TREE SAFETY REPORT

Ailanthus T1
Montpelier Square
London
SW7

Client	:	Montpelier Gardens
Date	:	08/03/2012
Ref	:	12 508
Surveyor	:	KM/JM
Author	:	JM

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1 Introduction

I was instructed by Robert Player of Garden Associates to undertake a detailed inspection of an Ailanthus tree located within Montpelier Square.

2 Caveats

Inherent in tree inspection is assessment of the risk associated with trees close to people and their property. Most human activities involve a degree of risk, such risks being commonly accepted if the associated benefits are perceived to be commensurate. Risks associated with trees tend to increase with the age of the trees concerned, but so do many of the benefits. It will be appreciated, and deemed to be accepted by the client, that the formulation of recommendations for all management of trees will be guided by a cost/benefit balance.

Lonsdale writes in 'Principles of Tree Hazard Assessment and Management' that… 'The (risk) value of 1 in 10,000 is generally considered as acceptable when an identifiable risk is imposed upon people in the "wider interest", and is perhaps appropriate as far as risks and benefits from trees are concerned.'

Ultimately, the landowner / site manager will determine his own thresholds and exposure.

Validity period

The conclusions and recommendations in this report are valid for a period of one year from the date of survey. Trees are living organisms subject to change; this validity period may be reduced should changes in condition occur to the subject(s) of the report or surrounding area. All recommendations are given in the context of the site's current usage; any change would dictate a re-inspection.

3 Site Appraisal

Montpelier Square includes a private garden located within the City of Westminster, London. It is situated within a residential area and is surrounded on all four sides by public highways. Internally the garden is well maintained and includes a large central area of lawn which is surrounded by paths, shrubs and a number of mature trees. The subject Ailanthus tree is located on the southern side of the garden, close to the junction with Montpelier Square and Stirling Street.

Whilst access to the garden is limited to local residents the tree stands on the edge of the garden and immediately adjacent to the public highway. The target area associated with this tree therefore includes the garden as well as the public footway, highway and nearby residential properties.

4 Methodology

Where considered necessary invasive investigation may include but not be limited to:

- Hand-excavation of ground around the base of trees
- Test-boring with twist-drill or resistograph*
- Extraction of increment cores**
- Removal of loose dead bark
- Removal of shoots, branches and foliage
- Removal and identification of fungi
- Climbing Inspection***

When considered necessary, laboratory analysis of samples will be commissioned, subject to approval from the client.

4.1.1 Resistograph*

The Resistograph is a device used to identify and assess the extent of decay and defects in standing and felled timber. The device is essentially a battery powered drill with an extremely fine (1.1mm diameter with a flat 3mm tip) drill bit which is driven into the tree up to a depth of up to 48cm. The energy required to drive the drill into the tree is measured and a graph produced displaying distance travelling into the wood on the x-axis and the amplitude (essentially the torque) on the y-axis. By examining the changes in torque required to propel the drill into the wood, it is possible to detect wood weakened by decay, decay cavities and other defects.

4.1.2 Increment cores**

An increment core is a method similar to the Resistograph for investigating conditions within a standing tree. A 5mm core of living wood is removed with a hand auger up to a maximum depth of up to 40cm. This core can then be investigated for signs of fungal decay, whilst major defects such as decay cavities and cracks become obvious.

4.1.3 Climbing Inspection***

A Climbing Inspection is the close inspection of those parts of the tree that cannot be inspected while standing on the ground. A Climbing Inspection will usually be carried out by ascending the tree using rope and harness or by Mobile Elevated Work Platform (MEWP). For reasons of safety both of these methods require a second competent climber the cost of which is reflected in the unit rate. A lone inspector using a ladder might, taking appropriate precautions, carry out inspections within 4 metres of ground level.

5 Subject Trees

ID	:	T1
Common name	:	Tree of Heaven
Botanical name	:	*Ailanthus altissima*
Age Class	:	Mature
Height (m)	:	16
Physiological condition	:	Fair
Structural condition	:	Fair
DBH	:	525mm

5.1 Description

T1		
Roots/Rooting area	:	The tree is located within a cultivated bed and in close proximity to the southern boundary wall of the square. The rooting environment surrounding the tree is reasonable although may be restricted by the presence of a gravel path to the north and the public highway to the south.
Stem Base	:	Minor canker present to south. South-western exudation to side of stem at heights of approximately 0.4m and 1.3m. Evidence of past exudation. Old gummy exudation has dried to a clear resin stain.
Stem	:	Large canker patch at 3.5m to western side of stem. Has resulted in the formation of a sunken depression to bark. A further small canker present at 3.7m to southern side of stem. Evidence of past exudation. Old gummy exudation has dried to a clear resin stain. Occasional medium sized pruning wounds to stem.
Crown break and primary scaffolds	:	Major stem division at 9m. No apparent significant defects.
Secondary scaffolds	:	Truncated branches indicate tree has recently been substantially reduced. No apparent significant defects.
Foliage/Outer crown	:	Good shoot vigour

5.2 Photographs

Photograph 1:- Canker to lower stem

Photograph 2:- Canker to lower stem showing area of bark necrosis

5.3 Resistographs

No.	:	01	Diameter	:	525mm	**Comments:** No evidence of internal decay. Reading indicative of sound wood throughout.
Date	:	08/03/2012	Level	:	1.3m	
Location	:	Montpelier Sq	Direction	:	South-west	
Setting	:	01	Species	:	Ailanthus	

Figure 1

6 Conclusions

There are several cankers present on the trunk of the tree. The presence of dried resinous exudates indicates that these are likely to be active areas of infection. The cankers include areas of dead bark, exposed wood and some superficial decay.

A canker is formed when a pathogen invades the trunk, or branches of a tree causing the localised death of the bark, cambium and underlying wood. Cankers often continue to increase in size as the pathogen kills adjacent healthy tissue and, because the underlying cambium is dead, appear as sunken sites on the trunk or branch.

Cankers may become an issue for two reasons. Firstly if they spread and encircle a trunk or stem then the part beyond this will die. This can result in the death of twigs, branches or whole stems. Secondly the canker kills the overlying bark and exposes the underlying wood to greater risk of infection from decay causing fungi.

At the present time none of the cankers affecting this tree appear to be of any great significance. They are not large enough to risk girdling any of the affected parts and, aside from some superficial underlying decay caused by the canker itself, do not appear to have enabled any decay causing fungi to infect the tree. The tree is exhibiting good vitality and the cankers do not seem to have caused any physiological dysfunction to date.

The situation should however be monitored in order to assess whether the cankers are continuing to spread, and to identify any decay fungi should they occur.

7 Recommendations

It is recommended that the tree be monitored on an annual basis to determine whether the cankers are spreading and whether any decay fungi may have infected the tree. This should be undertaken by a competent and experienced person and should include the keeping of appropriate written and photographic records.

7.1 Re-inspection period

Re-inspect on an annual basis.

7.2 Risk assessment

The numeric risk assessment is based on the following:

Size (of tree or tree part) and potential impact:		
1	<5cm	Twigs and minor deadwood
1.5	5-10cm	Small branches and mid-sized deadwood
2	10-20cm	Large branches/deadwood and small stems
2.5	20-30cm	Very large branches and large stems from primary stem divisions
3	30+cm	Medium to large trees

Likelihood/Probability (of identified tree or tree part failing)	
1	Highly unlikely
1.5	Less than likely
2	Not unlikely
2.5	More than likely
3	Highly likely

Target		
1	Negligible	No property of value or frequency of usage
1.5	Low	Property of low value, low frequency of use
2	Medium	Property of moderate value, moderate frequency of use
2.5	High	Property of high value, high frequency of use
3	Very high	Property of very high value, very high frequency of use

Ranges of target are derived by structure repair value and pedestrian/vehicular frequency. The ratings range from 1 – 3 with 3 being a high target area and 1 being a low target area.

The total score of the factors gives the overall risk rating, a score of **7** or more indicates the need for remedial works.

7.2.1 Caveats

The numeric risk assessment does not supersede the written conclusions or recommendations and should primarily be considered as a checklist to the assessor. It should be noted that attempts to quantify likelihood that a tree or structure will fail are extremely subjective and not statistically grounded and are dependent on the expertise and experience of the assessor. It should also be noted that the values are approximations and estimations.

In addition only a snapshot of site usage is seen at the time of the survey and clients are advised to consider the assessment of targets against their personal knowledge.

7.2.2 Risk assessment at time of inspection

The numeric risk assessments for the trees are as follows, based on the most likely scenario with the highest risk:

Tree		T
Size	:	1
Probability	:	1.5
Target	:	2.5
Risk Rating	:	5

8 Appendix

8.1 Definitions

In the context of tree management services, the following meanings apply:

Survey

A general assessment of trees at the level specified by the instructing party and plotting of trees individually or in groups on a Tree Schedule and recording of observations on a tabulated schedule. Trees are surveyed and assessed only from land in the clients ownership or public land, access from neighbouring private land is not sought other than by special arrangement with the instructing party.

Inspection

A detailed examination of a tree or trees to determine the state of their health or mechanical integrity or both as might be specified by the instructing party, or to determine the cause of an effect such as damage to a structure in relation to a tree or trees. Trees will be surveyed, assessed and inspected only from land in the clients ownership or public land, access from neighbouring private land will not be sought other than by special arrangement with the instructing party.

Target

A target is anything of value (persons or property), which could be harmed in the event of tree failure.

8.2 Cross sectional representations

Cross sectional representations are produced based on the measurements made with the resistograph. These diagrams are intended only as a guide. Since these diagrams are usually based only on four measurements at the cardinal points, any representation of the extent of decay should be considered approximate. Such representations are however based on an understanding of the physiology of trees and the way in which decay typically progresses through the tissues of a live tree, and are useful in displaying the extent of decay in relation to the minimum safe residual wall.

Note, depths quoted on the cross sectional diagram should be considered the actual depth of decay, whilst depths quoted on the resistographs refer to the scale bar at the bottom of the graph. Account is made on the cross-sectional diagram for the distance before the drill begins to bore into wood – something that cannot be excluded from the resistograph reading.

8.3 Minimum safe residual wall t/R=0.3

The t/R ratio was developed by scientist Claus Mattheck as a means of determining whether a tree with a hollow (or decayed) stem is safe to be retained. The research, which is generally accepted in the arboricultural industry, states that if the residual wall (*t*) of sound wood is greater than one third the radius (R) of the stem, the tree is safe to be retained. It should be noted however that other factors are very often involved, and the $t/R = 0.3$ rule should be considered as a guide only, not as a ruling principle. As Figure 8.1 illustrates, a tree may continue to stand even if the residual wall is less than the threshold, especially if remedial action is taken to reduce the risk of failure.

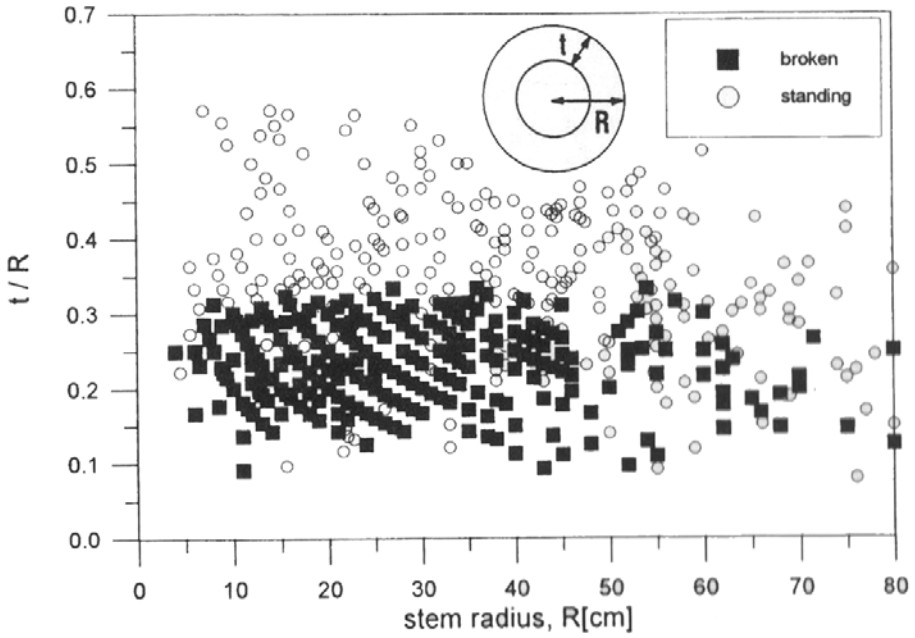
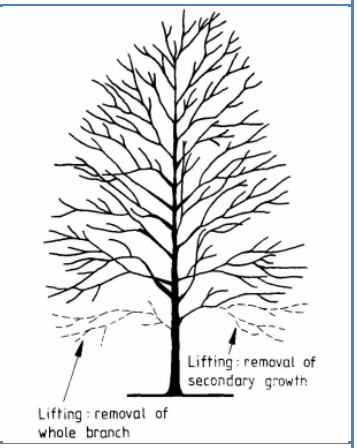
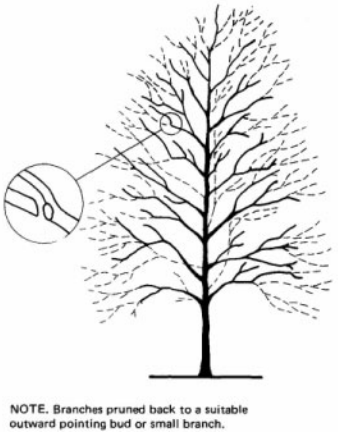
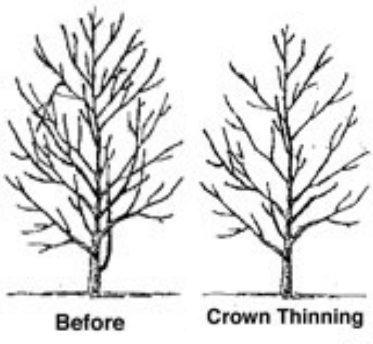


Figure 8.1: Illustration of the t/R ratio based on research data from >1000 samples, from Mattheck & Breloer (1994).

8.4 Explanation of Management Prescriptions

Management Prescription	Explanation
Bracing work req.	Installation of modern accepted industry standard tree bracing system (e.g. Cobra system) to mitigate risk of union failure.
Coppice tree	Felling of the main stem or stems (usually of a previously coppiced tree or species that is commonly coppiced) to ground level promoting regrowth of fresh shoots.
Crown clean	Removal of unsightly features within the tree; for example climbing plants, dead or dying and damaged branches, accumulations of leaf litter and rubbish.
Crown lift	Removal of the lowest branches or parts of these branches which extend below a particular height, usually to necessitate access. Removal of branches greater in diameter than one third the diameter of the stem from which they are removed should be avoided. 
Crown reduce	A crown reduction is a very common arboricultural operation performed to reduce the height and/or spread of a tree by selectively cutting back smaller branches. This can be done to help prevent damage to the tree caused by 'wind-loading', but more commonly is performed when a tree is outgrowing its confines, or for purely cosmetic reasons. Crown reductions are specified as a reduction of total leaf area. Reductions of greater than 30% should be avoided except in exceptional circumstances as this can be detrimental to the health of the tree. Also, the branch removed should not leave a wound diameter greater than a ⅓ of the diameter of the branch from which it has been cut, at the pruning point. 
Crown thin	Crown thinning involves the removal of some of the branches and leaf area of the tree with the intention of creating an even and balanced tree structure. This may include the removal of damaged, crossing and crowded branches. As with reductions, removal of more than 30% of the leaf area should be avoided and the branch removed should not leave a wound diameter greater than a ⅓ of the diameter of the branch from which it has been cut, at the pruning point. 
Decay detection	Decay detection by invasive or non-invasive measures is recommended if it is suspected that the tree is afflicted by decay fungi and may be structurally unsound.

Management Prescription	Explanation
Epicormic growth removal	Epicormic growth is the proliferation of young shoots around the stem and branches from adventitious buds present beneath the bark.
Fell to ground level	Complete removal of the tree leaving a stump at ground level
Fell tree and treat stump	Complete removal of the tree leaving a stump which is then poisoned to prevent regrowth.
Formative prune	Formative pruning is an operation usually completed early in the life of a tree to promote good form and reduce the possibility of defects forming in later life.
Hanger removal	Removal of a partially or completely loose branch which presents a hazard, especially in high wind.
Ivy removal	Complete removal of Ivy as distinct from Ivy severance.
Monolith to safe level	Removal of all side branches and tree top leaving a standing trunk at a given height which may then be left to decay and fall apart.
Pollard to original points	Pollarding involves cutting back the crown of the tree back to the trunk and allowing new branches to sprout from the cuts and is, strictly speaking, the correct term only when a tree has been previously pollarded and there are pollard points present. Pollarding to original points is to make a new series of cuts at the same position as the cuts of the previous cycle.
Remove basal growth	Removal of shoots from around the base of the stem of a tree.
Sever Ivy	Sever Ivy at the base of the tree to kill off growth in the canopy. A section of approximately 30cm should be removed to prevent ivy from re-grafting together and continuing to grow.
Stubs removal	Pruning cuts should be made in accordance with the recommendations in BS3998 – cuts should be made at the appropriate place neither flush cutting, nor leaving stubs.
Stump removal	Removal of the stump either through excavation by hand or machines, or by grinding out with a stump grinder.
Undertake climbing assessment	Climbing assessments may be deemed necessary to inspect features in the crown which are not sufficiently visible from the ground. A written report of the relevant findings should be produced.

8.5 Glossary

Adapted from Strouts & Winter (2000), Lonsdale (1999).

Aerial	Above ground.
Axiom of uniform stress	The tendency for woody plants to try to equalise the forces acting upon it, so that each cell of the tree is being acted upon by the same level of mechanical stress as any other. The mechanism by which a tree creates compensatory growth to correct for damage or defect.
Blight	A loose term describing the extensive and rapid death and collapse of soft tissue.
Bole (trunk)	The main stem of a tree below the first major branch.
Bracket fungus	A fungus whose fruiting bodies resemble brackets, shelves or hooves.
Branch bark ridge	The raised arch of bark tissue that forms within the acute angle between a branch and its parent stem.
Butt	The basal end of the trunk.
Callus	A term with more than one botanical meaning, especially an undifferentiated mass of cells, for example forming on the surface of wounded living plant tissue; also used to describe the fold of differentiated wood and bark forming around a tree wound (woundwood).
Canker	A clearly defined patch of dead and sunken or malformed bark.
Co-dominant	Stems usually originating at the same point and of roughly equal size mass and vigour, especially at their origins from the main trunk and their overall canopy space.
Compartmentalisation	A term coined by the late US Researcher Alex Shigo to explain the manner in which trees contain the spread of decay through the wood.
Crown-lifting	The practice of removing the bottom branches of the tree canopy to effect greater ground clearance around the stem.
Epicormic	Adventitious growth from dormant buds beneath the bark. Often produced as a result of stress, especially in the vicinity of recent wounding.
Flush-cut	A pruning cut close to the parent stem which removes part of the branch bark ridge.
Fruit body	A general term for any kind of fungal, spore bearing structure.
Host (tree)	The tree on which a parasitic organism (be it fungal, microbial, insect pest).
Hot-Spot	The zone between approximately one metre above the ground and the height of the lowest live branch where a high proportion of stem failures are observed to occur.
Included Bark	Ingrown bark. Bark of adjacent part of the tree (usually in forks acutely angled branches or basal flutes) which is in face-to-face contact so that there is weakness due to the lack of woody union.

Lion-tailing	A term applied to a branch of a tree that wholly or largely lacks side-branches, except near its tip, and may be liable to snap due to end loading.
Necrosis	Death of plant tissue, usually characterised by a change in colour to brown or black.
Occlusion	The overgrowth of a wound with (callus) tissue produced subsequently (verb occlude).
Remedial action	In tree hazard management, action to remove or mitigate the risk of injury to persons or damage to property.
Retrenching	A technique used particularly in the management of veteran trees which pose an unacceptable risk, but without recourse to removal. The attempt to stimulate the creation of a new crown below the existing one by harsh reduction, often in stages, (see Read, 2000).
Rootplate	The area of roots usually of the same diameter (or larger) as the canopy. Crossing roots fuse together and form a solid plate of roots and soil which provides the main element of stability for the tree (Thomas, 2000).
Sail Area	The profile of a tree presented to the wind.
Stag-headed	Describes the silhouette of a large tree whose crown has died back so that the ends of the dead branches protrude like spikes or antlers from the reduced foliated crown.
Stem breakage	Distinct from windthrow, stem break occurs when the wood of the stem itself fails leading to a portion of the tree snapping off leaving an upright stem. Usually associated with some form of defect or decay.
Windthrow	Loss of anchorage in the substrate resulting in the entire tree toppling whilst keeping the rootplate intact.

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