

Tree Survey

St James's Square Bath



On behalf of
St James's Square Garden Ltd

Inspected and prepared by
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1.0 Introduction

All Tree Services Ltd was instructed by Beverley Attinger to undertake a survey of trees at St James's Square, Bath.

2.0 Scope of survey

- 2.1 Undertake a visual assessment of the health and condition of the five principal trees and record the findings.
- 2.2 Carry out PiCUS tomograph surveys on tulip tree (T1) and copper beech (T7) and provide a report.
- 2.3 Make recommendations for remedial work to address safety issues and enhance tree longevity.

3.0 Limitations

- 3.1 No assessment has been made with regard to any impact the trees may have on buildings or structures.
- 3.2 Comments are restricted to arboricultural considerations associated with tree condition and safety.
- 3.3 Trees are dynamic, living organisms whose health and condition may change rapidly. Although the risk of harm from tree failure is generally low, no tree can be considered entirely risk free. Given their proximity to high use areas it is recommended that a visual inspection of all mature trees is undertaken annually and/or after periods of extreme weather. A PiCUS survey of T1 and T7 should be carried out every three years in order to monitor the progress of any decay.
- 3.4 This report and the recommendations within it are valid for a period of twelve months from the date of survey.

4.0 Inspection notes

- 4.1 The site was inspected by Jim Walker on 09th January 2014.
- 4.2 For continuity, tree numbers correspond with the tree survey of November 2009. The trees have been surveyed in a clockwise direction commencing with the tulip tree (T1) and concluding with the copper beech (T7).
- 4.3 When assessing tree safety, the following factors have been taken into consideration – species, maturity, structural condition, risk posed to third parties in the event of failure and likely response to remedial works.
- 4.4 The trees were visually inspected from ground level with use of binoculars, nylon mallet and metal probe where appropriate.

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- 4.5 Dimensions are estimated and approximate.
- 4.6 The physiological condition of a tree has been recorded as Good (G), Fair (F), Poor (P) or Dead (D).
- 4.7 PiCUS tomograph inspections were carried out on the tulip tree (T1) and copper beech (T7) to monitor any progression in the decay identified in the survey of 2010.
- 4.8 Recommendations for tree work have been divided into four categories based on tree health and potential risk to people or property:-
- 1) Work to be undertaken within 12 months
 - 2) Work to be undertaken within 24 months
 - 3) Work to be undertaken as part of scheduled maintenance/landscape management
 - 4) No work required
- 4.9 The removal of major dead wood has been recommended only where it is of potential risk to the safety of site users. In general, dead wood is beneficial to wildlife and should be retained where practical. In most cases the dead wood may be reduced as far as necessary to ensure stability.
- 4.10 All tree work should be undertaken to BS 3998:2010 'Tree Work - Recommendations' and carried out by a recognised contractor.
- 4.11 As the trees are within a Conservation Area, a six week notification (Section 211 notice) must be submitted to the local planning authority and consent given, prior to any work commencing.
- 4.12 Attention is drawn to the Wildlife and Countryside Act 1981 (as amended), Countryside and Rights of Way Act 2000, and The Conservation of Habitats and Species Regulations 2010. These acts and regulations provide statutory protection for listed species of flora and fauna. Of particular relevance to tree work is the comprehensive protection afforded to birds and bats (including roosts). This has implications for timing of works, as well as the requirement for surveys and licenses in certain cases.

5.0 Summary

- 5.1 In general the five mature trees on site are in fair condition for their age and species. They appear to have survived the recent stormy weather well, with no major damage to live growth, and have shed only minor twigs and deadwood.
- 5.2 The results of the tomograms of Ts1 and 7 indicate that the fungal decay has not advanced significantly.
- 5.3 Remedial work is recommended to the tulip tree within two years to prune growth back to the previous reduced height as well as inspect the cable bracing.
- 5.4 Work to the two fern-leaf beech trees (G4) is recommended within two years to remove faulted limbs and maintain statutory clearance over the highway.

5.5 Minor work is recommended to the London plane (T5) and copper beech (T7) within one year, in order to remove faulted/ broken limbs and major deadwood.

6.0 References

Lonsdale, D. (1999). Principles of tree hazard assessment and management. HMSO, London.

Strouts, R.G. & Winter, T.G. (1994). Diagnosis of ill-health in trees. HMSO, London.

Mattheck, C. & Breloer, H. (1995). The body language of trees: A handbook for failure analysis. Research for amenity trees 4. HMSO, London.

Shigo, Alex L. (1991). Modern arboriculture. Shigo & Trees Associates, Durham NH.

Weber, K. & Mattheck, C. (2003). Manual of wood decays in trees. Arboricultural Association.

British Standards Institution, (2010). BS 3998:2010 Tree Work - Recommendations. London.

Appendix 1

Survey Schedule

Tree/Group Number	Common & Scientific Name	Height (m)	Crown Spread (m)	Age Class	Physiological Condition	Condition Notes.	Work Recommendations	Category
T1	Tulip Tree <i>Liriodendron tulipifera</i>	26	22	MA	G	Crown reduction carried out in Feb '08 with good extension growth of approximately 2m. Pruning wounds appear to be occluding well. Main fork at 3m. Cavity on secondary stem on W aspect at 10m. Minor dead wood. Six cobra braces installed pre 2008 to supplement existing cables. These appear to be worn. Iron rod braces at 4m. Small <i>Rigidoporus ulmarius</i> brackets at base on W and N aspect.	Inspect cables. Adjust or replace with 8t Cobra cable bracing as required. Undertake light crown reduction and thinning to previous pruned level (2008)	2
G4	Fern-leaved Beech <i>Fagus sylvatica</i> ' <i>Asplenifolia</i> '	19	16	MA	G	Group of two trees forming joint canopy. Pollard origin. Previous crown lifting work. Fused, crossing and rubbing limbs. Cavities in scaffold stems. Major and minor dead wood. Minor broken suspended limbs. Minor damage to root buttresses.	Remove crossing and rubbing limbs. Remove broken limbs and major dead wood. Crown lift over road to ensure minimum 5m clearance over road	2
T5	London Plane <i>Platanus x acerifolia</i>	28	30	MA	F	Forks at 9m. Large dead limb in central upper crown at 15m. Minor broken and suspended limbs. Crossing and rubbing limbs. Minor dead wood. Minor basal epicormic growth on southeast and west aspects. Fair extension growth.	Remove large dead limb. Remove crossing, rubbing and broken limbs.	1
T7	Copper Beech <i>Fagus sylvatica</i> ' <i>Purpurea</i> '	26	30	MA	F	Pollard origin at 4m. Three old cable braces situated low in crown. Exposed buttress roots with minor mower damage. Small <i>Ganoderma</i> sp. bracket at base on W aspect with some decay. One large broken suspended limb at 10m. Minor dead wood, broken and suspended limbs. Rubbing limb on E aspect at 12m. Partially fused limb on W aspect at 12m. Fair extension growth.	Remove large broken limb. Remove major dead wood and rubbing limb. Inspect cable bracing Inspect fused limb.	1

Key to Tree Survey Schedule

Height (m)	Height of tree to nearest metre
Crown Spread (m)	Average diameter of canopy spread to nearest metre
Age Class-	Y Young (newly planted tree 0-10yrs), SM Semi-mature (tree in first third of normal life expectancy for species) EM Early-Mature (tree in second third of normal life expectancy for species) MA Mature (tree in final third of normal life expectancy for species) OM Over mature (tree beyond normal life expectancy for species) V Veteran (tree that is of interest biologically, aesthetically or culturally because of its age, size or condition).
Physiological condition	G Good - Fully functioning biological system with normal extension growth, leaf/bud size, crown density, incremental growth for species F Fair - Fully functioning biological system but displaying below average extension growth, leaf/bud size, crown density, incremental growth for species. P Poor - Biological system with low functionality. Symptoms include: - poor extension growth, small and/or chlorotic leaves, small buds, limited incremental growth, sparse crown and/or die back. D Tree is dead
Category	Suggested timing of work 1 Work to be undertaken within 12 months 2 Work to be undertaken within 24 months 3 Work to be undertaken as part of scheduled maintenance/ landscape management 4 No work required

Appendix 2

PiCUS Tomograph surveys

Picus Sonic Tomography - Explanatory Notes

The Picus tomograph measures the time taken for sonic stress waves to pass through the wood of a tree between twelve sensors that are placed at a predetermined level around the tree stem.

The differing velocities of these waves help determine the wood density of a cross section of the tree (sound waves generally travel faster through sound wood than through decayed wood). These velocities are then calculated and interpreted to produce a colour image of the internal decay patterns.

The different colours on the tomogram indicate the relative sound velocities through the cross section which help indicate the varying levels of wood density/decay:-

Dark brown represents the highest velocity and therefore dense/sound wood.

Green indicates wood of lesser density. This may be wood whose density is reduced but not yet decayed. i.e. wood with early fungal infection.

Pink and blue indicates decayed wood, cracks, included bark and/or cavities.

The interior red line indicates the t/R ratio. This is based on Mattheck and Breloer's (1995) method for calculating the safety margin of hollow/decayed stems. It is the ratio between the thickness of sound residual wall remaining (t) and the radius of the cross section (R). For a central cavity this ratio should be no less than 0.3 to 0.35 (or 30-35% of the radius).

If the ratio is less than this, then remedial work should be undertaken to reduce the lever-arm of the affected stem.

The yellow lines on the tomogram indicate where there are pronounced changes in sonic velocity between one sensor and the next. These may indicate cracks, included bark or shakes in the wood.

The red numbers around the tomogram indicate the position of the sensors.

The graph axis indicates the dimension of the cross-section in centimetres.

North is at sensor no. 1 and is indicated on the tomogram.

The height on the tree stem at which the tomogram is taken is measured from ground level on the upper slope aspect of the stem and is indicated in the survey notes. The sensors are placed horizontally around the stem from this point.

The tomogram represents a cross-section of the tree at one level only. Decay levels may differ above or below the point of measurement. Comments and recommendations are limited to the findings of the tomograph survey only.

Tomograph Survey - Results

T1 Tulip Tree

This tree has two small brackets of the decay fungus *Rigidoporus ulmarius* at ground level on the west (sensor 5) and north aspects (sensor 1). This decay causes a brown rot, resulting in degradation of the cellulose within the wood, whilst leaving the lignin largely intact. In an advanced state this can lead to the brittle fracture of the affected stem. The decay is usually confined to the central region of the buttress zone of the tree, (ref: Principles of Tree Hazard Assessment and Management. D. Lonsdale 1999).

Two tomograms were taken at 5cm and 110cm from ground level in 2010; the results of which indicated a central area of decay occupying 27% and 11% of the cross section respectively.

Two further tomograms were taken in January 2014, at the same heights, to monitor any change in the decay levels.



Fig 1 - Fruiting body at sensor no.1



Fig 2 - Fruiting body at sensor no. 5

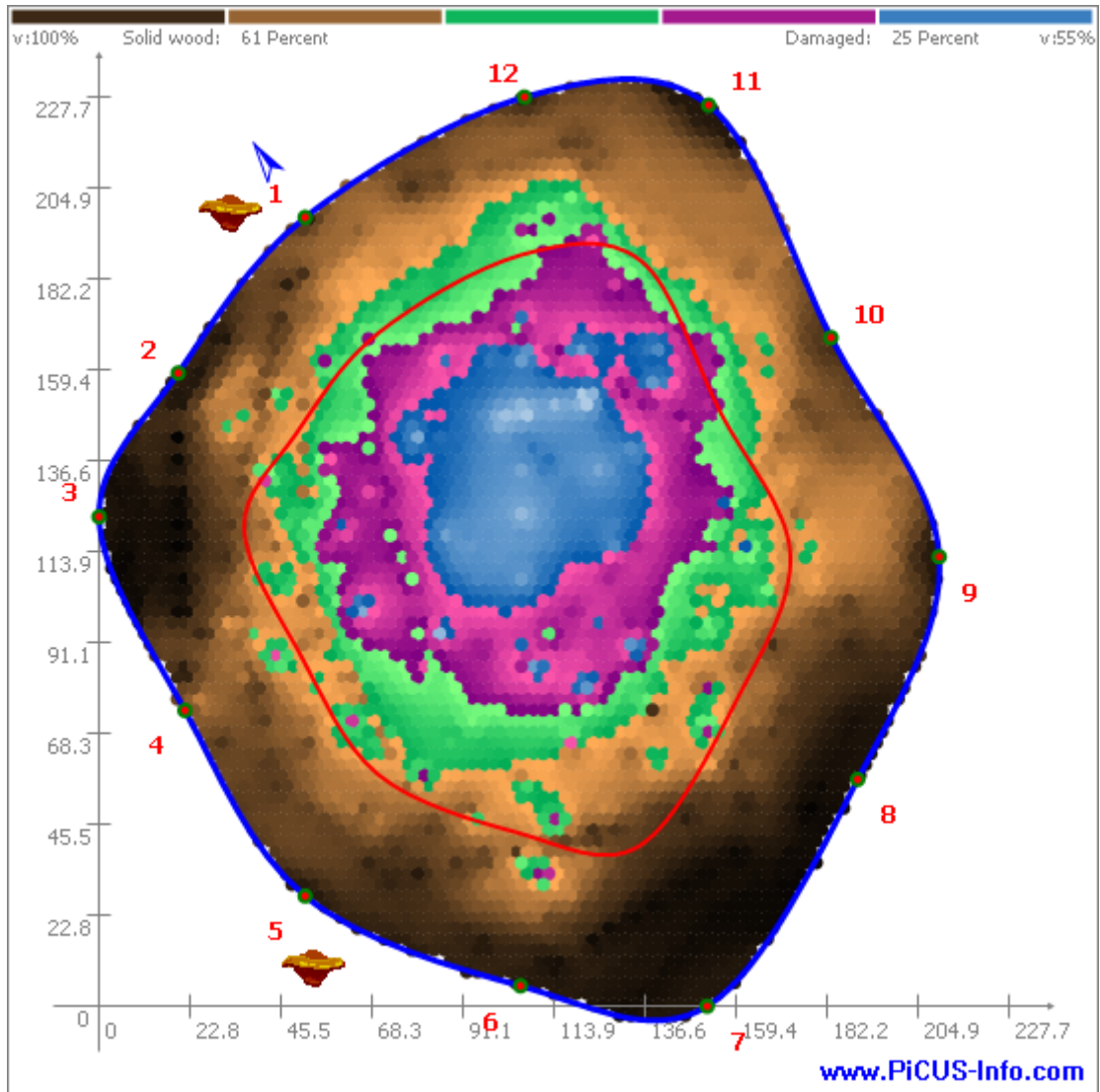
The results of the survey indicate that the decay levels remain broadly unchanged since the 2010. The 2014 readings actually show a 2% decrease in decay levels. This is due to slight variations in the location of sensors around the tree stem and is within acceptable limits.

The tomograph results indicate that there is still sufficient residual wall remaining at the point of measurement so as not to significantly reduce the strength of the stem. The previous crown reduction has also reduced leverage on the stem and this scale should be maintained by regular pruning (three to five years).

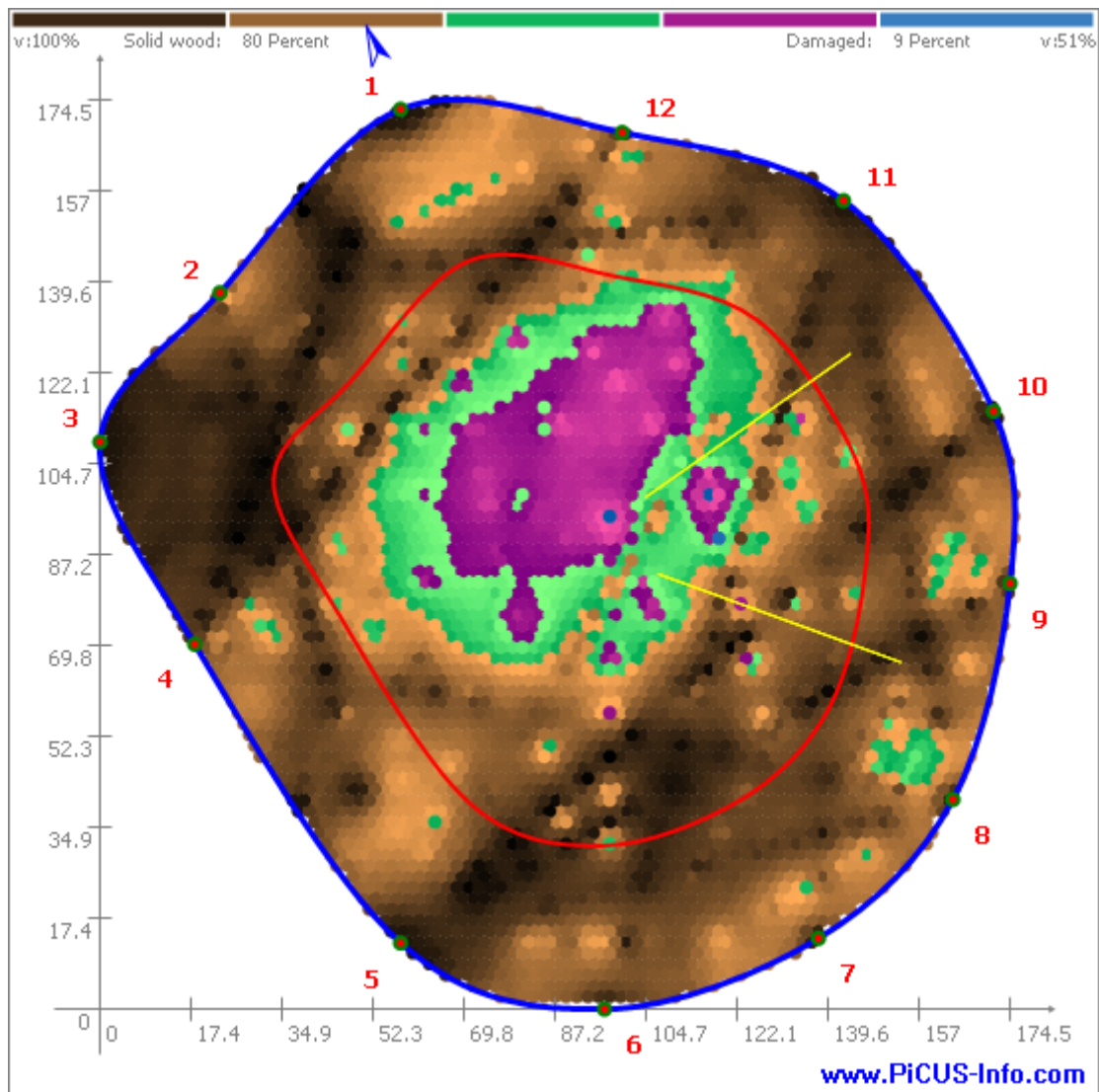
There is no indication that the fruiting bodies are putting on incremental growth, nor have any new fruiting bodies appeared.

The tulip tree is an important feature of the local area and should be retained as long as the benefit to the community, wildlife and landscape outweighs the risk posed to people and property. Based on the levels of decay identified in the tomograph survey, the tree may be retained, dependent upon regular visual inspection to monitor its condition. This should be undertaken annually and/or after periods of extreme weather. In addition, remedial work should be undertaken within two years in order to maintain the tree at a reduced scale.

Species: Tulip tree *Liriodendron tulipifera*
Tag No. T1
Height: 26m
Stem Diameter at 1.5m: 178cm
Measurement level: 5cm
Survey Notes: *Rigidoporus ulmarius* fruiting bodies at stem base at sensor nos. 1 and 5



Species: Tulip tree *Liriodendron tulipifera*
Tag No. T1
Height: 26m
Stem Diameter at 1.5m: 178cm
Measurement level: 110cm
Survey Notes: *Rigidoporus ulmarius* fruiting bodies at stem base below sensor nos. 1 and 5



T7 Copper Beech

This tree has a small *Ganoderma* sp. fungal bracket at ground level on the west aspect between sensor nos. 3 and 4. This fungus causes a white rot of the heartwood whereby the lignin is selectively degraded, leaving the cellulose largely intact. When very advanced, this decay can lead to structural failure; however, the decayed wood can retain considerable tensile strength and trees can produce compensatory growth around the infected area and remain standing for many years.

One tomogram was taken at 20cm above ground level in 2010; the result of which indicated approximately 10% of the cross section as decayed.

Another tomogram was taken in January 2014, at the same height, to monitor any change in the decay levels.



Fig 3 - Fruiting body between sensor nos. 3 & 4



Fig 4- Close up of *Ganoderma* sp. fruiting body

The results of the survey indicate that the decay levels remain broadly unchanged since the 2010, with 10% of the cross section highlighted as decayed (blue/pink). Please note the variation in decay pattern compared to 2010, due to variation in location of sensors between the two tomograms.

There is no indication that the fruiting bodies are putting on new incremental growth, nor have any new fruiting bodies appeared.

Due to the relatively small area of stem infected by this fungus, the tree may be retained, dependent on regular inspection to monitor its condition. This should be undertaken annually and/or after periods of extreme weather.

Species: Copper beech *Fagus sylvatica Purpurea*
Tag No. T7
Height: 26m
Stem Diameter at 1.5m: 148cm
Measurement level: 20cm
Survey Notes: Small *Ganoderma sp.* fruiting body at base on west aspect between sensor nos. 3 and 4

