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# ARBORICULTURAL IMPACT ASSESSMENT TREE PROTECTION SPECIFICATION

## Liverpool Health + Academic Precinct Main Works

Prepared for: JOHNSTAFF PROJECTS

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Revision B

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## 1.0 INTRODUCTION

### 1.1 Background

1.1.1 This Arboricultural Impact Assessment Report and Tree Protection Specification was prepared for Johnstaff Projects, on behalf of NSW Health Infrastructure, in relation to the Main Works for Liverpool Hospital, Elizabeth Street, Liverpool. The purpose of this Report is to undertake a Visual Tree Assessment<sup>1</sup> (VTA), determine the impact of the proposed works on the trees, and where appropriate, recommend the use of sensitive construction methods to minimise adverse impacts.

1.1.2 In preparing this Report, the author is aware of and has considered the objectives of *State Environmental Planning Policy Vegetation in Non-Rural Areas (2017)*, *Liverpool City Council's Tree Management Policy (2016)*, *Australian Standard 4970 Protection of Trees on Development Sites (2009)*, *Australian Standard 4373 Pruning of Amenity Trees (2007)* and *Australian Standard 2303 Tree Stock for Landscape Use (2015)*.

Refer to Methodology (**Appendix 1**)

1.1.3 This impact assessment is based on an assessment of the following supplied documentation/plans only:

- Main Works Tree Protection & Removal Plan (Issue D) – prepared by Clouston Associates, 26.02.2020
- Main Works Concept Landscape Plan – Ground (Issue D) – prepared by Clouston Associates, 26.02.2020

Refer to Plans (**Appendix 2**)

## 2.0 RESULTS

### 2.1 The Site

2.1.1 The site comprises the existing Liverpool Hospital complex and is bound by Campbell Street and Liverpool Girls High School to the north, Elizabeth Street to the south, the rail corridor to the east and Goulburn Street to the west.

2.1.2 The site is generally level and contains a number of landscape areas comprising predominantly of garden beds and lawns bordering internal access roads and carparks, and courtyard areas.

### 2.2 The Proposal

2.2.1 This application seeks consent for the construction and operation of a redevelopment of the Liverpool Hospital Campus including:

- Construction of a new 6-storey Integrated Services Building (ISB) as well as building refurbishment, demolition and site preparation work
- Pedestrianisation of Campbell Street between Goulburn and Forbes Streets
- Internal road re-configurations and revised connections to the existing road network
- Covered pedestrian walkway connections to the existing hospital facilities
- Wayfinding and signage
- Associated landscaping

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<sup>1</sup> Mattheck & Breloer (2003)

## 2.3 The Trees

2.3.1 Sixty-four (64) trees were assessed using the Visual Tree Assessment<sup>2</sup> (VTA) criteria and notes, and comprise a mix of Australian-native and exotic species such as *Eucalyptus* spp. (Eucalypt), *Corymbia* spp. (Eucalypt), *Ficus* spp. (Fig), *Fraxinus angustifolia* 'Raywoodii' (Claret Ash) and *Washingtonia* spp. (Fan Palm).

2.3.2 As required by Clause 2.3.2 of *Australian Standard 4970 Protection of Trees on Development Sites (2009)*, each of the trees assessed has been allocated a Retention Value. The Retention Value is based on Useful Life Expectancy and Landscape Significance with consideration to tree health, structural condition and site suitability. The Retention Values do not consider any proposed development works and are not a schedule for tree retention or removal. The trees have been allocated one of the following Retention Values:

- Priority for Retention
- Consider for Retention
- Consider for Removal
- Priority for Removal

Refer to Tree Assessment Schedule (**Appendix 3**)

2.3.3 An additional thirty-three (33) trees have also been addressed in this Report. A full VTA of these trees was not undertaken. Species and tree dimensions were recorded only.

2.3.4 Trees 2-19 *Washingtonia filifera* (Cotton Palm) are a group of seventeen (17) palms located near the existing hospital entry on the corner of Elizabeth Street and Goulburn Street. It is understood that these trees were originally planted in Elizabeth Street sometime in the 1900-1920's and were relocated onto the site during the last major upgrade in the late 1980's early 1990's. These trees do not appear to be listed within the NSW Heritage Database.<sup>3</sup>

2.3.5 Trees 20-25 *Syagrus romanzoffianum* (Cocos Palm) are listed as exempt species within the *Liverpool City Council Tree Management Policy (2016)*.<sup>4</sup>

## 3.0 ARBORICULTURAL IMPACT ASSESSMENT

### 3.1 Tree Retention

#### 3.1.1 Tree 1

Tree 1 was identified as *Ficus macrocarpa* var. *Hillii* (Hills Fig) and is located in the landscape area near the existing hospital entry on the corner of Elizabeth Street and Goulburn Street. The tree is of high Landscape Significance and has been allocated a Retention Value of *Priority for Retention*.

3.1.2 The supplied plans show Tree 1 is to be retained with new pavements proposed within its Tree Protection Zone (TPZ). The extent of work represents a *Major Encroachment* as defined by *Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970)*. Clause 3.3.4 of AS-4970 notes that design factors and tree sensitive methods can be used to minimize the impact of the encroachment.

<sup>2</sup> Mattheck & Breloer (2003)

<sup>3</sup> NSW Office of Environment & Heritage (2019)

<sup>4</sup> Liverpool City Council (2017)

- 3.1.3 Pavements (including sub-base materials) areas within the TPZ should be installed above existing grade and utilise existing sub-base layers where possible. Pavement sub-base layers should either be thinned, or finished pavement levels and kerbs modified as required to enable the retention of roots (>25mmØ) as required by the Project Arborist. Sub-base materials should be lightly compacted above and around roots using hand tools only.
- 3.1.4 Irrigation should be installed to provide supplementary watering twice per week (or as directed by the Project Arborist) to help buffer against any potential physiological stress associated with the development works. In addition, the TPZ should be mulched with a 75mm layer of composted woodchip mulch.
- 3.1.5 Trees 2-5 & 13-15**  
Trees 2-5 and 13-15 were identified as *Washingtonia filifera* (Cotton Palm) and are located in the landscape area near the existing hospital entry on the corner of Elizabeth Street and Goulburn Street. The trees are of high Landscape Significance and have been allocated a Retention Value of *Consider for Retention*.
- 3.1.6 The supplied plans show Trees 2-5 and 13-15 are to be retained with new pavements proposed within their TPZ areas. The extent of work represent *Major Encroachments* as defined by AS-4970. Clause 3.3.4 of AS-4970 outlines that tree species and tolerance to root disturbance should be considered when determining the potential impact of an encroachment. Palms are arborescent monocots which have an adventitious root system comprised of numerous fibrous roots that arise independently from the Root Initiation Zone (RIZ) at the base of the trunk. Research has shown that when transplanting palms, most species require a minimum rootball radius of 300mm for successful transplantation.
- 3.1.7 With consideration to this research, palm species can be considered more tolerant of root disturbance within the TPZ than tree species that produce a woody root system. Therefore, the proposed pavements should not reduce the Useful Life Expectancy (ULE) of Trees 2-5 and 13-15. Pavement areas should be designed to ensure the RIZ is retained and protected. Root pruning should be undertaken by the Project Arborist prior to the commencement of mechanical excavation.
- 3.1.8 Irrigation should be installed to provide supplementary watering twice per week (or as directed by the Project Arborist) to help buffer against any potential physiological stress associated with the development works. In addition, the TPZ areas should be mulched with a 75mm layer of composted woodchip mulch.
- 3.1.9 Tree 16**  
Tree 16 was identified as *Eucalyptus microcorys* (Tallowwood) and is located in the landscape area near the existing hospital entry on the corner of Elizabeth Street and Goulburn Street. The tree is of moderate Landscape Significance and has been allocated a Retention Value of *Consider for Retention*.
- 3.1.10 The supplied plans show Tree 16 is to be retained with new pavements proposed within its TPZ. The extent of work represents a *Major Encroachment* as defined by AS-4970. New pavement surfaces should be installed as outlined within in Sections 3.1.3 and 3.1.4.
- 3.1.11 Trees 129 & 129d**  
Trees 129 and 129d were identified as *Corymbia citriodora* (Lemon-Scented Gum) and are located in a small garden area between Campbell Street and Liverpool Girls High School. The trees are of moderate Landscape Significance and have been allocated a Retention Value of *Consider for Retention*.
- 3.1.12 The supplied plans show Trees 129 and 129d are to be retained with road realignment works proposed within their TPZ areas. The extent of work represent *Major Encroachments* as defined by AS-4970.

3.1.13 No significant root growth is likely to be present beneath the carriageway due to the highly compacted nature of the sub-base/sub-grade which creates an inhospitable growing environment. However, the works should be undertaken using tree sensitive demolition and excavation methods supervised by the Project Arborist. Excavation using compact machinery (<3t fitted with a flat bladed bucket) is permissible within the TPZ where approved by the Project Arborist. The works should be undertaken in small increments, guided by a spotter who is to look for roots and prevent damage. Any excavation works to the rear of the existing kerbline or within Structural Root Zone (SRZ) areas should be undertaken by hand/hand tools. If during the demolition and excavation works, the Project Arborist determines the trees will significantly impacted, they should be removed and replaced.

#### 3.1.14 Tree 140

Tree 140 was identified as *Ficus rubiginosa* (Port Jackson Fig) and is located in a small garden area at the centre of cul-de-sac accessed from Campbell Street. The tree is of high Landscape Significance and has been allocated a Retention Value of *Priority for Retention*.

3.1.15 The supplied plans show Tree 140 is to be retained with new pavements and steps proposed within its TPZ. The extent of work represents a *Major Encroachment* as defined by AS-4970. New pavement surfaces should be installed as outlined within in Sections 3.1.3 and 3.1.4.

3.1.16 The stairs (and other landscape fixtures as required) within the TPZ should be supported on isolated piers/piles (with all other parts of the structures positioned above existing ground levels). Excavation for piers/piles within the TPZ areas should be undertaken using tree sensitive methods (hand/hydrovac/airspade etc). Piers/piles locations should be flexible and/or the footing design modified to enable the retention of roots (>25mmØ) as required by the Project Arborist.

#### 3.1.17 Trees 141-142

Trees 141 and 142 were identified as *Eucalyptus saligna* (Sydney Blue Gum) and are located in a small garden area within the centre of the site. The trees are of high Landscape Significance and have been allocated a Retention Value of *Priority for Retention*.

3.1.18 The supplied plans show Trees 141 and 142 are to be retained with gravel, pavement and turf surfaces and stairs proposed within their TPZ areas. The extent of work represent *Major Encroachments* as defined by AS-4970.

3.1.19 The works should be undertaken as outlined within Sections 3.1.3, 3.1.4 and 3.1.16. The installation of turf within the TPZ areas should be undertaken using hand tools and roots (>25mmØ) should be protected. No mechanical cultivation/ripping of soils should be undertaken within TPZ areas.

3.1.20 It should be noted there are a number of wound/s within the crowns Trees 141 and 142 which appear to be the result of cockatoo damage. An aerial inspection (and potentially internal diagnostic testing) should be undertaken to determine the significance of these wounds. Ongoing inspection and testing maybe required if significant defects are identified, particularly as the trees are proposed to be retained with a landscape area with a frequent occupancy rate. In addition, this species develops relatively high levels of deadwood which will need to be increasingly managed as the trees age.

#### 3.1.21 Trees 159-163 & Trees 167-170

Trees 159-163 and Trees 167-170 were identified as *Fraxinus angustifolia* 'Raywood' (Claret Ash) and are street trees growing in the road reserve of Campbell and Forbes Streets. The trees are of low Landscape Significance and have been allocated a Retention Value of *Consider for Removal*.

- 3.1.22 The supplied plans show Trees 159-163 and Trees 167-170 are to be retained with new pavements and walls/landscape fixtures proposed within their TPZ areas. The extent of work represent *Major Encroachments* as defined by AS-4970.
- 3.1.23 The works should be undertaken as outlined within Sections 3.1.3, 3.1.4 and 3.1.16. Reference should be made the Arboricultural Impact Assessment & Tree Protection Specification (Rev D, dated 25.09.2019) prepared for the Infrastructure REF.
- 3.2.24 Trees 164-166**  
Trees 164-166 are a group of *Callistemon salignus* (White Bottlebrush) and are located at the corner of Campbell and Goulburn Streets. The trees are of low Landscape Significance and have been allocated a Retention Value of *Consider for Removal*.
- 3.2.25 The supplied plans show Trees 164-166 are to be retained with new pavements and walls/landscape fixtures proposed within their TPZ areas. The extent of work represent *Major Encroachments* as defined by AS-4970.
- 3.1.26 The works should be undertaken as outlined within Sections 3.1.3, 3.1.4 and 3.1.16. Reference should be made the Arboricultural Impact Assessment & Tree Protection Specification (Rev D, dated 25.09.2019) prepared for the Infrastructure REF.
- 3.2.27 Trees 171-173**  
Trees 171-173 were identified as *Jacaranda mimosifolia* (Jacaranda) and *Lagerstroemia indica* (Crepe Myrtle) and are located adjacent to Goulburn Street. The trees are of low Landscape Significance and have allocated a Retention Value of *Consider for Removal*.
- 3.2.28 The supplied plans show no works are proposed within the TPZ areas of Trees 171 and 172.
- 3.2.29 Other Trees**  
There are several trees are located within Liverpool Girls High School adjacent to the existing multi-storey carpark and within an internal hospital courtyard. These trees were not included in the scope of this report and have not been surveyed or assessed. The supplied plans show the trees are nominated for retention and tree sensitive design and construction measures should be used within their TPZ areas.

## **3.2 Other Works within TPZ Areas**

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- 3.2.1 Demolition Works**  
Demolition works within the TPZ areas should be supervised by the Project Arborist and utilise tree sensitive methods. Structures should be demolished in small sections ensuring demolition machinery/equipment does not contact with any part of the tree.
- 3.2.2 Existing pavements shall be carefully lifted to minimise damage to the existing sub-base and to prevent damage to tree roots. Wherever possible, the existing sub-base material shall remain in-situ.
- 3.2.3 Several structures to be demolished are located within SRZ of the trees. Structures within an SRZ can contribute to tree stability by providing ballast to the rootplate or acting as a stop to the overturning of the rootplate. If possible, existing underground structures should be left in situ.

### 3.2.4 Underground Services

Underground services (and associated infrastructure) should be located outside of the TPZ areas. Where this is not possible, services should be installed using tree sensitive excavation (hand/hydrovac etc) methods with the services located around/below roots (>25mmØ) as deemed necessary by the Project Arborist. Excavation using compact machinery fitted with a flat bladed bucket is permissible where approved by the Project Arborist, and should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmØ).

- 3.2.5 Alternatively, boring methods may be used for underground service installation where the obvert level (highest interior level of pipe) is greater than 1200mm below existing grade. Excavations for starting and receiving pits for boring equipment should be located outside of the TPZ areas or located to avoid roots (>25mmØ) as deemed necessary by the Project Arborist. OSD tanks (where required) should be located outside of the TPZ areas.

### 3.2.6 Landscape Planting & Turfing

The installation of plants and turf within TPZ areas should be undertaken using hand tools and roots (>25mmØ) should be protected. No mechanical cultivation/ripping of soils should be undertaken.

## 3.3 Trees to be removed

- 3.3.1 The supplied plans show sixty-eight (68) trees are proposed for removal to accommodate the development works. Refer to Table 1.

### 3.3.2 Table 1

Species	Tree No.	Total No.
<i>Callistemon salignus</i> (Willow Bottlebrush)	155 & 156	2
<i>Callistemon viminalis</i> (Weeping Bottlebrush)	150	1
<i>Corymbia citriodora</i> (Lemon-Scented Gum)	124-126, 129e, 129g & 129h	6
<i>Corymbia maculata</i> (Spotted Gum)	27, 129a & 129c	3
<i>Eucalyptus microcorys</i> (Tallowwood)	152	1
<i>Fraxinus angustifolia</i> 'Raywoodii' (Claret Ash)	127, 130, 131, 133-139	10
<i>Howea forsteriana</i> (Kentia Palm)	38	1
<i>Jacaranda mimosifolia</i> (Jacaranda)	28-34, 36, 120, 123 & 132	11
<i>Livistona australis</i> (Cabbage Tree Palm)	35	1
<i>Magnolia grandiflora</i> (Bull Bay Magnolia)	151 & 157	2
<i>Melia azedarach</i> (White Cedar)	26, 121, 129b, 153 & 154	5
<i>Syagrus romanzoffianum</i> (Cocos Palm)	20-25	6
<i>Ulmus parvifolia</i> (Chinese Elm)	143-149 & 158	8
<i>Washingtonia filifera</i> (Cotton Palm)	6-12 & 17-19	10
<i>Washintonia robusta</i> (Mexican Fan Palm)	37	1
		<b>68</b>

- 3.3.3 Of the trees listed above, forty-six (46) are either of low Landscape Significance or are relatively small in size (i.e. 10m or less in height). Replacement planting using healthy, advanced-size specimens could replace the loss of amenity from tree removal within a short timeframe.

### 3.4 Replacement Planting

3.4.1 The proposed development includes the provision of new tree planting across the site. This tree planting will help to off-set the loss of canopy cover and amenity resultant from the tree removal.

3.4.2 Limited soil volumes, particularly in paved areas and over structures, can be a major limitation to tree health and development. Table 2 provides generic soil volumes for different tree sizes. Refer to Table 2.

3.4.3 Table 2: Generic Soil Volumes<sup>5</sup>

Tree Size	Soil Volume (harsh sites)	Soil Volume (favorable sites)
Small (<7m)	36m <sup>3</sup>	25m <sup>3</sup>
Medium (7-10m)	38m <sup>3</sup>	27m <sup>3</sup>
Large (10m+)	39m <sup>3</sup>	27m <sup>3</sup>

3.4.4 It should be noted the soil volumes outlined above are a guide only and wherever possible greater volumes should be provided to promote tree health over the long term. Estimating soil volumes is not an exact science and the variables to be considered for each planting site include:

- Soil quality (water and nutrient holding capacity)
- Evaporation and transpiration
- Water

3.4.5 A minimum soil depth of 750mm (excluding drainage) should be provided for new tree plantings. This minimum depth is required to ensure new trees develop a root system adequate to withstand potential, severe wind tunnel effects. Soil depths should not exceed 1.2m (excluding drainage) to ensure the maximum possible area for lateral root spread is provided.

3.4.6 Replacement planting should be supplied in accordance with *Australian Standard 2303 (2015) Tree Stock for Landscape Use*.

## 4.0 SUMMARY & CONCLUSIONS

4.1 Ninety-seven (97) trees were addressed within this Report and consists of a mix of Australian native and exotic species.

4.2 The supplied plans show that twenty-nine (29) trees are proposed for retention as part of the development works. These are Trees 1-5, 13-16, 129, 129d, 140-142 and 159-173. Tree sensitive design and construction methods should be used where works are proposed within their TPZ areas as outlined within Section 3.1. These methods should be confirmed as feasible by the relevant project consultants (i.e architect, landscape architect, engineer etc) and may require flexibility at the time of construction. The trees should be protected as per the Tree Protection Specification (**Appendix 5**). An updated Arboricultural Impact Assessment & Tree Protection Specification should be prepared by an AQF Level 5 Arborist when detailed plans are available.

4.3 The supplied plans show sixty-eight (68) trees are proposed for removal to accommodate the development works. These are Trees 6-12, 17-38, 120, 121, 123-127, 129a-129c, 129e, 129g, 129h, 130-139 and 143-158. Of the trees listed above, forty-six (46) are either of low Landscape Significance or are relatively small in size (i.e. 10m or less in height).

<sup>5</sup> City of Sydney (2011)

- 4.5 The proposed development includes the provision of new tree planting across the site. This tree planting will help to off-set the loss of canopy cover and amenity resultant from the tree removal. Replacement planting should be supplied in accordance with *Australian Standard 2303 (2015) Tree Stock for Landscape Use*.
- 4.6 An aerial inspection (and potentially internal diagnostic testing) should be undertaken on Trees 141 and 142 to determine the significance of the wounds in the trees' crowns and branch crotches. Ongoing inspection and testing maybe required if significant defects are identified, particularly as the trees are to be retained with a landscape area with a frequent occupancy rate.

## 5.0 LIMITATIONS & DISCLAIMER

TreeiQ takes care to obtain information from reliable sources. However, TreeiQ can neither guarantee nor be responsible for the accuracy of information provided by others. Plans, diagrams, graphs and photographs in this Arboricultural Report are visual aids only and are not necessarily to scale. This Report provides recommendations relating to tree management only. Advice should be sought from appropriately qualified consultants regarding design/construction/ecological/heritage etc issues.

This Report has been prepared for exclusive use by the client. This Report shall not be used by others or for any other reason outside its intended target or without the prior written consent of TreeiQ. Unauthorised alteration or separate use of any section of the Report invalidates the Report.

Many factors may contribute to tree failure and cannot always be predicted. TreeiQ takes care to accurately assess tree health and structural condition. However, a tree's internal structural condition may not always correlate to visible external indicators. There is no warranty or guarantee, expressed or implied that problems or deficiencies regarding the trees or site may not arise in the future. Information contained in this report covers only the trees assessed and reflects the condition of the trees at the time of inspection. Additional information regarding the methodology used in the preparation of this Report is attached as Appendix 1. A comprehensive tree risk assessment and management plan for the trees is beyond the scope of this Report.

Reference should be made to any relevant legislation including Tree Management Controls. All recommendations contained within this Report are subject to approval from the relevant Consent Authority.

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Standards Australia (2009), *Protection of Trees on Development Sites AS-4970*

Standards Australia (2007), *Pruning of Amenity Trees AS-4373*

Standards Australia (2015) *Tree Stock for Landscape Use AS-2303*

**Appendix 1: Methodology**

- 1.1 Site Inspection:** This report was determined as a result of several comprehensive site inspection during February 2019. The comments and recommendations in this report are based on findings from these site inspections.
- 1.2 Visual Tree Assessment (VTA):** The subject tree(s) was assessed using the Visual Tree Assessment criteria and notes as described in *The Body Language of Trees – A Handbook for Failure Analysis*.<sup>6</sup> The inspection was limited to a visual examination of the subject tree(s) from ground level only. No internal diagnostic testing was undertaken as part of this assessment.
- 1.3 Tree Dimensions:** The dimensions of the subject tree(s) are approximate only.
- 1.4 Tree Locations:** The location of the subject tree(s) was determined from the supplied plans.
- 1.5 Trees & Development:** Tree Protection Zones, Tree Protection Measures and Sensitive Construction Methods for the subject tree were based on methods outlined in *Australian Standard 4970-2009 Protection of Trees on Development Sites*.
- The *Tree Protection Zone* (TPZ) is described in AS-4970 as a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The *Structural Root Zone* (SRZ) is described in AS-4970 as the area around the base of a tree required for the tree's stability in the ground. Severance of structural roots within the SRZ is not recommended as it may lead to the destabilisation and/or demise of the tree.
- In some cases it may be possible to encroach into or make variations to the theoretical TPZ. A *Minor Encroachment* is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. A *Major Encroachment* is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.
- 1.6 Tree Health:** The health of the subject tree(s) was rated as *Good, Fair or Poor* based on an assessment of the following factors:
- I. Foliage size and colour
  - II. Pest and disease infestation
  - III. Extension growth
  - IV. Crown density
  - V. Deadwood size and volume
  - VI. Presence of epicormic growth
- 1.7 Tree Structural Condition:** The structural condition of the subject tree(s) was rated as *Good, Fair or Poor* based on an assessment of the following factors:
- I. Assessment of branching structure  
(i.e. co-dominant/bark inclusions, crossing branches, branch taper, terminal loading, previous branch failures)
  - II. Visible evidence of structural defects or instability  
(i.e. root plate movement, wounds, decay, cavities, fungal brackets, adaptive growth)
  - III. Evidence of previous pruning or physical damage  
(root severance/damage, lopping, flush-cutting, lions tailing, mechanical damage)
- 1.8 Useful Life Expectancy (ULE):** The ULE is an estimate of the longevity of the subject tree(s) in its growing environment. The ULE is modified where necessary to take in consideration tree(s) health, structural condition and site suitability. The tree(s) has been allocated one of the following ULE categories (Modified from Barrell, 2001):
- I. 40 years +
  - II. 15-40 years
  - III. 5-15 years
  - IV. Less than 5 years

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<sup>6</sup> Mattheck & Breloer (2003)

- 1.9 Landscape Significance:** Landscape Significance was determined by assessing the combination of the cultural, environmental and aesthetic values of the subject tree(s). Whilst these values are subjective, a rating of high, moderate, low or insignificant has been allocated to the tree(s). This provides a relative value of the tree's Landscape Significance which may aid in determining its Retention Value. If the tree(s) can be categorized into more than one value, the higher value has been allocated.

Landscape Significance	Description
Very High	The subject tree is listed as a Heritage Item under the <i>Local Environmental Plan</i> with a local or state level of significance.
	The subject tree is listed on Council's Significant Tree Register or meets the criteria for significance assessment of trees and/or landscapes by a suitably qualified professional. The criteria are based on general principles outlines in the Burra Charter and on criteria from the Register of the National Estate.
High	The subject tree creates a 'sense of place' or is considered 'landmark' tree.
	The subject tree is of cultural or historical importance or is widely known.
	The subject tree is a prominent specimen which forms part of the curtilage of a heritage item with a known or documented association with that item.
	The subject tree has been identified by a suitably qualified professional as a species scheduled as a Threatened or Vulnerable Species for the site defined under the provisions of the NSW <i>Biodiversity Conservation Act (2016)</i> or the Commonwealth <i>Environmental Protection and Biodiversity Conservation Act (1999)</i> .
	The subject tree is known to contain nesting hollows to a species scheduled as a Threatened or Vulnerable Species for the site as defined under the provisions of the NSW <i>Biodiversity Conservation Act (2016)</i> or the Commonwealth <i>Environmental Protection and Biodiversity Conservation Act (1999)</i> .
	The subject tree is an excellent representative of the species in terms of aesthetic value.
	The subject tree is of significant size, scale or makes a significant contribution to the canopy cover of the locality.
Moderate	The subject tree makes a positive contribution to the visual character or amenity of the area.
	The subject tree provides a specific function such as screening or minimising the scale of a building.
	The subject tree is a good representative of the species in terms of aesthetic value.
Low	The subject tree is a known environmental weed species or is exempt under the provisions of the local Council's Tree Management Controls
	The subject tree makes little or no contribution to the amenity of the locality.
	The subject tree is a poor representative of the species in terms of aesthetic value.

- 1.10 Retention Value:** Retention Value was based on the subject tree's Useful Life Expectancy and Landscape Significance. The Retention Value was modified where necessary to take in consideration the subject tree's health, structural condition and site suitability. The subject tree(s) has been allocated one of the following Retention Values:

- I. Priority for Retention
- II. Consider for Retention
- III. Consider for Removal
- IV. Priority for Removal

ULE		Landscape Significance			
	Very High	High	Moderate	Low	Insignificant
40 years +	Priority for Retention	Priority for Retention		Consider for Removal	Priority for Removal
15-40 years		Priority for Retention	Consider for Retention		
5-15 years		Consider for Retention			
Less than 5 years	Consider for Removal	Priority for Removal			

The above table has been modified from the Footprint Green Tree Significance and Retention Value Matrix.



# GROUND LEVEL PLAN

This ground floor plane illustrates both the internal Hospital ground floor spaces and the external public realm.

The two internal hospital streets are clearly defined here along with the indoor - outdoor connection that this provides.

The new public realm areas provide a consistent design and materials language to link the various hospital buildings together.

The pattern language of the external spaces links into the interior hospital spaces at all the key entry points.

LEGEND



Existing trees retained



Proposed Trees



Paving and banding



Mass Planting



Lawn



Gravel



Mulch



Road



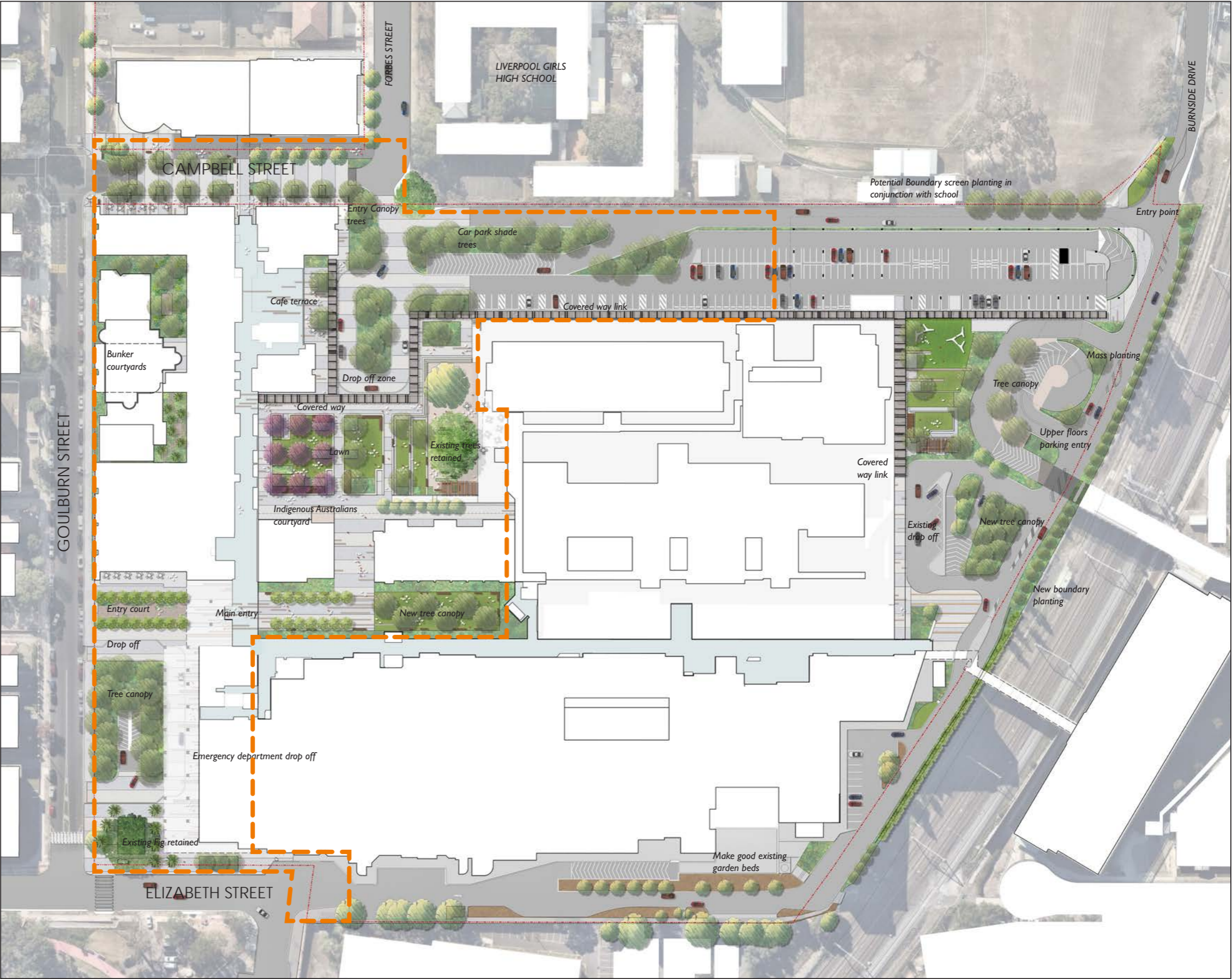
Internal Walkway



Covered Way



Main Works scope of works



# COVERED WAYS

Making it easy to find your way around is a key design principle. The external covered walkways provide a clear line of sight, and weather proof connections from car parks to the hospital entrances. Refer also to the circulation plan on page 17, and the discussion on CPTED measures on page 340

LEGEND



Existing trees retained

Proposed Trees



Paving and banding

Mass Planting

Lawn

Gravel

Mulch

Road

Internal Walkway

Covered Way

Main Works scope of works

The site plan illustrates the proposed covered walkways (indicated by orange dashed lines) connecting various parts of the hospital complex. Key features include:

- Streets:** Campbell Street, Forbes Street, Goulburn Street, Elizabeth Street, and Burnside Drive.
- Buildings and Landscaping:** Liverpool Girls High School, Bunker courtyards, Indigenous Australians courtyard, lawn, and existing trees retained.
- Walkways and Connections:** Entry canopy trees, Car park shade trees, Covered way link, Entry court, main entry, new tree canopy, Existing drop off, New tree canopy, New boundary planting, Mass planting, Tree canopy, upper floors parking entry, Existing drop off, New boundary planting, Make good existing garden beds.
- Other Features:** Potential Boundary screen planting in conjunction with school, entry point, Emergency department drop off, Existing Fig retained.

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# TREE REMOVALS


LEGEND


 Existing Trees to be Retained

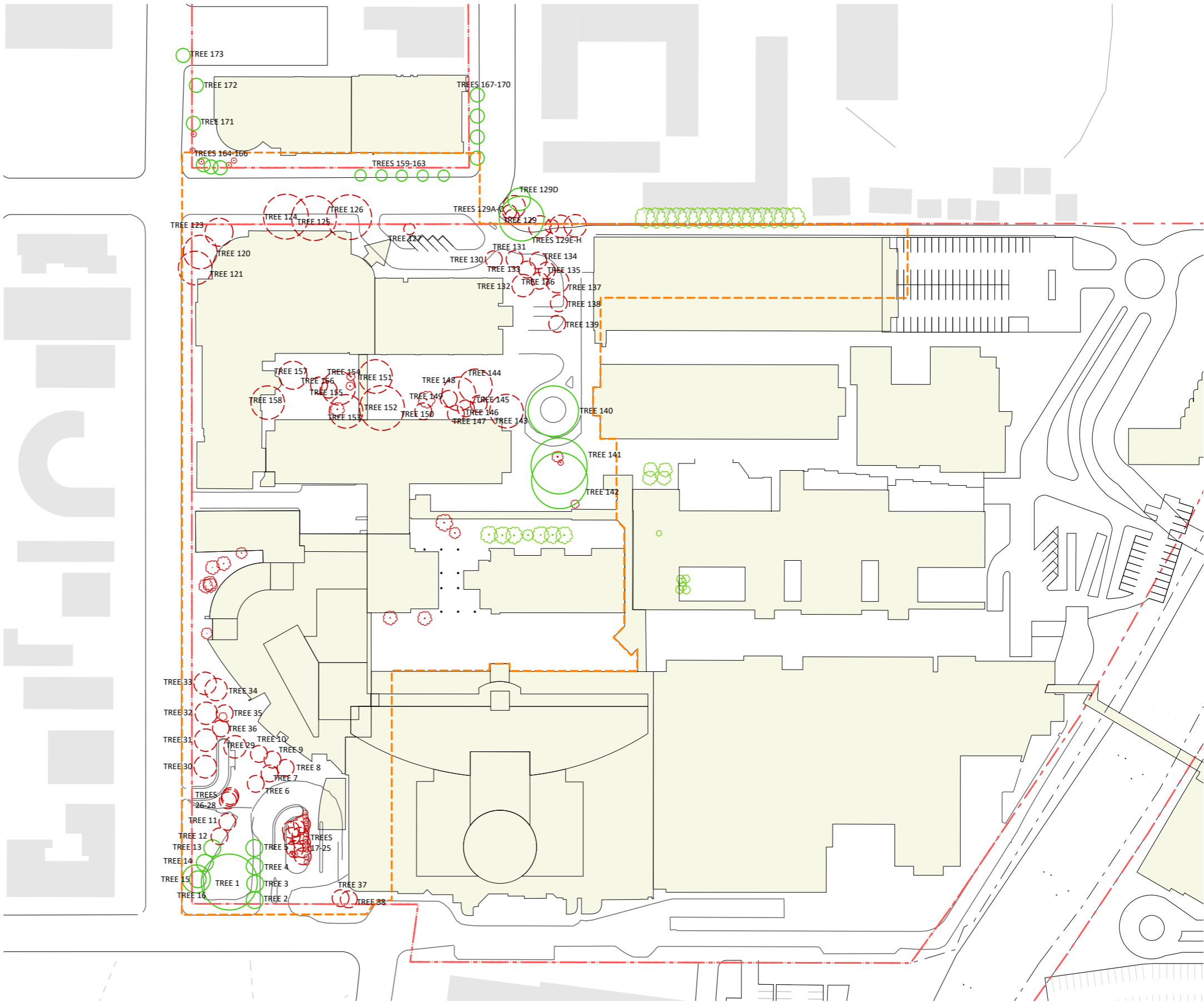
 Trees for removal

 Vegetation not included in arborist schedule to be retained

 Vegetation not included in arborist schedule to be removed

 LHAP Site Boundary

 Main Works SSDA Boundary



# PROPOSED TREE PLANTING

New areas on site have been maximised for new tree planting and lawn and garden spaces where possible.

LEGEND

Proposed Tree (Main Works)

Main Works scope of works

An aerial photograph of a hospital site with overlaid architectural and landscaping plans. The main works scope of works is outlined in orange dashed lines, covering a large central and left portion of the site. Numerous green circles of varying sizes are placed throughout this area, representing proposed tree planting locations. The circles are clustered in several areas: a large group in the upper left, a vertical strip in the center, and several smaller groups along the perimeter of the main works area. To the right of the main works area is a large parking lot with several cars parked. Further right is a road with a median and some existing trees. The bottom of the image shows a scale bar and a north arrow.

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# GOULBURN STREET FORECOURT



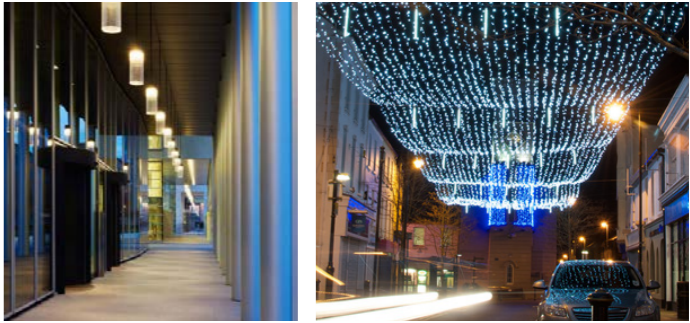
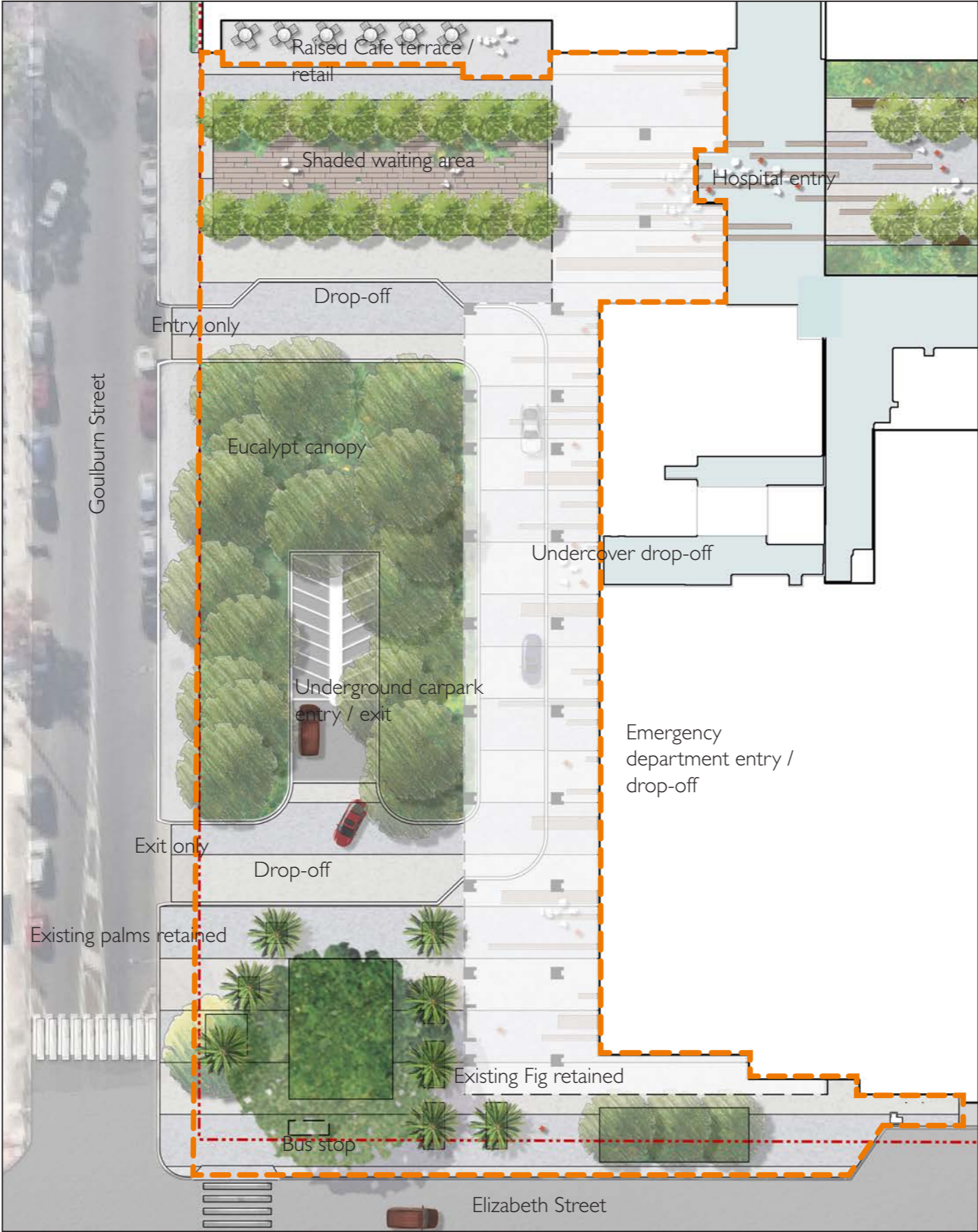
The Goulburn Street entry forecourt remains the Hospital's main front door. It provides undercover drop-off for emergency.

The large Fig tree (*Ficus Hilli*) on the corner has been retained along with several of the Palms (*Washingtonia*).

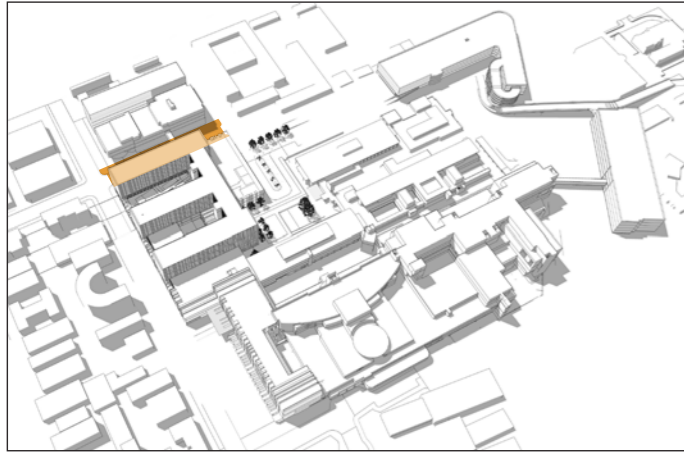
This precinct enjoys some afternoon sun and the central forecourt enclosed by the drop-off loop, will provide lush green planting with a high eucalypt canopy.

Indoor outdoor connections are made with the exterior paving patterning linking through the internal foyer.

To manage the Possible Maximum Flood level (PMF) there are rising flood gates that protect the main front entry and the underground car park entry.



# CAMPBELL STREET



Campbell Street links the main Hospital campus with the Ingham Institute and the future development of the ERH.

The north face of the hospital on Campbell street will have an active frontage comprising retail outlets allied to the Hospital.

The street is envisioned as a slow-speed street with a narrow carriageway.

The existing *Pyrus* will be retained along the northern frontage to the Ingham Institute. The rest of the street is proposed to have a tall stemmed eucalypt such as *Corymbia maculata*. This is proposed to provide the following:

- Appropriate scale to the six storey building
- Dappled light to the paved pedestrian areas
- Urban heat island reduction
- Attractive green outlook for patients on the upper IPU floors and wellness centre
- Help mitigate wind.



# FORBES STREET FORECOURT



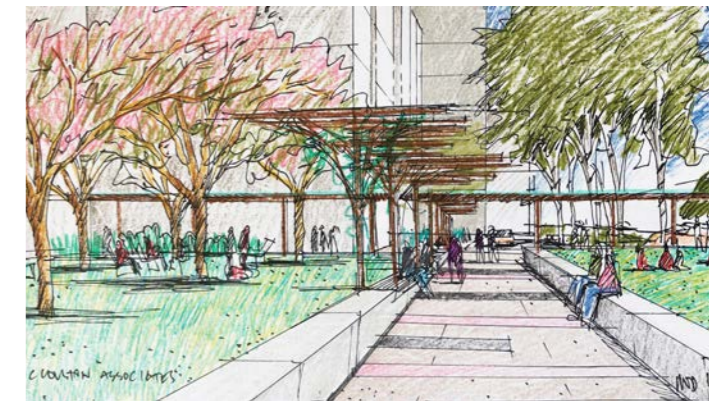
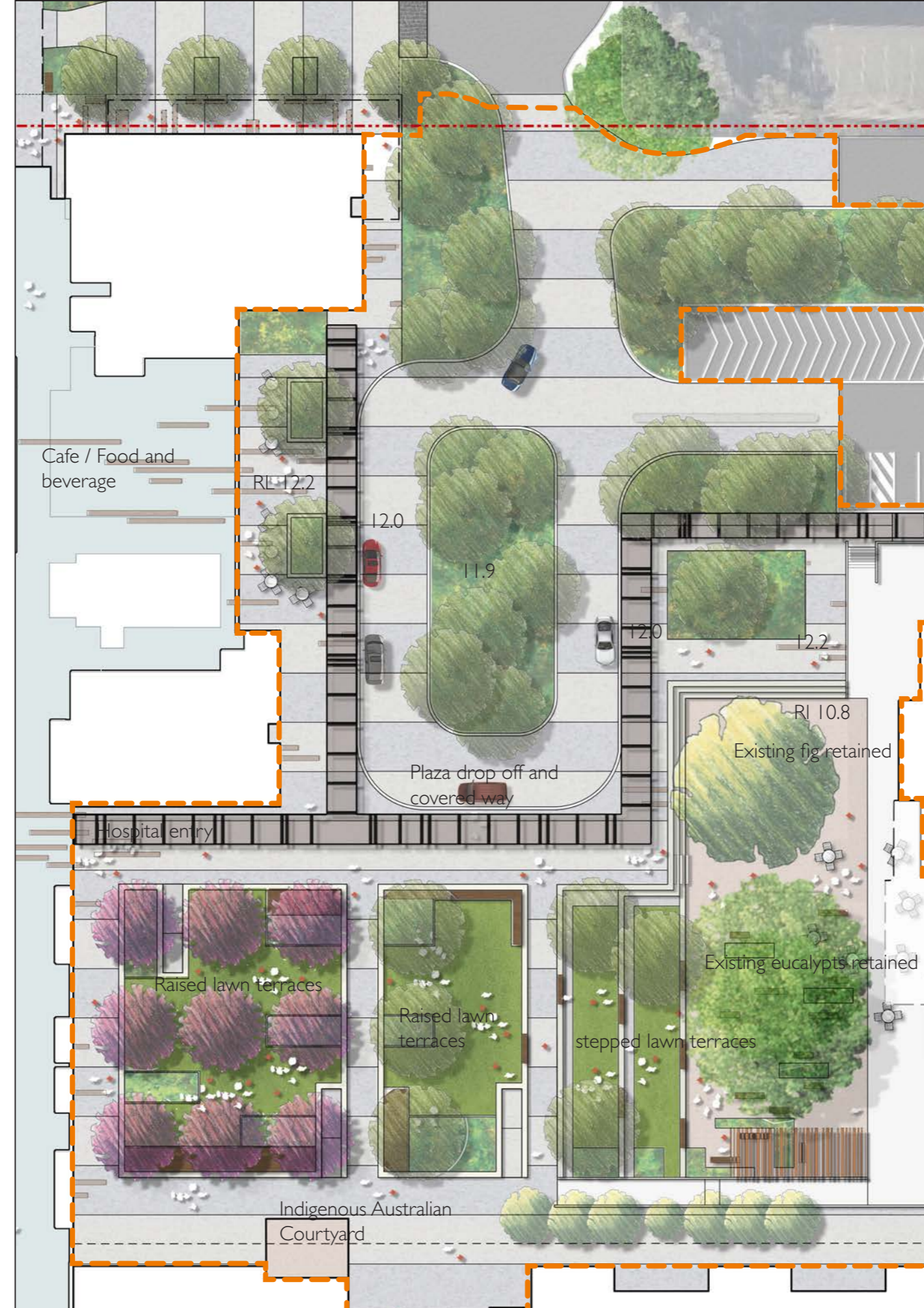
The Forbes Street forecourt is the largest area of open space on the campus. It has the best microclimate of the campus, with its north facing aspect. The space has two primary functions:

Plaza entry drop off space:

- Canopy tree gateway to provide shade and patient outlook from upper level wards
- Vehicle drop-off zone with covered way access to the buildings.

Large sunny lawn courtyard for patients staff and visitors

- Two large existing eucalypts retained
- Large Fig retained
- Terraced courtyard with raised lawns to protect from pedestrian cross cutting
- Deciduous trees for winter sun and summer shade
- Cafe terrace indoor / outdoor connection
- Ample seating opportunities
- Enclosed garden spaces
- A range of garden spaces to suit different sized groups and different privacy needs



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### Appendix 3: Tree Assessment Schedule

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
1	<i>Ficus macrocarpa</i> var. Hillii (Hills Fig)	20	10	1000	Good	Good	Surface roots. Structures within SRZ. Bark inclusions, minor.	Mature	15-40	High	Priority for Retention	12.0	3.5	Retain & protect.
2	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Retain & protect.
3	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Retain & protect.
4	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Retain & protect.
5	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Retain & protect.
6	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald. Located in concrete circular planter.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.
7	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald. Located in concrete circular planter.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.
8	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald. Located in concrete circular planter.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.
9	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald. Located in concrete circular planter.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
10	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald. Located in concrete circular planter.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.
11	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.
12	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.
13	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Retain & protect.
14	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Retain & protect.
15	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Retain & protect.
16	<i>Eucalyptus microcorys</i> (Tallowwood)	12	5	375	Good	Good		Mature	15-40	Moderate	Consider for Retention	4.6	2.3	Retain & protect.
17	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.
18	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Good	Wound/s, possibly from sunscald.	Mature - Late mature	5-15	High	Consider for Retention	5.0	n/a	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
19	<i>Washingtonia filifera</i> (Cotton Palm)	24	3	300	Good	Fair	Trunk cavity/s, minor.	Mature - Late mature	15-40	Moderate	Consider for Retention	5.0	n/a	Remove.
20	<i>Syagrus romanzoffianum</i> (Cocos Palm)	7	3	250								4.0	n/a	Remove.
21	<i>Syagrus romanzoffianum</i> (Cocos Palm)	7	3	250								4.0	n/a	Remove.
22	<i>Syagrus romanzoffianum</i> (Cocos Palm)	7	3	250								4.0	n/a	Remove.
23	<i>Syagrus romanzoffianum</i> (Cocos Palm)	7	3	250								4.0	n/a	Remove.
24	<i>Syagrus romanzoffianum</i> (Cocos Palm)	7	3	250								4.0	n/a	Remove.
25	<i>Syagrus romanzoffianum</i> (Cocos Palm)	7	3	250								4.0	n/a	Remove.
26	<i>Melia azedarach</i> (White Cedar)	8	3	225								2.7	1.8	Remove.
27	<i>Corymbia maculata</i> (Spotted Gum)	20	3	200								2.4	1.7	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
28	<i>Jacaranda mimosifolia</i> (Jacaranda)	6	3	200								2.4	1.7	Remove.
29	<i>Jacaranda mimosifolia</i> (Jacaranda)	7	4	220								2.6	1.8	Remove.
30	<i>Jacaranda mimosifolia</i> (Jacaranda)	7	4	200								2.4	1.7	Remove.
31	<i>Jacaranda mimosifolia</i> (Jacaranda)	7	4	200								2.4	1.7	Remove.
32	<i>Jacaranda mimosifolia</i> (Jacaranda)	7	4	200								2.4	1.7	Remove.
33	<i>Jacaranda mimosifolia</i> (Jacaranda)	7	4	200								2.4	1.7	Remove.
34	<i>Jacaranda mimosifolia</i> (Jacaranda)	7	4	200								2.4	1.7	Remove.
35	<i>Livistona australis</i> (Cabbage Tree Palm)	8	3	400								5.0	n/a	Remove.
36	<i>Jacaranda mimosifolia</i> (Jacaranda)	6	3	100								2.0	1.5	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
37	<i>Washintonia robusta</i> (Palm Mexican Fan)	10	3	500	Good	Good	Potential to transplant.	Mature	15-40	Moderate	Consider for Retention	5.0	n/a	Remove.
38	<i>Howea forsteriana</i> (Kentia Palm)	7	3	150	Good	Good		Mature	5-15	Low	Consider for Removal	4.0	n/a	Remove.
120	<i>Jacaranda mimosifolia</i> (Jacaranda)	10	6	525	Good	Good	No access to base.	Mature	15-40	Moderate	Consider for Retention	6.4	2.6	Remove.
121	<i>Melia azedarach</i> (White Cedar)	11	6	550	Good	Good	No access to base.	Mature	15-40	Moderate	Consider for Retention	6.6	2.6	Remove.
123	<i>Jacaranda mimosifolia</i> (Jacaranda)	10	10	525	Good	Good	No access to base.	Mature	15-40	Moderate	Consider for Retention	6.4	2.6	Remove.
124	<i>Corymbia citriodora</i> (Lemon-Scented Gum)	18	8	450	Good	Good		Mature	15-40	Moderate	Consider for Retention	5.4	2.4	Remove.
125	<i>Corymbia citriodora</i> (Lemon-Scented Gum)	19	8	575	Good	Good		Mature	15-40	Moderate	Consider for Retention	7.0	2.7	Remove.
126	<i>Corymbia citriodora</i> (Lemon-Scented Gum)	19	8	575	Good	Good		Mature	15-40	Moderate	Consider for Retention	7.0	2.7	Remove.
127	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	6	2	175	Poor	Fair	Crown density 25-50%. Medium (25-75mmØ) deadwood in moderate volumes. Small (<25mmØ) & medium (25-75mmØ) epicormic growth in moderate volumes. Wound/s, no visible sign of decay.	Semi-mature	<5	Low	Priority for Removal	2.1	1.6	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
129	<i>Corymbia citriodora</i> (Lemon-Scented Gum)	16	8	650	Good	Good	Previous branch failures. Mechanical damage to exposed surface roots.	Mature	15-40	Moderate	Consider for Retention	7.8	2.8	Retain & protect.
129a	<i>Corymbia maculata</i> (Spotted Gum)	10	5	200	Good	Good	Partially suppressed.	Mature	5-15	Low	Consider for Removal	2.4	1.7	Remove.
129b	<i>Melia azedarach</i> (White Cedar)	8	5	150 150	Good	Good	Partially suppressed.	Mature	15-40	Low	Consider for Removal	2.6	1.8	Remove.
129c	<i>Corymbia maculata</i> (Spotted Gum)	14	8	300	Good	Good	Partially suppressed.	Mature	15-40	Moderate	Consider for Retention	3.6	2.0	Remove.
129d	<i>Corymbia maculata</i> (Spotted Gum)	14	8	350	Good	Good	Mechanical damage to exposed surface roots.	Mature	15-40	Moderate	Consider for Retention	3.6	2.0	Retain & protect.
129e	<i>Corymbia citriodora</i> (Lemon-Scented Gum)	15	8	400	Good	Good		Mature	15-40	Moderate	Consider for Retention	4.8	2.3	Remove.
129g	<i>Corymbia citriodora</i> (Lemon-Scented Gum)	15	8	500	Good	Good	Kerb displacement.	Mature	15-40	Low	Consider for Removal	6.0	2.5	Remove.
129h	<i>Corymbia citriodora</i> (Lemon-Scented Gum)	14	8	300	Good	Good	Partially suppressed.	Mature	15-40	Low	Consider for Removal	3.6	2.0	Remove.
130	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	8	3	200	Good	Good	Small (<25mmØ) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.4	1.8	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
131	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	6	3	175	Good	Good	Small (<25mmø) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.1	1.7	Remove.
132	<i>Jacaranda mimosifolia</i> ( <i>Jacaranda</i> )	10	4	266	Good	Good	Small (<25mmø) deadwood in low volumes. Co-dominant inclusions, minor. Wound(s), early signs of decay.	Mature	15-40	Moderate	Consider for Retention	3.2	2.0	Remove.
133	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	7	3	175	Good	Good	Small (<25mmø) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.1	1.7	Remove.
134	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	8	3	200	Good	Good	Medium (25-75mmø) deadwood in low volumes. Small (<25mmø) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.4	1.8	Remove.
135	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	9	3	200	Good	Good	Medium (25-75mmø) deadwood in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.4	1.8	Remove.
136	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	8	3	225	Good	Good	Medium (25-75mmø) deadwood in low volumes. Small (<25mmø) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.7	1.8	Remove.
137	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	9	4	200	Good	Good	Small (<25mmø) deadwood in low volumes. Small (<25mmø) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.4	1.8	Remove.
138	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	9	3	200	Good	Good	Exposed surface roots Small (<25mmø) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	2.4	1.8	Remove.
139	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	7	3	250	Good	Good	Small (<25mmø) epicormic growth in low volumes. Wound(s), early signs of decay.	Mature	15-40	Low	Consider for Removal	3.0	1.9	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
140	<i>Ficus rubiginosa</i> (Port Jackson Fig)	12	18	1500	Good	Good	Bark inclusions, minor. Wound/s, various stages of decay.	Mature	15-40	High	Priority for Retention	15.0	4.0	Retain & protect.
141	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	25	10	1075	Fair	Good	Crown density 50-75%. Medium (25-75mmø) epicormic growth in moderate volumes. Wound/s, various signs of decay. Possible cockatoo damage at branch crotches.	Mature	15-40	High	Priority for Retention	13.0	3.5	Retain & protect.
142	<i>Eucalyptus saligna</i> (Sydney Blue Gum)	25	10	1075	Fair	Good	Crown density 50-75%. Medium (25-75mmø) epicormic growth in moderate volumes. Wound/s, various signs of decay. Possible cockatoo damage at branch crotches.	Mature	15-40	High	Priority for Retention	13.0	3.5	Retain & protect.
143	<i>Ulmus parvifolia</i> (Chinese Elm)	9	6	350								4.2	2.2	Remove.
144	<i>Ulmus parvifolia</i> (Chinese Elm)	9	6	350								4.2	2.2	Remove.
145	<i>Ulmus parvifolia</i> (Chinese Elm)	8	3	200								2.4	1.7	Remove.
146	<i>Ulmus parvifolia</i> (Chinese Elm)	8	3	200								2.4	1.7	Remove.
147	<i>Ulmus parvifolia</i> (Chinese Elm)	8	3	200								2.4	1.7	Remove.
148	<i>Ulmus parvifolia</i> (Chinese Elm)	9	6	350								4.2	2.2	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
149	<i>Ulmus parvifolia</i> (Chinese Elm)	8	3	200								2.4	1.7	Remove.
150	<i>Callistemon viminalis</i> (Weeping Bottlebrush)	6	3	25								2.0	1.9	Remove.
151	<i>Magnolia grandiflora</i> (Bull Bay Magnolia)	11	6	450								5.4	2.4	Remove.
152	<i>Eucalyptus microcorys</i> (Tallowwood)	21	8	550								6.6	2.6	Remove.
153	<i>Melia azedarach</i> (White Cedar)	10	6	225								2.7	1.8	Remove.
154	<i>Melia azedarach</i> (White Cedar)	15	6	50								6.0	3.5	Remove.
155	<i>Callistemon salignus</i> (Willow Bottlebrush)	5	3	250								3.0	1.8	Remove.
156	<i>Callistemon salignus</i> (Willow Bottlebrush)	5	3	250								3.0	1.8	Remove.
157	<i>Magnolia grandiflora</i> (Bull Bay Magnolia)	9	5	375								4.6	2.3	Remove.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
158	<i>Ulmus parvifolia</i> (Chinese Elm)	10	6	29								3.5	2.0	Remove.
159	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	150 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
160	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	150 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
161	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	150 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
162	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	150 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
163	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	150 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
164	<i>Callistemon salignus</i> (Willow Bottlebrush)	7	5	200	Good	Fair	Bark inclusions, major. Climber in crown. Close proximity to wall. Small (<25mmø) deadwood in moderate volumes.	Mature	15-40	Low	Consider for Removal	2.4	1.7	Retain & protect.
165	<i>Callistemon salignus</i> (Willow Bottlebrush)	7	5	200	Good	Fair	Bark inclusions, major. Climber in crown. Close proximity to wall. Small (<25mmø) deadwood in moderate volumes.	Mature	15-40	Low	Consider for Removal	2.4	1.7	Retain & protect.
166	<i>Callistemon salignus</i> (Willow Bottlebrush)	7	5	200	Good	Fair	Bark inclusions, major. No access to base. Small (<25mmø) deadwood in moderate volumes.	Mature	15-40	Low	Consider for Removal	2.4	1.7	Retain & protect.

Tree No.	Species	Height (m)	Radial Crown Spread (m)	DBH comb. (mm)	Health Rating	Structural Condition Rating	Comments	Age Class	ULE (years)	L/Sign	Retention Value	Radial TPZ (m)	Radial SRZ (m)	Implication
167	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	100 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
168	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	100 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
169	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	100 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
170	<i>Fraxinus augustifolia</i> 'Raywoodii' (Claret Ash)	5 max	2max	100 max	Good	Good	Semi-dormant. Crown lifted.	Semi-mature	15-40	Low	Consider for Removal	2.0	1.5	Retain & protect.
171	<i>Jacaranda mimosifolia</i> (Jacaranda)	6	5	250	Good	Good	Recently constructed path. Root severance not known.	Mature	15-40	Low	Consider for Removal	3.0	1.9	Retain & protect.
172	<i>Jacaranda mimosifolia</i> (Jacaranda)	8	5	150 150	Good	Good	Recently removed tree at base.	Mature	15-40	Low	Consider for Removal	2.6	1.8	Retain & protect.
173	<i>Lagerstroemia indica</i> (Crepe Myrtle)	7	5	250	Good	Poor	Wounds, various stages of decay.	Mature	5-15	Low	Consider for Removal	3.0	1.9	Retain & protect.

## Appendix 4: Plates



**Plate 1:** Showing Tree 1



**Plate 2:** Showing Trees 6-10, 17-19 and 20-25



**Plate 3:** Showing Tree 140



**Plate 4:** Showing Trees 141 and 142

## Appendix 5: General Tree Protection Specification

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### 1.0 Appointment of Project Arborist

A Project Arborist shall be engaged prior the commencement of work on-site and monitor compliance with the protection measures. The Project Arborist shall inspect the tree protection measures and Compliance Certification shall be prepared by the Project Arborist for review by the Principal Certifying Authority prior to the release of the Compliance Certificate.

The Project Arborist shall have a minimum qualification equivalent (using the Australian Qualifications Framework) of NSW TAFE Certificate Level 5 or above in Arboriculture.

### 1.1 Compliance

Contractors and site workers shall receive a copy of these specifications a minimum of 3 working days prior to commencing work on-site. Contractors and site workers undertaking works within the Tree Protection Zone shall sign the site log confirming they have read and understand these specifications, prior to undertaking works on-site.

The Project Arborist shall undertake regular site inspections and certify that the works are being undertaken in accordance with this specification.

Compliance Documentation shall be prepared by the Project Arborist following each site inspection. The Compliance Documentation shall include documentary evidence of compliance with the tree protection measures and methods as outlined within this Specification. Upon the completion of the works, a final assessment of the trees shall be undertaken by the Project Arborist and future recommended management strategies implemented as required.

### 1.2 Tree & Vegetation Removal

The trees to be removed shall be removed prior to the establishment of the tree protection measures. Tree removal works shall be undertaken in accordance with the *Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016)*.

Tree and vegetation removal shall not damage the trees to be retained.

### 1.3 Tree Protection Zone

The trees to be retained shall be protected prior and during construction from activities that may result in an adverse effect on their health or structural condition. The area within the Tree Protection Zone (TPZ) shall exclude the following activities, unless otherwise stated:

- Modification of existing soil levels, excavations, trenching or movement or rock
- Mechanical removal of vegetation
- Storage of materials, plant or equipment or erection of site sheds
- Affixing of signage or hoarding to the trees
- Preparation of building materials, refueling or disposal of waste materials and chemicals
- Lighting fires
- Movement of pedestrian or vehicular traffic
- Temporary or permanent location of services, or the works required for their installation
- Any other activities that may cause damage to the tree

NOTE: If access, encroachment or incursion into the TPZ is deemed essential, prior authorisation is required by the Project Arborist.

### 1.4 Tree Protection Fencing

TPZ fencing shall be installed at the perimeter of the TPZ. Refer to Tree Assessment Schedule (**Appendix 3**). Fencing set back distances may be reduced for demolition/construction access with approval from the Project Arborist and where ground protection is installed to the unfenced areas of the TPZ. The exact location of the fencing shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works.

As a minimum, the Tree Protection Fence shall consist of 1.8m high wire mesh panels supported by concrete feet. Panels shall be fastened together and supported to prevent sideways movement. The tree shall not be damaged during the installation of the Tree Protection Fencing. Refer to Typical Tree Protection Details (3) (**Appendix 6**).

#### 1.5 Site Management

Materials, waste storage, and temporary services shall not be located within the TPZ.

#### 1.6 Scaffolding

Where possible, scaffolding shall not be located within the TPZ. Scaffolding shall not be in contact with the tree. As necessary, this shall be achieved by erecting scaffolding around branches. Branches shall be tied back and protected as deemed necessary by the Project Arborist. Refer to Typical Tree Protection Details (5) (**Appendix 6**).

#### 1.7 Works within the Tree Protection Zones

In some cases works within the TPZ may be authorised by the determining authority. **These works shall be supervised by the Project Arborist.** When undertaking works within the TPZ, care should be taken to avoid damage to the tree's root system, trunks and lower branches.

If roots (>25mmØ) are encountered during the demolition, excavation and construction works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Adjustment of final levels and design shall remain flexible to enable the retention of roots (>25mmØ) where deemed necessary by the Project Arborist.

#### 1.8 Ground Protection

Where deemed necessary by the Project Arborist, machinery movements shall be restricted to areas of existing pavement or from areas of temporary ground protection such as ground mats or steel road plates. Refer to Typical Tree Protection Details (3) (**Appendix 6**).

#### 1.9 Trunk Protection

Trunk protection shall be installed as deemed necessary by the Project Arborist. Trunk protection shall be installed by wrapping padding (either carpet underlay or 10mm thick jute geotextile mat) around the trunk and first order branches to a minimum height of 2m. Timber battens (90 x 45mm) spaced at 150mm centres shall be strapped together and placed over the padding. Timber battens must not be fixed to the trees. Refer to Typical Tree Protection Details (3) (**Appendix 6**).

Branch protection shall be installed as deemed necessary by the Project Arborist.

#### 1.10 Structure & Pavement Demolition

Demolition of existing structures/pavement within the TPZ shall be supervised by the Project Arborist. Machinery is to be excluded from the TPZ unless operating from the existing slabs, pavements or areas of ground protection (refer to Section 1.8). Machinery should not contact the tree's roots, trunk, branches and crown.

The existing pavement shall be carefully lifted to minimise damage to the existing sub-base and to prevent damage to tree roots. Wherever possible, the existing sub-base material shall remain in-situ. Machinery shall work backwards out of the TPZ to ensure machinery remains on un-demolished sections of pavement at all times.

Structures below grade shall be retained to minimise disturbance to the tree's roots. Where this is not possible structures shall be shattered prior to removal with a hand-operated pneumatic/electric breaker. Where the Project Arborist determines that the tree is using underground elements (i.e footings, pipes, rocks etc.) for support, these structures shall be left in-situ.

If roots (>25mmØ) are encountered during the demolition works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute geotextile fabric. The geotextile fabric shall be kept in a damp condition at all times.

### 1.11 Pavement Installation

Installation of the pavements and sub-base within the TPZ shall be supervised by the Project Arborist. Pavements (including sub-base materials) shall be installed at or above existing grade and utilise existing sub-base layers where possible. Pavement sub-base layers shall either be thinned, or finished pavement levels and kerbs modified as required to enable the retention of roots (>25mmØ) as deemed necessary by the Project Arborist. Subbase materials shall be lightly compacted above and around roots using hand tools only. The new surfaces and sub-base materials shall be placed at or above grade to minimise excavations and retain roots (unless prior root mapping results show above sensitive construction to be unnecessary).

### 1.12 Footings within the TPZ

Footings installation within TPZ areas shall be supervised by the Project Arborist. Other than for the isolated piers/posts all other parts of the structure shall be installed above grade.

Drilling/piling machinery shall be excluded from the TPZ unless operating from an area where ground protection has been installed (refer to Section 1.8) or from the existing slabs or pavements. Drilling/piling machinery shall be of a suitable size to not damage the trees' roots, trunk, branches and crown. Machinery shall work in conjunction with an observer to ensure that adequate clearance from trees is maintained at all times.

### 1.13 Underground Services

Underground service installation within the TPZ shall be supervised by the Project Arborist.

The installation of underground services shall be located outside of the TPZ. Where this is not possible, they shall be installed using tree sensitive excavation methods (hand/hydrovac/airspade) with the services installed around/below roots (>25mmØ, or as determined by the Project Arborist). Excavation using compact machinery (<3.5t) fitted with a flat bladed bucket is permissible where approved by the Project Arborist. Excavation using compact machinery should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmØ).

Alternatively, boring methods may be used for underground service installation where the obvert level (highest interior level of pipe) is greater than 1000mm below existing grade. Excavations for starting and receiving pits for boring equipment should be located outside of the TPZ areas or located to avoid roots (>25mmØ) as deemed necessary by the Project Arborist. OSD tanks (where required) should be located outside of the TPZ areas.

### 1.14 Excavations, Root Protection & Root Pruning

All excavation works (including root investigations) within TPZ areas shall supervised by the Project Arborist and utilise tree sensitive methods (hand/hydrovac/airspade). Excavation using compact machinery (<3.5t) fitted with a flat bladed bucket is permissible where approved by the Project Arborist. Excavation using compact machinery should be undertaken in small increments, guided by a spotter who is to look for and prevent damage to roots (>25mmØ).

Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute mat, followed by a layer of plastic membrane. Coverings shall be weighted to secure them in place. The mat shall be kept in a damp condition at all times.

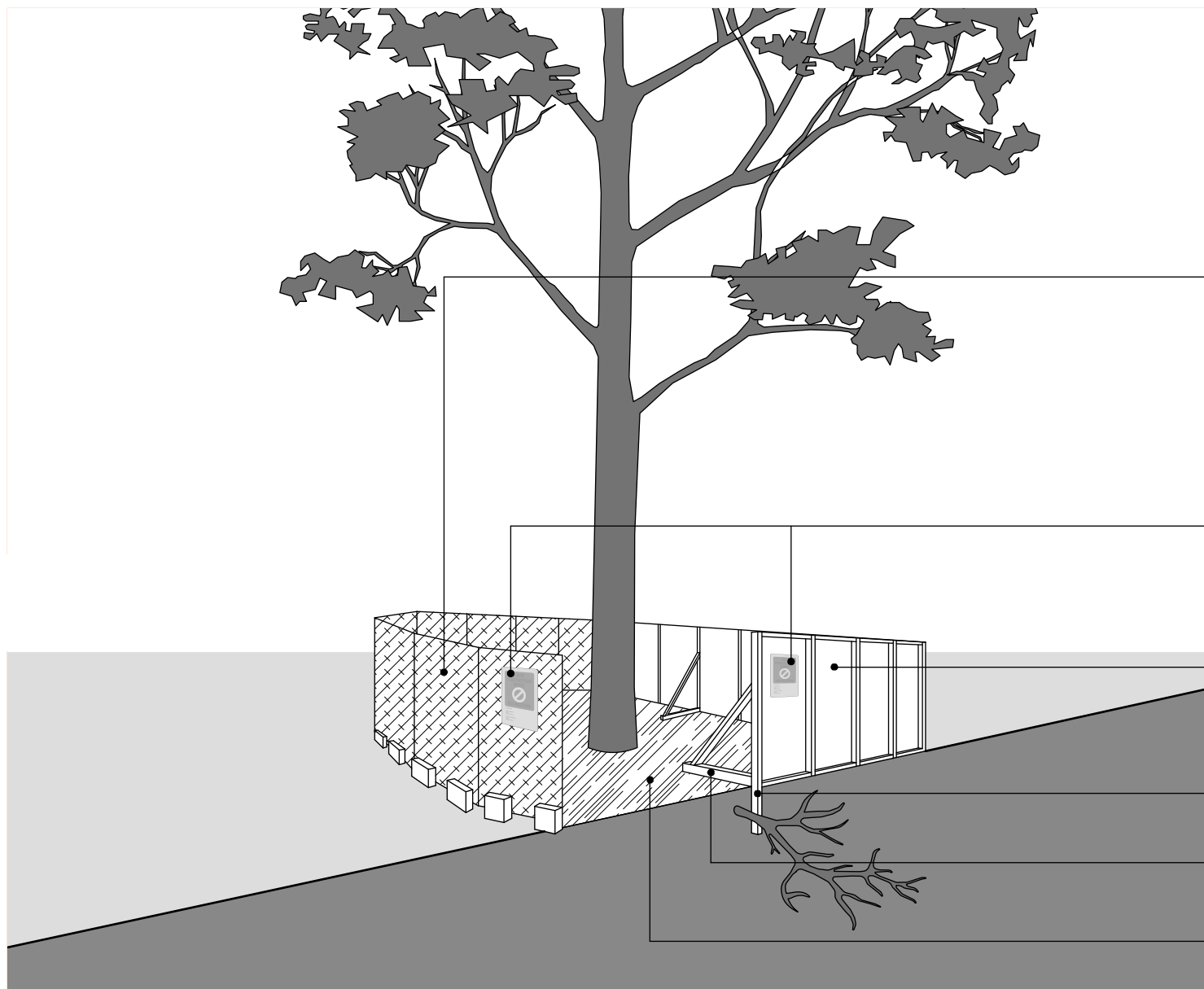
No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the Project Arborist. Tree sensitive excavation and root pruning shall be undertaken along the excavation line prior to the commencement of mechanical excavation to prevent tearing and shattering damage to the roots from excavation equipment.

Roots (>25mmØ) shall be pruned by the Project Arborist only. Roots (<25mmØ) may be pruned by the Principal Contractor. Root pruning shall be undertaken with clean, sharp secateurs or a pruning saw to ensure a smooth wound face, free from tears. Damaged roots shall be pruned behind the damaged tissues with the final cut made to an undamaged part of the root.

### 1.15 Plant Installation

Plant installation within the TPZ shall be undertaken using hand tools and roots (>25mmØ) shall be protected. Mechanical augers shall not be used. No mechanical cultivation/ripping of soils shall be undertaken within the TPZ.





**Note:**

No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

**Option 1 - Fencing**

1.8m high chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet.

Tree Protection Zone (TPZ) sign

**Option 2 - Fencing**

Plywood or wooden panel paling fence. This type of fencing material also prevents building materials or soil entering the TPZ.

Installation of supports should avoid damaging roots.

Bracing is permissible within the TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer installed across surface of TPZ.

