Tree Risk Management Appraisal

at

Waddow Hall, Waddington Road, Clitheroe, Lancashire, BB7 3LD

Prepared by:

Bowland Tree Consultancy Ltd

July 2020

CONTENTS

1. CIVIL LAW REGARDING TREE OWNERSHIP AND DUTY OF CARE
2. QTRA METHODOLOGY OVERVIEW AND APPLICATION IN MANAGEMENT DECISIONS
3. SUMMARY OF SURVEY FINDINGS AND RECOMMENDATIONS
4. TREE SURVEY SCHEDULE
5. TREE SURVEY PLAN
6. QTRA PRACTICE NOTE

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TREE RISK MANAGEMENT APPRAISAL
WADDOW HALL, CLITHEROE

Project Details

Project No.:	BTC1989
Site:	Waddow Hall, Waddington Road, Clitheroe, BB7 3LD
Survey Type:	Negative Recording Walkover Tree Survey
Tree(s) Considered:	Within areas as identified by client on site
Report Time Frame:	12 months from date of issue
Next Inspection Date:	≈18 months from date of issue
Client:	Girl Guiding UK
Survey Dates:	18 & 19 June 2020
Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Report Prepared by:	Joseph Lambert BSc(Hons) FdSc MArborA
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Date of Issue:	16 July 2020
Version No:	1

1. CIVIL LAW REGARDING TREE OWNERSHIP AND DUTY OF CARE

1.1 Under civil law the owner of the land on which a tree stands, together with any party who has control over the tree's management, has a duty of care to take reasonable steps to prevent or minimise the risk of personal injury and/or damage to property from any tree located within the curtilage of the land in question.

1.2 In turn, it is accepted that these steps should normally include commissioning a qualified and experienced arboriculturist to survey the tree in order to identify and appraise any risk of harm to persons or damage to property that it may present and, where unacceptable risks are identified, taking suitable remedial action to negate or reduce those risks accordingly.

2. QTRA METHODOLOGY OVERVIEW AND APPLICATION IN MANAGEMENT DECISIONS

2.1 A survey was carried out in order to consider the general structural stability of the trees at the site and the associated risk of harm that they pose to persons and/or damage that they pose to property and, from this information, to make management recommendations to reduce any risks identified to be unacceptable to a level that is considered to be either tolerable or broadly acceptable (see Table 1, below).

2.2 The Quantified Tree Risk Assessment (QTRA) methodology utilised for the tree survey (see appended QTRA Practice Note for more details) quantifies the three components of tree failure risk, which are:
i. *Target* (something with potential to be harmed and/or damaged by the mechanical failure of tree parts);
ii. *Impact Potential*; and
iii. *Probability of Failure* (within the coming year).

2.3 The product of the three component values is the annualised 'Risk of Harm', which is a combined measure of the likelihood and the consequence of tree failure considered in terms of the loss within the coming year, and is expressed as a probability. In applying the 'Tolerability of Risk Framework' (ToR) the QTRA methodology divides the 'Risk of Harm' into three threshold values, being;
1. *Unacceptable* (i.e. >1/1,000), which is unacceptable and will not ordinarily be tolerated;
2. *Tolerable* (i.e. between 1/1,000,000 and 1/1,000, where the Risk of Harm will be tolerable if it is As Low As Reasonably Practicable (ALARP); but a Risk of Harm 1/10,000 or greater will not ordinarily be Tolerable where it is imposed on others, such as the public. In the Tolerable range management decisions are informed by consideration of the benefits and costs of risk control, including benefits provided by trees that would be lost to risk control measures; and
3. *Broadly Acceptable* (<1/1,000,000), which is already ALARP.

2.4 The QTRA advisory thresholds, (see Table 1, below) are proposed as a reasonable approach to balancing safety from falling trees with the costs of risk reduction. This approach takes account of the principles of ALARP and ToR, but does not dictate how these principles should be applied. While the thresholds can be the foundation of a robust policy for tree risk management, tree managers should make decisions based on their own situation, values and resources.

Table 1: QTRA Advisory Risk Thresholds:

Threshold	Description	Action
Risk of harm of 1/1,000 or greater	**Unacceptable** - Risks will not ordinarily be tolerated	▪ Control the risk
Risk of harm between 1/1,000 and 1/10,000	**Unacceptable** (where imposed on others) - Risks will not ordinarily be tolerated	▪ Control the risk ▪ Review the risk
	Tolerable (by agreement) Risks may be tolerated if those exposed to the risk accept it, or 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
Risk of harm between 1/10,000 and 1/1,000,000	**Tolerable** (where imposed on others) - Risks are tolerable if ALARP	▪ Assess costs and benefits of risk control ▪ Control the risk only where a significant benefit might be achieved at reasonable cost ▪ Review the risk
Risk of harm less than 1/1,000,000	**Broadly Acceptable** - Risk is already ALARP	▪ No action currently required ▪ Review the risk

2.5 As detailed in Table 1, above, a Risk of Harm less than 1/1,000,000 is Broadly Acceptable and already

ALARP (i.e. 'as low as reasonably practicable'). A Risk of Harm 1/1,000 or greater is unacceptable and will not ordinarily be tolerated. Between these two thresholds, the Risk of Harm is in the Tolerable region of the ToR Framework and will be tolerable if it is ALARP, but a Risk of Harm 1/10,000 or greater will not ordinarily be Tolerable where it is imposed on others, such as the public. Here, management decisions are informed by consideration of the benefits and costs of risk control, including benefits provided by trees that would be lost to risk control measures.

2.6 In respect of the above the assessor (i.e. Bowland Tree Consultancy Ltd) may consider the costs of risk control when providing options for management if specifically asked to do so, but the tree owner/manager, who owns the risk and therefore exercises control over the costs, must consider the balance and make the final management decision(s).

3. SUMMARY OF SURVEY FINDINGS AND RECOMMENDATIONS

3.1 A negative recording' 'Walkover Tree Survey' (see 'Schedule of Operations' appended to agreed project quote) was carried out on 18 and 19 June 2020 at the site under consideration. The survey extents were informed by the client's representative, Luke Gaskill, who provided plans of the site boundaries. In this respect it is noted that we were informed by the client that trees to the north of the site, which are within land under agricultural tenancy agreements, were not to be included within the remit of the walkover survey on behalf of Girl Guiding UK.

3.2 The survey identified 46 individual trees, 26 groups of trees and two woodlands as detailed in the appended Tree Survey Schedule (TSS) and Tree Survey Plan (TSP). The surveyed trees are in the young to mature age range and have heights of up to 29 metres, stem diameters of up to 1600 millimetres, and maximum diametrical crown spreads of up to approximately 22 metres.

3.3 The site is currently used as an activity centre for Girl Guiding UK and consists of a main residential building to the centre-south with a carpark to its east and several outbuildings. There are a number of outdoor activity and camping areas positioned around the centre of the wider site, with camping fields to the north of the main building, a low ropes course in a wooded area to its south-east, a high ropes course in a wooded area to its south-west, and an obstacle course and zip wire to its north-west. The River Ribble runs along the south of the main site which is used as part of the activity centre.

3.4 An access road into the site runs from Clitheroe Road in the east serving the car-park and the main building, with further hard surfaced internal tracks extending from the main building to the north to give access to the camping areas. A public footpath also runs from east to west through the site, initially following the access road from Waddington Road to the east, before passing to the north of the main building and out to join Edisford Road to the west. A further footpath, forming part of the Ribble Greenway footpath runs to the south of the river and passes through a section of land under the management of Waddow Hall.

3.5 The surveyed area is bordered to the north by agricultural ground, to the east by the moderately high usage Clitheroe Road and Waddington Road beyond which are further agricultural fields, to the south by the River Ribble, Clitheroe cemetery and further agricultural land, and to the west by the moderate usage Edisford Road, beyond which are further agricultural fields and Shireburne Caravan Park (see TSP).

3.6 As a component of this appraisal various targets were identified to be within falling distances of the surveyed trees, including, but not restricted to, pedestrians and vehicles and their occupants on Clitheroe Road and Edisford Road, pedestrians using the footpath through the site and to the south of the site, persons using the activity centre and outdoor activity equipment and facilities as well as various items of property such as buildings, parked vehicles and the outdoor activity equipment itself.

3.7 In turn, as highlighted with the colours red and orange in the appended Tree Survey Schedule and in Table 2 (overleaf), the risk assessment established that trees T4, T12, T15, T17, T27, T30, T34, T36, T37, T39, T44 and groups G1, G5, G18, G20, G22, G23, G24 and woodland W2 have calculated QTRA risk indices that fall within the unacceptable risk threshold range of 1/10,000 or over (please refer to Table 1, on the previous page, with regard to advisory tree risk thresholds). Consequently, as also detailed in Table Two, management recommendations have been made in order to negate the risk that these trees present, with both the trees, groups and woodlands being highlighted with the colours red and orange in Table 2, in the TSS, and on the TSP.

3.8 However, as also detailed in Table 2 (below), various works have been recommended to several of the surveyed trees with calculated QTRA risk indices that fall within the tolerable and broadly acceptable risk threshold ranges (as highlighted with the colours yellow and green, respectively), either for general non-risk management related reasons (as denoted with the suffix (M)) or, where relevant, to enable applicable trees to be inspected in further detail for risk assessment purposes (as denoted with the suffix (I)).

Table 2: Tree Work Recommendations:

No.	Species	Management Works Recommended*	Responsible Professional	Work Priority
T2	Oak	1. Remove torn and hanging branch (M).	1. Tree contractor	1. Moderate
T4	Sycamore	1. Remove tree due to identified increased risk of main stem failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
T5	Ash	1. Remove tree due to evident state of decline as a result of colonisation by Ash Dieback Disease, and subsequent projected increase in failure risk on further decline (M).	1. Tree contractor	1. Low
T6	Ash	1. Remove tree due to evident state of decline as a result of colonisation by Ash Dieback Disease, and subsequent projected increase in failure risk on further decline (M).	1. Tree contractor	1. Moderate
T10	Common Holly	1. Coppice Holly and Elm and subsequently manage as part of hedgerow (M).	1. Tree contractor	1. Low
T11	Ash	1. Remove tree due to evident state of decline as a result of colonisation by Ash Dieback Disease, and subsequent projected increase in failure risk on further decline (M).	1. Tree contractor	1. Low
T12	Sycamore	Remove tree due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
T14	Ash	1. Remove tree in accordance with good arboricultural management practice due to colonisation by Ash Dieback Disease (M).	1. Tree contractor	1. Low
T15	Common Beech	1. reduce height of remaining canopy by approximately 6m (to a similar height of neighbouring Beech trees) in order to reduce wind exposure and loading to upper branch system, and subsequently reduce leverage on weakened and decayed areas around main union, due to identified increased risk of failure and subsequently unacceptable risk of damage to property.	1. Tree contractor	1. High
T16	Ash	1. Remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
T17	Ash	1. Remove tree due to identified increased risk of branch failure and subsequent unacceptable risk of damage to property.	1. Tree contractor	1. High
T18	Ash	1. Remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
T20	Ash	1. Remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate

Table continued overleaf

Table 2: Tree Work Recommendations (cont.):

No.	Species	Management Works Recommended*	Responsible Professional	Work Priority
T21	Sycamore	1. Sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow future inspections (I).	1. Tree contractor/ Ground staff	1. Moderate
T27	Sycamore	1. Carry out aerial inspection of decay pocket now visible following death of ivy and subsequently report findings to tree consultant in order for them to re-consider risk, re-evaluate QTRA index, and recommend mitigation works if necessary.	1. Client to instruct climbing arborist	1. High
T30	Ash	1. Remove tree due to evident severe decline due to Ash Dieback Disease and identified increased risk and unacceptable risk of harm to persons.	1. Tree contractor	1. High
T31	Ash	1. Remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
T32	Ash	1. Sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow future inspections (I). 2. Block desire line path to south of tree along river bank with low brash barrier to discourage use.	1. Tree contractor/ Ground staff 2. Ground staff	1. Moderate
T33	Oak	1. Remove broken branches on west side of canopy (M).	1. Tree contractor	1. Moderate
T34	Sycamore	1. Remove tree due to identified increased risk of stem failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
T36	Common Beech	1. Remove tree due to identified increased risk of whole tree failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
T37	Sycamore	1. Remove tree due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
T38	Sycamore	1. Option 1: Prune tree to reduce top and west side of canopy by approximately 2.5m in order to re-balance it following utility pruning and reduce sail area in order to reduce weighting on decayed buttress root 2. Option 2: Remove tree due to buttress decay and subsequent potential progression of decay over long term.	1. Tree contractor 2. Tree contractor	1. Moderate
T39	Ash	1. Remove tree due to identified increased risk of branch failure as a result of colonisation by Ash Dieback Disease and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
T41	Ash	1. Sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow clear visible inspection (I). NB: Client to inform tree consultant when works to remove ivy have been completed.	1. Tree contractor/ Ground staff	1. High
T42	Ash	1. Remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Low

Table continued overleaf

Table 2: Tree Work Recommendations (cont.):

No.	Species	Management Works Recommended*	Responsible Professional	Work Priority
T43	Ash	1. Remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
T44	Oak	1. Prune tree to remove hanging branch from canopy. 2. Sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow future inspections (I).	1. Tree contractor 2. Tree contractor/ ground staff	1. High
T45	Beech	1. Option 1: Re-appraise physiological condition and progression of decay fruiting bodies in 12 to 13 months from date of report (i.e. during late summer 2021). NB: Client to inform tree consultant if this option is selected and subsequently arrange re-inspection date 2. Option 2: Remove tree due to identified increased risk of failure into adjacent cemetery and subsequent risk of damage to property.	1. Tree consultant 2. Tree contractor	1. Moderate
G1	Ash, Larch, Aspen, Oak, Goat Willow, Hawthorn	1. Restrict access to wooded area by blocking entrance pathway from adjacent field to west in light of condition of Ash and subsequent identified increased risk of failure and unacceptable risk of harm to persons. 2. Remove trees affected by Ash Dieback Disease in accordance with good arboricultural management practice (M).	1. Ground Staff 2. Tree contractor	1. High
G3	Common Ash	1. Remove Ash within group that are succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
G4	5no. Sycamore	1. Sever ivy around entire affected stem circumferences and remove ivy up to a height of approximately 2m in order to allow future inspections (I).	1. Tree contractor/ grounds staff	1. Moderate
G5	Ash, Larch, Sycamore, Wild Cherry	1. Remove all Ash within group due to severe decline as a result of colonisation by Ash Dieback Disease and identified increased and unacceptable risk of harm to persons.	1. Tree contractor	1. High
G6	Ash, Elm, Hazel, Horse Chestnut, Sycamore	1. Remove Ash trees within group succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Low
G8	Ash	1. Remove all dead and dying Ash trees within falling distance of camping areas (M).	1. Tree contractor/ Grounds staff	1. Moderate
G9	3no. Ash	1. Remove tree to south-east in accordance with good arboricultural management practice due to effects of colonisation by Ash Dieback Disease (M).	1. Tree contractor	1. Low
G 10	2no. Ash	1. Remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate

Table continued overleaf

Table 2: Tree Work Recommendations (cont.):

No.	Species	Management Works Recommended*	Responsible Professional	Work Priority
G 11	Beech, Ash, Elm, Plum, Sycamore, Elder, Cypress	1. Remove Ash trees within group succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
G 12	12no. Ash	1. Remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
G 15	approx. 7no. Larch, 1no. Silver Birch, 1no. Sycamore, 1no. Ash	1. Remove Ash trees within group succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
G 17	2no. Common Ash	1. Remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Low
G 18	Ash, Beech, Hawthorn, Oak, Sycamore	1. Remove Sycamores (see TSS) adjacent to road due to identified increased risk of stem failures and subsequent unacceptable risk of harm to persons. 2. Remove young to semi-mature Ash in group within falling distance of road due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor 2. Tree contractor	1. High 2. Moderate
G 19	2no. Common Beech	1. Remove group due to projected continued physiological and structural decline and resultant expected future increased risk index (M).	1. Tree contractor	1. Moderate
G 20	Sycamore	1. Remove deadwood over 50mm diameter from trees within striking distance of road due to identified increase risk of deadwood failure and subsequent unacceptable risk of harm to persons. 2. Prune tree to south-east to reduce height by approximately 6m to retrenched lower canopy in order to eliminate from striking distance of road.	1. Tree contractor 2. Tree contractor	1. High 2. High
G 21	2no. Ash	1. Remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	1. Tree contractor	1. Moderate
G 22	2no. Ash	1. Remove group due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High
G 23	2no. Ash	1. Remove trees due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	1. Tre contractor	1. High

Table continued overleaf

Table 2: Tree Work Recommendations (cont.):

No.	Species	Management Works Recommended*	Responsible Professional	Work Priority
G 24	Common Ash, Goat Willow, Hawthorn, Sycamore	1. Remove all Ash and dead Elm in group within striking distance of Clitheroe Road to east due to identified increased risk of branch failure and unacceptable risk of harm to persons. 2. Remove Goat Willow due to projected boundary wall displacement (M). 3. Sever ivy on Sycamore stem and remove around entire circumference up to a height of approximately 2m in order to facilitate future inspections (I). 4. Remove any attenuated young stems which significantly overhang road to east during works described above (M).	1. Tree contractor	1. High 2. Moderate 3. Moderate 4. Moderate
G 25	approx. 12no. Silver Birch, 1no. Cherry	1. Sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m on applicable trees in order to allow clear visible inspection (I). NB: Client to inform tree consultant when works to remove ivy have been completed	1. Tree contractor/ ground staff	1. High
G 26	7no. Sycamore, 2no. Holly, 1no. Copper Beech, 1no. Black Pine	1. Sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m on applicable trees in order to allow clear visible inspection (I).	1. Tree contractor/ ground staff	1. Moderate
W1	Ash, Beech, Sycamore, Wild Cherry	1. Sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m of all trees within falling distance of road and footpath in order to facilitate future inspections (I).	1. Tree contractor/ ground staff	1. Moderate
W2	Ash, Beech, Sycamore	1. Identify and remove Ash trees that are succumbing to Ash Dieback Disease within woodland due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	1. Tree contractor	1. High

*Note: it shall be the client's responsibility to arrange contact with the applicable local council's planning department in order to check for the presence of any statutory tree protection measures, such as the site's location within a Conservation Area and/or the presence of any Tree Preservation Orders, prior to scheduling or carrying out any tree works

3.9 With regard to general arboricultural management it was also noted during the survey that there is a significant presence of Ash Dieback Disease within the site. In this respect it is noted that, whilst the most prominent trees close to highways and footpaths have been identified and the risks that they pose evaluated, as per the scope of the survey, a potentially substantial number of other Ash trees on site are evidently succumbing, or likely to succumb, to the disease. As such, it is strongly recommended that a planned approach be adopted by those managing the site in order to monitor and remove any trees that succumb to the disease that are within falling distances of identifiable targets such as roads, footpaths and buildings. In turn, consideration should also be given to providing replacement trees of suitable species and in appropriate number in compensation of any Ash tree losses.

3.10 In this respect it is strongly advised that all management recommendations made herein to remove the Ash trees that are succumbing to the disease be carried out within 12 months of the date of this report as, whilst risks posed may be deemed tolerable at the time of the survey, it is anticipated that the foreseeable further decline and subsequent death of those trees will, in turn, increase their future risk of failure.

3.11 Additionally, given the high usage of the site during certain times of the year and the proximity of trees to adjacent high value targets such as Clitheroe Road, Waddington Road and Edisford Road, it is also strongly recommended that consideration be given to providing appropriate activity centre staff with basic

training to allow them to identify common defects in trees. In this respect it should be noted that activity centre staff members have the advantage of working on the site on a day to day basis and, as such, would likely be the first to encounter and subsequently identify defects, or to see changes in trees that could potentially become hazards, that, in turn, could pose an unacceptable risk of harm to persons and/or damage to property. Nonetheless, it should also be noted that, whilst basic tree survey skills for ground staff is a useful management tool, it would not be sufficient to replace detailed, periodic inspections by an arboriculturist. Accordingly, advice in this respect should be sought from an arboricultural consultant.

2.1 It is also advised that, following severe inclement weather events, activity centre staff undertake a walkover of the areas internal to the site that are under moderately high usage, as well as the areas adjacent to the high usage targets of roads to the east and west, in order to identify potential signs of incipient tree failure or recent tree failures. The implementation of such a system will allow the risks posed to be dealt with appropriately and, in turn, minimise potential for harm and/or damage to persons and/or property as a result of the failure of a tree part damaged during any such weather.

2.2 Furthermore, it is also recommended that usage of areas directly below and adjacent to tree canopies, such as the high ropes area, be restricted during times of severe inclement weather when tree failure is more likely to occur in order to reduce the occupancy in target areas during these times and, in turn, the associated risk of harm to persons.

2.3 During the survey it was also noted that there were several areas of high pedestrian usage on soft surfaces within the rooting areas of trees where activity equipment is installed and some ground compaction and subsequent risk of root damage was evident as a result, although it is noted that woodchips have been added in many of these areas to mitigate the effects of pedestrian ground. As such, it is strongly advised this practice be sustained in order to provide a continuous cover of woodchips in these areas and consequently reduce the risk of significant ground compaction and subsequent tree root damage within rooting zones.

2.4 Table 3, below, details the trees that are recommended for more detailed inspections for risk management related reasons following any works recommended in Table 2, along with their accompanying re-inspection schedule.

Table 3: Tree Re-Inspection Recommendations:

No.	Species	Re-Inspection Recommendations*	When?
T7	Common Oak	▪ Review stem base during Autumn 2020 in order to identify any fresh fungal fruiting bodies present. NB: Client to inform tree consultant when fungal fruiting bodies become evident.	Autumn 2020
T45	Beech	▪ Review tree canopy during to appraise canopy vitality following fire damage.	Summer 2021
T46	Beech	▪ Option 1: (see Table 2) Re-appraise physiological condition and progression of decay fruiting bodies in 12 to 13 months from date of report (i.e. during late summer 2021). NB: Client to inform tree consultant if this option is selected and subsequently arrange re-inspection date; or	Late Summer 2021
G 25	approx. 12no. Silver Birch, 1no. Cherry	▪ Re-inspect group following severance and removal of ivy.	Within 3 months of date of report

*Note: Unless otherwise specified, all inspections detailed in Table 3 are to be carried out by the project tree consultant

2.5 Finally, where trees are recommended for removal, whether for risk management purposes or for other arboricultural management reasons, then it is strongly recommended that replacement trees of suitable sizes and species be planted in appropriate locations throughout the site, both in order to mitigate for the loss of the multiple benefits they provide to the environment, and to help ensure continuity of canopy cover in the local area. Accordingly, new tree planting advice should be sought from an arboricultural consultant.

2.6 Subsequently, any new tree planting should be carried out in accordance with BS8545:2014 (Trees: From Nursery to Independence in the Landscape – Recommendations) to ensure they are provided with adequate care and maintenance following planting for their successful establishment and growth.

2.7 Finally, in consideration of the regular usage of various areas of the wider site that are within falling distance of trees, and the associated identified targets such as pedestrians and vehicles and their occupants, and trains using the adjacent railway line alongside the stakeholders' duty of care (see paragraph 1.1) it is subsequently recommended that, as a component of the review of the tree data and recommendations included herein, consideration be given to initiating an 'Individual Tree Survey' (see 'Schedule of Operations' appended to agreed project quote) of areas with trees that are identified to be under regular usage.

Site:	Waddow Hall, Waddington Road, Clitheroe, Lancashire, BB7 3LD
Client:	Girl Guiding UK
Brief:	Carry out a negative recording 'Walkover Tee Survey' within area specified by client, report on risk posed to persons and property, and make management recommendations where appropriate

Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Survey Date:	18 & 19 June 2020
Viewing Conditions:	Overcast, prolonged periods of light and heavy rain, and moderate winds
Job Reference:	BTC1989

No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
T1	Oak	M	10	620	9	G	▪ Three partially occluded basal cavities to a diameter of approximately 100mm, probed to depths of up to 300mm. ▪ Frequent bacterial canker growth throughout canopy from a height of 1.5m and up. ▪ Lateral crack in primary branch at a height of 5m to approximately 250mm diameter. ▪ Severe bark necrosis and evident hollowing on west primary branch to approximately 250mm diameter. ▪ Evidently previously heavily reduced to a height of approximately 9m.	▪	P = Primary branch of approximately 250mm diameter. T = Persons using grassed area adjacent to and below tree's canopies.	3	3	3	N/A	500 K	N/A
T2	Oak	M	14	650	15	G	▪ Moderate stem lean and biased canopy east. ▪ Moderate deadwood to approximately 100mm diameter. ▪ Torn and hanging branch of approximately 120mm diameter on south side of canopy at a height of approximately 4m.	▪ Tree contractor to remove torn and hanging branch (M).	P = Hanging torn branch of approximately 120mm diameter. T = Persons using grassed area below tree canopy.	3	3	2	N/A	50K	M
T3	Hybrid Black Poplar	M	25	1030	16	G	▪ Moderate ivy cover from ground level up to a height of approximately 8m. ▪ Multiple primary leaders arise from stem at a height of approximately 12m. ▪ Evident failure of several up to approximately 75mm diameter which were lying on ground; typical of species during inclement weather. ▪ Outdoor cinema seating area below tree's canopy to west.	▪ Client to prohibit use of cinema seating area below tree's canopy during periods of inclement weather due to tendency of tree species to shed smaller branches at these times.	P = Branches up to approximately 100mm diameter. T = Persons using outdoor cinema seating area below tree canopy to west.	3	4	2	N/A	500 K	N/A

HEADINGS & ABBREVIATIONS

NO.	TREE/GROUP REFERENCE NUMBER. REFER TO PLAN OR NUMBERED TAGS WHERE APPLICABLE
SPECIES:	COMMON NAME
AGE:	Y = YOUNG, SM = SEMI MATURE, EM = EARLY MATURE, M = MATURE, PM = POST MATURE
HEIGHT:	APPROXIMATELY 80% OF TREES ARE MEASURED USING AN ELECTRONIC CLINOMETER AND THE REMAINDER ESTIMATED AGAINST THE MEASURED TREES
DIAMETER:	STEM DIAMETER MEASURED OR ESTIMATED AT A HEIGHT OF APPROXIMATELY 1.3 METRES
CROWN SPREAD:	MEASURED OR ESTIMATED DIAMETER OF CROWN(S) AT THE WIDEST POINT
VITALITY:	A MEASURE OF PHYSIOLOGICAL CONDITION WHEREBY D = DEAD, MD = MORIBUND, P = POOR, M = MODERATE, G = GOOD
MANAGEMENT:	SUFFIXES: (M) = FOR GENERAL ARBORICULTURAL OR SILVICULTURAL MANAGEMENT; (S) = TO REMOVE OR REDUCE THE RISK OF DIRECT DAMAGE TO A FIXED STRUCTURE BY MEANS OF CIRCUMFERENTIAL ROOT, STEM OR BRANCH GROWTH; (I) = TO ENABLE THE TREE(S) TO BE INSPECTED FURTHER FOR RISK ASSESSMENT PURPOSES
TARGET RANGE:	HIGHEST VALUE TARGET THAT THE MOST SIGNIFICANT PART LIKELY TO FAIL COULD STRIKE. RANGES 1-6. 1 = HIGH, 6 = LOW VALUE/OCCUPANCY
RISK ASSESSMENT DESCRIPTION:	DESCRIPTION OF PART IDENTIFIED AS MOST LIKELY TO FAIL AND ASSOCIATED TARGET, ASSESSED IN ACCORDANCE WITH QTRA SYSTEM
SIZE RANGE:	SIZE CATEGORY OF MOST SIGNIFICANT PART CONSIDERED LIKELY TO FAIL - RANGES 1-4 WHEREBY 1 = LARGE, 4 = SMALL, P = PROPERTY
P.O.F:	PROBABILITY OF FAILURE WITHIN 12 MONTHS. RANGES 1-7. 1 = HIGH, 7 = LOW
REDUCED MASS %:	WHERE THE MASS OF A TREE OR BRANCH IS REDUCED BY DEGRADATION THE RISK INDEX IS MULTIPLIED TO REFLECT THE PERCENTAGE OF MASS REDUCTION
RISK INDEX:	E.G. RISK INDEX 20 = RISK OF SIGNIFICANT HARM 1 IN 20,000. AN ADDITIONAL FIGURE, IN BRACKETS, MAY BE SUFFIXED 'T' REPRESENTING THE RATE OF MULTIPLE OCCUPATION OVER THE YEAR, E.G. 10(10T) REPRESENTS A RISK OF HARM 1/10,000 TO 10 OCCUPANTS OR AN EQUIVALENT MONETARY VALUE. SEE QTRA PRACTICE NOTE FOR MORE INFORMATION REGARDING COLOURS USED TO SIGNIFY RISK INDEX
WORK PRIORITY:	H (HIGH) = TREE WORKS TO BE GIVEN IMMEDIATE CONSIDERATION. M (MODERATE) = TREE WORKS TO BE CARRIED OUT WITHIN 12 MONTHS OF SURVEY (TIMING MAY BE SPECIFIED IN MANAGEMENT RECOMMENDATIONS). L (LOW) = TREE WORKS THAT ARE NOT CONSIDERED ESSENTIAL FOR RISK MANAGEMENT PURPOSES, BUT ARE RECOMMENDED IN ACCORDANCE WITH PRUDENT ARBORICULTURAL MANAGEMENT (TO BE REVIEWED IN 12 MONTHS, OR SPECIFIED TIME, IF APPLICABLE). N/A = NOT APPLICABLE

Site:	Waddow Hall, Waddington Road, Clitheroe, Lancashire, BB7 3LD
Client:	Girl Guiding UK
Brief:	Carry out a negative recording 'Walkover Tee Survey' within area specified by client, report on risk posed to persons and property, and make management recommendations where appropriate

Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Survey Date:	18 & 19 June 2020
Viewing Conditions:	Overcast, prolonged periods of light and heavy rain, and moderate winds
Job Reference:	BTC1989

No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
T4	Sycamore	M	20	850	12	M	▪ Access for inspection partially impeded by location in contact with stone boundary wall to east and metal fencing to west, parts of which have grown into the main stem to a height of approximately 1m. ▪ Multiple stems arising from ground level with very tight unions and included bark, and subsequently measured as a single stem. ▪ Significant basal decay on south and west side with white rot decay causing *Ganoderma australe* fungal fruiting body to west side of stem at ground level. ▪ Areas of bark necrosis from ground level to a height of approximately 2m. ▪ Significant hollowing from ground level to a height of approximately 2m when sounded with nylon mallet.	▪ Tree contractor to remove tree due to identified increased risk of main stem failure and subsequent unacceptable risk of harm to persons.	P = Main stem of approximately 500mm diameter between ground level and a height of approximately 2m at first main union. T = Persons using staff path and grassed outdoor areas around buildings.	3	1	2	N/A	4K	H
T5	Common Ash	M	18	1x460 1x280 (ts)	12	M/P	▪ Canopy showing a moderate reduction in vitality with moderate twig dieback due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to evident state of decline as a result of colonisation by Ash Dieback Disease, and subsequent projected increase in failure risk on further decline (M).	P = Dead and moribund branches up to approximately 100mm diameter. T = Persons using lawn area adjacent to rear of single storey building.	3	4	3	N/A	<1M	L
T6	Common Ash	M	23	420	9	MD	▪ Located edge of woodland adjacent to access road to hall and car park. ▪ Canopy showing a severe reduction in vitality and severe secondary branch dieback associated with effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to evident state of decline as a result of colonisation by Ash Dieback Disease, and subsequent projected increase in failure risk on further decline (M).	P = Primary branches up to approximately 120mm diameter. T = Vehicles and occupants access road within site to south-east of tree.	3	3	2	N/A	50K	M

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T7	Common Oak	M	29	1240	22	G	▪ Unidentified old fruiting body on west side main stem at ground level between buttresses with slight staining adjacent. ▪ No significant hollowing detected to buttress roots when sounded with nylon mallet.	▪ Tree consultant to review stem base during Autumn 2020 in order to identify any fresh fungal fruiting bodies present. NB: Client to inform tree consultant when fungal fruiting bodies become evident.	P = Whole tree at ground level. T = Vehicles and occupants using access road to south of tree.	3	1	5	N/A	<1M	L
T8	Common Oak	M	21	910	12	M	▪ Areas of necrotic bark and evident decayed outer wood of approximately 600mm width of circumference and 200mm height, probed to a depth of approximately 25mm on west side. ▪ Staining visible on buttresses on south and east side. ▪ No significant hollowing evident when sounded with nylon mallet. ▪ Partially occluded pruning wounds up to approximately 250mm diameter on west side at height of approximately 3m and 6m with evidence of brown rot decay to centres.	▪ Tree consultant to monitor tree's physiological condition and for progression of basal stem decay as a component of future cyclical inspections.	P = Whole tree at ground level. T = Vehicles and occupants using access road to south of tree.	3	1	3	N/A	40K	L
T9	Common Oak	M	23	970	16	M	▪ Canopy showing a moderate reduction in vitality with a moderate amount of deadwood up to approximately 120mm diameter. ▪ Branch of approximately 320mm diameter at a height of approximately 8m on north-east side has evidently previously failed and has been removed.	▪ Tree consultant to monitor physiological condition as a component of future cyclical inspections.	P = Deadwood up to approximately 120mm diameter. T = Vehicles and occupants using access road below tree canopy.	3	3	3	N/A	500 K	L
T10	Common Holly	M	10	400	10	M-P	▪ Possibly located within area under agricultural tenancy and, as such, may not be included within survey area. ▪ Canopy sparse and showing a significant reduction in vitality. ▪ Single stem with multiple adventitious shoots and self-set Elm arising from base.	▪ Tree contractor to coppice Holly and Elm and subsequently manage as part of hedgerow (M).	P = Deadwood up to approximately 75mm diameter. T = Persons using pathway adjacent to road to east.	3	4	3	50%	<1M	L
T11	Common Ash	M	12.5	200	7	P	▪ Possibly located within area under agricultural tenancy and, as such, may not be included within survey area. ▪ Canopy showing a moderately significant reduction in vitality due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to evident state of decline as a result of colonisation by Ash Dieback Disease, and subsequent projected increase in failure risk on further decline (M).	P = Dead branches up to approximately 100mm diameter. T = Persons using path below tree's canopy.	3	4	3	N/A	<1M	L

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T12	Sycamore	M	20	650	18	G	▪ Stem bifurcates at a height of approximately 2m with tight union. ▪ Evident fracture between two primary branches of approximately 450mm diameter extending down to a height of approximately 1m from ground level. ▪ Probed either side to 200mm depth indicating crack extends through main stem. ▪ Necrotic strip and staining on west side of approximately 200mm width from ground level up to main bifurcation pint.	▪ Tree contractor to remove tree due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	P = Primary branches of approximately 450mm diameter at main bifurcation. T = Vehicles and occupants using access track to campsite to west of tree.	3	2	1	N/A	1K	H
T13	Common Ash	M	23	700	14	P	▪ Located to south edge of group adjacent to field with long grass below indicating area immediately adjacent and below tree is of low usage. ▪ Significant basal hollowing on south-east side with opening of approximately 500mm width evidently extending under buttresses. ▪ Incremental growth on main stem indicating hollowing extending upwards from base. ▪ Buttresses to north and west gave no indication of significant hollowing when sounded with nylon mallet. ▪ Canopy showing a significant reduction in vitality with significant twig dieback due to effects of colonisation by Ash Dieback Disease.	▪ Waddow Hall management to leave grassed area uncut both below and within striking distance of tree in order to deter access.	P = Whole tree at ground level. T = Persons using field area adjacent to tree.	4	1	2	N/A	40K	M
T14	Common Ash	EM	12	410	8	M-P	▪ Canopy showing a moderate reduction in vitality with moderate twig dieback due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree in accordance with good arboricultural management practice due to effects of colonisation by Ash Dieback Disease (M).	P = Deadwood up to 75mm. T = Persons using grassed area below tree's canopy	2	4	3	50%	1M	L

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T15	Common Beech	M	28	1600#	15	G	▪ Located within evidently low usage wooded area, and consequently partially sheltered by surrounding trees. ▪ Approximately 17m from rear of wooden cabin within camping area. ▪ Approximately 5000mm girth and therefore classed as 'veteran' (in accordance with Fig. 1.3 of Lonsdale (2013) - Ancient and Other Veteran Trees: Further Guidance on Management. ▪ Multiple stems arising from a height of approximately 2m with tight unions. ▪ Two stems arising to south of approximately 1m diameter have previously failed with significant decay visible within wounds. ▪ Remaining stem arising vertically has sustained a branch failure of approximately 300mm diameter at a height of approximately 6m with little occlusion and evident decay within. ▪ Canopy moderately biased to north.	▪ Tree contractor to reduce height of remaining canopy by approximately 6m (to a similar height of neighbouring Beech trees) in order to reduce wind exposure and loading to upper branch system, and subsequently reduce leverage on weakened and decayed areas around main union, due to identified increased risk of failure and subsequently unacceptable risk of damage to property.	P = Main stem of approximately 900mm diameter at a height of approximately 2m. T = Wooden cabin to south of tree.	3	P	2	N/A	3K	H
T16	Common Ash	EM	21	370	10	P	▪ Canopy showing a significant reduction in vitality with severe branch dieback extending into tertiary branches due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund branches up to approximately 150mm diameter. T = Vehicles and occupants using internal access road below tree's canopy.	3	3	3	N/A	500 K	M
T17	Ash	M	20	450#	14	P	▪ Located to edge of woodland W1 adjacent to low voltage overhead power line. ▪ Dense ivy to main stem and location behind stone wall impeded inspection. ▪ Canopy showing a severe reduction in vitality due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to identified increased risk of branch failure and subsequent unacceptable risk of damage to property.	P = Primary branches up to approximately 200mm diameter. T = Adjacent low voltage overhead power line.	3	P	2	N/A	3K	H

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T18	Common Ash	EM	20#	450#	14	M-P	▪ Located to edge of woodland W1 adjacent to low voltage overhead power line and overhanging public footpath to north. ▪ Dense ivy to main stem and location behind stone wall restricting inspection. ▪ Canopy showing a significant reduction in vitality due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund branches up to approximately 150mm diameter. T = Persons using footpath below tree's canopy.	3	3	2	N/A	50K	M
T19	Common Ash	M	30	1130	22	M	▪ Wound of approximately 250mm diameter on west side of main stem at a height of approximately 2m. ▪ Regrowth around wound of approximately 50mm diameter. ▪ Main stem bifurcates at a height of approximately 6m. ▪ Lower parts of canopy showing minor twig dieback possibly indicating early stages of colonisation by Ash Dieback Disease.	▪ Tree consultant to monitor tree's canopy condition as a component of future cyclical inspections.	P = Deadwood up to approximately 100mm diameter. T = Persons using access pathway to zip-wire below tree's canopy.	2	4	2	50%	100 K	L
T20	Common Ash	EM	21	460	14	P	▪ Dense ivy to main stem and primary branches. ▪ Canopy showing a severe reduction in vitality and significant tertiary branch dieback with deadwood up to approximately 120mm diameter in canopy due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Deadwood up to approximately 120mm diameter. T = Persons using seating area to east of tree.	2	3	3	N/A	50K	M
T21	Sycamore	M	25	1100	14	G	▪ Moderately dense ivy to upper main stem. ▪ Decay cavity on south side between buttresses with two openings up to approximately 200mm width, 700mm height, and evidently extending under buttresses. ▪ Buttress root to south of approximately 350mm diameter evident hollowing when sounded with nylon mallet. ▪ Bifurcates at height of approximately 3m with tight union and incremental strip to north side of union. ▪ Canopy showing good vitality and moderately biased to south-east away from low use path to north.	▪ Tree contractor or grounds maintenance staff to sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow future inspections (I). ▪ Tree consultant to monitor progression of stem decay and canopy vitality as a component of future cyclical inspections.	P = Whole tree at ground level. T = Persons using path internal to site to north of tree.	3	1	4	N/A	400 K	M

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T22	Common Beech	M	24	1450	24	G	▪ Referenced as T13 in 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Severe basal fluting, possibly indicative of star shake/internal cracking. ▪ Several instances of bark damage to stem base exhibiting non progressive decay. ▪ Stem bifurcates at a height of approximately 2m with a very tight fork. ▪ Large 500mm diameter spherical growth to stem at a height of approximately 16m, indicative of wound wood from previously failed large branch. ▪ Views of upper primary branches and canopy obscured by leaf cover.	▪ Tree consultant to monitor condition of tight branch union and basal damage as a component of future cyclical inspections.	P = Stem arising to south west from bifurcation point. T = Persons using high ropes course adjacent to tree.	2	1	4	N/A	40K	L
T23	Sycamore	M	20.5	680	14	G	▪ Referenced as tree T12 in previous 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Several instances of bark damage to stem base exhibiting none progressive decay. ▪ Frequent partially occluded pruning wounds to a diameter of approximately 140mm. ▪ Minor deadwood to a diameter of approximately 100mm.	▪	P = Deadwood up to approximately 100mm diameter. T = Persons using high ropes course below tree's canopy.	2	4	3	50%	1M	N/A
T24	Common Beech	M	23	1100	16	G	▪ Referenced as tree T11 in previous 2017 survey. ▪ Frequent climbing jugs bolted to stem, from base to a height of approximately 15m. ▪ Invasive cable bracing system attached at a height of approximately 15m. ▪ Metal chains to support parts of high ropes system in contact with tree stem and branches. ▪ Informed by document provided by Luke Gaskill at time of survey that tree was aerial inspected in November 2019 with no significant concerns or issues arising.	▪ Relevant professional responsible for maintenance of high ropes course to ensure cable bracing is periodically checked and adjusted when needed in order to avoid damage and restrictions to tree growth (M). ▪ NB: It is strongly recommended a soft barrier be installed between tree branches/ stems and metal chains in order to prevent damage to bark and cambium.	P = Deadwood up to approximately 100mm diameter. T = Persons using high ropes course below tree's canopy.	2	4	3	50%	1M	M

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T25	Sycamore	M	23	960	14	G	▪ Referenced as tree T6 in previous 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ D-ring bracket bolted to stem at a height of approximately 2m. ▪ Metal climbing brackets inserted up stem from a height of 3.5m to approximately 12m where stem bifurcates. ▪ Invasive cable bracing system evident at a height of approximately 12m; around base of north-eastern primary leader to a diameter of approximately 350mm with evident envelopment of bracing system. ▪ Small amount of deadwood up to approximately to 100mm diameter.	▪ Relevant professional responsible for maintenance of high ropes course to ensure cable bracing system is periodically checked and adjusted when needed in order to avoid damage and restrictions to tree growth (M).	P = Primary branch of approximately 350mm diameter with enveloped cable bracing system at a height of approximately 12m. T = Persons using high ropes course below tree's canopy.	2	2	5	N/A	100 K	M
T26	Sycamore	M	21	820	16	G	▪ Referenced as tree T7 in previous 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Moderate stem lean north-west. ▪ D-ring bracket bolted to stem at a height of approximately 2m. ▪ Metal climbing brackets inserted up stem from a height of 3.5m to approximately 12m. ▪ Frequent partially occluded pruning wounds to approximately 200mm diameter to a height of 12m. ▪ Stem bifurcates at a height of 10m. ▪ South primary leader bifurcates at approximately 12m. ▪ Invasive cable bracing round north primary leader and second south primary branch for high ropes course. ▪ Small amount of deadwood up to approximately 100mm diameter.	▪ Relevant professional responsible for maintenance of high ropes course to ensure cable bracing system is periodically checked and adjusted when needed in order to avoid damage and restrictions to tree growth (M).	P = Primary branch of approximately 350mm diameter with enveloped cable bracing system. T = Persons using high ropes course below tree's canopy.	2	2	4	N/A	100 K	M

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T27	Sycamore	M	20	1300	21	G	▪ Referenced as tree T8 in previous 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Ivy evidently severed and removed following previous survey. ▪ Four invasive cable brackets attached and enveloped to a height of approximately 4m. ▪ Stem trifurcates at a height of approximately 4.5m. ▪ Central and west leaders are crossed and rubbing with a subsequent wound evident a height of approximately 6m and decay pocket evident on western leader. ▪ Small amount of deadwood up to a diameter of approximately 80mm.	▪ Climbing arboriculturist to carry out aerial inspection of decay pocket now visible following death of ivy and subsequently report findings to tree consultant in order for them to re-consider risk, re-evaluate QTRA index, and recommend mitigation works if necessary.	P = Branch above decay pocket of approximately 350mm diameter. T = Persons using high ropes course below tree's canopy.	2	2	3	N/A	10K	H
T28	Common Beech	M	22	1150	20	G	▪ Referenced as tree T9 in previous 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Four invasive cable brackets attached and enveloped to a height of approximately 3.5m. ▪ Stump located to south-east of tree of previously removed Beech tree heavily decayed with immature *Kretzschmaria deusta* fungal fruiting bodies, however none detected on tree T27 at time of survey.	▪	P = Deadwood up to approximately 100mm diameter. T = Persons using high ropes course below tree's canopy.	2	4	3	50%	1M	N/A
T29	Common Beech	M	18	1100	20	G	▪ Previously referenced as tree T10 in 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Ascending primary branch, to a diameter of approximately 350mm, at a height of approximately 4m, with a tight union only on west side and potential for a 'cupboard door' type failure. ▪ Canopy has been significantly reduced in past to a height of approximately 15m, and is biased to south-east.	▪	P = Primary branch of approximately 350mm diameter at a height of approximately 4m. T = Persons using evidently lower usage area within high ropes course.	3	2	3	N/A	100 K	N/A

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T30	Common Ash	EM	22	450	10	MD	▪ Located to south of wooden camp fire and associated seating area. ▪ Canopy moribund and showing a severe secondary and primary branch dieback and reduction in vitality due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to evident severe decline due to Ash Dieback Disease and identified increased risk and unacceptable risk of harm to persons.	P = Branches up to approximately 150mm diameter. T = Persons using seating area below tree's canopy.	2	3	2	N/A	5K	H
T31	Common Ash	EM	16	1x420 1x250 (ts)	14	P	▪ Canopy showing a significant reduction in vitality with moderate twig and tertiary branch dieback due to effects of colonisation by Ash Dieback Disease. ▪ Attenuated stem arises to west from ground level over corner of high ropes course. ▪ Canopy moderately biased to south.	▪ Tree contractor to remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Deadwood up to approximately 100mm diameter. T = Persons using corner of high ropes area below tree's canopy.	2	4	3	N/A	500 K	M
T32	Common Ash	M	20	850	14	M	▪ Located in sheltered wooded group. ▪ Dense Ivy to main stem and into primary branches. ▪ Large pruning wound with partial occlusion and associated decay pocket of approximately 300mm diameter probed to a depth of approximately 400mm at a height of approximately 1.8m on north side. ▪ Moderately significant hollowing when sounded with nylon mallet. ▪ Canopy highly biased south away from adjacent United Utilities pumping station. ▪ Evident desire line along river bank approximately 10m away to the south	▪ Tree contractor or grounds maintenance staff to sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow future inspections (I). ▪ Ground staff to block desire line path to south of tree along river bank with low brash barrier to discourage use.	P = Main stem at a height of approximately 1.8m. T = Persons using desire line path to south of tree.	4	1	3	N/A	300 K	M
T33	Common Oak	M	16	790	10	G	▪ Upper canopy is evidently retrenching, although lower canopy is displaying good vitality. ▪ New obstacle course being installed below tree canopy to west. ▪ Two broken branches up to approximately 50mm diameter on west side. ▪ Deadwood up to approximately 150mm diameter present in canopy at top of tree where canopy has retrenched	▪ Tree contractor to remove broken branches on west side of canopy (M).	P = Deadwood up to approximately 120mm diameter. T = Persons using new obstacle course area.	2	3	3	N/A	50K	M

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No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
T34	Sycamore	M	21	1x780 1x560 (ts)	16	G	▪ Significant basal decay below point of bifurcation at 2m wide union. ▪ Large opening to south-west of approximately 1m in height, 500mm width and extending under entire buttress area. ▪ Adjoining cavity to north-east at ground level of approximately 300mm diameter. ▪ Further cavities between buttresses on south-west side. ▪ Hollowing evidently extends up larger stem to south.	▪ Tree contractor to remove tree due to identified increased risk of stem failure and subsequent unacceptable risk of harm to persons. NB: Stem to be retained at a height of approximately 8m for habitat value.	P = Main stem of approximately 560mm diameter arising to north. T = Persons using access path to zip wire to east of tree.	3	1	2	N/A	4K	H
T35	Common Beech	M	26	1400	22	G	▪ Several areas of previous bark wounds up to approximately 100mm diameter and frequent partially occluded decay pockets up to approximately 150mm diameter from loss/ pruning of branches. ▪ Target canker on north side at a height of approximately 1.8m and itself of approximately 200mm height and 900mm length around circumference. ▪ Relatively recent loss of branch of approximately 300mm diameter to south-east at a height of approximately 4.5m leaving broken stub of approximately 2m in length. ▪ No visible decay, but partially occluded wound on south-west side of remaining stub indicating decay pocket and stress notch for initial failure. ▪ Evidently unauthorised rope swings in tree canopy on north side and east side.	▪ Waddow Hall grounds staff to remove unauthorised rope swing. ▪ Tree consultant to monitor tree's physiological and structural condition as a component of future cyclical inspections.	P = Primary branches up to approximately 300mm diameter. T = Persons using access path to zip wire to south of tree.	3	2	3	N/A	100 K	L
T36	Common Beech	PM	24	1250	18	MD	▪ Canopy showing severe reduction in vitality with significant dieback to secondary branches in upper and western canopy to road. ▪ Area of necrotic bark on west side of stem from ground level to a height of approximately 1m, with evident hollowing and decay to buttresses below when sounded with nylon mallet. ▪ Canopy moderately biased to east away from road.	▪ Tree contractor to remove tree due to identified increased risk of stem failure and subsequent unacceptable risk of harm to persons.	P = Whole tree at ground level. T = Vehicles and occupants on Edisford Road to west.	2	1	3	N/A	4K	H

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Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Survey Date:	18 & 19 June 2020
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T37	Sycamore	PM	18	760	9	MD	▪ Canopy moribund with deadwood up to approximately 300mm diameter where primary branches have died back. ▪ Significant areas of basal hollowing all round main stem when sounded with nylon mallet and two small immature soft rot decay causing *Kretzschmaria deusta* fungal fruiting bodies visible on buttress to east.	▪ Tree contractor to remove tree due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	P = Deadwood up to approximately 300mm diameter. T = Vehicles and occupants on Edisford Road to west.	2	2	2	N/A	1K	H
T38	Sycamore	M	15	780	17	M	▪ Soft rot decay causing *Kretzschmaria deusta* fungal fruiting bodies to buttress root of approximately 200mm diameter on south side at ground level. ▪ Visible hollowing probed to a depth of 300mm and further hollowing detected to buttress root when sounded with nylon mallet. ▪ Remaining buttress roots sounded with nylon mallet and gave no indication of significant hollowing at time of survey. ▪ Evidently heavily pruned on east side away from high voltage overhead power line. ▪ Canopy consequently moderately to highly biased to south-east.	▪ Option 1: Tree contractor to prune tree to reduce top and west side of canopy by approximately 2.5m in order to re-balance it following utility pruning and reduce sail area in order to reduce weighting on decayed buttress root; and Tree consultant to review in 12 months following survey to monitor progression of decay within buttress area. ▪ Option 2: Tree contractor to remove tree due to buttress decay and subsequent potential progression of decay over long term.	P = Whole tree at ground level. T = Persons using footpath to south of tree.	3	1	3	N/A	40K	M
T39	Common Ash	M	26	790	16	MD	▪ Canopy showing a severe reduction in vitality due to effects of colonisation by Ash Dieback Disease with significant dieback extending into secondary and some primary branches.	▪ Tree contractor to remove tree due to identified increased risk of branch failure as a result of colonisation by Ash Dieback Disease and subsequent unacceptable risk of harm to persons.	P = Branches up to approximately 260mm diameter. T = Persons using footpath and wooded area below tree's canopy.	3	2	2	N/A	10K	H
T40	Sycamore	M	21	550	14	G	▪ Cavity of approximately 200mm width, 600mm height and 400mm depth on north side of main stem, with evidently recent fire damage within. ▪ Remaining buttresses gave no indications of significant hollowing extending within when sounded with nylon mallet.	▪ Tree consultant to monitor lower stem condition as a component of future cyclical inspections. ▪ Waddow Hall management to consider removal of tree if fire damage within cavity continues.	P = Whole tree at ground level. T = Persons using desire line paths within woodland.	3	1	4	N/A	400 K	L

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T41	Common Ash	M	18	450#	12	M	▪ Located in dense linear group restricting inspection. ▪ Dense Ivy to main stem and primary branches.	▪ Tree contractor or grounds maintenance staff to sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow clear visible inspection (I). NB: Client to inform tree consultant when works to remove ivy have been completed. ▪ Tree consultant to re-inspect tree following severance and removal of ivy. NB: QTRA risk index to be recalculated following re-inspection if considered necessary.	P = Deadwood up to approximately 100mm diameter. T = Persons using footpath adjacent to tree's canopy.	3	4	3	N/A	<1M	H
T42	Common Ash	EM	15	410	14	P	▪ Canopy showing a significant reduction in vitality and severe twig and tertiary branch dieback due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund branches up to approximately 100mm diameter. T = Persons using footpath adjacent to tree's canopy.	3	4	3	N/A	<1M	L
T43	Common Ash	M	25	1100	22	P	▪ Canopy showing a severe reduction in vitality with severe twig and tertiary branch dieback due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove tree due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Deadwood up to approximately 150mm diameter. T = Persons using pathway within cemetery to south of tree.	3	3	3	N/A	500 K	M
T44	Common Oak	M	17	900	20	G	▪ Branch of approximately 250mm diameter on west side at a height of approximately 6m has partially failed and is hanging within tree canopy to south over cemetery. ▪ Dense ivy restricting inspection.	▪ Tree contractor to prune tree to remove hanging branch from canopy. ▪ Tree contractor or grounds maintenance staff to sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow future inspections (I).	P = Partially failed hanging branch of approximately 250mm diameter. T = Persons using cemetery below tree's canopy.	3	3	1	N/A	5K	H

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T45	Common Beech	M	22	900	16	M/P	▪ Canopy severely fire scorched on south side as a result of burning of branches of neighbouring tree which has been felled.	▪ Tree consultant to review tree's canopy during summer 2021 to appraise vitality following fire damage.	P = Deadwood up to approximately 120mm diameter. T = Persons using adjacent cemetery.	4	3	3	N/A	<1M	L
T46	Common Beech	M	24	1150	22	G	▪ Part of wider linear group along boundary wall with lower use part of cemetery to west. ▪ Exposed buttresses on east side due to soil erosion from animals within field. ▪ Hollowing and necrosis of several buttresses on east side when sounded with nylon mallet. ▪ Several instances of immature soft rot decay causing *Kretzschmaria deusta* fungal fruiting bodies on east side. ▪ However, no mature fruiting bodies observed noted at time of survey thereby suggesting localised early stages of colonisation. ▪ Stem bifurcates at a height of approximately 2m with tight union. ▪ Canopy moderately biased to east over field.	▪ Option 1: Tree consultant to re-appraise physiological condition and progression of decay fruiting bodies in 12 to 13 months from date of report (i.e. during late summer 2021). NB: Client to inform tree consultant if this option is selected and subsequently arrange re-inspection date; or ▪ Option 2: Tree contractor to remove tree due to identified increased risk of failure into adjacent cemetery and subsequent risk of damage to property.	P = Whole tree at ground level. T = Grave headstones in cemetery to west of tree.	3	P	3	N/A	30K	M
G1	Ash, Larch, Aspen, Oak, Goat Willow, Hawthorn	EM	≤ 22	≤ 640	≤ 12	P-G	▪ Closely to moderately spaced group. ▪ Ground level rope and wood structure based assault course set up within group, with predominantly Ash trees around course. ▪ Moderate to severely enveloped ropes and straps in to various tree stems up to a height of approximately 2.5m. NB: Informed by Luke Gaskill when on site that ropes course is now redundant and no longer used. ▪ Widespread dieback evident throughout immediate areas of Ash due to effects of colonisation by Ash Dieback Disease, with large number of trees dead and dying and several in late stages of decline. ▪ Stems of up to approximately 250mm diameter of Ash are now dead or moribund.	▪ Ground staff to restrict access to wooded area by blocking entrance pathway from adjacent field to west in light of condition of Ash and subsequent identified increased risk of failure and unacceptable risk of harm to persons. ▪ Tree contractor to remove trees affected by Ash Dieback Disease in accordance with good arboricultural management practice (M).	P = Dead stems of Ash up to approximately 250mm diameter. T = Persons using wooded area below trees' canopies.	3	3	1	N/A	5K	H

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G2	2no. Black Pine, 1no. Atlas Cedar	M	≤ 26	≤ 900	≤ 18	M-G	▪ Closely spaced group. ▪ Most northerly Pine, which is largest tree in group, has a severe stem lean east towards adjacent marquee. ▪ Cedar has highly attenuated branch arising to the west.	▪	P = Stem of Pine leaning to north over marquee. T = Persons using marquee below Pine tree.	2	1	5	N/A	400 K	N/A
G3	Common Ash	SM-EM	≤ 16	≤ 290	≤ 8	M-P	▪ Group within wider wooded area located along staff access pathway. ▪ All showing moderate to severe reductions in vitality due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove Ash within group that are succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund stems up to approximately 200mm diameter. T = Staff using path below and adjacent to trees' canopies.	3	3	2	N/A	50K	M
G4	5no. Sycamore	M	≤ 21	≤ 1x690 1x470 (ts)	≤ 14	G	▪ Closely spaced linear group. ▪ Tree to north is twin stemmed from ground level with a tight union and one main stem of approximately 470mm arising to south-west over wooden outbuilding. ▪ Moderate to dense ivy to several stems, which partially impeded inspection.	▪ Tree contractor or grounds maintenance staff to sever ivy around entire affected stem circumferences and remove ivy up to a height of approximately 2m in order to allow future inspections (I). ▪ Tree consultant to monitor tight union of Sycamore as a component of future cyclical inspections.	P = Sycamore stem of approximately 470mm diameter arising to west from ground level. T = Persons using wooden outbuilding below trees.	2	2	4	N/A	100 K	M
G5	Ash, Larch, Sycamore, Wild Cherry	EM	≤ 22	≤ 600	≤ 8	G-P	▪ Closely to moderately spaced planted block of predominantly Larch. ▪ Ground level rope based assault course set up within group. ▪ Ground evidently compacted within root-zones due to foot traffic associated with usage. ▪ Light deadwood up to approximately 75mm in diameter throughout group. ▪ Approximately five Ash in late stages of decline with canopies showing severe secondary and primary branch dieback due to colonisation by Ash Dieback Disease.	▪ Tree contractor to remove all Ash within group due to severe decline as a result of colonisation by Ash Dieback Disease and identified increased and unacceptable risk of harm to persons.	P = Primary branches up to approximately 120mm diameter. T = Persons using ground level ropes course below trees' canopies.	2	3	2	N/A	5K	H

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G6	Common Ash, Elm, Hazel, Horse Chestnut, Sycamore	EM	≤ 12	≤ 410	≤ 10	G-P	▪ Closely spaced group. ▪ Ash within group showing moderate to severe reductions in vitality due to effects of colonisation by Ash Dieback Disease. ▪ Stem of Ash to north-east of group bifurcates at a height of approximately 1.75m with a tight union and canopy is showing a severe reduction in vitality and secondary branch dieback associated with effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove Ash trees within group succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund branches up to approximately 100mm diameter. T = Persons using grassed area immediately adjacent to access road.	3	4	3	N/A	<1M	L
G7	Beech, European Larch	M	≤ 21	≤ 600	≤ 12	G	▪ Closely spaced group forming shelterbelt copse on top of hill. ▪ NB: Larch are generally shallow rooted trees and can be particularly susceptible to wind throw by rootplate failure during high winds.	▪ Waddow Hall management to advise grounds maintenance staff to leave grass uncut directly below tree canopies to discourage tent pitching immediately adjacent to group due to failure susceptibility of Larch during high winds. ▪ Waddow Hall grounds staff to periodically appraise group, particularly after inclement weather, to check for failed or partially failed trees and, if necessary, to instruct suitable mitigation works prior to use of adjacent camping field.	P = Larch within group at ground level. T = Persons camping in field adjacent to group.	2	1	4	N/A	40K	L
G8	Common Ash	Y-SM	≤ 10	≤ 180	≤ 5	M-MD	▪ Mixture of evidently self-set and planted Ash below area of loosely spaced mature trees. ▪ Ash Dieback widespread within group with trees exhibiting moderate to severe reductions in vitality associated with effects of colonisation by Ash Dieback Disease. ▪ Several trees up to approximately 150mm diameter are evidently dead and have failed into wooded area.	▪ Tree contractor or grounds staff to remove all dead and dying Ash trees within falling distance of camping areas (M).	P = Young to semi-mature Ash trees up to approximately 150mm diameter at ground level. T = Persons camping in fields adjacent to group.	2	3	3	N/A	50K	M

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G9	3no. Common Ash	M	≤ 20	≤ 860	≤ 18	M-MD	▪ Crown of tree to south-east showing a severe reduction in vitality and severe secondary branch dieback associated with effects of colonisation by Ash Dieback Disease. ▪ Tree to centre has a target canker on east side of main stem at a height of approximately 1.5m. ▪ Trees to centre and north-west showing moderate to significant reductions in vitality.	▪ Tree contractor to remove tree to south-east in accordance with good arboricultural management practice due to effects of colonisation by Ash Dieback Disease (M). ▪ Tree consultant to monitor progression of decline of remaining trees within group through future cyclical inspections.	P = Secondary branches up to approximately 250mm diameter of tree to south-east. T = Persons using area below group.	4	2	3	N/A	1M	L
G10	2no. Common Ash	M	≤ 19	≤ 560	≤ 12	P	▪ Adjacent to access driveway to property. ▪ Canopies showing a moderately significant reduction in vitality with significant twig and tertiary branch dieback associated with effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund branches up to approximately 120mm diameter. T = Persons using access track below tree canopy.	2	3	3	N/A	50K	M
G11	Beech, Ash, Elm, Plum, Sycamore, Elder, Cypress	SM-EM	≤ 19	≤ 680	≤ 14	G-P	▪ Closely to moderately spaced woodland belt. ▪ Several Beeches throughout group have tight forks and included bark unions. ▪ Bark damage to tree bases throughout group, likely from animal damage. ▪ Upper canopy inspections impeded by dense lower foliage within group. ▪ Ash within group showing moderate symptoms of effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove Ash trees within group succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	P = Beech stems up to approximately 200mm diameter at tight unions. T = Persons using wooded area and adjacent tracks/footpaths.	2	3	3	N/A	50K	M
G12	approx. 12no. Ash	EM	≤ 18	≤ 300	≤ 8	P-MD	▪ Part of wider wooded group located to either side of footpath internal to site and to south-west corner of high ropes course. ▪ Canopies showing moderate to severe reductions in vitality and severe secondary branch dieback due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund branches up to approximately 150mm diameter. T = Persons using footpath below group's canopy.	3	3	2	N/A	50K	M

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G13	3no. Sycamore, 1no. Beech	M	≤ 22	≤ 1000	≤ 12	G	▪ Referenced as group G6 in previous 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Moderately spaced group. ▪ Frequent bark damage to stem bases throughout group. ▪ Sycamore located to west of group has evident decay pocket on south-east side at a height of approximately 1.5m probed to a depth of approximately 200mm.	▪	P = Deadwood up to approximately 120mm diameter. T = Persons using high ropes course below group's canopy.	2	3	3	50%	100 K	N/A
G14	2no. Sycamore	M	≤ 20	≤ 700	≤ 11	G	▪ Referenced as group G5 in previous 2017 survey. ▪ Located within 'high-ropes' climbing area. ▪ Moderate instances of partially occluded pruning wounds to a diameter of approximately 150mm from base to a height of approximately 15m. ▪ Several instances of deadwood to a diameter of approximately 100mm. ▪ Both canopies moderately suppressed by larger trees to east and west.	▪	P = Deadwood up to approximately 100mm diameter. T = Persons using high ropes course below trees' canopy.	2	4	3	50%	1M	N/A
G15	approx. 7no. Larch, 1no. Silver Birch, 1no. Sycamore, 1no. Ash	SM-EM	≤ 21	≤ 420	≤ 10	G-P	▪ Referenced as group G4 in 2017 survey. ▪ Ash within group showing a moderately significant reduction in vitality and significant secondary branch dieback due to effects of colonisation by Ash Dieback Disease. ▪ Frequent deadwood from Larch up to approximately 50mm diameter lying on ground.	▪ Tree contractor to remove Ash trees within group succumbing to Ash Dieback Disease due to evident state of decline and projected further decline, and subsequent increase in failure risk (M).	P = Dead and moribund branches up to approximately 100mm diameter from Ash. T = Persons using high ropes course below group's canopy.	2	4	2	N/A	50K	M

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G16	4no. Corsican Pine, 1no. Deodar Cedar	M	≤ 25	≤ 940	≤ 14	G	▪ Closely spaced group. ▪ Stem of Pine located to south-west, which is largest tree in group, bifurcates at a height of approximately 4m with a tight union and natural bracing evident at a height of approximately 6m. ▪ Stem of central Cedar bifurcates at a height of approximately 4m with a tight union. ▪ Minor deadwood up to approximately 100mm diameter.	▪	P = Deadwood to approximately 100mm diameter. T = Persons using surrounding recreational field.	3	4	3	N/A	<1M	N/A
G17	2no. Common Ash	M	≤ 22	≤ 750	≤ 18	MD	▪ Canopies showing severe reductions in vitality and severe secondary and primary branch dieback due to effects of colonisation by Ash Dieback Disease. ▪ Not accessed to inspect due to location on steep grass bank adjacent to zip wire tower.	▪ Tree contractor to remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P= branches up to approximately 250mm diameter. T = Persons using grass bank adjacent to zip-wire access area.	4	3	2	N/A	500 K	L
G18	Ash, Beech, Hawthorn, Oak, Sycamore	Y-M	≤ 24	≤ 760	≤ 12	G-MD	▪ Small wooded copse adjacent to Edisford Road on a blind bend and bordering narrow section of road. ▪ Approximately six semi-mature to early-mature Sycamore within boundary hedge adjacent to road showing a severe reduction in vitality with moderately significant deadwood up to approximately 180mm diameter and dense ivy to main stems. ▪ Approximately four young to semi-mature Ash showing a significant reduction in vitality with tertiary branch dieback due to effects of colonisation by Ash Dieback Disease and overhanging road. ▪ Ash tree to south-west of group has evidently had primary branch struck at a height of 4m on west side by passing large vehicles.	▪ Tree contractor to remove Sycamores (see comments) adjacent to road due to identified increased risk of stem failures and subsequent unacceptable risk of harm to persons. ▪ Tree contractor to remove young to semi-mature Ash in group within falling distance of road due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Dead stems up to approximately 180mm diameter. T = Vehicles and occupants using Edisford Road.	3	3	1	N/A	5K	H

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G19	2no. Common Beech	M	≤ 21	≤ 900	≤ 10	P	▪ Loosely spaced pair located in grassland field. ▪ Canopies showing significant reductions in vitality with dieback to upper canopies. ▪ Tree to north-east has slight stem lean into field, stem hollowing at 7m on roadside from removal of previous stem, and biased canopy to field. ▪ Tree to south-west has necrotic bark on buttresses to east and large diameter deadwood in upper canopy up to approximately 200mm diameter. ▪ Both trees approaching later stages of decline.	▪ Tree contractor to remove group due to projected continued physiological and structural decline and resultant expected future increased risk index (M).	P = Deadwood up to approximately 200m diameter. T = Vehicles and occupants using Edisford Road to west.	3	3	2	N/A	50K	M
G20	3no. Sycamore	M	≤ 20	≤ 750	≤ 10	M-P	▪ Three Sycamore which are part of a wider group. ▪ All have upper canopy retrenchment with moderately significant amounts of deadwood up to approximately 120mm diameter in upper canopy. ▪ Tree to south-east within striking distance of road has a significant area of basal decay on north-west side of stem at ground level of approximately 1m width around circumference of buttress and up to 700mm height with soft outer wood probed to depth of approximately 200mm. ▪ Historic cavity with large occlusions on east side buttresses surrounding east cavity sound, and slightly biased canopy to east	▪ Tree contractor to remove deadwood over 50mm diameter from trees within striking distance of road due to identified increase risk of deadwood failure and subsequent unacceptable risk of harm to persons. ▪ Tree contractor to prune tree to south-east to reduce height by approximately 6m to retrenched lower canopy in order to eliminate from striking distance of road.	P = Deadwood up to approximately 120mm diameter. T = Vehicles and occupants on Edisford Road to west.	2	3	2	50%	10K	H
G21	2no. Common Ash	PM	≤ 18	≤ 700	≤ 14	P-D	▪ Part of wider linear group along field boundary with cemetery. ▪ Likely all parts of a now outgrown hedgerow. ▪ Dense ivy impeded inspection, although tree to south is evidently largely dead and has sustained a 200mm diameter primary branch failure into field. ▪ Tree to north showing a moderately significant reduction in vitality due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove group due to effects of colonisation by Ash Dieback Disease and projected further decline, and subsequent increase in failure risk (M).	P = Branches up to approximately 200mm diameter. T = Grave headstones in cemetery to west of tree.	4	P	2	N/A	30K	M

Site:	Waddow Hall, Waddington Road, Clitheroe, Lancashire, BB7 3LD
Client:	Girl Guiding UK
Brief:	Carry out a negative recording 'Walkover Tee Survey' within area specified by client, report on risk posed to persons and property, and make management recommendations where appropriate

Surveyor:	Joseph Lambert BSc(Hons) FdSc MArborA
Survey Date:	18 & 19 June 2020
Viewing Conditions:	Overcast, prolonged periods of light and heavy rain, and moderate winds
Job Reference:	BTC1989

No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
G22	2no. Common Ash	M	≤ 16#	≤ 450#	≤ 16	P-MD	▪ Closely spaced pair within garden of Grundy Cottages, but indicated as within client's management boundaries. ▪ Dense ivy from ground level and dominant within canopy completely impeded visual inspection. ▪ Canopies both showing a severe reduction in vitality with severe dieback extending into secondary branches due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove group due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	P = Dead and moribund branches up to approximately 150mm diameter. T = Vehicles and occupants on Waddington Road to east.	2	3	2	N/A	5K	H
G23	2no. Common Ash	EM	≤ 15	≤ 400#	≤ 12	P-MD	▪ Pair of Ash located to edge of wooded area adjacent to road. ▪ Dense ivy from ground level extending into canopy, which significantly impeded inspection. ▪ Canopies showing a severe reduction in vitality with severe twig and secondary branch dieback due to effects of colonisation by Ash Dieback Disease.	▪ Tree contractor to remove trees due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	P = Dead and moribund branches up to approximately 120mm diameter. T = Vehicles and occupants on Clitheroe Road to east.	2	3	2	N/A	5K	H
G24	Common Ash, Goat Willow, Hawthorn, Sycamore	Y-EM	≤ 18	≤ 450	≤ 14	G-MD	▪ Largely self-set group of young to early-mature trees adjacent to road. ▪ Approximately ten semi-mature to early-mature Ash overhanging road to northern end of group on steep bank to east down to road showing severe reduction in vitality and secondary and primary branch dieback due to effects of colonisation by Ash Dieback Disease. ▪ Sycamore to centre has dense ivy to main stem ▪ Semi-mature dead Elm to south of group within striking distance of road. ▪ Goat Willow to centre of group has a moderate stem lean to south-east over road from ground level with slightly raised ground on south-west side of stem indicating a possible previous partial rootplate failure. ▪ Main stem in very close proximity to boundary wall and likely to displace through future incremental growth.	▪ Tree contractor to remove all Ash and dead Elm in group within striking distance of Clitheroe Road to east due to identified increased risk of branch failure and unacceptable risk of harm to persons. ▪ Tree contractor to remove Goat Willow due to projected boundary wall displacement (M). ▪ Tree contractor to sever ivy on Sycamore stem and remove around entire circumference up to a height of approximately 2m in order to facilitate future inspections (I). ▪ Tree contractor to remove any attenuated young stems which significantly overhang road to east during works described above (M).	P = Deadwood up to approximately 150mm diameter. T = Vehicles and occupants using Clitheroe Road to east.	2	3	2	N/A	5K	H

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Survey Date:	18 & 19 June 2020
Viewing Conditions:	Overcast, prolonged periods of light and heavy rain, and moderate winds
Job Reference:	BTC1989

No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
G25	approx. 12no. Silver Birch, 1no. Cherry	M	≤ 16	≤ 410	≤ 12	G	▪ Linear group located along roadside within dense Hawthorn hedge and as such unable to fully access group to inspect in detail. ▪ Dense ivy to several stems extending into canopies further restricting inspection.	▪ Tree contractor or grounds maintenance staff to sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m on applicable trees in order to allow clear visible inspection (I). NB: Client to inform tree consultant when works to remove ivy have been completed. ▪ Tree consultant to re-inspect group following severance and removal of ivy. NB: QTRA risk index to be recalculated following re-inspection if considered necessary.	P = Deadwood up to approximately 75mm diameter. T = Vehicles and occupants using Clitheroe Road to east.	2	4	3	50%	1M	H
G26	7no. Sycamore, 2no. Holly, 1no. Copper Beech, 1no. Black Pine	M	≤ 28	≤ 1270	≤ 24	G	▪ Previously referenced as group G9 in 2017 survey. ▪ Sycamore located to east of access road bifurcates with tight union and included bark with adaptive growth to either side. ▪ Copper Beech has significant sweeping stem lean to north-west from ground level before correcting by a height of approximately 7m. ▪ Two Sycamore to west side of drive are twin stemmed from ground level with tight unions and moderate ivy cover. ▪ Informed by Luke Gaskill that area adjacent and below group is no longer used for events marquee.	▪ Tree contractor or grounds maintenance staff to sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m in order to allow clear visible inspection (I). ▪ Tree consultant to monitor condition of union of Sycamore to east of access road as a component of future cyclical inspections.	P = Stem of Sycamore at main union at a height of approximately 1.5m. T = Vehicles and occupants using access driveway below tree canopy.	3	1	4	N/A	400 K	M
W1	Ash, Beech, Sycamore, Wild Cherry	SM-M	≤ 25	≤ 650	≤ 18	G-P	▪ Several semi-mature to early-mature Ash within woodland showing moderately significant reductions in vitality due to effects of colonisation by Ash Dieback Disease. ▪ Several stems adjacent to internal access road and footpath to north have dense ivy which impeded inspection.	▪ Tree contractor or grounds maintenance staff to sever ivy around entire stem circumference and remove ivy up to a height of approximately 2m of all trees within falling distance of road and footpath in order to facilitate future inspections (I).	P = Deadwood up to approximately 120mm diameter. T = Persons using wooded area below tree canopy.	3	3	3	50%	1M	M

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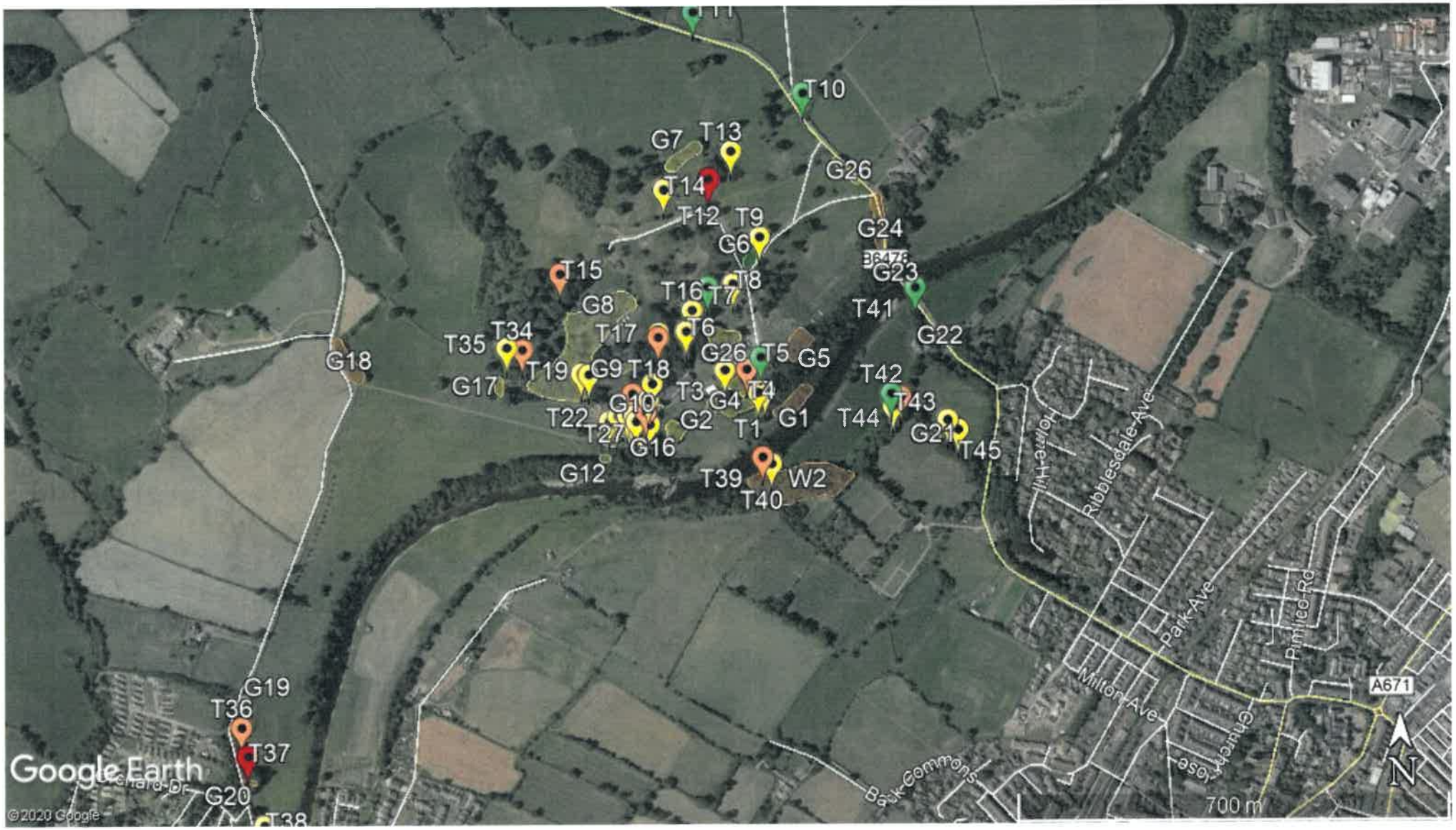
No.	Species	Age	Height (m)	Stem Diam. (mm)	Crown Spread (m)	Vitality	Comments	Management Recommendations	Risk Assessment Description (Part/Target)	Target	Size	P.O.F	Reduced Mass %	Risk Index	Work Priority
W2	Ash, Beech, Sycamore	M	≤ 20	≤ 600	≤ 18	G-MD	▪ Mixed woodland on steep bank, with very dense vegetation in places which impeded inspection. ▪ Approximately eleven Ash showing severe reductions in vitality and dieback extending into secondary and primary branches due to effects of colonisation by Ash Dieback Disease. ▪ Dense ivy to many trees. ▪ Full leaf canopies further impeded inspection in parts.	▪ Tree contractor to identify and remove Ash trees that are succumbing to Ash Dieback Disease within woodland due to identified increased risk of branch failure and subsequent unacceptable risk of harm to persons.	P = Dead Ash branches up to approximately 250mm diameter. T = Persons using desire line paths and defined footpaths through and adjacent to woodland.	3	2	2	N/A	10K	H



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*** See QTRA Methodology Overview and Application in Management Decisions Section of Report for details regarding Risk of Harm**

Site: Waddow Hall, Waddington Road, Clitheroe, BB7 3LD

Job No.: BTC1998

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Date: July 2020

TREE SURVEY PLAN

(Master Plan)

Bowland Tree Consultancy Ltd

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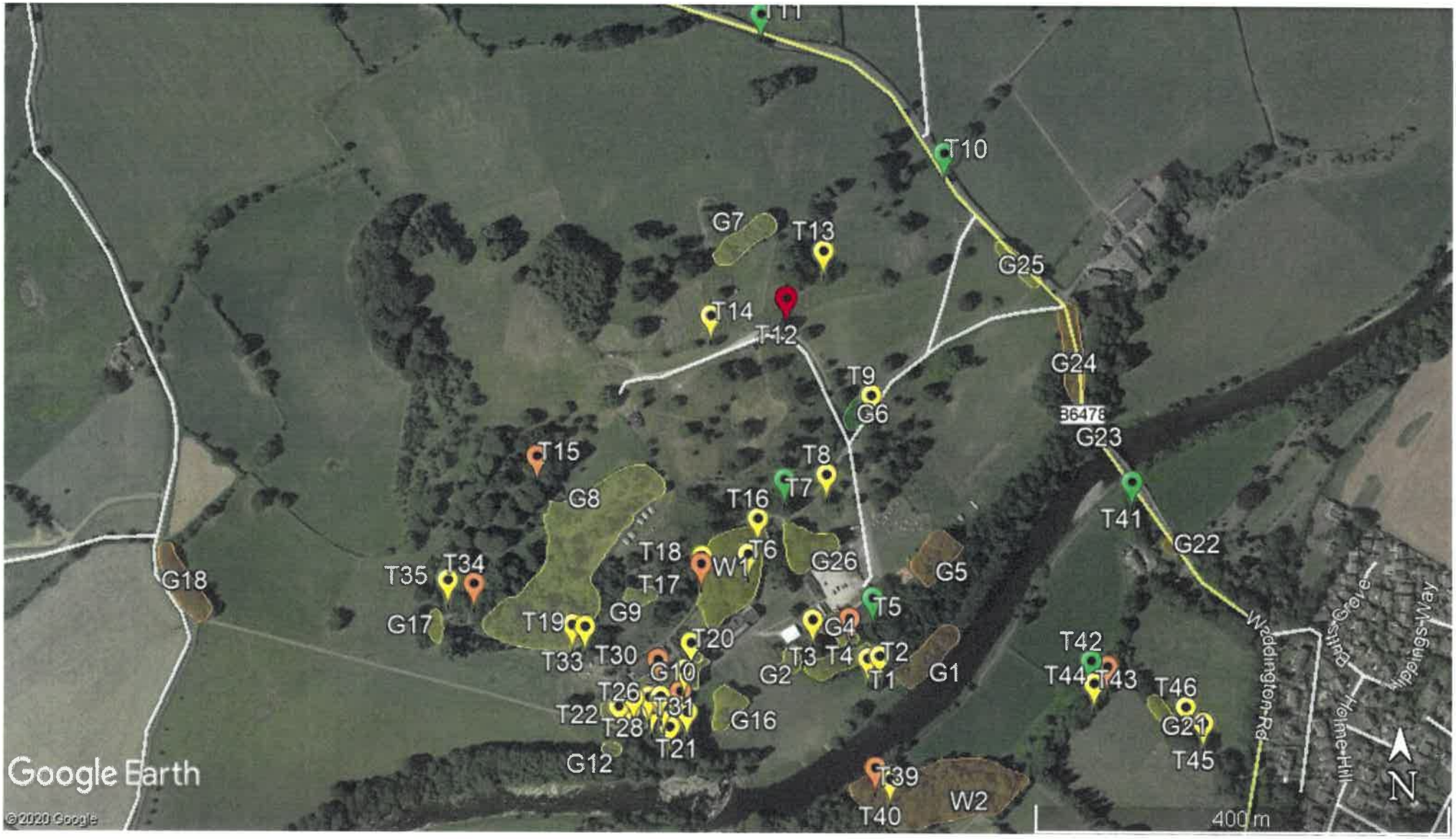

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Site: Waddow Hall, Waddington Road, Clitheroe, BB7 3LD

Job No.: BTC1998

Scale: Not to Scale

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Date: July 2020

TREE SURVEY PLAN

(Overview Plan North)

Bowland Tree Consultancy Ltd

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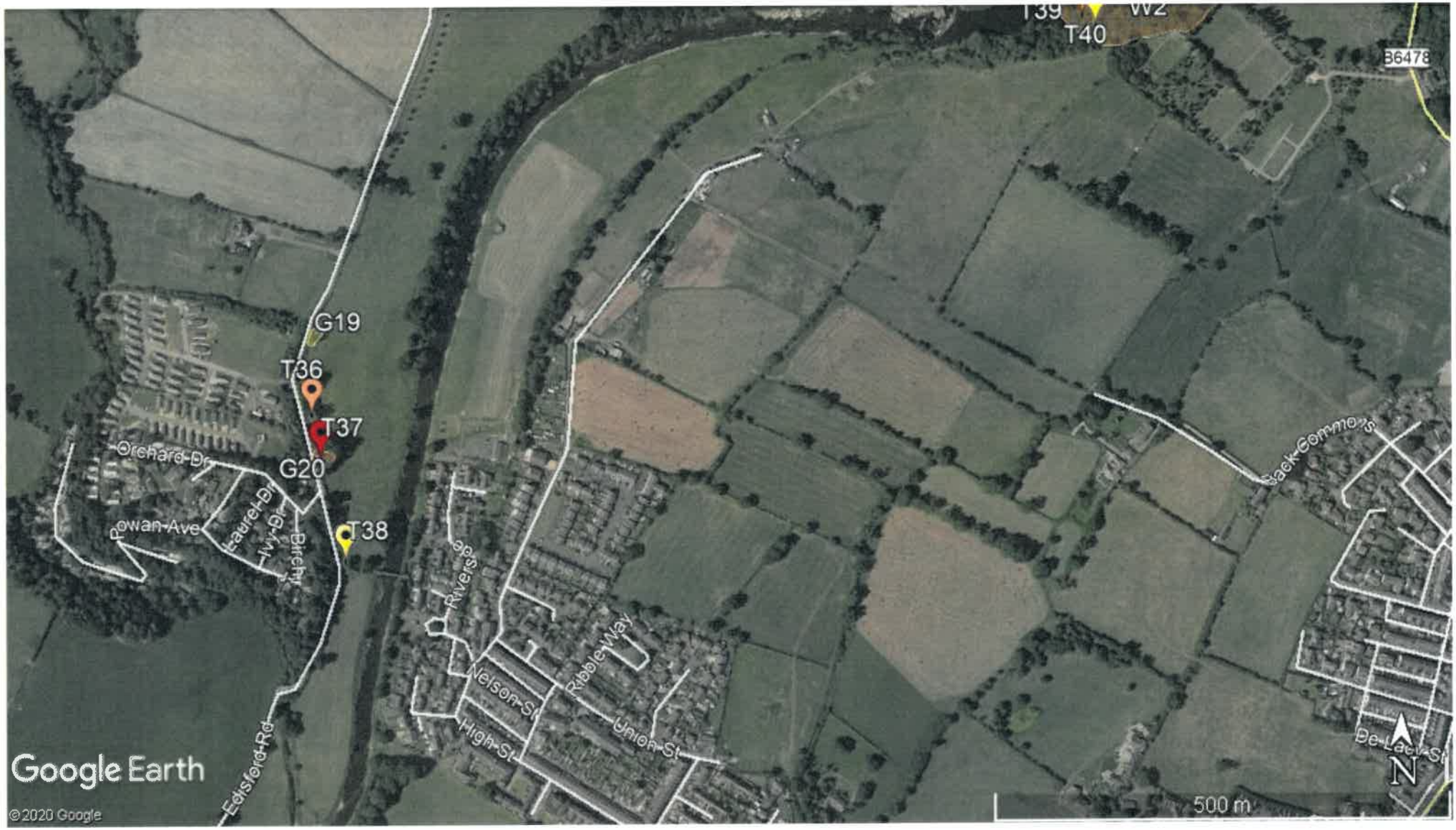

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Job No.: BTC1998

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Date: July 2020

TREE SURVEY PLAN

(Overview Plan South)

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Job No.: BTC1998

Scale: Not to Scale

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Date: July 2020

TREE SURVEY PLAN

(Plan 1 of 14)

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TREE SURVEY PLAN

(Plan 2 of 14)

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*** See QTRA Methodology Overview and Application in Management Decisions Section of Report for details regarding Risk of Harm**

Site: Waddow Hall, Waddington Road, Clitheroe, BB7 3LD

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Date: July 2020

TREE SURVEY PLAN

(Plan 3 of 14)

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TREE SURVEY PLAN

(Plan 4 of 14)

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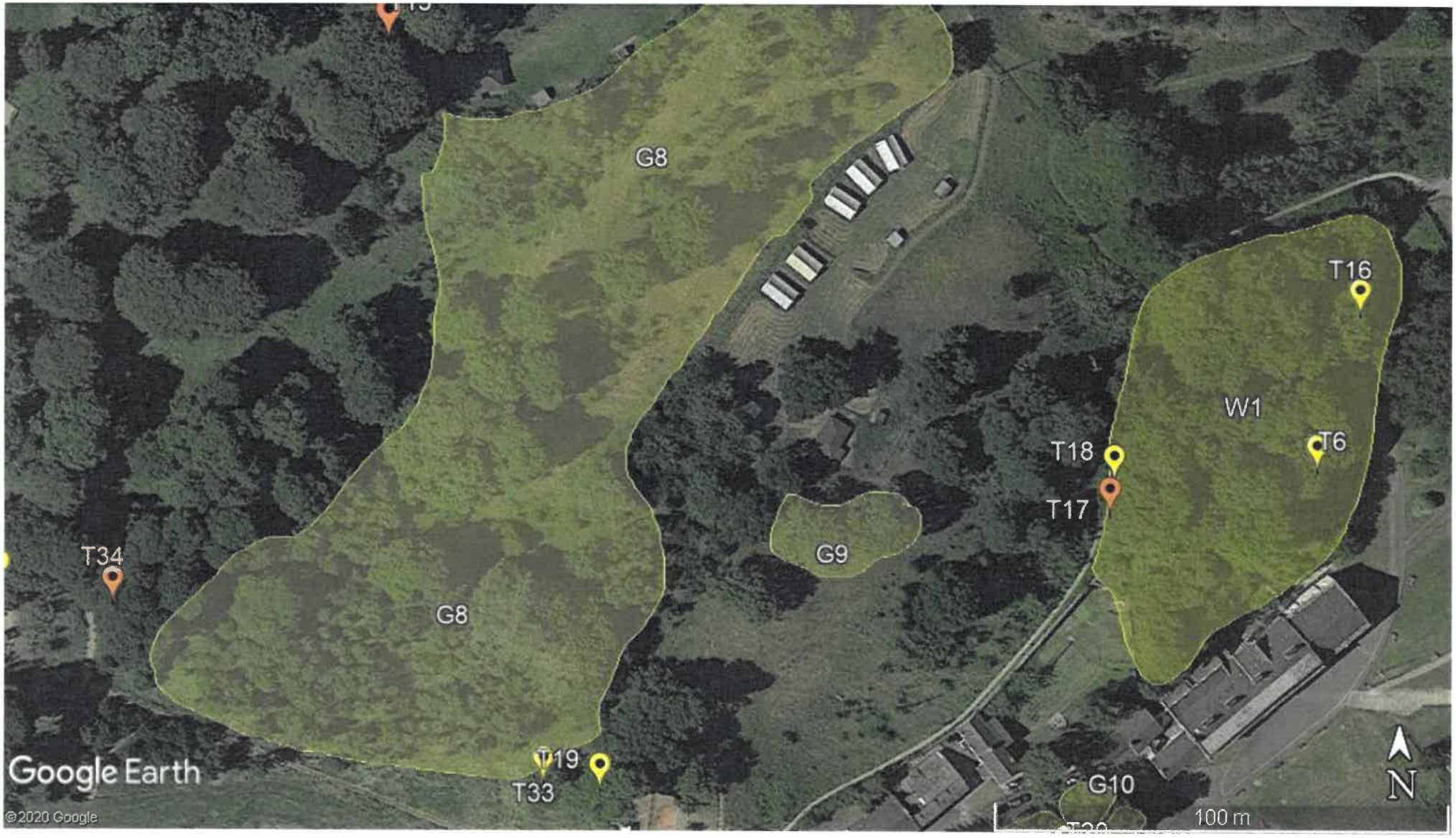

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Site: Waddow Hall, Waddington Road, Clitheroe, BB7 3LD

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TREE SURVEY PLAN

(Plan 5 of 14)

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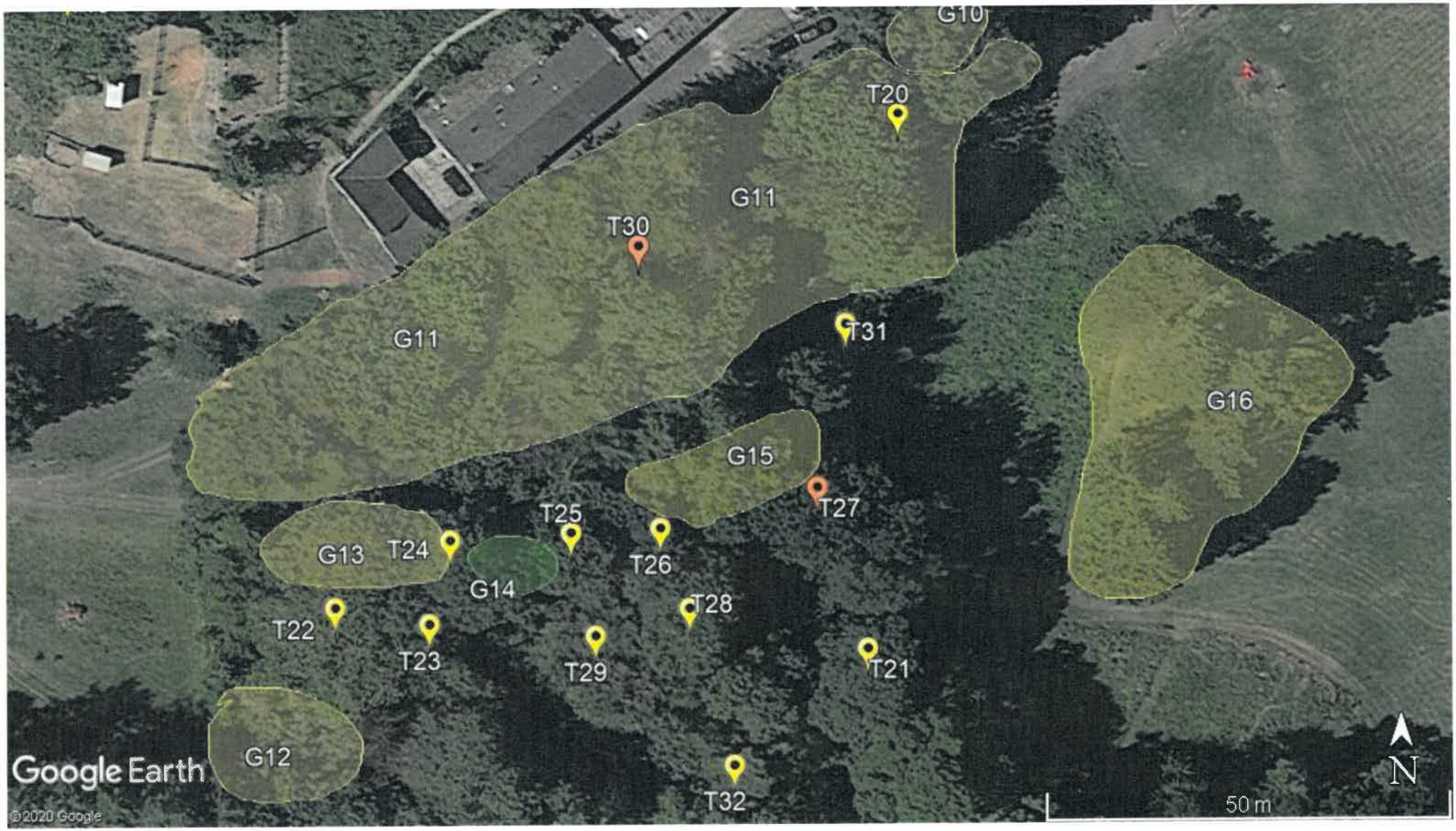

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TREE SURVEY PLAN

(Plan 6 of 14)

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Job No.: BTC1998

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TREE SURVEY PLAN

(Plan 7 of 14)

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TREE SURVEY PLAN

(Plan 8 of 14)

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Date: July 2020

TREE SURVEY PLAN

(Plan 9 of 14)

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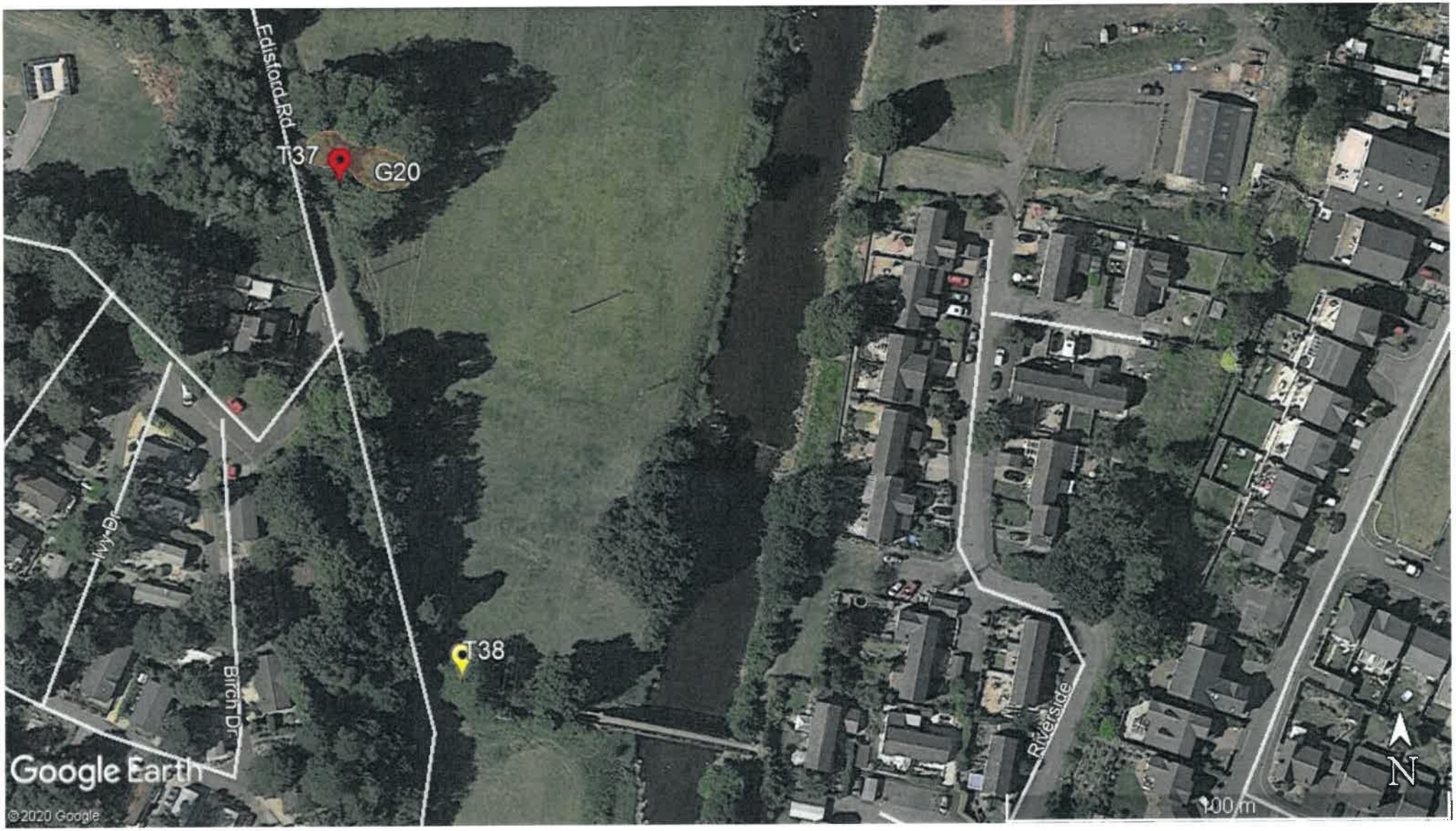

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Job No.: BTC1998

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Date: July 2020

TREE SURVEY PLAN

(Plan 10 of 14)

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Job No.: BTC1998

Scale: Not to Scale

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TREE SURVEY PLAN

(Plan 11 of 14)

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Job No.: BTC1998

Scale: Not to Scale

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Date: July 2020

TREE SURVEY PLAN

(Plan 12 of 14)

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Job No.: BTC1998

Scale: Not to Scale

Paper Size (for printing): A3

Date: July 2020

TREE SURVEY PLAN

(Plan 13 of 14)

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Site: Waddow Hall, Waddington Road, Clitheroe, BB7 3LD

Job No.: BTC1998

Scale: Not to Scale

Paper Size (for printing): A3

Date: July 2020

TREE SURVEY PLAN

(Plan 14 of 14)

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QTRA Quantified Tree Risk Assessment

Simply Balancing Risks With Benefits

Quantified Tree Risk Assessment

PRACTICE NOTE

VERSION 5

Bowland Tree Consultancy Ltd

DISCLAIMER

Survey Limitations: Unless otherwise stated all trees are viewed from ground level using non-invasive techniques. The disclosure of hidden crown and stem defects, in particular where they may be above a reachable height or where trees are ivy clad or in areas of ground vegetation, cannot therefore be expected. All obvious defects, however, are reported. Where the QTRA Risk Index is calculated as Tolerable or Broadly Acceptable, but the tree(s) have not been adequately inspected (e.g. due to the presence of ivy and/or ground vegetation which impeded the inspection), then it is essential to follow the recommendations made in the Management Recommendations column and to have the applicable tree(s) re-inspected as recommended.

Detailed tree safety appraisals are only carried out under specific written instructions. Comments upon evident tree safety relate to the condition of said tree at the time of the survey only. The level of detail of the survey is as per the brief detailed on the Tree Survey Schedule and as per the specifics set out in the associated fee estimate for the project.

Unless otherwise stated all trees should be re-inspected annually in order to appraise their on-going mechanical integrity and physiological condition. It should, however, be recognised that tree condition is subject to change, for example due to the effects of disease, decay, high winds, development works, etc. Changes in land use or site conditions (e.g. development that increases access frequency) and the occurrence of severe weather incidents are also significant considerations with regards tree structural integrity and trees should therefore be re-assessed in the context of such changes and/or incidents and inspected at intervals relative to identified and varying site conditions and associated risks.

Where trees are located wholly or partially on neighbouring private third-party land then said land is not accessed and our inspection is therefore restricted to what can reasonably be seen from within the site. Any subsequent comments and judgments made in respect of such trees are based on these restrictions and are our preliminary opinion only. Recommendations for works to neighbouring third-party trees are only made where a potentially unacceptable risk to persons and/or property has been identified during our survey. Where significant structural defects of third-party trees are identified and associated management works are considered essential to negate any risk of harm and/or damage then we will first attempt to inform the site occupier of the issues and, if not possible, then inform the relevant Council. Where a more detailed assessment is considered necessary then appropriate recommendations are set out in the Tree Survey Schedule.

The potential influence of trees upon existing or proposed buildings or other structures, resulting from the effects of their roots abstracting water from shrinkable load-bearing soils, is not considered herein.

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Statutory Tree Protection: It is the client's responsibility to check for the presence of any statutory tree protection measures, such as the site's location within a Conservation Area and/or the presence of any Tree Preservation Orders, directly with the applicable Council's planning department prior to scheduling or carrying out any tree works. In turn, it is also the client's responsibility to check for the need for a felling licence with the Forestry Commission prior to scheduling or carrying out any tree works. Bowland Tree Consultancy Ltd cannot be held responsible for any decisions made by the client to prune or remove trees where any such statutory protection exists.

Quantified Tree Risk Assessment Practice Note

"When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind"

William Thomson, Lord Kelvin, Popular Lectures and Addresses [1891-1894]

1. INTRODUCTION

Every day we encounter risks in all of our activities, and the way we manage those risks is to make choices. We weigh up the costs and benefits of the risk to determine whether it is acceptable, unacceptable, or tolerable. For example, if you want to travel by car you must accept that even with all the extensive risk control measures, such as seat-belts, speed limits, airbags, and crash barriers, there is still a significant risk of death. This is an everyday risk that is taken for granted and tolerated by millions of people in return for the benefits of convenient travel. Managing trees should take a similarly balanced approach.

A risk from falling trees exists only if there is both potential for tree failure and potential for harm to result. The job of the risk assessor is to consider the likelihood and consequences of tree failure. The outcome of this assessment can then inform consideration of the risk by the tree manager, who may also be the owner.

Using a comprehensive range of values[1], Quantified Tree Risk Assessment (QTRA) enables the tree assessor to identify and analyse the risk from tree failure in three key stages. 1) to consider land-use in terms of vulnerability to impact and likelihood of occupation, 2) to consider the consequences of an impact, taking account of the size of the tree or branch concerned, and 3) to estimate the probability that the tree or branch will fail onto the land-use in question. Estimating the values of these components, the assessor can use the QTRA manual calculator or software application to calculate an annual Risk of Harm from a particular tree. To inform management decisions, the risks from different hazards can then be both ranked and compared, and considered against broadly acceptable and tolerable levels of risk.

A Proportionate Approach to Risks from Trees

The risks from falling trees are usually very low and high risks will usually be encountered only in areas with either high levels of human occupation or with valuable property. Where levels of human occupation and value of property are sufficiently low, the assessment of trees for structural weakness will not usually be necessary. Even when land-use indicates that the assessment of trees is appropriate, it is seldom proportionate to assess and evaluate the risk for each individual tree in a population. Often, all that is required is a brief consideration of the trees to identify gross signs of structural weakness or declining health. Doing all that is reasonably practicable does not mean that all trees have to be individually examined on a regular basis (HSE 2013).

The QTRA method enables a range of approaches from the broad assessment of large collections of trees to, where necessary, the detailed assessment of an individual tree.

Risk of Harm

The QTRA output is termed the Risk of Harm and is a combined measure of the likelihood and consequences of tree failure, considered against the baseline of a lost human life within the coming year.

ALARP (As Low As Reasonably Practicable)

Determining that risks have been reduced to As Low As Reasonably Practicable (HSE 2001) involves an evaluation of both the risk and the sacrifice or cost involved in reducing that risk. If it can be demonstrated that there is gross disproportion between them, the risk being insignificant in relation to the sacrifice or cost, then to reduce the risk further is not 'reasonably practicable'.

Costs and Benefits of Risk Control

Trees confer many benefits to people and the wider environment. When managing any risk, it is essential to maintain a balance between the costs and benefits of risk reduction, which should be considered in the determination of ALARP. It is not only the financial cost of controlling the risk that should be considered, but also the loss of tree-related benefits, and the risk to workers and the public from the risk control measure itself.

[1] See Tables 1, 2 & 3.

When considering risks from falling trees, the cost of risk control will usually be too high when it is clearly 'disproportionate' to the reduction in risk. In the context of QTRA, the issue of 'gross disproportion'[2], where decisions are heavily biased in favour of safety, is only likely to be considered where there are risks of 1/10 000 or greater.

Acceptable and Tolerable Risks

The Tolerability of Risk framework (ToR) (HSE 2001) is a widely accepted approach to reaching decisions on whether risks are broadly acceptable, unacceptable, or tolerable. Graphically represented in Figure 1, ToR can be summarised as having a Broadly Acceptable Region where the upper limit is an annual risk of death 1/1 000 000, an Unacceptable Region for which the lower limit is 1/1 000, and between these a Tolerable Region within which the tolerability of a risk will be dependent upon the costs and benefits of risk reduction. In the Tolerable Region, we must ask whether the benefits of risk control are sufficient to justify their cost.

In respect of trees, some risks cross the Broadly Acceptable 1/1 000 000 boundary, but remain tolerable. This is because any further reduction would involve a disproportionate cost in terms of the lost environmental, visual, and other benefits, in addition to the financial cost of controlling the risk.

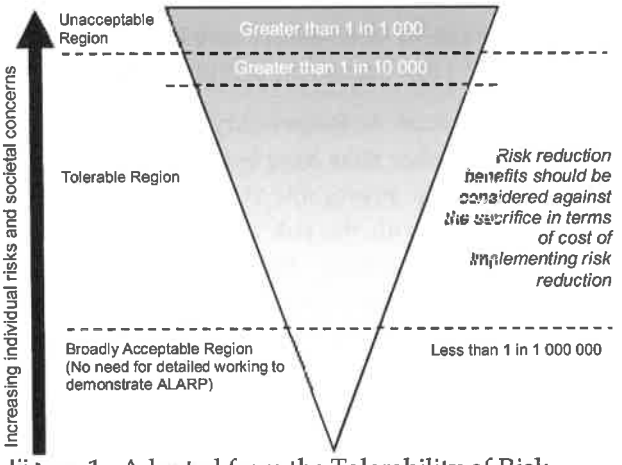

Figure 1. Adapted from the Tolerability of Risk framework (HSE 2001).

Value of Statistical Life

The Value of Statistical Life (VOSL), is a widely applied risk management device, which uses the value of a hypothetical life to guide the proportionate allocation of resources to risk reduction. In the UK, this value is currently in the region of £2 000 000, and this is the value adopted in the QTRA method.

In QTRA, placing a statistical value on a human life has two particular uses. Firstly, QTRA uses VOSL to enable damage to property to be compared with the loss of life, allowing the comparison of risks to people and property. Secondly, the proportionate allocation of financial resources to risk reduction can be informed by VOSL. *"A value of statistical life of £1 000 000 is just another way of saying that a reduction in risk of death of 1/100 000 per year has a value of £10 per year"* (HSE 1996).

Internationally, there is variation in VOSL, but to provide consistency in QTRA outputs, it is suggested that VOSL of £2 000 000 should be applied internationally. This is ultimately a decision for the tree manager.

2. OWNERSHIP OF RISK

Where many people are exposed to a risk, it is shared between them. Where only one person is exposed, that individual is the recipient of all of the risk and if they have control over it, they are also the owner of the risk. An individual may choose to accept or reject any particular risk to themselves, when that risk is under their control. When risks that are imposed upon others become elevated, societal concern will usually require risk controls, which ultimately are imposed by the courts or government regulators.

Although QTRA outputs might occasionally relate to an individual recipient, this is seldom the case. More often, calculation of the Risk of Harm is based on a cumulative occupation – i.e. the number of people per hour or vehicles per day, without attempting to identify the individuals who share the risk.

Where the risk of harm relates to a specific individual or a known group of people, the risk manager might consider the views of those who are exposed to the risk when making management decisions. Where a risk is imposed on the wider community, the principles set out in the ToR framework can be used as a reasonable approach to determine whether the risk is ALARP.

3. THE QTRA METHOD - VERSION 5

The input values for the three components of the QTRA calculation are set out in broad ranges[3] of Target, Size, and Probability of Failure. The assessor

[2] Discussed further on page 5.

[3] See Tables 1, 2 & 3.

estimates values for these three components and inputs them on either the manual calculator or software application to calculate the Risk of Harm.

Assessing Land-use (Targets)

The nature of the land-use beneath or adjacent to a tree will usually inform the level and extent of risk assessment to be carried out. In the assessment of Targets, six ranges of value are available. Table 2 sets out these ranges for vehicular frequency, human occupation and the monetary value of damage to property.

Human Occupation

The probability of pedestrian occupation at a particular location is calculated on the basis that an average pedestrian will spend five seconds walking beneath an average tree. For example, ten pedestrians per day, each occupying the Target for five seconds, is a daily occupation of fifty seconds. The total seconds in a day are divided to give a probability of Target occupation (50/86 400 = 1/1 728). Where a longer occupation is likely, as with a habitable building, outdoor café, or park bench, the period of occupation can be measured, or estimated as a proportion of a given unit of time, e.g. six hours per day (1/4). The Target is recorded as a range (Table 2).

Weather Affected Targets

Often the nature of a structural weakness in a tree is such that the probability of failure is greatest during windy weather, while the probability of the site being occupied by people during such weather is often low. This applies particularly to outdoor recreational areas. When estimating human Targets, the risk assessor must answer the question 'in the weather conditions that I expect the likelihood of failure of the tree to be initiated, what is my estimate of human occupation?' Taking this approach, rather than using the average occupation, ensures that the assessor considers the relationship between weather, people, and trees, along with the nature of the average person with their ability to recognise and avoid unnecessary risks.

Vehicles on the Highway

In the case of vehicles, likelihood of occupation may relate to either the falling tree or branch striking the vehicle or the vehicle striking the fallen tree. Both types of impact are influenced by vehicle speed; the faster the vehicle travels the less likely it is to be struck by the falling tree, but the more likely it is to strike a fallen tree. The probability of a vehicle occupying any particular point in the road is the ratio of the time it is occupied - including a safe stopping distance - to the total time. The average vehicle on a UK road is occupied by 1.6 people (DfT 2010). To account for the substantial protection that the average vehicle provides against most tree impacts and in particular, frontal collisions, QTRA values the substantially protected 1.6 occupants in addition to the value of the vehicle as equivalent to one exposed human life.

Property

Property can be anything that could be damaged by a falling tree, from a dwelling, to livestock, parked car, or fence. When evaluating the exposure of property to tree failure, the QTRA assessment considers the cost of repair or replacement that might result from failure of the tree. Ranges of value are presented in Table 2 and the assessor's estimate need only be sufficient to determine which of the six ranges the cost to select.

In Table 2, the ranges of property value are based on a VOSL of £2 000 000, e.g. where a building with a replacement cost of £20 000 would be valued at 0.01 (1/100) of a life (Target Range 2).

When assessing risks in relation to buildings, the Target to be considered might be the building, the occupants, or both. Occupants of a building could be protected from harm by the structure or substantially exposed to the impact from a falling tree if the structure is not sufficiently robust, and this will determine how the assessor categorises the Target.

Multiple Targets

A Target might be constantly occupied by more than one person and QTRA can account for this. For example, if it is projected that the average occupation will be constant by 10 people, the Risk of Harm is calculated in relation to one person constantly occupying the Target before going on to identify that the average occupation is 10 people. This is expressed as Target 1(10T)/1, where 10T represents the Multiple Targets. In respect of property, a Risk of Harm 1(10T)/1 would be equivalent to a risk of losing £20 000 000 as opposed to £2 000 000.

Tree or Branch Size

A small dead branch of less than 25mm diameter is not likely to cause significant harm even in the case of direct contact with a Target, while a falling branch with a diameter greater than 450mm is likely to cause some harm in the event of contact with all but the most robust Target. The QTRA method categorises

Size by the diameter of tree stems and branches (measured beyond any basal taper). An equation derived from weight measurements of trees of different stem diameters is used to produce a data set of comparative weights of trees and branches ranging from 25mm to 600mm diameter, from which Table 1 is compiled. The size of dead branches might be discounted where they have undergone a significant reduction in weight because of degradation and shedding of subordinate branches. This discounting, referred to as 'Reduced Mass', reflects an estimated reduction in the mass of a dead branch.

Table 1. Size

Size Range	Size of tree or branch	Range of Probability
1	> 450mm (>18") dia.	1/1 - >1/2
2	260mm (10½") dia. - 450mm (18") dia.	1/2 - >1/8.6
3	110mm (4½") dia. - 250mm (10") dia.	1/8.6 - >1/82
4	25mm (1") dia. - 100mm (4") dia.	1/82 - 1/2 500

* Range 1 is based on a diameter of 600mm.

Table 2. Targets

Target Range	Property (repair or replacement cost)	Human (not in vehicles)		Vehicle Traffic (number per day)	Ranges of Value (probability of occupation or fraction of £2 000 000)
1	£2 000 000 – >£200 000	Occupation:	Constant – 2.5 hours/day	26 000 – 2 700 @ 110kph (68mph)	1/1 – >1/10
		Pedestrians & cyclists:	720/hour – 73/hour	32 000 – 3 300 @ 80kph (50mph)	
				47 000 – 4 800 @ 50kph (32mph)	
2	£200 000 – >£20 000	Occupation:	2.4 hours/day – 15 min/day	2 600 – 270 @ 110kph (68mph)	1/10 – >1/100
		Pedestrians & cyclists:	72/hour – 8/hour	3 200 – 330 @ 80kph (50mph)	
				4 700 – 480 @ 50kph (32mph)	
3	£20 000 – >£2 000	Occupation:	14 min/day – 2 min/day	260 – 27 @ 110kph (68mph)	1/100 – >1/1 000
		Pedestrians & cyclists:	7/hour – 2/hour	320 – 33 @ 80kph (50mph)	
				470 – 48 @ 50kph (32mph)	
4	£2 000 – >£200	Occupation:	1 min/day – 2 min/week	26 – 4 @ 110kph (68mph)	1/1 000 – >1/10 000
		Pedestrians & cyclists:	1/hour – 3/day	32 – 4 @ 80kph (50mph)	
				47 – 6 @ 50kph (32mph)	
5	£200 – >£20	Occupation:	1 min/week – 1 min/month	3 – 1 @ 110kph (68mph)	1/10 000 – >1/100 000
		Pedestrians & cyclists:	2/day – 2/week	3 – 1 @ 80kph (50mph)	
				5 – 1 @ 50kph (32mph)	
6	£20 – £2	Occupation:	<1 min/month – 0.5 min/year	None	1/100 000 – 1/1 000 000
		Pedestrians & cyclists:	1/week – 6/year		

Vehicle, pedestrian and 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 Target Range 4 is between the upper and lower limits of 1/1 000 and >1/10 000 (column 5). Using the VOSL £2 000 000, the property repair or replacement value for Target Range 4 is £2 000 - >200.

Probability of Failure

In the QTRA assessment, the probability of tree or branch failure within the coming year is estimated and recorded as a range of value (Ranges 1 – 7, Table 3).

Selecting a Probability of Failure (PoF) Range requires the assessor to compare their assessment of the tree or branch against a benchmark of either a non-compromised tree at Probability of Failure Range 7, or a tree or branch that we expect to fail within the year, which can be described as having a 1/1 probability of failure.

During QTRA training, Registered Users go through a number of field exercises in order to calibrate their estimates of Probability of Failure.

Table 3. Probability of Failure

Probability of Failure Range	Probability
1	1/1 - >1/10
2	1/10 - >1/100
3	1/100 - >1/1 000
4	1/1 000 - >1/10 000
5	1/10 000 – >1/100 000
6	1/100 000 – >1/1 000 000
7	1/1 000 000 – 1/10 000 000

The probability that the tree or branch will fail within the coming year.

The QTRA Calculation

The assessor selects a Range of values for each of the three input components of Target, Size and Probability of Failure. The Ranges are entered on either the manual calculator or software application to calculate a Risk of Harm.

The Risk of Harm is expressed as a probability and is rounded, to one significant figure. Any Risk of Harm that is lower than 1/1 000 000 is represented as <1/1 000 000. As a visual aid, the Risk of Harm is colour coded using the traffic light system illustrated in Table 4 (page 7).

Risk of Harm - Monte Carlo Simulations

The Risk of Harm for all combinations of Target, Size and Probability of Failure Ranges has been calculated using Monte Carlo simulations[4]. The QTRA Risk of Harm is the mean value from each set of Monte Carlo results.

In QTRA Version 5, the Risk of Harm should not be calculated without the manual calculator or software application.

Assessing Groups and Populations of Trees

When assessing populations or groups of trees, the highest risk in the group is quantified and if that risk is tolerable, it follows that risks from the remaining trees will also be tolerable, and further calculations are unnecessary. Where the risk is intolerable, the next highest risk will be quantified, and so on until a tolerable risk is established. This process requires prior knowledge of the tree manager's risk tolerance.

Accuracy of Outputs

The purpose of QTRA is not necessarily to provide high degrees of accuracy, but to provide for the quantification of risks from falling trees in a way that risks are categorised within broad ranges (Table 4).

4. INFORMING MANAGEMENT DECISIONS

Balancing Costs and Benefits of Risk Control

When controlling risks from falling trees, the benefit of reduced risk is obvious, but the costs of risk control are all too often neglected. For every risk reduced there will be costs, and the most obvious of these is the financial cost of implementing the control measure. Frequently overlooked is the transfer of risks to workers and the public who might be directly affected by the removal or pruning of trees. Perhaps more importantly, most trees confer benefits, the loss of which should be considered as a cost when balancing the costs and benefits of risk control.

When balancing risk management decisions using QTRA, consideration of the benefits from trees will usually be of a very general nature and not require detailed consideration. The tree manager can consider, in simple terms, whether the overall cost of risk control is a proportionate one. Where risks are approaching 1/10 000, this may be a straightforward balancing of cost and benefits. Where risks are 1/10 000 or greater, it will usually be appropriate to implement risk controls unless the costs are grossly disproportionate to the benefits rather than simply disproportionate. In other words, the balance being weighted more on the side of risk control with higher associated costs.

Considering the Value of Trees

It is necessary to consider the benefits provided by trees, but they cannot easily be monetised and it is often difficult to place a value on those attributes such as habitat, shading and visual amenity that might be lost to risk control.

A simple approach to considering the value of a tree asset is suggested here, using the concept of 'average benefits'. When considered against other similar trees, a tree providing 'average benefits' will usually present a range of benefits that are typical for the species, age and situation. Viewed in this way, a tree providing 'average benefits' might appear to be low when compared with particularly important trees – such as in Figure 2, but should nonetheless be sufficient to offset a Risk of Harm of less than 1/10 000. Without having to consider the benefits of risk controls, we might reasonably assume that below 1/10 000, the risk from a tree that provides 'average benefits' is ALARP.

In contrast, if it can be said that the tree provides lower than average benefits because, for example, it is declining and in poor physiological condition, it may be necessary to consider two further elements. Firstly, is the Risk of Harm in the upper part of the Tolerable Region, and secondly, is the Risk of Harm likely to increase before the next review because of an increased Probability of Failure. If both these conditions apply then it might be appropriate to consider the balance of costs and benefits of risk reduction in order to determine whether the risk is ALARP. This balance requires the tree manager to take a view of both the reduction in risk and the costs of that reduction.

[4] For further information on the Monte Carlo simulation method, refer to http://en.wikipedia.org/wiki/Monte_Carlo_method

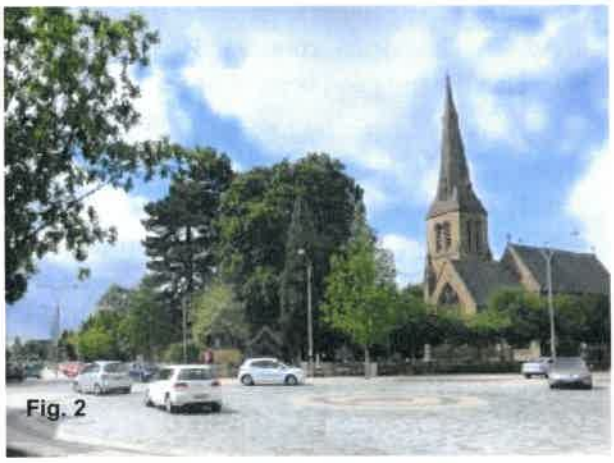
Fig. 2

Lower Than Average Benefits from Trees

Usually, the benefits provided by a tree will only be significantly reduced below the 'average benefits' that are typical for the species, age and situation, if the life of the benefits is likely to be shortened, perhaps because the tree is declining or dead. That is not to say that a disbenefit, such as undesirable shading, lifting of a footpath, or restricting the growth of other trees, should not also be considered in the balance of costs and benefits.

The horse chestnut tree in Figure 3 has recently died, and over the next few years, may provide valuable habitats. However, for this tree species and the relatively fast rate at which its wood decays, the lifetime of these benefits is likely to be limited to only a few years. This tree has an already reduced value that will continue to reduce rapidly over the coming five to ten years at the same time as the Risk of Harm is expected to increase. There will be changes in the benefits provided by the tree as it degrades. Visual qualities are likely to reduce while the decaying wood provides habitats for a range of species, for a short while at least. There are no hard and fast measures of these benefits and it is for the tree manager to decide what is locally important and how it might be balanced with the risks.

Where a risk is within the Tolerable Region and the tree confers lower than average benefits, it might be appropriate to consider implementing risk control while taking account of the financial cost. Here, VOSL can be used to inform a decision on whether the cost of risk control is proportionate. Example 3 below puts this evaluation into a tree management context.

There will be occasions when a tree is of such minimal value and the monetary cost of risk reduction so low that it might be reasonable to further reduce an already relatively low risk. Conversely, a tree might be of such considerable value that an annual risk of death greater than 1/10 000 would be deemed tolerable.

Occasionally, decisions will be made to retain elevated risks because the benefits from the tree are particularly high or important to stakeholders, and in these situations, it might be appropriate to assess and document the benefits in some detail. If detailed assessment of benefits is required, there are several methodologies and sources of information (Forest Research 2010).

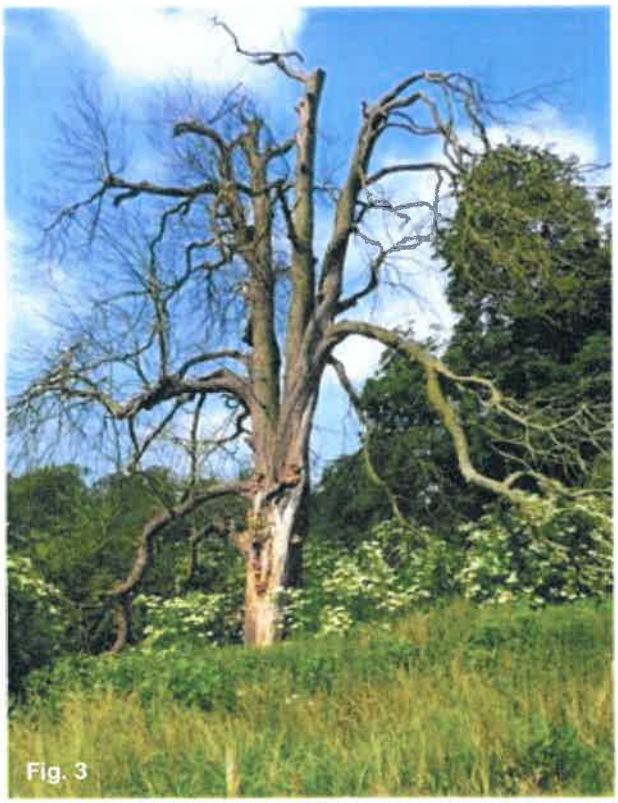
Fig. 3

Delegating Risk Management Decisions

Understanding of the costs with which risk reduction is balanced can be informed by the risk assessor's knowledge, experience and on-site observations, but the risk management decisions should be made by the tree manager. That is not to say that the tree manager should review and agree every risk control measure, but when delegating decisions to surveyors and other staff or advisors, tree managers should set out in a policy, statement or contract, the principles and perhaps thresholds to which trees and their associated risks will ordinarily be managed.

Based on the tree manager accepting the principles set out in the QTRA Practice Note and or any other specific instructions, the risk assessor can take account of the cost/benefit balance and for most

situations will be able to determine whether the risk is ALARP when providing management recommendations.

Table 4. QTRA Advisory Risk Thresholds

Thresholds	Description	Action
	Unacceptable Risks will not ordinarily be tolerated	• Control the risk
1/1,000		
	Unacceptable (where imposed on others) Risks will not ordinarily be tolerated	• Control the risk • Review the risk
	Tolerable (by agreement) Risks may be tolerated if those exposed to the risk accept it, or 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
1/10 000		
	Tolerable (where imposed on others) Risks are tolerable if ALARP	• Assess costs and benefits of risk control • Control the risk only where a significant benefit might be achieved at reasonable cost • Review the risk
1/1 000 000		
	Broadly Acceptable Risk is already ALARP	• No action currently required • Review the risk

QTRA Informative Risk Thresholds

The QTRA advisory thresholds in Table 4 are proposed as a reasonable approach to balancing safety from falling trees with the costs of risk reduction. This approach takes account of the widely applied principles of ALARP and ToR, but does not dictate how these principles should be applied. While the thresholds can be the foundation of a robust policy for tree risk management, tree managers should make decisions based on their own situation, values and resources. Importantly, to enable tree assessors to provide appropriate management guidance, it is helpful for them to have some understanding of the tree owner's management preferences prior to assessing the trees.

A Risk of Harm that is less than 1/1 000 000 is Broadly Acceptable and is already ALARP. A Risk of Harm 1/1 000 or greater is unacceptable and will not ordinarily be tolerated. Between these two values, the Risk of Harm is in the Tolerable Region of ToR and will be tolerable if it is ALARP. In the Tolerable Region, management decisions are informed by consideration of the costs and benefits of risk control, including the nature and extent of those benefits provided by trees, which would be lost to risk control measures.

For the purpose of managing risks from falling trees, the Tolerable Region can be further broken down into two sections. From 1/1 000 000 to less than 1/10 000, the Risk of Harm will usually be tolerable providing that the tree confers 'average benefits' as discussed above. As the Risk of Harm approaches 1/10 000 it will be necessary for the tree manager to consider in more detail the benefits provided by the tree and the overall cost of mitigating the risk.

A Risk of Harm in the Tolerable Region but 1/10 000 or greater will not usually be tolerable where it is imposed on others, such as the public, and if retained, will require a more detailed consideration of ALARP. In exceptional circumstances a tree owner might choose to retain a Risk of Harm that is 1/10 000 or greater. Such a decision might be based on the agreement of those who are exposed to the risk, or perhaps that the tree is of great importance. In these circumstances, the prudent tree manager will consult with the appropriate stakeholders whenever possible.

5. EXAMPLE QTRA CALCULATIONS AND RISK MANAGEMENT DECISIONS

Below are three examples of QTRA calculations and application of the QTRA Advisory Thresholds.

Example 1.

	Target		Size		Probability of Failure		Risk of Harm
Range	6	x	1	x	3	=	<1/1 000 000

Example 1 is the assessment of a large (Size 1), unstable tree with a probability of failure of between 1/100 and >1/1 000 (PoF 3). The Target is a footpath with less than one pedestrian passing the tree each week (Target 6). The Risk of Harm is calculated as less than 1/1 000 000 (green). This is an example of where the Target is so low consideration of the structural condition of even a large tree would not usually be necessary.

Example 2.

	Target		Size		Probability of Failure		Risk of Harm
Range	1	x	4	x	3	=	1(2T)/50 000

In Example 2, a recently dead branch (Size 4) overhangs a busy urban high street that is on average occupied constantly by two people, and here Multiple Target occupation is considered.

Having an average occupancy of two people, the Risk of Harm 1(2T)/50 000 (yellow) represents a twofold increase in the magnitude of the consequence and is therefore equivalent to a Risk of Harm 1/20 000 (yellow). This risk does not exceed 1/10 000, but being a dead branch at the upper end of the Tolerable Region it is appropriate to consider the balance of costs and benefits of risk control. Dead branches can be expected to degrade over time with the probability of failure increasing as a result. Because it is dead, some of the usual benefits from the branch have been lost and it will be appropriate to consider whether the financial cost of risk control would be proportionate.

Example 3.

	Target		Size		Probability of Failure		Risk of Harm
Range	3	x	3	x	3	=	1/500 000

In Example 3, a 200mm diameter defective branch overhangs a country road along which travel between 470 and 48 vehicles each day at an average speed of 50kph (32mph) (Target Range 3). The branch is split and is assessed as having a probability of failure for the coming year of between 1/100 and 1/1 000 (PoF Range 3). The Risk of Harm is calculated as 1/500 000 (yellow) and it needs to be considered whether the risk is ALARP. The cost of removing the branch and reducing the risk to Broadly Acceptable (1/1 000 000) is estimated at £350. To establish whether this is a proportionate cost of risk control, the following equation is applied. £2 000 000 (VOSL) x 1/500 000 = £4 indicating that the projected cost of £350 would be disproportionate to the benefit. Taking account of the financial cost, risk transfer to arborists and passers-by, the cost could be described as being grossly disproportionate, even if accrued benefits over say ten years were taken into account.

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