ARBORICULTURAL IMPACT ASSESSMENT REPORT

521 BARRENJOEY ROAD
BILGOLA BEACH NSW 2107

Prepared for Peter Madew

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Revision C

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APPENDICES

1. INTRODUCTION

1.1 This report was commissioned by Peter Madew, the owner of 521 Barrenjoey Road, Bilgola Beach to provide an Arboricultural Impact Assessment (AIA) report relating to the proposed residential development of the site and the existing trees located on the site or on an adjoining site and within close proximity to the proposed works. This report shall form part of the development application documentation for submission to Northern Beaches Council for the construction of a multiple storey dwelling and swimming pool, plus a secondary dwelling and garage structure.

1.2 A total of 53 trees (or groups of trees) are included in this assessment. Of the 53 trees, 30 trees (or groups of trees) are located within the site boundaries and 23 trees (or groups of trees) are located on adjoining land. Generally, a tree is protected in accordance with the Northern Beaches Council Local Environment Plan if it is a height greater than five (5) metres. In some instances a tree meet the prescribed size, however may not be protected for other reasons such as it being a noxious weed species or a species listed as exempt from protection.

1.3 The purpose of this report is to undertake a visual assessment of the trees, determine the sustainability of the trees in the landscape, determine the impact of the proposed works on the trees and provide recommendations for tree protection measures for those trees being retained.

1.4 This report shall reflect the expert opinion of the Arborist. The Arborist is acting independently of and not as the advocate for the owner. The Arborist shall not receive any commission to prune or remove the tree/s which is the subject of this report.

1.5 This report has been prepared in accordance the Australian Standard "*Protection of Trees on Development Sites*" (AS 4970:2009).

1.6 Details shown on the following plans were reviewed in this assessment:

Title	Author	Job No.	Date
Architectural drawings (preliminary)	Peter Downes Designs	-	April 2021
Architectural drawings (driveway design)	Peter Downes Designs	-	24.5.21
Topographical survey plan	Richards & Loftus	2861	March 2021

1.7 Key Definitions and Abbreviations used in this report.

- TPZ = Tree Protection Zone. This is the area as defined by AS 4970 – "*Protection of trees on development sites*" and means the typical minimum area above and below ground at a given distance from the trunk to provide for protection of the tree. Most importantly it represents the root zone required to be kept uninjured to maintain a healthy and viable tree. Note, roots will usually extend well beyond this zone, so this represents the minimum remaining root zone required, assuming all others are lost or damaged due to construction. It is typically calculated as a circle centred on the trunk unless existing site conditions can be assessed and indicate otherwise. According to the Australian Standard, a minor encroachment of 10% of the TPZ is allowable, provided the 10% is compensated for elsewhere and contiguous to the TPZ. For the purpose of this report the extent of impact has been broken down to the following categories:
  - 0% of root zone impacted – no impact of significance
  - 0 to 10% of root zone impacted – low level of impact
  - 10 to 15% of root zone impacted – low to moderate level of impact
  - 15 to 20% of root zone impacted – moderate level of impact
  - 20 to 25% of root zone impacted – moderate to high level of impact
  - 25 to 35% of root zone impacted – high level of impact
  - >35% of root zone impacted – significant level of impact
- SRZ = Structural Root Zone. This is the area as defined by AS 4970 – "*Protection of trees on development sites*" and means the area immediately around the base of the tree at a given distance from the trunk. The woody roots and soil cohesion in this area are considered vital to the structural stability of the tree. Damage or removal of soil and roots from this area will typically render the tree unstable and require its removal. It is typically calculated as a circle, centred on the trunk, unless existing site conditions can be assessed and indicate otherwise.

2. METHODOLOGY

2.1 Health and Condition Assessment

A site inspection was undertaken on 30 March 20201 to visually assess the trees in view from ground level. This report is limited to the methods of assessment listed below (and outlined in **Appendix 1**), and does not include any internal probing, compaction testing, drilling, root mapping, aerial inspection or diagnostic testing.

- Tree Species (botanical and common name).
- Tree height and canopy spread was estimated.
- Diameter at Breast Height (DBH) and Diameter at Ground Level (DGL) was measured or estimated
- Health and vigour assessed, including indicators such as foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of deadwood, dieback, epicormic growth.
- Condition assessed, including visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators.
- Life expectancy of the tree was estimated, suitability of the tree to the site and its existing location.
- The photographs included in this report were taken at the time of inspection.
- The comments and recommendations in this report are based on findings from the site inspection.

Note: Due to the steep terrain of the site and inaccessibility to some of the trees, the DBH and DGL was not measured for every tree. Approximately half of the trees were measured using a forestry diameter tape. The DBH and DGL for the remaining trees was estimated by making a comparison to those nearby trees that were measured.

2.2 Landscape Significance

The significance of a tree in the landscape is a combination of its environmental, heritage and amenity values. A criteria for the assessment of landscape significance as devised by Andrew Morton (2003) and shown in **Appendix 2** have been applied. Whilst it may be somewhat subjective to assess these values consistently, it is appropriate to assign some measure to assist in determining the overall retention value of a tree.

The rating system which has been applied to the tree and to assist in determining a priority for retention, includes the following categories:

1. Significant
2. Very High
3. High
4. Moderate
5. Low
6. Very Low
7. Insignificant

2.3 Tree Retention Value

The retention value shown in the Tree Assessment Schedule in **Figure 3** has been determined on the basis of the estimated longevity of the tree and its landscape significance rating, in accordance with Table 1 below.

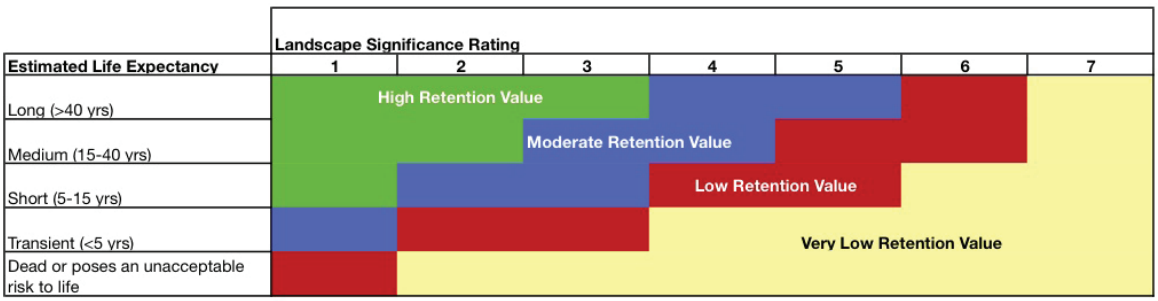


Table 1: Tree Retention Values - assessment methodology (Ref:- Morton, Andrew 2006 modified from Couston, Mark & Howden, Melanie (2001) Footprint Green Pty Ltd, Sydney, Australia)

3. OBSERVATIONS

3.1 The Site

The property is legally identified as Lot 129 in Deposited Plan 16902 and is located on the northern side of Barrenjoey Road (refer to **Figure 1** and **Figure 2**). Irregular in shape, the site is a vacant and heavily treed parcel of land with a total area of 689.2 square metres. The land adjoining the east and western side boundaries are also vacant properties that are heavily vegetated. The rear northern boundary adjoins residential properties that are accessed via Plateau Road. There is currently no vehicular or pedestrian access on to the site. The Council land which is adjacent to the front boundary and Barrenjoey Road consists of a steep embankment containing dense bushland vegetation. The section of Barrenjoey Road where is passes the property is commonly known as 'the bends', being a narrow and winding section of road. The carriageway does not permit any vehicular stopping or parking outside the site.

The site has a southerly aspect with exposure to coastal winds and weather patterns from the south (refer to Figure 1). The topography of the site is steep, with a level change of approximately 25 metres from the Barrenjoey Road carriageway up to the rear northern boundary. Sandstone rock is evident at various locations on the site which is indicative of the geology of the area.

According to the Pittwater Local Environmental Plan 2014, the property is zoned as E4 Environmental Living, being land identified as holding biodiversity and ecological significance. The prominent tree species found growing on the site is identified as *Angophora costata* (Sydney Red Gum) which is a locally occurring species and therefore holds a high landscape significance rating (in accordance with **Appendix 2**).

According to the NSW Planning Portal online mapping the majority of the property is identified as bushfire prone land - Vegetation Category 2. A small portion at the front of the site is identified as a Vegetation Buffer. Furthermore, the NSW Rural Fire Service online mapping tool identifies the site as being located within a designated 10/50 Vegetation Clearing Entitlement Area. This ruling allows for the potential removal of trees located within 10 metres of a home without seeking approval from the local governing authority.

Figure 1 (above): An aerial image showing an overview of the area with with the site indicated by a red arrow (aerial image accessed from http://maps.six.nsw.gov.au/ on 20/5/21).

Figure 2 (right): An aerial image of the site with boundary lines highlighted in red (accessed from http://maps.six.nsw.gov.au/ on 20/5/21).

3.2 **The Trees**

The information and characteristics of the trees are set out in the Tree Assessment Schedule in **Figure 3.** Each tree has been provided with an identification number for reference purposes which is noted on the Tree Location Plan (in **Figure 4**) using the Level 5 architectural drawing prepared by Peter Downes Designs and the topographical survey plan as a base layer. The tree identification numbers on the plan correlate with the Tree Assessment Schedule. Site photos can be found in **Figure 5-10**.

Note: Tree No. 29 and No. 53 are existing trees located on the adjoining land to the east of the property. These trees were not shown on the survey plan. The position of these trees have been plotted by using offset distances from other existing trees indicated on the survey plan.

Note: For the future convenience of identifying the trees contained in this report, the majority of trees were tagged. Those tagged trees have a small aluminium tag nailed into the trunk with the identification number etched on the tag. The majority of tags are attached to the eastern side of the trunk and approximately 1-1.5 metres above ground level. In some instances it was too difficult to access the trunk of the tree, therefore the tree was not tagged.

Tree No.	Plant Name (Species/Common Name)	Age	Tree Height (m)	Average Canopy spread (m)	DBH (m)	DGL (m)	Crown Class	Vigour	Condition	Useful Life Expectancy	Landscape Significance	Tree Retention Value	Observations/ comments	Tree Protection Zone (TPZ) radius in metres	Structural Root Zone (SRZ) radius in metres	Remove or retain?	Impact / Incursion
1	*Angophora costata** (Sydney Red Gum)	mature	10.0	8.0	3 x 0.20 1 x 0.25	0.80	co-dominant	normal	good to fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Positioned on embankment adjacent to site on Council land. Four main trunks. Twig dieback evident.	5.2	3.0	remove	Construction of driveway crossover & turntable for cars will necessitate removal of tree.
2	*Angophora costata** (Sydney Red Gum)	mature	9.0	6.0	2 x 0.15	0.30	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Positioned on embankment adjacent to site on Council land.	2.5	2.0	remove	Construction of driveway crossover & turntable for cars will necessitate removal of tree.
3	*Banksia integrifolia** (Coastal Banksia)	mature	10.0	6.0	0.30	0.35	co-dominant	normal	good	medium (15-40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation. Positioned on embankment adjacent to site on Council land. Positioned on edge of Barrenjoey Rd.	3.6	2.1	remove	Construction of driveway crossover & turntable for cars will necessitate removal of tree.
4	*Angophora costata** (Sydney Red Gum)	mature	10.0	6.0	0.30	0.35	co-dominant	normal	fair	medium (15-40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation. Positioned on embankment adjacent to site on Council land. Secondary limb junction at approx. 80cm above ground level.	3.6	2.1	remove	Construction of driveway crossover & turntable for cars will necessitate removal of tree.
5	*Banksia integrifolia** (Coastal Banksia)	mature	7.0	4.0	0.15	0.20	supressed	normal	fair	medium (15-40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation. Positioned on embankment adjacent to site on Council land. Canopy overhangs Barrenjoey Rd.	1.8	1.7	remove	Construction of driveway crossover & turntable for cars will necessitate removal of tree.
6	*Angophora costata** (Sydney Red Gum)	mature	7.0	6.0	0.10 0.25	0.10 0.25	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Positioned on embankment adjacent to site on Council land.	3.2	1.9	remove	Construction of driveway crossover & turntable for cars will necessitate removal of tree.
7	*Angophora costata** (Sydney Red Gum)	mature	10.0	6.0 (bias to S/W)	0.25	0.35	supressed	low	fair	long (>40yrs)	high	high	bushland vegetation. Positioned on embankment adjacent to site on Council land. Twig dieback evident.	3.0	2.1	remove	Construction of driveway crosover will necessitate removal of tree.
8	*Angophora costata** (Sydney Red Gum)	mature	8.0	8.0 (bias to W)	0.27 0.19	0.40	co-dominant / partially supressed	normal	fair	long (>40yrs)	high	high	bushland vegetation. Positioned on embankment adjacent to site on Council land. Large deadwood.	4.0	2.3	remove	Construction of driveway crosover will necessitate removal of tree.
9	*Angophora costata** (Sydney Red Gum)	mature	10.0	12.0 (bias to W)	3 x 0.22 0.28	2 x 0.40	co-dominant	normal to low	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Located on vacant land to east of site. Over-extending limb (deadwood) overhanging property - pruning required. Fused limbs evident.	5.6	2.6	retain	Proposed structures located outside TPZ of tree.
10	*Angophora costata* (Sydney Red Gum)	mature	9.0	6.0 (bias to W)	0.33	0.40	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	4.0	2.3	retain	Proposed structures located outside TPZ of tree.
11	*Eucalyptus umbra* (Bastard Mahogany)	mature	8.0	8.0	0.25 0.12	0.27 0.15	supressed	normal	good	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Borers evident.	3.4	2.0	remove	Located within footprint of garage
12	*Angophora costata* (Sydney Red Gum)	mature	7.0	6.0 (bias to W)	0.22	0.25	supressed	low	poor	short (5-15yrs)	high	moderate	Locally indigenous species representative of bushland vegetation. Deadwood evident. Wound at base. Poor wound closure.	2.6	1.8	remove	Located within footprint of garage
13	*Eucalyptus umbra** (Bastard Mahogany)	mature	9.0	6.0	2 x 0.12	0.20	supressed	normal	fair	medium (15-40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation. Deadwood evident. Co-dominant @ 1.2m.	2.0	1.7	retain	Proposed cut line located just outside TPZ of tree.

Figure 3: Tree Assessment Schedule

Tree No.	Plant Name (Species/Common Name)	Age	Tree Height (m)	Average Canopy spread (m)	DBH (m)	DGL (m)	Crown Class	Vigour	Condition	Useful Life Expectancy	Landscape Significance	Tree Retention Value	Observations/ comments	Tree Protection Zone (TPZ) radius in metres	Structural Root Zone (SRZ) radius in metres	Remove or retain?	Impact / Incursion
14	*Angophora costata** (Sydney Red Gum)	mature	8.0	10.0	0.21 2 x 0.15	0.45	co-dominant / partially supressed	low	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Deadwood evident. Co-dominant @ 1.0m.	3.6	2.4	retain	Excavation for garage located in TPZ of tree representing a minor encroachment of approx. 5%
15	*Eucalyptus umbra** (Bastard Mahogany)	mature	8.0	4.0	0.18	0.20	supressed	normal	good	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.2	1.7	retain	TPZ of tree does not extend into subject property.
16	*Angophora costata** (Sydney Red Gum)	mature	9.0	4.0 (bias to W)	0.20	0.25	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.4	1.8	retain	TPZ of tree does not extend into subject property.
17	*Angophora costata** (Sydney Red Gum)	mature	9.0	8.0 (bias to W)	0.25	0.30	co-dominant	normal	good	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Inactive termite mound at base.	3.0	2.0	retain	TPZ of tree does not extend into subject property.
18	*Angophora costata** (Sydney Red Gum)	mature	8.0	6.0 (bias to W)	2 x 0.15	0.25	co-dominant	normal	poor	medium (15-40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation. Major deadwood evident.	2.5	1.8	retain	TPZ of tree does not extend into subject property.
19a 19b	*Angophora costata** (Sydney Red Gum)	mature	6.0-8.0	4.0 - 6.0	0.15 0.20	0.19 0.22	co-dominant / partially supressed	normal	fair to poor	medium (15-40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation. Decay at root buttress evident.	3.0	2.0	retain	Excavation for garage located in TPZ of tree representing a minor encroachment of approx. 4%
20a 20b	*Angophora costata** (Sydney Red Gum)	mature	8.0	4.0 - 5.0	2 x 0.15	2 x 0.18	co-dominant / partially supressed	normal	fair	long (>40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation.	2.5	1.8	retain	Proposed cut line located outside TPZ of trees.
21	*Eucalyptus umbra** (Bastard Mahogany)	mature	9.0	8.0	0.15 0.28	0.17 0.3	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	3.8	2.1	retain	Proposed cut line located outside TPZ of tree.
22	*Angophora costata* (Sydney Red Gum)	mature	6.0	4	0.16	0.20	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Deadwood evident.	1.9	1.7	remove	Located within footprint of garage
23	*Eucalyptus umbra* (Bastard Mahogany)	mature	5.0	2	0.13	0.15	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Rot at root buttress.	1.6	1.5	remove	Located within footprint of garage
24	*Angophora costata* (Sydney Red Gum)	mature	5.0	3.0	0.16	0.19	co-dominant / partially supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	1.9	1.6	remove	Located within footprint of garage
25	*Angophora costata* (Sydney Red Gum)	mature	7.0	6.0 (bias to S/W)	0.21	0.25	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.5	1.8	remove	Excavation for garage and underground access will necessitate removal of tree.
26	*Angophora costata* (Sydney Red Gum)	mature	7.0	6.0 (bias to W)	0.19	0.23	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.3	1.8	retain?	Minor encroachment in TPZ - less than 2m from corner of garage
27	*Angophora costata* (Sydney Red Gum)	mature	7.0	5.0	0.24	0.27	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.9	1.9	retain	Proposed structures located outside TPZ of tree.
28	*Angophora costata* (Sydney Red Gum)	mature	7.0	6.0	.17 0.29	0.35	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	4.1	2.1	retain	Proposed structures located outside TPZ of tree.
29	*Angophora costata** (Sydney Red Gum)	mature	6.0	8.0	.29 0.26	0.60	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	4.7	2.7	retain	Proposed structures located outside TPZ of tree.
30	*Angophora costata** (Sydney Red Gum)	mature	9.0	6.0	.16 .26	0.45	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	3.7	2.4	retain	Proposed structures located outside TPZ of tree.

Figure 3: Tree Assessment Schedule continued.

Tree No.	Plant Name (Species/Common Name)	Age	Tree Height (m)	Average Canopy spread (m)	DBH (m)	DGL (m)	Crown Class	Vigour	Condition	Useful Life Expectancy	Landscape Significance	Tree Retention Value	Observations/ comments	Tree Protection Zone (TPZ) radius in metres	Structural Root Zone (SRZ) radius in metres	Remove or retain?	Impact / Incursion
31	*Angophora costata* (Sydney Red Gum)	mature	6.0	7.0	.19 .18	.20 .22	co-dominant / partially supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	3.1	2.0	retain	Proposed structures located outside TPZ of tree.
32	*Angophora costata* (Sydney Red Gum)	mature	7.0	5.0	.11 .15 .21	.3 .16	co-dominant / partially supressed	normal	fair to poor	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Major decay.	3.4	2.1	retain	Proposed structures located outside TPZ of tree.
33	*Angophora costata* (Sydney Red Gum)	mature	8.0	3.5	0.16	0.19	co-dominant / partially supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.0	1.6	retain	Proposed structures located outside TPZ of tree.
34	*Eucalyptus umbra* (Bastard Mahogany)	mature	5.0	2.0	0.18	0.23	supressed	normal	fair to poor	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.2	1.8	remove	Balcony attached to secondary dwelling will necessitate removal of tree.
35	*Eucalyptus umbra* (Bastard Mahogany)	mature	8.0	7.0	.25 .18	.27 .2	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	3.7	2.1	remove	Proposed secondary dwelling will necessitate removal of tree.
36	*Angophora costata* (Sydney Red Gum)	mature	7.0	6.0	0.23	0.25	co-dominant / partially supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.8	1.8	remove	Proposed secondary dwelling will necessitate removal of tree.
37	*Angophora costata* (Sydney Red Gum)	mature	8.0	5.0	0.18	0.23	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	2.2	1.8	remove	Proposed secondary dwelling will necessitate removal of tree.
38	*Allocasuarina torulosa* (Forest She-Oak)	mature	9.0	3.0	0.20	0.25	co-dominant	low	poor	short (5-15yrs)	high	moderate	Locally indigenous species representative of bushland vegetation.	2.4	1.8	remove	Proposed secondary dwelling will necessitate removal of tree.
39	*Angophora costata* (Sydney Red Gum)	mature	8.0	4.0	0.17	0.25	supressed	low	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Leaning trunk.	2.0	1.8	remove	Proposed secondary dwelling will necessitate removal of tree.
40	*Angophora costata* (Sydney Red Gum)	mature	9.0	8.0	.24 .33	0.50	co-dominant	normal	good	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Branch lopped - epicormic growth. Co-dominant at 50cm above ground.	4.9	2.5	remove	Proposed secondary dwelling will necessitate removal of tree.
41	*Angophora costata* (Sydney Red Gum)	mature	7.0	2.0	0.14	0.25	supressed	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	3.0	1.8	remove	Proposed secondary dwelling will necessitate removal of tree.
42	*Angophora costata* (Sydney Red Gum)	mature	7.0	6.0	0.2 x 2 0.24 0.17	0.46	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Four ascending trunks. Decay evident.	4.9	2.4	remove	Proposed primary and secondary dwelling will necessitate removal of tree.
43	*Angophora costata* (Sydney Red Gum)	mature	7.0	5.0 (bias to west)	0.17 0.15	0.35	supressed	normal	poor	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Deadwood major. Leaning trunks.	2.8	2.1	retain	Proposed structures located outside TPZ of tree. Minor canopy pruning likely for clearance to new building.
44	*Angophora costata* (Sydney Red Gum)	mature	9.0	10.0	0.35	0.40	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Deadwood persistent.	4.2	2.3	retain	Proposed structures located outside TPZ of tree. Minor canopy pruning likely for clearance to new building.
45	*Angophora costata* (Sydney Red Gum)	mature	8.0	12.0	0.33	0.45	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Evidence of termite activity.	4.0	2.4	retain	Proposed structures located outside TPZ of tree. Minor canopy pruning likely for clearance to new building.
46	*Angophora costata* (Sydney Red Gum)	mature	7.0	5.0	0.23	0.33	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Upright specimen.	2.8	2.1	remove	New primary dwelling will necessitate removal of tree.
47	*Eucalyptus umbra (Bastard Mahogany)*	mature	8.0	7.0	0.35	0.40	dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation.	4.2	2.3	remove	New primary dwelling will necessitate removal of tree.
48	*Glochidion ferdinandi* (Cheese Tree)	mature	5.0	6.0	0.22	0.25	co-dominant	normal	fair	medium (15-40yrs)	high	moderate	Locally indigenous species representative of bushland vegetation.	2.6	1.8	remove	New primary dwelling will necessitate removal of tree.

Figure 3: Tree Assessment Schedule continued.

Tree No.	Plant Name (Species/Common Name)	Age	Tree Height (m)	Average Canopy spread (m)	DBH (m)	DGL (m)	Crown Class	Vigour	Condition	Useful Life Expectancy	Landscape Significance	Tree Retention Value	Observations/ comments	Tree Protection Zone (TPZ) radius in metres	Structural Root Zone (SRZ) radius in metres	Remove or retain?	Impact / Incursion
49	Angophora costata (Sydney Red Gum)	mature	7.0	20.0 (bias to north and west)	.28 .39	0.80	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Two low lying limbs, fused branches.	5.8	3.0	remove	New primary dwelling will necessitate removal of tree.
50	Eucalyptus botryoides (Bangalay)	mature	7.0	10.0	.48 .35	0.60	co-dominant	normal	fair	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Tree has previously been lopped for views.	7.1	2.7	remove	Primary dwelling represents an encroachment of approx. 35% in the TPZ and SRZ of the tree.
51	Angophora floribunda* (Rough barked Apple)	mature	10.0	10.0	0.20 2 x 0.30	0.70	co-dominant	normal	good	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Located on adjoining property.	5.6	2.8	retain	Proposed structures located outside TPZ of tree.
52	*Araucaria heterophylla** (Norfolk Island Pine)	mature	15.0	10.0	0.65	0.90	dominant	normal	good	long (>40yrs)	high	high	Large mature specimen located on neighbouring property to the rear of the site.	7.8	3.2	retain	Proposed structures located outside TPZ of tree.
53	Angophora costata* (Sydney Red Gum)	mature	6.0	15.0 (bias to west)	0.36	0.55	dominant	normal	good	long (>40yrs)	high	high	Locally indigenous species representative of bushland vegetation. Pruning of overhanging canopy possibly required.	4.3	2.6	retain	Proposed structures located outside TPZ of tree. Minor canopy pruning likely for clearance to new building.

** Those trees located on adjoining land*

Figure 3: Tree Assessment Schedule continued.

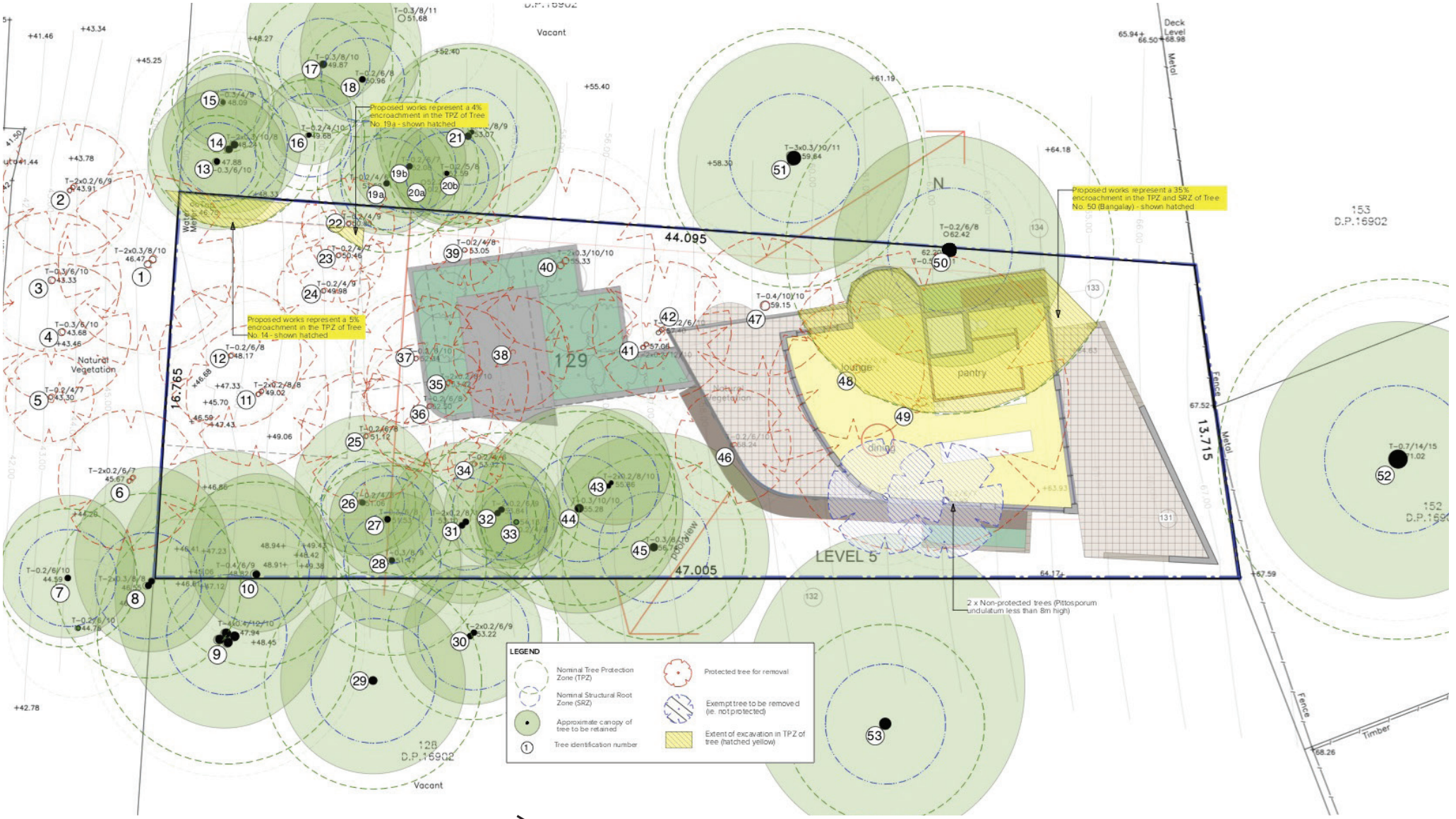


Figure 4: Tree Location Plan showing an overlay of the existing trees located on the site and the indicate Tree Protection Zones and Structural Root Zones for those trees to be retained as part of the development. (Note, do not measure from drawings).

Figure 5: Photograph viewing west at the council road reserve at the front of the site (Photo: J Willis)

Figure 6: Photograph viewing east at the council road reserve at the front of the site (Photo: J Willis)

Figure 7: Photograph viewing south from the middle of the site (Photo: J Willis)

Figure 8: Photograph viewing south along the eastern boundary from the top of the site. (Photo: J Willis)

Figure 9: Photograph viewing west across the top portion of the site (Photo: J Willis)

Figure 10: Photograph viewing south down the site. (Photo: J Willis)

4. DISCUSSION | IMPACT ASSESSMENT

4.1 The intention of this assessment is to determine the level of incursion by the proposed works to the root zones and canopies of the trees located on the site and on adjoining land. Furthermore this assessment shall evaluate the likely impact resulting from the proposed works on the existing trees. The Tree Location Plan shown in **Figure 4** indicates the tree locations and the proposed removal or retention of each tree. The Site Plan in **Figure 11** and **Figure 12** indicates the encroachment (where applicable) for those trees located outside the footprint of the proposed structures. The calculated Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) are indicated as dashed lines around the trees. The following criteria have been examined as part of this assessment:-

- Existing Relative Levels (RL)
- Tree Protection Zone (TPZ)
- Structural Root Zone (SRZ)
- Footprint of the proposed development and any temporary structures (such as scaffolding)
- Incursions to the TPZ & SRZ, including excavation, filling, and potential above ground impacts to tree canopy;
- Existing structures located in the TPZ of the retained trees; and
- Assessment of the likely impact of the works on the existing trees.

4.2 Summary of existing trees

The site is heavily treed containing numerous ecologically significant trees that are indicative of the original vegetation found in the area. Of the fifty three (53) trees included in this assessment approximately 70% are identified as *Angophora costata* (Sydney Red Gum) and 15% are identified as *Eucalyptus umbra* (Bastard Mahogany). These species are associated with the Endangered Ecological Community (EEC) known as the Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion. The tree canopy layer of this EEC is typically characterised by *Corymbia maculata* and *Eucalyptus paniculata.* Associated species found growing on higher rocky ridges that receive on-shore winds tend to support *Angophora costata* and *Eucalyptus umbra* as the dominant tree canopy layer.

The trees on the property tend to be growing in clusters forming groves that are predominantly located to the lower portion of the site. The trees are relatively short in comparison to their potential biological mature height. This is presumably due to the prevailing coastal winds which the site would experience from the south, thereby suppressing the height of the trees.

On the basis of the ecological significance of the trees as a grove, they are considered to hold a retention value that is either high or moderate. However as a stand alone tree, in many instances the tree has fair to poor condition and often with a limited crown size due to a co-dominant or suppressed crown class. Of the fifty three (53) trees assessed, forty three (43) trees are considered to have a high retention value and ten (10) trees are considered to have a moderate retention value. The author assumes all the trees are self sown, with exception to Tree No. 53 (Norfolk Island Pine) which is located in the rear yard of a neighbouring property to the north.

4.3 Summary of proposed works

The proposed architectural drawings indicate a multiple storey dwelling with rooftop swimming pool located to the rear of the site. A multiple storey secondary dwelling is located to the immediate south of the primary residence and adjacent to the western side boundary. The proposal includes a garage/workshop structure to the southwestern corner of the site. To allow for vehicular and pedestrian access on to the site, it is proposed to cut into the existing road reserve embankment to allow for the installation of a driveway crossover. The crossover shall include a turntable which will allow for safer manoeuvrability to enter and exit the site. Pedestrian access to the dwellings shall be via an underground walkway, steps and lifts.

4.4 Proposed tree removal

The proposed development involves the removal of twenty eight (28) trees. Of these trees to be removed, eight (8) trees are located on the council road reserve and twenty (20) trees are located

within the site. The identified trees for removal are protected species that hold ecological significance. As such, Council permission must be sought prior to their removal. The trees proposed for removal include twenty two (22) high retention value trees (including No's. 1-2, 6-8, 11, 22-25, 34-37, 39-42, 46-47,49-50) and six (6) trees moderate retention trees (including No's. 3-5, 12, 38 and 48). A breakdown of the proposed structures and associated tree removal is as follows:

i) Tree removal to accommodate the driveway crossover

The proposed driveway crossover will necessitate the removal of eight (8) council owned trees located on the road reserve, identified as Tree No. 1-8 inclusive. In order to allow for access on to the site it is inevitable that these trees are to be removed as part of the works.

ii) Tree removal to accommodate the garage/workshop

The proposed garage structure will require deep excavation to achieve a level that relates to the Barrenjoey Road street frontage and driveway crossover. The garage works necessitate the removal of six (6) trees located to the south western corner of the site, identified as Tree No. 11, 12, 22-25.

iii) Tree removal to accommodate the secondary dwelling and balcony

The proposed multiple storey secondary dwelling will necessitate the removal of eight (8) trees, identified as Tree No. 34-41 inclusive.

iv) Tree removal to accommodate the primary dwelling

The proposed multiple storey primary dwelling is positioned towards the top of the site and adjacent to the western side boundary. The dwelling will necessitate the removal of five (5) trees that are located within the building footprint and are identified as Tree No. 11, 12, 22-25.

Note: The author attended an initial site meeting in February 2021 with the owner and architect to discuss the trees and future positioning of the new buildings. During this meeting it was decided to position the buildings towards the western side of the property so that the heavy concentration of trees towards the south eastern portion of the site could be retained as part of the works.

4.5 <u>Proposed deep excavation to the southwestern corner of site:</u> (refer to **Figure 11**)

The proposed garage structure located to the southwestern corner of the site with a setback distance of 1.0 metre from the western boundary. The excavation works are located in the TPZ of the neighbouring Tree No. 14 and No. 19a (both Sydney Red Gums), representing an encroachment of 5% and 4% respectively. The author assumes the deep excavation may well extend beyond the 1.0 metre setback of the garage structure indicated on the drawing. This will depend upon the method of excavation adopted as part of the works. It would be preferable to adopt an excavation method which results in limited cutting beyond the line of the garage walling. Overall, the extent of encroachment is considered to be acceptable and should not result in any adverse impact upon the tree.

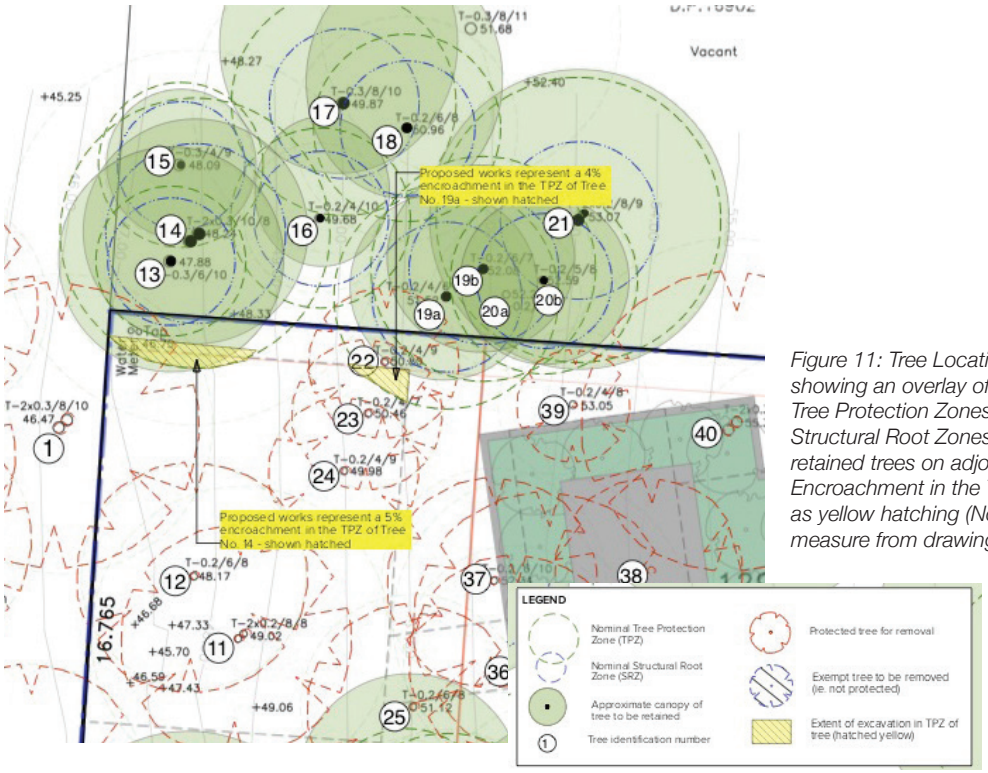


Figure 11: Tree Location Plan showing an overlay of indicative Tree Protection Zones and Structural Root Zones for those retained trees on adjoining land. Encroachment in the TPZ is shown as yellow hatching (Note, do not measure from drawings).

4.6 Encroachment in TPZ of Tree No. 50 (Bangalay) (refer to **Figure 12**)

The proposed multiple storey dwelling is located in the TPZ and SRZ of Tree No. 50 (Bangalay) representing an encroachment of approximately 35%, which is considered to be major (ie. greater than 10%). As such, the works may result in an high to significant level of impact upon the tree. The potential root and canopy loss would inevitably compromise the vigour and long term preservation of the tree. Furthermore the proposed excavation in the SRZ may potentially result in the severance of large woody roots that are providing anchorage and stability for the tree. It is the author's opinion the extent of encroachment is well above acceptable limits and would render the tree unviable.

If the proposal is approved in its current form it is recommended the tree is removed prior to the commencement of any works on the site.

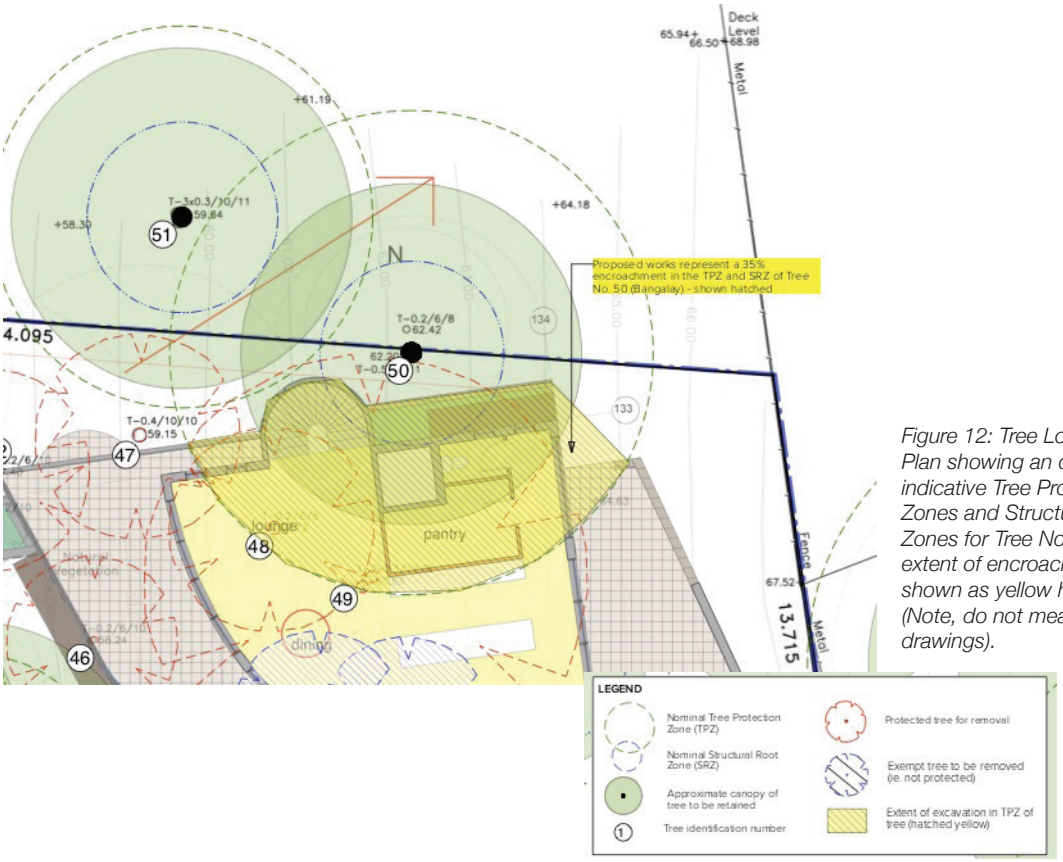


Figure 12: Tree Location Plan showing an overlay of indicative Tree Protection Zones and Structural Root Zones for Tree No. 50. The extent of encroachment is shown as yellow hatching (Note, do not measure from drawings).

4.7 Proposed canopy pruning to retained trees

The proposed works will likely result in the canopy pruning of some of the retained trees. It is estimated clearance pruning will be required to accommodate the new structures to four (4) trees, including Tree No. 43, 44, 45 and 53. Overall the pruning is considered to be minimal and should not result in any more than a 10% reduction of live crown volume. As such, the anticipated pruning for clearance should not result in any adverse impact upon the retained trees.

5. CONCLUSION | RECOMMENDATIONS

5.1 A total of fifty three (53) trees (or groups of trees) are included in this assessment including thirty (30) trees located within the site boundaries, and twenty three (23) trees located on the adjoining land. The site is vacant (free of any structures), steeply sloping and heavily treed. The identified trees are consistent with locally occurring vegetation in the area and therefore hold a high ecological value. This is reflected in Council's zoning of the site as E4 Environmental Living, being land identified as holding biodiversity and ecological significance. According to the NSW Planning Portal, the site is also zoned as Bush Fire Prone Land (Category 2) and is also located within a designated 10/50 Vegetation Clearing Entitlement Area.

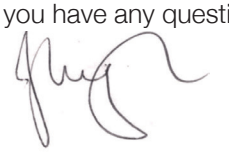
5.2 The proposed structures have been positioned towards the western side of the property in order to retain the grove of Sydney Red Gums located towards the south eastern portion of the site. The proposed development will result in the removal of twenty eight (28) trees, including eight (8) trees located on the council road reserve (Tree No. 1-8) and twenty (20) trees located within the site boundaries (Tree No. 11, 12, 22-25, 34-42, 46-50). The above mentioned trees are considered to hold a moderate or high retention value on the basis of ecological significance and a medium to long estimated life expectancy. With consideration to the bushfire rating on the site and compensatory planting further advice should be sought by the New South Wales Rural Fire Service or a bushfire consultant regarding the planting of trees on bushfire prone land. .

5.3 The proposed garage structure is located in the TPZ of two (2) trees located on adjoining land (being Tree No. 14 and No. 19a), representing a minor encroachment of 4-5%. The author assumes the line of excavation may well extend towards the western boundary. If this assumption is correct, the extent of encroachment will be approximately 10% and is still considered to be within acceptable limits.

5.4 It is assumed all future underground services will extend directly along side the proposed structures and where possible, utilise the underground access path that is indicated on the plans. This will minimise any disturbance to the root systems of the retained trees. If additional trenching is required through the TPZ of the retained trees, the applicant should seek further advice from a qualified arborist.

5.5 To ensure the protection and long term preservation of the trees identified in this report, it is recommended an experienced and qualified consulting arborist (AQF Level 5) is engaged to oversee the construction activities located in the TPZ of the identified trees. The arborist should prepare a tree protection plan relating to tree protection measures of the retained trees, plus prepare a pruning specification. The specified tree protection measures are to be adhered to during the course of the construction activities. The consulting arborist should be engaged for the duration of the project and certify that all tree protection measures have been adhered to in accordance with the prepared tree protection plan.

If you have any questions regarding this report please do not hesitate to contact the undersigned.



Joanne Willis
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Member of I.A.C.A. (Institute of Australian Consulting Arborists)
Member of I.S.A (International Society of Arboriculture)

Assumptions

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However Joanne Leigh – Consulting Arborist can neither guarantee nor be responsible for the accuracy of information provided by others.
Unless stated otherwise:
- Information contained in this report covers only the tree that was examined and reflects the condition of the tree at the time of inspection: and
- The inspection was limited to visual examination of the subject tree without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject tree may not arise in the future.

6. REFERENCES

- Draper, Danny B. and Richards, Peter A (2009) “Dictionary for Managing Trees in Urban Environments”. CSIRO Publishing, Collingwood, VIC Australia
- Harris, R.W; Clark, J.R; & Matheny, N.P (2004) Arboriculture; Integrated Management of Landscape Trees, Shrubs & Vines 4th Edition, Prentice Hall, New Jersey.
- Mattheck, Claus (2007) “Updated Field Guide for Visual Tree Assessment”. Karlsruhe Research Centre, Germany.
- Standards Australia (2009) AS2970-2009 “Protection of Trees on Development Sites”, Sydney.
- Council’s relevant tree planning documents.

APPENDIX 1: TREE INSPECTION INVENTORY NOTES

The values for terminology provided below are sourced from SRIV© Sustainable Retention Index Value © From Draper BD and Richards PA 2009, Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Age: Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as Young, Mature and Over-mature.
Young - Tree aged less 20% of life expectancy, in situ.
Mature - Tree aged 20-80% of life expectancy, in situ.
Over-mature - Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

Height: In metres (estimated)

Spread: Average diameter of canopy in metres (estimated)

Crown class:
(D) Dominant (crown extends above general canopy; not restricted by other trees)
(C) Co-dominant (crown forms the bulk of the general canopy but crowded by other trees)
(I) Intermediate (crown extends into dominant/codominant canopy but quite crowded on all sides)
(S) Suppressed (crown development restricted from overgrowing trees)

Vigour: Ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. dormant, deciduous or semi-deciduous trees. Vigour can be categorized as:
Normal Vigour Ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.
High Vigour Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.
Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.
Dormant Tree Vigour Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last extension growth is distinct from those most recently preceding it, evident by bud scale scars. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.

Useful Life Expectancy: The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as Immediate, Short Term, Medium Term and Long Term.
Short Term - Period of time less than 15 years.
Medium Term - Period of time 15 - 40 years.
Long Term - Period of time greater than >40 years.

Condition: A tree's crown form and growth habit, as modified by its environment (aspect, suppression by other trees, soils), the stability and viability of the root plate, trunk and structural branches (first (1st) and possibly second (2nd) order branches), including structural defects such as wounds, cavities or hollows, crooked trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with vigour and it is possible for a tree to be of normal vigour but in poor condition. Condition can be categorized as:
Good Condition - Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour.
Fair Condition - Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour.
Poor Condition - Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from, or contributed to by vigour.

APPENDIX 2: CRITERIA FOR ASSESSMENT OF LANDSCAPE SIGNIFICANCE

The level of landscape significance has been determined using the following key criteria as a guide:

1. SIGNIFICANT
• The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance; or
• The subject tree forms part of the curtilage of a Heritage Item (building /structure /artifact as defined under the LEP) and has a known or documented association with that item; or
• The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to commemorate an important historical event;
• The subject tree is scheduled as a Threatened Species or is a key indicator species of an Endangered Ecological Community as defined under the Threatened Species Conservation Act 1995 (NSW) or the Environmental Protection and Biodiversity Conservation Act 1999; or
• The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species; or
• The subject tree is a Remnant Tree, being a tree in existence prior to development of the area; or
• The subject tree has a very large live crown size exceeding 300m2 with normal to dense foliage cover, is located in a visually prominent in the landscape, exhibits very good form and habit typical of the species and makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity; or
• The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.

2. VERY HIGH
• The tree has a strong historical association with a heritage item (building/structure/artifact/garden etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site; or
• The subject tree is listed on Council's Significant Tree Register; or
• The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor or has known wildlife habitat value;
• The subject tree has a very large live crown size exceeding 200m2; a crown density exceeding 70% Crown Cover (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area.

3. HIGH
• The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence; or
• The tree is a locally-indigenous species and representative of the original vegetation of the area; or
• The subject tree has a large live crown size exceeding 100m2; and
• The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (eg crown distortion/suppression) with a crown density of at least 70% Crown Cover (normal); and
• The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area.

4. MODERATE
• The subject tree has a medium live crown size exceeding 40m2; and
• The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% Crown Cover (thinning to normal); and
• The tree makes a fair contribution to the visual character and amenity of the area; and
• The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms.
• The tree has no known or suspected historical association

5. LOW
• The subject tree has a small live crown size of less than 40m2 and can be replaced within the short term with new tree planting; or
• The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% Crown Cover (sparse); and
• The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area.

6. VERY LOW
• The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or a nuisance species.
• The subject tree is scheduled as exempt (not protected) under the provisions of the local Council's Tree Preservation Order due to its species, nuisance or position relative to buildings or other structures.

7. INSIGNIFICANT
• The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993

Ref:- Morton, Andrew (2003) Criteria for Assessment of Landscape Significance Earthscape Horticultural Services. Sydney, Australia