Arboricultural Report:

Quantified Tree Risk Assessment (QTRA)

Client:	QTS Group
Site:	Howgate Road
	Slaithwaite
Postcode:	HD7 5AY
Date:	May 2022
Prepared by:	Mike Kiss BSc (Hons), Dip Arb L6 (ABC), Tech Cert (ArborA), MArborA
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APPENDICES

1. INTRODUCTION

1.1 Terms of Instruction

Thompson Tree Services (Midlands) Limited have been instructed by QTS Group to carry out a walkover tree survey of trees adjacent Howgate Road & Holme Lane, Slaithwaite; with individual tree inspections as required; and to produce a report.

The principal objectives are to:

a) Survey all trees within the identified area

b) Provide an appraisal of Risk of Harm due to tree failure, utilising the Quantified Tree Risk Assessment (QTRA) method

c) Schedule compartments and selected trees to include basic data, tree dimensions and locations

d) Make recommendations regarding any future management

1.2 Information Provided

I was provided with a location map showing land owned by Network Rail and a description of the area to be surveyed (trees with potential to impact on residential properties or the road network of Howgate Road & Holme Lane).

1.3 Site visits

I made an unaccompanied visit of the above site on 8th May 2022 and I undertook the survey on the same day.

Access throughout the curtilage of the site was unlimited, although I did not access trackside. The deciduous trees were at various stages of the annual process of leaf emergence. The weather was dry and bright with good visibility. I do not consider that the conditions compromised my assessment of the trees in any way.

1.4 Site Location

The site is situated within the village of Slaithwaite, Kirklees, as illustrated below (figures 1 & 2). A brief site description is provided in Observations (section 5).

Figure 1 – Aerial photograph of the site. Image courtesy of Google.

Figure 2 – Aerial photograph of the site. Image courtesy of Google.

2. SCOPE OF REPORT & LIMITATIONS

2.1 Limitations: Generic

The information, opinions and recommendations contained within this report are based on my site observations and information provided, interpreted in the context of my arboricultural knowledge & experience (section 9).

The trees have been assessed within their current context and surrounding land use. Subsequent change of land use may affect target values. Changes to either the surrounding built environment or local tree population are likely to modify wind flow patterns and may affect likelihood of failure.

This report details the trees condition as observed on the day of the survey. Trees are living organic structures whose condition can change rapidly. Due to the ephemeral nature of annual fungal fruiting bodies, absence of these does not necessarily mean that parent fungi are not present.

Due to the unpredictable laws and forces of nature, and a natural failure rate of intact trees, no tree should ever be considered absolutely safe from failure.

2.2 Limitations: Site Specific

This report has been complied with the use of data collected from ground level inspection in accordance with the methodology described (section 4).

On the day of my site visit, access throughout the site was unlimited. However, due to difficulties associated with confines of the site regarding adjacent properties, rail network, nature of ground features, and proximity of adjacent trees I was not able to view all parts of the tree crowns from all angles. The inspection was restricted where trees were ivy-clad or where basal growth or other vegetation obscured lower stems and root collars.

The survey was undertaken while the deciduous tree were at various stages of leaf emergence. As leaf cover and condition is a key indicator of tree vitality, assessment of the physiological condition of the trees should be considered provisional.

No below ground assessment or excavation has been attempted, nor has any effort been made to assess subsidence risk potential or direct damage caused by roots.

The contents of this report are valid until the reinspection dates set out in Recommendations (section 8), or until any significant alteration to the site or surrounding area that may affect the trees; whichever is sooner.

3. DESK STUDY & REGULATORY FRAMEWORK

3.1 Duty of Care

A legal duty of care is owed through both statute and common law in regard to risk to a target from structural tree failure. The principal statutory legislation is under the Occupiers Liability Act (1957), the Health and Safety at Work Act (1974) and the Highways Act (1980).

The duty is owed by the person who has control over a tree's management, this may be the owner, licensee or occupier of land on which the tree stands (the 'duty holder'). "It is the duty holder's fundamental responsibility as a reasonable and prudent landowner, to consider the risks posed by their trees." (NTSG 2011).

3.2 Tree Preservation Orders and Conservation Areas

Trees may be offered statutory protection under the Town and Country Planning Act (1990) (as amended) and Town and Country (Tree Preservation) (England) Regulations (2012).

According to the interactive mapping system provided by Kirklees Council (www.Kirklees.gov.uk: accessed 07.05.22) it appears that the trees to the south of the rail lines (compartment one) are subject to a statutory protection as they are covered by a Tree Preservation Order (TPO) (17/78/W1). As such an application must be submitted to the Local Planning Authority (LPA) for approval prior to any works taking place. It should be noted that this service is not intended to be definitive and so the LPA should be contacted to confirm this status.

A search of previous planning applications on the planning portal (www.Kirklees.gov.uk: accessed 07.05.22) for the postcode HD7 5AY reveals an application from 2017 (2017/TWA/90730/W) to carry out tree work on protected trees within the same TPO (17/78/W1). The application was for the removal of three trees, the reduction of another, and to prune a fifth. The proposed work was refused, and only light pruning (crown lifting) permitted. There are no other records of planning applications to work on any trees within this TPO.

3.3 Felling Licence

The removal of trees is restricted under the Forestry Act (1967) such that a felling licence may be required to implement proposed tree works, depending on volume of timber to be felled.

3.4 Wildlife Legislation

Statutory protection of flora and fauna in England and Wales is provided by the Wildlife and Countryside Act (1981), the Countryside and Rights of Way Act (2000) and the Conservation of Species and Habitat Regulations (2017) (as amended).

A wildlife and biosecurity assessment should be carried out and findings used to inform how and when any works are to be carried out. The responsibility for this lies with the tree work contractor and should be included on their pre-work site assessment.

3.5 Land Based Designations

According to the UK Governments MAGIC Website (www.magic.defra.gov.uk; accessed 07.05.22) No part of the site is a designated Site of Special Scientific Interest (SSSI). The site does not contain Ancient Semi-Natural Woodland (ANSW) nor Planation on Ancient Woodland Site (PAWS).

The Ancient Tree Inventory (www.ati.woodlandtrust.org.uk; accessed 07.05.22) does not hold records of any notable, veteran or ancient trees on site. It should be noted that this inventory is reliant on volunteer submitted records and associated limitations should be recognised.

3.6 Traffic Data

The Department for Transport (www.dft.go.uk: accessed 07.05.22) holds traffic count data for Holme Road, which has an average daily flow of 726 (‘all motor vehicles’). Not data is held for Howgate Road.

4. METHODOLOGY

4.1 Visual Tree Assessment

The tree inspection was carried out in accordance with the Visual Tree Assessment (VTA) method (Mattheck 2007), which provides a systematic framework for formal tree inspection, as summarised:

i. VTA Stage 1 - Inspection of the tree for visual evidence of internal defects
ii. VTA Stage 2 – Confirmation of defects and measuring their extent
iii. VTA Stage 3 – Assessment of defects and estimation of residual strength

This inspection was undertaken from ground level and in accordance with stage one VTA, involving the use of non-invasive methods to identify tree health issues and structural defects by visual observation. In addition, use of a nylon sounding mallet and a probe has been made where appropriate (preliminary stage two VTA).

Should a more detailed inspection be required then this will be highlighted in the recommendations. This may involve the use of decay detection tools or aerial inspection (advanced stage two VTA) and interpretation of findings to form a prognosis (stage three VTA).

4.2 Data Collection

The location of the tree has been plotted onto an aerial photograph purchased from Bluesky Mapping. National Tree Map data has also been overlaid onto this photograph. This data is derived from a Light Detection and Ranging (LiDAR) survey and assigns points and polygons corresponding to tree canopy features.

The site was divided into two compartments. The dimensions of the largest tree of each species were recorded for each compartment. Height, crown spread radius and stem diameters were estimated unless a greater level of accuracy was deemed necessary. Selected trees are recorded individually as necessary.

4.3 Quantified Tree Risk Assessment

The Quantified Tree Risk Assessment (QTRA) method has been applied in consideration of the risks associated with the tree. It is important to note that it is not the purpose of the survey to make a definitive statement on the safety of your tree or to provide predictions of what will or will not happen, as this would not be reasonably practicable. Further guidance on the method, its application, and the use of results to inform management decisions is provided in the enclosed QTRA Practice Note (appendix 4).

A quantified assessment of the target value, size of part and likelihood of failure are made individually. These are then used as inputs to the QTRA model, which calculates an annual Risk of Harm from tree failure, which can then be compared to risks encountered elsewhere.

To inform management decisions, the risks from tree hazards shall be considered against Broadly Acceptable or Tolerable levels of risk as laid out within the Tolerability of Risk framework (ToR) (HSE 2001). This is a widely accepted approach to assessing acceptable levels of risk. In applying ToR to QTRA, there are three threshold values;

i. Broadly Acceptable: Risk of Harm is less than 1/1M is and already considered As Low As Reasonably Practicable (ALARP).

ii. Unacceptable: Risk of Harm 1/1000 or greater will not ordinarily be tolerated.

iii. Tolerable: region lies between these two thresholds. The Risk of Harm will be tolerable if it is As Low As Reasonably Practicable (ALARP). In the Tolerable Region, management decisions are informed by consideration of the costs and benefits of risk control. NB: A Risk of Harm 1/10K or greater will not ordinarily be Tolerable where it is imposed on others.

Selected trees are recorded individually if assessment indicates that the Risk of Harm is equal to or greater than 1/1M. The remaining tree population may contain minor defects that are generally not recorded individually unless they are of sufficient concern to affect the risk assessment, or there is a particular reason to do so.

It is assumed that the tree owner/manager accepts the principles set out in the QTRA Practice Note unless Thompson Tree Services (Midlands) Ltd are otherwise notified. On this basis, the cost/benefit balance will be taken into account when providing management recommendations.

4.4 QTRA Advisory Risk Thresholds

Risk Thresholds	Description	Action
1/1000	**Unacceptable** Risks will not ordinarily be tolerated	• Control the risk
	Unacceptable (where imposed on others) Risks will not ordinarily be tolerated	• Control the risk • Review the risk
1/10K	**Tolerable** (by agreement) Risks may be tolerated if either: • those exposed to the risk accept it • the tree has exceptional value	• Control the risk unless there is broad stakeholder agreement to tolerate it, or the tree has exceptional value • Review the risk
1/1M	**Tolerable** (where imposed on others) Risks are generally tolerable	• Assess costs and benefits of risk control • Control the risk only where a significant benefit might be achieved at a reasonable cost • Review the risk
	Broadly Acceptable	• No action currently required • Review the risk

Table 1 - QTRA Advisory Risk Thresholds

Outlines how the risk values can be used to inform your risk management decisions (based upon the Tolerability of Risk Framework). For further guidance please refer to the QTRA Practice Note (appendix 4).

5. OBSERVATIONS & DISCUSSION

5.1 Site Appraisal

The site is broadly formed by treed rail embankments to the west of railway bridge MVL3/61. Howgate road lies to the south, Holme Road to the northwest with residential properties to all sides. The two compartments as described are dissected by the railway lines.

5.2 Target Values

Target values have been extrapolated from observations on site and traffic count figures supplied by the Department for Transport (see section 3.6).

As such, Holme Road is assessed as target range two and Howgate Road target range three. However, when considering windthrow of entire trees with potential to impact on adjacent properties, higher risk ratings tend to arise from use of 'property' (target range two).

Assessment of risk to the rail network itself is outside the scope of this report. It is assumed that a rail specific tree management strategy and risk assessment system is in place to deal with trees with potential to impact on the lines (i.e. International Railway Solution 70723 / THREATS - Network Rail).

5.3 General Arboricultural Observations

The mature tree population of the site contributes significantly to the arboricultural amenity of the site, forming a strong landscape feature and valuable wildlife corridors.

Compartment One

The age structure of the trees within compartment one is dominated by mature trees of a single species (sycamore). The resilience and sustainability of the tree population is therefore poor, with few successors to mature trees and little species diversity.

Several trees throughout the site were covered in dense epicormic growth or ivy, preventing full inspection. Low crowns of trees adjacent Howgate Road likely cause some nuisance to residents and road users.

Compartment Two

The tree population within compartment two has greater species diversity and age class distribution, however with fewer mature trees and overall lower arboricultural value.

5.4 Summary of Findings

A summary of my findings relating to trees identified individually is outlined below. The complete data set and comments resulting from my survey (including individual QTRA Risk of Harm calculations), are presented in the Compartment Schedules and the Individual Tree Schedules (appendix 1 & 2), corresponding to trees plotted on the Tree Location Plan (appendix 3).

Compartment One

Tree Number	Tree Species	Key Observations	QTRA Risk of Harm
G1.1	Mixed Group	Low crowns / diseased ash	1/30K
T1.2	Sycamore	Stem lean / recently exposed	1/30K
T1.3	Sycamore	Mature woodland edge tree	<1/1M
T1.4	Sycamore	Included bark union	N/A
T1.5	Sycamore	Included bark union	N/A

Compartment Two

Tree Number	Tree Species	Key Observations	QTRA Risk of Harm
T2.1	Sycamore	Tight forks between stems	1/1M

5.5 T1.2 - Sycamore

Sycamore (T1.2) is located immediately adjacent Howgate Road, leaning towards and overhanging the road. Although there are no apparent significant defects in the tree itself, the apparent recent removal of adjacent mature sycamore is likely to have modified wind loading to some extent.

The tree is likely early mature and as such the crown architecture results in adequate growth points for pruning. Once more advanced life stages are reached, (i.e. late mature) sycamore trees tends to hold leaf bearing material at the distal ends of branches. At this stage there are typically fewer options for pruning. I have therefore made management recommendations for a crown reduction, as my preferred option. A phased reduction may be appropriate to further reduce the crown size in the future, depending on response to the initial pruning. It is hoped that increased light will stimulate development of a lower inner crown. Alternatively, the removal of the tree may be an option. NB: Relevant permissions from the LPA are required (see section 3.2).

5.6 T1.4 & T1.5 - Sycamores

Both these sycamore (T1.4 & T1.5) are located towards the top of the embankment. They have highly adapted rooting systems, with voids beneath. They both have potentially significant included bark unions. However, due to the extent of basal epicormic growth, ivy and raised soil levels, full inspection was not possible. In my opinion they are highly unlikely to impact on Howgate Road or residential properties in the event of failure. They may however, impact on the rail network. I suggest therefore that these trees are assessed in the context of a rail specific tree management strategy and risk assessment system (see section 5.2).

5.7 Trees on Adjacent Land

It was noted during my survey that several trees on land to the west of compartment one, are currently numbered and marked with spray paint. My desk study did not reveal any recent application to the LPA to carry out any work to these trees (see section 3.2). However, if these trees are removed at any time in the future, a reassessment of the trees within compartment one will be required due to the change in wind flow patterns across the site.

6. CONCLUSIONS

6.1 General Conclusions

The mature tree population of the site contributes significantly to the arboricultural amenity of the site, forming a strong landscape feature and valuable wildlife corridors. The narrow woodland block to the south of the railway that includes compartment one is of particular note, with several fine mature trees. These trees are offered statutory protection as they are covered by a Tree Preservation Order.

6.2 Risk of Harm and Risk Management

I consider that the trees with the greatest associated risk on site are mixed group (G1.1) and sycamore (T1.2) which both pose an annual Risk of Harm of 1/30K. Although such risk may be considered Tolerable if As Low As Reasonably Practicable (ALARP), as the risks are at the upper end of the Tolerable region and for the reasons discussed (section 5.5) I have made recommendations for pruning of these trees as a medium priority.

Note that risk associated with tree failure onto the nail network has not been assessed. I suggest therefore that the trees adjacent the lines are assessed in the context of a rail specific tree management strategy and risk assessment system, with particular reference to sycamores (T1.4 & T1.5).

7. RECOMMENDATIONS

7.1 Summary of Recommendations

A summary of my recommendations is outlined below. My recommendations are presented in full in the Compartment and Individual Tree Schedule (appendix 1 & 2).

7.2 Emergency Management Recommendations

No emergency or high priority work has been identified.

7.3 Medium Priority Management Recommendations

I recommend that the following work is carried out as a medium priority and within one year of the date of this report:

Tree Number	Tree Species	Recommendations
G1.1	Mixed Group	Prune as specified in Tree Schedule
T1.2	Sycamore	Prune as specified in Tree Schedule
T1.4	Sycamore	Further investigation as specified in Tree Schedule
T1.5	Sycamore	Further investigation as specified in Tree Schedule

7.4 Formal Reinspection & Informal Checks

I recommend that all retained trees are formally reinspected within two years of the date of this report.

In addition, I recommend that regular informal checks are made of retained trees for obvious changes in condition or presence of annual fungal fruiting bodies. Checks should also be carried out after high wind events.

7.5 General Recommendations

Recommendations for work are given with 'estimated hours.' This is an estimate of 'man hours' required for each job. However, variables such as access of plant and disposal of arisings are outside the scope of this report and are yet to be discussed.

All tree work should be carried out in accordance with British Standard 3998:2010 'Tree Work – Recommendations.'

It is strongly recommended that an Arboricultural Association Approved Contractor is used to carry out any tree work. A list of these is available from the Arboricultural Association (www.trees.org.uk).

8. DISCLAIMER

Reports remain the copyright of Thompson Tree Services (Midlands) Ltd and any transfer to a third party must be with our express consent.

11th May 2022

Mike Kiss **DATE**

9. QUALIFICATIONS & EXPERIENCE

9.1 Qualifications

2021 Level 6 Diploma in Arboriculture (ABC)

2018 Quantified Tree Risk Assessment: Registered User (QTRA)

2010 Professional Tree Inspection (Lantra) (Refresher 2017 ArborA)

2009 Technicians Certificate in Arboriculture (ArborA)

2001 BSc (Hons) Geography (The University of Sheffield)

9.2 Experience

2017 - Thompson Tree Services (Midlands) Ltd
Arboricultural Association Approved Contractor (AAAC)
Supervisor / climbing arborist / tree surveyor / consultant

2013 - 2017 Gristwood & Toms Ltd
Arboricultural Association Approved Contractor (AAAC)
Team leader / climbing arborist / tree surveyor

2011 - 2013 Bristol City Council (BCC)
Arboricultural Officer (Parks)

2008 - 2011 Midland Forestry Ltd
Arboricultural Association Approved Contractor (AAAC)
Team leader / climbing arborist / tree surveyor

9.3 Memberships

2022 - Arboricultural Association: Professional Member (MArborA) (PR7385)

2019 - 2021 Arboricultural Association: Technician Member (TechArborA)

10. BIBLIOGRAPHY & REFERENCES

Arboricultural Association: www.trees.org.uk

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Mattheck, C & Breloer, H (2006) *The Body Language of Trees: A Handbook for Failure Analysis.* Research for Amenity Trees No. 4. DETR

National Tree Safety Group (2011) *Common Sense Risk Management of Trees*

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Watson, G. (2013) *Tree Pests and Diseases – An Arborists' Field Guide.* Arboricultural Association

Watson, G. & Green, T. (2011) *Fungi on Trees – An Arborists' Field Guide.* Arboricultural Association

11. GLOSSARY OF TERMS

Key to Tree Schedule

Age class

- Newly Planted: A tree which is not yet fully established in the landscape
- Young: A tree in the first third of its life expectancy
- Early Mature: A tree in the second third of life expectancy
- Mature: A tree in the final third of its life expectancy

Condition (structural or physiological)

- Good: Containing no apparent significant defects or pathogens
- Fair: Containing defects or pathogens that have potential to have an impact on the function of the tree, or component of the tree
- Poor: Containing defects or pathogens that significantly compromise structural integrity or cause dysfunction to the tree, or component of the tree

Inspection Frequency

- Biannual: Occurring twice a year
- Annual: Occurring once a year
- Biennial: Occurring once every two years

Priority of Work

- Emergency Work: To be carried out within timeframe as identified within report
- High Priority: To be carried out within six months
- Medium Priority: To be carried out with twelve months
- Low Priority: To be carried out in the interests of good arboricultural management as and when resources allow

Arboricultural Operations

- Coppicing: Removal of all aerial parts of the tree leaving a 'coppice stump' for regeneration
- Crown Clean: Selective removal of dead, diseased and broken branches from the tree crown
- Crown Lift: Selective removal of lower branches from a tree crown to provide clearance
- Crown Reduction: Pruning to reduce the height and / or spread of a tree crown
- Crown Thin: Selective removal of live branches to reduce crown density
- Felling: Cutting down a tree, usually to ground level
- Haloing: Removing or pruning trees from around the crown of another (usually mature or post-mature) tree to prevent it becoming supressed
- Pollarding: Semi-formal pruning system that maintains crown size by initial heading of branches on young trees or young portions of older trees, followed by removal of sprouts to their point of origin at appropriate intervals, without disturbing the resulting pollard heads

Glossary of Arboricultural Terms

Arboriculture: Practice and study of the care of trees and other woody plants in the landscape

Arborist: Professional who possesses the technical competence, through experience and related training, to provide for or supervise the management of trees

Arisings: Parts of the tree that have been removed for disposal, branches, leaves, roots etc.

Bificates: A division of the main stem into two main scaffolds

Branch Union: Point where a branch originated from the trunk or another branch

Buttress Roots: Roots at the trunk base that help support the tree and equalise mechanical stress

Cavity: Open or closed hollow within a tree stem, branch or root, usually associated with decay

Codominant: Forked stems or branches of nearly the same diameter, arising from a common union and lacking a branch collar

Crown: Upper part of a tree, consisting of branches and foliage

Deadwood: Branch or stem wood bearing no live tissues

- Minor deadwood **-** deadwood of a diameter less than 25mm and / or unlikely to cause significant harm or damage upon impact with a target beneath the tree
- Major deadwood – deadwood with a diameter of more than 25mm

Decay: The process of decomposition or degradation by microorganisms

Decay Detection Device: Any device used to assess the presence and / or extent of internal decay in trees

Deciduous: Tree or other plant that sheds all of its foliage annually (contrast with *evergreen*)

Defect: Imperfection, weakness, or lack of something necessary; in trees defects are injuries, growth patterns, decay or other conditions that reduce the load-bearing capacity

Epicormic Growth: Shoot arising from a dormant bud or from newly formed adventitious tissue

Failure: Breakage of stem, branch, or roots, or loss of mechanical support in the root system

Fungal Fruiting Body: Reproductive structure of a fungus that usually develops in diseased tissues (see *annual* and *perennial*)

Fungus: Heterotrophic, parasitic or saprophytic absorptive organism from the kingdom Fungi

Honeydew: Sugary substance excreted by certain insects, including aphids and some scales, when feeding on plants

Incipient failure: In wood tissues, a mechanical failure which results only in deformation or cracking, and not in the fall or detachment of the affected part

Included Bark: Bark that becomes embedded in the union between branch and trunk or between codominant stems; lacks wood connections, resulting in a weak structure

Light Detection and Ranging (LiDAR): Remote-sensing method that uses laser technology to measure tree size and location in relation to the target of concern, with results depicted in a computer image

Overextended Branch: Branch that extends outside the normal crown area

Probe: Stiff, small-diameter rod that is inserted into a cavity or crack to estimate its size or depth

Pruning: Removing branches (or roots) from a tree or other plant, using approved practices, to achieve a specified objective

Pruning Wound: A wound created through the process of pruning; British Standard 3998 (2010) describes natural target pruning to minimise chance of ingress by pathogens

Quantified Tree Risk Assessment (QTRA): A quantified method of assessing tree risk

Response Growth: New wood produced in response to loads to compensate for higher strain experienced (adaptive growth); includes reaction wood (compression and tension, flexure wood and woundwood

Rib: A ridge of wood that has usually developed because of locally increased mechanical loading, often associated with internal cracking in the wood of the stem, branch or root

Risk Rating: the level of risk combining the likelihood of a tree failing and impacting a specified target, and the severity of the associated consequences

Root Collar: Flared area at the tree trunk base where the roots and trunk come together

Root Plate: Combination of large structural and smaller roots and soil near the base of the tree trunk, largely responsible for holding the tree erect

Scaffold: Pertaining to tree architecture or form, a strong and properly spaced arrangement, framework, or system of branches throughout the crown

Size of Part: Relating to risk assessments, identifying the size of the hazard, or parts of a tree which may cause harm if failure occurs

Sounding: Process of striking a tree with a mallet or other appropriate tool and listening for tones that indicate dead bark, a thin layer of wood outside a cavity, or cracks in wood

Species Diversity: Measure of the number and variety of different species found in a given area

Stem: Woody structure bearing foliage and buds that gives rise to other stems (branches)

Structural Defect: Feature, condition, or deformity of a tree that indicates a weak structure or instability that could contribute to tree failure

Structural Roots: Large, woody tree roots that anchor and support the trunk and crown

Subsidence: In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Sustainability: Ability to maintain ecological, social and economic benefits over time

Sweep: Corrected stem lean characterized by a leaning lower trunk and a top that has grown back toward vertical

Symptom: Plant reaction to a disease or disorder (e.g. spot, wilt, dieback) (contrast with *sign*)

Target: People, property of activities that could be injured, damaged or disrupted by tree failure

Torsion: Action of twisting or being twisted

Tree Architecture: The structural form and shape of a tree

Tree Population: A defined set, group or collection of trees

Trificates: A division of the main stem into three main scaffolds

Wind Exposure: Exposure to forces of wind

Wind Load: The force on a tree or structure resulting from the impact of wind

Windthrow: Uprooting and overthrowing of a tree caused by the wind