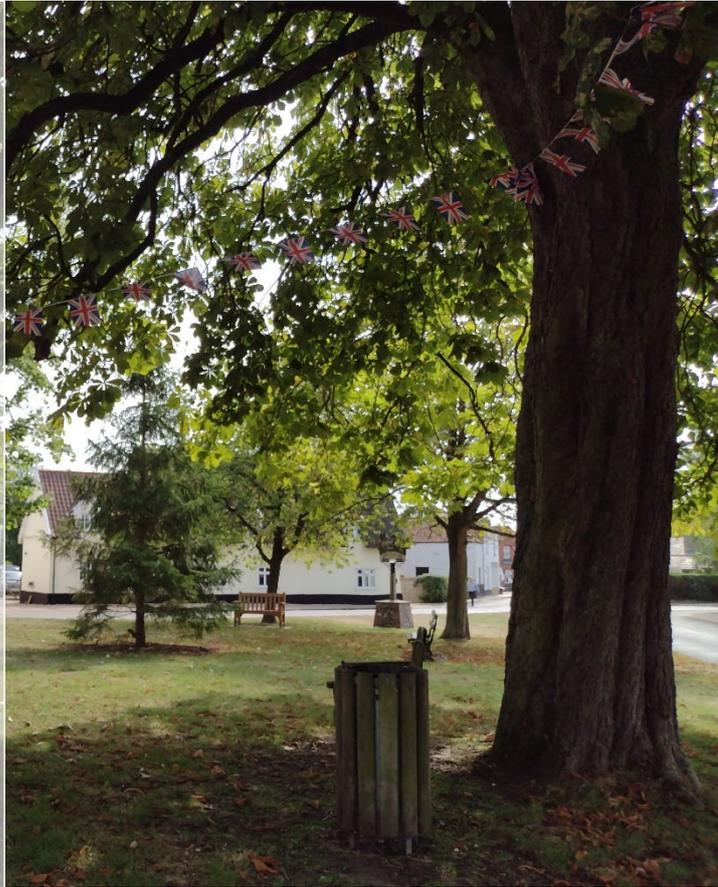


# Quantified Tree Risk Assessment

Compiled by: J Urwin

2nd September 2022



Instructed by C Garrod

on behalf of  
Great Hockham Parish Council

refs. GHC/THA/6922

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# 1 Introduction

## **Instruction and brief**

- 1.1 Ravencroft Tree Services Ltd. has been instructed by C Garrod, for Great Hockham Parish Council to undertake an inspection of and provide a risk assessment for trees on two sites in the village.
- 1.2 This appraisal aims to evaluate any existing and potential tree hazards and specify works to mitigate any risk of harm to persons or property using the Quantified Tree Risk Assessment (QTRA) system.
- 1.3 The assessment also takes into consideration the social, environmental and economic benefits which the trees provide to the site and surrounding area.

## **Limitations**

- 1.4 The collection of all tree survey data was undertaken from ground level without invasive inspection of individual trees, trunks, buttresses or root flares; the disclosure of hidden defects cannot therefore be expected. As explained in the fee proposal, inspection was restricted where trees were ivy clad, located wholly or partly on neighbouring land or impeded by poor access due to ditches, fencing and where basal growth or other vegetation obscured lower stems and root collars. Were more detailed assessments using internal examination equipment required, recommendations would have been set out in the survey schedule. Height, spread and other dimensions were estimated unless otherwise stated.
- 1.5 This information is confidential to our client and their professional advisers. No liability is accepted for its contents to any other than our clients.
- 1.6 The assessment and its recommendations relate specifically to the condition of the trees on the day that the inspection was carried out. They are necessarily invalid if development works of any type are undertaken on or close to trees other than those recommended herein. This includes changes to soil levels, excavations carried out on the land subject to this survey and abnormal weather conditions generating new defects or exacerbating those already present but currently obscured.
- 1.7 Trees are dynamic, living organisms and failures a part of their natural processes. Even healthy trees or their parts may fail, particularly - although not exclusively - as a result of strong winds or violent storms. Occasionally, yet with ever greater frequency, extreme weather systems occur bringing with them an unusual degree of tree damage. Clearly, Ravencroft Tree Services Ltd. cannot be held liable for the consequences of any such events or similarly unpredictable failures.

- 1.8 Assessment of the potential effects of trees on buildings or other structures resulting from their abstraction of water from shrinkable load-bearing soils was not included in our instruction and is not considered here.
- 1.9 These trees may be subject to conservation area or Tree Preservation Order protection. If so, prior to any works being instructed or undertaken, the council's tree officer must be informed to establish whether all proposed works comply with all applicable regulations. Please note that the council requires 6 weeks' notice of proposed tree works within conservation areas, in accordance with section 211 of the Town and Country Planning Act (1990). Where trees are protected by a Tree Preservation Order, an application for works will be required to ensure adherence to the stipulations of this same Act. If trees were identified by our inspection as being dead or dangerous, they *may* be exempt from the Act, requiring only five days notification to the council's tree officer before commencement of works.
- 1.10 This report is based on findings from the site survey, tree observations and any information provided. Conclusions have been drawn from the author's professional qualifications and experience in arboriculture.

#### **Documents received**

- 1.11 No plans or other relevant documents were received prior to the survey being undertaken.

## 2 Inspection method

### **Consideration of risk**

- 2.1 Under the Quantified Tree Risk Assessment system the 'targets' (people and property) onto which trees could fail are assessed and quantified, so enabling the arboriculturist to determine whether a closer inspection of any particular tree is required and to what degree of rigour.

### **Tree plotting and identification**

- 2.2 Any trees recorded were mapped during inspection to a level of detail sufficient to enable distinction and position. Recorded trees' stems were tagged where applicable using a numbered aluminium disc. Where trees were inaccessible due to thick vegetation or other barriers at the stem base, or the tree belonging to a neighbouring property or group, no tag was applied. Subsequent individual numbering may not reflect any previous documentation. Tree ID numbers form the basis of the identification system used in the survey schedule.
- 2.3 Trees may have been grouped where individual identification was neither feasible nor useful. These trees typically share a taxonomic or spatial connection. Marked trees may remain as part of the group in which they are located for the purposes of reference while being assigned a different work priority or re-inspection interval.

### **Quantified Tree Risk Assessment**

- 2.4 After the mapping of target areas the surveyor will have walked the site, not necessarily with the intention of inspecting or surveying all parts or all sides of every tree but to take a general overview and look for signs of substantial defects which might be significant relative to the targets. Only these would then be further investigated and their defects recorded.
- 2.5 The level of detail at which trees were assessed was guided by the target appraisal. This involved evaluating trees on approach before undertaking a closer inspection in line with recognised Visual Tree Assessment principles and may have included the use of binoculars, probe and mallet. Where necessary, the tree or branch was then considered in terms of both size and probability of failure. Values derived from the assessment of these three components (target range, size and probability of failure) were combined to calculate the risk of that harm occurring. This risk of harm for all combinations of these three ranges has been calculated using Monte Carlo simulations\*.

The QTRA risk of harm is the mean value from each set of Monte Carlo results.

\* For an overview of the Monte Carlo simulation method, please refer to [http://en.wikipedia.org/wiki/Monte\\_Carlo\\_method](http://en.wikipedia.org/wiki/Monte_Carlo_method)

- 2.6 Target assessment was based on the average estimated occupancy of any area under trees over any 24 hour period throughout the coming year, derived from observations made on site such as desire lines, compaction, access & type of use, etc.
- 2.7 Once the calculation for risk of harm was completed, remedial works may have been specified to reduce that risk to more tolerable levels. For the purposes of this survey, a tolerable risk of harm (where that risk is imposed on an unwitting general public and is judged to be **as low as reasonably practicable** [ALARP]) is accepted to range from less than one in ten thousand (< 1 in 10k) to one in one million (1 in 1M), in keeping with industry and HSE guidelines. Risks less than one in one million (<1 in 1M) are judged to be broadly acceptable.
- 2.8 These works were subsequently assigned a work priority based on their risk of harm, ensuring that the most significant risks are to be reduced first. Tree hazards that were found to present a more acceptable risk were given a lower priority. Implementation of works recommended remains at the discretion of the site manager.

Works priority ratings have been assessed as follows: -

Risk of harm	Works priority	Degree of urgency	To be completed~
>1 in 1k	1 - Unacceptable risk of harm	Requiring immediate action *	within 7 days or as advised
<1 in 1k to 1 in 10k	2 - Significant risk of harm	Requiring swift Action	within 2 months
<1 in 10k to 1 in 60k	3 - Tolerable risk of harm	Important management	within 6 months
<1 in 60k to 1 in 1M	4 – Tolerable to broadly acceptable	General management, as budget allows **	Within 9 months
<1 in 1M	5 - Broadly acceptable		As recommended

\* Notification of these trees would have been given directly to the person instructing this report on the day the survey was carried out. This date can be found on the cover page and survey schedule. Recommended works in priorities 1 & 2 may be deemed necessary in order to discharge the duty of

care owed by tree owners to the general public and other users of their land under the Occupier's Liability Act 1984. Recommended works in priority 3 & 4 may be required to ensure the risks are ALARP.

\*\*These categories exist to inform of potential defects which may worsen over time. As the risks decrease to the broadly acceptable threshold of 1 in 1M they may only require demonstration that the risks are ALARP, i.e. they are at a point where the cost of mitigatory work disproportionately outweighs an insignificant risk. The categories are a guide for what is in effect a sliding scale. For example, a risk of harm at the upper end of works priority 3 may be treated similarly to those at the lower end of works priority 2.

- 2.9 Contained within the schedule are the general management recommendations considered by the surveyor significant enough to be worthy of mention. Whilst of lower priority at present, if these works were carried out sooner, greater consequent expenses might be avoided. It may be considered prudent to undertake these works proactively as funds become available, to minimise the urgency and expense of remedial works. In addition to reducing risks associated with tree failure, general management of tree stocks, carried out to British Standard 3998:2010 Tree work - Recommendations, may improve the structural form of trees, increasing their aesthetic value and prolonging their use for shading, wildlife and air cooling.

### 3 Future management

#### **Survey frequency**

- 3.1 A walkover assessment of trees is recommended to be repeated every eighteen months, unless any identifiable problems or noticeable defects appear, in which case professional arboricultural advice should be sought. It may also be beneficial to inspect the trees in late summer or early autumn when most decay fungus fruit bodies are to be found.

#### **Planting**

- 3.2 Opportunities exist on these sites to increase diversity by planting a wider variety of trees and plants which will in turn encourage a more complete ecosystem and capable of co-existence with their environment. To maintain an ongoing tree stock, we advise replacement planting if ever a tree is removed. Whether a native species to encourage wildlife, or more unusual species to make an impact; a smaller tree as a focal point or a larger specimen as an architectural statement, we would be pleased to offer guidance on selection, planting and aftercare, this latter being the most important part of the process.
- 3.3 In order to ensure the sustainability of the tree population on the sites, planting and establishment works may be given precedence over - without replacing - the lowest priority tree works, when organising budgets.

## 4 Site summary

### **Site visit**

- 4.1 Jonathan Urwin, arboriculturist for Ravencroft Tree Services Ltd., undertook the assessment of the trees at Great Hockham during a visit on 2<sup>nd</sup> September 2022.

### **Site descriptions**

- 4.2 The village Green lies near the centre of Great Hockham and The Paddocks a short distance north from there. There is public access onto both sites and roads around all boundaries. Beyond the roads stand various residential properties.

### **General assessment and mitigation**

- 4.3 There is a range of ages and developmental stages of trees on the sites, which include a variety of naturalised species. Although the structural and physiological condition of the trees varies, most have been assessed as fair to good.
- 4.4 The possible risk of harm changes around the sites, dependant as it is on how frequently any area within failing distance of trees is occupied (target range) and how likely it is that a tree should fail (probability of failure). Estimated target ranges have been assessed as follows: - Parking, roads, buildings, seating areas and footpaths have been designated a higher target range as the targets are either static or numerous. All other areas have been recorded by degrees in slightly lower ranges, being less often visited and for less time. By their nature static targets often give rise to a proportionately higher risk of harm than a moving target which occupies the space for less time. In addition to occupancy levels, approximate repair costs of property may also have been considered.
- 4.5 Any works recommended are expected to be carried out by fully qualified arboricultural contractors to British Standard 3998:2010 Tree work - Recommendations. The sites' aesthetic depends heavily on their trees' good conditions and forms, so careful works of a high standard are very important.
- 4.6 Some of the trees carry dead wood. Clearly the cost of removing all dead wood from the trees' crowns may be prohibitive and unnecessary, therefore only instances with a higher probability of failure and / or larger pieces likely to contact a target need be considered. Deadwood removal may be undertaken easily to reduce risk of harm and inexpensively discharge some of the duty of care imposed by the Occupier's Liability Act. This may be done from the ground with care, the appropriate PPE and subject to a risk assessment. Either a pole with a hook fixed to the end or a strong nylon

line with a small, weighted bag may be used. The bag with line attached can be thrown over the dead branch and both ends of the line pulled to break the branch at a point nearer to its union with live wood. This activity may be carried out at intervals - perhaps annually - and a record kept of trees cleared of the most likely deadwood to fail over a target. This record will provide proof of an effective system which may be used as part of any defence against the remote possibility of a claim.

- 4.7 No trees fully inspected are calculated to fall outside the level of risk generally accepted by HSE and industry standards as tolerable. The recommended works fall into the category of general management and as such may be carried out within the recommended timeframes in priority order as budget restrictions allow. Some of the recommended works are straightforward requiring little time and may be carried out easily by groundwork teams. It is advisable to instruct only fully insured, qualified and experienced contractors, of which there are several in Norfolk, for any larger or more difficult works you may choose to undertake.



**Key**

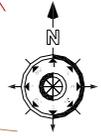
- Works priority 5 tree
- ▨ Boundary of area surveyed

Survey schedule															
Tree ID	Tag no.	Tree species	Life stage	EPS habitat potential	Height (m)	Stem dia. (mm)	General observations	Most likely failure	Target range	Size range	Probability of failure	Risk of harm	Recommended works	Works priority	To be completed
T4	110	Horse chestnut	Mature	Low	21	950	Minor dead wood in crown, low branch east has split at approx. 6m	Branch fracture	3	3	4	1 in 500k	Remove rope swing & reduce split, extended branch by 1 - 1.5m	4	within 9 months
T1	917				17	900	Dead wood in crown, tree overhangs road and seating	Dead wood		4		3	< 1 in 1M	Remove dead wood of 25mm dia. & greater from crowns	5
T2	108	Sycamore	Semi mature		16	480	Minor dead wood in crowns over road								
T3	109														
G1	No tag	Various	Mature		to 18	to 900	Dead wood in crowns over access & play area		4	4	3				as part of general management

There are, at the time of this survey, no trees within range of targets which are considered to present a significant risk of harm, i.e. a risk of 1:10,000 or greater

All works recommended are expected to be carried out by fully qualified arboricultural contractors to British Standard 3998:2010 Tree work - Recommendations

Next survey due date:- March 2024



PROJECT  
Great Hockham P.C.

TITLE  
Tree location plan

SCALE  
Not to scale, drawn @ A4

DATE SURVEYED  
2nd September 2022

DRAWN BY  
J.U.

PROJECT NUMBER  
GHC/TLP/6922

DRAWING NUMBER  
001

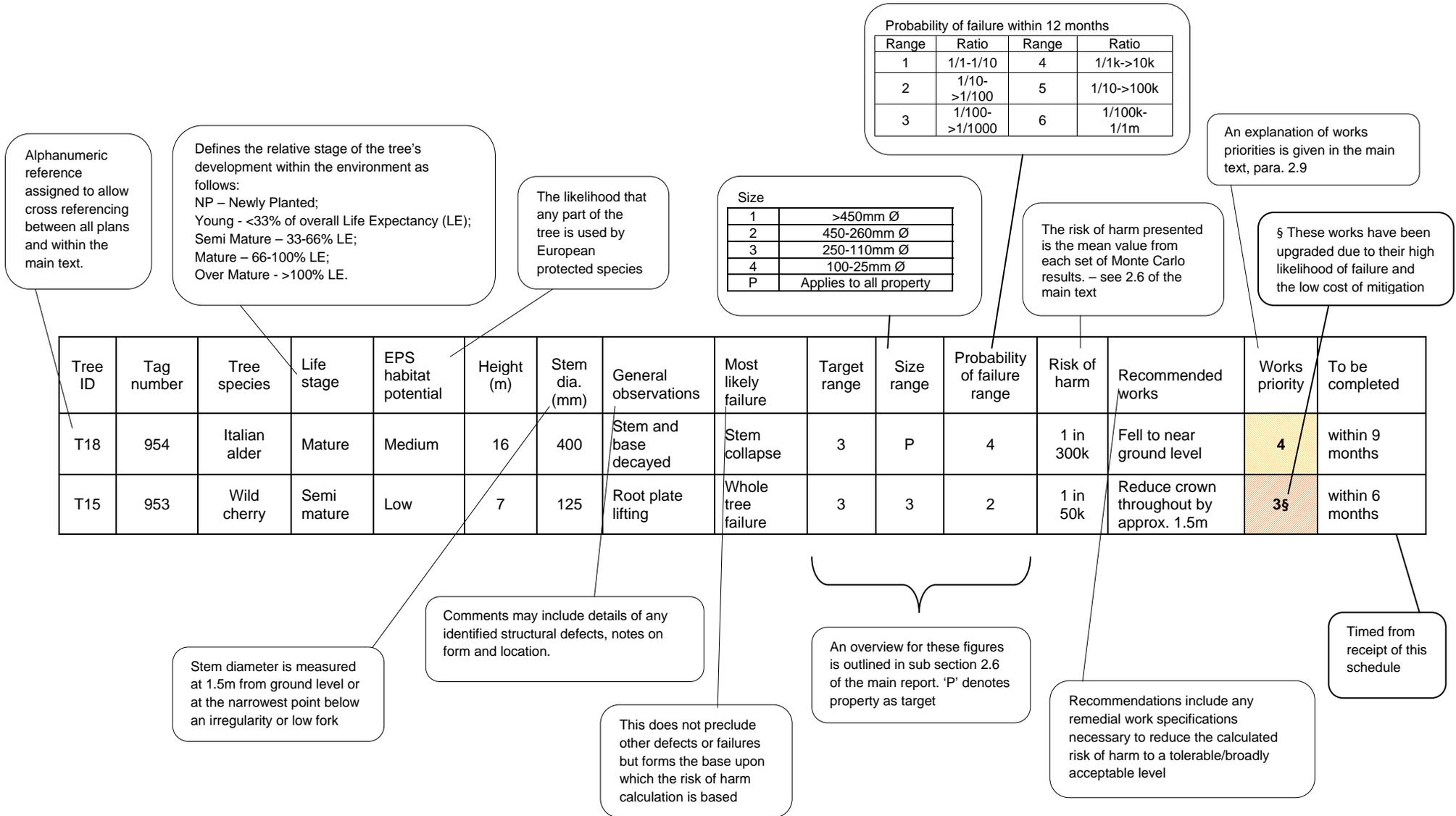
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Ravencroft Tree Services Ltd. is registered at Summer Hill House, Fakenham, NR21 9HA No.4936062  
The original of this drawing was produced in colour, monochrome copies may be unreliable  
This plan is not to be scaled from - all dimensions to be checked  
<https://ravencrofttrees.co.uk/consultancy/terms-and-conditions/>

# Survey schedule explanation

The survey schedule details the data taken of trees with identifiable defects. Below is an example schedule with an explanation of its component parts.



## Target ranges

Target range	Property value	Pedestrian frequency	Vehicle frequency per day	Value (probability of occupation or fraction of £2M - value of statistical life)
1	Very high £2M - >£200k	<b>Occupation:</b> constant - 2.5hrs/day <b>Pedestrians &amp; cyclists:</b> 720/hr - 73/hr	26,000-2700 vehicles @ 110kph (68mph)	1/1 - >1/10
			32,000-3300 vehicles @ 80kph (50mph)	
			47,000-4800 vehicles @ 50kph (32mph)	
2	High £200k - >£20k	<b>Occupation:</b> 2.4hrs/day - 15mins/day <b>Pedestrians &amp; cyclists:</b> 72/hr - 8/hr	26,00-270 vehicles @ 110kph (68mph)	1/10 - >1/100
			32,00-330 vehicles @ 80kph (50mph)	
			47,00-480 vehicles @ 50kph (32mph)	
3	Moderate high £20k - >£2000	<b>Occupation:</b> 14/day - 2mins/day <b>Pedestrians &amp; cyclists:</b> 7/hr - 2/hr	260-27 vehicles @ 110kph (68mph)	1/100 - >1/1,000
			320-33 vehicles @ 80kph (50mph)	
			470-48 vehicles @ 50kph (32mph)	
4	Moderate £2000 - >£200	<b>Occupation:</b> 1min/day - 2mins/week <b>Pedestrians &amp; cyclists:</b> 1/hr - 3/day	26-4 vehicles @ 110kph (68mph)	1/1,000 - > 1/10,000
			32-4 vehicles @ 80kph (50mph)	
			47-6 vehicles @ 50kph (32mph)	
5	Low £200 - >£20	<b>Occupation:</b> 1min/week - 1min/month <b>Pedestrians &amp; cyclists:</b> 2day - 2/week	3-1 vehicles @ 110kph (68mph)	1/10,000 - >1/100,000
			3-1 vehicles @ 80kph (50mph)	
			5-1 vehicles @ 50kph (32mph)	
6	Very low £20 - £1	<b>Occupation:</b> <1min/month <b>Pedestrians &amp; cyclists:</b> 1/week - 6/year	None	1/100,000 - 1/1,000,000

Vehicle, pedestrian & property targets are categorised by their frequency of use or their monetary value. The probability of a vehicle or pedestrian occupying a target area in, for example, target range 4 is between the upper and lower limits of >1/1,000 and 1/10,000. Using the value of statistical life (VOSL) of £2,000,000 the property repair or replacement value for target range 4 is £2,000 - £200

## What is Quantified Tree Risk Assessment? A Non-technical Summary

Tree safety management is a matter of balancing the Risk of Harm from falling trees with the benefits from trees. Although it may seem counter intuitive, the condition of trees should not be the first consideration. Instead, tree managers should first consider the usage of the land on which the trees stand, which in turn will inform the process of assessing the trees.

Quantified Tree Risk Assessment (QTRA) applies established and accepted risk management principles to tree safety management in accordance with ISO 31000:2009, *Risk management – Principles and guidelines*, which is published by national standards agencies. By quantifying the Risk of Harm as a probability, QTRA enables the tree manager to manage the risk from tree failure to widely accepted risk thresholds.

Using the QTRA approach, the land-use (people and property) upon which trees could fail is assessed and quantified first. This enables tree managers to determine whether or not and to what degree of rigour a survey or inspection of the trees is required. Where necessary, the tree or branch is then considered in terms of both size (potential impact) and probability of failure. Values derived from the assessment of these three components are combined to calculate the risk of harm as a probability, which can then be compared to advisory levels of risk acceptability.

The method moves the management of tree safety away from labelling trees as either 'safe' or 'unsafe', thereby requiring definitive statements of tree safety from either tree surveyors or tree managers. Instead, QTRA quantifies the risk of significant harm from tree failure in a way that enables tree managers to balance safety with tree value and operate to predetermined risk thresholds.

By taking a QTRA approach to tree risk, tree managers commonly find they spend less resources on assessing and managing tree risk, whilst maximising the benefits their tree populations provide. Furthermore, in the event of a 'tolerable' or 'acceptable' tree risk being realised, they are in a robust position to demonstrate that they have acted reasonably and proportionately.