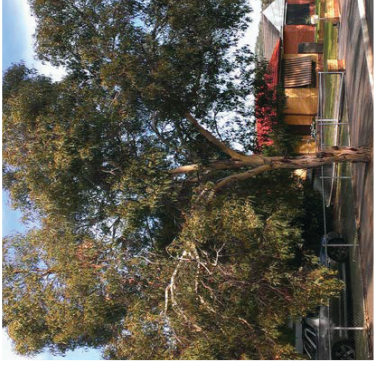
Casuarina equisetifolia,
Coast Sheoak
Height: 15m Width: 6m
Evergreen



Eucalyptus erythrocorys,
Red Cap Gum
Height: 8m Width: 4m
Evergreen



Eucalyptus gomphocephala,
Tuart
Height: 18m Width: 10m
Evergreen



Eucalyptus leucoxylon,
White Ironbark
Height: 12m Width: 5m
Evergreen



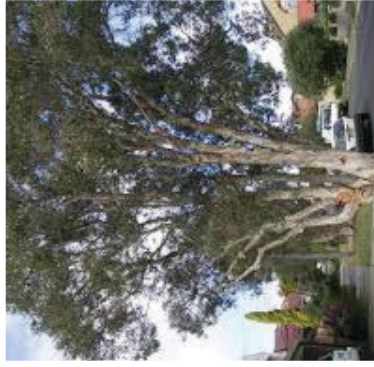
Eucalyptus spathulata,
Swamp Mallett
Height: 8m Width: 5m
Evergreen



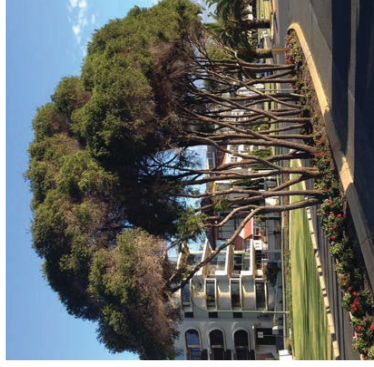
Eucalyptus sideroxylon,
Ironbark
Height: 15m Width: 8m
Evergreen



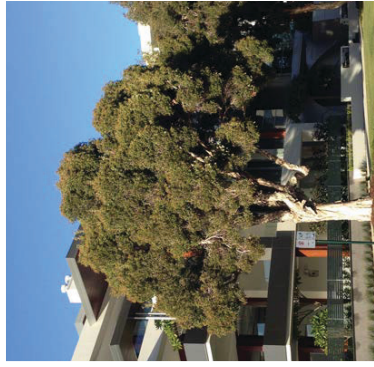
Eucalyptus utilis,
Coastal Moorit
Height: 10m Width: 8m
Evergreen



Melaleuca cuticularis,
'Salt Water Paperbark'
Height: 10m Width: 6m
Evergreen



Melaleuca lanceolata,
Rottnest Tea Tree
Height: 10m Width: 6m
Evergreen



Melaleuca quinquenervia,
Paperbark
Height: 12m Width: 5m
Evergreen

CARPARK PLANTING TREE SPECIES CONTINUED...

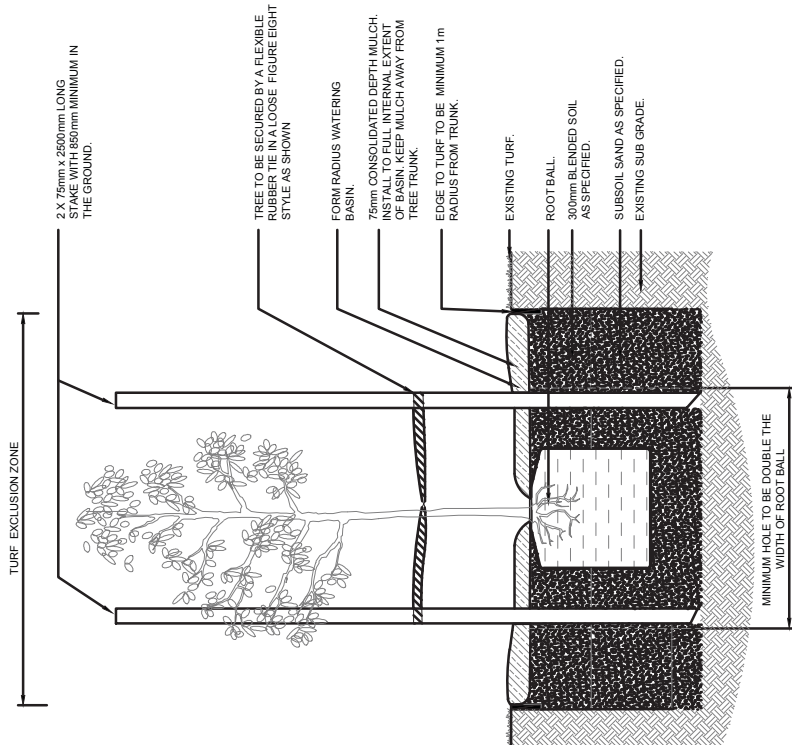


Metrosideros excelsa
New Zealand Christmas Tree
Height: 15m Width: 12m
Evergreen

5.0 BEST PRACTICE TREE PLANTING - TYPICAL SOFTSCAPE DETAILS

SOFTSCAPE DETAIL

The following softscape details are 'typical' and indicative only. Any works should consider local conditions and constraints, coupled with other suitable site investigations and technical advice prior to commencing works.



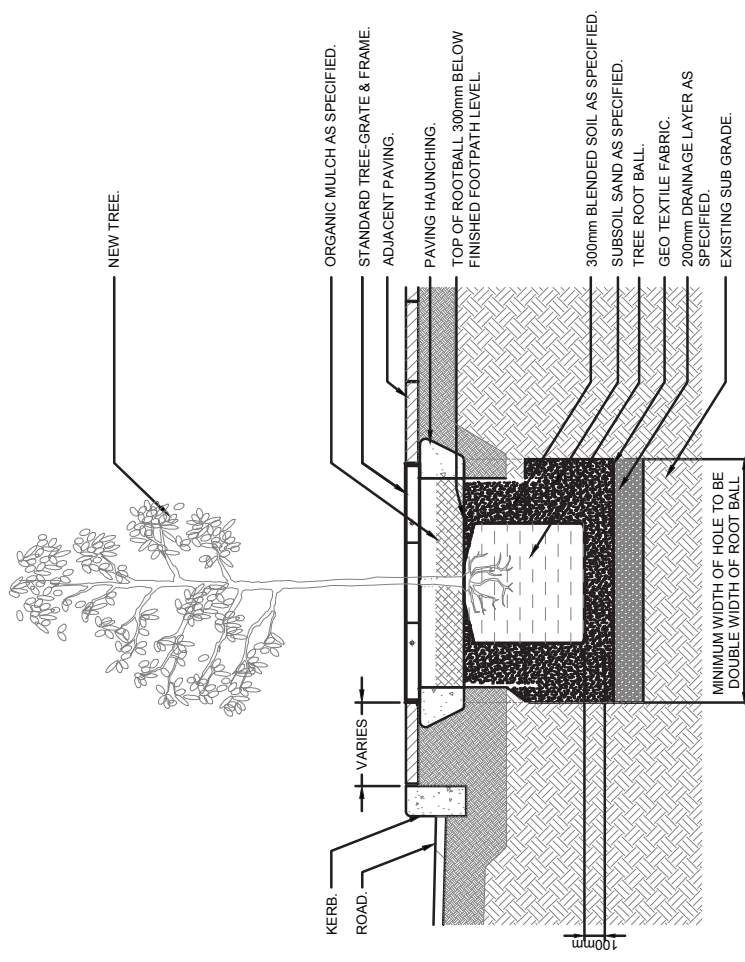
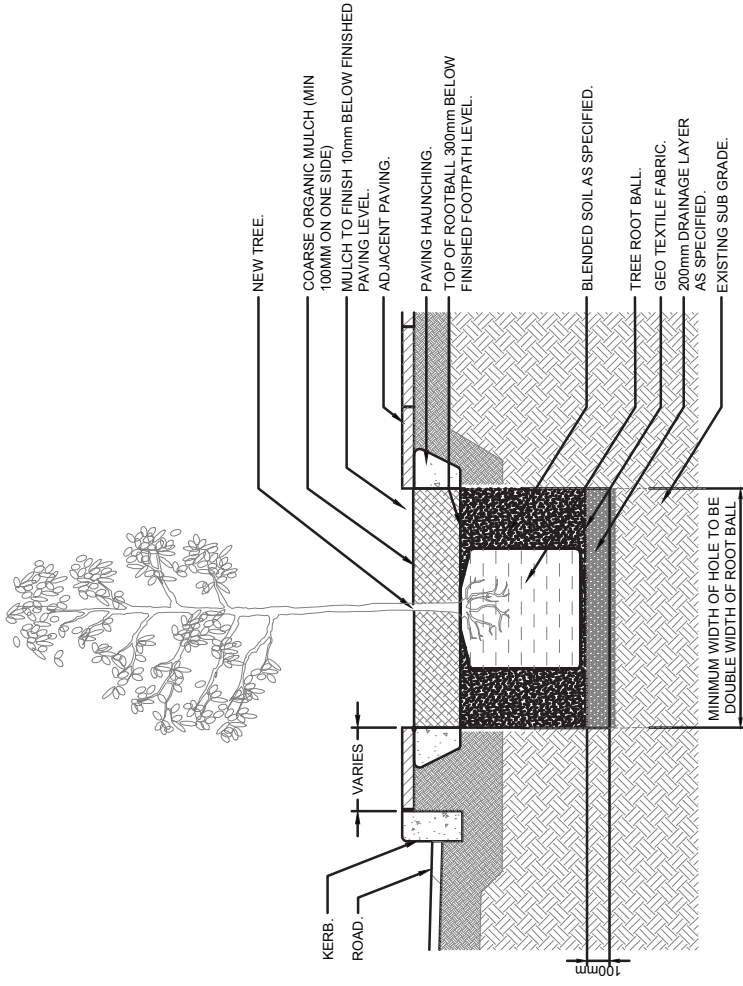
TYPICAL TREE PLANTING IN SOFTSCAPE DETAIL

5.1 BEST PRACTICE TREE PLANTING - TYPICAL HARDSCAPE DETAILS

HARDSCAPE DETAIL OPTIONS

The following hardscape details are 'typical' and indicative only. Any works should consider local conditions and constraints, coupled with other suitable site investigations and technical advice prior to commencing works.

Recommended minimum carpark tree planting area within hardstand 1.2m x 1.2m. However as a rule the planting area should be double the width of the root ball.



TYPICAL TREE PLANTING IN HARDSCAPE DETAIL

TYPICAL TREE PLANTING IN HARDSCAPE WITH TREE GRATE DETAIL

6.0 PLANTING SELECTION

The pattern of existing plants of the site is determined primarily by the landforms, soil types and fertility, and location to the coast.

Whilst there is less variation and numbers of species within the Quindalup dune complex than other areas of the Swan Coastal Plain, it nonetheless contains a large number of endemic plants.

Transplanting existing Xanthorrhoeas (Grass trees) and Macrozamia (Zamia Palms) in areas that are to be cleared, for use in other areas of the site is to be undertaken.

Planting should be selected with a focus on endemic planting to provide habitat and biodiversity benefits, and to provide a sense of place in keeping with the sites coastal context.

Planting selection criteria shall ensure the right plant for the right location is used and include:

1. Maintain sightlines, particularly within urban environment;
2. Site specific analysis (soils, pH, verge width);
3. Projected future climate conditions (reduced rainfall and increased temperatures);
4. Desired ecosystem services; i.e. urban shade/cooling, storm water mitigation, biodiversity, feature planting etc.
5. Functions and uses of the space;



6.1 GROUND COVER SELECTION



Carpobrotus virescens
Pigface
Height: 0.2m x Width: 2m



Eremophila glabra
Tar Bush
Height: 0.3m x Width: 1m



Gastrobium nervosum
Pea Flower
Height: 0.2-0.6m x Width: 1m



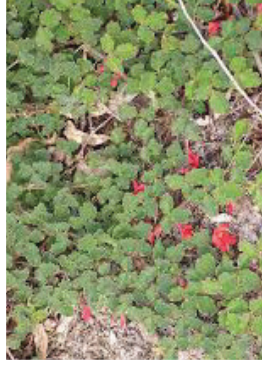
Grevillea crithmifolia
Grevillea
Height: 0.2-0.6m x Width: 1m



Hardenbergia comptonia
Native Wisteria
Height: 0.3m x 0.6m x Width: 2m



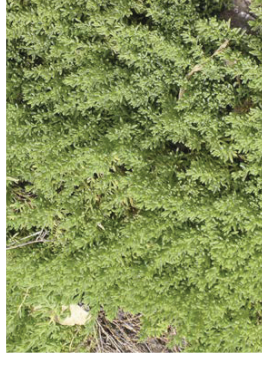
Hemandra pungens
Snake Bush
Height: 0.2m x Width: 1m



Kennedia prostrata
Running Postman
Height: 0.2m x Width: 2m



Scaevola crassifolia (prostrate)
Thick-leaved fan-flower
Height: 0.5m x Width: 1m



Threlkeldia diffusa
Coast Bonefruit
Height: 0.2-0.5m x Width: 0.5m



Westringia dampieri
Westringia
Height: 0.3 - 0.8m x Width: 1m

6.2 SHRUB SELECTION



Atriplex cinerea
Grey Saltbush
Height: 70cm
Width: 1m



Calothamnus quadrifidus
One-sided Bottlebrush
Height: 0.5m x Width: 1m



Enchyalena tomentosa
Ruby Saltbush
Height: 0.8m x Width: 1m



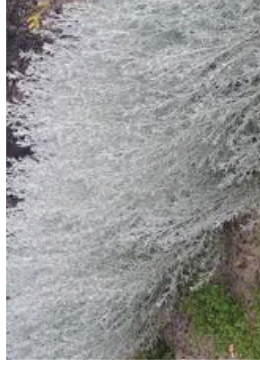
Guichenotia ledifolia
Guichenotia
Height: 0.4-1.0m x Width: 1m



Leucophyta brownii,
Cushion Bush
Height: 70cm
Width: 1m



Melaleuca huegelii (prostrate)
Chenille Honey Myrtle
Height: 0.6m x Width: 1m



Olearia axillaris
Coastal Daisybush
Height: 1- 1.5m x Width: 1-1.5m



Pimelea ferruginea
Rice Flower
Height: 1m x Width: 1m

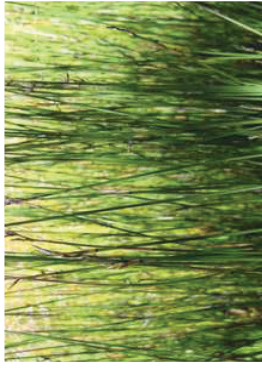


Rhagodia baccata
Berry Saltbush
Height: 1.2m - Width: 1m

6.3 GRASSES SELECTION



Austrostipa elegantissima
Feather Spear Grass
Height: 1m-1.2m x Width: 1m



Baumea juncea
Bare Twig Rush
Height: 1.2m x Width: 1m



Conostylus aculeata
Prickly Conostylus
Height: 0.3m x Width: 0.3m



Conostylus candicans
Grey Cottonheads
Height: 0.3m x Width: 0.3m



Ficinia nodosa
Knotted Club Rush
Height: 0.8m x Width: 1m



Lepidosrema gladiatum
Cushion Bush
Height: 70cm
Width: 1m



Lomandra maritima
Coastal Lomandra
Height: 0.6m x Width: 0.8m



Spinifex longifolius
Height: 0.5m x Width: 1m

6.4 TALL SHRUB SELECTION



Acacia pulchella
Prickly Moses

Height: 70cm x Width: 1m



Atriplex isatidea
Coast Saltbush

Height: 1m-2.5m
Width: 1m-2m



Banksia attenuata (dwarf)
Candle Banksia

Height: 2m x Width: 1.5m



Hibbertia cuneiformis
Cutleaf Hibbertia

Height: 1.3m x Width: 1m



Jacksonia sternbergiana
Green Stinkwood

Height: 2-4m x Width: 2m



Macrozamia reidleyi
Zamia Palm

Height: 1-3m x Width: 1-3m



Melaleuca systena
Coastal Honey Myrtle

Height: 1-2m x Width: 1-2m



Templetonia retusa
Cockies Tongue

Height: 1-2m x Width: 1-2m



Xanthorrhoea preissii
Grass Tree

Height: 1-4m x Width: 1-2m