



Project No: LENN/COURTYARD/20 Report No: LENN/COURTYARD/AIA/B

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# ARBORICULTURAL IMPACT ASSESSMENT TREE PROTECTION SPECIFICATION

**Lennox Village Shopping Centre - Courtyard**  
**Great Western Highway & Pyramid Street**  
**Emu Plains**

Prepared for: CHALLENGER INVESTMENT PARTNERS

17<sup>th</sup> December 2020

Revision B

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## 1.0 INTRODUCTION

### 1.1 Background

1.1.1 This Arboricultural Impact Assessment and Tree Protection Specification Report was prepared Challenger Investment Partners in relation to the courtyard refurbishment works at Lennox Village Shopping Centre. 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 has considered the objectives of the following:

- *State Environmental Planning Policy Vegetation in Non-Rural Areas (2017)*
- *Penrith Local Environmental Plan (2010)*
- *Penrith City Council Tree & Vegetation Removal Fact Sheet (not dated)*
- *Australian Standard 4970 Protection of Trees on Development Sites (2009)*
- *Australian Standard 4373 Pruning of Amenity Trees (2007)*
- *Australian Standard 2303 Tree Stock for Landscape Use (2015)*
- *Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016)*

Refer to Methodology (**Appendix 1**)

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

- Existing/Demolition Plan - Courtyard DA03 (issue A) prepared by i2C Markup, dated 16.12.20
- Proposed Ground Floor Plan – Courtyard DA04 (issue A) prepared by i2C Markup, dated 16.12.20
- Proposed Roof Plan – Courtyard DA05 (issue A) prepared by i2C Markup, dated 16.12.20

Refer to Plans (**Appendix 2**)

### 1.2 The Proposal

1.2.1 The supplied plans show the proposed works include:

- Demolition of existing structures and pavements
- Installation of new deck, softfall infills, steps, screening wall and doors
- Associated works

Refer to Plans (**Appendix 2**)

## 2.0 RESULTS

### 2.1 The Site

2.1.1 Lennox Village Shopping Centre is located on the corner of the Great Western Highway and Pyramid Street, Emu Plains.

2.1.2 For the purpose of this report, the site is the existing courtyard on the southern side of the existing shopping centre.

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

## 2.2 The Trees

2.2.1 Trees 10 and 10A were assessed using the Visual Tree Assessment<sup>2</sup> (VTA) criteria and notes.

Refer to Tables 1 & 2

2.2.2 Table 1: Tree 10

|                                   |                                                                                                                                                                                                                        |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Species</b>                    | <i>Corymbia citriodora</i> (Lemon Scented Gum)                                                                                                                                                                         |
| <b>Diameter at Breast Height:</b> | 1560mm                                                                                                                                                                                                                 |
| <b>Height:</b>                    | 20m                                                                                                                                                                                                                    |
| <b>Radial Crown Spread:</b>       | 11mm                                                                                                                                                                                                                   |
| <b>Age Class:</b>                 | Late-mature                                                                                                                                                                                                            |
| <b>Health:</b>                    | Fair                                                                                                                                                                                                                   |
| <b>Structural Condition:</b>      | Good                                                                                                                                                                                                                   |
| <b>Useful Life Expectancy:</b>    | 5-15 years                                                                                                                                                                                                             |
| <b>Landscape Significance:</b>    | High                                                                                                                                                                                                                   |
| <b>Retention Value:</b>           | Consider for Retention                                                                                                                                                                                                 |
| <b>Comments</b>                   | Crown density 25-50%. Small (<25mmø) & large (>75mmø) deadwood in moderate volumes. Small (<25mmø) & medium (25-75mmø) epicormic growth in low volumes. Wound(s), various stages of decay. Previous branch failure(s). |

2.2.3 Table 2: Tree 10A

|                                   |                                                  |
|-----------------------------------|--------------------------------------------------|
| <b>Species</b>                    | <i>Phoenix canariensis</i> (Canary Is Date Palm) |
| <b>Diameter at Breast Height:</b> | 600mm                                            |
| <b>Height:</b>                    | 3m                                               |
| <b>Radial Crown Spread:</b>       | 3m                                               |
| <b>Age Class:</b>                 | Semi-mature                                      |
| <b>Health:</b>                    | Good                                             |
| <b>Structural Condition:</b>      | Good                                             |
| <b>Useful Life Expectancy:</b>    | 40+                                              |
| <b>Landscape Significance:</b>    | Low                                              |
| <b>Retention Value:</b>           | Consider for Removal                             |
| <b>Comments</b>                   |                                                  |

2.2.4 Trees 10 and 10A are not listed within Schedule 5 (Environmental Heritage) of the *Penrith Local Environmental Plan (2010)*.<sup>3</sup> Penrith City Council has confirmed that no Significant Tree Register is currently available for the Local Government Area.<sup>4</sup>

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

<sup>3</sup> Penrith City Council (2010)

<sup>4</sup> Penrith City Council (2020)

### 3.0 ARBORICULTURAL IMPACT ASSESSMENT

#### 3.1 Tree 10

- 3.1.1 Tree 10 was identified as *Corymbia citriodora* (Lemon Scented Gum) and is located in the courtyard area on the southern side of the shopping centre complex. The tree is of high Landscape Significance and has been allocated a Retention Value of *Consider for Retention*.
- 3.1.2 The supplied plans show Tree 10 is proposed for retention with a deck, softfall infills, steps, screening wall and doors 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)*.
- 3.1.3 Tree sensitive design and construction methods can be used to minimise impacts of development on tree health and reduce conflict between trees and built structures. Much of the information published in this field has been incorporated into best practice guidelines and standards (i.e. *British Standard 5837 Trees in Relation to Design, Demolition and Construction 2012* & *Australian Standard 4970-2009 Protection of Trees on Development Sites (AS-4970)*). Specifically, 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.
- 3.1.4 The following tree sensitive design and construction methods should be used to minimise adverse impacts:
- Existing ground levels within the TPZ should be maintained.
  - The deck and subframe, play equipment and privacy screen (and other landscape fixtures as required) should be supported on isolated piered footings (with all other parts of the structures positioned above existing ground levels). Excavation for footings within the TPZ should be undertaken by hand and footing locations should be flexible and/or the footing design modified to enable the retention of roots (>25mmØ) as required by the Project Arborist.
  - A minimum clearance of 200mm should be provided between the tree, deck and sub-frame and the deck, and the new structures should be cut away as required to accommodate the root crown or any mounding at the base of the tree. To ensure accuracy, clearance should be determined on site during construction rather from survey drawings. Provision should be made in the design for future cutting back of the structure to accommodate tree growth.
- 3.1.5 It should be noted that Tree 10 is of a significant age and may be less tolerant of construction impacts than younger, more vigorous trees and will need to be carefully protected during the construction period. A drip irrigation system should be provided under the deck to provide additional water to the TPZ through the construction stage of the project and/or during extended dry periods. An application of soil wetting agent is also recommended to aid penetration of supplementary watering through the soil profile.
- 3.1.6 Tree 10 is likely to develop increasing volumes of deadwood as it ages which will need to be periodically removed. In addition, given the tree's fair health, age class and location, it would be prudent to undertake an aerial inspection of tree's crown prior the commencement of the building works. The inspection should be undertaken by an AQF Level 5 Arborist and provide a detailed assessment of all defects within the tree's crown.

### 3.2 Other Works within the TPZ

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#### 3.2.1 Demolition Works

Demolition works within the TPZ should be supervised by the Project Arborist and utilise tree sensitive methods, ensuring demolition machinery/equipment does not contact the tree. Structures within a Structural Root Zone (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 and sub-base layers should be left in situ and reused.

#### 3.2.2 Underground Services

Underground services should be located outside of the TPZ. 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 required by the Project Arborist. Excavation using compact machinery (<2T) 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).

3.2.3 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 or located to avoid roots (>25mmØ) as required by the Project Arborist. OSD tanks (where required) should be located outside of the TPZ.

#### 3.2.4 Landscaping

The installation of plants/turf within the TPZ should be undertaken using hand tools and roots (>25mmØ) should be protected. Excavation and installation of imported soil mixes should be excluded from the TPZ areas other than the installation of soil conditioners to a maximum depth of 50mm above the existing soil profile.

### 3.3 Tree 10A

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3.3.1 Tree 10A was identified as *Phoenix canariensis* (Canary Island Date Palm) and is located in the courtyard area on the southern side of the shopping centre complex. The tree appears to be a self-sown specimen with low Landscape Significance and has been allocated a Retention Value of *Consider for Removal*.

3.3.2 The supplied plans show Tree 10A is to be removed as part of the proposed landscape treatment. A new tree planting could replace the loss of the loss of canopy cover and amenity resultant from tree removal within a short timeframe. Tree 10A will need to be carefully removed using hand tools without damaging the adjacent Tree 10.

### 4.0 CONCLUSION

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4.1.1 Two (2) trees were addressed within this Report. The supplied plans show Tree 10 is proposed for retention with a deck, softfall infills, steps, screening wall and doors proposed within its TPZ. The extent of work represents a *Major Encroachment* as defined by AS-4970 and tree sensitive methods should be used for works within its TPZ to minimise adverse impacts. The tree should be protected in accordance with Tree Protection Specification (**Appendix 4**) and the Typical Tree Protection Details (**Appendix 5**).

4.1.2 The supplied plans show Trees 10A is to be removed as part of the proposed landscape treatment. A new tree planting could replace the loss of the loss of canopy cover and amenity resultant from tree removal within a short timeframe.

## 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 viewed 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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## 6.0 BIBLIOGRAPHY & REFERENCES

Barrell (1995), 'Pre-development Tree Assessments', in *Trees & Building Sites, Proceedings of an International Conference Held in the Interest of Developing a Scientific Basis for Managing Trees in Proximity to Buildings*, International Society of Arboriculture, Illinois, USA, pp. 132-142

Dunster J, Smiley T, Matheny N, Lilly S (2013), *Tree Risk Assessment Manual*, Champaign, Illinois, International Society of Arboriculture, USA

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NSW Office of Environment and Heritage's Atlas of NSW Wildlife (2011), *BioNet Atlas of NSW Wildlife*

Simon, Dormer & Hartshorne (1973), *Lowson's Botany*, Bell & Hyman, London

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 a comprehensive site inspection during May 2020.
- 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>5</sup> The inspection was limited to a visual examination of the subject tree(s) from ground level only. No internal diagnostic or tissue testing was undertaken as part of this assessment. Trees outside the subject site were assessed from the property boundaries only.
- 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. Trees not shown on the supplied plans have been plotted in their **approximate location only**.
- 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>5</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.

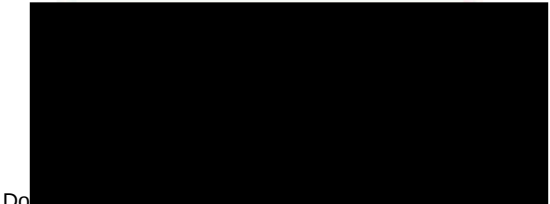
| Landscape Significance | Description                                                                                                                                                                                                                                                                                                                            |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 outlined 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.                                                                                                                                                                                                                                            |
| Moderate               | The subject tree is of significant size, scale or makes a significant contribution to the canopy cover of the locality.                                                                                                                                                                                                                |
|                        | 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.                                                                                                                                                                                                                                 |
| Low                    | The subject tree is a good representative of the species in terms of aesthetic value.                                                                                                                                                                                                                                                  |
|                        | 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.                                                                                                                                                                                                                                                  |

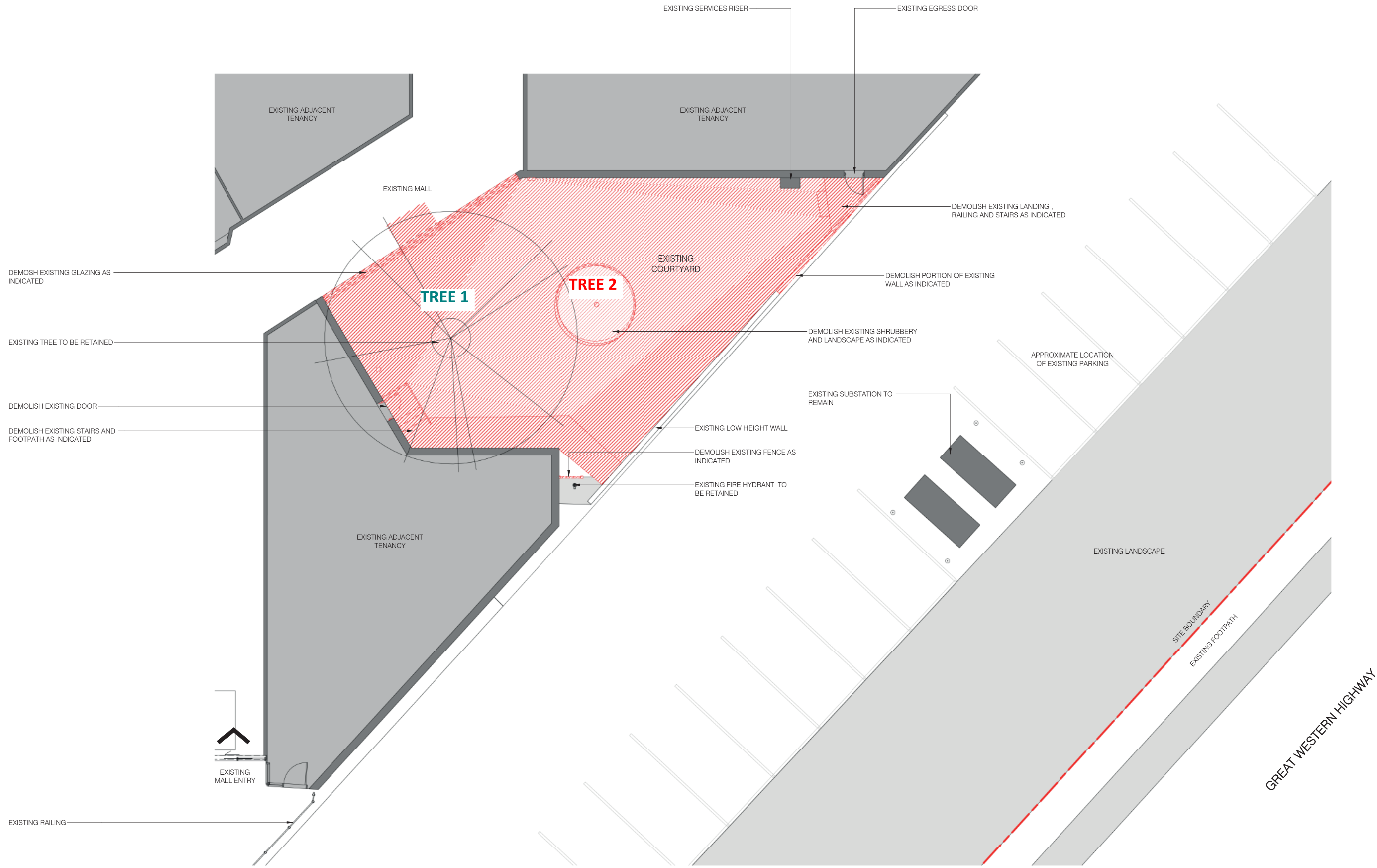
- 1.10 Retention Value:** Retention Value was based on the subject tree's Useful Life Expectancy and Landscape Significance. The Retention Value was modified where necessary to take in consideration the subject tree's health, structural condition and site suitability. The subject tree(s) has been allocated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





EXISTING / DEMO GROUND FLOOR PLAN - COURTYARD 1 : 100

LEGEND

-  to be demolished
-  to be retained
-  demolished trees
-  existing trees
-  boundary line

\*Note: all existing areas, levels, heights and dimensions shown are approximate only. Dimensions to be confirmed on site. Wall thickness assumed at 300mm.

| no. | date     | ISSUE / revision | by  |
|-----|----------|------------------|-----|
| A   | 16/12/20 | DA ISSUE         | HSY |

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project - address  
LENNOX VILLAGE - CENTRE REFURBISHMENT  
PYRAMID STREET, EMU PLAINS, NSW, 2750

drawing title  
EXISTING / DEMOLITION PLAN - COURTYARD

job no.  
2020-054

|             |              |       |     |
|-------------|--------------|-------|-----|
| drawing no. | DA03         | issue | A   |
| scale @ A1  | As Indicated | drawn | ESC |

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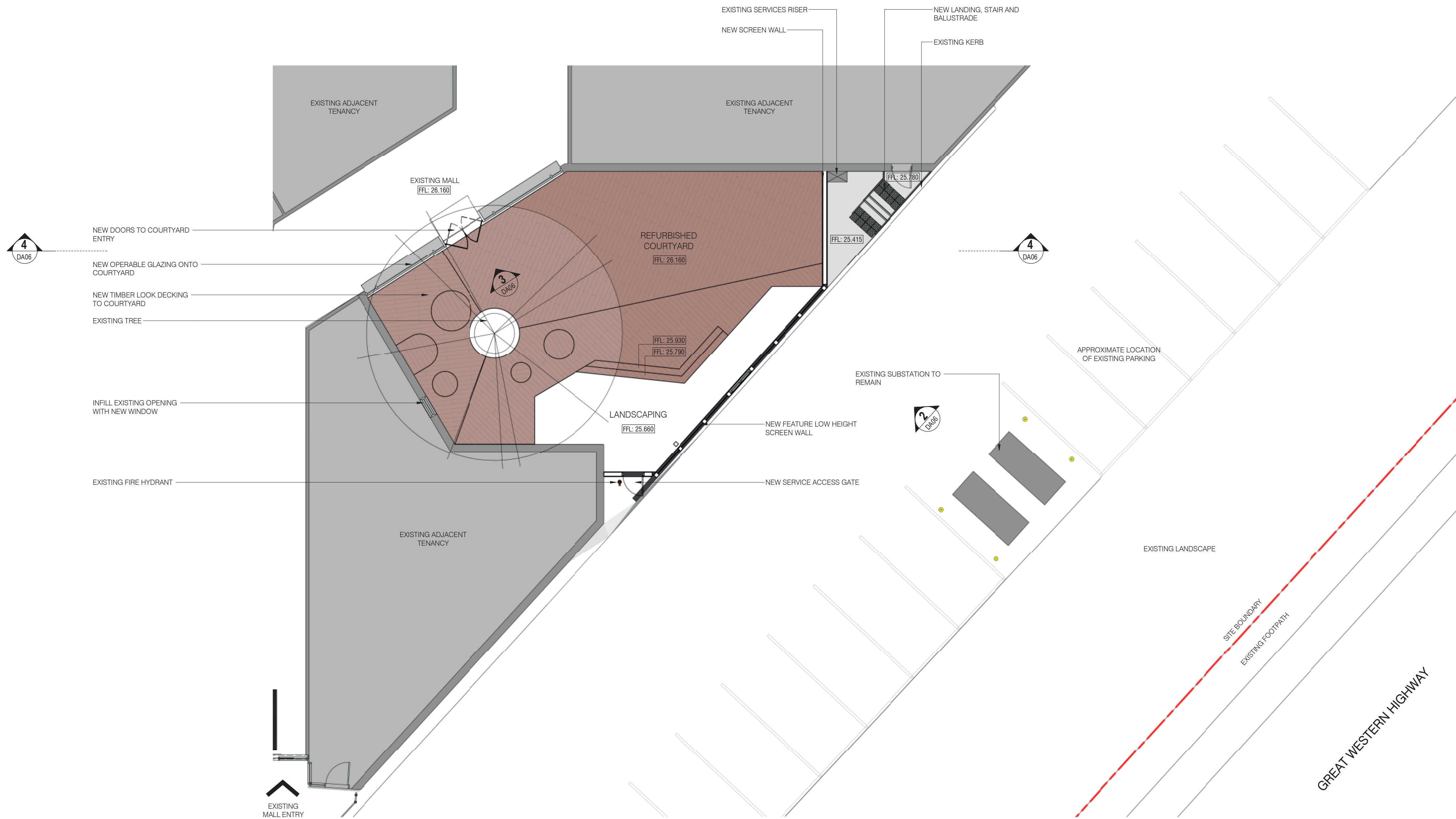
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PROPOSED GROUND FLOOR PLAN - COURTYARD 1 : 100

LEGEND

- existing
- existing trees
- boundary line

\*note: all existing areas, levels, heights and dimensions shown are approximate only. dimensions to be confirmed on site. wall thickness assumed at 300mm.

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project - address  
LENNOX VILLAGE - CENTRE  
REFURBISHMENT  
PYRAMID STREET, EMU  
PLAINS, NSW, 2750

drawing title  
PROPOSED GROUND FLOOR  
PLAN - COURTYARD

job no.  
2020-054

|             |              |       |     |
|-------------|--------------|-------|-----|
| drawing no. | DA04         | issue | A   |
| scale @ A1  | As Indicated | drawn | ESC |

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### Appendix 3: Plates

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**Plate 1:** Tree 10 (left) and Tree 10A (right)

## Appendix 4: 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.

The site-specific requirement for mulching, irrigation, the location of tree protection fencing and temporary access, and other specific tree protection measures shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works.

### 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.

### 1.2 Tree Protection Zone

The tree 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 and trenching
- Mechanical removal of vegetation
- Movement of natural rock
- 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.

### 1.3 Site Management

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

### 1.4 Trunk Protection

Trunk protection shall be installed on Trees 10. 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.

### 1.5 Ground Protection

Pedestrian, vehicular and machinery access within a TPZ 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**).

### 1.6 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 authorized 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 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 1.7). Machinery shall work in conjunction with a spotter to guide the machinery operator and ensure that the ground surface/tree roots beneath the structure/pavement are not disturbed/damaged by demolition works. Machinery should not contact any part of a tree. Wherever possible, footings or elements below grade shall be retained to minimise disturbance to roots.

Small structures to be demolished within a TPZ shall be carefully broken up in small sections using a hand-operated pneumatic/electric breaker and waste material removed by hand/hand tools. Large structures to be demolished within the TPZ shall be undertaken within the footprint of the existing structure ('top down, pull back') and away from the trees.

When removing slab/pavement sections within TPZ, machinery shall work backwards out of the TPZ to ensure machinery remains on un-demolished sections of slab at all times. Existing sub-base materials within a TPZ shall remain in-situ and (and reused) where possible. If the existing sub-base is to be removed, these works shall be undertaken by hand/hand tools ensuring that tree roots are retained and protected.

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. Where the Project Arborist determines that the tree is using underground elements (i.e footings, pipes, rocks etc.) for support, these elements shall be left in-situ.

### 1.9 Underground Services

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 required by the Project Arborist. Excavation using compact machinery (<2t) 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 1200mm below existing grade. Excavations for starting and receiving pits for boring equipment shall be located outside of the TPZ areas or located to avoid roots (>25mmØ) as deemed necessary by the Project Arborist.

### 1.10 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. These methods include hand, airspade or hydrovac excavation. Where approved by the Project Arborist, excavation using compact machinery fitted with a flat bladed bucket is permissible. Unless specified otherwise, excavation using compact machinery (<2t) shall 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. Hand 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.



