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Certificate No. AHC50510 December 2014

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**ARBORICULTURAL IMPACT ASSESSMENT
CARPARK UPGRADE**

WOODBERRY LEARNING CENTER

**WOODBERRY ROAD
WOODBERRY**

Prepared for

**DEPARTMENT OF EDUCATION & COMMUNITIES
ASSESST MAMAGEMENT UNIT**

28th JUNE 2022

**By
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Diploma in Arboriculture**

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1. INTRODUCTION

The purpose of this report is to undertake an inspection of sixteen (16) trees located within the school grounds where it is proposed to where it is proposed to construct a new carpark area.

The report will include an inspection of their health, structural condition and assessment of impacts of installation.

The report is based on the design by Metiri Project No: 210171:

- Detail Plan – Sheet No. 2 Revision 3 Dated 28/06/22
- Tree Removal Plan - Sheet No. 11 Revision 3 Dated 28/06/22

Tree assessment will be by means of a Level 2 - Basic Tree Assessment as described in the International Society of Arboriculture (ISA) Tree Risk Assessment Manual and conducted from the ground only.

Impact Assessment will be in accordance with Australian Standards – AS 4970 – 2009, Protection of Tree on Development Sites

Assessment does not include soil testing, root inspection, aerial inspection, testing for structural strength, decay or any other investigative inspection methods.

The final report will contain these outcomes:

- Tree Assessment
- Impact Assessment
- Replanting Advice
- Recommendations

The report should be read and considered in its entirety

2. METHODOLOGY

An assessment was made on the 15th of June 2022 to evaluate the health and condition of the trees.

Assessment of trees is by means of a Visual Tree Inspection (VTA) as described by Claus Mattock and Helge Breloer, 1994, *The Body Language of Trees – A Handbook for Tree Failure Analysis* in conjunction with a Level 1 or 2 Tree Assessment as described in the International Society of Arboriculture (ISA) Tree Risk Assessment Manual and are conducted from the ground only.

A level 2 Basic Assessment consists of a detailed visual inspection of a tree and its surrounding site. It involves a complete walk around the tree looking at the site, buttress roots, trunk and branches. The tree is also looked at from a distance and close up to consider crown shape and surroundings. The use of simple tools to acquire more information about the tree or any potential defects may be used but is not mandatory

Trunk diameters were measured using a diameter tape whilst tree heights and canopy spread was estimated.

Photographs were taken using a digital camera; no enhancements were made to any photographs used in this report.

Assessment of did not include soil testing, root inspection, aerial inspection or any other investigative inspection methods.

3. SULE – Safe Useful Life Expectancy

The SULE method (developed by Jeremy Barrell) of assessment involves classifying trees, after an inspection, into one of five categories that will give an indication of its safe useful life expectancy. The value system is a planning tool only and should be taken in context with other attributes, characteristics or site conditions. These values would change as a result of the proposed development.

SULE takes into consideration the species, age, location, health and condition in trying to determine the possible outcomes and future potential of a tree (Appendix 3).

4. LIMITATIONS

Tree health and environmental conditions can change at any time due to unforeseen circumstances and as such the contents contained in this assessment refer to the tree's condition on the day of inspection only.

Only the tree specified was assessed and assessment was performed within the limitation specified.

Assessment of the tree was by visual inspection from the ground only and as such not all faults may have been detected. More advanced assessment techniques such as aerial inspections for evaluation of structural defects in trunks and branches, decay testing and root inspections would need to be undertaken in further determining the structural integrity of the trees.

A visual assessment can only take into consideration the outward signs of a trees condition. There are many problems that can occur inside a tree that cannot be seen, such as fungal diseases and undetected structural faults such as decay and hollows. Problems can also occur within the root systems due to contaminated soils and root diseases.

These issues would require further investigative methods to be undertaken in further determining the health and condition of the tree.

The time frame for risk categorization should not be considered a guarantee period for the risk assessment. Any tree whether it has visible weaknesses or not will fail if the force applied exceed the strength of the tree or its parts

No guarantee can be given nor can it be predicted that branch failure or uprooting (windthrow) would not occur as a result of extreme winds, storm activity, lightning strike and /or excessive rainfall.

No tree can be declared completely safe and total mitigation of risk can only be achieved by removal. As such there is always some degree of risk that branch or root crown failure may occur

As root systems are neither symmetrical or entirely predictable in their depth and are affected by topography, characteristics of soil or substrate and underground obstructions their location and subsequent extent of potential damage is often unpredictable and assessing the impacts of construction can often be difficult to determine.

As such it is possible that the changed surrounding conditions may inadvertently affect their condition in the future

5. TREE EVALUATION

Table 1 – Tree Assessment

Tree No	Botanical Name Common Name	Age	HGT (m)	Canopy Spread(m) N S E W	DBH (mm)	Structure	Health	Condition	SULE	Comments
19	<i>Corymbia eximia</i> Yellow Bloodwood	M	10>15	6556	450 400	Good	Good	5	1b	No significant signs of dieback or decline No significant structural defects (Photo 1)
19A	<i>Agonis flexuosa</i> Willow Peppermint	M	<5	2211	Multi Avg. <100	Poor	Good	3	3b	Previously cut to short stump Poor branch structure - Multi stemmed epicormic shoots re-sprouting from stump (Photo 1)
19B	<i>Callistemon viminalis</i> Weeping Bottlebrush	S/M	<5	1122	Multi Avg. <100	Poor	Good	3	3b	Previously cut to short stump Poor branch structure - Multi stemmed epicormic shoots re-sprouting from stump (Photo 1)
19C	<i>Callistemon viminalis</i> Weeping Bottlebrush	S/M	<5	1111	Multi Avg. <100	Poor	Good	3	3b	Previously cut to short stump Poor branch structure - Multi stemmed epicormic shoots re-sprouting from stump (Photo 1)
20	<i>Callistemon viminalis</i> Weeping Bottlebrush	S/M	5	2332	140 140 120 110	Good	Good	5	2d	No significant signs of dieback or decline No significant structural defects (Photo 1)
21	<i>Eucalyptus sideroxylon</i> Red Iron Bark	M	15	7151	350	Good/ Fair	Good	5	2d	Dieback of some small branches but no significant signs of decline Fair habit & form Suppressed canopy orientated to the northeast Not likely to develop into a good representative of the species No significant structural defects (Photo 2 & 3)

Tree No	Botanical Name Common Name	Age	HGT (m)	Canopy Spread(m) N S E W	DBH (mm)	Structure	Health	Condition	SULE	Comments
22	<i>Corymbia maculata</i> Spotted Gum	M	15	3631	480	Good	Good	5	1b	No significant signs of dieback or decline No significant structural defects Poor Architecture = Fair habit & form Canopy spread partially restricted by larger adjacent tree - Orientated to the east (Photo 2 & 3)
23	<i>Eucalyptus microcorys</i> Tallowwood	M	20	5757	610	Good	Good	5	1b	No significant signs of dieback or decline No significant structural defects (Photo 2 & 3)
24	<i>Tristaniopsis laurina</i> Water Gum	M	5	2222	Multi Avg. 4x100	Good	Good	5	2d	No significant signs of dieback or decline No significant structural defects (Photo 2 & 3)
24A	<i>Cupaniopsis anacardioides</i> Tuckeroo	S/M	5>10	2121	Multi Avg <100	Fair	Good	4	2d	No significant signs of dieback or decline Poor branch structure - Damaged trunk resulting in epicormic regrowth indicated by crooked ends and vertical growth. Buttress wood indicated a more stable attachment (Photo 2 & 3)
25	<i>Eucalyptus spp.</i> Eucalyptus Tree	M	15>20	3735	350	Good	Good/ Fair	5	3a	Initial state of decline. Dieback of small branches, twigs & thinning of crown foliage Whilst no significant signs of decline were evident health & vigour appears to be slightly diminished Crown density approx. 70% No significant structural defects (Photo 2 & 3)
26	<i>Ficus benjamina</i> Weeping Fig	M	10>15	5363	270 220 190	Good	Good	5	1b	No significant signs of dieback or decline No significant structural defects Fair habit & form Canopy spread partially restricted by larger adjacent tree - Orientated to the east (Photo 2 & 3)

Tree No	Botanical Name Common Name	Age	HGT (m)	Canopy Spread(m) N S E W	DBH (mm)	Structure	Health	Condition	SULE	Comments
27	<i>Eucalyptus microcorys</i> Tallowwood	M	15>20	5566	400	Good	Good	5	1b	No significant signs of dieback or decline No significant structural defects (Photo 2 & 3)
28	<i>Eucalyptus microcorys</i> Tallowwood	M	15>20	3744	320 340 120 120	Good/ Fair	Good/ Fair	5	2d	Some dead small & medium size branches but no significant signs of decline Co-dominant trunks minor bark inclusion No cracking or splitting could be seen at the co-dominant union that would indicate failure was imminent or probable Remove DW 30mm or over in diameter Remove or prune branches that are in decline (Photo 5)
29	<i>Eucalyptus spp.</i> Eucalyptus Tree	S/M	10>15	2221	250	Fair	Good/ Fair	4	2c	No significant signs of dieback or decline Whilst no significant signs of decline were evident health & vigour appears to be slightly diminished and crown density appears to be thinning Fair habit & form- Bent/bowed trunk Not likely to develop into a good representative of the species (Photo 5)
30	<i>Casuarina glauca</i> Swamp Oak	S/M	10	2133	180 130	Good	Good	5	2d	No significant signs of dieback or decline No significant structural defects (Photo 4)

6. PROTECTION ZONES

Tree Protection Zones (TPZ) are the principle means of protecting trees that could be impacted upon by development. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The TPZ incorporates the Structural Root Zone (SRZ).

The method used to determine the TPZ and SRZ for these trees have been based on Australian Standard 4970 – 2009 Protection of Trees on Development Sites 3.3.5.

6.1 TPZ - Tree Protection Zones

Australian Standard 4970 – 2009 Protection of Trees on Development Sites requires that the Diameter at Breast Height (DBH) of the trunk measured 1.4m above ground be multiplied by 12 to obtain the radius of a Tree Protection Zones (TPZ). The minimum TPZ is no less than 2.0 meters but no greater than 15 meters

It is possible that minor encroachments can be established for these trees provided encroachment is less than 10% and outside their Structural Root Zone and that the area lost to encroachment can be compensated for elsewhere and contiguous with the TPZ.

6.2 SRZ – Structural Root Zones

Where major encroachment into the TPZ is expected the Structural Root Zone (SRZ) requires to be calculated. **The SRZ considers the trees structural stability only.** The minimum SRZ is no less than 1.5 meters. The woody root growth and soil cohesion in this area are necessary to hold the tree upright

6.3 Table 2 – TPZ / SRZ & Impacts

Tree No.	DBH (mm)	DGL (mm)	TPZ Radius (m)	SRZ Radius (m)	Impacts
19	450 400	550	7.2	2.57	Within the footprint of the driveway
19A	Multi Avg. <100	500	3.0	2.47	Within the footprint of the driveway
19B	Multi Avg. <100	350	3.0	2.13	Within the footprint of the driveway
19C	Multi Avg. <100	380	3.0	2.20	Within the footprint of the driveway
20	140 140 120 110	380	3.0	2.20	Within the footprint of the driveway
21	350	380	4.2	2.20	Within the footprint of the driveway

Tree No.	DBH (mm)	DGL (mm)	TPZ Radius (m)	SRZ Radius (m)	Impacts
22	480	550	5.7	2.57	Within the footprint of the driveway
23	610	730	7.3	2.90	Within the footprint of the driveway
24	Multi Avg. 4x100	320	3.0	2.05	Within the footprint of the driveway
24A	Multi Avg <100	240	3.0	1.82	Within the footprint of the driveway
25	350	390	4.2	2.23	Within the footprint of the driveway
26	270 220 190	400	4.8	2.25	Within the footprint of the driveway
27	400	500	4.8	2.47	Within the footprint of the driveway
28	340 320 110 110	670	6.0	2.80	Potential damage to minor roots within the TPZ
29	250	310	3.0	2.02	Development outside of the TPZ No direct impacts expected
30	180 130	260	2.6	1.88	Potential damage to roots within the TPZ / SRZ

7. IMPACT ASSESSMENT

7.1 Tree Nos. 19, 19A, 19B, 19C, 20, 21, 22, 23, 24, 24A, 25, 26 & 27

Based on the Site Plan Tree Nos. 19, 19A, 19B, 19C, 20, 21, 22, 23, 24, 24A, 25, 26 & 27 are within the footprint of the driveway / carparking area and as such their removal will be necessary to facilitate the development as proposed (Photo 1, 2 & 3).

The retention of any of these trees would require significant changes to the design / development footprint that would enable a tree/s to be retained and survive the impacts of construction however would not likely achieve the desired design outcomes and objectives of the development.



Photo 1 -Trees within footprint of the proposed driveway / carpark



**Photo 2 -Trees within footprint of the proposed driveway/carpark
View looking to the northeast**



**Photo 3 -Trees within footprint of the proposed driveway/carpark
View looking to the east**

7.2 Tree No. 30

Based on the Site Plan construction will encroach into the calculated TPZ and SRZ of the tree. The main area of concern is damage that may be caused to roots within the SRZ and excessive damage to roots within the TPZ (See Appendix 1 Site Plan).

Damage to structural roots will significantly increase the risk of failure, especially during high winds. Tree roots anchor the tree and their continued function is an important factor in a tree's survival during any construction. Decrease in structural stability will result regardless of species although to what degree depends on many factors such as how many and how close to the tree roots are cut.

Severing of roots on one side of a tree (such as may occur when excavation is past a tree trunk but still within the drip zone), may weaken the tree making it unstable and likely to collapse sometime in the future. Excessive removal of soil from around the root zone can significantly reduce roots anchorage capacity increasing the risk of root crown failure.

Excessive damage to secondary and minor roots may initiate decline in tree health and vigour. Excessive removal of smaller absorbing roots can cause immediate water stress. The survival of the tree is linked to its tolerance of water stress and the ability of the tree to form new root rapidly.

Due to the close proximity of construction and extent of encroachment into its TPS & SRZ it is likely that the trees will be adversely impacted upon by the development that may be detrimental to both stability and / or health & vigour (Photo 4).



Photo 4 - Construction of within TPZ & SRZ

7.3 Tree No. 26

Based on the proposed plan the construction of the carpark will slightly encroach into TPZ of the tree but will remain outside of its SRZ (Photo 5).

Although construction is expected within the TPZ encroachment is expected to be less than 10% of the total TPZ and the area lost to encroachment is outside its SRZ and can be compensated for elsewhere and contiguous with the TPZ (See Attachment 1 Site Plan).

It is considered that provided encroachment does not exceed more than 10% of the TPZ and existing ground levels within the remaining TPZ remains unchanged the tree can be retained should not be significantly impacted upon by the proposed development

This does not mean that construction activity (particularly excavation) within the TPZ can be carried out without regard to roots.

Typically, most roots are found within the top 900mm of soil, and most of the fine roots active in water and nutrient absorption are in the top 300mm of soil. Large roots can also be encountered close to the surface.

- Any excavation within the root zone must be carried out carefully to avoid excessive damage to roots.
- No roots shall be cut within the calculated SRZ of a tree.



Photo 5
Encroachment less than 10% of TPZ of T28
Encroachment not within SRZ of T29

7.4 Tree No. 29 & all other remaining trees

Based on the proposed plans construction is not expected to encroach within the calculated TPZ's of Tree No. 29 or any other trees further south of Tree No. 29. It is considered that provided encroachment does not exceed more than 10% of their TPZ's and ground levels within the TPZ's remain unchanged they can be retained should not be impacted upon by the development (Photo's 5, 6 & 7).



Photo 6 - Construction not within TPZ of trees



Photo 7 - Construction not within TPZ of trees

8. RE-PLANTING

A list of medium and larger sized trees to compensate for tree removal is provided below

Medium Size Trees

More suitable for planting closer to school facilities such as recreational areas, playgrounds and the like but not in areas that are too close to buildings or heavily congested

Cupaniopsis anacardioides - Tuckeroo

Callistemon viminalis - Weeping Bottlebrush

Callistemon salignus White Bottlebrush

Elaeocarpus reticulatus Blue Berry Ash

Elaeocarpus eumundi Quandong

- Medium size native evergreen trees will attract honey and nectar feeding birds and provide shade and screening. Leaf drop in not usually prolific

These trees are very adaptable, can tolerate full sun or part shade. They prefer moist well-drained soils but are very adaptable to sandy or clay soils and should only reach heights up to eight to 12 meters in cultivation.

Sapium sebiferum – Chinese Tallow Tree

Koelreuteria paniculata - Golden Rain Tree

- Non- native deciduous trees reaching 10-12m high x 8-12m spread. Good autumn color in sunny position. Prefers moist well-drained loamy soils but are very adaptable to most soils with reasonable.

Larger Size Trees

Eucalyptus microcorys - Tallowwood

Eucalyptus acmenoides - White Mahogany

Lophostemon confertus - Brush Box

These are large trees and can reach heights up to twenty meters or more and should only be planted in areas that are occasionally or rarely used and/ or more distant from school facilities. They prefer moist well-drained soils and tolerate clay soils

9. PLANTING GUIDELINES

Preparing the Planting Hole

- Planting hole should be at 1.5 / 2 times the width of the root ball on sites with poor soils
- Holes should be wider at the top than at the bottom.
- The soil under the root ball should not be disturbed
- Ensure drainage is adequate.
 - A layer of gravel in the bottom of the hole will not improve drainage and should not be used.

Planting

- In most cases the root ball at planting should be 25 – 50mm higher than the surrounding grade to allow for expected settling of backfill soil.
- Ensure that the depth of the planting hole is the same as or slightly less than the distance between the topmost structural roots and the bottom of the root ball
 - Many young trees lack a well-defined root flare. If structural roots are too far below the surface in a root ball planting height may need to be adjusted to place structural roots at the correct height. Excess soil may have to be removed.
- If possible, mark the tree in the nursery and orientate the tree so that it faces the same compass direction as it when it was growing in the nursery.
- Material used to cover and support root balls serve little purpose once the root balls are in their planting holes. Thoroughly stabilizing the lower part of the root ball with backfill at planting usually keeps firm root balls from shifting.

Backfilling

- When refilling the hole the backfill should be free of clumps.
- Replaced soil around the base of the root ball should be firm but not compacted.
 - Soil compaction can slow water penetration and root growth
- The rest of the soil should be patted lightly or left to settle on its own but do not cover the root ball with soil.
 - Watering will assist in settling the soil naturally.

AFTER PLANTING

Support systems

- Stakes can keep the tree in place while allowing the top to move freely. Two stakes with separate ties is usually recommended.
 - Do not use a support system unless it is necessary. Supports should be removed after one year to avoid trunk girdling.

Mulching

- For small trees the mulch layer should be 50 -75mm deep. Mulch should not be allowed to cover the base of the trunk as contact can lead to bark injury from Fungi or pests.

Watering

- In the first year or two it is important to keep the root ball moist but not over-watered.
- During the warm summer weather the tree will probably need water about twice a week.

Fertilization

- Until the root system can grow and absorb more water, adding fertilizer to the soil is likely to be ineffective however this can depend on various factors.
- Only a slow released native fertilizer should be used.

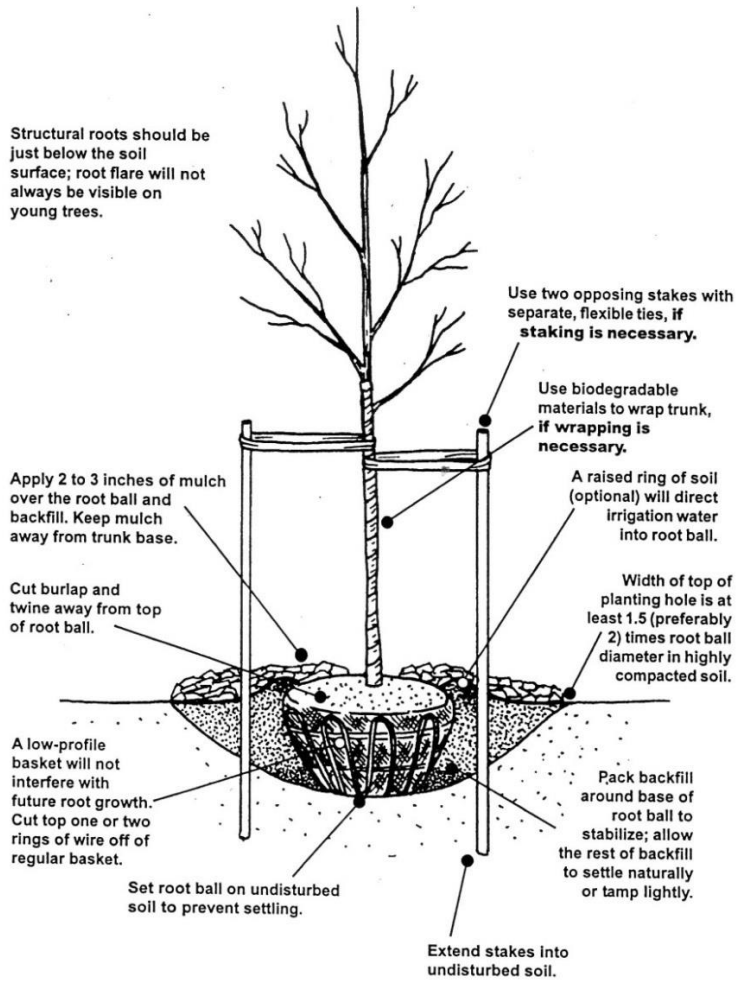
Pest Management

- Monitor plants to inspect for problems associated with pest and disease.

Figure 1

Tree Planting Diagram

Structural roots should be just below the soil surface; root flare will not always be visible on young trees.



10. RECOMMENDATIONS

Based on the Plans and after an assessment of the potential impacts of the proposed development the following outcomes are recommended:

1. Removal of Tree Nos. 19, 19A, 19B, 19C, 20, 21, 22, 23, 24, 24A, 25, 26 & 27

Reason:

The trees are within the footprint of the driveway /carparking area and such their removal would be necessary to facilitate the development as proposed

2. Removal of Tree No. 30

Reason:

Due to the close proximity of construction and extent of encroachment into its TPZ and or SRZ its removal would be necessary as it will be adversely impacted upon in a manner that will be detrimental stability and/ or their overall condition

3. Retention of Tree No. 28

Reason:

Although construction may occur within the TPZ it is expected that encroachment will be less than 10% and that as the area lost to encroachment is outside the SRZ and can be compensated for elsewhere and contiguous with the TPZ the tree should not be significantly impacted upon by the proposed development

4. Retain Tree No. 29 and all other remaining trees

Reason:

Construction is not expected to encroach within the calculated TPZ's of these trees and as such they are not expected to be impacted upon by construction.

5. Re-plant with medium size tree elsewhere within the school grounds

Reason:

To compensate for tree removal.

11. REFERENCES

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Report by



Diploma of Arboriculture

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APPENDIX 1

SULE - Safe Useful Life Expectancy

1. Long SULE

- a. Structurally sound and can accommodate future growth
- b. Long term potential with minor remedial treatment
- c. Trees of special significance which warrant extra care

2. Medium SULE

- a. Will live between 15-40 years
- b. Will live for more than 40 years but would be removed for safety or nuisance reasons
- c. May live for more than 40 years but will interfere with more suitable specimens and need removal eventually
- d. More suitable for retention in the medium term with some remedial care

3. Short SULE

- a. Trees that may only live between 5-15 more years
- b. May live for more than 15 years but would need removal for safety or other reasons
- c. Will live for more than 15 years but will interfere with more suitable specimens or provide space for replacement plantings
- d. Require substantial remedial care but are only suitable for short term retention

4. Removals

- a. Dead, dying or seriously diseased
- b. Dangerous trees through instability or loss of adjacent trees
- c. Structural defects such as cavities
- d. Damaged that are clearly not safe to retain
- e. May or are causing damage to structures
- f. That will become dangerous

5. Moved or Replaced

Trees, which can be reliably moved or replaced

- a. Small trees less than 5 meters
- b. Young trees between 5-15 years
- c. Trees that have been regularly pruned to control growth

APPENDIX 2

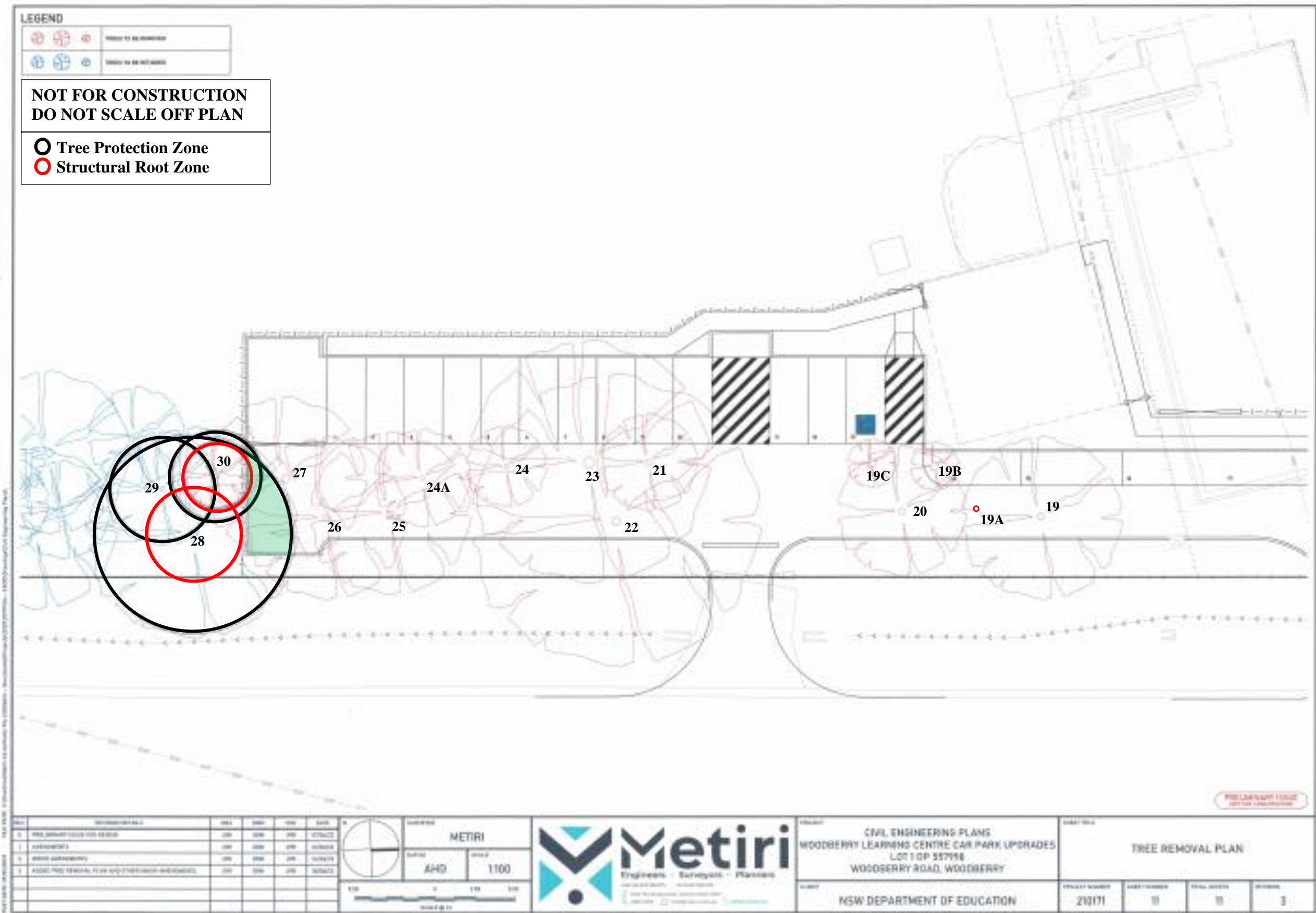
CONDITION RATINGS

Each tree or groups of trees have been placed into categories ranging from 1 to 6, with no.1 being in the worst condition through to no.6 in a health condition.

This is based on observations of their health and structure.

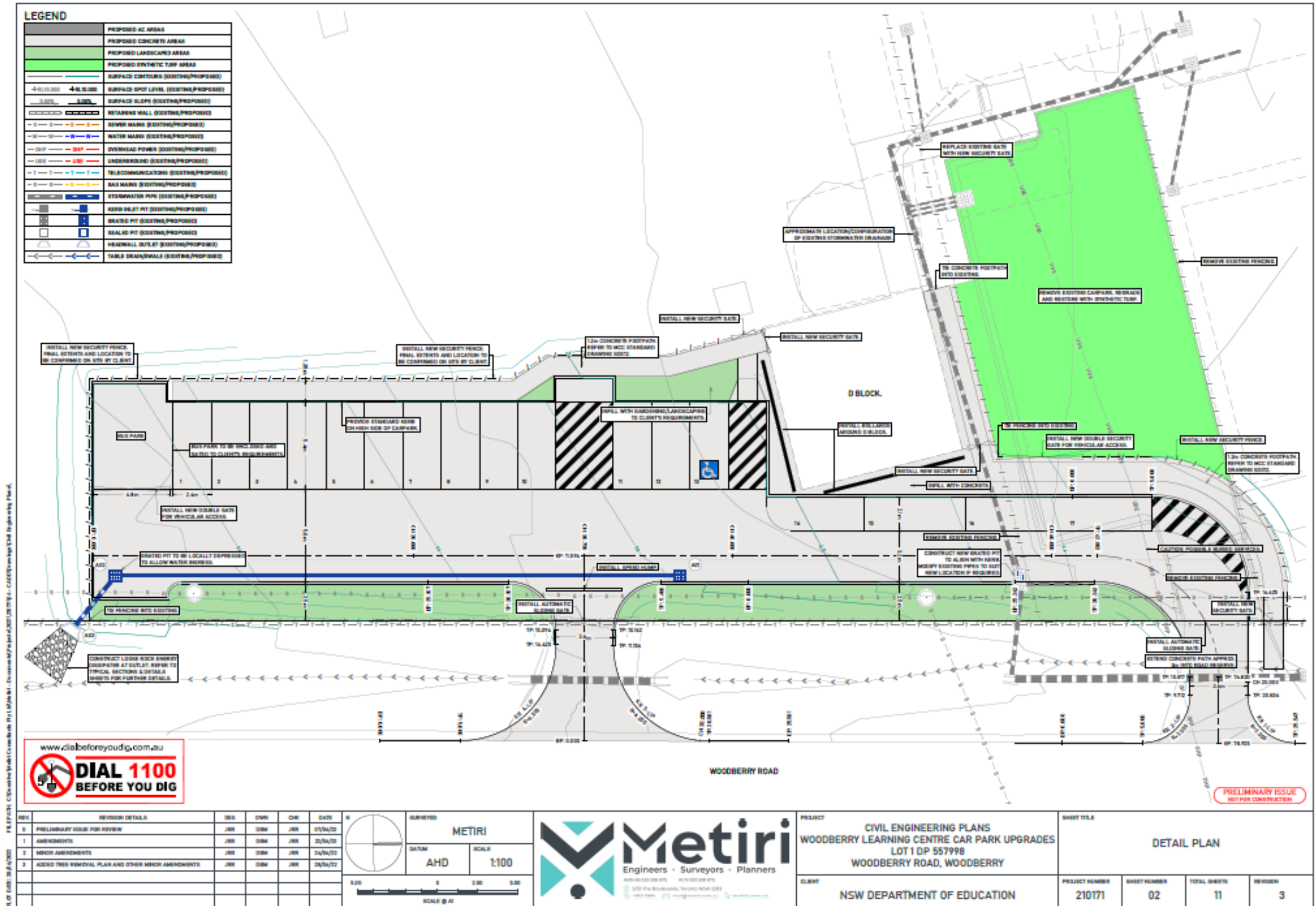
1. A dead tree.
2. A tree in severe decline. Major structural damage that cannot be repaired, dieback of trunk or scaffold branches and the majority of foliage consist of epicormic growth.
3. A tree in decline. Significant structural damage that cannot be repaired, dieback of medium to larger branches and epicormic growth.
4. A tree moderate vigor, dieback of smaller branches and twigs, thinning of crown, poor leaf colour and moderate structural defects that could be mitigated with regular care.
5. A tree in slight decline with only a small amount of twig dieback and minor structural damage that could be easily rectified.
6. A healthy vigorous tree that shows reasonably free signs of pest and diseases and good structural form.

APPENDIX 3 – TREE REMOVAL PLAN



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APPENDIX 4 – DETAIL PLAN



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