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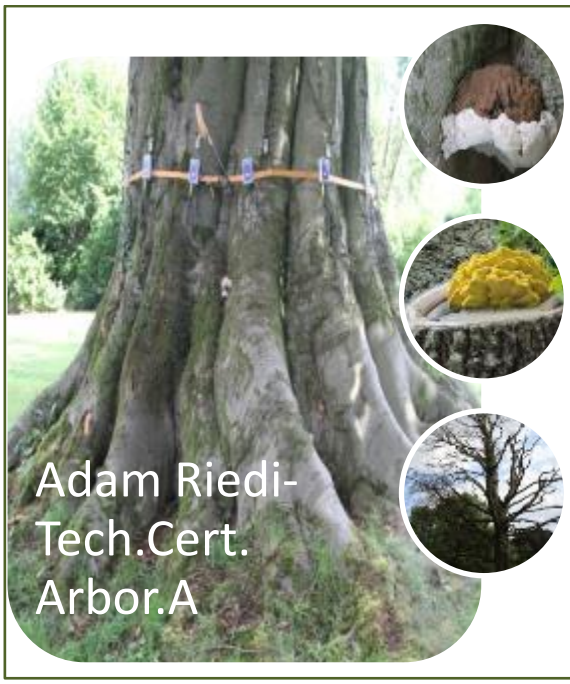

Tree Condition Survey Report

Grosvenor and Lansdowne
Crescent Gardens, Edinburgh.

EH12 5EQ

06/08/2021

Contents

Part One

General introduction

Client brief

Mr Angus Todd asked Adam Riedi of Blebo Tree Surgery to prepare a fee proposal for arboricultural consultancy services for a site under his management.

Land and tree owners owe a legal duty of care to ensure that reasonable steps are taken to manage risks associated with their trees.

Trees also confer many benefits to individual and society as well as to other living organisms. It is therefore necessary to balance risk from trees with their values and not incur unnecessary ecological and financial costs.

The purpose of a formal tree survey is to pro-actively manage the tree population and discharge the client's legal duty of care under Owner occupier (Scotland) and Health and Safety legislation.

The author and surveying team – qualifications and experience

Adam Riedi holds the Arboricultural Association Technicians Certificate, and also holds the LANTRA Professional Tree Inspection Certificate. He has been working in the industry since 1995 as both a contracting and consulting arborist. As part of a continuing professional development programme, he is currently working towards the Royal Forestry Society Professional Diploma in Arboriculture.

Mr Riedi was the Secretary of the Scottish Branch of the Arboricultural Association from 2012 to 2014 where his role included the organisation of seminars and events. In May 2010 he chaired a seminar given by world-leading tree expert Professor Claus Mattheck (Institute of Materials Research, Karlsruhe University, Germany). He has demonstrated modern ultra-sound decay detection techniques at a number of events and colleges.

In 2011 he attended a visual tree assessment elite field training course held in Germany with Professor Claus Mattheck.

In 2012 Mr Riedi was asked to join an international research group researching trees, wood-decay fungi and ultrasound diagnostics with tree consultants and leading academics from the UK, Holland, Germany and Switzerland.

Mr Riedi has recently delivered arboricultural management plans for tree collections at Falkland palace (National Trust for Scotland), Kinross House, House of Falkland and Scone Palace and Diane's Grove at Blair Castle. Mr Riedi has delivered tree surveys for Ardkinglas Woodland Garden and Smeaton-Hepburn woodland garden for the National Tree Collections of Scotland. He has also provided arboricultural surveys for Edinburgh City Council, Fife Council and Perth and Kinross Council.

In 2016 Mr Riedi became the co-ordinator of The Ancient Tree Forum in Scotland where his main role has been to deliver a series of seminars on understanding and managing veteran trees.

Survey Objectives

- To provide an assessment of the hazards posed by the tree population and quantify the associated risk to create a defensible strategy for individual tree management.
- To prioritise and specify remedial work and, where necessary, more detailed investigation, to deal with potential hazards observed during individual tree assessment.
- To attempt to preserve the amenity value of the landscape, while managing the conflicts that may arise with respect to the client's duty of care.

Introduction

The historical record relates that there has been some form of tree planting and tree management at the garden since its origins in the first half of the 19th century. The gardens were designed as part of the wider design ethos that underpinned the construction of the Edinburgh new town.

The tree population of the garden at Grosvenor and Lansdowne Crescent confers considerable landscape, amenity and health benefits for the residents, road users and pedestrians.

The prominence of the garden means there are significant targets close to the tree population and safety considerations for the public, sites users and the duty holder.

The gardens are elliptical in form with the majority of trees growing around the perimeter. The tree population consists largely of deciduous tree species. There is also a significant structural planting of evergreen shrubs.

The gardens are fortunate to still have a small collection of elms that are, due to the wider ravages of Dutch elm disease, of considerable importance.

It is recommended that crown lift pruning be carried out to maintain clearance around the outer perimeter of the whole garden to ensure continued safe usage of the road and parking spaces adjacent (see Schedule for further details).

One small tree is recommended for complete removal.

Six trees are reccomended for pruning.

Thirteen trees are recommended for futher inspection to fully asess structural condition.

Part Two

Tree Survey and Tree Management Recommendations

Visual tree assessment (VTA) - an introduction

A tree can be defined as a self-optimising bio-mechanical structure of lightweight design.

Its form is a consequence of available light, load adaptive growth and circumstances set within the context of its own genetic abilities and constraints.

A tree (when functioning normally) will respond to increased load, either caused by a specific structural defect or by a direct increase in wind and gravitational load, by preferentially depositing adaptive growth tissue in the affected areas. This model is described as the axiom of uniform stress (axiomatic, as it cannot be absolutely proven or disproven).

The VTA Level 1 (ground level, visual assessment only) system can, therefore, make reasonable inferences about the tree's internal condition on the basis of external appearance.

Assessment of vigour and vitality is an appraisal of biological function, which is the driver of all processes within the tree including adaptive growth and reaction to wounding and invasion by pathogens. Excessive biological function, such as long phototrophic branches seeking light, may disrupt this aspiration towards mechanical self-optimisation.

Biology and mechanics should be seen as both separate and intimately co-dependent processes. Examples of trees that seem to represent the duality of the bio-mechanical nature of trees may often be observed.

A tree may bear a crown of normal size, density and foliar condition and yet the main stem may be 90% hollow and extremely prone to failure.

Equally, a tree may be intact and structurally sound, free of decay and other major structural defects, but may have poor vitality and its biological function may be declining fast.

The tendency of trees to form weak structures (such as compression forks and other mechanically non-optimised structures) or their ability to resist pathogens and external loads is coded within the genetic make-up of every individual tree species. Despite this fact, trees must be viewed as unique individuals growing in unique circumstances.

The form and position of the tree is also assessed for intrinsic stability. Stem and crown morphology, oscillation under wind and gravitational load, exposure and altered exposure, and tree group dynamics are all considered, along with the likely shear strength and structure of the soil.

The condition of the tree can then be put into the context of a tree risk paradigm. The three components of risk are: the probability of foreseeable mechanical failure (condition), the magnitude of mechanical failure (size of the defective part) and the consequences of mechanical failure (people and property and other things perceived to be valuable).

Finally, the value of the tree (ecological, botanical, landscape) is weighed against the risk of harm and the cost and practicality of any remedial work.

Work specified to reduce unacceptable risk from individual trees to be within an acceptable threshold is given a priority rating based on time from the issue of the report. Remedial work may take the form of complete tree removal, varying degrees of pruning, cable bracing or reduction of the target rating.

For trees that will be retained, a re-inspection date is also stated. Trees are dynamic organisms living in a highly dynamic environment, so a regular re-inspection cycle is required. It is also worth remembering that tree condition may improve as well as deteriorate. Good adaptive growth, compartmentalisation of wood decay fungi and other defensive and adaptive strategies may overcome an episodic lapse of condition. Environmental factors and pathogens may become more or less severe and frequent.

Further inspection (VTA Level 2) is recommended in the initial Level 1 survey when it is not possible to evaluate the presence, extent or severity of a defect visually and from ground level. Examples of further inspection include such measures as the aerial inspection of a suspected defect, decay mapping using diagnostic tools or the sampling of affected foliage for laboratory analyses.

Further inspection would not be reasonably employed with low-value and low-risk trees, or as a substitute for a lack of competency with VTA 1.

The duty of care of the tree owner is not reasonably discharged unless further inspection is carried out within the stated time scales.

Good further inspection should quantify the extent and severity of any defect and help to avoid unnecessary tree removal or pruning, as well as negligent tree management through inaction.

Trees and risk

Land and tree owners owe a legal duty of care to ensure that reasonable steps are taken to manage risks associated with their trees.

Trees also confer many benefits to individuals and society, as well as to other living organisms. It is therefore necessary to balance risk from trees with their values and not incur unnecessary ecological and financial cost.

Although general values derived from trees are to be weighed against risk and the reasonable practicability of reducing risk, no tree surveying method or case law currently exist that would reduce an owner's liability on the basis of high individual tree values.

On average, three members of the public per year are killed by trees in the UK in public areas.

The average risk from trees throughout the UK as a whole is within the “broadly acceptable” region of tolerability in the risk model employed by the Health and Safety Executive.

Although this indicates that the general risks from trees are low, individual trees obviously do exist that constitute an unacceptable risk of harm to people and property.

A coherent tree-risk strategy must steer a course between negligence and excessive risk aversion.

Duty holder's responsibilities - a general introduction

As this section has not been written by a legal specialist, it is strongly advised that the client take further guidance from the legal profession. This is a general introduction to a complex situation and is by no means definitive.

In the recently published (December 2011) guidance from the National Tree Safety Group (NTSG) the following statement is made:

This document may be presented to a court for consideration as supporting documentation in any case involving death or personal injury caused by a falling tree or branch. Reported judgements already demonstrate that courts will consider publications of this nature when addressing the duty of care. It must, however, be appreciated that the guidance in this document will not in itself determine a court's judgement in any individual case. First, all cases are sensitive to their own facts. Second, a court will always reserve to itself the decision as to whether a tree owner has acted as "a reasonable and prudent landowner". This guidance, can, however, inform the court in the making of that decision.

It should be noted that the recent guidance by NTSG and the analyses and commentary on case law dealing with trees and negligence relate almost exclusively to English cases and English law. Commentary on this area of law within Scotland does not appear to exist in much of the literature, nor does guidance aimed at the arboricultural specialist or the tree owner in Scotland. The reason cited by NTSG for the emphasis on English law and cases is "a lack of case law in Scotland".

The duty holder obligations are defined in Civil Law by the *Occupiers' Liability (Scotland) Act, 1960*.

The duty of care of the owner is to take reasonable care to avoid acts or omissions that cause a reasonable foreseeable risk of injury to persons or property and to demonstrate they have behaved as a reasonable and prudent landowner.

Under criminal law (*Health and Safety At Work Act 1974* and *The Management of Health and Safety at Work Regulations 1999*) the duty holder is required to have a suitable and sufficient risk assessment system and to apply measures that are reasonable and practicable.

Although no tree can be guaranteed to be absolutely safe, a balanced, defensible and proportionate strategy for tree management should be adopted.

Standards and regularity of inspection

Given the dynamic nature of trees and the environment in which they grow it is strongly advised that tree inspection is regarded as a cyclical and on-going activity. It is strongly recommended that budgets are allocated for this purpose.

The professional arboriculturalist will recommend a re-inspection frequency for each tree surveyed, depending on the tree's condition and its proximity to targets.

However, given the natural failure rate of trees under extreme weather, trees may fail in an unforeseeable way. Trees should be re-inspected after extreme weather events.

My own view is that detailed inspection (surveying using a professional arboricultural consultant) should not be replaced by informal observations (incidental day-to-day observations by members of staff principally preoccupied with other activities) or formal inspections (of specific trees and associated targets by a non-arboriculturalist).

Rather, informal observations and formal inspections should supplement the defined cycle of regular detailed inspection defined by the arboricultural specialist appointed.

Record keeping and procedures

A mechanism and the necessary forms should be created for recording and storing information on incidents, weather events and control mechanisms applied.

A typical form might include the following fields:

- Date
- Member of staff
- Nature of weather event
- Gardens open period
- Staff on-site using the grounds
- Staff aware of the potential for recent damage to trees and associated risks
- Visitors/contractors expected on-site
- Full or partial site closure required due to weather
- Tree numbers inspected
- Significant damage to tree stock
- Remedial action required
- Exclusion of staff from any areas
- Exclusion of visitor/external contractors
- Control mechanisms employed
- External contractor required
- Tree consultant required to further appraise tree condition
- Word to be carried out by (date)

Both scheduled and emergency tree work should be recorded. Below is an example of a possible format. This also allows a record of financial costs incurred to be kept, and may help towards budgeting for further inspection and remedial work.

Tree number	Origin (formal survey/post-storm walkover/staff based observation)	Nature of action (further-inspection/felling/ pruning)	Final date for completion of works	Date Actually carried out	Carried out by	Next scheduled formal inspection	Comments	Cost
8888	Adam Riedi survey December 2018	Pruning	20th May 2019	12th February 2019	An. arborist ltd	December 2020	None	£200.00

Methodology

The VTA (visual tree assessment) system was used to evaluate the physiological and structural condition of each tree.

The VTA system was used together with the QTRA (quantified tree risk assessment) system for recording target values. On occasion, the QTRA system was used to calculate a precise risk of harm for a particular tree. Elements of the tree STATICS system were also used.

A nylon *Thor* hammer and manual probe were employed for simple decay detection.

Tree heights were measured using the *trupulse* laser hypsometer system.

Existing tree tags from a previous tree survey were used for the purposes of consistency of management and to allow the use of a previously created map.

The field work for the current survey was carried out on the 5th of August 2021 under reasonable working conditions.

Tree selection method

The trees included in the survey were selected on the basis of their prominence in the landscape, their physical size and the proximity to significant targets.

OBSERVATIONS

Genus

The tree population individually surveyed are made up of trees from 12 separate genera.

These genera are;

Acer, Aesculus, Cotoneaster, Cupressus, Fraxinus, Ilex, Laburnum, Prunus, Quercus, Sorbus, Tilia and *Ulmus*

Species

The tree population individually surveyed is made up of 19 species/cultivars/hybrids. A list of these trees can be found below.

Common name	Botanical name
sycamore	*Acer pseudoplatanus*
horse chestnut	*Aesculus hippocastanum*
Himalayan tree cotoneaster	*Cotoneaster fridgidus*
Leyland cypress	*Cupressus x Leylandii*
common ash	*Fraxinus excelsior*
weeping ash	*Fraxinus excelsior 'pendula'*
common holly	*Ilex aquifolium*
silver holly	*Ilex aquifolium f. aureomarginata*
common laburnum	*Laburnum anagyroides*
Gean	*Prunus avium*
flowering cherry	*Prunus 'Kanzan'*
Turkey oak	*Quercus cerris*
Rowan	*Sorbus aucuparia*
whitebeam	*Sorbus aria*
Swedish whitebeam	*Sorbus x intermedia*
small leaved lime	*Tillia cordata*
common lime	*Tilia x europaea*
English elm	*Ulmus minor*
Wheatley elm	*Ulmus minor subsp.sarniensis*

General observations

Exposure and topography

The tree population has moderate exposure to the prevailing south westerly wind. The area of land is largely flat and appears to be on largely free draining soils.

Rooting zone

It was noted by the survey team as a common theme that there are many trees with prominent surface rooting. This may be indicative of a thin, compacted or otherwise inhospitable soils.

The majority of trees appear to be growing in variable soils with reasonable soil ecology. It was noted by the surveying team that the use of herbicide around the base of trees (particularly tree growing on the grassed areas) seems common place. It is advised that this practice be discontinued as soon as possible as it is known that application of herbicides not only damages the tree itself but has a negative effect on soil organisms and mycorrhizae fungi that are essential to the resilience of any tree population.

Historic tree work

In the past decades, the primary branches of some trees have been removed by crown lift pruning. Presumably the original motivation was to allow easier access under the trees or for perceived aesthetic improvements.

It is absolutely essential that in the future all pruning work is rigorously specified and carried out to the very highest standards by those who are in expert in their field and have an intimate understanding of the current British standards for tree pruning. It is evident that the existing specification of pruning works and the actual pruning work has been carried out without any meaningful understanding of tree physiology in general and the pruning tolerance of particular species.

Site usage and target ratings

Two target rating zones exist around the trees.

The site is zoned as QTRA 1-2 This is based upon the financial value of replacement or repair of buildings and property and the regularity of vehicular and pedestrian traffic.

Summary of recommended remedial work

Felling

One tree is recommended for complete felling.

Pruning

Six trees are recommended for pruning.

Cable bracing

No trees are recommended for cable bracing.

Further inspection

Thirteen trees are recommended for further inspection

Re-inspection

It is recommended that trees should have re-inspection cycles depending on their size, condition and the proximity to targets. All trees have been recommended for re-inspection in 24 months (2 years).

RECOMMENDATIONS

Recommendations for individual tree management

1. All felling and stump grinding should be carried out to the standards defined in BSI 3998: 2010, *Recommendations for tree work*, section 12. The landowner and the project arboriculturalist should consider whether any further trees of low quality should also be removed to facilitate re-planting and the formation of well-balanced retained specimen trees.

2. Pruning work should be carried out to the standards defined in BSI 3998: 2010, *Recommendations for tree work*, section 7. Pruning work should only be specified by an arboricultural consultant and carried out by arboricultural contractors who can work to the very highest standard.

3. Further inspection should be carried out where necessary by a qualified and experienced Person

4. Re-inspection should be carried out within the stated time scales and after extreme weather events.

5. Create naturalistic organic zones within tree groups without use of herbicides or inputs that can damage soil ecology and reduce tree health.

General tree management proposal for all areas

1. It is strongly advised that arboricultural recommendations made within this report are carried out within the appointed time scales. It may be necessary to devote a larger financial budget to arboricultural programmes in the future. It is advised that a formal budget and schedule of work are created by the client. That can be done after consultation among the client, the arboricultural consultant and contractors.

2. Some of the trees have potential structural defects that could be observed from ground level. These defects could not be accurately assessed within the context of a ground level visual survey. Given the high amenity value of the trees, their legal status and the potentially high cost of arboricultural operations, it is essential that any trees with potential defects are subject to further investigation.

3. That the legal status of the trees, the laws and guidelines covering tree management be respected and adhered to. Of particular importance are:

- Trees in conservation areas: these are protected by the 'Town and Country Planning (Scotland) Act 1997'. Applications to carry out tree work should be made to the local planning authority.
- Trees and the public road: 'Roads (Scotland) Act 1994' and amendments.
- Protected flora and fauna: 'Nature Conservation Act 2004' (Scotland).
- Felling licences. Forestry Commission Scotland.

4. All arboricultural remedial work should be carried out to the standards defined in British Standard 3998 '*Recommendations for tree work*': 2010, and be carried out by professional arborists with the relevant qualifications (level 3 or above) and public liability and employers insurance for arboriculture.

5. If any non-arboricultural work (e.g. path creation, maintenance) is planned, all work should adhere to the guidelines defined in British Standard 5837: '*Trees in relations to construction – recommendations 2012*' in order to protect the trees from unnecessary damage. Any activity likely to affect the trees, above or below ground, within or out-with the area should be monitored and recorded. Work carried out by statutory undertakers out-with the site but potentially within the rooting zone of the trees, should be recorded and the implications for tree health and stability assessed.

6. That a qualified ecologist be consulted prior to any tree work commencing, in order to advise on the likely impact on any protected flora and fauna.

7. In the event of site usage altering, the risk from trees should be re-evaluated in altered areas.

8. Should paths be upgraded, or new features like benches be installed, thought should be given to avoiding impacting on tree condition during construction of structures, but also to not unnecessarily raising the target rating of trees through a lack of strategic planning. Careful consideration should be given to the positioning of benches etc.

9. Dead wood may constitute an unacceptable risk of harm. However, dead wood plays a vital part in soil ecology and is an important and threatened habit for many insects, plants, fungi and mammals. It is strongly recommended that a dead wood management strategy is developed in order to maximise the potential of dead wood in less formal areas.

10. Given the speed and propagation velocity of newly arrived pests and diseases it is recommended that a bio-security policy is put together in order to formulate controls and measures to protect the tree collection from the unwitting transmission of dangerous pathogens.

Specifications for tree work

This section defines in more detail the specifications for the suggested courses of action advised within the tree schedule. All tree work should be carried out by qualified and insured arborists to the standards defined in the following document; British Standard Institution 3998: 2010, "*Recommendations for tree work*".

Pruning

Dead wood management: removal, or shortening, of all dead branches from the crown of the tree.

Crown reduction: reduction of the height and/or lateral width of the crown of the tree. This can be an effective method of reducing the lever arm forces (wind and gravitational load) on the tree or individual limbs, thus compensating for bio-mechanical defects by improving the ratio of strength to mass.

Extreme crown reduction: this involves removal of a large proportion, or all, of the primary branches, and possibly, also the reduction in height of the principle stem. This can be appropriate on trees where structural defects are so severe that conventional pruning systems cannot hope to re-instate the ratio of strength to mass within tolerable limits. The physiological response of any individual tree is uncertain, and the success of the operation should be assessed annually. Some species and individuals may produce adventitious growth and continue to function as compact bio-mechanical structures. Other trees may not respond well and become standing dead wood. Any tree parts, or whole trees, that move to senescence have high ecological and habitat values but may constitute a hazard depending on their proximity to targets, so ongoing monitoring is essential. Coronet cuts can also be used to encourage niche habitats and adventitious growth. For more information see: **Read, H.** (2000) *Veteran Trees: A guide to good management*, English Nature; **BS** 3998: 2010, *Recommendations for tree work*; **Fay, N.** (2003) Coronet Cutting and Retrenchment Pruning - Natural fracture pruning techniques (www.treeworks.co.uk/press_releases_publications.php).

Fell or section fell: the removal of trees with significant structural defects or those trees that are in severe conflict with their context.

Further Inspection: this aims to clarify the presence, extent and severity of potential defects highlighted in the Level 1 survey. Inspection can vary from a simple aerial visual assessment by arborists of potential defects that are hard to assess from ground level, through to decay mapping using Ultrasound Tomography.

Target reduction method: valuable old trees with structural defects can sometimes be defensibly retained if the target rating is reduced. Target reduction measures may include fencing-off trees, re-directing paths and use of barrier planting.

Cable bracing: the artificial restraint of branches and stems to prevent mechanical failure. Bracing can be specified as dynamic or static depending on the severity of the defect.

Limitations

1- The observations and recommendations contained within this document are valid for 6 months from the date of this report (6th August 2021). Given the dynamic and complex nature of living trees it is advised that regular tree inspections are maintained as stated in the tree schedule and after extreme weather.

2- This survey is based upon observations of the site as it currently exists.

3- Tree condition should be re-evaluated after extremes of weather that may affect the trees' health or stability. Alteration to the site and the context in which these trees grow will make it necessary to re-assess tree condition.

4- Only the trees with individual tree numbers fall within the scope of this survey.

5- The survey was carried out using the Visual Tree Assessment Level 1 (VTA) technique as defined by C. Mattheck (2003; 2007).

6- The survey was carried out from ground level and from within the site boundaries.

7- No soil, pathogen or tree samples were taken. No drilling or other decay detection devices were employed.

8- No detailed assessment of the rooting zone and below-ground tree physiology was made.

10- No neighboring property was entered in order to survey the trees. All VTA observations were made from within areas of public access. Some measurements were estimated due to limitations imposed by the terrain.

11- Trees are dynamic and complex organisms and are subject to change. No long-term guarantee can be given as to the absolute safety of any tree.

12- Target ratings and zones were established on the basis of the site at it was observed. If the client, on the basis of frequent site visits, is able to observe that the target rating is higher than is stated, then the hazard posed by the tree population should be upgraded and management recommendations reviewed.

Part Three

Tree schedule

Key to tree schedule

Full term	Explanation
Tree Tag Number	Number on metal tag attached to the tree at approximately 2 metres above ground level.
Tree Species	Botanical Name (Common English Name). Where contemporary botanical opinion about taxonomy and nomenclature is at variance then the species synonym is also stated as (*syn.)*
Target Rating	Target value based on QTRA version 4.
Height	Height of tree in metres
Tree diameter	Measured in cm at 1.5 metres from ground level
Age Class	Young (up to the first 1/3rd of expected height). Early-mature (1/3rd to 2/3rds of expected height), Mature (close to expected ultimate height with rapid girth expansion), Late-mature (at ultimate height and with slow girth expansion),
Vigour	Physiological condition: Normal, Fair, or Poor
Summary of tree condition	**Good**: Full healthy canopy; free from major cavities, wounds, pests or diseases. A tree of excellent shape and form. **Moderate:** Slightly reduced leaf cover or isolated sparse leaf cover, minor deadwood or isolated major deadwood; early stages of decay or disease; stable structural defects. A tree of reasonable shape and form. **Poor:** Overall sparse foliage; extensive deadwood; well-established decay organisms; cavities and or large wounds; structural defects prone to failure. A tree of distorted and imbalanced shape and form. **Very Poor:** Large areas of dead crown; advanced decay; structurally unsafe. A tree of very poor shape and form. **Dead:** Dead tree.

Full term	Explanation
Notes on the structural and physiological condition and its growing context.	Observations made using the Level 1 Visual Tree Assessment system.
Preliminary Management Recommendations	Specified works that are recommended for the reduction of the identified hazard(s), or for further investigation. NWR = No Work Required PRUNING EXTREME PRUNING FELLING FURTHER INSPECTION CABLE BRACING
Urgency Rating	Timescale within which the recommended works should be completed: U2 = urgent: within 2 weeks H3 = high: within 3 months M6 = moderate: within 6 months L12 = low: within 12 months NA = not applicable IBA= if budgets allow
Re-inspection Frequency	Re-inspection frequencies based on the hazard rating of the tree: VH6 = very high risk: in 6 months H12 = high risk: in 12 months M24 = moderate risk: in 24 months L3 = low risk: in 3 years VL5 = very low: in 5 years TBD = To be determined NA = Not applicable

Tag number	Species	Target	Height	Diameter	Age	Vigour	Condition	Recommendations	Urgency	Re-inspection
182	*Ilex aquifolium (common holly) group*	2	6	16	Early mature	Normal	MODERATE.	NWR	NA	M24
183	*Quercus cerris (Turkey oak)*	2	11	47	Early mature	Normal	MODERATE POOR Reasonable intact trunk. Suppressed and asymmetric crown. Two cavities at approximately 4 meters from ground level.	FURTHER INSPECTION Aerial inspection of cavities.	M6	TBD
184	*Acer pseudoplatanus (sycamore)*	2	11	38	Early mature	Normal	MODERATE Reasonable intact trunk Supporting largely defect free asymmetric crown.	NWR	NA	M24
185	*Acer pseudoplatanus (sycamore)*	2	16	47	Early mature	Normal	MODERATE Reasonable intact trunk of bowing form. Suppressed asymmetric crown. Un occluded pruning wounds from historic crown lift pruning.	NWR	NA	M24
187	*Sorbus x intermedia (Swedish whitebeam)*	2	10	40	Early mature	Normal	MODERATE Reasonable intact trunk with bowing form supporting largely defect free crown.	NWR	NA	M24
188	*Sorbus x intermedia (Swedish whitebeam)*	2	7	35	Early mature	Normal	MODERATE Reasonable intact trunk with bowing form supporting largely defect free crown.	NWR	NA	M24
189	*Acer pseudoplatanus (sycamore)*	2	13	55	Early mature	Normal	MODERATE Reasonable intact trunk Supporting largely defect free asymmetric crown.	NWR	NA	M24
190	*Acer pseudoplatanus (sycamore)*	2	15	51	Early mature	Normal	MODERATE Reasonable intact trunk Supporting largely defect free asymmetric crown.	NWR	NA	M24
191	*Tilia cordata (Small leaved lime)*	2	8	14	Young	Normal	MODERATE Reasonable intact trunk. Suppressed and bowing form.	NWR	NA	M24
192	*Cotoneaster fridgidus (Himalayan tree cotoneaster)*	2	6	12	Early mature	Normal	MODERATE Multiple stems arising from close to ground level. Reasonable intact trunks. Suppressed and bowing form.	NWR	NA	M24
193	*Ilex Aquifolium (common holly)*	2	8	17	Early mature	Normal	MODERATE Reasonable intact trunk. Historic pollarding at 2 meters from ground level with crown re-formed.	NWR	NA	M24
194	*Prunus 'Kanzan' (flowering cherry)*	2	8	38	Early mature	Normal	MODERATE Reasonable intact trunk. Grafted at 1.5 metres from ground level. Primary branch cluster above graft point. Adequate unions. Largely defect free asymmetric crown.	NWR	NA	M24
195	*Prunus avium (gean)*	2	7	13	Young	Normal	MODERATE Reasonable intact trunk with distorted form supporting largely defect free asymmetric crown.	NWR	NA	M24
196	*Sorbus acuparia (rowan)*	2	8	23	Early mature	Normal	MODERATE Surface roots. Reasonable intact trunk. Steep fork at 1.3 metres from ground level. Slightly gaunt crown.	NWR	NA	M24
197	*Ilex aquifolium f. aureomarginata (silver holly) group*	2	9	23	Early mature	Normal	MODERATE.	NWR	NA	M24
198	*Ilex aquifolium f. aureomarginata (silver holly) group*	2	9	31	Early mature	Normal	MODERATE.	NWR	NA	M24

199	*Tilia cordata (Small leaf lime)*	2	15	49	Early mature	Normal	MODERATE Shrubs obscuring trunk to some extent. Reasonable intact trunk supporting largely defect free crown. Phototropic primary branches to south over road.	NWR	NA	M24
200	*Tilia cordata (Small leaf lime)*	2	14	55	Early mature	Normal	MODERATE Shrubs obscuring trunk to some extent. Reasonable intact trunk supporting largely defect free crown. Phototropic primary branches to south over road.	NWR	NA	M24
203	*Acer pseudoplatanus (sycamore)*	2	17	56	Early mature	Normal	MODERATE Reasonable intact trunk but with historic pruning wounds from crown lift pruning. Largely defect free asymmetric crown but with significant deadwood in lower crown.	PRUNING Remove deadwood.	M6	M24
204	*Ulmus minor (English elm)*	2	16	19	Early mature	Normal	MODERATE POOR One co dominant stem at base removed possible incipient decay but good wound wood formation. Reasonable intact remaining trunk. Suppressed and leaning form.	NWR	NA	M24
205	*Ulmus minor subsp.sarniensis (Wheatley elm)*	2	25	64	Mature	Normal	MODERATE Important specimen tree. Reasonable intact trunk. Characteristic ascending primary branches. Largely defect free crown. Partially failed branch to south overhanging road.	PRUNING Remove partially failed branch overhanging road.	H3	M24
206	*Prunus 'Kanzan' (flowering cherry)*	2	6	18	Early mature	Normal	MODERATE POOR Suppressed and leaning form. Reasonable intact trunk bit with some un occluded pruning wounds. Proposed for removal due to poor form and proximity to parking.	FELL Fell to ground level.	M6	NA
207	*Prunus 'Kanzan' (flowering cherry)*	3	7	24	Early mature	Normal	MODERATE Reasonable intact trunk. Grafted at 1.5 metres from ground level. Primary branch cluster above graft point. Adequate unions. Largely defect free asymmetric crown.	NWR	NA	M24
208	*Tilia cordata (Small leaf lime)*	2	10	15	Early mature	Normal	MODERATE Etiolated form. Reasonable intact trunk supporting largely defect free crown.	NWR	NA	M24
209	*Ilex aquifolium (common holly)*	2	8	14	Early mature	Normal	UNKNOWN Basal debris obscuring lower tree condition.	FURTHER INSPECTION Remove basal debris and visually re-inspect.	M6	TBD
210	*Ulmus minor (English elm)*	2	22	64	Mature	Normal	UNKNOWN Basal epicormic growth obscuring lower trunk condition.	FURTHER INSPECTION Remove basal epicormic growth and visually re-inspect.	M6	TBD
211	*Acer pseudoplatanus (sycamore)*	2	17	66	Mature	Normal	UNKNOWN Ivy obscuring tree condition. Trunk and crown with slight bias to south.	FURTHER INSPECTION Remove ivy growth and visually re inspect. According to previous tree surveyor, decay detection is required in lower trunk, this should also be carried out if not carried out previously.	M6	TBD
214	*Acer pseudoplatanus (sycamore)*	2	13	36	Early mature	Normal	MODERATE Reasonable intact trunk Supporting largely defect free asymmetric crown.	NWR	NA	M24
215	*Cotoneaster fridgidus (Himalayan tree cotoneaster)*	2	10	18	Early mature	Normal	MODERATE.	NWR	NA	M24
216	*Ilex aquifolium (common holly) group*	2	7	13	Early mature	Normal	MODERATE.	NWR	NA	M24

217	*Aesculus hippocastanum (horse chestnut)*	2	22	76	Mature	Normal	MODERATE POOR Reasonable trunk but with multiple occluded pruning wounds from historic crown lift pruning. Long phototropic primary branches- some apparently arising from epicormic growth and subsequently have less than optimal union with parent trunk. Some probable bark inclusions. It is likely that some crown reduction pruning will be recommended in the future- Aerial inspection is recommended at this stage to better asses condition of unions.	FURTHER INSPECTION Aerial inspection of unions.	H3	TBD
218	*Ilex aquifolium (common holly)*	2	8	13	Early mature	Normal	MODERATE.	NWR	NA	M24
219	*Cotoneaster fridgidus (Himalayan tree cotoneaster)*	2	7	17	Early mature	Normal	MODERATE Reasonable intact trunk. Multiple characteristic shoots arising from stem and crown.	NWR	NA	M24
220	*Prunus avium (gean)*	2	10	30	Early mature	Normal	MODERATE POOR Necrotic stub at 1 metre from ground level to west otherwise reasonable intact trunk supporting largely defect free crown. distorted upper form.	NWR	NA	M24
221	*Tilia x europaea (common lime)*	2	14	46	Early mature	Normal	UNKNOWN Basal epicormic growth obscuring lower trunk condition. Apparently Reasonable intact trunk supporting largely defect free but cluttered crown	FURTHER INSPECTION Remove basal epicormic growth and visually re inspect.	M6	TBD
222	*Ilex aquifolium (common holly) group*	2	10	30	Early mature	Normal	MODERATE.	NWR	NA	M24
223	*Fraxinus excelsior 'pendula' (Weeping ash)*	2	7	33	Early mature	Poor	POOR Distorted trunk with cavitating pruning wounds. Poor historic pruning. Very gaunt crown due to Chalara ash dieback infection.	FURTHER INSPECTION Review tree health in 12 months.	L12	TBD
224	*Acer pseudoplatanus (sycamore)*	2	14	47	Early mature	Normal	MODERATE Reasonable intact trunk Supporting largely defect free asymmetric crown.	NWR	NA	M24
225	*Ilex Aquifolium (common holly) group*	2	9	17	Early mature	Normal	MODERATE.	NWR	NA	M24
226	*Fraxinus excelsior 'pendula' (Weeping ash)*	2	14	51	Mature	Poor	UNKNOWN Debris obscuring lower trunk. Large occluded and un occluded pruning wounds from historic crown loft pruning. Approximately 50% crown die back due to Chalara ash dieback infection (some of the existing live crown has its origin in recent epicormic growth)	FURTHER INSPECTION Remove basal debris and visually re inspect.	M6	TBD
227	*Cupressus x Leylandii (Leyland cypress) group*	2	14	38	Mature	Normal	MODERATE Three trees planted in close proximity to one another to form group. Reasonable intact trunks. Largely defect free crowns.	NWR	NA	M24
228	*Ilex aquifolium f. aureomarginata (silver holly) group*	2	8	19	Early mature	Normal	MODERATE.	NWR	NA	M24
229	*Prunus avium (gean)*	2	8	15	Early mature	Normal	MODERATE Suppressed form. Reasonable intact trunk. Adequate unions. Asymmetric crown.	NWR	NA	M24
230	*Prunus avium (gean)*	2	8	18	Early mature	Normal	MODERATE Suppressed form. Reasonable intact trunk. Adequate unions. Asymmetric crown.	NWR	NA	M24

231	*Tilia x europaea (common lime)*	2	20	74	Mature	Normal	UNKNOWN Basal epicormic and ivy growth obscuring lower trunk. condition. Apparently Reasonable intact trunk supporting largely defect free but cluttered crown	FURTHER INSPECTION Remove basal epicormic and ivy growth and visually re inspect.	M6	TBD
233	*Prunus 'Kanzan' (flowering cherry)*	3	11	45	Mature	Normal	MODERATE Prominent buttress roots. Reasonable trunk with burl and un occluded pruning wound. Branches arising at approximately 1 5 metres from ground level with adequate unions. Largely defect free asymmetric crown with phototropic primary branches. Un occluded wound on branch to west with good wound wood formation.	NWR	NA	M24
234	*Prunus avium (gean)*	3	16	76	Late mature	Normal	MODERATE Large specimen for the species. Very small resupinate fruiting bodies of Ganoderma sp. fungi at base to east. Intact vital trunk co dominant at approximately 2 metres from ground level with very good load adaptive growth around union that may have been historically weak. Upper stem to east has broken canker with xylem exposed but apparently only insipient decay. Largely defect free asymmetric crown.	NWR	NA	M24
235	*Fraxinus excelsior (common ash)*	3	16	55	Early mature	Fair	MODERATE POOR Trunk with 30 degrees lean to east, thin bark in tensile wood of trunk suggestive of high tensile load. Cavity on upper trunk from historic pruning. Epicormic growth forming new lower crown. 5 percent crown dieback subjective of early Chalara ash dieback infection.	PRUNING Reduce crown height by approximately 2 metres. Reduce crown spread to east by approximately 2 metres.	H3	M24
236	*Aesculus hippocastanum (horse chestnut)*	3	8	24	Early mature	Fair	MODERATE Reasonable intact trunk supporting largely defect free crown. Approximately 10 % of foliage chlorotic.	NWR	NA	M24
237	*Sorbus x intermedia (Swedish whitebeam)*	3	9	66	Mature	Normal	MODERATE POOR Large prominent specimen. Remanence of fruiting bodies at base- possibly of Pholiota squarrosa. Simple acoustic test suggestive of hollow trunk. Cavity at approximately 2 metres from ground level to west with good wound wood formation. Largely defect free crown with some phototropic primary branches. May require decay detection in the future.	NWR	NA	M24
238	*Sorbus aria (whitebeam)*	2	8	26	Early mature	Normal	MODERATE Reasonable trunk with distorted form largely defect free crown.	NWR	NA	M24
239	*Sorbus aria (whitebeam)*	2	12	29	Early mature	Normal	MODERATE Reasonable trunk with distorted form largely defect free crown.	NWR	NA	M24
240	*Ilex Aquifolium (common holly) group*	3	12	33	Early mature	Normal	MODERATE.	NWR	NA	M24
Tree 60 (no tag)	*Fraxinus excelsior (common ash)*	3	10	19	Early mature	Normal	MODERATE Reasonable intact trunk Supporting largely defect free asymmetric crown.	NWR	NA	M24
241	*Tilia cordata (Small leaf lime)*	2	20	49	Mature	Normal	MODERATE Reasonable intact trunk with distorted upper form. Largely defect free crown but with isolated deadwood and hanging branches.	PRUNING Remove deadwood and hanging branches.	H3	M24
242	*Acer pseudoplatanus (sycamore)*	2	20	57	Early mature	Normal	MODERATE Reasonable intact trunk supporting largely defect free asymmetric crown with some isolated small diameter deadwood.	NWR	NA	M24
243	*Ilex Aquifolium (common holly)*	3	13	49	Mature	Normal	MODERATE Reasonable intact trunk. Co dominant stems arising at 1.3 metres from ground level supported by adequate unions. Largely defect free crown.	NWR	NA	M24
244	*Acer pseudoplatanus (sycamore)*	2	13	29	Early mature	Normal	MODERATE Reasonable intact trunk of sweeping form supporting largely defect free crown.	NWR	NA	M24

245	*Tilia cordata (Small leaf lime)*	2	15	46	Mature	Normal	MODERATE Reasonable intact trunk with un occluded pruning wounds from historic crown lift pruning. Largely defect free crown.	NWR	NA	M24
246	*Ulmus minor (English elm)*	3	14	54	Early mature	Fair	MODERATE Reasonable intact trunk. asymmetric crown. Approximately 5% crown dieback- possibly indicative of Dutch elm disease.	FURTHER INSPECTION Take Aerial samples to confirm if Dutch elm disease is present.	M6	TBD
247	*Aesculus hippocastanum (horse chestnut)*	2	21	74	Mature	Normal	MODERATE Reasonable intact trunk. Some large phototropic primary branches. Asymmetric crown.	NWR	NA	M24
249	*Tilia cordata (Small leaf lime)*	2	22	61	Mature	Normal	MODERATE Reasonable intact trunk. Largely defect free crown with isolated small diameter deadwood.	PRUNING Remove deadwood and hanging branches.	H3	M24
251	*Acer pseudoplatanus (sycamore)*	2	17	36	Early mature	Normal	UNKNOWN Dense shrub growth obscuring condition.	FURTHER IINSPECTION Remove shrub growth to allow visual re inspection.	H3	TBD
252	*Laburnum (laburnum)*	2	5	13	Early mature	Normal	MODERATE.	NWR	NA	M24
253	*Ulmus minor (English elm)*	2	11	24	Early mature	Normal	MODERATE Reasonable intact trunk with distorted upper form. Largely defect free crown.	NWR	NA	M24
254	*Ulmus minor (English elm)*	2	13	21	Early mature	Normal	MODERATE Reasonable intact trunk with distorted upper form. Largely defect free crown.	NWR	NA	M24
255	*Ulmus minor (English elm)*	2	21	60	Mature	Normal	UNKNOWN Basal epicormic and ivy growth obscuring lower trunk. condition. Apparently Reasonable intact trunk supporting largely defect free but cluttered crown.	FURTHER INSPECTION Remove basal epicormic and ivy growth and visually re inspect.	H3	TBD
256	*Ilex aquifolium (common holly) group*	2	9	36	Early mature	Normal	MODERATE.	NWR	NA	M24
257	*Acer pseudoplatanus (sycamore)*	2	19	55	Mature	Normal	MODERATE Reasonable intact trunk with un occluded pruning wounds from historic crown lift pruning. Largely defect free crown.	NWR	NA	M24
259	*Ilex aquifolium (common holly) group*	2	10	14	Early mature	Normal	MODERATE Reasonable intact trunk with un occluded pruning wounds from historic crown lift pruning. Largely defect free crown.	NWR	NA	M24
260	*Ulmus minor (English elm)*	2	9	19	Early mature	Normal	MODERATE Reasonable intact trunk with distorted upper form. Largely defect free crown.	NWR	NA	M24
261	*Tilia cordata (Small leaf lime)*	2	20	58	Early mature	Normal	MODERATE Reasonable intact trunk with distorted upper form. Large phototropic primary branch to south, otherwise largely defect free crown with medium diameter deadwood overhanging path.	PRUNING Remove deadwood and hanging branches.	M6	M24
263	*Ilex aquifolium (common holly) group*	2	9	19	Early mature	Normal	MODERATE.	NWR	NA	M24
264	*Acer pseudoplatanus (sycamore)*	2	18	61	Mature	Normal	UNKNOWN Ivy obscuring tree condition. Apparently intact trunk. Very distorted upper form. Crown bias to south.	FURTHER INSPECTION Remove ivy growth from trunk and visually re inspect.	H3	TBD
265	*Ilex Aquifolium (common holly)*	2	6	39	Early mature	Normal	MODERATE.	NWR	NA	M24
Perimeter tree group	*Mixed Tree Species*	2	NA	NA	NA	NA	NA	PRUNING Remove secondary and third order branches only to	M6	M24

								ensure a minimum vertical clearance of 4 metres from ground level on all trees overhanging the public road and car parking spaces.		
Perimeter shrub group	*Mixed shrub species*	2	NA	NA	NA	NA	NA	PRUNING Cut back shrubs that over reach onto the public road and parking spaces to ensure clear access.	M6	M24

APPENDIX 1

GLOSSARY OF ARBORICULTURAL TE

Abscission. The shedding of a leaf or other short-lived part of a woody plant, involving the formation of a corky layer across its base; in some tree species twigs can be shed in this way

Abiotic. Pertaining to non-living agents; e.g. environmental factors

Absorptive roots. Non-woody, short-lived roots, generally having a diameter of less than one millimetre, the primary function of which is uptake of water and nutrients

Adaptive growth. In tree biomechanics, the process whereby the rate of wood formation in the cambial zone, as well as wood quality, responds to gravity and other forces acting on the cambium. This helps to maintain a uniform distribution of mechanical stress

Adaptive roots. The adaptive growth of existing roots; or the production of new roots in response to damage, decay or altered mechanical loading

Adventitious shoots. Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Age class. A means of classifying the trees current position in its expected life cycle. This is often classified as; young, early mature, mature, over mature, veteran, dead.

Anchorage. The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Architecture. In a tree, a term describing the pattern of branching of the crown or root system

Arisings. All branch, stem wood, foliage, etc. that has been produced as a result of tree pruning or felling operations

Axil. The place where a bud is borne between a leaf and its parent shoot

Bacteria. Microscopic single-celled organisms, many species of which break down dead organic matter, and some of which cause diseases in other organisms

Bark. A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Basidiomycotina (Basidiomycetes). One of the major taxonomic groups of fungi; their spores are borne on microscopic peg-like structures (basidia), which in many types are in turn borne on or within conspicuous fruit bodies, such as brackets or toadstools. Most of the principal decay fungi in standing trees are basidiomycetes

Bolling. A term sometimes used to describe pollard heads

Bottle-butt. A broadening of the stem base and buttresses of a tree, in excess of normal and sometimes denoting a growth response to weakening in that region, especially due to decay involving selective delignification

Bracing. The use of rods or cables to restrain the movement between parts of a tree

Branch:

- **Primary.** A first order branch arising from a stem
- **Lateral.** A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
- **Sub-lateral.** A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch bark ridge. The raised arc of bark tissues that forms within the acute angle between a branch and its parent stem

Branch collar. A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot. A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling. An irreversible deformation of a structure subjected to a bending load

Buttress zone. The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium. Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker. A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Canopy species. Tree species that mature to form a closed woodland canopy

Cavity. A void in the tree's structure. This is normally caused by the activity of wood decay fungi

Cleaning out. The removal of dead, crossing, weak, and damaged branches, where this will not damage or spoil the overall appearance of the tree

Co-dominant (crown class).

Co-dominant (stems or branches). Two branches or stems of equal size that have arisen from 2 apical buds at the tip of the same stem. This is often associated (depending on genetic and circumstantial factors) with an inclusion of bark which may cause a point of mechanical weakness

Compartmentalisation. The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compression strength. The ability of a material or structure to resist failure when subjected to compressive loading; measurable in trees with special drilling devices

Compressive loading. Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition. An indication of the physiological vitality of the tree. Where the term 'condition' is used in a report, it should not be taken as an indication of the stability of the tree

Construction exclusion zone. Area based on the Root Protection Area (in square metres) to be protected during development, by the use of barriers and/or ground protection

Coppicing. A process whereby, following the cutting of a tree stem close to ground level, adventitous buds develop over time into stems arising from the parent stump

Crown/Canopy. The main foliage bearing section of the tree

Crown lifting. The removal of limbs and small branches to a specified height above ground level

Crown thinning. The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping. A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

Crown reduction/thinning. Reduction of the canopy volume by thinning to remove dominant branches whilst preserving, as far as possible the natural tree shape

Deadwood. Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Decurrent. In trees, a system of branching in which the crown is borne on a number of major widely-spreading limbs of similar size (cf. excurrent). In fungi with toadstools as fruit bodies, the description of gills which run some distance down the stem, rather than terminating abruptly

Defect. In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Delamination. The separation of wood layers along their length, visible as longitudinal splitting

Dieback. The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease. A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms (especially wood decay fungi)

Distal. In the direction away from the main body of a tree or subject organism (cf. proximal)

Dominance. In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud. An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so (for example, by pruning and or increased light levels)

Dysfunction. In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height). Stem diameter measured at a height of 1.5 metres (UK) or the nearest measurable point. Where measurement at a height of 1.5 metres is not possible, another height may be specified

Epicormic shoot. A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Excrescence. Any abnormal outgrowth on the surface of tree or other organism

Excurrent. In trees, a system of branching in which there is a well defined central main stem, bearing branches which are limited in their length, diameter and secondary branching (cf. decurrent)

Felling. The process of cutting a tree down, to a point near ground level, in a controlled way. This is a course of remedial action with the intention of permanently removing a tree.

Felling licence. In the UK, a permit to fell trees in excess of a stipulated number of stems or volume of timber

Flush-cut. A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root. A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Guying. A form of artificial support with cables for trees with a temporarily inadequate anchorage

Habit. The overall growth characteristics, shape of the tree and branch structure

Hazard beam. An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Heartwood/false-heartwood/ripewood. Sapwood that has become dysfunctional as part of the natural aging processes

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

Included bark (ingrown bark). Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Increment borer. A hollow auger, which can be used for the extraction of wood cores for counting or measuring wood increments or for inspecting the condition of the wood

Infection. The establishment of a parasitic micro-organism in the tissues of a tree or other organism

Internode. The part of a stem between two nodes; not to be confused with a length of stem which bear nodes but no branches

Lever arm. A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin. The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing. A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end-loading

Loading. A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Longitudinal. Along the length (of a stem, root or branch)

Minor deadwood. Deadwood of a diameter less than 25mm and unlikely to cause significant harm or damage upon impact with a target beneath the tree

Mulch. Material laid down over the rooting area of a tree or other plant primarily to help conserve moisture; a mulch may consist of organic matter or a sheet of plastic or other artificial material

Occluding tissues. A general term for the roll of wood, cambium and bark that forms around a wound on a woody plant (cf. woundwood)

Occlusion. The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen. A micro-organism which causes disease in another organism

Picus sonic tomography. A diagnostic technology which creates a two dimensional picture of a trees cross section by measuring the velocity of a series of ultra-sound pulses which are sent, and received, from a number of sensors (usually eight to twelve in number) which are placed around the trees circumference

Pollarding. The removal of the tree canopy, back to the stem or primary branches. Pollarding may involve the removal of the entire canopy in one operation, or may be phased over several years. The period of safe retention of trees having been pollarded varies with species and individuals. It is usually necessary to re-pollard on a regular basis, annually in the case of some species

Primary branch. A major branch, generally having a basal diameter greater than 0.25 x stem diameter

Primary root zone. The soil volume most likely to contain roots that are critical to the health and stability of the tree and normally defined by reference to BS5837 (2005) Trees in Relation to Construction Recommendations

Priority. Works may be prioritised, 1. = high, 5. = low

Probability. A statistical measure of the likelihood that a particular event might occur

Proximal. In the direction towards from the main body of a tree or other living organism (cf. distal)

Pruning. The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial. In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood. Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Removal of dead wood. Unless otherwise specified, this refers to the removal of all accessible dead, dying and diseased branchwood and broken snags

Removal of major dead wood. The removal of, dead, dying and diseased branchwood above a specified size

Respacing. Selective removal of trees from a group or woodland to provide space and resources for the development of retained trees.

Residual wall. The wall of non-decayed wood remaining following decay of internal stem, branch or root tissues

Root-collar. The transitional area between the stem/s and roots

Root-collar examination. Excavation of surfacing and soils around the root-collar to assess the structural integrity of roots and/or stem

Root protection area. An area of ground surrounding a tree that contains sufficient rooting volume to ensure the tree's long term retention, close to optimal physiological and structural condition. Calculated with reference to BS5837 (2005)

Root zone. Area of soils containing absorptive roots of the tree/s described. The **Primary** root zone is that which we consider of primary importance to the physiological well-being of the tree

Sapwood. Living xylem tissues

Secondary branch. A branch, generally having a basal diameter of less than 0.25 x stem diameter

Selective delignification. A kind of wood decay (white-rot) in which lignin is degraded faster than cellulose

Shedding. In woody plants, the normal abscission, rotting off or sloughing of leaves, floral parts, twigs, fine roots and bark scales

Silvicultural thinning. Removal of selected trees to favour the development of retained specimens to achieve a management objective

Simultaneous white-rot. A kind of wood decay in which lignin and cellulose are degraded at about the same rate

Snag (stub). In woody plants, a portion of a cut or broken stem, branch or root which extends beyond any growing-point or dormant bud; a snag usually tends to die back to the nearest growing point

Soft-rot. A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Sprouts. Adventitious shoot growth erupting from beneath the bark

Stem/s. The main supporting structure/s, from ground level up to the first major division into branches

Stress. In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

Stress. In mechanics, the application of a force to an object

Stringy white-rot. The kind of wood decay produced by selective delignification

Structural roots. Roots, generally having a diameter greater than ten millimetres, and contributing significantly to the structural support and stability of the tree

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

Subsidence. In relation to branches of trees, a term that can be used to describe a progressive downward bending due to increasing weight

Taper. In stems and branches, the degree of change in girth along a given length

Target canker. A kind of perennial canker, containing concentric rings of dead occluding tissues

Targets. In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping. In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Torsional stress. Mechanical stress applied by a twisting force

Tree preservation order (TPO). A legal protection of the tree, and its rooting zone, enforced by the planning department of local government. Most remedial work proposed on a preserved tree requires written approval from this authority.

Veteran tree. A loosely defined term for an old specimen that is of interest biologically, culturally or aesthetically because of its age, size or condition and which has usually lived longer than the typical upper age range for the species concerned

Vigour. In tree assessment, an overall measurement of the rate of shoot production, shoot extension. Often expressed as normal, fair, low or dead (for a given species) (*cf.* Vitality)

Vitality. In tree assessment, an overall measurement of physiological and bio-chemical processes, in which high vitality equates with healthy function (*cf.* Vigour)

White-rot. A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure. The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure. The force exerted by a wind on a particular object

Windthrow. The blowing over of a tree at its roots

Woundwood. Wood with atypical anatomical features, formed in the vicinity of a wound

APPENDIX 2

QUANTIFIED TREE RISK ASSESSMENT

Quantified Tree Risk Assessment-Version 3 (2010)

Land and tree owners owe a legal duty of care to ensure that reasonable steps are taken to manage risks associated with their trees.

Trees also confer many benefits to individual and society as well as to other living organisms. It is therefore necessary to balance risk from trees with their values and not incur unnecessary ecological and financial cost.

Adam Riedi is a trained and licensed user of the Quantified Tree Risk Assessment (QTRA) system. This system applies established risk management principles to tree safety management and aims to quantify the factors that need to occur before there is a significant risk of harm based upon a predetermined limit of reasonable and acceptable risk

This limit is set at 1:10,000 and is based upon pronouncements on thresholds for risk tolerance made by The British Medical Council and the Health and Safety Executive, amongst others.

The system quantifies the 3 components of risk; the presence of people or property, a tree or tree part of significant size and a probability that the tree or tree part will fail. All 3 components must be present, and with significant values, for a significant risk of harm to occur.

For example, a tree in a remote location, with a severe structural defect, could be defensible retained with no remedial work thought to be necessary. An identical tree in a busy street would pose a significant and unacceptable risk.

Zoning of land into different land use categories will help to identify those areas where a significant risk of harm may occur from trees. This allows the tree surveyor to prioritise their inspection of the tree stock.

Removal or reduction of the target (e.g. moving a summer house or re-directing access away from the tree) can obviously lower the risk of harm rating. Pruning or other remedial work may be sufficient to reduce the risk from a tree back to within tolerable/acceptable thresholds.

The purpose of the QTRA system is to protect the tree owner’s liability whilst defensibly retaining the values of trees which make them such an important part of our natural ecology and our society.

Zoning, targets and target ratings

A tree's proximity to traffic, structures, etc. is liable to bear consequences in the event of tree failure. The severity of known defects in a tree can be weighed against the likelihood of damage to people and property. The site was zoned into separate areas that reflected the target values on the site as it currently exists. This method has been adapted from Quantified Tree Risk Assessment (QTRA) version 3 (2010).

Target Range	Property (repair or replacement costs)*	Pedestrian Frequency	Vehicular Frequency examples	Probability Ratio (of occupation or fraction of value of £1,000,000)
1	>£50,000 - £1,000,000	>36 per hour - constant	26,102 vehicles @ 110kph (68mph)	1/1
			32,359 vehicles @ 80kph (50mph)	
			46,702 vehicles @ 50kph (32mph)	
2	>£13,888- £50,000	>10 per hour - 36 per hour	1,305 vehicles @ 110kph (68mph)	1/20
			1,617 vehicles @ 80kph (50mph)	
			2,335 vehicles @ 50kph (32mph)	
3	>£1,388- £13,888	>1 per hour - 10 per hour	363 vehicles @ 110kph (68mph)	1/72
			449 vehicles @ 80kph (50mph)	
			649 vehicles @ 50kph (32mph)	
4	>£58 - £1,388	>1 per day - 1 per hour	36 vehicles @ 110kph (68mph)	1/720
			45 vehicles @ 80kph (50mph)	
			65 vehicles @ 50kph (32mph)	
5	>£9 - £58	> 1 per week - 1 per day	2 vehicles @ 110kph (68mph)	1/17,280
			2 vehicles @ 80kph (50mph)	
			3 vehicles @ 50kph (32mph)	
6	≤ £9	≤ 1 per week	None	1/120,960

Table 1. 'Target' ranges for property, pedestrians and vehicles.

Vehicular, pedestrian and property targets are categorised by their frequency of use or their monetary value. For example, the probability of a vehicle or pedestrian occupying a target area in 'Target' range 4 is between the lower and upper limits of >1/17,280 and 1/720. Using the value of a 'Hypothetical Life' of £1,000,000 the structure value within the 'Target' range 4 is >£58-£1,388

Vehicular frequency examples for 'Target' range 1 are calculated on the basis of the stopping distance for a given road speed providing a duration of occupation for the average vehicle on that road. The total time in a day is divided by the duration of occupation with the quotient being the number of vehicles per day required to produce constant occupation. All other 'Target' ranges are calculated as a proportion of the 'Target' range 1 value e.g. 'Target' range 2 (probability ratio 1/20) 26,102/20 = 1305.1.

* Property values represent the likely cost of repair or replacement.

APPENDIX 3

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Standards Publications

BSI 3998: 2010, *Recommendations for tree work.*

BSI 5837: 2012, *Trees in relation to design, demolition and construction – Recommendations.*

APPENDIX 4

PATHOGENS OBSERVED

Hymenoscyphus fraxineus is an Ascomycete fungus that causes ash dieback, a chronic fungal disease of ash trees in Europe characterised by leaf loss and crown dieback in infected trees. The fungus was first scientifically described in 2006 under the name *Chalara fraxinea*.

Dutch Elm Disease (DED) – *Ophiostoma novo-ulmi* fungi is spread by *Scolytus spp.* beetles: the infection causes disruption of the metabolic and vascular functions of trees of the genus *Ulmus* (Elm). Edinburgh City Council (ECC) arboricultural programme is geared to an annual review of the development of the progress of DED in the city's *Ulmus* population. This survey process may have overlapped with the survey work carried out for this report. Not all crown symptoms of a tree of the genus *Ulmus* can be solely attributed to the onset of DED. Close liaison with ECC is advised to ascertain the results of their most recent work. A climbed inspection of trees suspected of infection by DED will provide twig samples for analysis. This could help to clarify whether crown symptoms are the consequence of DED, or of some other disorder or pathogen.
Control: See ECC.

Hedera helix (ivy) a climbing plant that may use coniferous and broad leaved trees as a means for structural support. May interfere with photosynthesis in individual trees whose crown has been severely colonised. Although it can also provide a valuable habitat, its presence severely hampers the VTA process which may be problematic in high target areas.
Control: Remove annually using hand tools.

Pulvinaria regalis (Horse chestnut scale): present on many of the trees of the *Acer*, *Aesculus* (Horse chestnut), *Tilia* (Lime) and *Ulmus* (Elm) genera. This insect is no longer confined to stressed trees and is now almost ubiquitous on a range of genera in many street trees throughout the United Kingdom.
On healthy trees, Horse chestnut scale is considered an aesthetic problem. However, on stressed trees, it can inhibit growth and thus contribute to further stresses. This should be factored in when monitoring trees that are potentially in decline.
Control: None is advised.

Ganoderma species-adspersum/applanatum (artist's fungi/southern bracket) Wood decay fungi that can be associated with decay of the roots and basal area of broad leaved and coniferous trees and lead to ductile structural failure.
Control: Ensure all trees are maintained in as close to optimal structural and physiological condition as is practical through best arboricultural practice.

Pholiota squarrosa (shaggy pholiota) Wood decay fungi that can be associated with decay of the roots and basal area of broad leaved trees and lead to ductile structural failure.
Control: Ensure all trees are maintained in as close to optimal structural and physiological condition as is practical through best arboricultural practice.

New challenges and pathogens

The last few years have seen a significant increase in the number of pests and diseases reaching the UK tree population. Many of these new threats to tree health have arrived with plant material imported by the horticultural nursery trade.

Not all of these threats have reached Scotland and some may never establish a significant presence here. The likely outcome for other the pests and diseases and their pathogenicity and propagation velocity is a matter for conjecture, but also for justifiable concern. Other factors such as climate change may change the nature and severity of new threats from pathogens.

A prominent threat to the tree population in the UK is *Phytophthora* species such as *P. ramorum,* which has a presence in Scotland and within the woodland garden itself. Other species of *Phytophthora* include *P. lateralis, P. austrocedrae* and *P. kernovia.*

The fungus *Splanchnonema platani* (formerly called *Massaria platani*) is common in continental Europe and is now established in south-east England. This causes brittle branch failure of plane trees.

Oak processionary moth - *Thaumetopoea processionea* - is now established in south-east England and the English midlands.

Asian longhorn beetle (*Anoplophora glabripennis*) is common in continental Europe and is established in south-east England.

APPENDIX 5

PLANTING AND REPLANTING

Planting and replanting

Following completion of essential tree remedial work, thought should be given to preparation of planting design plans.

The loss of any trees on this site should be mitigated by new planting.

Planting plans could be formulated following discussion between the arboricultural consultant and horticultural staff.

Issues to be considered should include historical features, loss of key species, new innovative planning with new tree species and planting of new areas.
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The plant selection, planting and aftercare should be carried out to the minimum standards defined in the British Standard 8545:2014 *Trees: from nursery to independence in the landscape. Recommendations* and the Horticultural Trades Association – *'National Plant Specification'* and *'Handling and Establishing Landscape Plants'*

A plan for re-planting over the coming decades should be set in place within the next 24-36 months. This should include replanting plans for ornamental trees, structural planting and planting for conservation, and should consider the following:

- Areas for inclusion within the planting plan and objectives.
- Environmental constraints and opportunities for planting.
- The species and cultivars for selection.
- Plant sourcing, specification, certification and provenance.
- Record keeping of plants selected and their provenance.
- Planting method and aftercare.
- Budgets should be created and agreed for all of the above.

Given the dynamic nature of trees and their interaction with their environment, the planting plans should be reviewed every 36 months. Climatic changes and new pathogens may require adjustment to the methods and direction adopted to ensure good future continuity of tree cover.

APPENDIX 6

ARBOR-ECOLOGY

HABITAT MANAGEMENT AND PROTECTED SPECIES

A qualified ecologist should be consulted prior to any tree work commencing, in order to advise on the likely impact on any protected flora and fauna.

Ecological management of individual trees has developed markedly in the last couple of decades.

Decay, death, dysfunction and structural failure of individual trees and their components were once regarded as essentially negative.

Increased understanding of the habitat value of standing and fallen deadwood, cracks and cavities has led to an appreciation of the ecological value of trees that seem to have completed their life cycle or are in poor structural condition.

A significant range of plants, mammals, birds, fungi and invertebrates are dependent on saprophytic environments and the niches created by tree fracture and collapse. It is estimated that 6% of the total British fauna is dependent on dead wood.

Veteran trees, or trees that are unusually old for the species, are often particularly rich in terms of ecological and bio-diversity values.

In high-target areas, or areas of formal design, retention of dead branches in the crown of a live tree, or leaving a 4-metre-high stump for habitat, may very well be in direct conflict with tree safety issues and constitute an unacceptable risk of harm to people or property.

In areas where the target rating is lower or the landscape is more naturalistic in composition, a strategy may be adopted to create standing and fallen dead wood, extreme pruning and crown removal. Where trees of high ecological value exist it may be more appropriate to reduce the risk of harm by excluding, or significantly reducing, access in some areas.

It is recommended that the duty holder should:

1. Create a section within the tree policy that deals with conservation practices, existing valuable species of flora and fauna, and legislation.

2. Identify areas suitable for the retention of standing and fallen deadwood.

3. Ensure that once these habitats are demarcated and protected, then they are not subsequently moved or disrupted.

4. Identify species of flora and fauna currently existing on the site and be aware of those of particular value or that are protected by legislation.

5. Contact Scottish Natural Heritage in the event of needing further or more specialised information regarding land management and ecology.

APPENDIX 7

TREES AND THE AGEING PROCESS

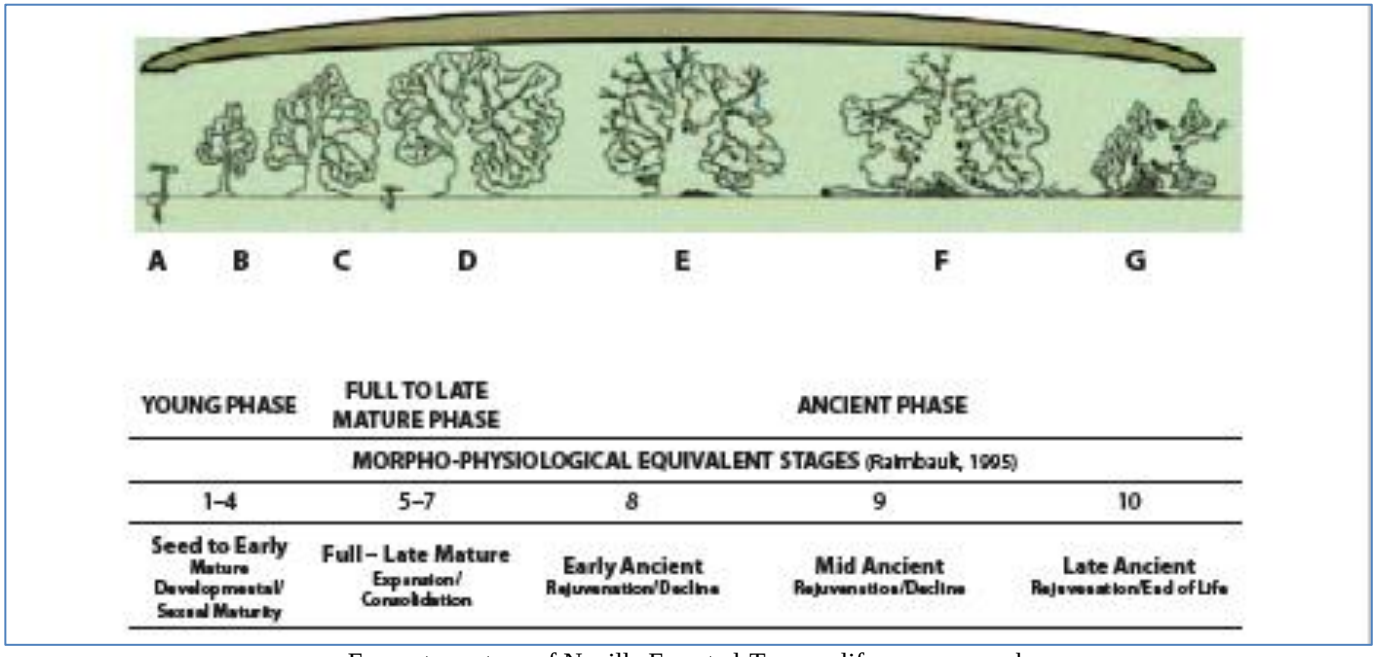
The conventional view of the life cycle of trees that persisted into the latter half of the 20th century was much influenced by the idea of definite growth. Organisms like *Homo sapiens* have, broadly speaking. a definite life cycle that moves in a more or less linear way towards senescence. This view of development has to some extent entered the vocabulary and associated modes of thought we might use when looking at trees and their growth.

Terms such as "over-mature" suggested a tree in a enfeebled state and that following peak crown size life is characterised by passivity in the face of time, decay and disease. In anthropomorphic terms, the tree was "just getting old".

The concept of the veteran and ancient trees (both post-peak crown maturity age classes) has begun to replace that of "over-maturity". Given many tree species can live for hundreds and even thousands of years, study of the ageing strategies of trees tends towards a less linear continuum of growth that may be punctuated in episodic lapses in condition and living mass. The ability of the tree to produce new roots, trunk increments and branches means that trees have an indefinite growth pattern with episodic opportunities for rejuvenation. Symbiotic relationships with mycorrhizal fungi and some species of saproxylic and wood decay fungi are an essential component of the ageing process.

This awareness tends to make the management of ageing tree populations more complicated in some respects. Ageing trees in complex bio-mechanical condition can be vitally important habitats in their own right. Is the trees current condition "the beginning of the end" or merely a well-controlled and regulated process which does not tally with earlier views of how a tree should look and behave? Equally, there are always some individual trees with irremediable structural defects and failing health and whose standing dead remains (depending on species and circumstance) may have a negligible habitat value.

The situation in the botanical collections of the garden is made more complex by the fact that we are largely dealing with non-native trees interacting as they age with organisms that are largely native to the UK. Western red cedar may live for a thousand years in north-west America but for how long in north-east Scotland, or south-west England or south-west France? How these exotic trees age, as well as for how long, are questions that are not yet fully answered in my view.



Excerpt courtesy of Neville Fay et al-Trees, a lifespan approach

APPENDIX 8

CROWN LIFT PRUNING

Crown lift pruning

Tree species and individuals within each species vary considerably in their tolerance to pruning. The wound response to pruning is genetically coded within each tree species. The existing biological and structural condition of an individual tree along with its age will also have a significant influence on response to pruning and other natural events such as pathogen attack and extremes of climate.

The crown morphology of individuals will determine the size and distribution of wounds assuming that a fixed pruning objective is implemented (for example, lift crown to ensure 5 metres clearance from ground level).

A fixed objective of this sort can be problematic to successfully carry out well right across the range of individuals of diverse, species and condition.

Some considerations against excessive crown lift pruning are as follows;

- Crown lifting is often done to a particular height that reflects a non-arboricultural management objective. Therefore, all branches below a certain height are removed regardless of wound size and frequency and the pruning tolerance of the species involved.
- Several pruning wounds together can lead, in time, to the coalescence of several small decay columns into one significant column.
- The lower branches are acting as "pumping stations" for the transport of water and nutrients to the upper crown.
- The removal of lower branches can end up with a top-loaded bio-mechanical structure with decreased stability and wider oscillation under wind and gravitational load and poor stem taper.
- The removal of lower and interior branches means that in the event of the necessity to reduce the crown height or the length of individual branches (in order to reduce wind and gravity load on a defective part) there are fewer branches to prune back to and sustain the remainder of the tree.

This does not mean that it is not possible to realistically implement crown lift pruning. Rather, that it should be carried out with a good degree of knowledge of the tree species and individuals involved and an ability to adapt and compromise where certain trees are concerned.

7.6 Crown lifting

COMMENTARY ON ***7.6***
Crown lifting involves pruning to achieve a desired vertical clearance above ground level or other surface (see Figure 3). This is sometimes necessary to facilitate site usage.

If crown lifting involves the removal of branches which form a substantial proportion of the lower crown of a mature or old tree, the resulting wounds on the stem(s) have the potential to become the seat of extensive decay, which could lead to mechanical failure. Failure could also become likely in the short term, since branch removal can cause an immediate impairment of biomechanical properties.

Extensive crown lifting should if possible be phased over a number of years, with a view to providing some opportunity for physiological and biomechanical adaptation to the resulting wounding and branch removal.

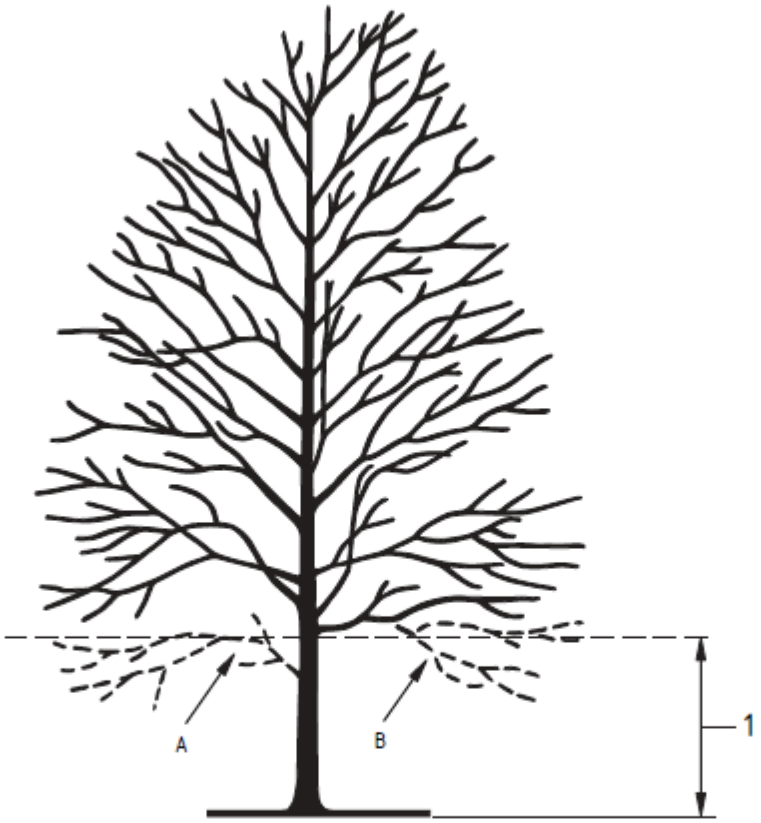
Crown lifting should be avoided or minimized in mature or old trees if possible, since it can increase the probability of stem failure. If it cannot be avoided, it should preferably involve the removal of secondary branches or branch shortening rather than removal of branches back to the stem, provided that the desired clearance can thereby be achieved. The choice of these options should take account of factors such as the size, growth-potential, branching habit and shade tolerance of the tree.

Crown lifting that involves cutting back branches to the stem(s) should preferably not result in the removal of more than 15% of the live crown height. Also, the remaining live crown should make up at least two-thirds of the height of the tree. Unless the objectives change, there should be no further crown lifting (except in the case of a young tree undergoing formative pruning; see **7.4**), which would increase the effect of wounding on the stem(s) and the impairment of biomechanical properties.

NOTE For example, if the stem of a 20 m-high tree is branch-free to a height of 5 m, 15% of its live crown height (15 m) is 2.25 m. On this basis alone, the tree could be crown lifted to a height of 5 m + 2.25 m = 7.25 m, but the overall maximum is one-third of tree-height; i.e. 6.7 m.

Excerpt from the BSI:3998 2010

Figure 3 **Crown lifting**



Key

1 Clearance to be specified by the removal of either main branches (A) or secondary branches (B)

When specifying crown lifting, the points between which the clearance will be measured should be stated; for example, this may be from ground or roof level to the point of origin of the lowest remaining branch or the lowest remaining foliage.

Excerpt from the BSI:3998 2010

Example of crown lift pruning with the pruning points indicated in red

Specifications for crown lift pruning.

1. All the trees in the garden that stray over the public highway should be crown-lifted to the minimum standards defined within BSI 5837: 2012, *Trees in relation to design, demolition and construction – Recommendations*.

2. The arboricultural contractor should be supervised and assisted by the project arboriculturalist to ensure that the specification is carried out to the highest possible standard.