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REPORT

Arborist Impact Assessment

PREPARED FOR

NSW LAHC Land and Housing Corporation Project manager, Mr. Ben Oglivie Housing Plus

1 Winbourne Street & 6 Mulgoa Way Mudgee NSW 2850

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17th of November 2022

PREPARED BY

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1. EXECUTIVE SUMMARY

1.1 LAHC C/o Mr Ben Oglivie, commissioned an arborist impact assessment to evaluate the potential impacts on trees by a proposal development and if viable to make recommendations that reduce the impacts on trees at 1 Winbourne Street and 6 Mulgoa Way Mudgee NSW 2850.

1.2 The assessment was conducted on the 21st of April 2022, by a senior AQF level 5 arborist

1.3 Twenty two (22) trees were assessed on site and on the adjacent surroundings area and all trees have impacts from the proposed development.

1.4 The impacts for the proposed development anticipate the following;

1.4.1 Three (3) trees of **high retention value** are positioned within the proposed development, these trees are numbered 1, 2 and 12.

1.4.2 Eight (8) trees of **moderate retention value** are positioned within the proposed development, these trees are numbered 3, 5, 13, 14, 15, 17, 18 and 20.

1.4.3 Tree 6 is of **low retention value** and positioned within the proposed development.

1.4.4 Ten (10) trees of **very- low retention value** is positioned within the proposed development, these trees are numbered 4, 7, 8, 9, 10, 11, 16, 19, 21 and 22.

1.5 Tree works are as follows:

Table 1: Tree Works

Tree number	Count	Tree Works
1, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21 and 22	18	Remove.
2, 3, 5, and 14.	4	Retain.

1.6 Recommended Management and Protection Measures are as follows: *Table 2: Recommended Management and Protection Measures*

Tree number	Count	Recommended Management and Protection Measures
1, 4, 6, 7, 8, 9, 10, 11, 12, 13,	17	Remove and replenish.
15, 16, 17, 18, 19, 20, and 22		
21	1	Remove (exempt from replenishment).
		Retain and protect. Tree protective fencing. Low impact
3, 5, and 14.	.3	driveway. Sensitive construction measures, utilizing pier and
5, 5, and 14.	3	beam footings and AQF level 5 supervision to preserve
		structural roots.
2	1 Retain and protect. Tree protective fencing.	

2. INTRODUCTION

2.1 AIMS

The aim of the report is to:

2.1.1 To assess tree health, condition, retention value and evaluate impacts on trees by the proposed development.

2.1.2 To provide options, if viable to reduce the impacts of the proposed development on the existing trees and make recommendations for tree management and protection during development.

2.2 SCOPE

2.2.1 Mr. Ben Oglivie, the project manager of Housing Plus, LAHC-Land and Housing Corporation, commissioned an arborist impact assessment for the site at 1 Winbourne Street and 6 Mulgoa Way Mudgee NSW 2850.

2.2.2 The assessment was conducted on the 21st of April 2022, by Gregor van Emmerik Dip. Arb AQF L5 (Ryde), Tree Risk Assessment Qualified (vTRA),) & Tree Contractors Association of Australia (TCAA) member. McArdle Arboricultural Consultancy prepared the report.

2.2.3 Tree management measures are regulated by the Mid-Western Regional Council Development Control Plan 2013 (DCP) and the Mid-Western Regional Local Environmental Plan 2012 (LEP).

2.2.4 Twenty-two (22) trees were assessed on site and on the adjacent surrounding area and all twentytwo (22) trees are impacted by the proposed development. The proposed development is the construction of four (4) dual occupancy dwellings by way of dividing the two (2) existing lots (Lot 17 and 18) into four (4) lots. The dual occupancies will require service installation such as sewerage, electricity and water.

2.2.5 The inspection, does not include below ground root excavation, no expert laboratory analysis was conducted, including internal diagnostics, inaccessible trunk and aerial inspection. No pathology test or soil analysis were conducted. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale.

2.2.6 The owner or manager of this site has not provided other documentation relating to the trees. Apart from post-site research and comparisons of similar sites, our observations are the only details analysed.

2.2.7 REFERENCES Level and Detail survey Plan BARNSON 11th May 2022

2.3. METHODOLOGY

2.3.1 The inspection was primarily conducted using ground-based collection of data to identify visible signs of tree health, structure and potential hazards. Collection data methods may include; a mallet for sound test, trowel, screw driver for compaction and probing cavities to identify pathogens pests and disease. The assessments do not involve laboratory analysis. Methods may include the following;

2.3.2 **Visual Tree Assessment (VTA)** (Mattheck and Breloer 1994), a method assessing for biological and lower level mechanical functions and signs of decay, damage or defects (Appendix A).

- 2.3.3 Tree AZ Categories (Barrell 2010) classifies importance of trees on development sites, (Appendix B).
 - Category A- suitable for retention and
 - Category Z- (Z1 to Z12): not worthy of constraint.

2.3.4 **Tree Useful Life Expectancy (TULE)** (Barrell 1993; adapted with permission for TCAA 2014), (Appendix C) measures its remining lifespan and assigns a category as;

- 1. Long- >40 years
- 2. Medium- 15-40years,
- 3. Short- 5-15years,
- 4. Remove- next 5yrs,
- 5. No potential for retention and
- 6. Small, young or regularly clipped.

2.3.5 **Landscape Significance Rating** (Morton 2006), (Appendix D) measures its contribution to the amenity, heritage and ecological criteria and is classified as;

- 1. Significant- listed heritage or ecological item,
- 2. Very high- strong historical association with heritage or other value,
- 3. High- suspected heritage item or status strong historical or other value,
- 4. Moderate- no historical association but does not detract value of the item,
- 5. Low- the tree detracts from heritage value or exempt species,
- 6. Very low- causing significant damage to a heritage item and
- 7. Insignificant- dead and no visible habitat.

2.3.6 **Retention Value Rating** (Morton 2011) is determined once the TULE category and Landscape Significance ratings have been determined (Appendix E). the values are rated as;

- **High** considered worthy of preservation,
- Moderate- retention of these trees is desirable,
- Low- are generally not a constraint to development and
- Very Low- potentially hazardous or very poor specimens.

2.3.7 **Standards Australia**, AS 4970 2009– Protection of trees on development sites and AS 4373 2007-Pruning of Amenity Trees.

2.3.8 **Planting Specifications from NATSPEC** (Clark 2003) and Australian Standard [®] AS 2303-2018 Tree Stock for Landscape Use. (Appendix H).

2.3.9 **Tree Contractors** must have a minimum AQF Level 3 Certificate in arboriculture and work in accordance with Australian Standard[®] AS 4373 2007 Pruning of Amenity Trees, the Work Health & Safety (WHS) Act 2011 and the WHS Regulations 2017, the Safe Work Guide to Managing Risks of Tree Trimming and Removal Work 2016 and the Code of Practice for The Amenity Tree Industry 1998. Work near powerlines should be carried out in accordance with the Code of Practice for Work Near Overhead Power Lines.

3. **RESULTS**

3.1 THE SITE

- 3.1.1 The site is 1 Winbourne Street and 6 Mulgoa Way Mudgee NSW 2850.
- 3.1.2 This landscape is flat. The soils¹ are classified generally as sandy clay.
- 3.1.3 Figure 1 shows a scaled site map



Figure 1: Aerial map of 1 Winbourne Street and 6 Mulgoa Way Mudgee NSW 2850. Yellow line indicates site.

¹ Espade.environment.nsw.gov.au

McArdle Arboricultural Consultancy Pty Ltd ©

3.2 LEGISLATION AND SIGNIFICANCE IN THE ENVIRONMENT

Trees are subject to the following commonwealth and State legislation:

3.2.1 Commonwealth Legislation regulates the **Biosecurity Act 2015**, (diseases and pests) and the **Environmental Protection & Biodiversity Conservation Act 1999 (EPBC Act)** which manages nationally endangered ecological communities (EEC) and national heritage items. The EPBC Act delegates to the **NSW Biodiversity Conservation Act 2016 (BC Act**)² and allows state and local authorities to manage ecological and heritage matters of significance. The BC Act repealed (but still has some transitional arrangements) the NSW Threatened Species Conservation Act, 1995. The BC Act may require Species Impact Statement and Biodiversity Banking and Offset Scheme agreements determined by the Biodiversity Assessment Method (BAM).

3.2.2 NSW State Legislation³ is regulated under the **NSW Environmental Planning and Assessment Act 1979 (EP&A Act)**, which manages significant development and infrastructure in NSW. The EP&A Act utilises **Environmental Planning Instruments (EPI)**³, These instruments include **State Environment Planning Policies (SEPP) (Biodiversity and Conservation) 2021** that deal with matters of state or regional environmental planning significance and **Local Environmental Plans (LEP)** that provide local Councils a framework for land usage.

3.2.3 NSW **Rural Fire Act 1997** ⁴ regulates a **10/50 Vegetation Clearing Code**, may allow a designated area to clear trees within 10 metres of a home and clear underlying vegetation such as shrubs (but not trees), within 50 metres of a home to reduce risk from bushfires.

3.2.4 An analysis of state and local legislation, development controls and planning instruments concludes the following:

- **Tree management measures** ⁴ are regulated by the Mid-Western Regional Council Development Control Plan 2013 (DCP) and the Mid-Western Regional Local Environmental Plan 2012 (LEP).
- The Local Aboriginal Land Council is Mudgee.
- Land zoning is R1: General Residential.
- Groundwater Vulnerability Map.

3.3 LOCAL PLANNING AND ZONING CONTROLS

Site Address: 1 Winbourne Street and 6 Mulgoa Way Mudgee NSW 2850.





Figure 2: Land Zoning R1: General Residential.

Figure 3: Groundwater Vulnerability Map.

² https://www.environment.nsw.gov.au

³ https://www.planningportal.nsw.gov.au/

⁴ https://www.midwestern.nsw.gov.au/

McArdle Arboricultural Consultancy Pty Ltd ©

3.4 TREE SCHEDULE

Table 3: Tree Schedule - Health and Structural Condition of Trees.

Tree	Location	Botanical Name Common Name	Crown (m)	Height (m)	DBH* DRC (cm)	TPZ* SRZ (m)	Tree Health & Condition	TULE*	Retention Value	Control Measures
1	Mulgoa way	<u>Eucalyptus mannifera</u> Red Spotted Gum	14	18	88 96	10.56 3.25	Fair condition, 60 years old.	2d	High	Remove and replenish.
2	Winbourne st	<u>Eucalyptus mannifera</u> Red Spotted Gum	15	17.5	79 87	9.48 3.12	Fair condition, 60 years old.	2d	High	Retain and protect. Tree protective fencing.
3	Winbourne st	<u>Callistemon viminalis</u> Bottlebrush	9	8.5	28x 19x 16 60	4.44 2.67	Good condition, 60 years old.	2a	Moderate	Retain and protect tree with a low impact driveway. Sensitive construction measures, utilizing pier and beam footings and AQF level 5 supervision to preserve structural roots. Tree protective fencing.
4	Winbourne st	<u>Eucalyptus mannifera</u> Red Spotted Gum	8	7	66 85	7.92 3.09	Poor condition, 60 years old.	3b	Very Low	Remove and replenish.
5	Winbourne st	<u>Grevillea robusta</u> Silky Oak	6	12	43 51	5.16 2.49	Fair condition, 30 years old.	3b	Moderate	Retain and protect tree with a low impact driveway. Sensitive construction measures, utilizing pier and beam footings and AQF level 5 supervision to preserve structural roots. Tree protective fencing.
6	Winbourne st	<u>Washingtonia robusta</u> Mexican fan palm	3.5	6	59 68	3.00 2.00	Good condition, 30 years old.	1a	Low	Remove and replenish.
7	Winbourne st	<u>Callitris columellaris</u> White Cypress-pine	3	8	>15x2 25	2.52 1.85	Good condition, 15 years old.	2b	Very Low	Remove and replenish.
8	Winbourne st	<u>Callitris columellaris</u> White Cypress-pine	5.5	6	20x>15 40	3.24 2.25	Fair condition, 15 years old.	2b	Very low	Remove and replenish.
9	Winbourne st	<u>Ulmus parvifolia</u> Chinese Elm	4	5	2x>15 26	2.52 1.88	Fair condition, 10 years old.	1a	Very low	Remove and replenish.
10	Winbourne st	<u>Ulmus parvifolia</u> Chinese Elm	5	7	5x>15 45	4.08 2.37	Fair condition, 10 years old.	1a	Very low	Remove and replenish.
11	Winbourne st	<u>Fraxinus angustifolia</u> <u>subsp. oxycarpa</u> <u>'Raywood'</u>	3	5	>15 28	2.00 1.94	Poor condition, 10 years old.	3c	Very Low	Remove and replenish.
12	Winbourne st	<u>Eucalyptus sideroxylon</u> Ironbark	19	15	71 93	8.50 3.21	Good condition, 60 years old.	2b	High	Remove and replenish.

(* DBH- Diameter Breast Height, Diameter Root Collar. * TPZ- Tree Protection Zone. SRZ- Structural Root Zone. * TULE-Tree Useful Life Expectancy)

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Tree	Location	Botanical Name Common Name	Crown (m)	Height (m)	DBH* DRC (cm)	TPZ* SRZ (m)	Tree Health & Condition	TULE*	Retention Value	Control Measures
13	Winbourne st	<u>Ulmus parvifolia</u> Chinese Elm	13	18	47x 43x 33 94	8.76 3.22	Good condition, 60 years old.	3b	Moderate	Remove and replenish.
14	Winbourne st	<u>Eucalyptus robusta</u> Swamp Mahogany	7	14	38 46	4.56 2.31	Good condition, 30 years old.	2d	Moderate	Retain and protect tree with a low impact driveway. Sensitive construction measures, utilizing pier and beam footings and AQF level 5 supervision to preserve structural roots. Tree protective fencing.
15	Winbourne st	<u>Ulmus glabra</u> Golden elm	12	10.5	39x36x >15x3 78	8.52 2.98	Good condition, 60 years old.	2b	Moderate	Remove and replenish.
16	Winbourne st	<u>Ulmus parvifolia</u> Chinese Elm	5	6	>15 22	2.00 1.75	Fair condition, 10 years old.	4e	Very Low	Remove and replenish.
17	Mulgoa way	<u>Eucalyptus robusta</u> Swamp Mahogany	7	10	38 40	4.56 2.25	Good condition, 30 years old.	2d	Moderate	Remove and replenish.
18	Mulgoa way	<u>Eucalyptus robusta</u> Swamp Mahogany	8	12	39 40	4.68 2.25	Good condition, 30 years old.	2d	Moderate	Remove and replenish.
19	Mulgoa way	<u>Grevillea robusta</u> Silky Oak	3	8	2x>15 15	2.52 1.50	Poor condition, 10 years old.	4e	Very Low	Remove and replenish.
20	Mulgoa way	<u>Callistemon viminalis</u> Bottlebrush	7	8	38x26 51	5.52 2.49	Good condition, 30 years old.	2a	Moderate	Remove and replenish.
21	Mulgoa way	<u>Ligustrum lucidium</u> Privet	8	10	6x>15 45	4.08 2.37	Noxious condition, 30 years old.	4e	Very low	Remove (exempt from replenishment).
22	Mulgoa way	<u>Acer negundo</u> Box Elder	4.5	8	24 36	2.88 2.15	Poor condition, 10 years old.	4e	Very Low	Remove and replenish.

3.5 OBSERVATIONS



Plate 1: Tree 1, <u>Eucalyptus mannifera</u> (Red Spotted Gum).



Plate 2: Tree 2, *Eucalyptus mannifera* (Red Spotted Gum).



Plate 3: Tree 2, <u>Eucalyptus mannifera</u> (Red Spotted Gum), near services.



Plate 4: Tree 4, *Eucalyptus mannifera* (Red Spotted Gum).





Plate 7: Tree 12, Eucalyptus sideroxylon (Ironbark).



Plate 6: Tree 6, <u>Washingtonia robusta</u> (Mexican fan palm).



Plate 8: Tree 13, Ulmus parvifolia (Chinese Elm).



Plate 1: Tree 14, Ulmus parvifolia (Chinese Elm), and 15 <u>Ulmus glabra (</u>Golden elm).



Plate 2: Tree 17 and 18, Eucalyptus robusta (Swamp Mahogany).



Plate 3: Tree 19 *Grevillea robusta* (Silky Oak), and tree 20 *Callistemon viminalis* (Bottlebrush).

4. **DISCUSSION**

4.1 General Discussion Of Trees On Site

4.1.1 Twenty two (22) trees were assessed on site and on the adjacent surrounding area and all trees are impacted by the proposed development.

4.1.2 A review of the planning proposal was undertaken to reduce trees impacted by the development.

4.1.3 Trees near the driveways and foundations numbered; 3, 5 & 14 will require supervision, so the trees are not damaged. They will require suspended slabs on beams and piers on geofabric on grade.

4.2 Tree Useful Life Expectancy (TULE)

4.2.1 The sustainability of a tree is a measure of a tree quality and remaining lifespan, consideration to its health, condition and suitability to the locality and site conditions which is expressed as it's a **TULE category** located in appendix C.

4.2.2 Trees with a **long** T**ULE** rating indicate a retention of 40 or more years. Trees numbered 6, 9 and 10 have a **long** remaining lifespan.

4.2.3 Trees with a **medium** T**ULE** rating indicate a retention of 15 to 40 years. Trees numbered 3 and 20 have a **medium** remaining lifespan. Trees numbered 7, 8, 12 and 15 have a **medium** TULE as they may live for more than 40 years, but would need to be removed for safety or nuisance reasons. Trees numbered 1, 2, 14, 17 and 18 have a **medium** TULE as with intervention works required.

4.2.4 Trees with a **short** T**ULE** rating indicate a retention of 5 to 15 years. Trees numbered 4, 5 and 13 have a **short** TULE as they may live for more than 15 years, but would need to be removed for safety or nuisance reasons. Tree 11 has a **short** TULE as it should be removed to prevent interference with more suitable individuals or to provide space for new planting.

4.2.5 Trees with a **remove** TULE are recommended for removal within 5 years. Trees numbered 16, 19, 21 and 22 have a remove TULE as they are either; weed species trees, asthmatic or exotic trees in poor condition and must be removed immediately.

4.2.6 Tree 1&2 is a *Eucalyptus mannifera* (Red Spotted Gum) and has an issue with its proximity to sewerage services as observed in Plate 3. This is a major constraint for the development.

4.2.7 Tree 4 is a *Eucalyptus mannifera* (Red Spotted Gum), and is over-pruned with heavy lopping as observed in Plate 5 rendering the tree anaesthetic from a landscape perspective and shortening its life span.

4.3 The Landscape Significance of a tree is a measure of its contribution to amenity, heritage an ecological value and is assigned a Landscape Significance Rating based on criterion in appendix D.

4.3.1 **Very high amenity value** in the landscape trees are numbered 12 due to the live crown size exceeding 200m² and its constantly visible location by the residents.

4.3.3 **High amenity value** in the landscape trees are numbered 1, 2, 13 and 15 due to the live crown size exceeding 100m² and its frequently visible location by the residents.

4.3.4 **Moderate amenity value** in the landscape trees are numbered 3, 4, 18 and 21 due to the live crown size exceeding 40m² and its frequently visible location by the residents.

4.3.5 **Low amenity value** in the landscape trees are numbered 5, 6, 7, 8, 9, 10, 11, 14, 16, 17, 19, 20 and 22 due to the live crown size less than 40m² and are not readily viewed by the residents.

4.4 Retention Values

4.4.1 The retention values of a tree are a balance between its sustainability in the current setting (the landscape) and its significance within that setting (landscape significance). Retention values are determined once the TULE category and Landscape Significance ratings have been determined (Appendix E). The retention for the trees is determined as follows;

4.4.2 Three (3) trees of **high** retention value are numbered 1, 2 and 12. These trees are considered worthy of preservation and consideration should be given to their retention.

4.4.3 Eight (8) trees of **moderate** retention value are numbered 3, 5, 13, 14, 15, 17, 18 and 20. This value is assigned to trees that are considered desirable for retention and should be retained if possible.

4.4.4 Tree 6 has a **low** retention value. The value is primarily due to the trees not having special ecological or amenity value and not considered to be worthy of preservation.

4.4.5 Ten (10) trees of **very low** retention value are numbered 4, 7, 8, 9, 10, 11, 16, 19, 21 and 22. These trees are considered potentially hazardous or very poor specimens. Trees marked **exempt** from preservation are numbered 21. Due to their status as weed species these trees may be removed.

4.4.6 A summary of retention Values is itemised in Table 3 below;

Table 4 Retention Value Table

Retention Values	High	Moderate	Low	Very Low
Tree	Trees 1, 2 and 12.	Trees 3, 5, 13, 14, 15, 17, 18 and 20.	Trees 6	Trees 4, 7, 8, 9, 10, 11, 16, 19, 21 and 22.

4.5 Impact Assessment

4.5.1 The assessment determines how the proposed development will impact on the Tree Protection Zone (TPZ) and canopy. The impacts are classified as minor or major TPZ encroachments.

4.5.2 All (22) trees are impacted by the proposed development. The proposed development is the construction of four (4) dual occupancy dwellings by way of dividing the two (2) existing lots (Lot 17 and 18) into four (4) lots. The dual occupancies will require service installation such as sewerage, electricity and water.

4.5.3 Twenty-one (21) trees have **major TPZ encroachments**, that is, more than 10% or in SRZ, these trees are numbered 1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21 and 22.

4.5.4 Tree 2 has a **minor TPZ encroachments**, that is, less than 10%. Minor TPZ encroachments must be compensated for elsewhere and contiguous with the TPZ.

4.5.5 The TPZ encroachment zones of twenty-two (22) trees are summarised in Table 4 below;

Table 5: TPZ Encroachments Table

Tree	Botanical Name Common Name	TPZ Encroachment	Retention Value	Discussion	Diagrams
1	<u>Eucalyptus mannifera</u> Red Spotted Gum	31.7% Major (greater than 10%).	High	Impacts: Major impacts from the proposed development. Recommendation: Remove and replenish.	
2	<u>Eucalyptus mannifera</u> Red Spotted Gum	8.1% Minor (less than 10%)	High	Impacts: Minor impacts from the proposed development. Recommendation: Retain and protect.	
3	<u>Callistemon viminalis</u> Bottlebrush	17.7% Major (greater than 10%).	Moderate	Impacts: Major impacts from the proposed dwelling and paving. Recommendation: Retain and protect tree with a low impact driveway. Sensitive construction measures, utilizing pier and beam footings and AQF level 5 supervision to preserve structural roots.	n ean
4	<u>Eucalyptus mannifera</u> Red Spotted Gum	42% Major (greater than 10%).	Very Low	Impacts: Major impacts from the proposed dwelling and paving. Tree is in poor condition and will likely decline significantly with development. Recommendation: Remove and replenish.	R 75m Overlag 3.rs, 87m ² Rosener (3.rs, 87m ²) Rosener (7.5%, 344m ²)
5	<u>Grevillea robusta</u> Silky Oak	48.7% Major (greater than 10%).	Moderate	Impacts: Major impacts from the proposed dwelling and paving. Recommendation: Retain and protect tree with a low impact driveway. Sensitive construction measures, utilizing pier and beam footings and AQF level 5 supervision to preserve structural roots.	R 5.1m Incursion: 48.7%, 39.9 m ²
6	<u>Washingtonia robusta</u> Mexican fan palm	Major (in SRZ)	Low	Impacts : Major impacts from rain water pipe. Recommendation: Remove and replenish.	6 LOT
7	<u>Callitris columellaris</u> White Cypress-pine	53.1% Major (greater than 10%).	Very Low	Impacts: Major impacts from driveway. Tree is unworthy of being a constraint to development. Recommendation: Remove and replenish.	Rcursdim53.1%, 10.5 m ²

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			-	1 Windourne Street and 6 Mul	804 1147 1144800 1011 2000
8	<u>Callitris columellaris</u> White Cypress-pine	24.2% Major (greater than 10%).	Very low	Impacts: Major impacts from driveway. Tree is unworthy of being a constraint to development. Recommendation: Remove and replenish.	Inclusion 24 2%, 7.8 m
9	<u>Ulmus parvifolia</u> Chinese Elm	Major (in SRZ)	Very low	Impacts: Major impacts from rain water pipe. Recommendation: Remove and replenish.	
10	<u>Ulmus parvifolia</u> Chinese Elm	Major (in SRZ)	Very low	Impacts: Major impacts from rain water pipe. Recommendation: Remove and replenish.	10 PROP 6
11	<u>Fraxinus angustifolia</u> <u>subsp. oxycarpa</u> <u>'Raywood'</u>	100% Major (greater than 10%).	Very Low	Impacts: Major impacts from the proposed dwelling (within footprint). Recommendation: Remove and replenish.	
12	<u>Eucalyptus sideroxylon</u> Ironbark	100% Major (greater than 10%).	High	Impacts: Major impacts from the proposed dwelling (within footprint). Recommendation: Remove and replenish.	
13	<u>Ulmus parvifolia</u> Chinese Elm	100% Major (greater than 10%).	Moderate	Impacts: Major impacts from the proposed dwelling (within footprint). Recommendation: Remove and replenish.	
14	<u>Eucalyptus robusta</u> Swamp Mahogany	40.1% Major (greater than 10%).	Moderate	Impacts: Major impacts from the proposed dwelling and paving. Recommendation: Retain and protect tree with a low impact driveway. Sensitive construction measures, utilizing pier and beam footings and AQF level 5 supervision to preserve structural roots.	R (Kamior: 40.1%, 25.3 m ²)
15	<u>Ulmus glabra</u> Golden elm	36.1% Major (greater than 10%).	Moderate	Impacts: Major impacts from the proposed dwelling and paving. Recommendation: Remove and replenish.	
16	<u>Ulmus parvifolia</u> Chinese Elm	Major (in SRZ)	Very Low	Impacts: Major impacts from the trenching required for the proposed services. Recommendation: Remove and replenish.	
17	<u>Eucalyptus robusta</u> Swamp Mahogany	Major (in SRZ)	Moderate	Impacts: Major impacts from the trenching required for the proposed services. Recommendation: Remove and replenish.	116
18	<u>Eucalyptus robusta</u> Swamp Mahogany	Major (in SRZ)	Moderate	Impacts: Major impacts from the trenching required for the proposed services. Recommendation: Remove and replenish.	

19	<u>Grevillea robusta</u> Silky Oak	100% Major (greater than 10%).	Very Low	Impacts: Major impacts from the proposed driveway (within footprint). Recommendation: Remove and replenish.	19
20	<u>Callistemon viminalis</u> Bottlebrush	100% Major (greater than 10%).	Moderate	Impacts: Major impacts from the proposed dwelling (within footprint). Recommendation: Remove and replenish.	20 19
21	<u>Ligustrum lucidium</u> Privet	100% Major (greater than 10%).	Very low	Impacts: Major impacts from the proposed dwelling (within footprint). Recommendation: Remove (exempt from replenishment).	
22	<u>Acer negundo</u> Box Elder	100% Major (greater than 10%).	Very Low	Impacts: Major impacts from the proposed dwelling (within footprint). Recommendation: Remove and replenish.	

4.6 *Canopy Cover Loss:* Replenish tree removals with new tree plants within the site to compensate for loss of amenity in accordance with council requirements. To compensate for the reduction canopy cover, planting of indigenous trees which are appropriate to the local environment and provide koala habitat should be considered using the canopy cover formula (($\frac{1}{2}$ x canopy diameter)² x π) as follows.

Table 6: Canopy Cover Loss Table

Trees	Canopy Diameter (m)	Canopy Loss (m ²)	Total Canopy Loss	New Planting
1	14	154	984m ²	
4	8	50	984m-	Plant seventeen (17)
6	3.5	10		trees with a canopy size
7	3	7		at maturity of 10 metres.
8	5.5	24		
9	4	13		
10	5	20		
11	3	7		
12	19	284		
13	13	133		
15	12	113		
16	5	20		
17	7	38		
18	8	50		
19	3	7		
20	7	38		
22	4.5	16		

5. **RECOMMENDATION**

5.1 Tree Works Specifications

5.1.1 Twenty-two (22) trees were assessed on site and on the adjacent surrounding area.

5.1.2 Provisions of the Mid-Western Regional Council DCP Section 4.7 Tree Preservation Order, specify that a permit is required in respect to pruning or removing trees unless specified exempt (dead, dangerous, noxious, or trees under 4 meters height and 150 mm DBH).⁵

5.1.3 Tree works is recommended as follows (See Map B Tree Management Plan);

Table 7: Tree Works

Tree number	Count	Tree Works
1, 4, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 21 and 22	18	Remove. Seventeen (17) trees to replenish.
2, 3, 5, and 14.	4	Retain.

5.1.4 **Suitably Qualified Arborist:** Most councils require written consent prior to tree pruning or removal. Tree contractors must have a minimum AQF Level 3 and work in accordance with Australian Standard[®] AS 4373 2007 Pruning of Amenity Trees, the Work Health & Safety (WHS) Act 2011 and the WHS Regulations 2017, the Safe Work Guide to Managing Risks of Tree Trimming and Removal Work 2016 and the Code of Practice for The Amenity Tree Industry 1998. Work near powerlines should be carried out in accordance with the Code of Practice for Work Near Overhead Power Lines.

Tree contractors shall be members of Tree Contractors Association Australia (TCAA) or Arborists Australia (AA) and hold Workers Compensation and Public Liability Insurance. Tree contractors must liaise with the consulting arborist to ensure that pruning and / or removal is in accordance to specification.

5.1.5 **Replenishment Planting** of seventeen (17) trees in 45L volume pots in accordance with Council requirements new tree plantings should be a native species or from a vegetation community present on site to compensate for loss of amenity. Replenishment is to be completed in accordance with Planting Specifications from NATSPEC (Clark 2003) and Australian Standard [®] AS 2303-2018 Tree Stock for Landscape Use. (Appendix F).

5.1.6 Maintain aged eucalyptus **mulch** to all retained and replenished trees in accordance with Australian Standards[®] AS 4454- 2003 Compost, Soil Conditioners and Mulches.

5.1.7 Maintain a **watering schedule** for replenished trees; for example, a 45L pot requires approximately 35L of daily water. (Trees Impact: 2021).

⁵ https://midwestern.prelive.opencities.com/files/assets/public/council/plans-and-strategies/plan-development-control-plan-2013.pdf McArdle Arboricultural Consultancy Pty Ltd ©

5.2 Tree Protection Plan Specifications

See Map C Tree Protection Plan.

5.2.1 Tree Protection Measures are structures used to protect and isolate the TPZ. The proposed development will impact upon all twenty-two (22) trees. Eighteen (18) trees will be removed and four (4) trees will be retained and require tree protection measures as follows;

5.2.2 Four (4) trees require **tree protection fencing** around the TPZ **During Demolition**, to preserve the root zone around the TPZ and mature certified **mulch** spread 50-75mm deep to the extent of the dripline, (never exceed 100mm depth). Mulch should not have contact with the tree trunk, these trees are numbered 2, 3, 5, and 14.

5.2.3 **Tree trunk protection** is required around the stems of four (4) trees numbered 2, 3, 5, and 14 as tree protection fencing would be unpractical and block access to the work site. This is to consist of hessian, padding or geotextile fabric wrapped around the trees' trunk, with 1.8 metre lengths of timber spaced at small intervals and strapped over the top of the padding, not nailed or screwed into the trees.

5.2.4 Four (4) trees require **ground protection** using rumbles boards over the TPZ to mitigate adverse impacts to the root zone and provide an elevated path for foot traffic. These trees are numbered 2, 3, 5, and 14.

5.2.5 Minor TPZ encroachments must be compensated for elsewhere and contiguous with the TPZ.

5.2.6 All measures must be certified by an AQF level 5 arborist in accordance with AS[®] 4970-2009 Protection of Trees on Development Sites.

5.2.7 Trees near the driveways and foundations numbered; 3, 5, & 14 will require supervision so the trees are not damaged. They will require suspended slabs on beams and piers on geofabric on grade. A low impact driveway is to consist of concrete reinforced slab laid on grade on 300mm width piers. Piers will be hand excavated or under supervision of an AQF level 5 arborist to reduce root damage to preserved trees.

5.2.8 Table 6 below summarises the Recommended Management and Protection Measures:

Tree number	Count	Recommended Management and Protection Measures
1, 4, 6, 7, 8, 9, 10, 11, 12, 13,	17	Remove and replenish.
15, 16, 17, 18, 19, 20, and 22		
21	1	Remove (exempt from replenishment).
		Retain and protect. Tree protective fencing. Low impact
2 E and 14	.3	driveway. Sensitive construction measures, utilizing pier and
3, 5, and 14.	3	beam footings and AQF level 5 supervision to preserve
		structural roots.
2	1	Retain and protect. Tree protective fencing.

Table 8: Recommended Management and Protection Measures

5.3 Holding Points

5.3.1 Site Monitoring: The following table outlines the stages in the development process where the AQF level 5 Arborist project arborist is required monitor or certify trees. The site manager should notify the project arborist prior to works within the TPZ.

Table 9 Site Inspections During Construction Table (Project Arborist)

Stage	General Schedule of Work	Person	Certification by
Stage		Responsible	Project Arborist
	Prior to demolition, earthworks or site clearing, clearly mark trees	Competent	n/a
Pre-	for removal (spray paint on trunks).	Person	11 <i>/</i> d
construction	Tree Protection Systems (for retained trees) must be installed prior	Competent	Pre-construction
	to demolition, include mulching in TPZ.	Person	Tree Protection
	to demontion, include matching in 192.	Person	Certificate
	Scheduled inspection of trees during construction-usually monthly.	Project	Inspection and
Construction	Scheduled inspection of trees during construction-dsdairy monthly.	Arborist	Certification
construction	Supervise and protect any excavations within the TPZ of retained	Project	Supervision and
	trees.	Arborist	Certification
Post-	Final inspection after construction and prior to the removal of	Project	Final Tree Protection
construction	protection measures.	Arborist	Certificate

5.3.2 All retained trees should be protected by fencing and / or ground protection before any demolition, development, or soil stripping starts. The protected area is an exclusion zone. Fencing and ground protection should not be removed or altered unless agreed by the supervising arborist.

5.3.3 Ground protection should support all anticipated loading and prevent compaction in the TPZ.



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5.5 Map B Tree Management Plan-Current Proposal

Tre	e number	Count	Tree Works
1, 4, 6, 7,	8, 9, 10, 11, 12,		Remove. Seventeen
13, 15, 16	13, 15, 16, 17, 18, 19, 20,		(17) trees to
2:	1 and 22		replenish.
2, 3,	5, and 15.	4	Retain.







٦	Tree Mar	nagemen	t Plan		Hous	ing Plus			Original sca	le 1:200 A	43			
					Coser Incr	Tree for Removal with TPZ and SRZ		Tree for Retention with TPZ and SRZ	Tree for Pruning with TPZ and SRZ		0	•		
High	Moderate	Low to	Low	Very Lov		radial distance		radial distance	radial distance	Protection	Trunk	Replenish	Rumble	Exclusion
Retention	Retention	Moderate	Retention	Retentio	544)			Fencing	Protection	ment	Boards	Zone

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1 Winbourne Street and 6 Mulgoa Way Mudgee NSW 2850

	1
e	TPZ*
Tree	SRZ
	(m)
1	10.56
	3.25
2	9.48
	3.12
3	4.44
	2.67
4	7.92
	3.09
5	5.16
	2.49 3.00
6	
	2.00 2.52
7	2.52 1.85
8	3.24
	2.25 2.52
9	1.88
	4.08
10	2.37
	2.00
11	
	1.94 8.50
12	3.21
	8.76
13	3.22
	4.56
14	2.31
	8.52
15	2.98
	2.00
16	1.75
	4.56
17	2.25
_	4.68
18	2.25
_	2.52
19	1.50
	5.52
20	2.49
24	4.08
21	2.37
22	2.88
22	2.15

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5.6 Map C Tree Protection Plan



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		Tree Protection Plan	Housing Plus	Original scale 1:200 A3
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1 Winbourne Street and 6 Mulgoa Way Mudgee NSW 2850

Tree	TPZ* SRZ
Ļ	(m)
	10.56
1	3.25
	9.48
2	3.12
	4.44
3	2.67
	7.92
4	3.09
	5.16
5	2.49
	3.00
6	2.00
	2.52
7	1.85
	3.24
8	2.25
	2.52
9	1.88
	4.08
10	2.37
	2.00
11	1.94
	8.50
12	3.21
	8.76
13	3.22
	4.56
14	2.31
	8.52
15	2.98
_	2.00
16	1.75
	4.56
17	2.25
_	4.68
18	2.25
	2.52
19	1.50
	5.52
20	2.49
	4.08
21	2.37
22	2.88
22	2.15

5.7 Tree Protection Specifications

Tree Protection Zone (TPZ) Specifications: Australian standards AS 4970 -2009 Protection of Trees On Development Sites.



A Tree Protection fencing ensures construction does not encroach the TPZ.

Structural Root Zone (SRZ) is the area essential for tree stability. Works conducted within the SRZ may destabilize the tree and lead to potential failure.

Protective Fencing: Fencing must not be removed or altered. Specifications for fencing protection must be as follows:

- Installed prior to development and certified by a project arborist.
- Fully enclosed to the TPZ.
- Temporary chain wire mesh 1.8-meter cyclone fencing.
- Signposted with 300 x 450 signage. "No Entry Tree Protection Zone".
- Add mulch across surface of TPZ and water regularly.

Specifications for fencing on sloping/ uneven ground must be as follows:

- Star pickets spaced at 2m intervals with a minimum height of 1m.
- Connected by a continuous high-visibility barrier/hazard mesh.
- Alternative plywood or wooden paling fence panels.





Trunk and Branch Protection:

Specifications for trunk protection when fencing is impractical Must be as follows:

- A layer of padding, geotextile fabric or similar wrapped around the trunk to a minimum height of 2m.
- 1.8m lengths of timbers aligned vertically and spaced -with a small gap -evenly around the trunk.
- Boards are to be strapped to trees, not nailed or screwed to the tree.

Prohibitions for Tree Protection Zones: The following activities shall not be carried out within any TPZ:

- Disposal of chemicals and liquids (including concrete and mortar slurry, solvents, paint, fuel or oil);
- Stockpiling, storage or mixing of materials;
- Refuelling, parking, storing, washing and repairing tools, equipment, machinery and vehicles;
- Disposal of building materials and waste;

The following activities shall **not** be carried out within any TPZ **unless** under the supervision of a Project arborist:

- Increasing or decreasing soil levels (including cut and fill);
- Soil cultivation, excavation or trenching;
- Placing offices or sheds;
- Assembly of scaffolding or hoardings; and/or another act that may adversely affect the tree.

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Root Protection Specifications: If temporary access for machinery is required within the TPZ, ground protection measure will be required to prevent root damage and soil compaction within the TPZ. Specifications for ground protection are as follows.

- Permeable membrane such as geotextile fabric
- Layer of mulch or crushed rock (at minimum depth of 100mm)
- Or rumble boards strapped over mulch or aggregate.

•



Mulch Within TPZ: Maintain aged eucalyptus mulch to retained trees for the duration of the development in accordance with Australian



Standards® AS 4454- 2003 Compost, Soil Conditioners and Mulches. .

Mulch should have at least 70% by mass of its particles, with a maximum size

of greater than 16 mm and spread 50-75mm deep to the extent of the dripline, (never exceed 100mm depth). Mulch should not have contact with the tree trunk, apply 200mm from trunk and shaping a soil berm dish close to the root ball to

facilitate establishment of watering.

Watering Schedule: Maintain a watering schedule for retained trees at a rate of approx. 45L daily (Trees Impact: 2021).

Excavation Within TPZ's: excavations shall be undertaken under supervision of the project arborist, using sensitive, non-destructive methods (e.g. Manual excavation (hand tools), Air-spade or Hydro-vacuum excavations (sucker-truck).

- no roots greater than 40mm in diameter are damaged, pruned or removed. All care shall be taken to preserve and avoid damaging roots; excavation should not occur within the SRZ.
- Exposed roots shall be protected from direct sunlight by covering with hessian or similar fabric and kept moist at all times.
- Hand excavation and root mapping shall be undertaken along excavation lines within the TPZ Any
 conflicting roots (>40mm in diameter) shall be pruned using clean, sharp secateurs or a pruning saw to
 ensure a clean cut, free from tears.

Installing Underground Services Within TPZ: All services should be routed outside the TPZ.

- If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches.
- The directional drilling boring methods, such as horizontal drilling (HDD) may be at least 600 mm deep. The project arborist should assess the likely impacts of boring and bore pits on retained trees.
- Excavations for entry/exit pits must be located outside the TPZ.



7. GLOSSARY

Aerial Inspection: Where a tree is climbed by an arborist to inspect upper stem and crown for signs or symptoms of defects and disease.

Assets Protection Zone APZ: is a fuel reduced area surrounding a built asset or structure.

Bracket fungus: The rigid fruiting body of some fungus species.

Branch collar: The ring of wood tissue which forms around the base of a branch (near the branch attachment).

Cavity: A void, initiated by a wound within the trunk, branches or roots. These voids are referred to as hollows. **Canker:** Fungal infections of the bark and cambium that can occur on all parts of the tree.

Co-dominant: Stems or branches equal in size and relative importance.

Crown: All the parts of a tree arising above the trunk where it terminates by its division forming branches, e.g. the branches, leaves, flowers and fruit: or the total amount of foliage supported by branches.

Crown Lifting: The removal of the lower branches of the tree.

Dead wood: Refers to any whole limb that no longer contains living tissues

Decay: Process of degradation of woody tissues by fungi or bacteria through decomposition of cellulose and lignin.

Deciduous: Describes trees and bushes that shed their leaves in the autumn. (opposite to evergreen) **Dieback:** Tree deterioration where the branches and leaves die.

Drip line: Where the canopy releases water shed from the foliage during precipitation.

DBH/Diameter: Diameter at breast height, about 1.4 meters of trunk height.

Epicormic Shoots: These shoots often have a weak point of attachment. Epicormic growth/shoots are generally a survival mechanism, often indicating the presence of a current, or past stress event such as fire, pruning, drought, etc.

Flush cut: A cut that damages or removes the branch collar or removes the branch and stem tissue and is inconsistent with the branch attachment as indicated by the bark branch ridge.

Genus/ Species: Identified using its botanical name. Where the species name is not known, species is used. The common name for trees may vary considerably in each area of geographical differences.

Height: Height has been estimated to + / - 2 meters.

Inclusion: The pattern of development at branch or stem junctions where bark is turned inward rather than pushed out. This fault is located at the point where the stems/branches meet.

Maturity: Tree age, Assessed as over-mature (last 1/3 of life expectancy), mature (1/3 to 2/3 life expectancy) and semi mature (less than 1/3 life expectancy).

Remedial (restorative) pruning: includes: Removing damaged, dead wood; trimming diseased or infested branches. Trimming branches back to undamaged tissue in order to induce shoots, from which a new crown will be established.

Resistograph[®] **testing** A Resistograph[®] is a specialised machine that measures timber density by drilling a 3mm diameter probe through the wood, simultaneously plotting the results on a graph at full scale.

Structural Integrity: Describes the internal supporting timber. (Substantial to frail)

Structural root zone (SRZ): Refers to the radial distance in metres, measured from the centre of the tree stem, which defines the critical area required to maintain stability of the tree.

Target: Are people, property, or activities that could be injured, damaged, or disrupted by a tree.

Tree Protection Zone (TPZ): Refers to the radius distance in metres, measured from the centre of the tree stem which defines the *tree protection zone* for a tree to be retained. This is generally the minimum distance from the centre of the tree trunk where protective fencing is to be installed to create an exclusion zone associated with construction works.

Vigour: Refers to the tree's health as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion, and the degree of dieback.

Windthrow: Tree failure when a force exerted by wind against the foliage crown and trunk overcomes resistance to that force in the root plate.

8. **BIBLIOGRAPHY**

Standards Australia, 2009, Australian Standards: Protection of Trees on Development Sites AS 4970-2009. Standards Australia, Sydney.

Standards Australia, 2007, Australian Standards: Pruning of Amenity Trees AS 4373-2007. Standards Australia, Sydney.

Barrell, J, 2012, Balancing Tree Benefits Against Tree Security: The duty holder's dilemma, Arboricultural journal. The International Journal of Urban Forestry, 34:1,29-44.

Barrell, J. 1993-95, 'Pre-planning Tree Surveys: Safe Useful Life Expectancy (SULE) is the Natural Progression' Arboricultural Journal V.

CSIRO Boland et al Forest Trees of Australia; Nelson University Press. Australia: 1984

Hadlington PW. and Johnston IA. 1983, Australian Trees. Australia: NSW University press. Hadlington PW and Johnston IA. 1983, Australian Insects. Australia: NSW University press.

Harris, R, Clark, J, & Matheny, N 2004, Arboriculture; Integrated Management of Landscape Trees, Shrubs, and Vines. 4th Edition, Prentice Hall, New Jersey.

Hayes, E. 2001, Evaluating Tree Defects. 2nd edition, Safe trees, Rochester, MN.

Leake, S. Elke, H, 2014, Soil for Landscape Development; Selection, Specification and Validation. CSIRO Victoria.

Lonsdale, D, 1999, Principles of Tree Hazard Assessment and Management. Forestry Commission, London.

Matheny, N.P and Clark, J.R, 1998, Trees and Development: A Technical Guide to Preservation of Trees during Land Development. International Society of Arboriculture, Champaign, Illinois.

Mattheck, C, 2007, Updated Field Guide for Visual Tree Assessment. Karlsruhe Research Centre: Mattheck, C & Breloer, H 1994, The Body Language of Trees; A handbook for failure analysis. Research for Amenity Trees No 4 Sixth impression – 2008, TSO (The Stationary Office), Norwich, UK.

Morton, A. 2011, Determining the Retention Value of Trees on Development Site. Illinois, USA Shigo, A.L, 1991, *Modern Arboriculture*, Shigo and Trees, Associates, Durham, New Hampshire. Thomas, E. Smiley, Nelda Matheny, and Sharon Lilly, 2011, Tree Risk Assessment & Principles. ISA Printed USA. Watson et al, 1996, Replacing Soil in The Root Zone of Mature Trees for Better Health. Journal Arboriculture.

WEBSITES

E-Spade, Environment NSW Government, https://www.environment.nsw.gov.au/eSpade2WebApp Department of Primary Industries www.dpi.nsw.gov.au Department of Agriculture Water and the Environment, http://www.environment.gov.au/ biodiversity Environment Energy and Science living Sustainable and resilient, https://www.environment.nsw.gov.au Native Vegetation Regulatory map, https://www.lmbc.nsw.gov.au/Maps Near Maps, http://maps.au.nearmap.com NSW legislation, https://www.legislation.nsw.gov.au/ NSW Planning Portal, https://www.legislation.nsw.gov.au/ NSW Planning Portal, https://www.planningportal.nsw.gov.au/ NSW Rural Fire Services, https://www.rfs.nsw.gov.au/plan-and-prepare SafeWork Australia, http://www.safeworkaustralia.gov.au Tree Impact Group, 2019, Threatened Biodiversity Profile Search (2021) https://www.treesimpact.com.au/ Urban J (2014) Tree Planting Specification. https://www.jamesurban.net

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APPENDIXES

Appendix A Visual Tree Assessment (Vta)



Diagram 1: VTA Chart by Claus Mattheck (1994) The Body Language of Trees adapted

	VISUAL TREE	DIAG	NOSTICS
1	Maturity: J - Juvenile; IM - Im	matu	re; SM - Semi-Mature; M - Mature
	Health & Vigour		Condition of Tree
KEY		KEY	
		2	Good Condition
		3	Good Condition but poor development
		3b	Moderate.
4	Dieback is more than 20%.		
	Epicormics		
5	Sparse Foliage Crown		Unbalanced Canopy
		6	Physical Damage
7	Insect damage-foliage		
7b	Borers		
8	Fungal Attack -pathogen	_	
	_	9	Cavity
10	Termite activity		Inclusions
4.01			Lean
12b	Dying	12	Heavily pruned
		13	Damage to roots
14		130	Encroachment
14	Parasitic Vine Present		
15	Damage by Climbing Plant	10	Indusions
17	Habitat Trop	16	Inclusions
17	Habitat Tree		
18	Endangered Species		

Schedule 1: Categorises for VTA

Appendix B **Tree A-Z Categories**

Schedule 2: Tree A-Z Categories Field Sheet (version 10.04-U8C) (Jeremy Burrell 2010)

Barrell (2019) Criteria for Assessing the importance of Trees on Development Sites.

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species **Z1** Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc 72 Too close to a building, i.e. exempt from legal protection because of proximity, etc Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged **Z**3 importance, etc High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure 74 Dead, dying, diseased or declining Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, **Z**5 etc **Z6** Instability, i.e. poor anchorage, increased exposure, etc Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people

- Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to **Z7** authorize removal, i.e. dominance, debris, interference, etc
- Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to 78 authorize removal, i.e. severe structural damage to surfacing and buildings, etc
 - Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population
- Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. 7.9 cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
- Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor **Z10** architectural framework, etc
- Z11 Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
- Z12 Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

- No significant defects and could be retained with minimal remedial care A1
- A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees
- Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for A3 more than 10 years
- Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment) A4

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

Further explanations to assist categorization

	Further explanations to assist categorization
	Any existing statutory definitions of trees that are too small to be legally protected should be applied and trees less than those heights or
	diameters will be Z1. If there are none, then if the tree has been planted for less than 5 years it is Z1. If it is less than 20 feet in height, it will
Z1	be Z1 unless it is significant, i.e. clearly mature, but small trees are not Z1. If it is greater than 35 feet in height it is not Z1 unless it was
	planted in the last 5 years. Applying Z1 to trees between 20 and 35 feet is a matter of judgment; the most obvious test being that the tree could
	be easily and reliably moved or replaced. Ideally, the replacement tree should not be less than 20% of the replaced tree's dimensions.
Z2	Any existing statutory rules that prevent protection of trees within a fixed distance of a structure will allow a tree to be subcategorized as Z2.
Z 3	Any existing statutory rules or guidance that prevent protection of trees for reasons other than size and proximity dictate Z3, i.e. invasive or
2.5	alien species. If none exist, then Z3 cannot be applied.
	This subcategory is for trees that are unlikely to recover from a serious health problem. The condition must be terminal with no obvious
Z4	potential to recover, i.e. severe crown dieback related to excavation damage or root decay, to the extent that the structural branch framework is
2.4	compromised. Trees that are likely to recover or improve should not be placed in this subcategory, i.e. trees suffering from a foliar problem
	that has little impact on the branch framework and varies from year to year.
	Severe means so bad that there is no realistic chance of the tree achieving its full potential and there is a high risk of failure. In many cases, the
	risk of failure can be reduced by dramatic reduction in tree size, but this has severe health, maintenance cost and amenity implications, so is
	unlikely to be a sustainable management option. A common example is a severely unbalanced tree within a group that will be particularly
Z5	vulnerable in adverse weather conditions and the adjacent trees mean there is no hope of remedial works resulting in an improvement. Topped
	trees do not automatically fit into this subcategory, although there is an obvious temptation. Species prone to decay, such as willow and poplar,
	often have severe decay at the origin of vigorous re-growth, creating a high risk of failure in adverse weather conditions. Z5 is clearly
	appropriate for them. However, this needs to be a careful judgment because topping in itself does not necessarily condemn a tree to this

Appendix CTree Useful Life Expectancy – (TULE)Schedule 3: SULE (Jeremy Barrell 1993) adapted with permission for TCAA Consulting Arborists 2014.

Schedu		Barron 1000) adapte	-	Expectancy (TULE)			
					5	6	
	1 LONG TULE	2 MEDIUM TULE	3 SHORT TULE	4 REMOVAL	NO POTENTIAL FOR RETENTION	o SMALL, YOUNG OR REGULARLY CLIPPED	
	Trees that appeared to be retainable at the time of the assessment for more than 40 years or with low level of risk.	Trees that appeared to be retainable at the time of the assessment for 15 to 40 years or with and with low to medium level risk.	Trees that appeared to be retainable at the time of the assessment for 5 to 15 years or with medium to high level of risk.	Trees that should be removed within the next 5 years or with high to very high level of risk.	Trees that must be removed immediately or with very high to extreme level of risk.	Trees that can be reliably transplanted or replaced.	
а	Structurally sound trees located in positions that can accommodate future growth.	Trees that may only live for between 15 and 40 more years.	Trees that may only live for between 5 and 15 more years.	Dead, dying, suppressed or declining trees through disease or inhospitable conditions.	Dead, dying suppressed or declining trees diseased or inhospitable conditions.	Small trees less than 5 metres in height.	
b	Trees that could be made suitable for retention in the long term by Intervention Works.	Trees that may live for more than 40 years, but would need to be removed for safety or Nuisance reasons	Trees that may live for more than 15 years, but would need to be removed for safety or nuisance reasons	Dangerous trees through instability or recent loss of adjacent trees.	Dangerous trees through instability or recent loss of adjacent trees.	Young trees less than 15 years old but over 5 metres in height.	
С	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long- term retention.	Trees that may live for more than 40 years, but should be removed to prevent interference with more suitable individuals or to provide space for new planting.	Trees that may live for more than 15 years, but should be removed to prevent interference with more suitable individuals or to provide space for new planting.	Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.	Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.	Trees that have been regularly pruned to artificially control growth.	
d		Trees that could be made suitable for retention in the medium term by Intervention works.	Trees that require substantial Intervention works, and are only suitable for retention in the short term.	Damaged trees that are clearly not safe to retain.	Damaged trees that are clearly not safe to retain and must be removed immediately.		
е				Trees that may live for more than 5 years, but should be removed to prevent interference with more suitable individuals or to provide space for new planting.	High Toxicity Allegan trees, asthmatic and poisonous trees and must be removed immediately.		
f				Trees that may cause damage to existing structures within 5 years.	OTHER, with legitimate explanation to be removed immediately.		
g				Trees that will become dangerous after removal of other trees for reasons given in 1A-1F.			
	1 5 1/	1 5 8	INSPECTION	,	17.1		
	1-5 Years by competent inspector or event monitored.	1-5 Years by competent inspector or event monitored.	1-3 years by competent inspector or event monitored.	Annually by competent inspector or event monitored.	1-7 days by competent inspector and event monitored.	Bi-annually by competent inspector	

Appendix D Landscape Significance Rating

Schedule 4: Determining Heritage, Ecological and Amenity Value for Landscape Significance. (Morton 2006)

		Landscape Significance Criteria	
RATING	HERITAGE VALUE	ECOLOGICAL VALUE	AMENITY VALUE
	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 is listed on Council's Significant Tree Register.	The subject tree is scheduled as a Threatened Species as defined under the Threatened Species Conservation Act 1995 (NSW) or the Environmental Protection and Biodiversity Conservation Act 1999.	The subject tree has a very large live crown size exceeding 300m ² with normal to dense foliage cover, is located in a visually prominent position in the landscape, exhibits very good form and habit typical of the species.
SIGNIFICANT	The subject tree forms part of the curtilage of a Heritage Item (building/structure/artefact as defined under the LEP) and has a known or documented association with that item.	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.	The subject tree 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.
	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 a remnant tree, being a tree in existence prior to development of the area.	The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.
1. VERY HIGH	The tree has a strong historical association with a heritage item (building/structure/artefact/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.	The tree is a locally indigenous species, representative of the original vegetation of the area and is a dominant or associated canopy species of an Endangered Ecological Community (EEC) formerly occurring in the area occupied by the site.	The subject tree has a very large live crown size exceeding 200m ² , a crown density exceeding 70% (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.
2. HIGH	The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence.	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 large live crown size exceeding 100m ² ; The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. Crown distortion/suppression) with a crown density of at least 70% (normal); 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.
MODERATE	The tree has no known or suspected historical association, but does not detract or diminish the value of the item and is sympathetic to the original era of planting.	The subject tree is a non-local native or exotic species that is protected under the provisions of this DCP.	The subject tree has a medium live crown size exceeding 40m ² ; 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% (thinning to normal); and The tree is visible from surrounding properties, but is not visually prominent – view may be partially
ઌં			obscured by other vegetation or built forms. The tree makes a fair contribution to the visual character and amenity of the area.
4. LOW	The subject tree detracts from heritage values or diminishes the value of a heritage item.	The subject tree is scheduled as exempt (not protected) under the provisions of this DCP due to its species, nuisance or position relative to building or other structures.	The subject tree has a small live crown size of less than 40m ² and can be replaced within the short term (5-10 years) with new tree planting.
VERY LOW	The subject tree is causing significant damage to a heritage Item.	The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or is a known nuisance species.	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. 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% (sparse).
7.INSIGNIFI- CANT	The tree is completely dead and has no visible habitat value.	The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993 within the relevant Local Government Area.	The tree is completely dead and represents a potential hazard.

Schedule 5: Determining the Tree Retention Value (Morton, A 2011)

Tree Retention Priorities				
RETENTION VALUE	RECOMMENDED ACTION			
HIGH	These trees 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 dripline) should also be considered, particularly in relation to a high-rise development. Significant pruning of the trees to accommodate the building envelope or temporary scaffolding is generally not acceptable.			
MODERATE	The retention of these trees is desirable. These trees should be retained as part of any proposed development if possible, however these 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	These trees are not considered to be 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	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.			

Appendix F Tree Planting Specifications

Tree planting specifications are in accordance with NATSPEC specification for Trees, Ross Clark (2003) and Australian Standard [®] AS 2303-2018 Tree Stock for Landscape Use. BEFORE PLANTING

- Don't plant trees too close to buildings, in-ground pools, avoid planting under power lines and over drainage pipes or near other large trees.
- A consider the effect on neighbouring properties (i.e. shade, loss of views, impact on foundations, fences and services).
- Plant deciduous trees if you want in summer shade and winter sun. Consider shadows cast from evergreen trees.
- Use locally native to attract native fauna and to reduce watering required.

BASIC TREE PLANTING

- 1. Dig the hole at least twice as wide as the pot size.
- 2. Loosen the soil at the sides of the hole. Fill hole with water and allow to drain away.
- 3. Place the loosened root ball in the hole. Fill back soil. The top of the root ball should be level with the surrounding soil.
- 4. Water the plant deeply after planting, once a week for the first two months.



Diagram 2 Urban J (2014) Tree Planting Specification diagram

Schedule 6: Watering Frequency Table

	Watering frequency for 45L pot			
Time of year	1 st month	2nd and 3rd month	4th to 6th month	
Sept-Feb.	4x week	3 x week	2 x week	
Mar-May	3 x week	2 x week	1 x week	
Jun-August	2 x week	1 x week	1x fortnight	

Appendix GReplenishment of Native Trees SpeciesSchedule 7: Tree Species and Sizes.

Botanical Name	Common Name	Height (m) at maturity	Crown Spread (m)
Leptospermum petersonii	Lemon-Scented Tea Tree	5	6
<u>Agonis flexuosa</u>	Willow Myrtle	7	6
<u>Elaeocarpus eumundi</u>	Quandong	8	4
<u>Corymbia ficifolia</u>	Red Flowering Gum	8	5
<u>Syzyqium luehmannii</u>	Riberry	8	5
<u>Waterhousea floribunda</u>	Weeping Lilly Pilly	8	5
<u>Acacia implexa</u>	Hickory Wattle	8	6
<u>Hymenosporum flavum</u>	Native Frangipani	8	6
<u>Tristaniopsis laurina</u>	Water Gum	9	5
<u>Corymbia eximia</u>	Yellow Bloodwood	10	7
<u>Callistemon viminalis</u>	Weeping Bottlebrush	10	8
<u>Melaleuca linariifolia</u>	Narrow-Leaved Paperbark	10	8
<u>Cupaniopsis anacardioides</u>	Tuckeroo	10	10
<u>Callistemon salignus</u>	Willow Bottlebrush	12	6
<u>Eucalyptus cinerea</u>	Argyle Apple	12	7
Elaeocarpus reticulatus	Blueberry Ash	15	8
<u>Flindersia australis</u>	Australian Teak	15	10
Brachychiton populneus	Kurrajong Tree	15	12
<u>Backhousia citriodora</u>	Lemon Myrtle	18	6
<u>Angophora costata</u>	Sydney Red Gum	20	10
Lophostemon confertus	Brush Box	20	16

MULCH: Adding a layer of mulch to reach 75mm, encourages water retention and microbes, that will break down and incorporate organic matter into the soil. Organic mulch will reduce weeds and root development.

- Add at least 70% by mass of its particles with a maximum size of greater than 16 mm in accordance to as 4454/2003 Compost, Soil Conditioners and Mulches. Apply 200mm from trunk and shaping a soil berm dish close to the root ball to facilitate establishment of watering.
- The TPZ of retained trees should be maintained with a 75mm depth of organic, certified, coarse Eucalyptus mulch.
- Mulch should be retained at 5075mm depth and never exceed 100mm in depth.
- Do not allowed mulch to contact the tree trunk. Retain a mulch free gap of not less than 75mm and preferably 200mm clear from the base of the tree trunk.

CORRECT MULCH METHOD

McArdle Arboricultural Consultancy Pty Ltd $\ensuremath{\mathbb{C}}$

Disclaimer

McArdle Arboricultural Consultancy Pty Ltd does not assume responsibility for liability associated with the tree on/or adjacent to this project site, the future demise and/or any damage which may result therefrom. They take care to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant can neither guarantee nor be responsible for the accuracy of information provided by others.

McArdle Arboricultural Consultancy Pty Ltd cannot be held responsible for any consequences as result of work carried out outside specifications, not in compliance with Australian Standards[®] or by inappropriately qualified staff. If further investigations such as, aerial, drill and root test are recommended, the report shall not be considered final until all investigations have been completed, as further defects may be found.

STATEMENT OF LIMITATIONS

McArdle Arboricultural Consultancy Pty Ltd makes every effort to accurately identify current tree health and hazards. Results may or may not correlate to actual tree structural integrity. There are many factors that may contribute to limb or total tree failure. Not all these symptoms are visible. There can be hidden defects that may result in a failure even though it would seem that other, more obvious defects would be the likely cause of failure. All standing trees have an element of unpredictable risk.

The inspection was limited to a visual ground examination of the tree, without aerial inspections and below ground excavations. The assessments are limited and do not include specialised analysis. No internal diagnostics, aerial inspection and pathology test were conducted. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale.

Jun M Halle

Consulting Arborist Jim McArdle

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