TREESCAN

URBAN FOREST MANAGEMENT

Tree Report

Westfield Warringah Mall

For DEM Australia Pty Ltd

June 2013

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Introduction
It is proposed to reconstruct and realign parts of the existing entry/exit roadway to Warringah Mall shopping centre off Brookvale. Many trees are located on the site and some would be affected by the proposed construction. This report assesses the trees on the site and comments on the effects of the proposal. Twelve trees are proposed for removal while the others are to be retained and protected during construction.

Plans considered are:

- Proposed ground level floor plan 03.02 Rev CP1 dated 9 April 2013 prepared by Westfield Design & Construction Pty Ltd
- Tree survey dated 20 April 2013 prepared by RPS Australia East Pty Ltd
- DEM markup plan dated 31 May 2013 relating to Trees 14 and 15

The site
The site is aligned approximately north/south and consists of the existing roadway off Old Pittwater Rd and adjoining areas. Trees planted in rows are located to either side of the roadway and are also located in central islands. The land is within the local government area of Warringah Council.

Present state of the trees
The site trees are assessed in Table 1 below; tree numbers are noted on the plan attached. Trees were inspected on 2 May 2013 from the ground only and no aerial or subterranean inspections were carried out. Observations of tree structure, tree health and root zone conditions were made during the assessment. Tree dimensions of trunk diameter, height and crown spread were taken from the Tree Survey.

In general the trees are in good health with full foliage cover of the crowns. Their structural condition however is often compromised by poor scaffold formation and in particular by confinement of the root systems due to the proximity of trees to the roadway and other structures.

All trees are of commonly planted native species, evidently part of the landscape plan installed at the construction of the roadway. There are no trees present which are remnants of an original vegetation community of the site.

Discussion

Tree retention

Most of the trees along the edges of the roadway are proposed for retention, although a few may be affected by changes to the kerbline in their vicinity.

Trees 33 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and Tree 34 *Eucalyptus microcorys* (Tallowwood) are close to the line of a new kerb, losing approximately 600mm and 500mm respectively to the west of the trunks. The existing kerb is approximately 1.5m from the trunks so that the additional excavation required may cause impact on the root systems. Before a decision can be made regarding the retention of these two trees, a root investigation would be required. The trees would be retained if no significant roots are found within the area. If significant roots need to be severed close to the trunk the trees may become unstable and require removal. Alternatively if significant roots are encountered it may be feasible to retain the existing kerbline in the vicinity of the trees.

Other trees along the sides of the roadway are not affected by the proposed changes and would be retained. Protection of the trunks and lower branches during construction would be required.

Tree 14 *Eucalyptus tereticornis* (Forest Red Gum) and Tree 15 *Melaleuca quinquenervia* (Broad-leaved Paperbark) are in a central raised bed surrounded by retaining walls; Tree 14 is leaning and may be unstable. Tree 15 is in poor structural condition due to a weak junction in the trunk. These trees would be retained although Tree 15 may be affected by the construction of a ramp to the south of the trunk.

In general the trees and their root zones would be protected by site safety fencing installed along the edges of the roadway and the new construction. Additional trunk armouring may be required where trees are close to construction.

Tree removal

Trees proposed for removal are in the central island areas where new roadways and ramps are proposed to be constructed. The ten trees affected are:

Tree 16 *Eucalyptus microcorys* (Tallowwood)
Tree 17 *Melaleuca quinquenervia* (Broad-leaved Paperbark)
Tree 26 *Lophostemon confertus* (Brushbox)
Tree 27 *Melaleuca quinquenervia* (Broad-leaved Paperbark)
Tree 27a *Callistemon viminalis* (Weeping Bottlebrush)

Tree 28 *Eucalyptus robusta* (Swamp Mahogany)
Tree 29 *Melaleuca quinquenervia* (Broad-leaved Paperbark)
Tree 30 *Melaleuca quinquenervia* (Broad-leaved Paperbark)
Tree 31 *Eucalyptus robusta* (Swamp Mahogany)
Tree 32 *Melaleuca quinquenervia* (Broad-leaved Paperbark)

These trees are confined within island planter beds in the centre of the roadway. In most cases their root systems have reached the limits of the available soil volume within the planters and in some areas are already causing uplift of kerbs and cracking of surfaces as roots extend from the planters.

Comments on trees proposed for removal are noted below:

Tree 16 *Eucalyptus microcorys* (Tallowwood) is a fair specimen although the root system is confined by kerbs to either side.

Tree 17 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and Tree 26 *Lophostemon confertus* (Brushbox) are stressed and have sparse leaf coverage.

Tree 27 *Melaleuca quinquenervia* (Broad-leaved Paperbark) is a very large specimen which is causing damage to the kerb due to root activity.

Tree 27a *Callistemon viminalis* (Weeping Bottlebrush) is poor and suppressed.

Tree 28 *Eucalyptus robusta* (Swamp Mahogany) has advanced crown dieback and is declining.

Tree 29 *Melaleuca quinquenervia* (Broad-leaved Paperbark) has a weak junction near the base and the root system is likely to cause damage in the near future.

Tree 30 *Melaleuca quinquenervia* (Broad-leaved Paperbark) is likely to cause damage in the near future.

Tree 31 *Eucalyptus robusta* (Swamp Mahogany) has major surface roots which have been deformed by the adjacent kerbs. Damage is likely in the near future.

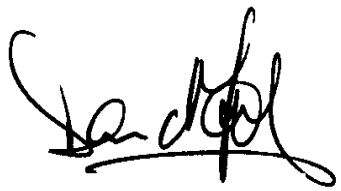
Tree 32 *Melaleuca quinquenervia* (Broad-leaved Paperbark) has already caused damage to the kerb and the road surface. Additional damage is likely in the future.

These trees are assessed with short safe useful life expectancy, 5 to 15 years, due to the likelihood of their removal for safety or nuisance reasons within this timespan.

Conclusions

The removal of ten trees would be necessary to enable the construction of the new roadway and access ramp. Most of these trees are of diminished value due to their confined locations within planter beds in the centre of the roadway.

Trees proposed for retention would require protection, depending on their proximity to disturbance as the result of construction nearby. In most cases the protection of the site fencing along the edges of the roadway would be sufficient, but some trees may also require trunk armouring to protect trunks and lower branches from accidental contact with machinery.



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Consulting Arborist

References

Barrell, J. 1993, 'Preplanning Tree Surveys: Safe Useful Life Expectancy (SULE) is the Natural Progression', *Arboricultural Journal* 17:1, February 1993, pp. 33-46.

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

Standards Australia 2009, Australian Standard AS 4970 *Protection of trees on development sites*, Standards Australia, Sydney.

Tree protection during construction

The following measures should be undertaken to reduce the possible effects of construction on the trees.

Services should be designed so that no trenching is required within 5m of the trees.

Excavation in the vicinity of trees should be done initially by hand. Any roots encountered <50mm in diameter should be cut cleanly with a hand saw. Any roots encountered >50mm in diameter should retained intact and referred to the site arborist for advice.

Prior to the start of construction trees should be fenced (in groups where possible) to a radius of 5m from each trunk except where access is required for construction, to form tree protection zones. Fences should be chainlink 1.8m high supported by steel posts.

Where access is required within these radii for building purposes, the fence should be set back 1.5m from the building face and the soil surface between the fence and the building should be protected by plywood sheets or strapped planking.

Where not otherwise protected trunks should be armoured with 2m lengths of 50x100mm hardwood timbers spaced at 150mm centres and secured by 8 gauge wires or steel strapping at 300mm spacing. The trunk protection should be maintained intact until the completion of all work on the site.

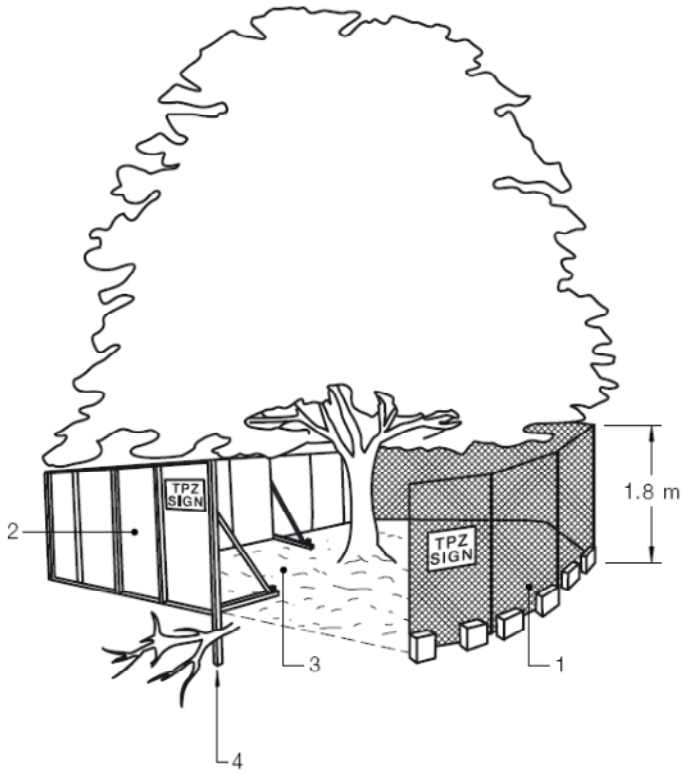
There should be no pedestrian or vehicular access to the tree protection zones. No building activities should take place within the tree protection zones, including storage or stockpiling. Runoff from the site should not be allowed to enter the tree protection zones.

A site arborist should be appointed to supervise any activities in the vicinity of trees, including fencing, excavation and root pruning, and make periodic visits and reports to monitor the state of the trees. Inspection should take place after installation of the fencing, at initial hand excavation and root pruning, during any works within the tree protection zones, at completion of the construction. A photographic record should be maintained of site inspections, including the state of the trees and any injury inflicted.

In the event of any tree to be retained becoming damaged during construction, the site arborist should be informed to inspect and provide advice on remedial action.

At the end of construction all retained trees should be pruned to remove deadwood and weak branches. All pruning should be done in accordance with Australian Standard AS4373- *Pruning of Amenity Trees*.

Guidelines for tree protection are noted in Australian Standard AS4970-2009 *Protection of Trees on Development Sites*. Figures below show fencing, ground protection and scaffold fencing details.



LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

FIGURE 3 PROTECTIVE FENCING

4.5.2 Trunk and branch protection

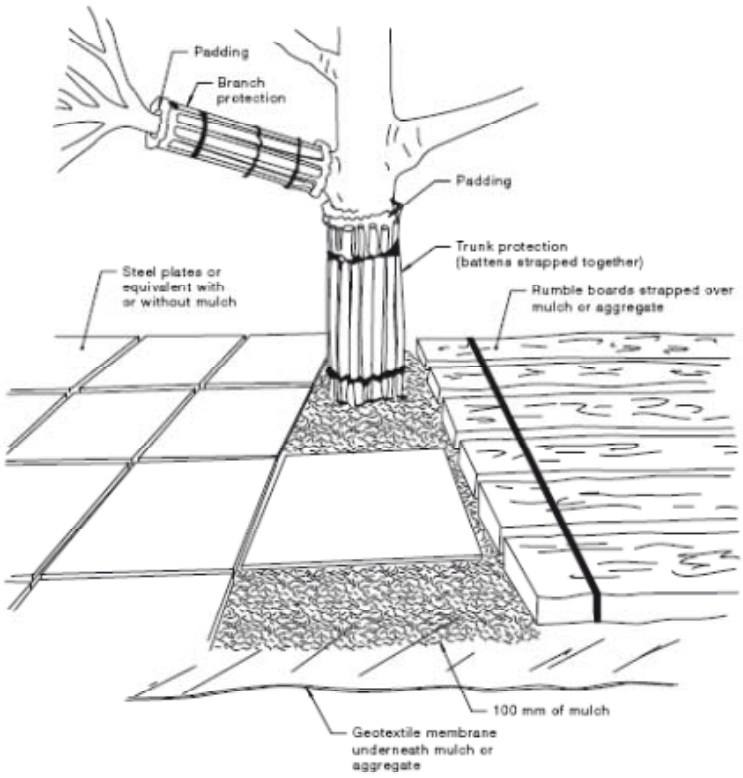
Where necessary, install protection to the trunk and branches of trees as shown in Figure 4. The materials and positioning of protection are to be specified by the project arborist. A minimum height of 2 m is recommended.

Do not attach temporary powerlines, stays, guys and the like to the tree. Do not drive nails into the trunks or branches.

4.5.3 Ground protection

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per Figure 4.

These measures may be applied to root zones beyond the TPZ.

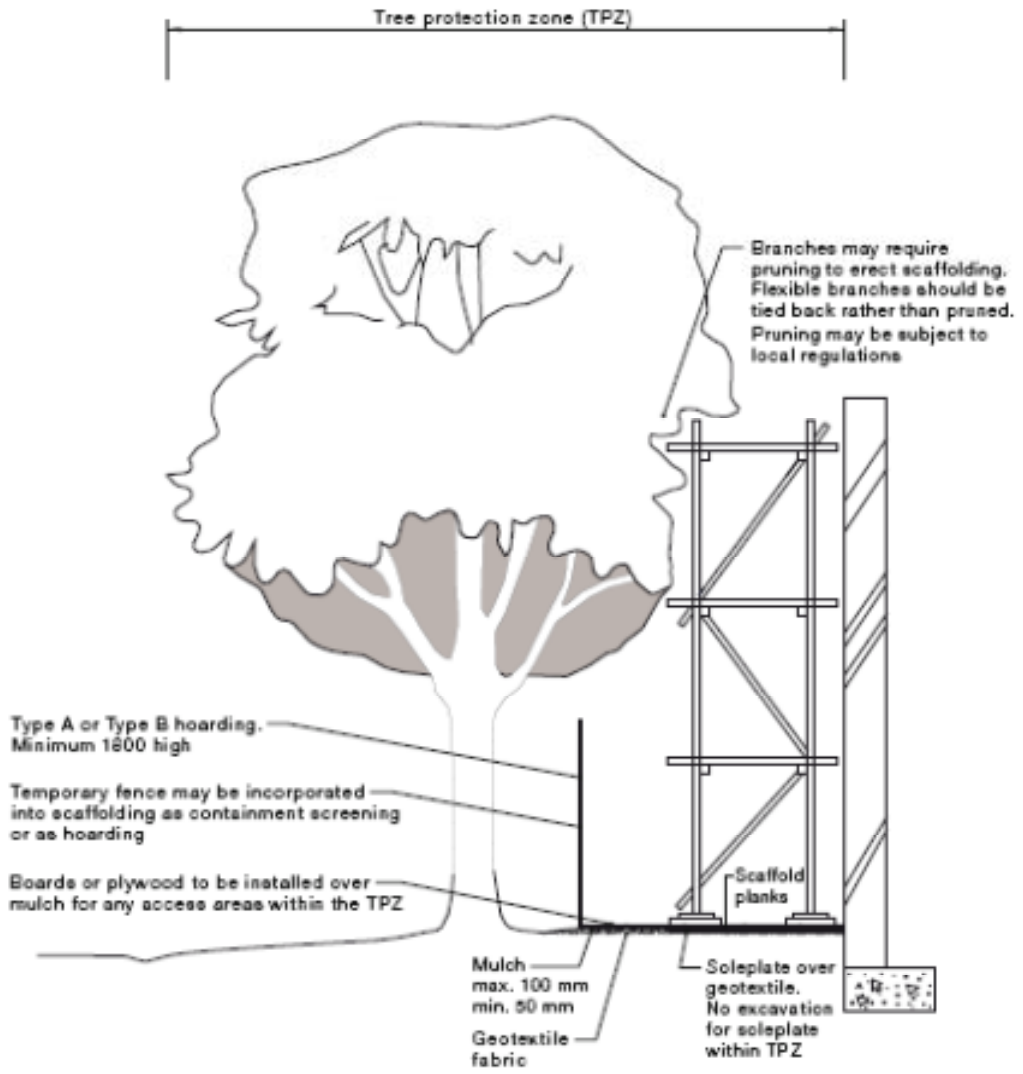


NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

FIGURE 4 EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION



NOTE: Excavation required for the insertion of support posts for tree protection fencing should not involve the severance of any roots greater than 20 mm in diameter, without the prior approval of the project arborist.

FIGURE 5 INDICATIVE SCAFFOLDING WITHIN A TPZ

Table 1: Site trees

Tree no	Species	Approx height m	Approx crown spread m	Approx trunk dbh mm	Health	Condition	SULE	Comment	Effect of proposed development
1	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	8	6	300	Good	Fair	2D	Root system confined by road	Retention
2	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	8	8	300	Good	Fair	3B	Trunk in contact with retaining wall	Retention
3	*Cinnamomum camphora* (Camphor Laurel)	7	6	300	Good	Fair	4C	Weed species	Retention
4	*Melaleuca bracteata* (Black Tea Tree)	10	8	300	Good	Fair	3B	Trunk in contact with retaining wall	Retention
5	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	10	6	400	Good	Good	2B	Weak junction at 5m height	Retention
6	*Melaleuca bracteata* (Black Tea Tree)	6	6	300	Good	Poor	3D	Trunk lean Weak junction near base	Retention
7	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	6	8	300	Good	Fair	3B	Multiple subtrunks Poor form	Retention
8	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	6	8	300	Good	Fair	3B	Multiple subtrunks Poor form	Retention
9	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	12	10	500	Good	Fair	3B	Weak junction with big ears defect at 2m height	Retention
10	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	8	8	400	Good	Fair	3C	Suppressed Weak junction at 2m height	Retention

Tree no	Species	Approx height m	Approx crown spread m	Approx trunk dbh mm	Health	Condition	SULE	Comment	Effect of proposed development
11	*Eucalyptus microcorys* (Tallowwood)	14	16	800	Good	Fair	3B	Weak junction at 3m height Small ears defect Epicormic shoots on trunk Root system confined by road Termite workings on trunk	Retention
12	*Eucalyptus microcorys* (Tallowwood)	8	8	400	Good	Fair	2B	Weak junction at 2m height Leaning Codominant subtrunks	Retention
13	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	8	12	400	Good	Fair	3B	Multiple subtrunks Poor form	Retention
14	*Eucalyptus tereticornis* (Forest Red Gum) ?	8	10	400	Good	Fair	3B	Root system confined by road to 2 sides in narrow planter bed Leaning Possibly unstable	Retention
15	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	8	10	400	Good	Poor	3B	Weak junction at 3m height Root system confined by road to 2 sides in narrow planter bed	Retention
16	*Eucalyptus microcorys* (Tallowwood)	10	10	300	Good	Fair	2B	Straight form Root system confined by road to 2 sides in narrow planter bed	Removal
17	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	8	6	300	Fair	Fair	3A	Sparse crown Stressed	Removal
18	*Lophostemon confertus* (Brushbox)	12	10	300	Good	Fair	3A	Root system confined by road and carpark Codominant crown	Retention
19	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	12	12	1000	Good	Poor	3B	Weak junctions at base Root system confined by road carpark and stormwater pit	Retention

Tree no	Species	Approx height m	Approx crown spread m	Approx trunk dbh mm	Health	Condition	SULE	Comment	Effect of proposed development
20	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	6	6	300	Good	Poor	3B	Weak junctions at base Root system confined by road carpark and stormwater pit	Retention
21	*Callistemon viminalis* (Weeping Bottlebrush)	5	6	Multi	Fair	Poor	3A	Sparse crown Poor form	Retention
22	*Callistemon viminalis* (Weeping Bottlebrush)	5	4	multi	Fair	Poor	3A	Sparse crown Poor form	Retention
23	*Lophostemon confertus* (Brushbox)	5	6	200	Good	Fair	2D	Good specimen with confined root system	Retention
24	*Lophostemon confertus* (Brushbox)	7	8	300	Good	Fair	2B	Root system confined by road carpark and stormwater pipe	Retention
25	*Lophostemon confertus* (Brushbox)	7	8	300	Good	Fair	2B	Root system confined by road carpark and stormwater pipe	Retention
26	*Lophostemon confertus* (Brushbox)	4	6	200	Fair	Poor	3A	Sparse crown Stressed	Removal
27	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	13	12	1000	Good	Poor	3B	Root system confined by road to 2 sides Kerb damage	Removal
27a	*Callistemon viminalis* (Weeping Bottlebrush)	3	2	200	Poor	Poor	4A	Suppressed Declining	Removal
28	*Eucalyptus robusta* (Swamp Mahogany)	5	4	300	Poor	Poor	4A	Crown dieback Declining	Removal
29	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	6	6	400	Good	Poor	3B	Leaning Weak junction at base Confined root system	Removal

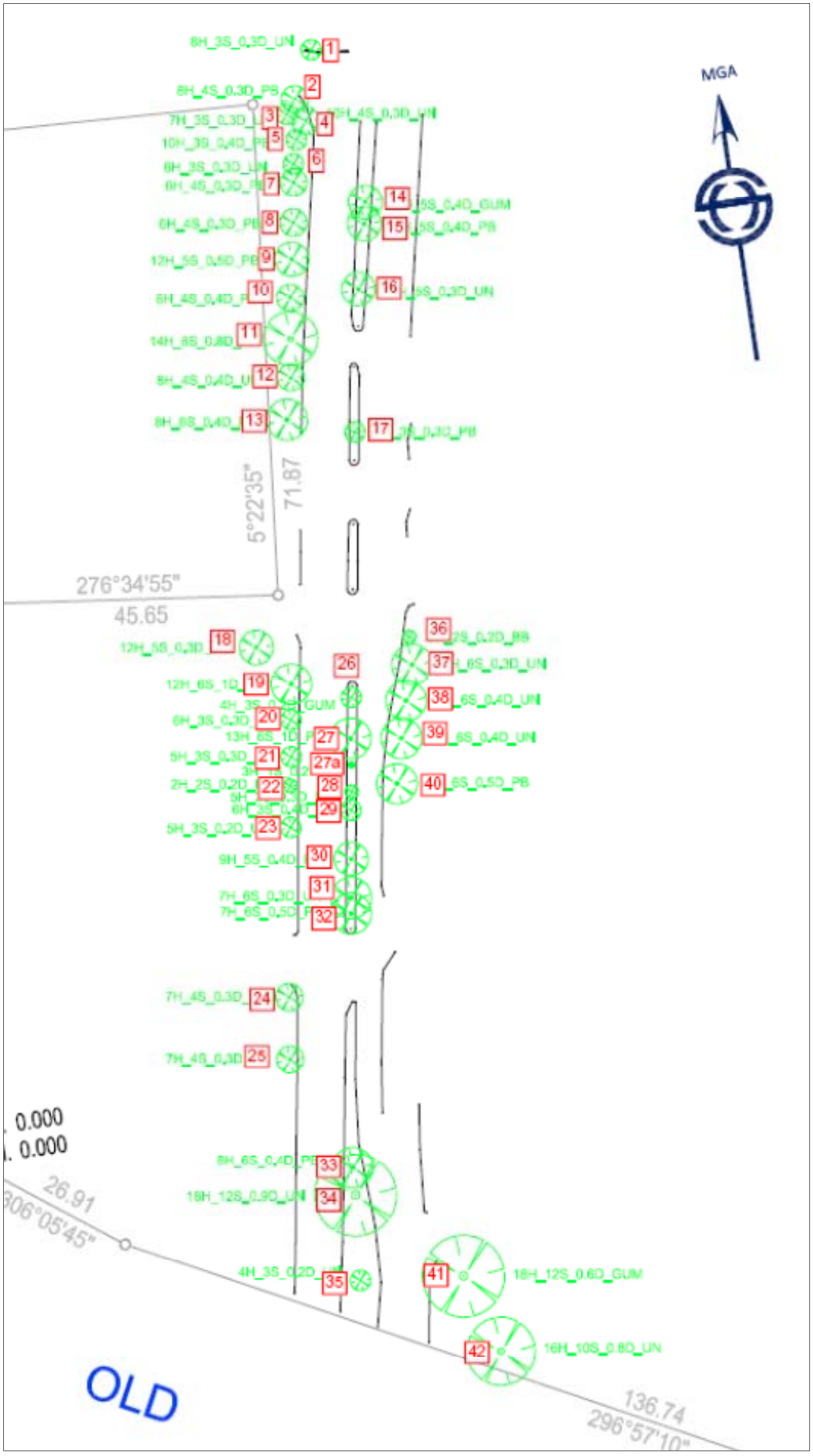
Tree no	Species	Approx height m	Approx crown spread m	Approx trunk dbh mm	Health	Condition	SULE	Comment	Effect of proposed development
30	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	9	10	400	Good	Fair	3B	Root system confined by road to 2 sides	Removal
31	*Eucalyptus robusta* (Swamp Mahogany)	7	12	300	Good	Poor	3B	Trunk wounds Massive root system confined by road to 2 sides	Removal
32	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	7	12	500	Good	Poor	3B	Leaning Damage to road Confined root system	Removal
33	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	8	12	400	Good	Fair	3B	Suppressed One-sided crown Root system confined by road	Retention
34	*Eucalyptus microcorys* (Tallowwood)	18	24	900	Fair	Fair	2D	Weak junctions at 4m height Root system confined by road to 2 sides Hydrant nearby	Retention
35	*Jacaranda mimosifolia* (Jacaranda)	4	6	200 x 2	Good	Poor	3D	Weak junction at base Codominant subtrunks	Retention
36	*Callistemon viminalis* (Weeping Bottlebrush)	5	4	200	Good	Poor	4A	Leaning One-sided crown Root system confined by road and footpath	Retention
37	*Melaleuca bracteata* (Black Tea Tree)	6	12	300	Good	Fair	3B	Multi-stemmed form Weak junctions Root system confined by road	Retention
38	*Melaleuca bracteata* (Black Tea Tree)	8	12	400	Good	Fair	3B	Multi-stemmed form Weak junctions Root system confined by road	Retention
39	*Melaleuca bracteata* (Black Tea Tree)	8	12	400	Good	Fair	3B	Multi-stemmed form Weak junctions Root system confined by road	Retention

Tree no	Species	Approx height m	Approx crown spread m	Approx trunk dbh mm	Health	Condition	SULE	Comment	Effect of proposed development
40	*Melaleuca quinquenervia* (Broad-leaved Paperbark)	18	24	600	Fair	Fair	3B	Sparse crown Stressed Weak junction at 1m height Root system confined by road and ramp	Retention
41	*Eucalyptus microcorys* (Tallowwood)	8	12	500	Good	Fair	2D	Straight form Root system confined by footpath and retaining wall Termite workings on trunk	Retention
42	*Eucalyptus microcorys* (Tallowwood)	16	20	800	Good	Fair	2D	Codominant subtrunks Epicormic shoots on lower branches Root system confined by ramp building and footpath Termite workings on trunk	Retention

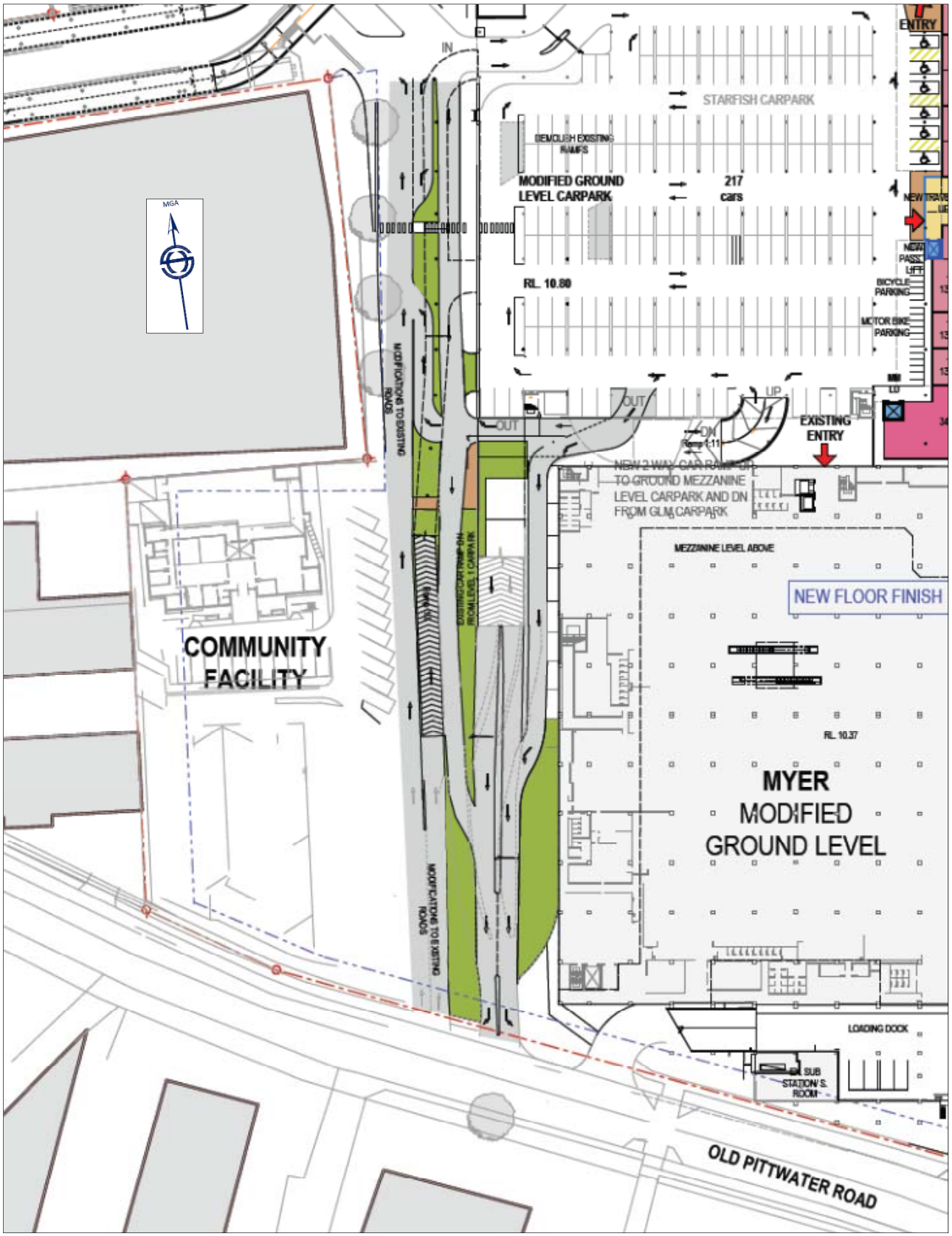
Table 2: SULE categories (after Barrell 1995)

	1	2	3	4
	Long: Appeared to be retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance.	Medium: appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance.	Short: appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance.	Transient: trees which should be removed within the next 5 years.
A	Structurally sound trees located in positions that can accommodate future growth.	Trees which may only live between 15 and 40 years.	Trees which may only live between 5 and 15 years.	Dead, dying, suppressed or declining trees.
B	Trees which could be made suitable for long-term retention by remedial care.	Trees which may live for more than 40 years but would be removed for safety or nuisance reasons.	Trees which may live for more than 15 years but would be removed for safety or nuisance reasons.	Dangerous trees through damage, structural defect, instability or recent loss of adjacent trees. Urgent removal may be required if near assets.
C	Trees of special significance which would warrant extraordinary efforts to secure their long-term retention.	Trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.	Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.	Trees which 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.
D		Trees which could be made suitable for retention in the medium term by remedial care.	Trees which require substantial remediation and are only suitable for retention in the short term.	Trees which are damaging or may cause damage to existing structures within the next 5 years.

Tree location plan



Ground level floor plan



Plates

Plate 1: right to left Tree 4 *Melaleuca bracteata* (Black Tea Tree), Tree 5 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and Tree 6 *Melaleuca bracteata* (Black Tea Tree)

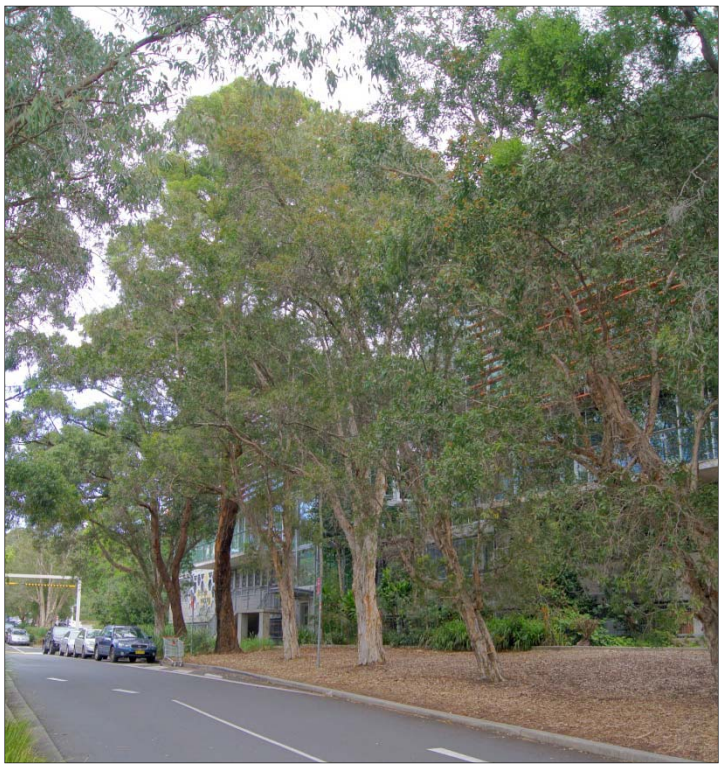


Plate 2: right to left Trees 7 to 10 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and Trees 11 and 12 *Eucalyptus microcorys* (Tallowwood)

Plate 3: Tree 14 *Eucalyptus tereticornis* (Forest Red Gum), Tree 15 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and at rear Tree 16 *Eucalyptus microcorys* (Tallowwood)

Plate 4: central section viewed from the north showing left to right:
Tree 36 *Callistemon viminalis* (Weeping Bottlebrush) , Tree 37 *Melaleuca bracteata* (Black Tea Tree), Tree 26 *Lophostemon confertus* (Brushbox), Tree 27 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and Tree 26 *Lophostemon confertus* (Brushbox)

Plate 5: Trees 24 and 25
Lophostemon confertus
(Brushbox)

Plate 6: right to left
Tree 26 *Lophostemon confertus* (Brushbox), Tree 27 *Melaleuca quinquenervia* (Broad-leaved Paperbark), Tree 27a *Callistemon viminalis* (Weeping Bottlebrush), Tree 28 *Eucalyptus robusta* (Swamp Mahogany), Trees 29 and 30 *Melaleuca quinquenervia* (Broad-leaved Paperbark)

Plate 7: left to right
Tree 31 *Eucalyptus robusta* (Swamp Mahogany) and Tree 32 *Melaleuca quinquenervia* (Broad-leaved Paperbark)

Plate 8: left to right
Tree 41 *Eucalyptus microcorys* (Tallowwood), Tree 33 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and at rear Tree 34 *Eucalyptus microcorys* (Tallowwood)

Plate 9: existing kerbline near Tree 33 *Melaleuca quinquenervia* (Broad-leaved Paperbark) and Tree 34 *Eucalyptus microcorys* (Tallowwood)

Plate 10: left to right Tree 36 *Callistemon viminalis* (Weeping Bottlebrush), Trees 37 to 39 *Melaleuca bracteata* (Black Tea Tree) and Tree 40 *Melaleuca quinquenervia* (Broad-leaved Paperbark)

Plate 11: Old Pittwater Rd entry showing Tree 34 *Eucalyptus microcorys* (Tallowwood) and Tree 35 *Jacaranda mimosifolia* (Jacaranda)

Plate 12: Old Pittwater Rd entry showing Trees 41 and 42 *Eucalyptus microcorys* (Tallowwood)

Terminology used in the report

Age classes (I) *Immature* refers to a well-established but juvenile tree. (S) *Semimature* refers to a tree at growth stages between immaturity and full size. (M) *Mature* refers to a full sized tree with some capacity for further growth. (O) *Overmature* refers to a tree about to enter decline or already declining.

Health refers to the tree's vigour as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion and the degree of dieback.

Condition refers to the tree's form and growth habit, as modified by its environment (aspect, suppression by other trees, soils), and the state of the scaffold (ie trunk and major branches), including structural defects such as cavities, crooked trunks or weak trunk/branch junctions. These are not directly connected with health and it is possible for a tree to be healthy but in poor condition.

Health	
Good	In good vigour with full leaf coverage of the crown; deadwood if present is internal and a normal feature of the species
Fair	Generally vigorous but shows symptoms of stress or decline, leaf coverage thinner than normal for the species; deadwood of smaller diameter may be present
Poor	Shows symptoms of advanced stress or decline including sparse crown with twig and branch dieback, lack of response to pests or disease
Structural condition	
Good	Has well-spaced branches and strong branch collars; form and habit typical of the species; good example of the species with low probability of significant failure
Fair	Has structural defects of moderate severity with low propensity for failure which could be remediated by pruning or modification of its environment
Poor	Has structural defects which have already failed and/or have a high propensity for failing in the future

Safe Useful Life Expectancy (SULE). In a planning context, the time a tree can expect to be usefully retained is the most important long-term consideration. SULE is a system designed to classify trees into a number of defined categories so that information regarding tree retention can be concisely communicated in a non-technical manner. SULE categories are easily verifiable by experienced personnel without great disparity. A tree's SULE category is the life expectancy of the tree modified first by its age, health, condition, safety and location (to give safe life expectancy), then by economics (ie cost of maintenance; retaining trees at an excessive management cost is not normally acceptable), effects on better trees, and sustained amenity (ie establishing a range of age classes in a local population). SULE assessments are not static but may be modified as dictated by changes in tree health and environment. Trees with short SULE may at present be making a contribution to the landscape but their value to the local amenity will decrease rapidly towards the end of this period, prior to their being removed for safety or aesthetic reasons. For details of SULE categories see Table 2, adapted from Barrell (1993 and 1995).

Decay is the result of invasion by fungal diseases through a wound.

Decline is the response of the tree to a reduction of energy levels resulting from **stress**. Recovery from a decline is difficult and slow; is usually irreversible.

Epicormic shoots are sprouts produced from dormant buds in the bark. Production can be triggered by fire, pruning or root damage but may also be as a result of stress or decline.

Sparse crown refers to reduced leaf density, often a precursor to dieback and may imply stress or decline. Also possibly a response to drought or root damage.

Stress refers to the response of the tree to a reduction of energy levels resulting from adverse influences such as altered soil conditions (compaction, poor nutrition, reduced oxygen or moisture levels), root damage, toxicity, drought, waterlogging; may be reversible given good arboricultural practices but may lead to **decline**.

Theoretical tree protection zone is the 'tree protection zone radius' as calculated from Australian Standard 4970-2009 *Protection of Trees on Development Sites*. However root mapping investigations increasingly show that the tree protection zone calculation of 12x trunk diameter is seldom relevant in practice and the theoretical tree protection zone may be considerably larger than the actual root zone or radically different in disposition.

Weak junctions are points of possible failure in the scaffold. They are usually caused by the trunk or branch bark being squeezed within the junction so that the necessary interlocking of the wood fibres does not occur and the junction is forced open by the annual increments in growth. This is often a genetic problem.

Disclaimer

All care has been taken to assess potential hazard but trees are always inherently dangerous. This assessment was carried out from the ground, and covers what was reasonably able to be assessed and available to the assessor at the time of inspection. No aerial or subterranean inspections were carried out and structural weakness may exist within roots, trunk or branches.

Any protection or preservation methods recommended are not a guarantee of tree survival or safety but are designed to improve vigour and reduce risk. Timely inspections and reports are necessary to monitor the trees' condition. No responsibility is accepted for damage or injury caused by the trees and no responsibility is accepted if the recommendations in this report are not followed.

Limitations on the use of this report

This report is to be utilised in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

Assumptions

Care has been taken to obtain information from reliable resources. All data have been verified insofar as possible; however, Treescan Urban Forest Management can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise:

Information contained in this report covers only the trees that were examined and reflects the condition of the trees at the time of inspection: and

The inspection was limited to visual examination of the subject trees without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.