

REVISION: E (Reference: 2308_b).

PROJECT ADDRESS:

Hickson Road South. Combined Stages 3 + 4.
Barangaroo, Sydney, NSW.

Review of Environmental Factors



INTRODUCTION AND SUMMARY:

- i. This report has been prepared by insert Elke Haege Thorvaldson, consulting arborist AQF Level 5, to support the Review of Environmental Factors (**REF**) for the Hickson Road South upgrade and refurbishment (the Activity).
- ii. The **Hickson Road South** (refer Figure 1: Locality Plan – Hickson Road South 240059-00-REF-C01.31) upgrade and refurbishment design comprises of the upgrade of Hickson Road from the northern side of the Napoleon Street intersection connecting to the existing road upgrade north of the High Street Steps, along with utility upgrades running adjacent to Barton Street and intersection upgrades.
- iii. This arboricultural impact assessment (**AIA**) report package is in relation to 16 existing street trees along Hickson Road and the proposal of new trees within the streetscape as part of the works.
- iv. The stage 3 area including existing trees were assessed on 2 August 2023 and both stage 3 and stage 4 were assessed on 28 October 2025 and 28 August 2025 by Elke Haege Thorvaldson, *AQF Level 5 consulting arborist* (the project arborist).
- v. The landscape and upgrade construction works proposal includes the **retention** of all the existing trees (of which there are 16 existing trees in total comprising:
 - **4** existing mature *Ficus macrocarpa var Hillii* (Hill's Weeping Fig) trees,
 - **11** existing juvenile *Liriodendron tulipifera* (Tulip Trees) and
 - **1** *Ficus macrophylla* (Moreton Bay Fig) within a raised planter in the forecourt of 38 Hickson /road / The Bond Plaza.

- vi. The landscape proposal includes the following proposed **new trees**:
- **33** new trees, proposed to be *Lophostemon confertus* (Brush Box),
 - **11** new palms, proposed to be *Livistona australis* (Cabbage Tree Palm) and
 - **64** *Fraxinus pennsylvanica* 'Urbanite' (Urbanite Ash) trees proposed to be planted in a double avenue with 5m spacings, which is a continuation of the existing double avenue of the same tree species installed along Hickson Road North (the adjacent site that connects to the Barangaroo Metro Station).
- vii. This arboricultural impact assessment describes the forecast impacts to the existing trees from the proposed upgrade works and the recommended tree protection measures.
- viii. This report also includes advice around the soil and surrounding treatment for the proposed new trees.
- ix. This arborist impact assessment package includes this written report, the tree data schedule (2 x A3 pages) and the arborist impact plans at 1:200 scale).
- x. In summary, the proposal is of acceptable impact to the overall existing trees, provided the recommendations are adhered.

ASSESSMENT AND REPORT PREPARED BY: Elke Haege Thorvaldson AILA FRLA, MAIH



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PROJECT TEAM:

Client: Infrastructure NSW, Project Lead and Engineering: Enspire Solutions Pty Ltd

Stage 3: Lendlease Pty Ltd

Consulting arborist AQF Level 5: Elke Haege Thorvaldson

Landscape Architecture: Hassell.

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The information contained in this assessment report is considered accurate at the time of tree inspection.

The condition of the trees and site conditions may change over time.



STAGING PLAN - HICKSON ROAD SOUTH
SCALE 1:1000



LOCALITY PLAN - HICKSON ROAD SOUTH
SCALE 1:1000

				Road HICKSON ROAD SOUTH REF PACKAGE CIVIL ENGINEERING PACKAGE
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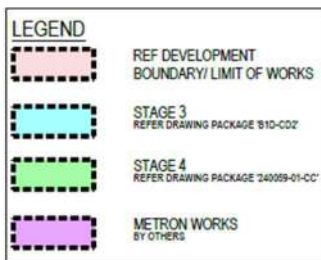


Figure 1. The above is a portion of the Enspire Context Staging Plan and Locality Plan – Hickson Road South 240059-00-REF-C01.31 showing the REF Development Boundary / Limit of Works. Source: Enspire Solutions Pty Ltd. Date provided: 29.10.25.

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1 Site Background

- 1.1 Elke Haege Thorvaldson visually assessed and inspected the trees from ground level on 2 August 2023, 28 August 2025, and 28 October 2025. The Visual Tree Assessment Method was used (after Mattheck 8.4 p 118, fig. 74).
- 1.2 The arborist impact assessment component of this report pertains to the existing 16 street trees described in this report.
- 1.3 Landscape and growing context: The street trees all have pavement surrounding all sides.
- 1.4 Trees T1-T10 and T16 are all relatively newly planted Tulip Trees with new unit paver on concrete base to surrounds.
- 1.5 Trees T11-14 are Hill's Figs with bitumen surround, and T15 is a Ficus macrophylla (Moreton Bay Fig) is planted within a raised garden bed adjacent 38 Hickson Road and The Bond Plaza.
- 1.6 Of particular contextual note: trees T11-T14 are mature, large and shade providing Ficus trees and are growing just west of a natural sandstone cliff / cutting which is along the eastern side of the footpath. This sandstone cutting has been observed as typically a wet sandstone wall (at all 3 site assessments). This likely contributes to these trees' ground conditions and canopy shape and extent.
- 1.7 Shade and Solar Exposure: It is noted that the southern portion of the subject site where trees T1-T10 and T16 are growing is a shaded streetscape due to tall adjacent buildings. .
- 1.8 The Ficus Trees T11-T14 currently are exposed on the west and are assessed as being able to tolerate such conditions.
- 1.9 New trees proposed north of Barton Street are predicted to be growing with western shade (due to a proposed building on the west yet to be built). Currently the streetscape north of Barton Street is very exposed to both sun and wind from all directions except east.

2 Assessment Methodology and Background

2.1 The following industry accepted, and recognised methodologies have been used to visually assess the health and condition of the tree. Results are shown in [Table A](#).

SUMMARY OUTLINE OF TREE ASSESSMENT METHODOLOGIES			
Refer to:	Category of Assessment	Methodology Name + description	Sources
Table A Arb_601	Visual Tree Assessment (VTA). On site measurements and calculations	Visual Tree Assessment (VTA) Procedure and strategy. Refer to Table A ¹	<i>Claus Mattheck and Breloer 2006. And David Lonsdale's Tree Assessment Strategy.</i>
Table A	Landscape Significance Rating	Determining Landscape Significance Rating	<i>Developed from: Earthscape Horticultural Services, December 2011</i>
Table A	SULE	Safe Useful Life Expectancy Procedure	<i>Jeremy Barrell 1996 from BS5837</i>
Table A	Retention Value	Determining Retention Value	<i>Developed from: Earthscape Horticultural Services, December 2011²</i>
Arborist Plan + Table A	Tree Protection Zones	Tree Protection Zones (TPZ's) and Structural Root Zones (SRZ's)	<i>AS 4970, Protection of Trees on Development Sites.</i>
Table A	Tree Retention Priorities	Analysing the implications for Proposed Development	<i>Earthscape Horticultural Services, December 2011</i>
	Australian Standards AS4790-2009	Protection of Trees on Development Sites. Determining permissible tree protection zones, encroachments, protection, fencing, incursions, terminology, and recommendations	<i>AS 4790-2009</i>
	QTRA. Quantified Tree Risk Assessment	QTRA quantifies the risk of significant harm from tree failure in a way that enables tree managers to balance safety with tree values and operate to predetermined limits of tolerable or acceptable risk.	<i>QTRA. Risk management principles to tree safety management. ³</i>

1. Table above outlines the Methodologies used.

¹ Claus Mattheck and Helge Breloer. Visual Tree Assessment and David Lonsdale's Tree Assessment Strategy.

² Modified from: Couston, Mark and Howden, Melanie, 2001, Tree Retention Values table, Footprint Green Pty., Ltd., Sydney, Australia.

³ [Directory of Licensed Users \(qtra.co.uk\)](http://www.qtra.co.uk)

3 Australian Standards and Data Collection Documents

- 3.1 The Australian Standard, *AS 4790-2009 'Protection of Trees on Development Sites* has been used as the guiding standard reference to provide recommendations of the assessed trees.
- 3.2 The *Australian Standard, AS 4373-2007 'Pruning of Amenity Trees'* has also been referred to in this assessment within the recommendations section.

Assessment particulars:

- 3.3 A visual tree assessment inspection from ground only was conducted. No invasive or destructive testing was conducted. Any changes to the proposed works will need tree re-assessment.
 - 3.4 The proposed REF landscape design plans (landscape plans by Hassell) as well as coordination with the Civil engineering design by Enspire have been used to assess the tree impacts and to create the Arborist impact plans.
 - 3.5 For existing trees, under the pavement tree rooting extent assessment was not possible given the surrounding hard-pave for trees T1 to T15. As a result, any works within any of the tree protection zones (TPZ's) of trees, particularly T11 – T14 will need to include project arborist site supervision and sign off and detailed Tree Protection Plan Methodology is recommended.
 - 3.6 New pavement is proposed near and around trees T10-T16.
-

4 Tree Data.

- 4.1 Refer to the *Table A Schedule* on the following page for the tree condition description and tree data. Provided on the next pages in this report is the following schedule:
 - a. *Table A: Tree Schedule – A3 size, 2 sheets.*
Provides tree reference number, detail on health and structure, SULE rating, landscape, and retention rating, SRZ's, TPZ's⁴ and relevant encroachment percentages.

Refer also to the '*Recommendations + Discussion*' Chapter 6 in this report.

5 Arborist Impact Plans:

- 5.1 The Arborist Impact Plans have been created on an A1 sized sheet at 1:200 scale:
-

⁴ TPZ and SRZ's are calculated using AS4970-2009 (adapted from Matheney and Clarke's British Standard adaption method, 1991).

Reference	Id #	Species, Common Name	Age class	Estimated Height (m)	Trunk Diameter 1.4m DBH	Proposal to: retain and protect or remove	AREA (m)				Diameter above root crown (RCB)	Health and Structural Condition	SULE (Appendix 2)	Landscape Rating (Appendix 1)	Retention Rating (Appendix 5)	Site Location	Refer to Appendix 4a and 4b				Refer to report.																	
							N	E	S	W							TPZ (m) Radius	TPZ (m2) Area	SRZ Radius (m)	SRZ (m2) Area zone	% TPZ Encroachment	% SRZ encroachment																
West side of Hickson Road.																																						
1		<i>Liriodendron tulipifera</i> Tulip Tree	J	6.5	0.08	Retain and Protect	2	2	2	2	0.11	Newly planted (1-5 years) with new unit pavers and tree pit surround. Tall, straight form. Crown lifted to approx. 2m high. New buds present. **Assessment conducted in mid-winter and no leaf growth to positively identify species of all deciduous trees.	Medium to Long (30-40)	Moderate	Moderate 4	Street tree	0.96	2.90	1.31	5.39	0%	0%																
2		<i>Liriodendron tulipifera</i> Tulip Tree	J	6.5	0.08	Retain and Protect	2	2	2	2	0.11	Newly planted (1-5 years) with new unit pavers and tree pit surround. Tall, straight form. Crown lifted to approx. 1.5m high. New buds present. No tree stakes.	Medium to Long (30-40)	Moderate	Moderate 4	Street tree	0.96	2.90	1.31	5.39	0%	0%																
16		<i>Liriodendron tulipifera</i> Tulip Tree	J	5	0.06	Retain and Protect	1.7	1.7	1.7	1.7	0.12	Newly planted. Form and age of tree marries with T1 and T2 and visually appears as part of the streetscape typology. Proposed works immediately adjacent: to the north and proposal to move pram ramp to north of tree. Likely to require shifting (transplant) or tree replacement slightly south of current location (TBA)	Medium to Long (30-40)	Moderate	Moderate 4	Street tree adjacent works zone	0.72	1.63	1.36	5.80	Allowable if arborist recommendations suitably followed. Refer Arborist report. Proposed new pavement and kerb alignment and pram ramp.																	
East side of Hickson Road																																						
3		<i>Liriodendron tulipifera</i> Tulip Tree	J	3.5	0.06	Retain and Protect	0.8	0.8	0.8	0.8	0.07	Poor form. Lean to west (over road), extensive bark damage (stripped/torn) for a 1m length. Moderate likelihood of developing inherent structural defects, and greater susceptibility and stunting. All tree stakes and ties have been removed. Epicormic shoots from the base indicating possible physical impact at root crown base. Recommendation for pruning and/or replacement (of same species and size) to allow tree to contribute to the avenue of same species / same size as intended. Note: works zone not at this location.	Short (<10)	Low	Low 6	Street tree East Side	0.72	1.63	1.08	3.69	0%	0%																
4		<i>Liriodendron tulipifera</i> Tulip Tree	J	4.5	0.07	Retain and Protect	1.2	1.2	1.2	1.2	0.08	T3 to T10 are all part of the same planting type, installation size, age, and species and form a single species avenue. T4: One tree stake missing. Crown lifted to 2.3m. One snapped branch and lean towards the street (west).	Medium (15-35)	Moderate	Moderate 5	Street tree East Side	0.84	2.22	1.15	4.12	0%	0%																
5		<i>Liriodendron tulipifera</i> Tulip Tree	J	4.5	0.08	Retain and Protect	1	1	1	1	0.145	Better visual form and condition than T3 and T4, however one tear out is present on the eastern side (400mm long). Tree has moderate likelihood of overcoming this wound.	Medium (15-35)	Moderate	Moderate 5	Street tree East Side	0.96	2.90	1.47	6.80	0%	0%																
6		<i>Liriodendron tulipifera</i> Tulip Tree	J	5	0.07	Retain and Protect	1	1	1	1	0.085	New shoots and new buds present. One snapped branch present but no tear out to main trunk. Crown lifted to 1.6m. Possible pruning for bicycle clearance	Medium (15-35)	Moderate	Moderate 4	Street tree East Side	0.84	2.22	1.18	4.34	0%	0%																
7		<i>Liriodendron tulipifera</i> Tulip Tree	J	5.5	0.08	Retain and Protect	1.2	1	3	1	0.09	Two tree stakes missing. One small tear out in trunk plus several taller end branches have snapped. Recommend to cleanly prune cut snapped /damaged branches (which some are currently 'hanging'). Physical damage is occurring along the roadway (possibly by truck, bus movements).	Medium (15-35)	Moderate	Moderate 5	Street tree East Side	0.96	2.90	1.20	4.55	0%	0%																
8		<i>Liriodendron tulipifera</i> Tulip Tree	J	5.5	0.08	Retain and Protect	1	1	2	3	0.09	Better form than trees T3-T7, likely because this tree appears to be better protected (physically) by the concrete pedestrian refuge (limiting truck/bus/car damage). Crown lifted to 1.6m. Possible pruning for bicycle clearance.	Medium (15-40)	Moderate	Moderate 4	Street tree East Side	0.96	2.90	1.20	4.55	0%	0%																
9		<i>Liriodendron tulipifera</i> Tulip Tree	J	6.5	0.07	Retain and Protect	1.2	1.2	1.2	1.4	0.1	One tree stake is missing. One round present at the root crown base which is now occluding. Tree has a tag (#0649). Possible pruning for bicycle clearance	Medium (15-35)	Moderate	Moderate 5	Street tree East Side	0.84	2.22	1.26	4.97	0%	0%																
10		<i>Liriodendron tulipifera</i> Tulip Tree	J	5.5	0.09	Retain and Protect	1.2	1.2	1.2	1.2	0.1	T10 is much taller than trees T3-T8. Located under a street light. Pruned for clearance. A sandstone wall is adjacent to the east of tree T10. 2 x tree stakes missing. Crown lifted to 1.9m. Tree has a tag (#0648). Possible pruning for bicycle clearance	Medium (15-35)	Moderate	Moderate 5	Street tree East Side	1.08	3.66	1.26	4.97	0%	0%																
<table border="0"> <tr> <td style="border: 1px solid black; padding: 5px;"> Age Class ST (Senescent) OM (Over Mature) M (Mature) SM (Semi-Mature) J (Juvenile) </td> <td style="border: 1px solid black; padding: 5px;"> (Diameter at Breast Height) DBH is used in TPZ calculation. </td> <td style="border: 1px solid black; padding: 5px;"> Dia. RCB is used in SRZ calculation </td> <td style="border: 1px solid black; padding: 5px;"> Crown Density PFC Dense >90% Normal 70-90% Slightly thin'g 60-70% Thinning 40-60% SP sparse <40% PFC = projected foliage cover </td> <td style="border: 1px solid black; padding: 5px;"> SULE Long (> 40 Years) Medium (15-40 Years) Short (5-15 Years) T (Transient < 5) H (Hazardous/Dead) </td> <td style="border: 1px solid black; padding: 5px;"> LANDSCAPE RATING S (Significant) VH (Very High) H (High) M (Moderate) L (Low) VL (Very Low) IN (Insignificant) Ex (Exempt TPO) T (Threatened S) </td> <td style="border: 1px solid black; padding: 5px;"> Retention Rating H - high 1 to 3 Priority retain M - moderate 4 to 5 Consider retain L - low 6 Consider Removal VL - very low 7 Priority Removal </td> <td style="border: 1px solid black; padding: 5px;"> Site Location O Inconspicuous /obscured location M Moderate location, not obscuring P Prominent position HV Highly Visible from street/surrounds E (Edges) Periphery of site WP Within Development Potential OB Outside Boundary </td> <td style="border: 1px solid black; padding: 5px;"> Measured in CAD. Encroachment based on root zone encroached as a % of TPZ. Canopy incursion based on incursion as a % of canopy. Refer arborist report for details. </td> </tr> <tr> <td colspan="2" style="border: 1px solid black; padding: 5px;"> Proposal to Retain </td> <td colspan="2" style="border: 1px solid black; padding: 5px;"> Proposal to remove (with approval) </td> <td colspan="2" style="border: 1px solid black; padding: 5px;"> Proposal to transplant </td> <td colspan="2" style="border: 1px solid black; padding: 5px;"> TPZ minimum is 2m and maximum is 15m diameter </td> </tr> </table>																						Age Class ST (Senescent) OM (Over Mature) M (Mature) SM (Semi-Mature) J (Juvenile)	(Diameter at Breast Height) DBH is used in TPZ calculation.	Dia. RCB is used in SRZ calculation	Crown Density PFC Dense >90% Normal 70-90% Slightly thin'g 60-70% Thinning 40-60% SP sparse <40% PFC = projected foliage cover	SULE Long (> 40 Years) Medium (15-40 Years) Short (5-15 Years) T (Transient < 5) H (Hazardous/Dead)	LANDSCAPE RATING S (Significant) VH (Very High) H (High) M (Moderate) L (Low) VL (Very Low) IN (Insignificant) Ex (Exempt TPO) T (Threatened S)	Retention Rating H - high 1 to 3 Priority retain M - moderate 4 to 5 Consider retain L - low 6 Consider Removal VL - very low 7 Priority Removal	Site Location O Inconspicuous /obscured location M Moderate location, not obscuring P Prominent position HV Highly Visible from street/surrounds E (Edges) Periphery of site WP Within Development Potential OB Outside Boundary	Measured in CAD. Encroachment based on root zone encroached as a % of TPZ. Canopy incursion based on incursion as a % of canopy. Refer arborist report for details.	Proposal to Retain		Proposal to remove (with approval)		Proposal to transplant		TPZ minimum is 2m and maximum is 15m diameter	
Age Class ST (Senescent) OM (Over Mature) M (Mature) SM (Semi-Mature) J (Juvenile)	(Diameter at Breast Height) DBH is used in TPZ calculation.	Dia. RCB is used in SRZ calculation	Crown Density PFC Dense >90% Normal 70-90% Slightly thin'g 60-70% Thinning 40-60% SP sparse <40% PFC = projected foliage cover	SULE Long (> 40 Years) Medium (15-40 Years) Short (5-15 Years) T (Transient < 5) H (Hazardous/Dead)	LANDSCAPE RATING S (Significant) VH (Very High) H (High) M (Moderate) L (Low) VL (Very Low) IN (Insignificant) Ex (Exempt TPO) T (Threatened S)	Retention Rating H - high 1 to 3 Priority retain M - moderate 4 to 5 Consider retain L - low 6 Consider Removal VL - very low 7 Priority Removal	Site Location O Inconspicuous /obscured location M Moderate location, not obscuring P Prominent position HV Highly Visible from street/surrounds E (Edges) Periphery of site WP Within Development Potential OB Outside Boundary	Measured in CAD. Encroachment based on root zone encroached as a % of TPZ. Canopy incursion based on incursion as a % of canopy. Refer arborist report for details.																														
Proposal to Retain		Proposal to remove (with approval)		Proposal to transplant		TPZ minimum is 2m and maximum is 15m diameter																																

Reference		(m)	(m)	AREA (m)				Refer to Appendix 4a and 4b				Refer to report.											
Id #	Species, Common Name	Age class	Estimated Height (m)	Trunk Diameter 1.4m DBH	Proposal to: retain and protect or remove	Canopy spread (m)				Diameter above root crown (RCB)	Health and Structural Condition	SULE (Appendix 2)	Landscape Rating (Appendix 1)	Retention Rating (Appendix 5)	Site Location	TPZ (m) Radius	TPZ (m2) Area	SRZ Radius (m)	SRZ (m2) Area zone	% TPZ Encroachm ent	% SRZ encroachm ent		
						N	E	S	W														
Hickson Road. East side and north of the Waterman Quay intersection.																							
11	<i>Ficus microcarpa x Hillii</i> Hill's Weeping Fig	M	18.7	0.35	Retain and Protect	3	3	4	5	0.84	Root crown base measurement includes the buttressing root flare. Tree is located at the end of the new granite paving and has asphalt paving around. Many in ground services run under/alongside this T11-T14. T11-T14 are all situated adjacent a tall sandstone natural cutting with sandstone block wall on top (to the east) which likely provides a higher humidity, sheltered/protected growing environment and likely ground water. T11-14 canopies are joined and visually read as one green bank of foliage and provide a shaded environment. Noting the mature age of these trees and high pedestrian/urban location, many scars and superficial marks are on the trunks of these trees and associated reaction wood regrowth. A black metal palisade fence at the kerb is likely to have protected the trees from vehicle traffic. Trees are likely at their full size (given local stunting constraints and age and current size). To replant Ficus trees in this location would be very slow and difficult to establish given limited soil volume available and the additional constraints these trees have compensated for during their development.	Long (>40)	High	High	2	Street tree	4.20	55.42	3.08	29.72	T11 - T14: All new flexible permeable pavement and new unit pavers proposed within the structural root zone (SRZ) of trees T11 to T14. All works within the SRZ to be under project arborist supervision and direction. Refer arborist report recommendations.		
12	<i>Ficus microcarpa x Hillii</i> Hill's Weeping Fig	SM to M	12	0.28	Retain and Protect	1	0	3	4	0.69	T12 is shorter at 12m than T11. T12 has had a limb removed on the east (of 150mm dia. Which is now displaying epicormic shooting). Softfall/no fines rubberised bonded material has been added to the bases of all trees (likely to take up possible trip hazards). A street light is to the north approximately 2.5m away between T12 and T13. Electrical cables run along and within the canopies, however the tree canopies all have been pruned for clearances around this overhead cable.	Long (>40)	High	High	2	Street tree	3.36	35.47	2.83	25.19			
13	<i>Ficus microcarpa x Hillii</i> Hill's Weeping Fig	SM to M	13	0.34	Retain and Protect	4	0	0	6	0.64	A more prominent lean towards the west occurs and tree is located a bit more centrally within the footpath. Asphalt trenching /patching is evident along both sides of the tree T13.	Long (>40)	High	High	3	Street tree	4.08	52.30	2.74	23.65			
14	<i>Ficus microcarpa x Hillii</i> Hill's Weeping Fig	SM to M	9.6	0.32	Retain and Protect	4	2	4	3	0.42	Extensive 'tear out' wound on the northern side of dominant trunk at the base to 1.5m up with frass present on open wound (which is starting to occlude indicating wound is not new). A fence is present along the western edge (near the kerb). Tree has been pruned on the western some years ago. Tree is located and marks the base of the Hickson Rd Steps. Foliage cover is dense with colour, size and form indicating healthy tree, albeit in fruit. T14 receives greater northern light/exposure than T11-T13. Retention of this tree, as well as the stand of Hill's Ficus is recommended, however if works encroach and impact too much (TBC), then replacement of the same species is recommended.	Medium (30-40)	High	High	3	Street tree	3.84	46.32	2.30	16.60			
15	<i>Ficus macrophylla</i> Moreton Bay Fig	J to SM	6	0.32	Retain and Protect	3	3	3	3	0.54	Located within a built up planter near 30 The Bond + 36A Hickson Rd Building courts/ open plaza. Some exposed roots visible and dry topsoil (recommend top up planter soil to cover roots and check watering/irrigation). Species has enough above ground space to develop and provide shade. The tree species typically has an umbrageous form. Tree in planter whilst species is appropriate, it will stunt within the planter.	Medium (30-40)	Moderate to High	Moderate	3	Plaza tree in planter	3.84	46.32	2.55	20.50		0%	0%
Age Class ST (Senescent) OM (Over Mature) M (Mature) SM (Semi-Mature) J (Juvenile)		(Diameter at Breast Height) DBH is used in TPZ calculation.				Dia. RCB is used in SRZ calculation		Crown Density PFC Dense >90% Normal 70-90% Slightly thin'g 60-70% Thinning 40-60% SP sparse <40% PFC = projected foliage cover		SULE Long (> 40 Years) Medium (15-40 Years) Short (5-15 Years) T (Transient < 5) H (Hazardous/Dead)		LANDSCAPE RATING S (Significant) VH (Very High) H (High) M (Moderate) L (Low) VL (Very Low) IN (Insignificant) Ex (Exempt TPO) T (Threatened S)		Retention Rating H - high 1 to 3 Priority retain M - moderate 4 to 5 Consider retain L - low 6 Consider Removal VL - very low 7 Priority Removal		Site Location O Inconspicuous /obscured location M Moderate location, not obscuring P Prominent position HV Highly Visible from street/surrounds E (Edges) Periphery of site WP Within Development Potential OB Outside Boundary		Measured in CAD. Encroachment based on root zone encroached as a % of TPZ. Canopy incursion based on incursion as a % of canopy. Refer arborist report for details.					
TPZ minimum is 2m and maximum is 15m diameter																							

6 Tree Impact, Results and Recommendations for existing trees

- 6.1 Elke Haege Thorvaldson, AQF Level 5 consulting arborist assessed 16 trees within the Stage 3 Hickson Road Upgrade, Barangaroo regarding the impact on the trees by the proposed road upgrade works, and provide recommendations for protection, or tree removal or tree transplantation within the works zones.
- 6.2 Trees T1-10 and T16 are all relatively recently planted (estimated at approximately 5-7 years old as of October 2025) with new unit paving surrounds installed. All trees are recommended to be retained and protected with tree protection zone fencing and signage to the extent of the canopy and/or tree pit opening (whichever the greater).
- 6.3 New Pavement is proposed near and/or around the following trees:
- 2 of the juvenile *Liriodendron tulipifera* (Tulip Trees) being T10 and T16 and
 - 4 of the mature *Ficus microcarpa* var. *Hillii* (Hill's weeping fig) being T11 – T14 .

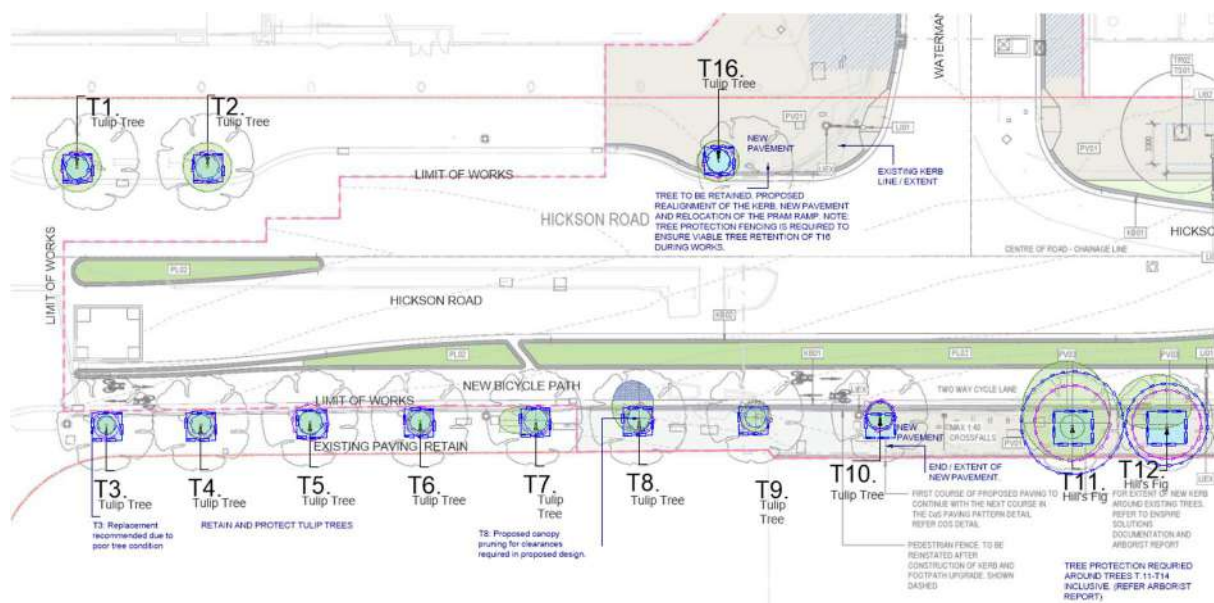


Figure 2. The southern portion of the subject site showing trees T1 to T16. Note: T14 - T15 are off the above diagram to the north (right).. The plan underlays the proposal plan with the Arborist Impact Plan over and survey below. In particular: no new paving is proposed around T1 to T9. New paving is proposed around trees 10 – T16. Canopy pruning is proposed for T8. Whilst T3 is recommended to be replaced due to poor condition (however this is to the discretion/action of City of Sydney council, as it is outside the scope area (denoted with a light red dashed line). Further: careful, on-site arborist supervision is required during the works around T11-14.

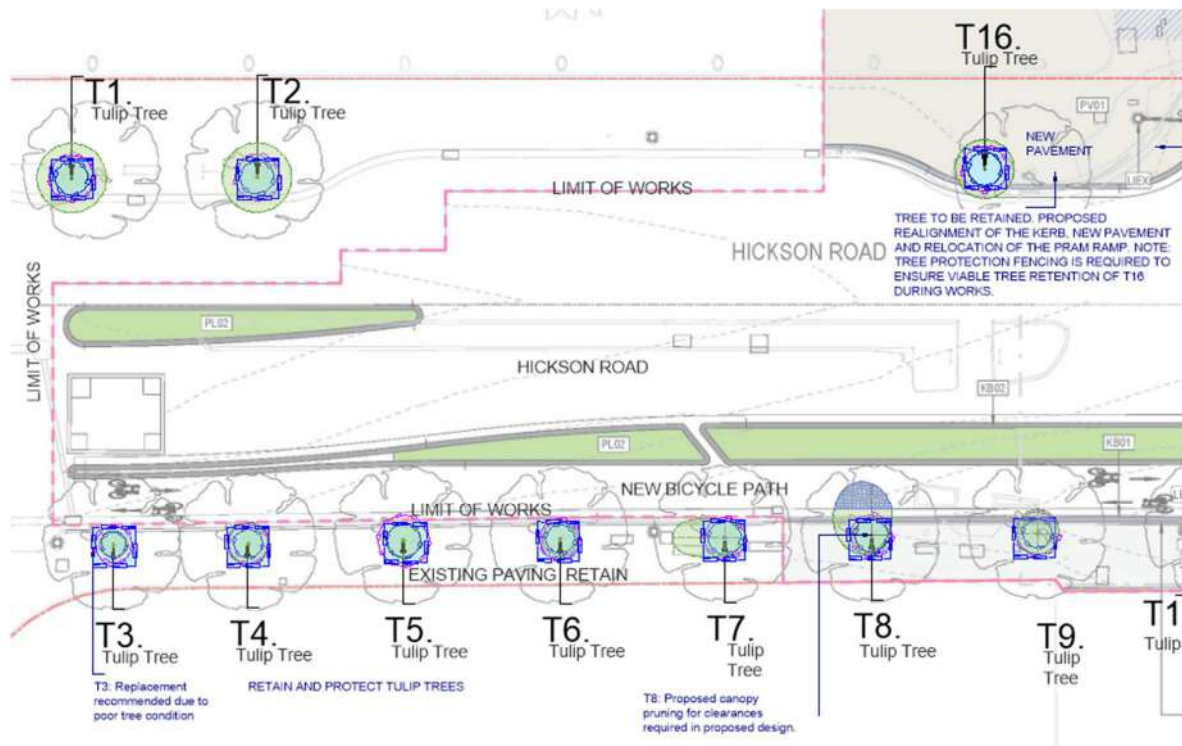


Figure 3. A portion of the proposal plan with the Arborist Impact Plan over and survey below showing the southern portion of the site. In particular: no new paving is proposed around T1 to T9. Canopy pruning is proposed for T8. Whilst T3 is proposed to be replaced due to poor condition, this is to the discretion/action of council as it is outside the scope area (denoted with a light red dashed line).



Figure 4. Photo above left is of T3 nearest the streetlights. The tree is in poor form and showing suckering at the base and a lean towards the roadside and a snapped central leader. Remedial pruning and removal of suckering stems is recommended. Date of photo: 28 October 2025. Source: ELKE

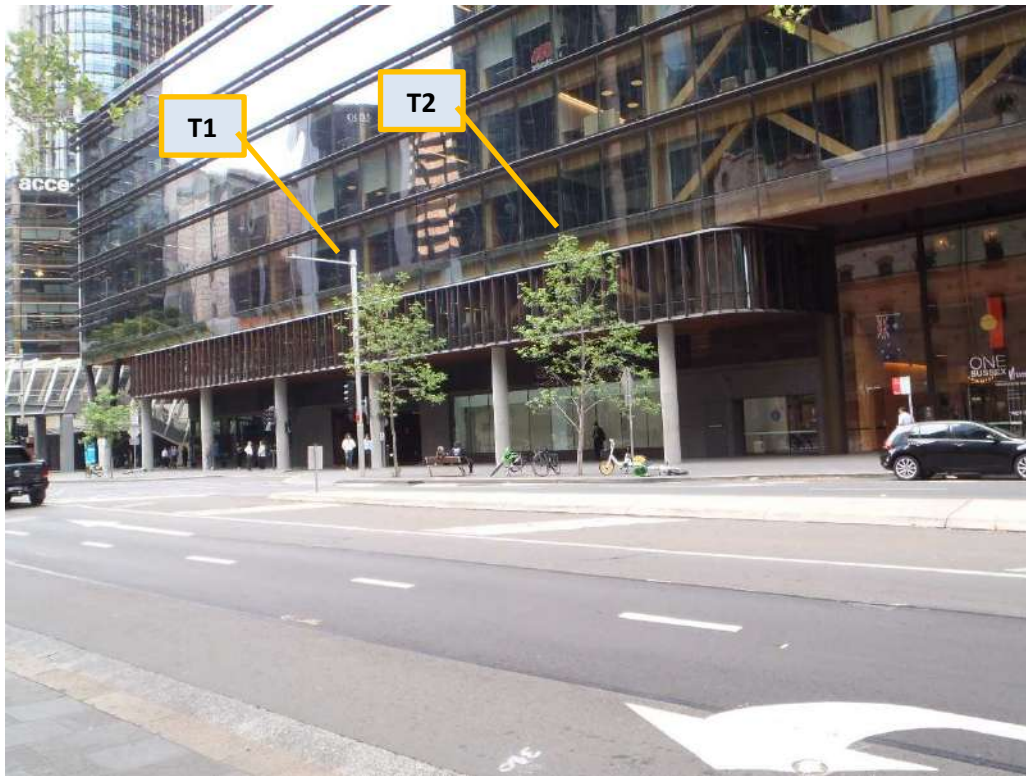


Figure 5. View looking south towards Napoleon Street with the existing Tulip Trees T3 to T6. The **Yellow** line on T6 shows a possible pruning location for bicycle clearance (recommended at 3m to 3.2m height clearance). Pruning is to be determined by the project arborist on site during the works for all trees.

The top photo shows T1 and T2 on the western side of Hickson Road and are also to be retained.

Date of photo: 28 October 2025. Source: ELKE

v

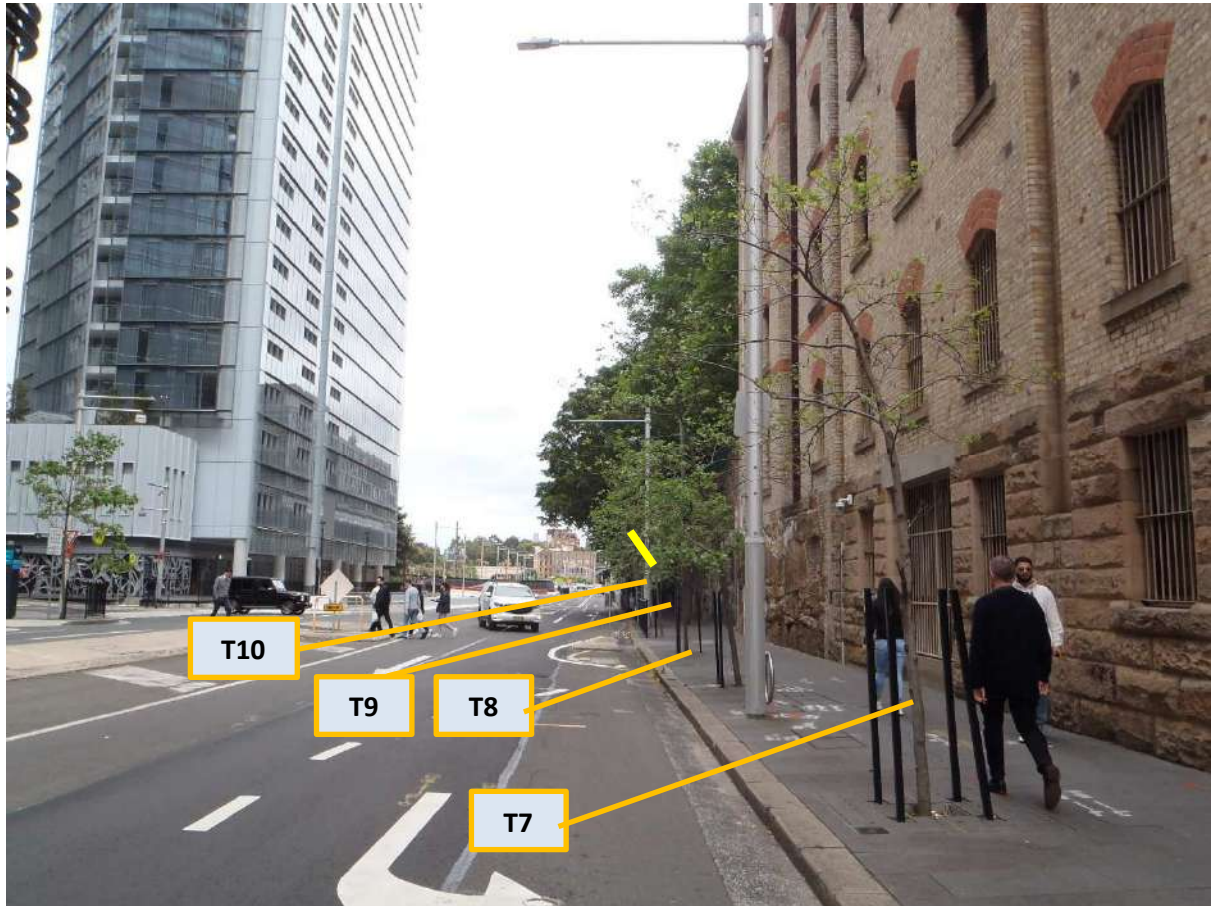
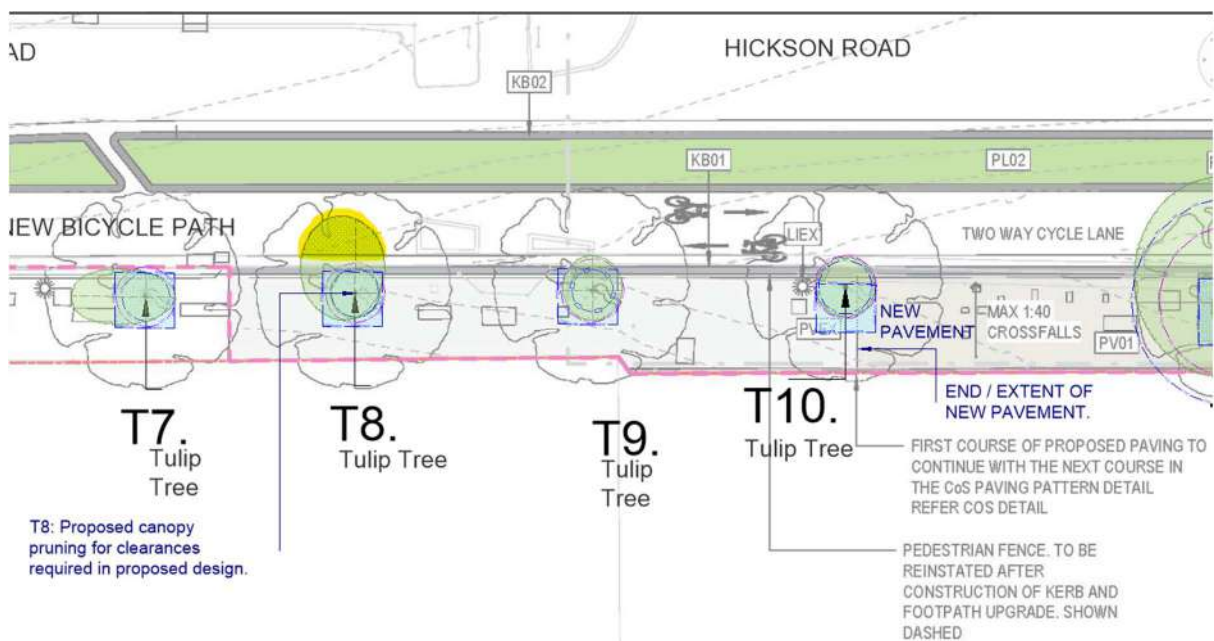


Figure 6. View looking north with the existing Tulip Trees T7 to T10. The **Yellow** line on T9-T10 shows a possible pruning location for bicycle clearance (recommended at 3m to 3.2m height clearance). Pruning is to be determined by the project arborist on site during the works for all trees. It is recommended that pruning for clearance to AS4373-2007 be implemented by an AQF Level 3 field practicing arborist. Date of photo: 28 October 2025. Source: ELKE



- 6.4 **Recommendation 1: Branch Pruning.** All pruning must be approved through council (City of Sydney) prior to, and under the supervision and sign off by the project consulting arborist (AQF Level 5), performed by an AQF Level 3 field practicing arborist and adhere to the Australian Standard 4373-2007 - Pruning of Amenity Trees. (*Refer to Appendix 6*). The below pruning recommendations are sought to be approved by City of Sydney.
- 6.5 Trees T9, T10 and T6 are to be assessed on site for possible branch pruning during the works period. Pruning would only be to provide bicycle lane height clearance (which is recommended to be 3m to 3.2m high). The pruning proposed is on the tree's west side only, and considered at the kerb line, with actual pruning back to the branch collar (per the Australian Standard 4373-2007). The pruning percentage of the canopy is to be estimated, in order to put the application to City of Sydney, and where the pruning is assessed as being <20% of the canopy, it is recommended approval through this REF be granted, provided the only reason for pruning is for bicycle use clearance of 3m to 3.2m.
- 6.6 Given the Tulip trees are still in juvenile form, they are likely to viably survive and compensate for the impact of pruning. (*Refer figures 5 and 6*).
- 6.7 Noting the poor condition of T3 and recommendation for remedial pruning to cleanly cut the snapped central leader, and to prune away the suckering shoots from the base of the tree, it is recommended this remedial pruning works be performed along with the bicycle lane clearance branch pruning described above, and by the same field-arborist, under the supervision and sign off by the project consulting arborist. (*Refer to Figure 4*).
-
- 6.8 **Recommendation 2: New pavement works around T16 and T10.** New paving is proposed around T16 and T10 both *Liriodendron tulipifera* (Tulip Trees). Noting the existing unit pavers meet / match the proposed unit pavers, it is assumed and recommended that the proposed new paving is to marry in, and as such, it is recommended that for T16 and T10 that the tree pit zone (approximately 1.36m x 1.36) and the Tree Protection Zone (TPZ) fencing are left undisturbed. This is assuming and recommending that the finished levels remain the same as existing. It is understood that the reason new pavement is needed around these already newly paved areas is due to the reconfiguration of the kerb and pram ramp, the extent of both (per the diagram below showing both the survey kerb and pram ramp and the proposed kerb and pram ramp) will not detrimentally impact trees T16 and T10.



Figure 7. T10. The proposed new unit pavement is to 'marry in' to the existing unit pavers in the photo above. The photo above is looking north with T10 in the foreground. The Hill's Figs are in the background being: T11 - T14. Date of photo: 28 October 2025. Source: ELKE

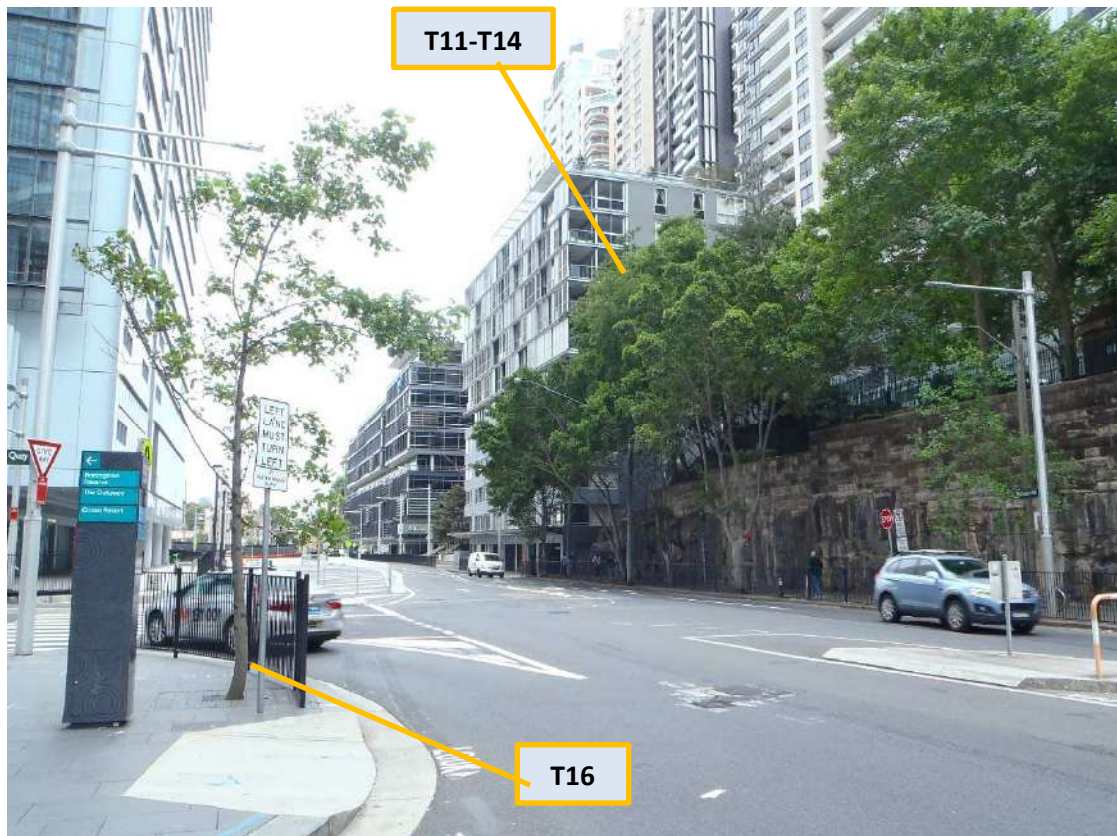


Figure 8. T16 is proposed for retention with new pavement around and a new tree next to it. The Pram ramp in the photo is proposed to be relocated to the pedestrian crossing shown on the left-hand side (Watermans Quay). Date of photo: 28 October 2025. Source: ELKE

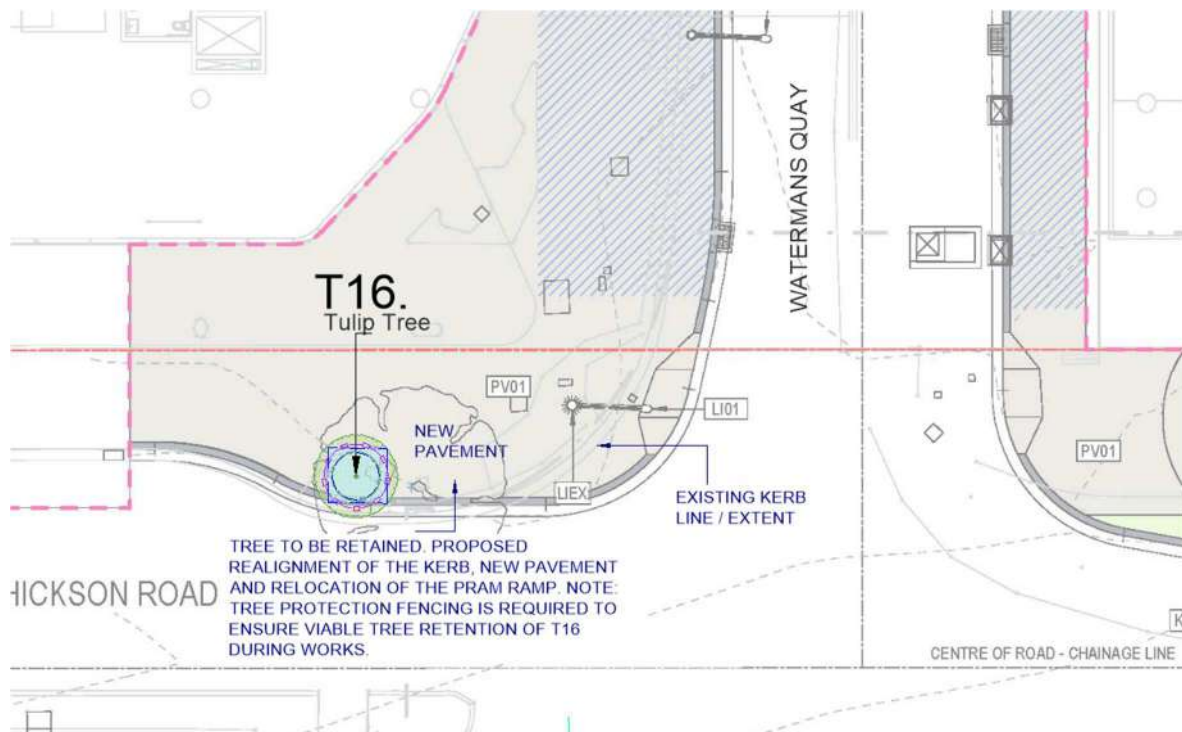


Figure 9. A portion of the proposal plan with the Arborist Impact Plan over and survey below showing the proposed pram ramp and alignment of the existing kerb, and extent of new pavement around T16 around Watermans Quay.

6.9 Impact to trees T11-T14 the mature *Ficus microcarpa* var. *Hillii* (Hill's weeping fig) T11 – T14.

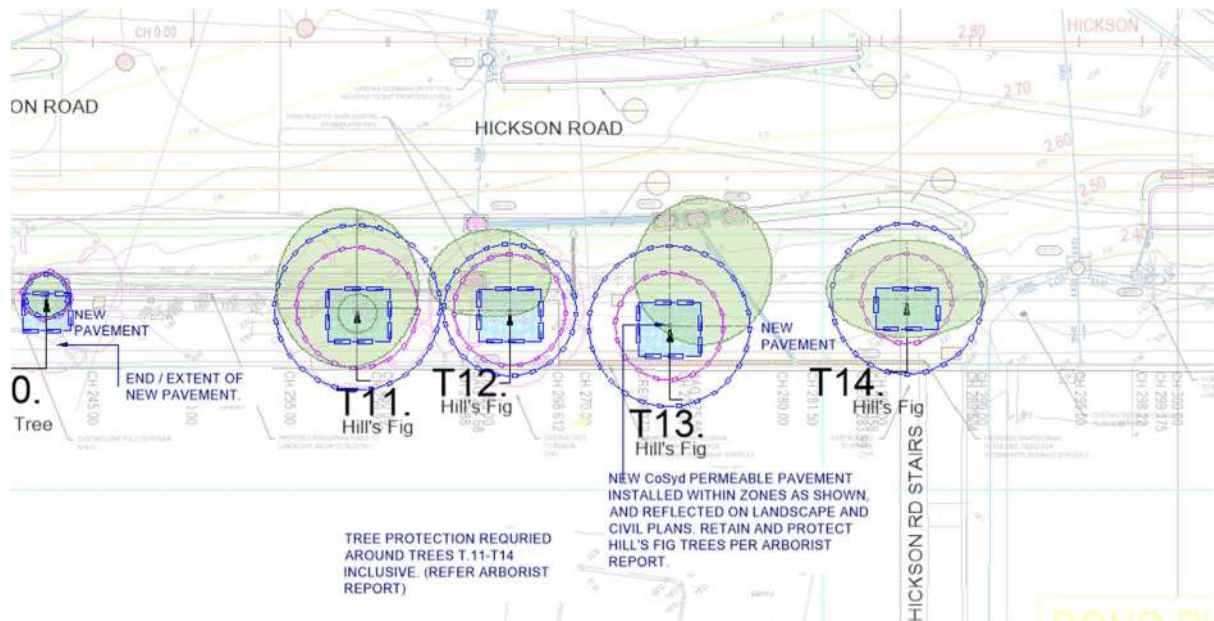


Figure 10. A portion of the arborist plan with the Arborist data over the survey to show and compare the existing streetscape. Note: the canopy extent has been mapped (shown with green), and the trees are not symmetrical.

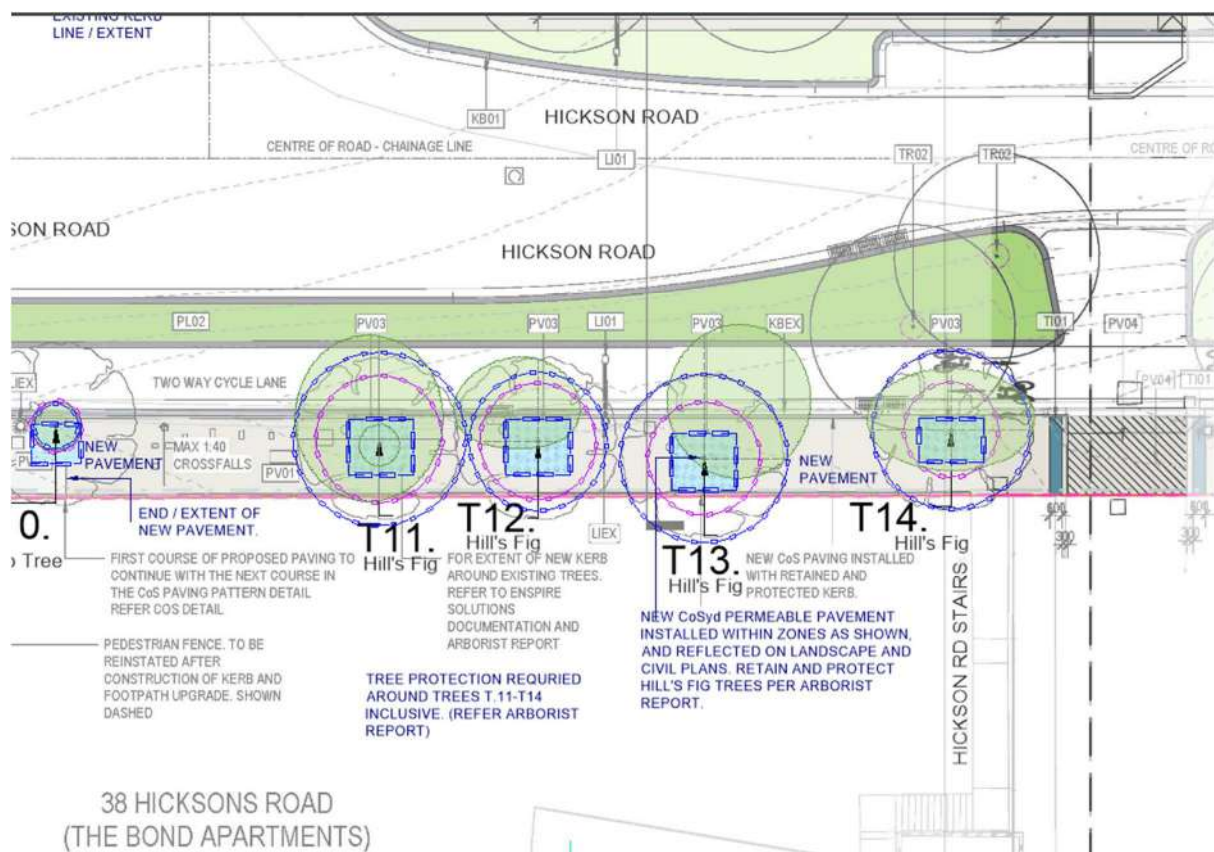


Figure 11. A portion of the proposal plan with the Arborist data over the proposed works to show and compare the new proposed streetscape arrangement.

- 6.10 High Priority Ficus trees (T11-T14). The four Hill's Figs along Hickson Road (as depicted in *Figures 10 and 11* above, are proposed to be retained and protected.
- 6.11 These Fig trees are rated as having a high retention value. T11-T14 are all situated adjacent to a tall natural sandstone cutting with sandstone block wall on top (to the east of the trees) which likely provides a higher localized humidity, sheltered/protected growing environment and likely ground water (the wall was wet at the time of inspections). (Refer to Figure 14 below).
- 6.12 The tree canopies of the Ficus trees T11-14 meet together and visually read as one green bank of foliage and provide a shaded environment. These tree are mature, provide shade and canopy protection within a highly urbanized local context. These four trees are likely at their full size (given local stunting constraints and age and current size). To replant new Ficus trees in this location would take many years to establish the existing canopy (over say 50 years) and it would be difficult to establish without substantial soil/growing media volume. There are multiple existing services constraints that limit the possibility of re-creating the existing Hill's Ficus canopy cover (as seen in Figure 14 below).
- 6.13 **Recommendation 3:** The proposal is for the priority retention and protection of the Hill's Ficus trees (T11-T14). It is recommended that tree protection fencing that encompasses the structural root zone (**SRZ**) is maintained during the works. The tree protection fencing is approximately 3.2m x 2.8m in a rectangular configuration. For T14, the tree protection fencing is approximately 3.2m x 2.1m to allow pedestrian access. Tree protection fencing for T1-T10 and T16 can be smaller at the fencing panel width of 1.8m wide.
- 6.14 **Recommendation 4:** It is noted that the bitumen pavement is to be removed around these trees with new unit pavers installed. Within the SRZ of T11 – T14, the removal of the top layer of bitumen must be under project arborist supervision with detailed methodology outlined in a Tree Protection Plan (**TPP**) and Tree Protection Specification (**TPS**) report to be provided at construction certificate / documentation phase (following the REF acceptance). The objective is to inflict as minimal disturbance as possible to the trees, the area within the trees' SRZ's and the sensitive root crown bases of the trees, in order to minimize irreversible damage, and in the interest of structural safety and tree health issues both during and after the works.
- 6.15 **Recommendation 5:** An appointed project consulting arborist AQF Level 5 (**project arborist**) is to provide TPZ fencing and signage sign off certificate prior to any works commencing, and is to assess the trees just prior to works commencing. The project arborist is to advise and inspect at intervals/hold points set out in the TPP and TPS.
- 6.16 **Recommendation 6:** Generally, within the SRZ, **do not remove** road base beneath the top bitumen layer (no excavation). Arborist supervision at all times within the TPZ fenced off zones.
- 6.17 Tree roots are likely to be present and growing within the bitumen layer itself (based on the assessment of the existing surface condition of the bitumen observed on site), tree species, and maturity.
- 6.18 To explain this further, bitumen (asphalt) can break down over time (aided often by moisture and air pockets within the bitumen). As a result of this, tree roots can grow within the small cracks and fissures that may be present or may have developed due to erosion or break down over time. Refer to figure 12 below.



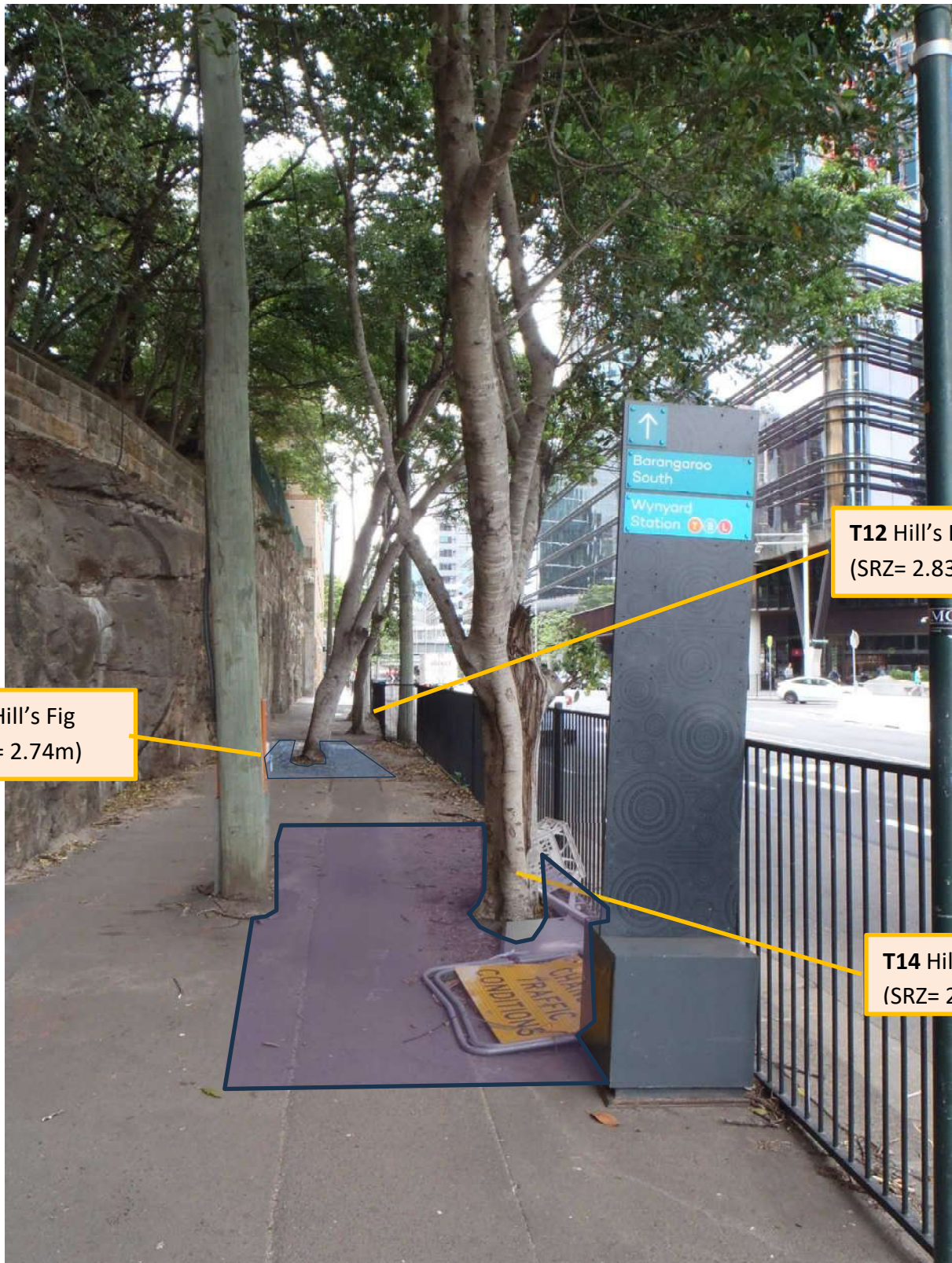
Figure 12. Example photo (not of this site) showing the presence of tree roots within and under bitumen base to illustrate the description and rationale of the recommendations around T11-T14.

Source: ELKE

- 6.19 It should be emphasised that the tree roots themselves **DO NOT** make the initial cracks and fissures. The growing conditions (air and water) can be suitable for tree roots to grow into these fissures within the asphalt and for tree roots to develop there. Once the tree roots are present in these fissures, the tree roots may begin to rely on the surrounding material (in this case bitumen/asphalt) as an anchor (similar to rocks in nature that trees can rely on for stability / anchoring). The tree roots, having found a crack/fissure in the bitumen may then rely on the stable surrounds provided by the bitumen for the trees' above ground forces that the tree needs to withstand (such as stability in wind events where wind energy is dissipated down into the tree branches, trunk and rooting system and ground. Therefore, removal of the bitumen can suddenly interrupt the relied upon anchoring forces provided by the bitumen and cause tree instability. Simply putting back new pavers does not solve the anchoring problem if the tree roots have been severed. This can lead to structural tree failure months and years after the impact/severance.
- 6.20 Further, the tree roots within bitumen can and do tend to attach onto the crumbs of aggregate within the bitumen, thus removal of bitumen ultimately severs the tree root connection to the tree. Therefore, the recommendation is for careful, hand excavation of the bitumen within the SRZ of the tree, to be as minimal and shallow as possible, and only under project arborist supervision, advice and sign off.
- 6.21 **Recommendation 7:** The project arborist is to advise on-site during this careful hand tool only work. It is recommended that for a nominated zone around each tree, the new surface being installed is to consist of a flexible permeable material such as no-fines resin bonded aggregate (such as Stoneset © or Filtapave © or similar approved equivalent such as a permeable type of Softfall). This is to be determined in coordination with the City of Sydney, the project landscape architect – HASSELL and the project consulting arborist ELKE).
- 6.22 It is noted that this approach has been implemented within the City of Sydney in several locations, such as along Bayswater Road between Kellett St and Ward Avenue, Kings Cross and Victoria Road, Darlinghurst. Some localized build up/tapering of the flexible permeable pavement may be required to accommodate the root crown base and root flare of the Hill's Fig trees (T11 – T14).
- 6.23 **Recommendation 8:** Retain the existing kerb where the kerb is within the SRZ's of trees T11-T14, the existing kerb is recommended to be retained. This is currently not defined on the plans provided. For the reasons discussed above in relation to tree root anchoring, the same applies to kerbs. Detailed documentation may be needed during construction documentation of this recommendation.
- 6.24 The main intent of the above recommendations is to limit impact to the root crown base and SRZ of trees T11 – T14. (Refer to figures 13 and 14 below).



*Figure 13. Photo looking north with T11 in the foreground. Note the many underground services and bitumen pavement that is to be upgraded to granite sets with permeable flexible pavement system such as Stoneset © around the Hill's Fig trees (T11-T13) in approximately 3.8 x 2.8m area and approximately 3.8 x 2.1m for T14. Date of photo: 28 October 2025.
Source: ELKE*

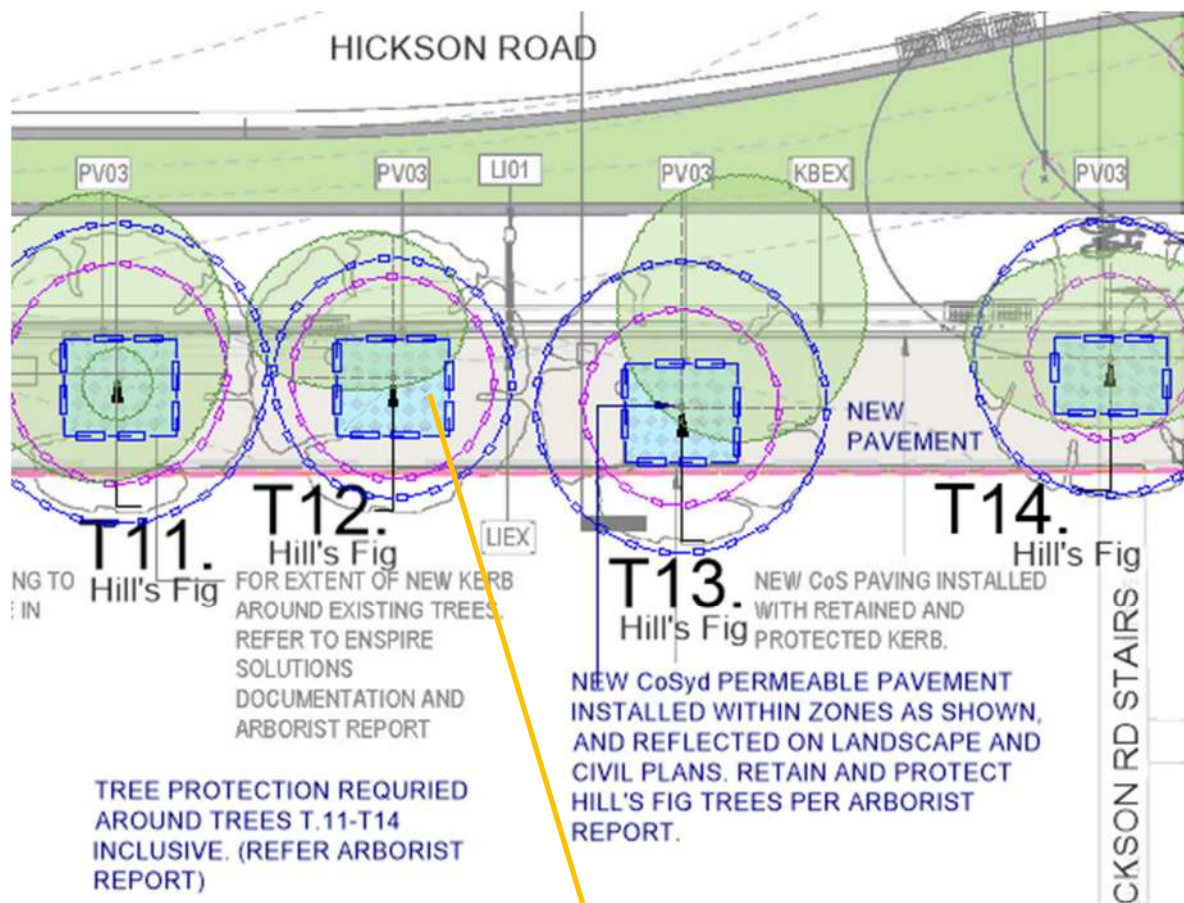


T13 Hill's Fig
(SRZ= 2.74m)

T12 Hill's Fig
(SRZ= 2.83m)

T14 Hill's Fig
(SRZ= 2.3m)

Figure 14 Indicative / diagram showing in blue the approximate zone of Flexible permeable pavement system recommended such as Stoneset © (to be coordinated in detail design phase with project team). Retain the existing kerb where it is within the SRZ's of trees T11-T14. Date of photo: 28 October 2025. Source: ELKE



Flexible permeable pavement system to part of the SRZ as shown in light blue. SRZ is shown in purple. Kerb to be kept as is / retained where within the SRZ. No excavation within SRZ. Project arborist supervision and sign off required.

Figure 15 Part of the arborist impact plan, *showing in blue* the proposed zone of Permeable, flexible, no-fines pavement such as Stoneset © (to be coordinated in detail design phase with project team). This is to be around trees T11-T14.



Figure 16 Examples of Flexible Permeable Pavement Systems : e.g. Stoneset ©



Figure 17 Examples of Flexible Permeable Pavement Systems : e.g. Stoneset ©



Figure 18 Example image of Filtapave © Permeable pavement System . The above image demonstrates how surface roots are kept exposed where they are above the finished surface level. This is the intent for the Hickson Road South Upgrade Project. Source: [Sustainable, Lightweight Filtapave Manufacturers | Sydney](#)

A. General Items to be complied with

- 6.25 Services and pits/openings within the Structural Root Zones (**SRZ**) of trees. The design is to ensure new services and any trenching works are excluded from within the SRZ of trees (particularly T11-T14). Contact the project arborist for prior written instructions if this is not achievable or if any cut/excavation, trenching, tunnel boring /under boring works or other works are needed in the SRZ of trees. It is acknowledged that existing services are currently located under and within the SRZ of existing trees. These are typically to remain and any connections into these services must be outside the SRZ and TPZ fenced zones of trees.
- 6.26 Generally, all works within the Structural Root Zone (SRZ) of trees to be retained, are to be under the direction, sighting and sign off by the project arborist. This **recommendation** occurs for all existing trees to be retained.
- 6.27 Retain the existing kerb where it is within the SRZ's of trees T11-T14.
- 6.28 All pruning must be approved prior, and under the supervision and sign off by the project consulting arborist (AQF Level 5), performed by an AQF Level 3 in field practical arborist and adhere to the Australian Standard 4373-2007 - Pruning of Amenity Trees. Refer Appendix 6.
- 6.29 Works: refers to all works, including demolition, site preparation phases, all services works, trenching, overhead works (such as piling), footings, construction vehicles and machinery, construction, and traffic management.
- 6.30 Tree Protection fencing and signage is recommended for the following trees (relating only to the proposed works covered in this report): trees: **T1 to T15** and any other trees where works are to occur within the TPZ and/or SRZ of the trees.
- 6.31 Tree protection fencing is to be in a rectangular form (not triangle and not trunk protection or other), and must encompass the whole tree pit opening.
- 6.32 For trees T1-T13, the tree protection fencing is approximately 3.2m x 2.8m in a rectangular configuration. For T14, the tree protection fencing is approximately 3.2m x 2.1m to allow pedestrian access. Tree protection fencing for T1-T10 and T16 can be smaller at the fencing panel width of 1.8m wide.
- 6.33 There may be isolated occurrences where the above dimensions are not possible, therefore it is recommended the project arborist advise and sign off in writing on a suitable compromise with description on suitable reasons for reduced or modified tree protection.
- 6.34 Refer to *Chapter 7* below for the TPZ fencing specification/type and size and TPZ fencing and signage specification. Note: the TPZ fencing will also act as trunk deflection protection as well and is in lieu of trunk protection.
- 6.35 TPZ signage is to be attached to all 4 sides of each of the TPZ fences and facing outwards from the tree. (Refer Chapter 7 below).

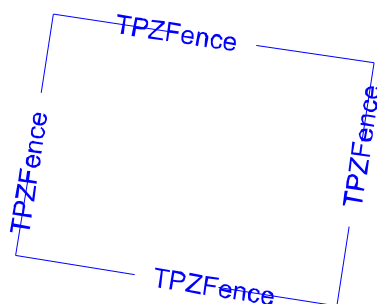


Figure 19. Symbol on the arborist plans indicating the TPZ fencing location and size. Note: This fencing does not encompass the full TPZ or SRZ due to pedestrian and vehicular access issues.

B. Table B: Tree protection recommendations:

6.36 The following is a summary of the Tree Protection Recommendations

Recommendation	Location (if applicable)	Timing and notes
Prior to works commencing		<ul style="list-style-type: none"> ○ ELKE (project consulting arborist) to review the certification plans prior to work commencing to ensure no new services, trenching, pits, earthworks (cut/fill), encroaching kerbs or pram ramps, or other impacts to the tree root zones are proposed. (prior to CC).
Tree Protection Plan (TPP) and Tree Protection Specification (TPS)		<ul style="list-style-type: none"> ○ A project arborist (AQF Level 5 in Arboriculture) is to be appointed for the duration of the works. ○ The TPP and TPS is to be put together with a suitable documentation and checklist for the Site Foreman, project arborist and project team.
Tree Protection Zone (TPZ) Fencing protection + TPZ signage on fencing And induction meeting with Foreman	Locations shown on the Arborist Plans (generally, Tree /trunk protection and signage is required around 15 existing trees	<ul style="list-style-type: none"> ○ Establish tree protection fencing and signage and sign off by project consulting arborist - prior to any works occurring on site. ○ Inductions with builder to be at the same time as above. <p>Works is defined in chapter 6.28.</p>
Works within SRZ or TPZ of trees (e.g. installation of footings, kerb works, removal of bitumen pavement or other)	For all trees to be retained. Mostly for trees T11 – T14 and for new pavement and pram ramp and kerb works around trees T10-T16.	<ul style="list-style-type: none"> ○ Hand tools only within the SRZ per project arborist supervision and direction. ○ Avoid tree roots (regardless of size) within the SRZ and avoid tree roots 30mm diameter in the TPZ. ○ Some on-site modifications to design may be needed e.g. footing location may need to shift slightly or extent of flexible pavement system or services locations (under project arborist direction, sighting, sign off – will also require project team coordination). ○ Arborist certification letter also will be required to document any deviation.
Tree pruning	Proposed for T8. Requires City of Sydney approval. All pruning must meet the Australian Standard 4373-2007 - Pruning of amenity trees by AQF Level 3 in- field practical arborist and signed off by the project arborist (AQF Level 5).	<ul style="list-style-type: none"> ○ To occur either at the project set up phase or during the construction works prior to canopy damage occurring. Refer Chapter 8 below.
End of works sign off / inspection	Prior to removal of trunk/tree fencing and signage an inspection by the project consulting arborist is critical. This is also a tree condition report (nearing end of project).	<ul style="list-style-type: none"> ○ At/nearing end of works and prior to removal of the TPZ fencing and signage.

Note: all sign offs / inspections are to be by the project arborist, AQF Level 5 consulting arborist. This table is to be detailed for the Tree Protection Plan (TPP) and Tree Management Specification (TMS) report.

7 Tree Protection Zone Fencing and TPZ signage

7.1 **Install compliant Tree Protection Fencing:** Prior to any construction and as soon as possible in the site set up phase, Tree Protection Zone fencing (TPZ fencing) and TPZ signage is to be installed in the locations determined by the project consulting arborist following DA approval.

7.2 TPZ fencing is to protect the retained trees and their necessary soil zone and root crown base by restricting the construction footprint that may unduly compact, damage, or disturb the tree soil zone and the tree root growing zone of tree as well as critical parts of the tree canopy.

7.3 For trees T1-T13, the tree protection fencing is approximately 3.2m x 2.8m in a rectangular configuration. For T14, the tree protection fencing is approximately 3.2m x 2.1m to allow pedestrian access. Tree protection fencing for T1-T10 and T16 can be smaller at the fencing panel width of 1.8m wide.

7.4 In addition, site set up and arborist sign off is required to ensure fencing is compliant and for the project arborist to discuss relevant ongoing tree protection and future inspections that may be required during the construction phase.



Figure 20 Example of tree protection fencing with pad footings and bolt cleated panels, and TPZ signage.

7.5 **Type of Fence:** Tree or trunk protection fences (TPZF) are to comply with AS 4970-2009 and are to be a minimum **1.8 m high**. This can be achieved with a 1.8 m high **(ATF) or chain link fence with non-penetrable footings**. E.g., temporary site or event fencing with plastic or concrete pad footing pads (that do not penetrate the ground). The fencing panels are to be **bolt cleated** together so they cannot be easily/readily lifted out of place without the use of a wrench or other tools.

- 7.6 Erect signage on all visible sides of the TPZ fencing, facing outwards, and in clear to read text size. For this project use **two signs per each tree** evenly spaced and facing **outwards** from the tree. TPZ Signage is to be on A3 or A2 weather resistant sign (e.g. plastic core flute or laminated) and state the following:

Tree Protection Zone.

Do not move this fence.
Do not store or dispose of materials or park vehicles inside the fenced zone.

Do not enter without prior written approval by the project consulting arborist: 0410 456 404

Tree Protection Zone.

Do not move this fence.

Do not store materials or park vehicles inside the fenced zone.

Do not enter without prior written approval by the project consulting arborist.

0410 456 404
elke@elkeh.com.au



Figure 21. Example (right) of 1.8m high tree protection fencing with pad footings and bolt cleated panels. Example (above) of a TPZ

- 7.7 The site contractor is to ensure that all people and contractors on site are inducted and made aware to **not enter** inside the tree protection fencing zone, **not to shift** the fence, **not to store** any materials inside the TPZ, and **not to damage, cut, crush, or sever any foliage, branches or tree roots** (roots over 30mm diameter) regardless if tree roots or tree parts are within the TPZ or not. If any of the above is required, contact the project consulting arborist prior and obtain prior written instructions/permission by the project arborist) including for any approved works within the TPZ fenced zone. Failure to do so, will result in non-compliance.
- 7.8 No cutting, shaving, or removing of any tree parts may occur, including **tree roots >30mm**, any trunk, branches, or foliage without the prior written consent of the project arborist.
- 7.9 Should **tree roots >30mm** be exposed or uncovered, contact the project consulting arborist for instructions (which may include root protection measures, root severance, tree removal, or other by the project consulting arborist only). The project consulting arborist is to advise on recommendations and implications at time of site inspection and make a record of the site visit which will be provided to the certifier and client.
-

8 Tree Pruning:

- 8.1 Trees T9, T10, T6 and T3 will possibly require pruning up to 20% of the tree canopy. (Refer to Recommendation 1 in Chapter 6 above). Should this be approved through the City of Sydney, the project consulting arborist is to supervise and sign off any tree pruning works.
- 8.2 Tree pruning is to be performed by an AQF Level 3 field-arborist and adhere to the Australian Standard 4373-2007 - Pruning of Amenity Trees. Sign-off by the project arborist is to follow and form part of the documentation for compliance.
- 8.3 At no time are trees to be retained and approved for pruning to be lopped, topped, or have their central dominant stems pruned or cut. (noting that T3 has had its central leader snapped and remedial pruning is recommended).
- 8.4 All pruning is to be performed by a person competent and experienced in the Australian Standard 4373-2007 - Pruning of Amenity Trees (with a minimum AQF Level-3 in arboriculture and be an in-field practicing arborist).
- 8.5 Pruning procedures are to be per clauses 4 and 5 of AS4373-2007.
- 8.6 Follow up formative pruning may be required, or pruning may need to be staggered across growing seasons.
- 8.7 Refer to Appendix 6. Refer also to Figures 5 and 6.
-

9 Site Photos.

- 9.1 The following site photos are from 28 October 2025 by Elke Haege Thorvaldson, consulting arborist, during the third site/tree assessment.



Figure 22. Hill's Fig trees T11 and T12 to be retained. The natural sandstone cutting and moisture from the sandstone wall on the east of the trees can be seen in the above photo (taken during a dry weather period). Date of photo: 28 October 2025. Source: ELKE

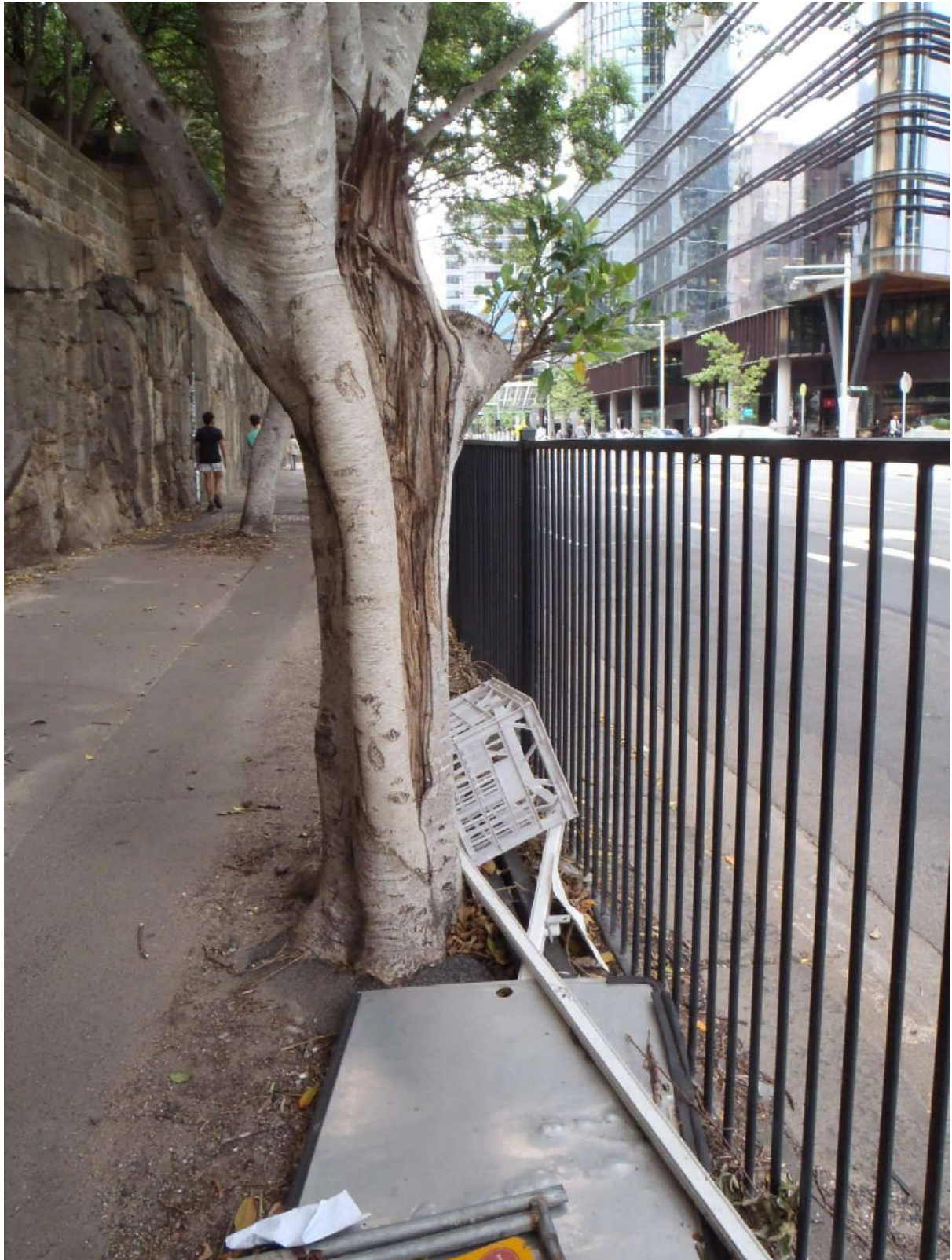


Figure 23. Hills Fig T14 has had prior damage to the trunk. The tree condition is to be recorded at each site inspection/supervision by the project arborist and any noteworthy changes (such as in relation to health or structurally) and recommended actions to be reported on and course of action to be discussed with the project team. Date of photo: 28 October 2025. Source: ELKE



Figure 24. T14 in foreground, T13 in the middle of the path and T12 visible behind near the red bicycle. Date of photo: 28 October 2025. Source: ELKE



Figure 25. The base of T14 Hill's Fig. Date of photo: 28 October 2025. Source: ELKE



Figure 26. The base of T13 Hill's Fig. Date of photo: 28 October 2025. Source: ELKE

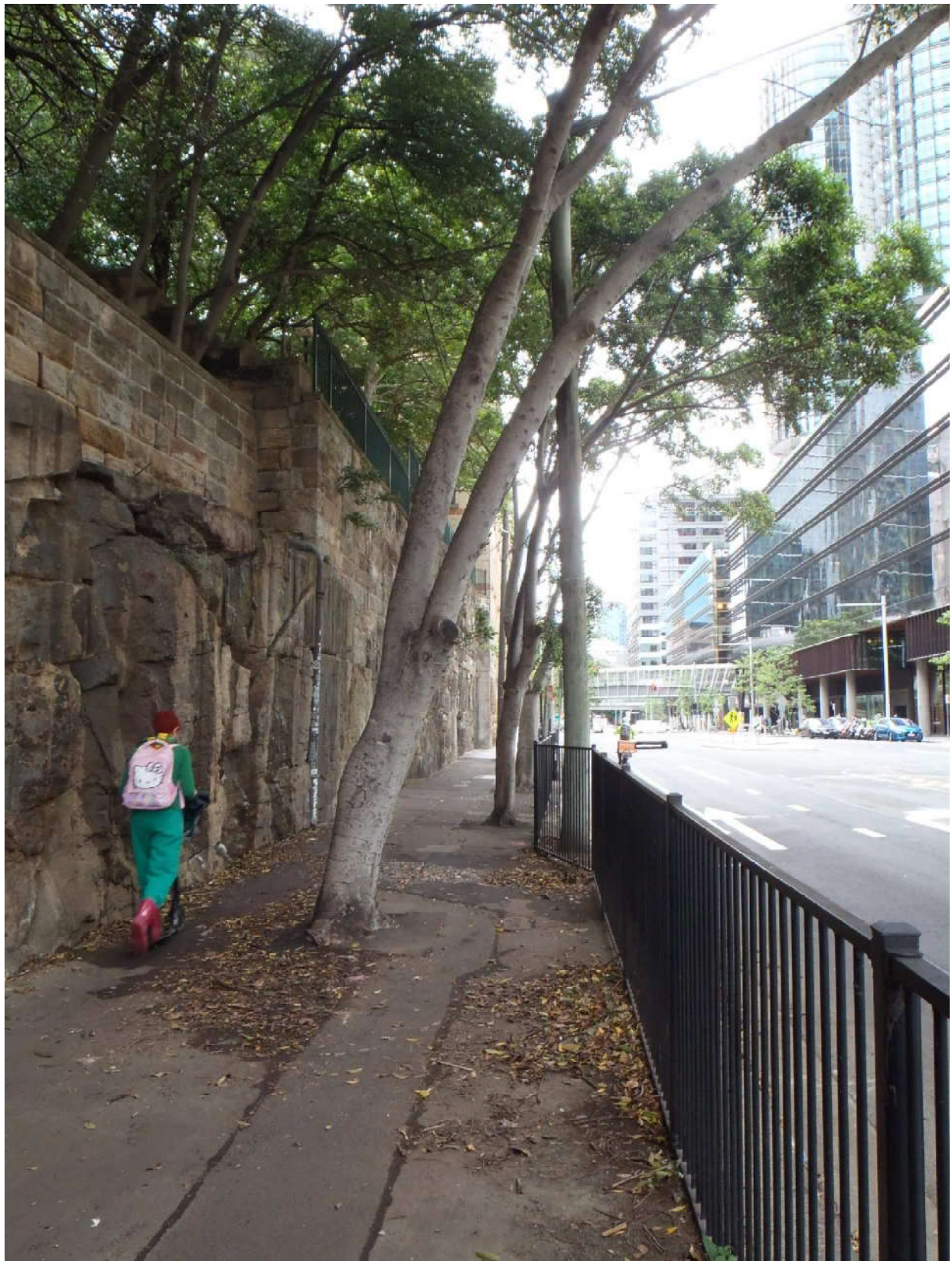


Figure 27. T13 Hill's Fig in foreground. T12 and T11 in background. Note the wet sandstone wall on the east (near the person). Date of photo: 28 October 2025. Source: ELKE



Figure 28. 12 Hill's Fig in foreground. and T11 in background. Note the wet pavement (from the wet sandstone wall) on the east. Date of photo: 28 October 2025. Source: ELKE

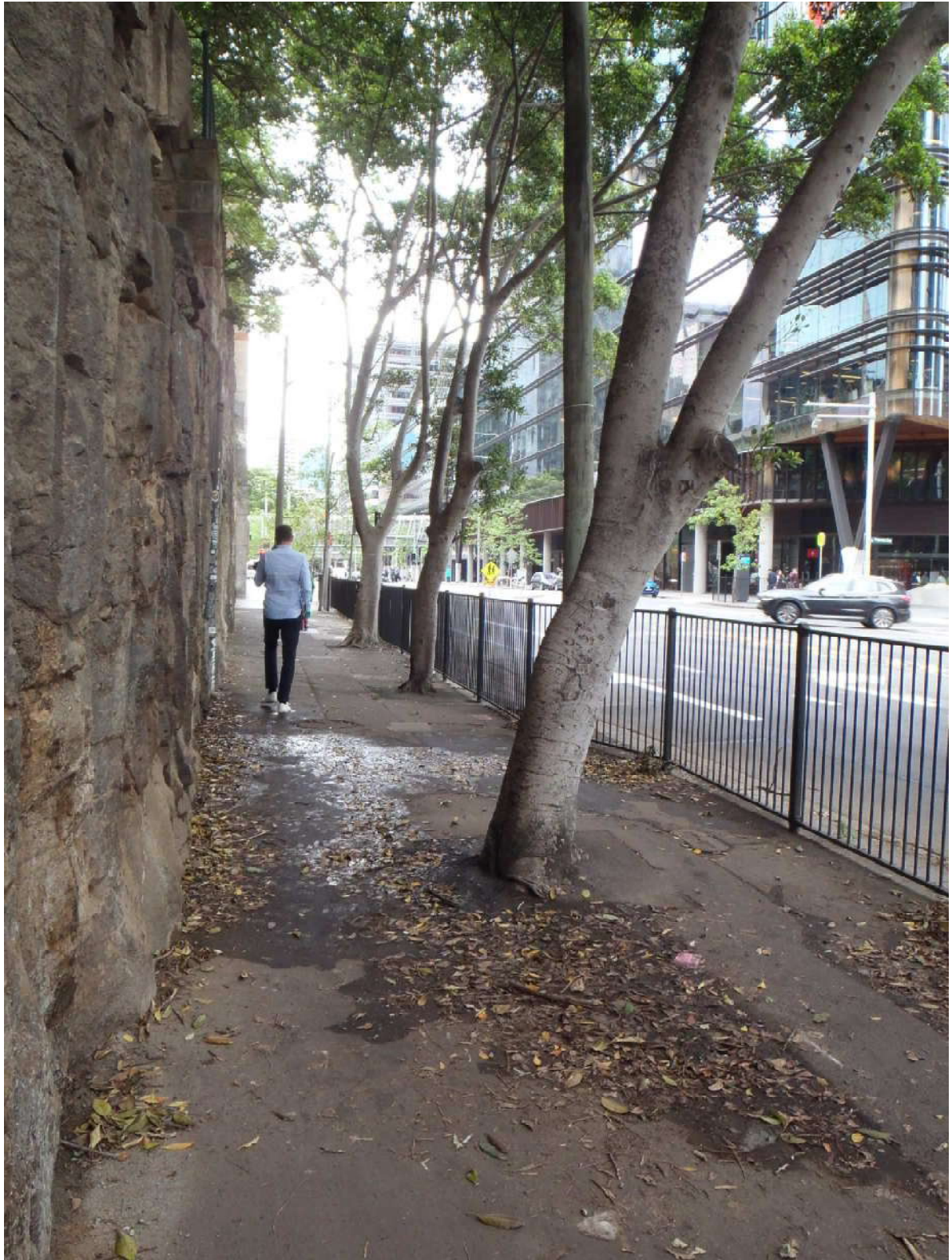


Figure 29. T13 Hill's Fig in foreground. T12 and T11 in background. Note the wet sandstone wall on the east (at the base of T13). Date of photo: 28 October 2025. Source: ELKE



Figure 30 Photos above showing T15, *Ficus macrophylla* (Moreton Bay Fig) in planter box adjacent the footpath. This tree and planter is considered outside the scope of works footprint. Soil and mulch top up and irrigation check is recommended..
Date of photo: 28 October 2025. Source: ELKE

9.2 The following photos are of the area of Stage 4



Figure 31 Photos above looking south towards Stage 4 along the western side of Hickson Road. The continuation of the double avenue of Celtis trees is proposed along this zone. **Note:** the Celtis tree in the centre of the photo has failed (died). There are 3 trees within this newly planted avenue/grove that have died as of 28 October 2025. Date of photo: 28 October 2025. Source: ELKE



Figure 32 The of the double avenue of Celtis trees is proposed along the Stage 4 portion on the western side of Hickson Road (linking up with Barangaroo Metro Station). **Note:** 2 Celtis trees on the right hand side of the photo have failed (died). Date of photo: 28 October 2025. Source: ELKE

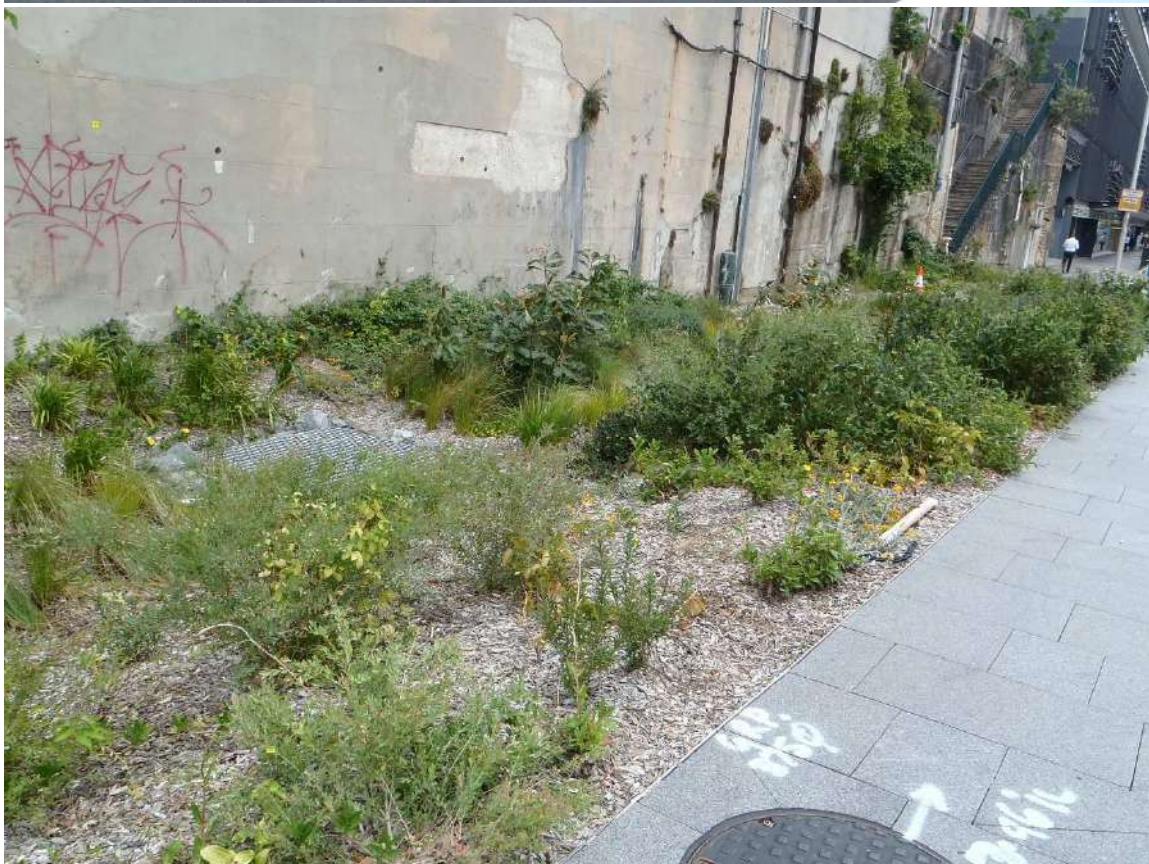


Figure 33 Photos above near the northern interface of Stage 4, showing the landscape treatment on the eastern side of Hickson Road being a swale.. Date of photo: 28 October 2025. Source: ELKE

10 New Trees and Strata Vault soil system and soil volume proposed.

10.1 The landscape proposal includes the following proposed **new trees**:

- **33** new trees, proposed to be *Lophostemon confertus* (Brush Box),
- **11** new palms, proposed to be *Livistona australis* (Cabbage Tree Palm) and
- **64** *Fraxinus pennsylvanica* 'Urbanite' (Urbanite Ash) trees planted in a double avenue with 5m spacings, which is a continuation of the existing double avenue of the same tree species installed along Hickson Road North (the adjacent site that connects to the Barangaroo Metro Station).

10.2 On the landscape architectural plans by Hassell, where the proposed trees are proposed in pavement (not garden beds), Strata Vault at 1.2m depth and connected in large blocks of trees is proposed.

10.3 This includes *Livistona australis* (Cabbage Tree Palms), *Lophostemon confertus* (Brush Box), and the new double avenue of *Fraxinus pennsylvanica* 'Urbanite' (Urbanite Ash) trees.

10.4 The average soil volume for each tree is around 14.3m³ to 15.2m³. The variation in volume is due to underground services constraints and other urban Infrastructure. In general, where it has been possible to connect and install Strata Vault, it has been. Where it has been possible to adjoin Strata Vault to adjacent garden beds, it has been.

10.5 Noting that the trees are connected (generally in groups of between 15 to ~25 trees, or connected into adjacent and adjoining garden beds), it is my opinion that these soil volumes in the form of Strata Vault are adequate to provide best industry practice for urban upgrade streetscape. Notably, shared root systems are the preferred method of planting copses and groups of trees in urban settings to allow for allocation of tree resources (soil nutrients, stability, air, water and rooting space). When shared rooting systems are implemented suitably, the trees will outperform in health, robustness, size, and longevity compared with an identical tree planted in an isolated tree in the proportionate soil volume.

10.6 Noting the Strata Vault is a proprietary product, it is recommended that the specification, installation and certification and sign off occur by the manufacturer and supplier being Citygreen ©, together with the designed soil volumes and extent per the Landscape architectural plans by Hassell, including adjoining soil zones to adjacent garden beds.

10.7 Elke is the co-author of: Leake S. and Haeger E, 2024, Soils for Landscape Development, Selection, Specification and Validation, CSIRO Publishing, 2nd Edition. As well, Elke is a developer of the Soil Volume Simulator, 2017.

10.8 Maintenance and passive irrigation, a maintenance and establishment period of 12 months is recommended which is recommended to include hand /manual watering (as required). It is noted that the new garden beds will be passively watered via adjacent surfaces runoff into the garden beds / tree pits. Subsurface drainage is therefore essential to avoid waterlogging.

10.9 Drainage: it is recommended subsoil drainage is installed and connected into the stormwater system at the base (below the subsoil) of every new garden bed, tree pit, and/or planted area. This is particularly important noting passive watering in the design, per the City of Sydney recommendations.

10.10 Noting the passive watering recommendation by City of Sydney, the pavement design and kerb/road runoff is recommended to fall towards the new and existing trees to allow for surface water runoff where it is at all possible. It is noted that this is not always possible and not a guarantee of optimal irrigation by any means, however it is noted that the City of Sydney (per the 24 May 2024 letter⁵) preference is not to have reticulated irrigation systems and instead capture stormwater and/or divert surface water to passively irrigate the trees.

11 Conclusion and Discussion

- 11.1 Provided the recommendations listed in Table B, and the recommendations in Chapter 6 are carried out satisfactorily to the project arborist, the impacts to the trees can be limited and therefore it can be concluded that the overall impact to existing trees is assessed as being acceptable.
- 11.2 Trees in highly urbanised locations (such as at Hickson Road South) almost invariably show and have existing impacts within their calculated TPZ and/or the SRZ that may have already compromised, stunted or foreshortened the lifespan or viability of a street tree such as caused by existing services, paving, roads and kerbs, damage above ground such as from vehicles, and hostile growing conditions with low maintenance (watering, fertilizing and aeration), yet these street trees can remain viable and provide amenity, provided their structural integrity is not detrimentally compromised.
- 11.3 Directly applying and adhering to AS4970-2009 / AS4970-2025 therefore has reduced capacities in providing baseline information, and in this project's application, consideration of each tree, in context and with consideration and analysis by a competent consulting arborist is necessary.
- 11.4 For this urbanized context, priority has been to retain as best as possible, the street trees that have been able to establish themselves and provide (or begin to provide) urban amenity (even if that amenity is reduced), particularly if considering replacement tree planting as an alternative, where the provision of adequate soil volumes for a new street trees will be limited (such as with the existence of substantial existing services).
- 11.5 In consideration of the priority of retention of the established Hill's Figs (T11-T14), scientific evidence shows large, mature trees compared to smaller stature trees provide far greater (and in some cases eight times greater) benefits including:
- urban heat island mitigation and moderated wind abatement and moderation of ambient air temperature extremes,
 - reduced stormwater runoff and lower costs for stormwater controls,
 - extended the life of streets where they provide shade (as there is longer time between resurfacing),
 - improved local air, soil and water quality,
 - reduced atmospheric carbon dioxide,
 - provision of wildlife and ecosystem habitat (birds, mammals, reptiles, insects, soil organisms)
 - increase property values,
 - long term local government budget cost savings.
 - enhance the attractiveness and safety of the local neighbourhood and

⁵ City of Sydney Letter – Request for Further information, File ref: X105548, dated 24 May 2024.

- promote human health and well being⁶
- where native trees are selected, improve environmental qualities and local identify characteristics of the local precinct.

12 References

- *Australian Standard AS4970-2009, and AS4970-2025 Protection of trees on Development Sites. Standards Australia.*
 - *Australian Standard AS 4373 – 1996, Pruning of Amenity Trees, Standards Australia.*
 - *Australian Standard AS 4454 – 2003, Composts, soil conditioners and mulches.*
 - *Barrell, Jeremy, 1996, Pre-development Tree Assessment, SULE Categories and Sub-Categories, Proceedings of the International Conference on Trees and Building Sites (Chicago), International Society of arboriculture, Illinois, USA.*
 - *Barrell, J, 2009, Draft for Practical Tree AZ version 9.02 A+NZ, Barrel Tree Consultancy, Bridge House, Ringwood BH24 1EX*
 - *Craul, P.J. 1985. A description of urban soils and their desired characteristics, Journal of Arboriculture 11(11):330-339.*
 - *Draper and Richards, 2009, Dictionary for Managing Trees in Urban Environments, CSIRO Publishing.*
 - *Leake S and Haege E, 2014, Soils for Landscape Development, Selection, Specification and Validation, CSIRO Publishing.*
 - *International Society of Arboriculture, 2009, The Landscape Below Ground III, Proceedings for a Third International Workshop on Tree Root Development in Urban soils, ISA, Champaign, Illinois, USA.*
 - *Mattheck C. and Breloer H., 2001, The Body Language of Trees - A handbook for failure analysis – Sixth impression (2001), The Stationery Office, London, U.K. Fig 120, Page 196.*
 - *Mattheck C., and Breloer H., 2010, The Body Language of Trees – A Handbook for Failure Analysis – 11th impression, The Stationery Office (TSO), London UK*
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⁶ *The Centre for Urban Forest Research, southern Centre for Urban Forestry Research and Information, US Forest Service, Department of Agriculture, The Large Tree Argument, the Case for Large-Stature Trees vs. Small-Stature Trees, circa: 2004*

13 Relevant Appendices

Appendix 1: Landscape Significance Rating

Refer to next page. As well this rating takes into consideration the context and relationship of the tree to its surrounds and contribution to the streetscape/site surrounds and character of the site.

Appendix 6: ISA Tree Risk Assessment

Methodology: ISA (International Society of Arboriculture, 2013)⁷. Hazard potential (Risk rating matrix)

<i>Likelihood of Failure and Impact</i>	<i>Consequences of Failure</i>			
	<i>Negligible</i>	<i>Minor</i>	<i>Significant</i>	<i>Severe</i>
<i>Very likely</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>Extreme</i>
<i>Likely</i>	<i>Low</i>	<i>Moderate</i>	<i>High</i>	<i>High</i>
<i>Somewhat likely</i>	<i>Low</i>	<i>Low</i>	<i>Moderate</i>	<i>Moderate</i>
<i>Unlikely</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>

Appendix 2: Safe Useful Life Expectancy

And Tree AZ by Jeremy Barrell

In 1993, the British Standard approach was superseded by a methodology known as Safe Useful Life Expectancy (SULE) developed by Jeremy Barrell, a British arboriculturist. SULE was based loosely on the British Standard BS 5837:1991 but is more systematic and rigorous in its approach. SULE made an attempt to assimilate the health, condition and value of a tree, using remaining life expectancy (in consideration of safety issues) as a measure of its sustainability in the landscape. This system was promoted as best practice in pre-development tree surveys and has been widely used throughout Britain, the United States and Australia. The concept behind SULE is that of sustained amenity, the longer a tree can contribute to amenity in a sustainable way (in consideration of safety and the proposed development), the higher the retention value. Other factors such as the size and appropriateness of retaining the tree in light of the proposed development (usefulness) are also considered.

The aim of SULE (and another method, Tree AZ) is to convert what amounts to a fairly complex arboricultural assessment into a few broad categories that are easily understood by planners and can be considered together with other constraints to determine the best layout and design of the site. Ultimately this is the main aim of establishing tree retention values.

Essentially these categories can be defined as follows:⁸

- Trees that are important to preserve (most suitable),
- Trees that are desirable to preserve (suitable),
- Trees that are undesirable for preservation (not particularly suitable); and
- Trees that should be removed (unsuitable).

**The SULE categories and classifications are subjective and based on the knowledge, experience and expertise of the assessor.*

⁷ <http://www.isa-arbor.com/education/onlineresources/basicreeriskassessmentform.aspx>

⁸ *The retention value of trees on development sites - Treenet*

PROCEDURE FOR ASSESSING SAFE USEFUL LIFE EXPECTANCY (SULE)

1	Estimate the age of the tree		
2	Establish the average life span of the species		
3	Determine whether the average life span needs to be modified due to the local environmental situation		
4	Estimate remaining life expectancy		
	Life Expectancy	=	the average modified life span of species – age of the tree
5	Consider how health may affect safety (& longevity)		
6	Consider how tree structure may affect safety		
7	Consider how the location will affect safety		
8	Determine safe life expectancy		
	Safe Life Expectancy	=	life expectancy modified by health, structure and location
9	Consider the economics of management (cost vs benefit of retention)		
10	Consider adverse impacts on better trees		
11	Consider sustaining amenities – making space for new trees		
12	Determine SULE		
	Safe Useful Life Expectancy	=	safe life expectancy modified by economics, effects on better trees and sustaining amenities

Appendix 3. Retention Rating

FIGURE 2 – TREE RETENTION VALUES – ASSESSMENT METHODOLOGY

Estimated Life Expectancy SULE	Landscape Significance Rating						
	1	2	3	4	5	6	7
Greater than 40 Years	High Retention Value						
15 to 40 Years			Moderate				
5 to 15 years				Low Ret. Value			
Less than 5 Years				Very Low Retention Value			
Dead or Hazardous							

Ref:- Modified from Couston, Mark & Howden, Melanie (2001) Tree Retention Values Table Footprint Green Pty Ltd, Sydney Australia

In effect what this table shows is that a tree that has high environmental, heritage and/or amenity value (high landscape significance) and is sustainable in the landscape in the long term should be considered of high retention value. A tree that has low landscape significance should be considered of low retention value, regardless of its sustainability. A tree that has a high landscape significance rating, but is dead or potentially hazardous (and beyond remedial treatment), has a low retention value since its health and condition diminish its value.⁹

⁹ [The retention value of trees on development sites - Treenet](#)

Appendix 4a. AS 4970. Development of Trees on Protection Sites:

C. Tree Protection Zone (TPZ)

The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is 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 TPZ incorporates the structural root zone (SRZ)

D. Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH \times 12.

TPZ = DBH \times 12 where DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2 m nor greater than 15 m (except where crown protection is required). Clause 3.3 covers variations to the TPZ. The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1 m outside the crown projection.

E. Structural Root Zone (SRZ)

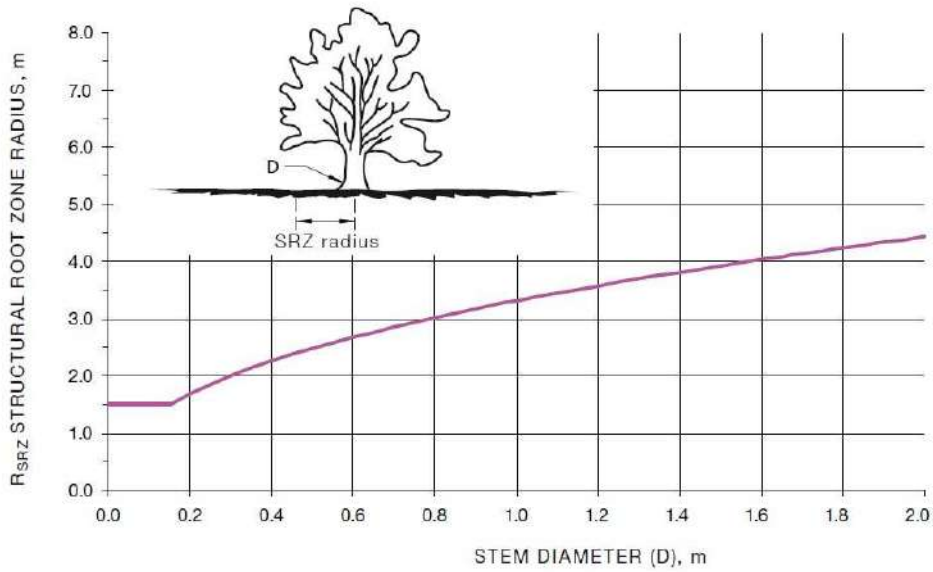
The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.

The SRZ only needs to be calculated when major encroachment into a TPZ is proposed.

There are many factors that affect the size of the SRZ (e.g., tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress using the following formula or Figure 1.

Root investigation may provide more information on the extent of these roots.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$ where D = trunk diameter, in m, measured above the root buttress



The curve can be expressed by the following formula:
 $R_{SRZ} = (D \times 50)^{0.42} \times 0.64$

NOTES:

- 1 R_{SRZ} is the calculated structural root zone radius (SRZ radius).
- 2 D is the stem diameter measured immediately above root buttress.
- 3 The R_{SRZ} for trees less than 0.15 m diameter is 1.5 m.
- 4 The R_{SRZ} formula and graph do not apply to palms, other monocots, cycads and tree ferns.
- 5 This does not apply to trees with an asymmetrical root plate.

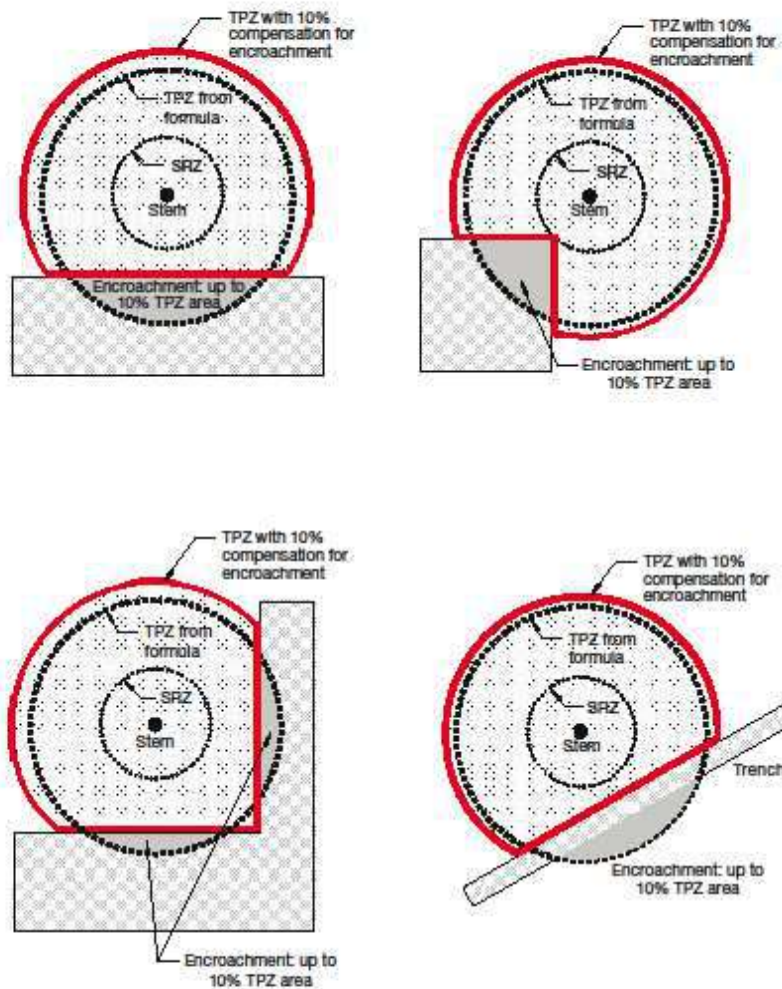
FIGURE 1 STRUCTURAL ROOT ZONE CALCULATION

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NOTE: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m (see Figure).

APPENDIX D
 ENCROACHMENT INTO TREE PROTECTION ZONE
 (Informative)

Encroachment into the tree protection zone (TPZ) is sometimes unavoidable. Figure D1 provides examples of TPZ encroachment by area, to assist in reducing the impact of such incursions.



NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

FIGURE D1 EXAMPLES OF MINOR ENCROACHMENT INTO TPZ

Appendix 5: Tree Retention Priorities

The following table describes the implications of the Retention Values on site layout and design. Refer to Plan 2: Tree Retention Values for direct correlations to table below.

Appendix 5

Tree Retention Priorities	
Retention Value	Recommended Action
"High"	<ul style="list-style-type: none">• These trees are considered worthy of preservation; as such careful consideration, should be given to their retention as a priority.• Proposed site design and placement of buildings and infrastructure should consider the Tree Protection Zones as discussed in the following section to minimise any adverse impact.• In addition to Tree Protection Zones, the extent of the canopy (canopy drip line) should also be considered, particularly in relation to high rise developments. Significant pruning of the trees to accommodate the building envelope or temporary scaffolding is generally not acceptable.
"Moderate"	<ul style="list-style-type: none">• The retention of these trees is desirable.• These trees should be retained as part of any proposed development if possible; however, they trees are considered less critical for retention.• If these trees must be removed, replacement planting should be considered in accordance with Council's Tree Replacement Policy to compensate for loss of amenity.
"Low"	<ul style="list-style-type: none">• These trees are not considered to worthy of any special measures to ensure their preservation, due to current health, condition or suitability. They do not have any special ecological, heritage or amenity value, or these values are substantially diminished due to their SULE.• These trees should not be considered as a constraint to the future development of the site.
"Very Low"	<ul style="list-style-type: none">• These trees are considered potentially hazardous or very poor specimens or may be environmental or noxious weeds.• The removal of these trees is therefore recommended regardless of the implications of any proposed development.

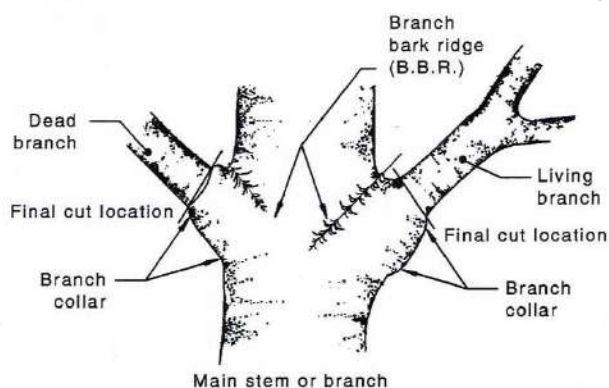
Source: Derived from: Earthscape Horticultural Services, December 2011

Appendix 6: Tree Pruning

Figure 1 from The Australian Standard 4373-2007 - Pruning of Amenity Trees.

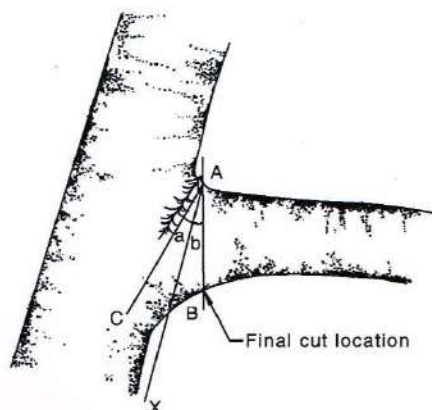
11

AS 4373—2007



(a) Up to but not including the branch collar

NOTE: When removing dead wood from a tree, make the final cut as close to the branch collar as possible. Do not damage living tissue. The branch collar is the best guide for the final cut when removing a living branch. However, if there is no branch collar use the branch bark ridge as depicted in Figure 1(b).



(b) In the absence of a collar using the branch bark ridge

NOTE: On living branches where the branch collar cannot be located, the branch bark ridge can be used as a guide. Line A-X is a line parallel to the stem or trunk occurring just outside the branch bark ridge. Line A-C indicates the angle of the branch bark ridge and Line A-B represents the angle and location of the final cut. Angle 'a' should equal angle 'b'.

FIGURE 1 FINAL CUT LOCATION

Appendix 7: Tree Protection Fencing Signage

Tree Protection Area. No Access.

Do not move this fence.

Activities generally excluded from this area include:

- no excavation or disturbance of the soil, including scraping of the surface or cultivation.
- no spreading or stockpiling of fill
- no storage of equipment and material
- no preparation or disposal of chemicals, paints or cement products (slurry).
- no parking of vehicles or machinery
- no dumping of waste - including wash down and cleaning of equipment, paint wash, cement wash
- no physical damage to trees, tree roots, bark, branches, soil.

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Builder contact:

