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TREE HAZARD RISK ASSESSMENT and TREE DECAY DETECTION REPORT

CLIENT	Mark Syder Park House Vicarage Road Salhouse Norwich Norfolk NR13 6HD
SITE INSPECTED	Mature Beech tree and Ancient Oak tree at Park House
INSPECTED BY	Nick Coleman MSc (Arb) MArborA CEnv Arboricultural Consultant Treecare Consultants Ltd
DATE OF INSPECTION	30 March 2023
DATE OF REPORT	21 April 2023

CONTENTS

1. INTRODUCTION

1.1 ASSIGNMENT

I have been instructed by Mark Syder of Park House, Salhouse to carry out a visual tree inspection and hazard risk assessment of a mature Beech tree and ancient Oak at his property. I also carried out a sound wave decay assessment of the Beech tree.

1.3 LIMITATIONS AND USE OF COPYRIGHT

This risk assessment represents the condition of the trees and the site as seen on the day of assessment.

This risk assessment considers only known targets, visible and detectable tree conditions. It is the responsibility of the client to check and agree the allocated Target Zone rating. If they feel that the perceived target zone frequency rating is different from the classification in this report, they should inform the tree inspector so the risk assessment can be amended accordingly.

Any tree, whether it has visible weaknesses or not, will fail if forces applied exceed the strength of the tree or its parts, for example in extreme weather events.

A detailed decay assessment was carried out using a Picus Sonic Tomograph and visual tree assessment has been undertaken utilising aids such as binoculars, sounding hammer and probes where necessary.

Trees are living organisms whose health and condition can change rapidly. The conclusions and recommendations in this report are only valid for two and a half years from the date of this report. Any changes to the site as it stands at present, eg building of extensions, excavation works, importing of soils, extreme weather events etc will invalidate this report.

1.4 DISCLAIMER

I have no connection with any of the parties involved in this situation that could influence the opinions expressed in this report.

1.5 QUALIFICATIONS AND EXPERIENCE

I have based this report on my site observations and investigations and I have come to conclusions in the light of my academic and experiential knowledge. I have qualifications and extensive practical experience in arboriculture and list the details in Appendix 1.

2. THE SITE

2.1. SITE VISIT

I carried out the visit on Thursday 30 March 2023. The weather at the time of inspection was mild with some cloud and frequent sunny spells. There was a brisk breeze with some gusts and visibility was good.

2.2 SITE DESCRIPTION

Park House is located to the north of Vicarage Road on the outskirts of the village of Salhouse. The house was constructed within the grounds of The Lodge Inn. There is an access drive from the highway. The main house is a rectangular, two storey dwelling of red brick construction. There is a single storey double garage attached to the northeast corner of the house and outbuildings in the rear garden. The property has a raised aspect overlooking the surrounding agricultural landscape with ancient hedgerows.

The assessed Beech tree stem is located 3.2m from the northeast corner of the garage and the Ancient Oak is 2.4m to the east of the side elevation of the garage. The Beech tree is likely to be associated with the original Lodge Inn garden and the Oak is a lapsed pollard from a much earlier agricultural landscape. There are several other ancient hedgerow Oaks in the surrounding farmland of a similar age.


Oak tree (left) and Beech tree (right) viewed from the field to the east.

3. OAK ASSESSMENT

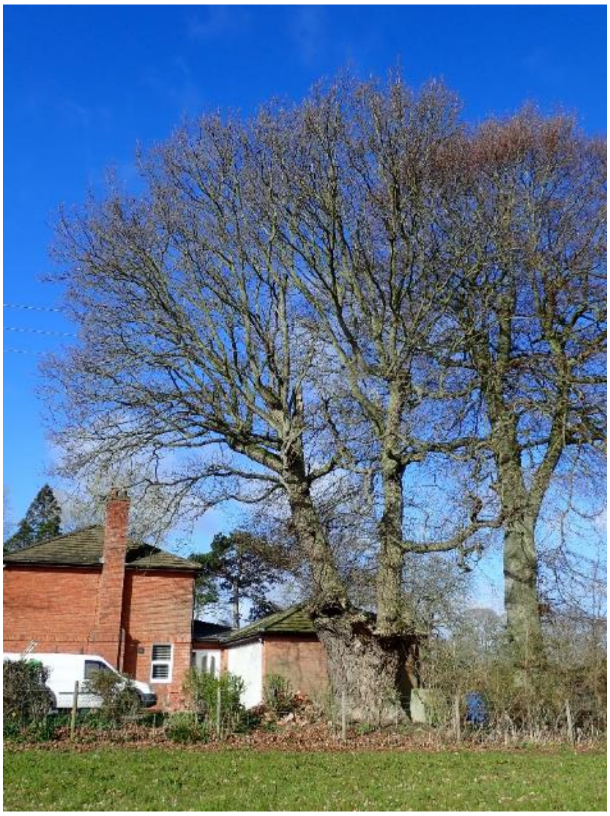
3.1 OAK VISUAL INSPECTION SCHEDULE

I carried out a systematic visual tree inspection and hazard risk assessment. A key to the tree hazard risk system is attached as Appendix 2.

Tree No:	1	**Tag No:**	No tag	**Species:**	Pedunculate Oak / Quercus robur
Age:	Ancient Estimated 420 years	**Height: (m)**	25m	**Diameter at 1m** **Circumference**	192cm 604cm
Crown Spread (m):	**N** 3m	**S** 10m	**E** 5m	**W** 8m	
Form:	An outgrown Oak pollard. This tree would have originally been managed as a hedge row pollard. The stem would have been regularly cropped for fuelwood and wood working material on a regular basis (10 to 15 years). All the branches would have been removed at approximately 2 to 2.5m from ground level which is above animal grazing height. Multiple short stubs would have been left as the work was undertaken with axes and billhooks. This repeated action resulted in a swollen knuckle at the top of the stem known as a pollard 'head'. Once this practice ceased the branches regrew and it appears three limbs became dominant and supported the crown. The main stem and limbs became naturally hollow and the limb to the east fractured and failed many years ago. The upper stem cylinder to the east is damaged and the two remaining vertical limbs also have internal decay. Subsequently, it appears the main limbs were heavily pruned at approximately 12m from ground level. This overzealous cutting (topping) of an important ancient tree is considered bad pruning practice and detrimental to tree health. The existing crown is formed from multiple, co-dominant branches which have grown since the topping event. There is likely to be localised decay at the old topping wounds.				
Hazard/Condition					
Roots					
The anticipated root zone is likely to extend further than the canopy spread. To the east the root area is surfaced by the fully porous field. To the north there is the neighbouring Beech tree at a distance of 5.5m. The rootzone in this area is reasonably permeable with gravel, concrete slabs and compost bins. The footprint of the double garage to the east is within the original root zone and it is anticipated that roots would have been impacted by its construction many years ago. To the south of the stem base there is the non-porous asphalt drive and fully porous hedgerow and field. There are no signs of soil surface cracking, heaving or dipping which would be indicators of instability. There is natural root buttress flare around the stem base associated with the main structural roots below ground. The stem is hollow and the central root 'crown' is also likely to be decayed. Hollowing is a natural ageing process. Bark is intact around the lower stem and there are no above ground indicators of significant root decay or defects. Root instability is not anticipated.					

Stem					
The tree has a short stem of very large girth, typical of an outgrown, lapsed pollard. There is accentuated root buttress flare at the base. The inner stem is hollow and the lower section filled with detritus to approximately 1.5m form ground level. There is a swelling to the west of the upper stem where the tree has laid down adaptive growth to strengthen the outer cylinder of wood. There is also a swelling at the attachment point of the two vertical stems to the north and south. These swellings are remnants of the old pollard 'head' and reaction growth, as these stems are also hollow. There is evidence of fire scorching of the decayed wood at the base of the southern stem. To the east of the upper stem there is a section of fractured deadwood which was once part of the lost, third stem. There are 'rolls' of robust wound-wood growth around the open cavities of the remaining two stems acting as strengthening arches to the structures. There are no signs of cracking, buckling or bulging of the stem which can be indicators of structural weakness.					
Crown					
The two remaining, vertical stems have short scaffold branches. The stems have previously been severed at 12m from ground level and the side limbs cut back to a few meters. This work may have been carried out when the house was constructed in the 1980s prior to the TPO being applied. The severing of these large limbs will have caused localised decay. The branches that have re-grown, since this event, have only established in the outer annual rings. Subsequently, they do not have a deep attachment to the parent branch. These re-grown branches are long and narrow, as they have grown in close competition with each other. The length can increase the lever arm loading on the attachment point. A combination of decay, poor attachment and lever arm loading makes the old topping points potential locations of failure.					
Identified Hazard:	Branches				
Risk:	Unlikely	**Size of hazard:**	Large	**Target Zone:**	Moderate
Action:				**Priority Code:**	3
Reduce and shape the crown to lessen the loading on the old 'topping' points. See annotated photograph in section 3.3.					
Inspection frequency:	2.5			**Work schedule:**	18months

3.2 OAK PHOTOGRAPHS


Oak tree viewed from the east.


Oak stem viewed from the east

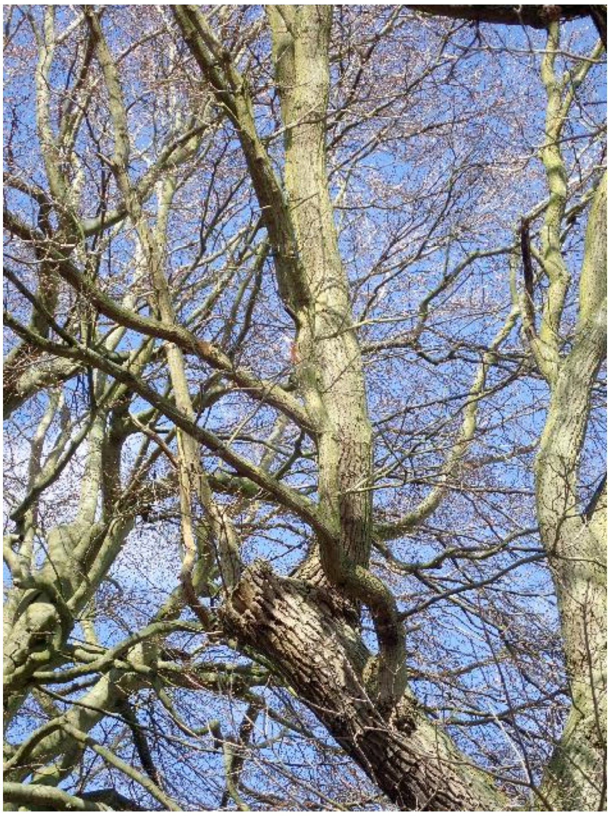

Detail of upper stem. Original pollard 'head' and fracture wound where third stem has previously failed.

Looking down into the hollow upper stem

Decay at the base of the northern stem. Fire scorch marks in the foreground.

Detail of the crown from the east.

Position of topping (Orange line). Everything above this point has re-grown since the topping event.

Detail of topping points with localised decay and multiple branch re-growth.	
	
	

3.3 OAK CONCLUSION

The Oak tree is an old, outgrown pollard and of cultural, historical and ecological importance. The main stem is hollow with the decay extending into the base of the two remaining, vertical limbs. A third large limb has previously failed leaving a fracture wound. Hollowing is a natural aging process and expected in a tree of this age. There is evidence of fire damage within the hollow to the south. The most likely point of failure is the old 'topping' points in the crown where the tree was heavily reduced in the past. I recommend that a reduction is undertaken to lessen the loading on the old topping points and the hollow stem. It is important that the load reduction is undertaken in the upper crown where the wood is younger and more likely to respond well to pruning. This will also keep wound sizes to a minimum. Please see annotated photograph below for reduction guide.

The tree should be inspected every two and a half years by a Professional Tree Inspector LANTRA qualified.

Proposed crown reduction			
Crown	**Present Dimensions**	**Proposed Dimensions**	**Proposed Reduction**
Height	25m	20.5m	4.5m
North Radius	3m	3m	0m
South Radius	10m	6.5m	3.5m
West Radius	5m	4m	1m
East Radius	8m	5m	3m

4. BEECH ASSESSMENT

4.1 BEECH VISUAL INSPECTION SCHEDULE

Tree No:	1	**Tag No:**	No tag	**Species:**	Common Beech / Fagus sylvatica			
Age:	Fully mature	**Height: (m)**	28m	**Diameter at 1.5m**	127cm			
Crown Spread (m):	**N**	8.5	**S**	7	**E**	8	**W**	7.5
Form:	Open grown tree partially shaded by the adjacent Oak tree to the southeast. The tree has a single, straight stem of gradual taper. Several branches have been removed from the lower crown leaving an exposed lower stem. The upper crown is spreading and domed.							

Hazard/Condition

Roots

The anticipated root zone is likely to extend further than the canopy spread. To the east the perceived root area is surfaced by the fully porous, agricultural field. To the north and west the root zone is surfaced by garden lawns which will be fully porous but water and nutrient uptake will be restricted under the outbuildings. The footprint of the double garage is within the root zone and it is anticipated that roots would have been impacted by its construction many years ago. To the south, there is the Oak tree and gravel and concrete slab footpath. To the east and southwest of the stem base are two areas of active sapwood decay caused by Honey Fungus / Armillaria species in the deep recesses between root buttresses. There is likely to be associated root decay with these infected areas but there is no above ground evidence of significant decay of the extended root buttresses. The extended root buttresses will be associated with the main, structural roots below ground. There are no signs of soil surface cracking, heaving, or dipping which would be indicators of instability.

Stem

The tree has a single, main stem with accentuated root buttress flare and gradual taper typical for a mature, open grown Beech. There are several occluded pruning wounds (closed by wound-wood growth) to a height of 9.5m where side branches have been removed in the past. There may be some localised decay behind these scars but there are no external signs of significant structural decay. As previously stated, there is localised sapwood decay in the valley between root buttresses to the east and southwest of the stem base. This sapwood decay is a wet, white stringy rot associated with Armillaria infection. A previous tree survey found Honey Fungus fruiting bodies at these locations. I undertook a Picus soundwave scan through the stem base near ground level. See section 4.3 below. There are some stem shoots present and branch stubs in the lower crown where principal limbs have been removed.

Crown

At 10m from ground level, the stem divides into a dominant vertical stem and a sweeping, principal limb growing to the northeast. There is an open, V shaped union with a natural brace from a grafted branch above. These main vertical limbs in turn support the spreading, scaffold branch network that forms the domed crown. There is evidence of previous pruning within the crown which is of good pruning standard. However, the removal of two large branches in the lower crown, one to the south the other the northwest, have not been done correctly leaving jagged stubs. There is a fractured branch stub at 12m from ground level to the east and another at 13.5m to the northwest. These were large diameter branches that have fractured and failed with the potential for causing harm. The western branch stub has attached growth which extends to the corner of the house and hangs over the garage. There is also a damaged branch at 15m from ground level to the north with a localised area of decay that extends through the branch. Overall,

the crown has good branch coverage and uniform density indicating moderate to good vigour and vitality compared with the optimum for a mature Beech tree.							
Identified Hazard:	Roots (Honey Fungus) & Branches (Previous failure)						
Risk:	Unlikely	**Size of hazard:**	Very Large	**Target Zone:**	Moderate		
Action:						**Priority Code:**	3
Reduce the wind and weight loading, see section 4.4 below.							
Inspection frequency:	2.5 years			**Work schedule:**	18 Months		

4.2 BEECH PHOTOGRAPHS

View from the northeast

View from the northwest


Stem union with natural brace


Old pruning stubs and natural fracture stubs

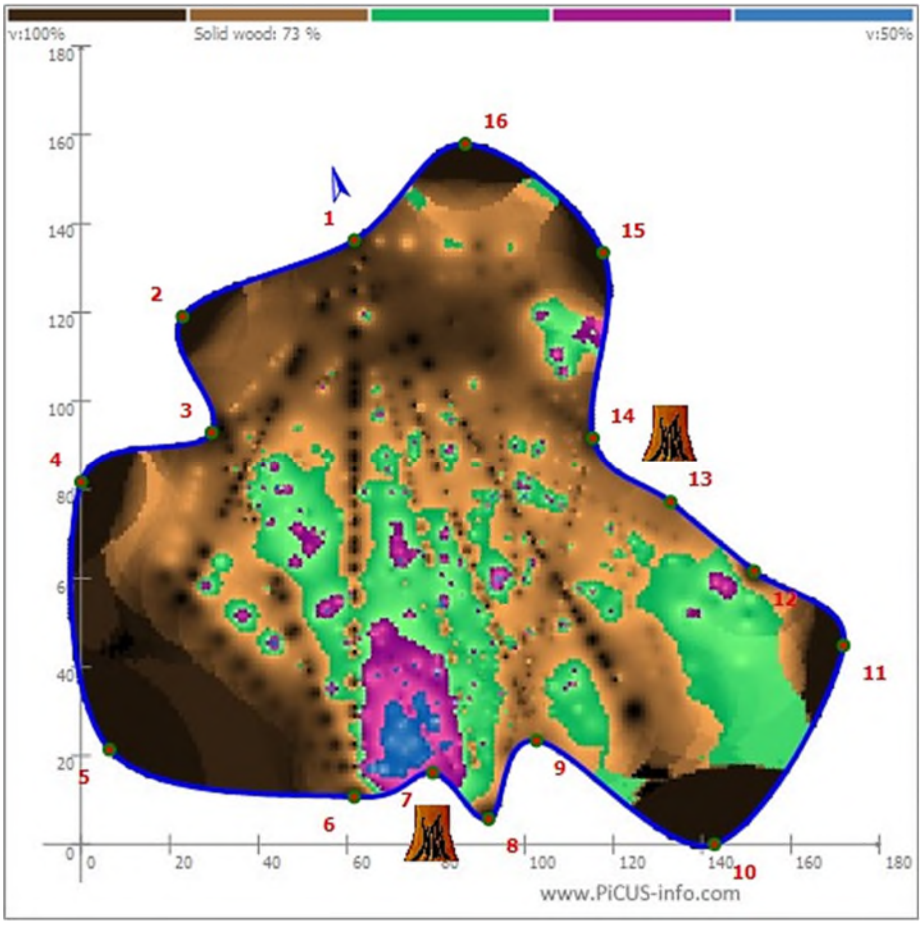

Detail of Honey Fungus decay


Detail of Honey Fungus decay

4.3 BEECH DECAY ASSESSMENT

Trunk Diameter at 1.3m:	127 cm
Position of Tomogram(s) taken:	Through the stem base.
Level of measurement above ground level:	7cm

Picus scan in progress



Soundwave tomogram through the stem base.

4.4 BEECH CONCLUSION

I undertook a visual tree inspection, investigation of the two areas of decay at the stem base and soundwave scan just above ground level. Physiologically the tree is in moderate to good condition with natural crown density and regular growth. There has been a history of removing the lower branches leaving a clear stem with domed crown above. This was most likely to allow light into the garden and later to clear the buildings. The last phase of branch removal was carried out to a poor standard, leaving long stubs. The removal of the bottom crown has resulted in the remaining lower branches being exposed to wind forces. This has resulted in the fracture and failure of two lower limbs. There is also a decayed branch in the middle crown to the north.

The tree has two areas of decay due to Honey Fungus between root buttresses. The Picus sound wave scan detected associated soundwave impedance to the southwest which penetrated approximately 35cm into the stem. At present the radiating root buttresses associated with structural roots appear intact and stability is unlikely to be impacted at this stage. Nonetheless, it will be important to monitor the progression of this decay.

I recommend that the crown is reduced to lessen the wind force on the crown structure. This will lessen the loading on individual limbs, lowering the risk of further branch failure. It will also reduce the loading on the root system. See annotated photograph below and specifications. The damaged branch at 15m to the north should be removed and the crown cleared of deadwood.

It would be prudent to have an annual visit in autumn to monitor for external signs of decay progression at the stem base and a follow up Picus scan should be undertaken in two and a half years to monitor the decay internally. If there are external changes in the meantime this scan should be brought forward.

Proposed crown reduction from northwest

Proposed crown reduction from east.

Proposed crown reduction			
Crown	**Present Dimensions**	**Proposed Dimensions**	**Proposed Reduction**
Height	28m	24m	4m
North Radius	8.5m	6m	2.5m
South Radius	7.5m	5m	1.5m
West Radius	7m	5m	2m
East Radius	8m	6m	2m

5. COMMENTS

5.1 IMPLEMENTATION OF WORKS

All tree work should be carried out to BS 3998:2010 'Tree work - Recommendations'.

5.2 TREES SUBJECT TO STATUTORY CONTROLS

Individual trees and woodlands in any location may be protected by legislation for various reasons. The reasons for protection can include visual amenity, biodiversity, wildlife protection or to avoid unnecessary tree loss. Substantial penalties can be incurred for contravention of legal protection. The main type of protection in an urban setting is when trees are protected within a Conservation Area or by a Tree Preservation Order (TPO) or if they are occupied by specific wildlife.

Conservation Area

In Conservation Areas, trees of a diameter greater than 75mm, measured at 1.5m from ground level are automatically protected (except in certain circumstances) under the Town and Country Planning Act 1990. Notice of intent is required to be given to the Local Planning Authority (LPA) before work is carried out. An application form can be downloaded from the LPA website. The LPA has six weeks to decide whether the tree should be made subject to a Tree Preservation Order. If the LPA do not respond within the six-week period, then the tree work that has been applied for may proceed.

Tree Preservation Order (TPO)

A Local Planning Authority (LPA) can protect trees and woodlands with a Tree Preservation Order in the interest of good amenity. In general, it is prohibited in the Town & Country Planning (Tree Preservation) (England) Regulations 2012 to cut down, top, lop, uproot, willfully damage or willfully destroy a tree without the Planning Authority's permission.

It will be necessary to apply to the LPA for permission to carry out any work on protected trees. The LPA has eight weeks to respond to the application to either refuse or permit the work applied for. The LPA can also make alternative work recommendations.

If an application for work is refused, or allowed subject to conditions, or if the council fails to deal with the application within 8 weeks, the applicant has a right of appeal to the Secretary of State under the provisions of section 78 of the Town and Country Planning Act 1990 (as amended).

I believe both these trees are covered by TPOs. The work specified in this report is necessary for reasonable management and should be acceptable to the LPA. However, tree owners should appreciate that they may take an alternative point of view and have the option to refuse consent.

Habitats Regulations

Bats, nesting birds and some mammals are protected under the Conservation of Habitats and Species Regulations 2010, Wildlife and Countryside Act 1981 and (as amended) Wildlife and Countryside Act 2000. A risk assessment will be required prior to commencement of any tree work or felling to assess the likelihood of disturbing or endangering any protected wildlife or habitat. If any protected species are present in any of the trees, or if the tree has a known bird nest or bat roost, then consultation with the Statutory Nature Conservation Organisation (SNCO) must be undertaken, prior to commencement of work.

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APPENDIX 1

QUALIFICATIONS

Nick Coleman MSc Arb MArborA CEnv

Qualifications and Professional Development

1. QUALIFICATIONS

- VE Tree Trainer (Vocational Education and Training on Veteran Trees EU Project) – December 2015
- Chartered Environmentalist (CEnv) 2008 – Arboricultural Association / Society for the Environment
- LANTRA Professional Tree Inspection – July 2007, Refresher - October 2014
- Professional Member of the Arboricultural Association 2005 - MArborA
- MSc in Arboriculture and Community Forest Management – 2002 Middlesex University
- NPTC – certificates of competence in Arboriculture
- Certificate in Management Studies – 1989 – Norwich City College
- Surrey County Diploma in Arboriculture 1981 – Merrist Wood College
- Ordinary National Diploma in Arboriculture – 1981 Merrist Wood College, Surrey
- City and Guilds I Horticulture 1977 – Isle of Ely College, Wisbech

2. CAREER SUMMARY

Nick Coleman began his career with trees in 1976 serving an apprenticeship with Peterborough Development Corporation, mainly tackling the ravages of Dutch elm disease. As part of the OND course he spent a year in Denmark for the Scandinavian Institute of Trees and Shrubs, gaining practical experience as a trainee arborist. Following the completion of the college course, he gained a wide practical knowledge of all aspects of commercial arboriculture. He worked as a craftsman arborist for Southern Tree Surgeons Ltd in both England and Ireland.

In 1985 he joined Norwich City Council's Tree Department gaining the post of chargehand arborist. In 1989, he went into partnership with Colin McDonald and formed Treecare. He gained his Master's degree in Arboriculture and Urban Forestry Management in 2002. In June 2005, the business became incorporated as Treecare Consultants Ltd. Through practical experience, continual professional development and further academic qualifications, Nick has now gained a reputation as a leading arboricultural consultant.

3. AREAS OF EXPERTISE

- Tree hazard risk assessments for tree owners
- Decay assessment and mapping
- Development Site Surveys to 'BS5837 2012: Trees in relation to Design, Demolition and Construction – Recommendations', including Arboricultural Impact Assessments and Method Statements
- Diagnosis of tree disorders
- Tree management reports to prioritise maintenance programs
- Tree ecology and conservation advice, in particular with relation to the specific needs of ancient trees
- Woodland design for conservation
- General arboricultural advice

4. **CONTINUAL PROFESSIONAL DEVELOPMENT**

Some relevant courses attended:

- Tomography and the redwood canopy – Arboricultural Association online learning – 2021
- Fungal symposium – Arboricultural Association online learning - 2021
- Tree Architecture – Tom Joye of Inverde (Belgium), Ancient Tree Forum – November 2019
- Refresher Course - Picus Sonic Tomograph/IMLResi decay detecting drill – Sorbus International with John Harraway – October 2019
- The mycorrhizal world with Lucio Montecchio – Barcham Trees - 10 July 2019
- Tree Architecture and Morphophysiology with Stefania Gasperini and Biovanni Morelli – Barcham Trees – April 2019
- Applied Tree Biology – Arboricultural Association - November 2018
- Re-inventing pruning – Barcham trees and Bruce Fraederich – October 2018
- Trees on the brink – Evolution of the deadly Ash dieback disease – Norwich Science Festival – October 2018
- Soils & trees – Arboricultural Association Conference – September 2018
- Ash dieback seminar – Norfolk County Council – August 2018
- Dr Klaus Mattheck Lecture – Symbiosis – June 2018
- Thinking Arb Day – Outdoor seminar Nottingham Forest Arboricultural Association – Feb 2018
- MTOA: Tree Safety Inspections and Advanced Tree Safety Inspections for Arborists - Frank Rinn – September 2017
- Tree Risk: What's the Likelihood of Failure – Arboricultural Association - August 2017
- Assessment of Tree Forks – Arboricultural Association – August 2017
- Risk Assessment for Commercial Arboriculture, Arboriculture Association – March 2017
- Picus Sonic Tomograph – tree ultrasound decay assessment masterclass at Kew Gardens – October 2016
- Intelligent plants, plant senses, tree senescence, and death, Treeworks Seminar, Kew Gardens – May 2016
- Valuing and Managing Veteran Trees, VE Tree Project – qualified short course trainer – December 2015
- Sustainability and the Urban Forest – 49th Arboricultural Association Conference 2015
- Tree research update with Glyn Percival of Bartlett Trees – April 2015
- ISA Tree Risk Assessment Qualified (TRAQ), International Society of Arboriculture – June 2014
- Professional Tree Inspector refresher and update – October 2014
- Visual Tree Assessment Methodology – latest research and update seminar. Dr Claus Mattheck – May 2014
- What's new in tree risk management and tree heritage assessment – Nov 2012
- Veteranisation Course – National Trust – Nov 2012
- Bats Survey: Surveying Trees – March 2011
- Biology of Decay in Trees – National Trust – October 2010
- Modern Diagnostic Devices for Decay/Defect Assessment – April 2010
- Meripilus Seminar – November 2008
- Subsidence and Trees: A Collaborative Approach – October 2008
- Decay Detection Master Class (Picus Sonic Tomograph) – July 2008
- Professional Tree Inspection – July 2007
- Tree Morphology Part II – June 2007
- Certificate in Continuing Education : Field Identification of Fungi – October 2006
- The Future of Tree Risk Management – September 2006
- Preparing for and giving evidence at Public Local Inquiries – September 2006
- British Standard 5837 Applications and Implications – March 2006
- Tree Morphology – March 2006
- Mean Streets, Trees in the Urban Environment – Feb 2006
- Life Within and Beneath The Tree – November 2005

- Arboriculture and Bats – Guide for Practitioners October 2005
- Bats in Woodlands, Ecology, Survey and Mitigation – September 2005
- Decay Detection Master Class (Picus Sonic Tomograph) - May 2005
- Defensible Tree Management Systems – October 2004
- Root Mechanics and Tree Engineering with Dr Claus Mattheck – May 2004
- Writing Professional Reports Workshop – April 2004
- Discussions and Demonstrations of Cable Bracing – March 2004
- Enhancing the Management of Ancient Trees – Ancient Tree Forum – June 2003
- Tree Statics and Dynamics Seminar – July 2003
- Principles of Tree Risk Assessment – July 2002
- Tree Mechanics with Dr Claus Mattheck – 2002
- Biology of Decay in Trees – Hatfield Forest – November 2001
- International Society of Arboriculture – Insurance and Mortgage Module Course – December 1997
- Modern Arboriculture – A System Approach to Practical Tree Care – Dr Alex Shigo - 1992

5. <u>PROFESSIONAL AFFILIATIONS</u>

- Arboricultural Association (Professional Member)
- Consulting Arborist Society (Professional Member)
- Active member of the Ancient Tree Forum
- International Society of Arboriculture
- Tree Care Industry Association
- The Tree Register of Britain and Ireland
- Royal Society for the Protection of Birds
- Bat Conservation Trust

Treecare Consultants Ltd

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APPENDIX 2

TREE SCHEDULE KEY

The tree schedule contains the following data:

Tree Number	Each tree is given a unique number for differentiation purposes. This number is specified in the tree schedule and on the site plan. The tree numbers usually run chronologically.
Type	Represents the type of vegetation being assessed. These are represented as - Tree (**T**), Group (**G**) & Stump (**S**). Tree (**T**) will be the most common entry.
Tag No	Each tree has been marked with a numbered, aluminium tag to aid on site identification. The tag is attached to the tree by a long nail to allow for annual incremental growth of the stem and should not need replacement for several years. Where possible the number is related to, or similar to, the given tree number. There may be occasions (walk-by assessment) when the tag number bears no relationship to the tree number but is still useful for on-site confirmation.
Common Name **Botanical Name**	The tree species have been identified. Both common and botanical names are given in separate columns in the schedule.
Tree age	Tree age is included because the stage of life has implications on the hazard potential. Tree age has been categorised as: - **Young** – (Shown as **Y** in the schedule) - Juvenile tree usually with dominant leading shoot growth and short side branches. Vigorous growth and often of conical form. **Semi mature** – (Shown as **SM** in the schedule) - Young, adolescent tree, leading shoot growth may not always be dominant but side branches are usually ascending. Vigorous growth and initial flower and seed production. Potential structural defects, minimal deadwood. **Early maturity** – (Shown as **EM** in the schedule) – Nearly adult tree with the main framework of the crown formed. Not yet at full dimensions. Loss of leading shoot dominance and horizontal side branches. Vigorous growth, strong flower and seed production. Possible shedding of inner, shaded branches, formation of some defects and deadwood.

	Mature – (Shown as **M** in the schedule) - Adult tree at full crown volume and dimensions. Maximum flower and seed production. Deadwood and defects that are likely to be present within the crown and reiteration growth in the lower canopy. **Over mature** – (Shown as **OM** in the schedule) – Declining tree with loss of overall vigour, reduction of full dimensions due to limb loss and branch tip die back. Major dead wood within the crown, possible hollowing of the stem and cavity formation. Retrenchment (shrinking) of the crown through increased reiteration growth on the lower branches and stem. **Ancient / Veteran** – (Shown as **V** in the schedule) – Ancient tree that has passed maturity and is old in comparison with other trees of the same species. These trees often have decayed or hollow stems and branches with abundant deadwood. They are important for their historical, cultural and ecological value. A veteran tree is a term that describes a tree that has survived various rigours of life and thereby shows signs of ancientness, irrespective of its age.
Height (m)	Where site lines allow, tree height has been calculated by means of a laser clinometer and recorded in metres. If the use of a laser clinometer is restricted due to confined space or obscuring vegetation, the height of the tree may be estimated based on the surveyor's experience. Adjacent trees or buildings with a clear view may be measured and used as a height scale. Where several trees are located in close proximity, one tree may be measured and the other trees estimated using the measured tree as a reference point. Tree height is important for determining the extent of the Target Zone.
Diameter	The stem diameter is generally measured at a height of 1.5m from ground level, unless otherwise stated. In the case of coppice stools the measurement is taken just above ground level and for multi stemmed trees, the measurement is taken just above the root buttress flare. This is done by means of a rounding down girth tape or calipers. On sloping ground, the tree is measured on the up-slope side of the tree.
Crown Spread	As it is rare that a tree's crown is asymmetric, the crown spread is measured at the points of the compass to give an estimated representation of the crown spread.
Tree form	is the tree's morphology and can aid identification and can influence hazard potential.
Condition	Following a methodical, visual tree assessment (VTA), the overall condition of the tree is recorded. The assessment entails observing the tree in context with its surroundings from a distance, followed by an assessment of the anticipated rooting zone and stem base. The next stage is close inspection of the **stem** and **root buttresses**, investigating any anomalies with probe, hand pick or sounding mallet. Finally, the **crown structure** is assessed and overall vigour and vitality of the twigs, shoots and foliage is evaluated, utilising binoculars, if necessary. Observations are recorded in the schedule detailing any identified defects that may be associated with potential tree failure or the cause of future conflict.

Hazard	A hazard in relation to trees, is the tree part or parts which have been identified as a likely source of harm. Harm could be personal injury, damage to property or disruption to activities. A hazard could be caused by the tree impacting on the local environment or a specific defect. A defect can be abnormalities, growth patterns, injuries, decay, disease or physiological condition that reduces the tree's structural strength or stability.
Risk	Risk is the likelihood of an event happening in the relation to the severity of the potential consequences. In the context of trees, it is the likelihood of an identified defect failing, impacting on a target and causing harm within a specified time period. The time period should be from the day of assessment until the prescribed time for re-assessment unless stated otherwise. Risk has been categorised into five levels of probability and is recorded in a separate column in the schedule: - i. **Extremely likely** – Defect failure has already started or is imminent within a short period of time even if there is no significant wind or increased load. Estimated **1:10** chance of failure within the defined time period. This is an **unacceptable risk** and requires immediate action. ii. **Probable** – Defect failure may be expected under normal weather conditions. Estimated **1:100** chance of failure within the defined time period. This is a **high risk** and requires prioritised attention in the work schedule. iii. **Possible** – Defect failure could occur under normal weather conditions but heightened in abnormal weather conditions. Estimated **1:1000** chances of failure in the specified time period. This is a **moderate risk** in the short term and requires planned attention in the work schedule. iv. **Unlikely** – Defect failure is not likely during normal weather conditions and may not fail in adverse weather conditions. Estimated **1:10,000** chance of failure within the specified time period. This is a **tolerable risk** and requires low priority in the work schedule. v. **Remote** – Negligible defects or if the likelihood of failure is minimal. Estimated **1:100,000** chance of failure within the specified time period. This is a **broadly acceptable risk** and requires no specific allocation of resources for health and safety reasons. Recommendations for general maintenance to improve the tree's overall condition are often given.

Size of Hazard	A hazard in relation to trees, is the tree part or parts which have been identified as a likely source of harm. The size and weight of the tree part has an influence on the severity of harm caused. Hazards have been categorised into four size ranges and recorded in a separate column in the schedule. i. **Small –** Short in length or below **2.5cm** in diameter. Small light weight tree, branches or deadwood whose impact is only likely to cause minor injury, or inexpensive damage. ii. **Medium –** Moderate length and weight, between **2.5cm and 10cm** diameter likely to be a secondary branch from a main limb or semi-mature sized tree. Impact has a potential to cause serious injury, possibly disablement or hospitalisation but unlikely to be fatal. Minor damage can be caused to property. iii. **Large –** Long length, between **10cm and 45cm** diameter and of considerable weight, likely to be a primary limb or medium size tree. Impact has a potential to cause fatal or disabling injuries, severe vehicle damage and moderate structural damage. iv. **Very large –** Long in length, **larger than 45cm** diameter and of significant weight. This is likely to be failure of a mature tree's main stem, large limb or the entire tree. Impact is likely to cause fatalities or disablement, crushed vehicles and severe structural damage.
Target Zone	The target zone is the area in which the tree or tree parts are likely to impact on when it fails. In a tree hazard risk assessment process, targets are people or property that could be harmed or disrupted by tree failure or its influence. As a precautionary measure, most target zones are set at one and a half times the tree height to allow for tree decline and future height increase. The target category reflects the intensity of use (occupancy) of the target zone around the tree and also relates to the value of the property that may be damaged. There are three categories of target zone, High, Moderate and Low. Examples of types of targets within these categories are listed below. **i. <u>High</u>** • Principle highways such as motorways, A roads or major junctions with constant vehicle use. • Public footpath with periods of concentrated pedestrian use. • High value, occupied buildings. • Main pedestrian assembly points. • School playgrounds and main assembly points

	ii. <u>Moderate</u> • Public highways with intermittent but frequent vehicle use, such as B roads. • Public footpath with intermittent to frequent pedestrian use. • Domestic dwellings and buildings of periodic occupation. • Public open spaces with regular use. • Patios, garages and outbuildings. • Woodland edges near occupied land. • School grounds and playing fields **iii. <u>Low</u>** • Slow roads with low volumes of traffic, tracks and bridleways. • Pathways with rare or low rates of pedestrian traffic. • Open recreational green space or domestic gardens of rare occupancy. • Low value structures, fences, inexpensive walls and garden features. • Woodland interiors.
Inspection Frequency	Considering the tree's condition and location, this is the recommended maximum period of time for the next visual assessment and updating of the records
Work Schedule	This is the maximum period of time that the recommended action is carried out.

Priority Code	The Priority Code categorises the urgency of the risk mitigation works or future maintenance. The codes can be adjusted to match the tolerance of risk of the client organisation. The priority codes are calculated by equating the Size of Hazard, Risk (likelihood of failure) and Target Zone in the Priority Code Reckoner shown below. The four Priority Codes are colour coded and recorded in a separate column in the schedule.	
	Priority 1	**Extreme** - Failure is imminent and the consequences severe. Urgent work requiring immediate action as soon as practically possible.
	Priority 2	**High** - Failure is very likely and the consequences are severe. Priority work within the work schedule that requires prompt attention and allocation of resources, for example within 6 months.
	Priority 3	**Moderate** - Failure is unlikely but the consequences could be serious. Planned work to manage future risk and improve tree condition for example 18 months.
	Priority 4	**Low** - Failure is unlikely and the consequences are negligible. No safety work required. Possible maintenance work
	Priority 4A	There may be general recommendations for maintenance work to improve the overall condition of the tree. This would be low priority and dependent on available resources.
	Priority 4B	No tree work recommended
Action	Describes tree management recommendations to mitigate the identified risk, or suggestions for general tree maintenance. There may also be recommendations for further monitoring or a more detailed inspection, such as a climbing assessment of the crown, root collar investigation and decay assessment.	

PRIORITY CODE RECKONER															
SIZE OF HAZARD	**RISK**														
	Extremely Likely			**Probable**			**Possible**			**Unlikely**			**Remote**		
Large	[Red]	[Red]	[Yellow]	[Purple]	[Purple]	[Yellow]	[Purple]	[Purple]	[Green]	[Yellow]	[Yellow]	[Green]	[Green]	[Green]	[Green]
Medium	[Red]	[Purple]	[Yellow]	[Purple]	[Purple]	[Green]	[Purple]	[Yellow]	[Green]	[Yellow]	[Green]	[Green]	[Green]	[Green]	[Green]
Small	[Yellow]	[Yellow]	[Green]	[Yellow]	[Yellow]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]	[Green]
TARGET ZONE	**High**	**Mod**	**Low**	**High**	**Mod**	**Low**	**High**	**Mod**	**Low**	**High**	**Mod**	**Low**	**High**	**Mod**	**Low**

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APPENDIX 3

EXPLANATION OF

DECAY DETECTION

1 DECAY IN TREES

Decay in trees is of major concern in relation to human safety and damage to property. Significant decay can eventually weaken stems, branches or roots enough to increase the chance of mechanical failure. Decay is a natural process and commonly occurs in trees without causing structural weakness. It is therefore inappropriate to regard a tree as hazardous merely because decay has been identified.

It is therefore important to be able to evaluate the tree to determine the extent of the decay so that informed management decisions can be made. This will ensure that hazardous trees are correctly identified and relatively safe trees are not removed or unsuitably pruned.

2 DECAY DETECTION METHOD WITH PICUS SONIC TOMOGRAPH

The method of decay detection is based on the fact that solid wood is a better sound wave conductor than wood that is decayed or structurally damaged. The Picus Sonic Tomograph consists of a set of sensors which are strategically placed around the area of the tree previously identified as potentially having decay or structural fault. Each sensor is connected to a nail which is tapped through the bark into contact with the wood. This process is virtually non-invasive to the tree's system (unlike other decay detection methods). The sensors are connected by data cable to a power supply and lap top computer. Each nail is tapped in turn and the sound wave flight paths are measured by each of the sensors. This results in a dense network of sound velocities through a cross section of the tree.

The velocity of sound through wood depends on the degree of elasticity and density of the material. Tree damage such as white rot, brown rot, soft rot, cavities and cracks reduce the elasticity and density of the wood.

The data from the sensors is translated by the computer software into a full colour tomogram of the cross section of the tree. This tomogram gives information about the presence of decay, cavities, faults or cracks in the tree. Features such as remaining wall thickness, opening angle of cavities and percentage of solid, decayed or altered wood can be measured by the computer.

3 READING THE TOMOGRAM

- It is important that final interpretation of the tomograms and prescription of action is undertaken by Arboricultural Consultants experienced and trained in using the Picus Sonic Tomograph.
- The Picus Sonic Tomograph detects and shows differences in the ability of wood to transmit sound waves.
- Dark colours on the tomogram, such as black and brown indicate areas of the trunk's cross section where the sound travels relatively fast. This can be indicative of areas of solid or reasonably solid or sound wood.
- The tomograph does not differentiate between extensive decay and open cavity; both are shown as pale blue or white.
- White, blue or violet areas on the tomogram show areas that sound travels relatively slowly, indicating significant decay.
- Green areas, are of lower density in comparison to black or brown areas. Green areas may not necessarily be decayed.

- Axis scales at the left and bottom of the tomogram represent the extent of the examined cross section.

- The numbered red points around the tomogram denote the sensor positions. Sensor number 1 usually denotes the north position unless stated otherwise and the other sensors are arranged anticlockwise direction.

- The tomogram can be superimposed with a circle in red (known as the t/R ratio) which shows 70% of the area of the cross section of the stem. Field studies worldwide have shown that the failure rate of hollow trees increases rapidly as it progresses beyond the 70% margin (Mattheck).

- The tomogram can also be superimposed with a green circle known as the Tree Stability Assessment or Tree SA. This depicts the calculated minimum wall thickness based on Tree Statics research (Wessolly). This method incorporates factors such as tree size, species, wood properties, environmental exposure and crown shape to calculate the recommended minimum wall thickness for that particular tree.

- The tomogram can also be annotated with the position of external damage or fungal fruiting bodies, distances can be measured and the position of resistograph tests can be shown.

- Some anomalies in the tomogram can occur due to cracks, voids between root buttresses, included bark and wet wood. These idiosyncrasies require careful interpretation by an experienced operator.