Arboricultural Report

& Method Statement

For planning purposes at

Hill House
Kingwell Road
Worsbrough
Barnsley
S70 4AG

Dated
6th March 2013

CROWN Consultants

Tree consultants throughout England and Wales

Contents

1. Introduction

1.1. Instruction

1.1.1. We are instructed by Lisa Jepson of Coda Architects to undertake an Arboricultural Survey at Hill House and produce our findings in a report. We are also instructed to produce a Method Statement detailing how trees shall be protected from the proposed construction activity.

1.2. Scope and Purpose of the Report

1.2.1. This report is designed to accompany a planning application for development proposals at the above site. Its purpose is to assist and inform the design and planning process. It is produced according to the guidance and recommendations within *BS 5837: 2012 - Trees in Relation to Design, Demolition and Construction.*

1.2.2. The Method Statement should be viewed as a *Heads of Terms* Method Statement which specifies the general principals to be adopted during construction and demolition. However, specific construction activities proposed within Root Protection Areas may need to be agreed in more detail if requested by the local authority at the reserved matters stage.

1.3. Drawings

1.3.1. We have been supplied with a measured plan of the site with tree positions already plotted. Where applicable, additional trees have been plotted according to measurements taken on site.

1.3.2. The *Tree Constraints Plan* shows the existing layout with the proposals overlaid. For each tree the stem location is indicated and scaled according to its diameter, the canopy is indicated according to measurements taken along the four cardinal points of the compass. Root protection areas are indicated which are calculated according to the guidelines within BS 5837 (2012).

1.3.3. he *Tree Protection Plan* shows the protection measures that are to be installed during the construction phase. This plan accompanies the Method Statement which is to be found in Section 5.

2. Site Overview

2.1. Brief Description (Existing Layout)

2.1.1. The trees surveyed are all located close to the entrance of an access track from Kingwell Road. The track serves as vehicular access for residential properties. The co-ordinates are 53.536012° -1.469582° and the altitude is 135m above sea level. (Co-ordinates may be pasted or typed into the following site: http://maps.google.co.uk/ where maps, satellite imagery and street views may be accessed).

2.1.2. Our survey covered the area indicated in Figure 1.

Figure 1 Extent of the survey (image is not current).

2.1.3. The track slopes down to meet Kingwell Road at an acute angle. It is proposed to widen the entrance to the track in order to enable better access to, and from, Kingwell Road. A new passing place is also proposed to enable safe passage without reversing back to the road.

2.1.4. On either side of the track are dry stone walls. To the right of the track (looking from the road) is an area of rough grassland at approximately the same level as the track. There are no trees in this area close to where it is proposed to widen the track. The nearest tree (T5) being approximately 23m away from the track entrance and well beyond any potential impact from widening it.

2.1.5. To the left of the track the ground slopes steeply upwards and forms a woodland with a rough grass floor. This is retained close to the track entrance by a stone wall. A large beech (T1) grows just beyond this wall. Two mature oaks and a young elm growing on the wooded embankment were included within the survey.

2.1.6. The Tree Constraints Plan and Tree Data Schedule should be referred to for descriptions and locations of all trees.

2.1.7. Photographs of the site are included in Section 10.

3. Tree Survey and Data Schedule

3.1. Survey Details

3.1.1. A ground level survey undertaken on 4th March 2013. The survey was conducted by Ivan Button. No climbed inspections or specialist decay detection were undertaken. Only trees with a stem diameter over 75mm were included, which lie within the site boundary or relatively close to it.

3.1.2. Where applicable, trees with significant defects have been highlighted and appropriate remedial works have been recommended. However, this report should not be seen as a substitute for a full *Safety Survey* or *Management Plan* which are specifically designed to minimise risk and liability associated with responsibility for trees.

3.1.3. Wherever possible, dimensions are obtained using diameter tapes, logger's tapes, distometers and clinometers. Where obstacles prevent accurate measurement, dimensions are estimated. Trees on privately owned third party are surveyed from the best available vantage point and observations relating to the condition of these trees should be treated accordingly. All height measurements should be regarded as approximate.

3.2. Data Schedule

3.2.1. The findings of the survey are presented in The Tree Data Schedule which is provided as a separate document as well as being appended to the end of this document within Appendix 6.

3.2.2. The Schedule includes scaled tree images based on measurements recorded for stem diameter, crown spread, crown height and overall height. Their purpose is to indicate, at a glance, the relative dimensions of each tree.

3.2.3. A definition of the Retention Categories can be found in Appendix 1. All other terms used within the Tree Data Schedule are defined and explained in Appendix 3.

3.3. Stem Diameters – Multiple Stems

3.3.1. Where a tree has more than one stem, the equivalent-single-stem diameter is usually recorded. This is calculated by adding the squares of the stems and then finding the square root of this total. The radius of the Root Protection Area is then calculated by multiplying the equivalent-stem-diameter by 12.

3.3.2. Occasionally this method is not appropriate (e.g. for coppiced specimens where there are numerous stems). In such cases the diameter at ground level may be recorded or a stem diameter which would provide a suitable Root Protection Area calculation. The form of the tree is recorded in the notes section.

4. Vegetation Overview

This section summarises all the recommendations within the Tree Data Schedule regardless of whether trees are to be retained, felled or pruned to facilitate the proposed development. It does not specify works that may be required to facilitate the development proposals. The protection status of the trees is also reported in this section.

4.1. Preliminary Management Recommendations

4.1.1. The trees were all deemed to be in an acceptable condition and no significant defects were observed. Consequently, no remedial works have been recommended.

4.2. Future Inspections

4.2.1. The table below suggests a schedule of future inspections based on the condition and location of each tree:

Inspection Frequency (years)	Tree Number
0.5	None
1	None
1.5	None
3	T1, T2, T3, T4, T5, G6

4.2.2. The trees should be inspected sooner if there is a noticeable decline in their condition, or following extreme weather events.

4.3. Tree Protection Status– Site Specific

4.3.1. On 5th March 2013, we were informed by Ed Jowett of Barnsley Metropolitan Borough Council that:

- The site is not within a conservation area.
- There are tree preservation orders affecting trees within the site.

4.4. Tree Protection – General Notes

4.4.1. Before undertaking works to trees protected by a tree preservation order, consent needs to be obtained from the local authority which will provide application forms and advice to potential applicants. The removal of dead wood is exempt.

4.4.2. Where the works are proposed for reasons of safety or ill health, a report from a suitably qualified arborist will usually be required. Trees that are dead, dangerous or dying are technically exempt from protection, though it would be prudent to give the local authority 5 days' notice of intention and take photographs before undertaking works without prior consent being granted. Fines of up to £20,000 per tree exist for unauthorised works to protected trees.

4.4.3. Where planning permission is granted and tree works have been approved as part of the planning consent. No further application is required in respect of protected trees and no further notice is required in respect of trees within a conservation area.

4.5. Species Present – Additional Information

4.5.1. The table below contains general information about the tree *species* that were observed within the survey. It does not contain information about the individual trees surveyed. Its purpose is to assist readers who are unfamiliar with the characteristics of the various species.

Species	Typical Height at Maturity	Typical Canopy Spread at Maturity	General Notes
Beech	25	18	Deciduous tree native to W and S Europe. Does not have resilient heartwood, therefore typically lives for 100 - 150 years before decay may cause structural failure if unmanaged. Can be an extremely attractive tree at maturity due to its size and majesty. Young branches may retain their foliage through winter as is evidenced in beech hedges. Visit http://www.pfaf.org/user/Plant.aspx?LatinName=Fagus+sylvatica for more info.
Elm	25	14	Several species of elm may be found in the UK. The most common being Wych Elm, English Elm and the Narrow-Leafed Elm. Many specimens are likely to be a cross as they freely hybridise. Attractive golden varieties are occasionally seen. The English Elm was once a common feature of the British landscape but has been decimated by Dutch Elm Disease. Visit http://en.wikipedia.org/wiki/Elm for more info.
Oak	22	18	Deciduous, long lived tree native and common throughout Europe with very durable timber. Excellent habitat tree - provides food and shelter for thousands of native species. Can be very attractive as a mature open grown specimen though not particularly ornamental, having no autumn colour or showy flowers. Responds well to pruning. Visit http://www.pfaf.org/user/Plant.aspx?LatinName=Quercus+robur for more info.
Sycamore	25	16	Deciduous tree native to S. Europe, widely naturalised in the UK. Often regarded as a weed species due to its invasive nature and ability to tolerate most conditions. Responds well to pruning. Not a good tree to park beneath in summer due to the sticky sap secreted by aphids. Visit http://www.pfaf.org/user/Plant.aspx?LatinName=Acer+pseudoplatanus for more info

4.5.2. The figures quoted regarding typical height and canopy spread should be treated as approximate. Actual heights and spreads vary according to several environmental factors such as soil conditions, climate and presence of competing vegetation.

5. Method Statement

Section A: Introduction and Overview

5.1. Definition of Terms

5.1.1. Some terms used within the Arboricultural Method Statement have very specific meanings. These are defined below:

5.1.2. **Root Protection Area (RPA).** This is a theoretical area of ground around a tree where the roots are likely to proliferate. Ground disturbance in this area should be minimised in order to avoid significant impact on tree health. RPAs are indicated on all plans accompanying this report as a pink line.

5.1.3. **Construction Exclusion Zone (CEZ).** These zones are created to protect roots and canopies form inadvertent damage by construction activity – see Section 5.8. *-Construction Exclusion Zones*. They are usually fenced off by protective barriers throughout the entire construction phase. No works are permitted in these zones other than minor landscaping works which do not require a change in ground level. Where practicable the entire *Root Protection Area* and the area beneath the tree canopy shall be treated as a *Construction Exclusion Zone*. These zones are hatched purple on the Tree Protection Plan.

5.1.4. **Restricted Activity Zone (RAZ).** It is not always possible to create a *Construction Exclusion Zone* over the entire RPA. This is because access may be required or some works may be proposed within the RPA. In such circumstances a *Restricted Activity Zone* is created where limitations are placed on construction activity. Ground protection measures may be specified or the Restricted Activity Zone may be fenced off throughout part of the construction phase. See the legend on the Tree Protection Plan to identify these zones.

5.2. Tree Protection Barriers - Overview

5.2.1. The Tree Protection Plan indicates the location of all proposed tree protection barriers according to the following legend and overview:

Symbol on Tree Protection Plan	Barrier type See Section 7	Location
	In-Ground System or Back-Stay System	Around the RPA of T5 and G6
	Back-Stay System	N/A
	Barrier Mesh System	Around T2, T3, T4,
	Plywood Boxing	N/A
	Cloth and Wire Wrap	N/A

5.2.2. The barriers shall be installed prior to the commencement of any construction activity including soil stripping and delivery of materials. A detailed specification of the barriers can be found in Section 7.

5.3. Planning Status

5.3.1. Tree protection measures specified within this report should be agreed with the local authority so that they may be conditioned upon planning consent.

5.3.2. The site manager must be familiar with all aspects of this Method Statement and should liaise with the author of this report for clarification, or regarding any unforeseen issues where trees may be impacted upon.

5.3.3. A copy of this Method Statement shall be available on-site at all times. All personnel working on the site shall be made aware of any sections appertaining to their work. This includes short term contractors and persons responsible for deliveries.

5.4. Overview of the Development Proposals

5.4.1. It is proposed to widen the existing entrance as indicated on the accompanying plans.

5.5. Overview of Protection Measures

5.5.1. Below is a list of potential arboricultural impacts and a summary of the proposed protection measures:

Reference	Comments	Potential Impact	Protection measures
T2 – T4	Existing surface replaced over RPA.	Root disturbance.	Restricted Activity Zone 'A' created - see Section 5.9 Excavation limited to existing surface and sub-base. Surface roots adjacent the track to remain undisturbed.
T5	New passing place Proposed over RPA.	Root severance. Soil compaction. Reduced water and oxygen uptake.	Restricted Activity Zone 'B' created - see Section 5.10 Excavation limited to 200mm. 3D cellular confinement system incorporated into a 'no-fines' sub-base. Hand dig methods to be used. Porous finish utilised.
All other retained trees	No works proposed in Root Protection Areas.	Compaction and contamination from general construction activity.	Protective fencing installed as specified in Section 7 and *Construction Exclusion Zone* created where appropriate. No works permitted in Exclusion Zone.

5.5.2. The above measures are described in more detail throughout the remainder of this section.

5.6. Timing of Operations

5.6.1. Activity within the site shall be phased according to the following chronology:

Order	Phase	Activity
1st.	Pre-Construction Phase	Detailed design submission for approval (see Section 5.7 below). Discharge of any planning conditions relating to trees.
2nd.		Install the tree protection barriers (see Tree Protection Plan and Section 7 -*Tree Protection Barriers*.
Protection measures confirmed acceptable by the local authority		
3rd.	Construction Phase	Demolish existing structures and remove existing surfaces where applicable.
4th.		Install new surface and walls taking into account restricted activities as specified in Sections 5.8 onwards
5th.	Post-Construction Phase	Remove protective barriers.

5.7. Confirming Detailed Proposals (Reserved Matters)

5.7.1. This Method Statement is a *Heads of Terms* method statement. This means that it specifies the general principles to be adopted during proposed development works. Often additional input is required from engineers to confirm the exact locations of services or technical specifications which are beyond the scope of an arborist. This is usually provided at the reserved matters stage via planning conditions. The table below highlights where such confirmation is required.

Nature of Activity	Areas Potentially Affected	To be Confirmed
Surfaces	Restricted Zones A and B	Exact specification; including depth of excavation, sub-base construction and surface type. To be agreed and approved by engineers and the local authority.

5.7.2. The limitations specified within this report need to be considered in detail by building and/or demolition contractors. Any conflicts should be raised at an early stage so that issues may be resolved and agreed with the local authority. This may require the production of a revised Method Statement.

Section B: Restrictions on Activities – Specific Zones

5.8. Construction Exclusion Zones

5.8.1. Within Construction Exclusion Zones (shaded purple on the Tree Protection Plan) the following restrictions shall apply:

- Fencing shall be erected and maintained throughout the entire project as indicated on the Tree Protection Plan and specified in Section 7 -*Tree Protection Barriers*.
- No construction activity whatsoever shall occur.
- No tree works, other than those specified in this report shall be undertaken.
- No alterations of ground levels or conditions.
- No chemicals or cement washings permitted.
- No excavation whatsoever.
- No temporary structures.
- No spoil shall be stored.
- No fires shall be permitted.
- All hazardous materials (including non-essential cement products) shall be forbidden.

5.9. Restricted Activity Zone A

5.9.1. Within this zone (indicated on the Tree Protection Plan) resurfacing is likely to be required. The following restrictions shall apply:

- No other building works shall be permitted.
- At all times a suitable load spreading surface shall be in place.
- The exposed surface roots illustrated in photographs 3 and 4, and marked on the Tree Protection Plan are to remain intact and undisturbed.
- Further detailed restrictions are specified in Section 9.1.
- No fires shall be permitted.
- All hazardous materials (including non-essential cement products) shall be forbidden.
- No machinery in excess of 4m tall shall pass through this zone.

5.10. Restricted Activity Zone B

5.10.1. Within this zone (indicated on the Tree Protection Plan) it is proposed to install a new passing place. This will involve removing the existing rough grass and replacing it with a gravel surface.

5.10.2. The following restrictions shall apply:

- No other building works shall be permitted.
- No vehicles or machinery shall pass over this area prior to the installation of the new driveway unless ground protection measures are in place.
- The new driveway shall be installed according to the Minimum-Dig method as specified in Section 9.2 -*Surfaces*.
- No spoil shall be stored.
- Storage of materials shall be limited to that which is required for the task in hand. Heavy materials that require storage for more than two days shall be stored outside the Restricted Zone.
- No fires shall be permitted.
- All hazardous materials (including non-essential cement products) shall be forbidden.

Section C: Restrictions on Activities – Throughout the Site

5.11. Canopy Protection

5.11.1. In order to protect tree canopies outside of *Construction Exclusion Zones* the following restrictions shall apply:

- No machinery in excess of 3m shall pass beneath the canopy of any tree without being carefully marshalled in order to ensure that no branches are damaged.
- If materials require installation or delivery beneath tree canopies, this shall be done without the use of overhead cranes.
- If materials are to be installed or delivered close to tree canopies (but not beneath them) and a crane is required, they shall be carefully marshalled in order to ensure that branches are not accidentally damaged.

5.12. Site Hoarding

5.12.1. If site hoarding shall be installed over the Root Protection Area of any tree, the following restrictions shall apply:

- Ground levels shall be maintained as existing.
- Post holes shall not exceed 300mm x 300mm.
- No post hole shall be excavated within 1.5m of any tree stem.
- Post holes shall be excavated using hand tools or by a post-hole auger attached to plant machinery sited outside the Root Protection Area(s).
- Roots in excess of 25mm shall be retained wherever possible.
- Roots in excess of 10mm shall be pruned with sharp secateurs.
- Pruning shall be minimal and only undertaken where absolutely necessary to facilitate the site hoarding. It shall be undertaken by a reputable tree surgeon working to BS 3998 (2010).
- Cement products shall be mixed away from Root Protection Areas (see Section 5.16 - *Hazardous Materials*).

5.12.2. Site hoarding may be installed in place of the specified tree protection measures subject to the approval of the local authority with regard to its location and specification.

5.13. Underground Services

5.13.1. No underground services are proposed.

5.14. Use of Heavy Plant

5.14.1. All machinery operatives are to be made aware of any *Construction Exclusion Zones* and *Restricted Activity Zones* that apply to this site (see the Tree Protection Plan and Section 5.8 onwards).

5.14.2. All machinery operatives are to respect these zones and ensure that no damage occurs to trees due to the careless use of machinery.

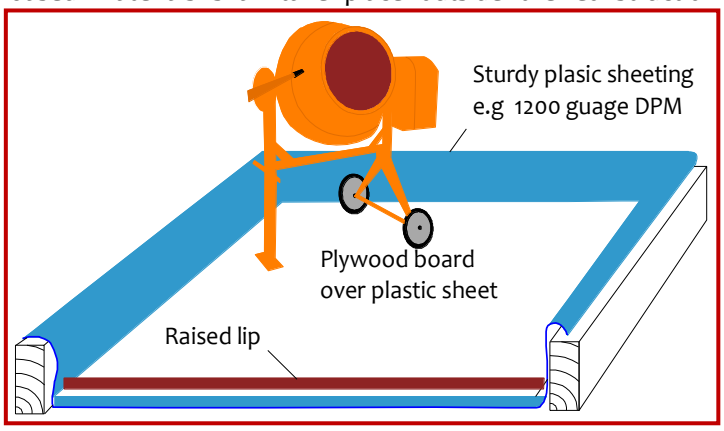
5.15. Siting of Cabins and Storage of Materials

5.15.1. Cabins and heavy building materials may be located or stored anywhere outside of *Construction Exclusion Zones* and *Restricted Activity Zones*.

5.15.2. Any proposal to install cabins or materials within these zones shall be agreed in writing with the local authority prior to installation.

5.16. Hazardous Materials

5.16.1. Any mixing of cement based materials shall take place outside the Construction Exclusion Zones and Restricted Activity Zones. Where cement is to be mixed at considerable distances from trees and water run-off cannot enter Root Protection Areas, then no further special measures are required. Otherwise, provision shall be made to ensure that the mixing area is contained so that no water run-off enters the Root Protection Area of any trees (see diagram for example). Mixers and barrows shall be cleaned within this area.



5.16.2. All other chemicals hazardous to tree health, including petrol and diesel, shall be stored in suitable containers as specified by current COSHH Regulations, and kept away from Root Protection Areas.

Section D: Post-Construction Phase

5.17. Removal of Tree Protection Barriers

5.17.1. This will be done after all major construction work is complete. Vehicular access will not be permitted within the Construction Exclusion Zones.

5.17.2. The local authority tree officer shall be made aware that the fencing is to be removed.

5.18. Landscaping

5.18.1. No machinery used within landscaping operations shall operate within the Root Protection Areas of retained trees.

5.18.2. Ground levels shall not be altered within Root Protection Areas without consultation and approval from the local authority.

6. Site Inspection

6.1. Inspection Schedule

6.1.1. In order to ensure that the trees are adequately protected it shall be necessary to confirm that the tree protection barriers are installed to the satisfaction of the local authority. This will be done by the local authority tree officer or an appointed arborist (see Section 6.2 below) who will provide the tree officer with a copy of inspection details.

6.1.2. The following inspection schedule is suggested though the local authority may specify additional supervision where deemed necessary.

Inspection	Attendees	Comments
Pre- Start To occur prior to any works taking place on the site.	N/A.	Site manager to study this Method Statement & contact the appointed arborist to agree all protection measures.
Pre-Construction After tree protection installed. Prior to any other activity, inc. soil stripping.	Photographs of tree protection measures to be sent to the local authority tree officer for approval.	Tree protection fencing locations & specification checked. Further protection measures / restrictions agreed.

* Where agreed with the L.A. it may be acceptable to supply photographs of the fencing to avoid the necessity for a site visit.

6.2. The Appointed Arborist

6.2.1. The appointed arborist must be acceptable to the local authority. He / she must have a good understanding of the project requirements and be suitably qualified to understand the hazards associated with development near to trees.

6.2.2. The appointed arborist should work closely with the site manager and shall have the authority to insist upon work stoppage until resolution of any major issues arising which could be detrimental to the health of protected or important trees.

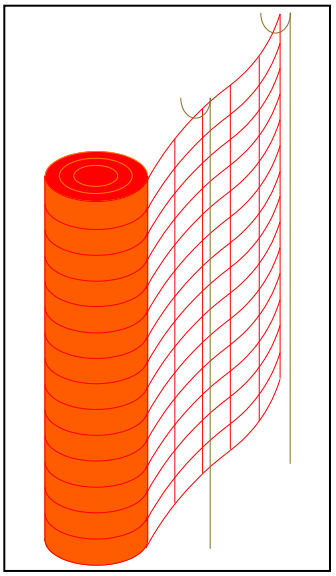
6.2.3. The appointed arborist must keep the local authority updated at each of the stages within the inspection schedule and will advise on any unexpected issues arising throughout the project which could impact on trees.

7. Tree Protection Barriers

Detailed Specification

The purpose of tree protection barriers is to keep construction activity away from *Restricted Activity Zones* or *Construction Exclusion Zones*. They should be appropriate to the nature and proximity of activity within the site. The barriers should be erected prior to the commencement of all activity including demolition, soil stripping and delivery of materials and demolition (except where existing structures require demolition to enable the barriers to be installed). Barrier systems are specified below and should be installed according to the legend on the Tree Protection Plan.

7.1. The Barrier-Mesh System



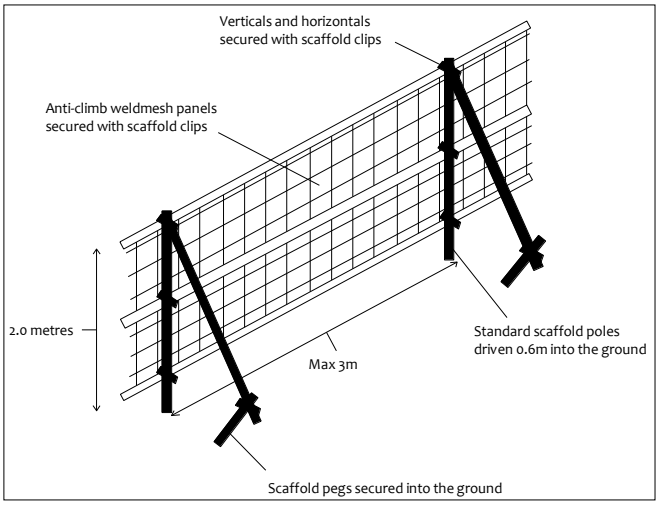
7.1.1. Where indicated by a thick red line (solid or dashed) on the Tree Protection Plan, it shall be acceptable to install a less robust system than those specified above. This is because of the nature of construction activity or its distance from tree protection areas. The purpose of such a system shall be to demarcate the protection zone. It is not intended that such fencing will withstand knocks by construction machinery.

7.1.2. In this system, high visibility plastic safety fencing, 1m high, minimum grade 140g/m2 is supported on steel fencing pins located at 2.5m intervals.

7.2. The In-Ground System

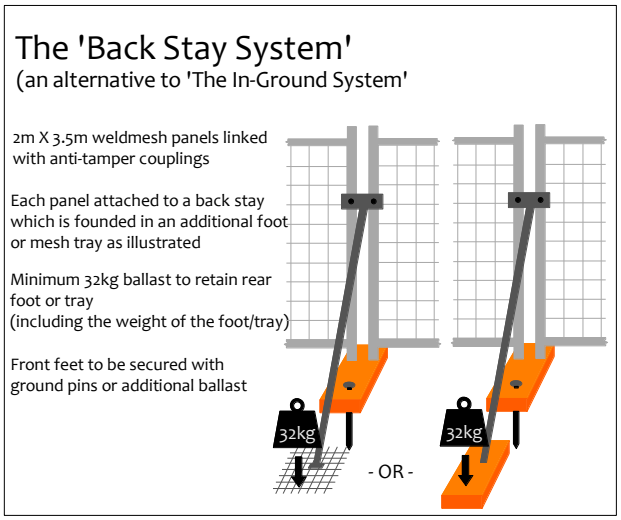
7.2.1. This system may be installed where indicated by a solid purple line on the Tree Protection Plan. It should be robust enough to withstand occasional knocks by plant machinery and, once installed, shall remain in place throughout the entire construction phase.

7.2.2. Vertical scaffold poles are driven into the ground, onto which are affixed horizontal scaffold poles and diagonal bracing struts. Weldmesh panels (or similar – e.g. Heras type fencing panels, or 18mm+ plywood boards) are secured to this scaffold framework using sturdy clips e.g. standard scaffold clips. The system is illustrated in the diagram to the right and is based on BS 5837 guidelines.



7.3. The Back-Stay System

7.3.1. This system may be installed where indicated by a solid or dashed purple line on the Tree Protection Plan. It is more practical over existing hard surfaces or where the fencing needs to be moved to enable permitted activities within a *Restricted Activity Zone*. This system should be able to withstand occasional knocks by machinery and should not be relocated except with the consent of the site manager and the approval of the local authority.



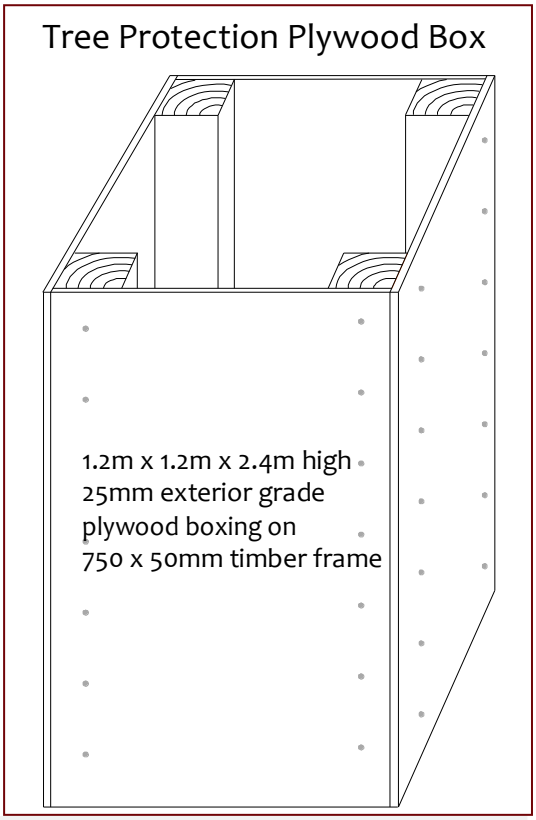
7.3.2. Within this system, weldmesh fencing panels (minimum height 2m) are affixed into rubber or concrete feet and clipped together with anti-tamper couplers. Where topography permits, two couplers should be used, spaced at least 1m apart. Alternate panels should be attached to a diagonal back stay connected to an additional foot or baseplate secured with ground pins or additional ballast. Where ground pins are not used, the total weight of the foot/plate plus ballast should total not less than 32kg.

7.3.3. Alternatively, timber struts may be used to affix the panels to existing walls using brackets and screws where the fence panels are sufficiently close for this to be effective.

7.3.4. Where it is not possible to install diagonal struts (such as very close to a hedge) then the front feet shall be secured using ground pins or ballast.

7.4. Stem Protection – Timber Boxing

7.4.1. Where indicated by a turquoise square on the Tree Protection Plan, it shall be necessary to install robust plywood boxing to protect a tree stem, The plywood boxing specification is indicated in the diagram opposite. It shall be affixed in place without securing it to any part of the tree. Instead, it shall be secured to the ground or to adjacent structures. It shall be made firm enough to withstand occasional knocks from construction vehicles.



7.5. Stem Protection – Cloth and Wire Wrap

7.5.1. If/Where indicated by a turquoise star on the Tree Protection Plan, it is proposed to protect a tree stem using sturdy cloth and wire. Other tree protection barriers, such as those specified above, are not considered appropriate due to the proximity of the tree stem to proposed activity. Plywood boxing may be installed as an alternative (see the above specification) if the site manager considers it possible.

7.5.2. The tree stem and any low limbs shall be protected from ground level to a height of 2.5m by wrapping them at least three times with a sturdy material such as hessian cloth or similar. Around this, chicken wire with 13mm holes shall be wrapped at least twice around and secured.

7.5.3. The wrappings shall be secured using string, wire or plastic cable clips. They shall not be secured by driving nails or tacks into the tree stem or bark.

7.6. Notices

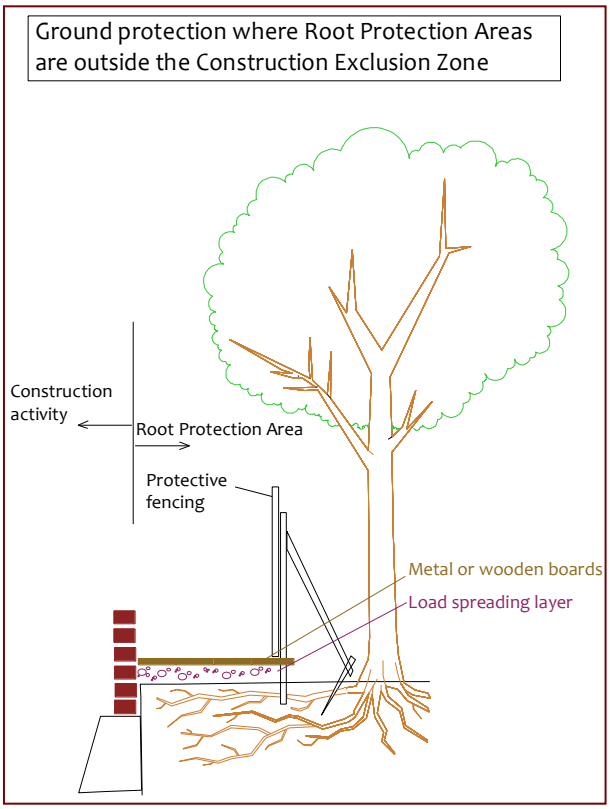
7.6.1. On sites with a high number of contractors, suitable weather-proof notices should be displayed to identify tree protection zones. They should state the purpose of the fencing and that it should not be moved, or traversed, other than by authorised personnel.

8. Ground Protection Measures

Detailed Specification

8.1.1. Ground protection measures shall need to be installed if it is proposed to drive any vehicle over any Restricted Zone A, unless a suitable load spreading surface is already in place (e.g. the existing tarmac). The purpose of the ground protection is to prevent soil compaction and contamination where it is not practicable to fence off Root Protection Areas because access is required.

Ground protection where Root Protection Areas are outside the Construction Exclusion Zone



8.1.2. Where vehicles or machinery are required to operate within the Restricted Zone, a geotextile fabric shall be installed followed by a compression resistant layer such as 150mm of compressible material (e.g. woodchip) or a 3D cellular confinement system infilled with 7 – 40mm angular gravel (e.g. *Cellweb*™). Either system shall act to spread the load of any vehicles passing through the restricted zone. Above this load spreading layer, 25mm wooden boards or 12mm road plates shall be secured. Plant machinery shall be limited to 2 tonnes.

8.1.3. If only pedestrian access is required, then 25mm wooden boards, e.g. scaffold boards firmly affixed together and laid directly onto the ground shall suffice. If the ground is uneven, then it shall first be made even using sand or soil to ensure the boards distribute loads over a large area of ground. Boards shall be appropriately weighted or pinned to prevent movement. Alternatively scaffold boards may be supported above ground on a scaffold framework

8.1.4. Where existing hard surfacing is to be retained throughout the entire project it shall not be necessary to install additional ground protection measures. However the hard surfacing must be firm enough to spread the load of any traffic passing overhead. Paving slabs shall need to be reinforced with scaffold boards or similar if vehicles or machinery are to be used in this area.

8.1.5. The ground protection measures shall be installed and approved before commencement of demolition and construction activity and before the arrival of plant machinery or materials. They shall remain in place until all heavy construction activity is complete or until they are due to be replaced with a new hard surface.

9. New Surfaces

Detailed Specification

9.1. Resurfacing an Existing Drive

9.1.1. Where it is proposed to resurface an existing driveway over Root Protection Areas (Restricted Zone A) the following restrictions shall apply:

- The existing hard surfacing shall remain in place throughout the entire construction project or until it is due to be replaced with a new surface. If the hard surfacing is removed for any reason it shall immediately be replaced by ground protection measures as specified in Section 8 until a permanent hard surface is installed. No vehicle shall pass over this zone unless a permanent hard surface or ground protection is in place.
- No excavation in excess of the existing sub-base shall occur. The existing sub-base may be retained undisturbed and incorporated into the new structure.
- Hand operated tools shall be used to lift existing surface. Mechanical excavators may be used so long as they operate from outside Root Protection Areas and are carefully marshalled by the appointed arborist or local authority tree officer.
- Any exposed roots in excess of 25mm are to be retained. Before the new surface is installed, 25mm of soil (or river sand) and a geotextile membrane shall be laid over the root. Until such times, the root shall be adequately protected from pedestrian damage using timber and sand.
- An impermeable surface is not considered necessary since the existing surface is not permeable.
- A 3 dimensional cellular confinement system may be incorporated into the sub-base and is encouraged. However, this is not considered compulsory since the resurfacing operation shall not cause a deterioration of rooting conditions beneath the existing driveway.
- No salt or lime based products are to be incorporated within the sub-base.

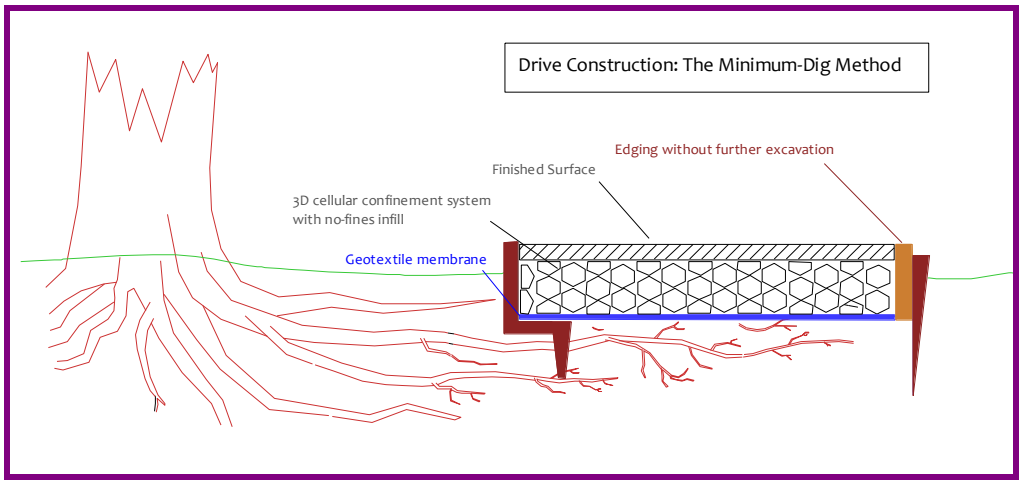
9.1.2. Where the existing surface is porous, it shall be replaced with a new surface which is equally as porous. Where the existing surface is impermeable (e.g. concrete or asphalt), replacement with a porous surface is encouraged but not compulsory.

9.2. Minimum-Dig Installation

9.2.1. This section details the Minimum-Dig Method which is proposed when installing the new passing place over the Root Protection Area of T5 (Restricted Activity Zone B).

9.2.2. Ground Preparation

- Surface vegetation may be killed using a translocated herbicide such as GlyphosphateTM.
- All excavation shall take place using hand tools to a maximum depth of 150mm below the level of the existing track.
- If any roots in excess of 25mm are encountered, they are to be retained undamaged and the level of the new surface adjusted to accommodate this wherever possible. Before the new surface is installed, 25mm of soil (or river sand) and a geotextile membrane shall be laid over the root. Until such times, the root shall be adequately protected from pedestrian damage using timber and sand.
- Roots in excess of 10mm which are severed shall be neatly pruned back with secateurs to minimise the likelihood of infection. If no roots are encountered it may be possible to continue to excavate in strata of 50mm until the arborist overseeing the operation deems that excavation should cease.



9.2.3. **Edgings.** If a retaining edge is needed, edging solutions (such as kerbstones) requiring further excavation will not be acceptable within Root Protection Areas. Instead, an above ground system shall be installed such as a tanalised timber edge (treated for a 40 year design life) retained by narrow pegs driven into the ground. Alternative above ground systems must be approved by the local authority.

9.2.4. Where required, batter slopes may be installed to tie in with existing ground levels (max 1:3 gradient, maximum 100mm increase in ground level). However, no increase in ground level shall be permitted immediately adjacent to any tree stem or associated buttress roots.

9.2.5. **The sub-base.** Once the edgings are in place, a geotextile membrane shall be laid down to prevent root penetration into the new surface. A thin layer (up to 35mm) of angular gravel or crushed aggregate gravel may then be laid over the membrane and levelled off.

9.2.6. A 3 dimensional cellular confinement system shall then be installed. Either of the two options specified below shall be acceptable from an arboricultural perspective:

9.2.7. **1) Rigid Cellular System** - A 3 dimensional cellular confinement system shall then be installed with a minimum thickness of 40mm. This may be filled with 7-14mm angular gravel. Example systems are illustrated below:

9.2.8. The entire cellular system shall be laid first and may be pinned in place using ground pins. This shall be followed by the infill, working from one end such that heavy machinery does not pass over any Root Protection Areas until the in-fill is installed.

9.2.9. **2) Flexible Cellular System** – see illustration. This will be filled with a no fines angular in-fill (e.g. 7 – 14mm or 20 – 40mm gravel).

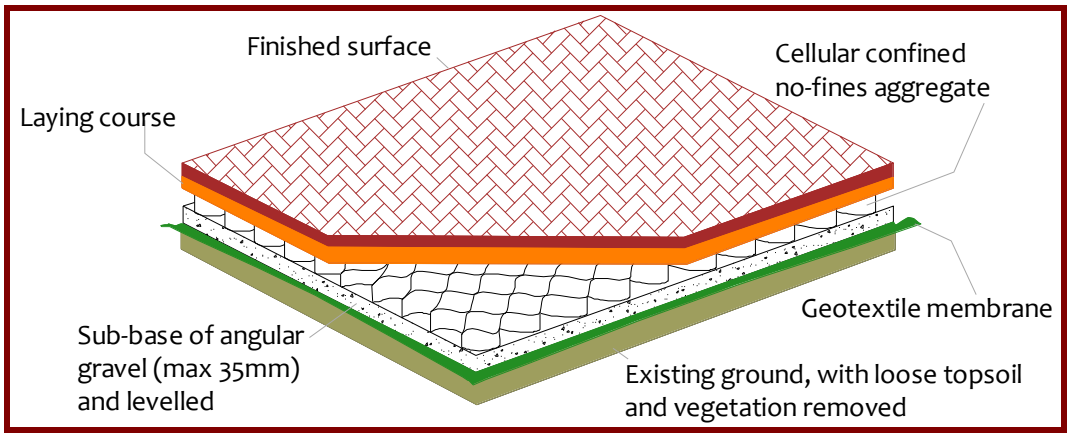
9.2.10. I understand that a 100mm deep system should be adequate to cope with the expected loads, though this should be verified with the manufacturer. A limestone based in-fill will not be acceptable. Enough infill should be used to allow for settlement and compaction and no more. If required, the infill may be periodically topped up.

9.2.11. The entire cellular system shall be laid first and may be pinned in place using ground pins. This shall be followed by the infill, working from one end such that heavy machinery does not pass over any Root Protection Areas until the in-fill is installed. The entire system may then be lightly compacted to a degree appropriate for the expected load.

9.2.12. Up to 50mm of 2 - 6mm clean hard grit (no fines) angular granular fill may be overlaid as a laying course.

9.2.13. **The Finished Surface**. The following surfaces are acceptable over rooting areas:

- **No-Fines gravel.** This option offers the maximum permeability. However, loose gravel should be avoided close to the site entrance as it has a tendency to spill out into the adjacent public footway. Resin bonded gravel may be acceptable if it is shown to be sufficiently porous to enable rainwater to easily pass through to the sub-base below.
- **Block paving.** This is a good alternative as it allows a fair degree of permeability. Blocks with extra wide nibs shall be utilised to enable maximum infiltration of water between the blocks. Blocks shall be jointed with 1mm – 4mm clean hard crushed stone (no fines) brushed over the spaces and settled with the aid of a vibrating plate compactor.
- **Porous asphalt to BS EN 13108-7 (previously Pervious Macadam BS 4987 – 1 & 2). This** offers a degree of permeability and is preferred over concrete or asphalt containing-fines (e.g. *Stone Mastic Asphalt* (BS EN 13108-5) or *Hot Rolled Asphalt* (BS EN 13108-4)). This surface may require a porous binder course. Actual specification will vary according to ground conditions and expected load, and should be agreed with a Highways Engineer or Geotechnical engineer.

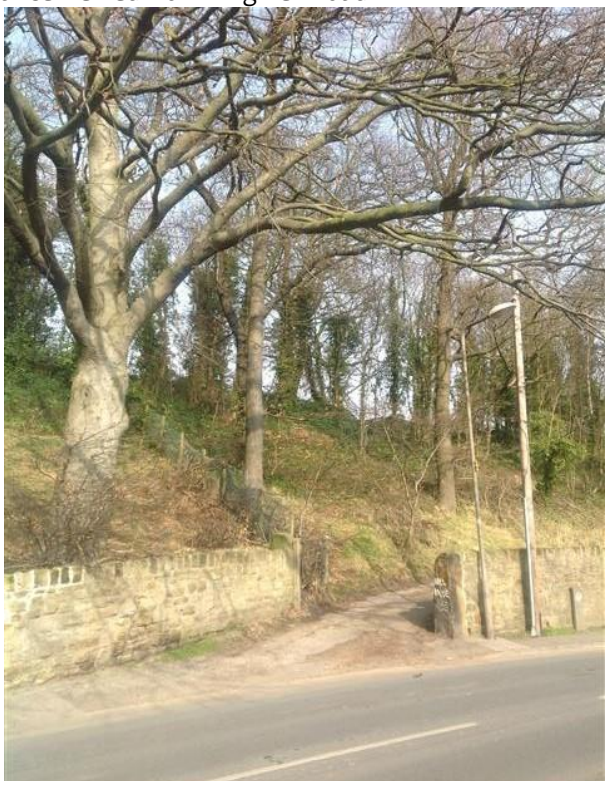


Over view Diagram – Road Construction Sympathetic to Trees

10. Photographs

Refer to the Tree Constraints Plan for photo locations

Photograph 1. Track entrance viewed from Kingwell Road.



Photograph 2. Track entrance viewed from Kingwell Road.

Photograph 3. Location of exposed surface roots.

Photograph 4. Exposed surface roots, to be retained.

Photograph 5. View back towards Kingwell Road

11. Signature

This report represents a true and factual account of the trees and proposed protection measures at

Hill House
Kingwell Road
Worsbrough, Barnsley
S70 4AG

Signed

.....

Ivan Button N.C.H. (Arb), FDSc (Arb), BSc (Hons), P.G.C.E., M. Arbor. A.

on behalf of

Crown Consultants Ltd

Dated

6th March 2013

CROWN Consultants
Tree consultants throughout England and Wales

Appendix 1: BS 5837: 2012 – Guidance Notes

This Standard prescribes the principles to be applied to achieve a satisfactory juxtaposition of trees and structures. It sets out to assist those concerned with trees in relation to design, demolition and construction to form balanced judgements.

It acknowledges the positive contribution trees may offer to a site, as well as the negative aspects of retaining inappropriate trees. It addresses the negative impacts that construction activity may have upon trees and offers mitigation strategies to minimise these impacts.

The Standard suggests a three stage approach to ensure best practice is followed when developing close to trees:

A1.1 Stage 1: Survey of Existing Trees

This identifies the existing trees on and adjacent to the site. Data is recorded for each tree and is presented in a Tree Data Schedule. Each tree is allocated a ***Retention Category*** according to its size, amenity value, condition and safe useful life expectancy. The categories are allocated independently of development proposals. Our interpretation of the Retention Categories is explained below:

A1.1.1 Retention Categories

A Category: Trees of high quality and amenity value. Usually, mature trees with a significant life expectancy which would enhance any development. Retention of these trees is strongly encouraged.

B Category: Trees of moderate quality and amenity value. Usually these are maturing trees or younger trees with exceptional form. Retention of these trees is desirable though the removal of occasional specimens may be acceptable.

C Category: Trees of low quality or small specimens with a relatively low amenity value. These trees are not considered to be a material planning constraint and their removal will generally be seen as acceptable in order to facilitate development.

U Category: Trees of such low quality that their removal is recommended regardless of development proposals.

A1.1.2 Occasionally trees are borderline and do not fall neatly into one of the categories A, B or C. In such cases we apply a superscript (**+/-**) such that:

C^{+} Indicates borderline C/B, though Category C is deemed to be most appropriate.

B^{-} Indicates borderline C/B, though Category B is deemed to be most appropriate.

A1.1.3 The British Standard suggests that each of the A, B and C categories may be further subdivided (A1, A2, A3, B1, B2, B3 etc) such that subcategory 1 denotes mainly arboricultural values, subcategory 2 denotes mainly landscape values and subcategory 3 denotes mainly cultural values (including conservation). Multiple subcategories may be used.

Our experience suggests that these subdivisions lack clarity and can be confusing. Within this report subcategories are **not** denoted. Where appropriate, the use of phrases such as '*Part of a formal group*', or '*Has a high ecological value*', or '*Offers good screening to the site*' are incorporated into the observation section of the Tree Data Schedule. We believe this conveys all relevant landscape and cultural information without any confusion.

A1.1.4 **Tree Constraints Plan (TCP).** This indicates the position, crown spread, Retention Category and Root Protection Area of each tree. It is used to inform where development may proceed without causing damage to trees.

A1.1.5 **Root Protection Area (RPA).** This is the area around each tree likely to contain the majority of roots. It should ideally remain undisturbed to avoid a detrimental impact on tree health. It is calculated according to the formula "radius of RPA" = "12 x stem diameter". This shape can then be modified to take into account site factors which influence rooting activity, e.g. underground structures. Where development works are proposed within the RPA they should be undertaken in a sympathetic manner to minimise root disturbance.

A1.1.5 **Shade Constraints.** BS 5837 suggests that shade constraints should be indicated on the TCP. This is denoted as a circle-segment drawn northwest to due east with a radius equal to the height of the tree. This does not represent the actual shade pattern which varies through the seasons. Rather, it indicates the area most shaded by the tree throughout the course of the year. Ideally habitable room windows should be located outside of these shade constraints.

A1.2 Stage 2: Arboricultural Impact Assessment

After the initial survey and the production of the Tree Constraints Plan, arborists and designers are encouraged to work together to establish a design proposal with minimal impact on the high quality trees. An assessment should be made of all possible impacts including the impact that the trees may have upon the proposal. The arborist may recommend mitigation strategies to minimise these impacts and help achieve a more harmonious juxtaposition between buildings and trees.

A1.3 Stage 3: Arboricultural Method Statement

This type of report specifies the measures necessary to protect trees against damage from construction activity. The Method Statement should be written in a manner that it may be conditioned and enforced by the local authority upon granting of planning permission. The site manager should be familiar with all aspects of the Method Statement and should ensure that all persons working on the site are aware of those aspects which appertain to their work. This includes service installation engineers and operators of plant machinery.

Appendix 2: Explanation of Tree Data & Glossary

This section explains the terms used in the **Tree Data Schedule** within Section 3.

A4.1 General Observations

A4.1.1	**Numbering System:**	Each item of vegetation has its own unique number prefixed by a letter such that T1=Tree 1, G2=Group 2, H3=Hedge 3 and W4=Woodland 4, S5=Shrub 5.
A4.1.2	**Age Categories:**	
	Young	Usually less than 10 years old.
	Semi-Mature	Significant future growth to be expected, both in height and crown spread (typically below 30% of life expectancy).
	Early-Mature	Full height almost attained. Significant growth may be expected in terms of crown spread (typically 30-60% of life expectancy).
	Mature	Full height attained. Crown spread will increase but growth increments will be slight (typically 60% or more of life expectancy).
	Veteran	A level of maturity whereby significant management may be required in order to keep the tree in a safe condition.
	Over Mature	As for veteran except management is not considered worthwhile.
A4.1.3	**Species:**	Common names and Latin names are given.
A4.1.4	**Height:**	Measured from ground level to the top of the crown.
A4.1.5	**Stem Diameter:**	Taken at 1.5m above ground level where possible. On multi-stemmed trees this measurement may be taken at ground level, though usually an indication of the number of stems and average diameter is given, e.g. 3 x 30cm.
A4.1.6	**Crown Height:**	Measured from ground level to the height at which the main crown begins. Where the crown is unbalanced it is measured on the side deemed to be most relevant. This is usually the side facing the area of anticipated development.
A4.1.7	**Tree Diagram:**	This scaled drawing is computer generated based on measurements taken for stem diameter, crown height and spread, and overall height. It is designed to help the reader rapidly assess the data. It is not an accurate representation of the form of the tree.
A4.1.8	**Crown Spread:**	Measured N, E, S & W, taken from the centre of the stem and usually rounded up to the nearest metre.
A4.1.9	**Observations:**	If a tree's position is considered to be relevant it will be commented upon (e.g. overhanging a children's play area). Tree form and pruning history are also recorded along with an account of any significant defects. Defects and descriptive terms are dealt with in more detail at the end of this section.
A4.1.10	**Recommendations:**	Usually based on any defects observed and intended to ensure that the tree is in an acceptable condition.
A4.1.11	**Priority Scale:**	Depending upon the threat posed by the tree, and the likelihood of failure, recommendations should be carried out according to the following priority scale:
	Urgent	To be carried out as soon as possible.
	Very High	To be carried out within 1 month.
	High	To be carried out within 3 months.
	Moderate	To be carried out within 1 year.
	Low	To be carried out within 3 years.
A4.1.12	**Inspection Frequency:**	An interval of 6 months, 1 year, 1.5 years or 3 years is allocated before the next inspection is due. Wherever practical, consideration should be given to seasonal changes so that deciduous trees are not always surveyed in winter when they have no leaves, or in summer when leaves may obscure branches within the upper crown.
A4.1.13	**Vigour:**	An indication of growth rate and the tree's ability to cope with stresses:
	High	Having above average vigour.
	Moderate	Having average vigour.
	Low	Having below average vigour.
	Very Low	Tree is struggling to survive and may be dying.
A4.1.14	**Physiological Condition:**	
	Good	Healthy and with no symptoms of significant disease.
	Fair	Disease present or vigour is impaired.
	Poor	Significant disease present or vigour is extremely low.
	Very Poor	Tree is dying.
A4.1.15	**Structural Condition:**	
	Good	Having no significant structural defects.
	Fair	Some defects observed though no high priority works are required.
	Poor	Significant defects found. Tree requires monitoring or remedial works.
	Very Poor	Major defects which will usually require significant remedial works or tree removal.
A4.1.16	**Amenity Value:**	
	Very High	Exceptional specimen, observable by a large number of people.
	High	Attractive specimen, observable by a significant number of people.
	Moderate	One of the above factors is not applicable.
	Low	Unattractive specimen or largely hidden from view.
A4.1.17	**Life Expectancy:**	The estimated number of years before the tree may require removal. Classified as (<10), (10 – 20), (20 – 40), or (40+).
A4.1.18	**Retention Category:**	These are explained in detail in Appendix 1.

A4.2 Evaluation of Defects

A4.2.1 Cavities, wounds, deadwood etc are all evaluated as follows:

Major	Such that structural integrity is, or will become, compromised and the tree is, or will inevitably become, hazardous.
Significant	A defect that may over time become a major defect, though not necessarily so. This will depend on the vigour of the tree and its ability to deal with decay etc.
Minor	A defect that is not likely to compromise the tree's structural integrity.

General Glossary

Adaptive growth	In tree biomechanics, the process whereby wood formation is influenced both in quantity and quality by the action of gravitational forces and mechanical stresses on the cambial zone.
Aerobic	Conditions in which oxygen is freely available, or to biomechanical processes that depend on the presence of oxygen.
Anaerobic	A condition marked by the absence of oxygen; Generally such areas are unsuitable for normal life and growth of plant tissues. These sites tend to be populated by bacteria capable of surviving low oxygen conditions often associated with Slime Flux.
Arboriculture	The culture and management of trees as groups and individuals primarily for amenity and other non-forestry purposes.
Arborist	A person possessing the technical competence through experience and related training to provide management of trees or other woody plants in a landscape setting. Generally involved with the development or management of trees for visual amenity or land management rather than the growth of trees for product or profit.
Barrier zone	A layer within an annual increment of wood which contains abnormal xylem cells, laid down by the cambium in response to wounding or other trauma.
Body language	In trees, the outward display of growth responses and or deformation in response to mechanical stress.
Bole	Or Trunk, the main stem of a tree below its first major branch.
Bracket	A type of fruiting body produced by various fungal species, plate like to hoof like in shape and often a one sided attachment to the wood or bark.
Branch bark ridge	A ridged area located at the union of a branch to a trunk or stem.
Branch Collar	Trunk tissue that forms around the base of a branch between the main stem and the branch, or between a main branch and a lateral branch. As a branch decreases in vigour or begins to die, the collar usually becomes more pronounced and completely encircles the branch.
Brown Rot	Form of decay where cellulose is degraded, while lignin is only modified.
Buttress Root	Roots that emerge from the base of the tree stem, normally large and well developed that rapidly reduce in diameter to create the Root Plate this offers structural support for the tree. Buttress roots divide rapidly forming the connection between the stem and the transport roots.
Cabling Bracing	Installing cables within the crown of a tree to prevent collapse.
Callus	Undifferentiated cells often formed at the edges of recent injuries. This tissue quickly becomes differentiated, forming cells of the type characteristic of that position on the tree (e.g. forming wood, bark, roots, etc.) see wound response tissue.
Cambium	A thin layer of actively growing and dividing cells, located between the xylem (sapwood) and bark of a plant; the part responsible for radial growth of a tree stem or branch.
Canopy	The topmost layer of twigs and foliage in a woodland, tree or group of trees.
Canker	A localised area of dead bark and cambium on a stem or branch, caused by fungal or bacterial organisms, characterised by woundwood development on the periphery. This may be annual or perennial.
Cavity	An open and exposed area of wood, where the bark is missing and internal wood has been decayed and dissolved.
Chlorotic	Also Chlorosis. A condition of the plant marked by yellowing of normally green foliage, often indicating nutrient deficiency or plant dysfunction.
Clinometer	Devices that measures vertical angles, and provides direct height measurements of objects by triangulation.
Co-dominant stems/trunk	Are forked branches or trunks of nearly the same size in diameter and lacking a normal branch union.
Compacted soils	Soils in which the air-space (oxygen space) has been reduced or eliminated, reducing water infiltration and percolation, reducing root presence and inhibiting new root development.
Compartmentalisation	The physiological process that creates the chemical and mechanical boundaries that act to limit the spread of disease and decay organisms.
Compression Failure	Localized buckling of fibres and other longitudinal elements produced by compression of wood along the grain; compression failures sometimes develop in standing trees.
Compression Strength	The ability of a material or structure to resist failure when subjected to compressive loading; measurable in trees using special drilling devices
Compression Wood	Abnormal wood formed on the lower side of branches and curved stems, with physical properties different from normal wood.
Conservation Area	In Great Britain, designated areas of architectural or historical interest, in which there are special procedures for planning applications. Additionally tree works cannot generally be undertaken without prior notification (Currently 6 weeks) to the relevant local planning authority. See also Tree Preservation Orders.
Core Sample	A sample of wood extracted from a trunk or branch, using an increment borer tool. The resulting core can be analysed for characteristics of growth, wood strength, structure, decay, and for species identification.
Crotch	The union of two or more branches; the auxiliary zone between branches.
Crown	The upper canopy of a tree, including upper trunk, scaffold branches, secondary branches, stems and leaves.
Crown lifting / raising	Crown Lift The removal of the lowest branches, usually to a given height. It allows more residual light and greater clearance underneath for vehicles etc.
Crown reduction	The reduction of a tree's height or spread while preserving its natural shape.
Crown thinning	The removal of some of the density of a tree's crown, usually 5-25% allowing more light through its canopy and reducing wind resistance.
Deadwood (noun)	Deadwood is often present within the crown or on the stems of trees. It may be an indication of ill health, however, it may also indicate natural growth processes. If a target is present beneath the tree, deadwood may fall and cause injury or damage and should be removed, otherwise deadwood can remain intact for conservation purposes (insects, fungi, birds etc.).
Deadwood (verb)	The removal of dead branches from a tree's canopy, usually of a specified size (in diameter).
Decay	Progressive deterioration of organic tissues, usually caused by fungal or bacterial organisms, resulting in loss of cell structure, strength, and function. In wood, the loss of structural strength.
Decay Detection	The assessment of decay within a tree has been traditionally difficult, but recent advances have made it possible to achieve accurate representations of the internal section of a tree in both 2D and 3D, removing doubt over the condition of the tree and allowing accurate management decisions.
Decurrent	In trees a, system of branching in which the crown is borne on a number of major widely spreading limbs of similar size. In fungi relates to toadstools whose gills run down the stem and leaves and other plant organs, which extend down the stem.
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.
Defoliation	The losing of plants foliage.

Dieback	**Progressive death of buds, twigs and branch tissues, on individual limbs resulting in Deadwood, or throughout the canopy, extreme cases can result in Stag Heading.**
Dripline	**A projected line on the ground that corresponds to the spread of branches in the canopy; the farthest spread of branches.**
Epicormic shoots	**Fast growing, weakly attached shoots/branches that often grow as a response to stress factors upon a tree or branch removal.**
Excurrent	**In trees, a system of branching that a single leader remains dominant, through the control of lateral branches.**
Failure	**In connection with tree hazards, a partial or total fracture within the wood tissue or loss of cohesion between roots and soil. (In total failure affected parts will snap or tear away completely, Partial failure there is a crack or deformation, which results in an altered distribution of mechanical stress.**
Feeder Roots	**Fine fibrous Water and nutrient absorbing roots located in the outer root system.**
Flush-Cut	**In trees and shrubs, a pruning cut close to the parent stem, which removes the branch bark ridge.**
Foliage	**The live leaves or needles of the tree; the plant part primarily responsible for photosynthesis.**
Formative pruning	**The trimming of a tree to remove weaknesses and irregularities which may lead to problems. The formative pruning operation is aimed at reducing the potential for future weaknesses or problems within the tree's crown.**
Gall	**An abnormal, disorganized growth of plant tissues, caused by parasitic or infectious organisms such as insects, fungi, bacteria, or viruses.**
Girdling	**In woody plants, any form of damage that destroys the bark and / or the Cambium all the way around the stem, branch or root, normally resulting in death of the damaged section.**
Girdling Root	**In woody plants, a root that grows across the buttress, or across other roots, eventually causing constriction of the radial growth.**
Growth Increment	**The incremental growth added as new annual ring develops each season over existing wood. This is seen as (growth) rings in cross-sections of wood.**
Hazard beam	**An upwardly curved branch in which strong internal stresses may occur without the compensatory formation of extra wood (longitudinal splitting may occur in some cases).**
Heartwood	**Inner non functioning tissues that provide structural support to trunk.**
Heave	**In relation to shrinkable clay soils, expansion due to rewetting of a volume of soil previously subjected to the removal or water by plant / trees following felling or root severance. Also in relation to root growth, the lifting of pavements and other structures by radial expansion. Also in relation to tree stability, the lifting of one side of a wind rocked root plate.**
Herbicide	**A chemical compound that causes the death of a plant.**
Included Bark	**Bark that becomes embedded in a crotch between branch and trunk or between co-dominant stems, usually found in narrow or tight crotches, and causes a weak structure.**
Increment Borer	**A tool that cuts and extracts a narrow cylinder of wood from a tree for analysis of the wood tissue and growth increments.**
Leader	**The primary terminal shoot or trunk of a tree.**
Limb	**A large lateral branch growing from the main trunk or from another larger branch.**
Lion Tailing	**Often the result of poor pruning practices; the main leader or branches are largely devoid of side branches, growth is restricted to the end of branches and is likely to suffer damage through end loading.**
Lopping	**In trees, a general term that related to the removal of branches from a tree.**
Monitoring	**Due to the relative life span of trees in relation to our own, long-term monitoring provides a valuable insight to the health of trees, identifying decline and or stabilisation and or improvement.**
Mulch	**A material laid over the root system of a tree to help conserve moisture within the soil. Additionally it may help control the development of weeds close to the tree.**
Mycelium	**A mass of growing filaments (hyphae) formed by fungi.**
Mycorrhizae	**The symbiotic relationship between roots and certain beneficial fungi. Mycorrhizae are the combined root / fungal growth.**
Natural Pruning	**The shedding of a branch or twig that has died back naturally and has become decayed at or near its base.**
Necrosis	**The failure and subsequent death of a branch, leader or tree.**
Negligence	**A failure to take reasonable action to deal with a hazard to prevent damage to property or person.**
Nutrient	**Substances that are absorbed by living organisms for the maintenance of internal processes.**
Occluding tissue	**The general tern of wood, cambium and bark that develop around the site of a wound on a woody plant**
Pathogen	**A microorganism that causes diseases within another organism.**
Phloem	**The principle conductive tissue that the products of Photosynthesis are transported around the plant**
Photosynthesis	**The process were light energy is used to create energy (Carbohydrate) for use within the plant.**
Pollard	**A term for a pollarded tree.**
Pollard head	**The swollen section of branch / stem that forms behind the pollarding cut.**
Pollarding	**The complete or partial removal of the crown of a young tree so as to encourage the development of numerous branches either for amenity or historically as fodder, repeated management is required cyclically to maintain the feature**
Prune or Pruning	**Selective removal of woody plant parts of any size, using saws, Loppers, Secateurs, or other pruning tools.**
Reaction Wood	**Wood with distinctive anatomical characteristics, formed in parts of leaning or crooked stems and in branches to provide additional strength / support. In hardwoods, tension wood usually forms. In conifers, compression wood is usually found.**
Reaction Zone	**A zone normally darker than surrounding wood that denoted the boundary often a defensive one between functional sapwood and dysfunctional or decaying wood.**
Re-grading	**The raising or lowering of a soil profile from its original grade.**
Rejuvenation pruning	**Where historically or environmentally important trees are to be retained, their life spans can be significantly extended through the adoption of particular pruning regimes.**
Rejuvenation root treatment	**Management of the root zone can have a significant positive effect upon the health of trees. Physical, mechanical and biological approaches are available and can be prescribed in accordance within the constraints of individual sites.**
Remedial pruning	**The removal of old stubs, deadwood, epicormic growth, rubbing or crossing branches and other unwanted items from the tree's crown.**
Resistograph	**Invasive decay detection technique whereby the resistance offered by the timber to a spinning probe is measured and plotted.**
Rib	**In tree body language, a long narrow, axial protuberance which often over lays a crack.**
Ring Barking	**Artificial Girdling of the stem, to result in the death of a tree. May be used in habitat creation were the retention of dead standing trees is required.**
Rod Bracing / Bolting	**Traditionally, this has relied upon the Installation of steel rods or bolts through the stems or limbs, to reduce twisting or splitting of the wood. The installation of such features does require legal interpretation.**
Root Barriers	**Both Buildings and services can benefit from the installation of root barriers to protect a soil volume from the ingress of roots.**
Root Collar	**The basal area of the tree; transition zone from trunk to root. Also sometimes called trunk flare.**

Root Plate	**The primary support area for the tree; an area of the root system close to the base that structurally anchors the tree to the soil.**
Root Rot	**Either a general term for decay within the wood of the lower stem / buttress roots, or a disease in which the fine roots are killed.**
Root System	**The portion of the tree containing the root organs, including buttress roots, transport roots, and fine absorbing roots; all underground parts of the tree.**
Root Zone	**The area and volume of soil around the tree in which roots are expected. May extend to three or more times the branch spread of the tree, or several times the height of the tree.**
Sail Area	**That area or the tree subjected to wind load.**
Sanitation	**In plant disease control, the removal of material that could a source of infection by a pathogen. Removal of diseased plant parts, such as fallen leaves and twigs, and pruning of dead and diseased branches. Diseased parts should be burned or buried under soil or active compost.**
Sapwood	**Xylem wood tissue, usually light in colour, representing the outer growth rings of the wood. Usually living, reactive wood tissue, in a healthy tree. See heartwood**
Scaffold limbs / scaffold Branches	**The branches that from the main network framework of the crown of a tree.**
Senescent	**A decline in growth and vigour due to age or stress factors.**
Shrub	**A woody plat that branches at or close to the ground level and so does not have a single stem.**
Slime Flux	**Relating to a toxic condition from the spreading of bacteria or their products from a source of infection; characterized by malodorous gases, or salt deposits upon the bark. If these products enter the sap stream, localised vessel necrosis can result, usually associated with anaerobic conditions.**
Soft Rot	**A kind of wood decay, were a fungi degrades cellulose within the cell wall, without causing overall degradation.**
Soil Compaction	**The compression of soil, causing a reduction of pore space and an increase in the density of the soil. Air is squeezed out and nutrients become locked. Tree roots cannot grow in compacted soil.**
Soil Profile	**The characteristics of a soil as regards to relative depth; the changes in soil texture and composition that occur with depth.**
Soil Texture	**The classification of the constituent particles of soil; includes sand, silt and clay particles. Directly related to soil porosity, permeability, and aeration.**
Sonic Decay Detection	**Non invasive method whereby sound waves are passed through the tree and the speed is measured. Slow speeds indicate decay and a tomography picture representing the inner stem is produced.**
Stag Heading	**In a tree, a state of dieback were dead branches protrude beyond the current living crown.**
Stress	**In plant physiology, conditions were one or more physiological functions Are not working within normal parameters.**
Stump Grinding	**The removal of a tree stump using a specialist grinding machine.**
Subsidence	**In relation to vegetation, the removal of water by plant growth resulting in localised shrinkage in the soil volume.**
Sucker	**Same as sprout.**
Suppressed	**Trees which are dominated by surrounding vegetation and whose crown development is restricted from above.**
Systemic	**Affecting the whole plant or organism. A systemic compound is carried throughout the entire plant to all parts through the vascular system.**
Target	**Any person or object within reach of a falling tree or part of a tree that may be injured or damaged.**
Target Pruning	**The pruning of a branch were the wound affects only branch material, often result in a target shaped wound.**
Tension Wood	**Reaction wood typically formed on the upper side of limbs or curved stems; characterized by lack of cell wall lignifications (higher ratios of cellulose to lignin).**
Tight Union / Tight Crotch	**Also, narrow crotch. A crotch with a narrow angle between branches, often having included bark.**
Tomography	**The comparison of sound or stress waves through the tree allows the creation of a 2D or 3D representation of the internal structure of a stem or branch section and highlights areas of damage. Virtually non-injurious.**
Topography	**The configuration of surface features, including the vertical and horizontal relationships of the ground and other features.**
Topping	**Cutting large limbs back severely, without regard to form or habit of the tree. Cuts are usually made between lateral branch nodes. This practice is extremely injurious to trees, and promotes decay and structural weakness within the crown.**
Tree	**A woody plant that typically has a single stem, at maturity has a height of a least 4 metres and a stem diameter at breast height of at least 75mm.**
Tree Preservation Order	**In Great Britain, an order made by the local planning authority, were consent must be gained before undertaking all but exempt works to a tree.**
Trunk Flare	**The basal area of the trunk that flares or widens, and merges with the main roots. See root collar**
Veteran Tree	**Veteran trees are often found in large parks or estates and commonly affected by extensive decay or have been subject to extensive works. These trees are retained for historical importance and often pose greater risk than normal, which is generally justified. They need careful management and often propping or bracing to support them, some require fencing to limit access.**
Vigour	**Active, healthy growth of plants: ability to respond to stress factors.**
Visual Tree Assessment (VTA)	**An assessment of the mechanical condition of trees based upon their 'body language'. Trees are dynamic and respond to faults / decay / environmental factors in various ways, these responses can be indicative of structural integrity.**
Wetwood	**An infection caused by bacteria living inside the plant tissues. The bacteria ferment the plant fluids, resulting in death of nearby cells, and often causing exudations of fluid from the bark, often referred to as a Slime Flux.**
White Rot	**A kind if wood decay were a fungi attacks the lignin within the wood matrix**
Wind loading	**Forces placed upon tree canopy, branches, trunk and roots of a tree under windy conditions.**
Wind Throw	**The failure of a tree due to wind loading.**
Witches Broom	**A deformed or unusual growth of twigs from adventitious buds, caused by insects, disease, or dieback of twigs and buds.**
Wood	**Secondary Xylem; the main structural support and water conducting tissue of trees and shrubs.**
Wound Response Tissue	**Also Occluding Tissue, Wound Wood or Callus. Differentiated wood tissue that grows around the margins of a wound or injury.**
Wound Wood	**Wood with atypical features, formed in the vicinity of a wound and a term to describe the occluding tissues around a wound**
Xylem	**Plant tissues with special function of translocation of water and dissolved nutrients.**

Appendix 3: Survey Methodology

A2.1 Ground level visual surveys are carried out using the *Visual Tree Assessment* technique described by Mattheck and Broeler (1994) and endorsed by the Arboricultural Association (LANTRA Professional Tree Inspection course, 2007).

A2.2 Structural condition is assessed by inspecting the stem and scaffold branches from all angles looking for weak branch junctions or symptoms of decay. Particular attention is paid to the stem-base. Cavities are explored using a metal probe in order to assess the extent of any decay. If this is not possible further inspection is recommended in the form of a climbed inspection or using specialist decay detection equipment.

A2.3 The physiological condition is assessed by inspecting the stem, branches and foliage for symptoms of disease. The overall vigour of the tree is also taken into account.

A2.4 Where significant defects are observed, recommendations are made according to a scale of priority in order to reduce the likelihood of structural failure. The position of the tree and its potential targets are taken into account.

A2.5 Measurements are obtained using a diameter tape, clinometer, distometer and loggers tape. Where this is not practical measurements are estimated.

A2.6 Some trees are surveyed as groups, though this is usually avoided close to areas likely to be developed.

A2.7 Finally, a *Retention Category* is allocated as described in Appendix 1.1.1.

Appendix 4: Author's Qualifications

Qualifications & Experience of Ivan Button N.C.H. (Arb), FDSc (Arb), BSc (Hons), P.G.C.E., M. Arbor. A.

Construction

Between 1983 and 1995 Ivan worked primarily within the construction industry and received training in a broad range of practical building skills and general construction principles. During this time he obtained a BSc (Hons) at Leeds University followed by a P.G.C.E at The University of Wales.

Arboriculture

He obtained a NCH (Arboriculture) at the University of Lincoln and became a member of the Arboricultural Association. He then worked for an Arboricultural Consultancy for one year before establishing a tree surgery and landscaping business in 1998. In 2005 Ivan commenced full time employment with a leading Arboricultural Association approved consultancy and soon adopted a senior role responsible for five consultants.

He obtained a FDSc in arboriculture at the University of Lancashire, which he passed with distinction and is now a Director and Principal Consultant of Crown Consultants Ltd. He is accredited as a LANTRA *Professional Tree Inspector*. A qualification produced in association with the Arboricultural Association and generally recognised as appropriate for all levels of tree inspection.

He is a member of the Consulting Arborist Society and is listed within their areas of professional expertise for QTRA and as an expert witness.

Ivan is a professional member of the Arboricultural Association and the International Society of Arboriculture.

He is a licensed Quantified Tree Risk Assessment user.

Ivan has undertaken professional expert witness training and has been registered as a Sweet and Maxwell Checked Expert Witness since 2008.

Throughout 2009 acted as the principal Tree Officer for Barnsley Metropolitan Borough Council.

Ivan has produced several hundred Arboricultural Reports for the purposes of Development, Safety, Management, Mortgage, Subsidence, Mitigation and Litigation.

Appendix 5: Further Information

Building Near Trees – General

National Joint Utilities Group publication # 10 (1995), *Guidelines for the Planning, Installation and Maintenance of Utility Services in Proximity to Trees. Downloadable at www.njug.demon.co.uk/pdf/NJUG%20Publication10.pdf*

NHBC Standards Chapter 4.2., *Trees and Buildings.*

Horticulture LINK project 212. (*University of Cambridge,* 2004), *Controlling Water Use of Trees to Alleviate Subsidence Risk.*

Tree Planting and aftercare

See www.trees.org.uk/leaflets.php# for downloadable leaflets on selecting a garden tree, planting, aftercare and veteran tree management.

British Standards

BS 5837: 2012. Trees in Relation to Design, Demolition and Construction – Recommendations.
Bs 3998: 2010. Recommendations for Tree Work.
BS 3936: 1992. Nursery Stock. Part 1: Specification for Trees and Shrubs.
BS 3936: 1992. Nursery Stock. Part 10: Specification for Groundcover Plants.
BS 4043: 1989. Transplanting Root-balled Trees.
BS 8004: 1986. Foundations.
BS 8103: 1995. Structural design of Low-Rise Buildings.
BS 8206: 1992. Lighting for Buildings.
BS 3882: 2007. Topsoil.
BS 4428: 1989. General Landscaping Operations (excluding hard surfaces).

Permission to do Works to Protected Trees / Tree Law

Forestry Commission (Edinburgh, 2003), *Tree Felling – Getting Permission.* Country Services Division - Forestry Commission. Downloadable at www.forestry.gov.uk/website/pdf.nsf/pdf/wgsfell.pdf/$FILE/wgsfell.pdf

Transport and the Regions (Department of the Environment, 2000), *Tree Preservation Orders, A Guide to the Law and Good Practice.* Downloadable at www.communities.gov.uk/publications/planningandbuilding/tposguide

C. Mynors, *The Law of Trees, Forests and Hedgerows* (Sweet and Maxwell, London, 2002)

Communities and Local Government website with numerous downloadable documents, from: http://www.communities.gov.uk/planningandbuilding/planning/treeshighhedges/

Lighting Levels

P.J. Littlefair, *B.R.E. 209: Site layout planning for daylight and sunlight A guide to good practice.* B.R.E. Bookshop, London.

British Standards Institution. Code of practice for day lighting. *British Standard* BS 8206: Part 2 (1992).

Chartered Institution of Building Services Engineers. *Applications manual: Window Design* (London, 1987).

NBA Tectonics. A study of passive solar housing estate layout. *ETSU Report* S-1126. Harwell, Energy Technology Support Unit (1988).

I.P. Duncan; D. Hawkes, Passive solar design in non-domestic buildings. *ETSU Report* S-1110. Harwell, Energy Technology.

P. J. Littlefair, Measuring Daylight, *BRE Information Paper 23/93 f3.50.* (Advises on measuring daylight under the real sky or an artificial sky, allowing for the changing nature of sky light).

High Hedges

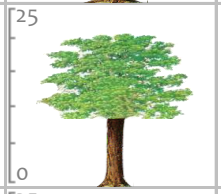
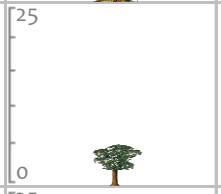
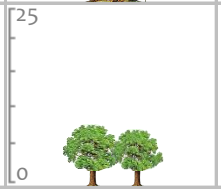
Communities and Local Government website with numerous downloadable documents, from: http://www.communities.gov.uk/planningandbuilding/planning/treeshighhedges/

Tree Specific Websites

www.crowntrees.co.uk	Crown Consultants site containing useful information
www.trees.org.uk	Arboricultural Association
www.rfs.co.uk	Royal Forestry Society of England, Wales and N. Ireland
www.treehelp.Info	The Tree Advice Trust
www.woodland-trust.org.uk	The Woodland Trust
www.treecouncil.org.uk	The Tree Council

Appendix 6: Tree Data Schedule and Site Plan(s)

The Tree Data Schedule and all plans accompanying this report follow this page. They are also provided as separate documents for ease of printing and referring between when viewing on a screen.

Reference (G = Group, H = Hedge)	Age & Species	Height (m)	Crown Ht (m)	Diameter (cm)	Crown Spread (m) W N E S	Scaled Tree Diagram (m)	Notes	Recommendations (independent of proposals) Priority	Inspect Freq (yrs)	Vigour / Physiological Condition / Structural Condition	Amenity Value / Life Expectancy (yrs) / Retention Category
T1	Mature **Beech** Fagus sylvatica.	22	6	99	W 10, N 13, E 10, S 12		Position: Atop retaining wall. Form: Single stemmed and vertical with a well-formed crown. History: No evidence of significant pruning. **Defects: No significant defects.** Other: Excellent specimen.	No action required.	n/a	3	High / Good / Good	High / 40+ / A
T2	Early-Mature **Oak** Quercus robur.	21	10	55	W 6, N 6, E 6, S 7		Form: Single stemmed and vertical with a narrow, upright habit. History: No evidence of significant pruning. **Defects: No significant defects.**	No action required.	n/a	3	High / Good / Good	Moderate / 40+ / A
T3	Mature **Oak** Quercus robur.	22	6	67	W 8, N 8, E 6, S 9		Form: Single stemmed and vertical with a well-formed crown. History: No evidence of significant pruning. **Defects: No significant defects.**	No action required.	n/a	3	High / Good / Good	High / 40+ / A
T4	Young **Elm** Ulmus sp.	4	2	8	W 2, N 2, E 2, S 2		Form: Twin-stemmed at 1m with a balanced crown. History: No evidence of previous pruning. **Defects: No significant defects.**	No action required.	n/a	3	High / Good / Good	Low / 40+ / C
T5	Mature **Sycamore** Acer pseudoplatanus.	18	7	93	W 6, N 7, E 9, S 8		Form: Single stemmed and vertical with a well-formed crown. History: No evidence of significant pruning. **Defects: No significant defects.**	No action required.	n/a	3	High / Good / Good	High / 40+ / A
G6	Young **Sycamore** Acer pseudoplatanus.	av 7	av 2	av 13	W 2, N av 2, E 2, S 2 each		Form: Regrowth from a stump. History: No evidence of significant pruning. **Defects: No significant defects.**	No action required.	n/a	3	High / Good / Fair	Low / 10-20 / C

Tree Constraints Plan
(Existing Layout)


Photo 1


Photo 2


Photo 3


Photo 4

Tree Ref.	Species	Height (m)	Root Protection Area		
			Radius (m)	m²	Square (m)
T1	Beech	22	11.9	443	21.1
T2	Oak	21	6.6	137	11.7
T3	Oak	22	8.0	203	14.3
T4	Elm	4	1.0	3	1.7
T5	Sycamore	18	11.2	391	19.8
T6	Sycamore	7	1.6	8	2.8

Drawing No:	CCL 08915 / TCP Rev: 1
Title:	Tree Constraints Plan (Existing Layout)
Site:	Hill House, Kingwell Road Worsbrough, S70 4AG
Scale:	1:200 (0, 5, 10m)
Paper Size:	A2

CROWN
Arboricultural Consultants
01422 316660

Tree Retention Categories
Stems & canopies shown

Category A tree	Trees of high quality with an estimated life expectancy of 40+ years. Usually large trees with significant presence or smaller trees with excellent form. Retention of these trees is highly desirable.
Category B tree	Trees of moderate quality with a life expectancy of 20+ years. Usually maturing trees, or younger trees with good form. Retention of these trees is desirable though less than Category A trees
Category C tree	Unremarkable trees of low quality and merit. Individual specimens are not considered to be a material planning consideration.
Category U tree	Trees unsuitable for retention due to their very poor condition.

Tree Constraints Plan (Existing Layout)

BS 5837 Root Protection Area (radius = 12xstem diameter)

Root Protection Area needing amendment due to site conditions, e.g. presence of exising road or building.

Root Protection Area having been amended to account for for site conditions

T1 = Tree No 1 G2 = Group No 2 H3 = Hedge No 3

BS 5837 Shade Pattern

1 Photo 1

X Tree to be removed to facilitate the proposal

X Tree to be removed due to its low quality

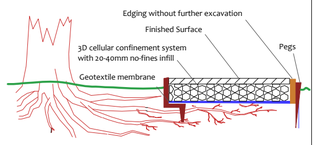
Proposed pruning

MN = Measured North:

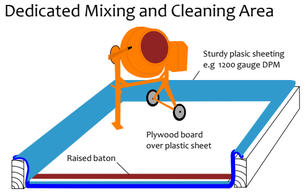
Canopy spreads are sometimes measured to an approximate N defined by site features. Often more accurate, especially where rows of trees are not aligned N-S or E-W.

Exposed surface roots in this area

Restricted Zone B: Minimum-Dig Method



Dedicated Mixing and Cleaning Area



Drawing No:	CCL 08915 / TPP Rev: 1
Title:	Tree Protection Plan
Site:	Hill House, Kingwell Road Worsbrough, S70 4AG
Scale: 1:200	Paper Size: A2

0 5 10m

CROWN
Arboricultural Consultants
01422 316660

Tree Retention Categories
Stems & canopies shown

Category A tree	Trees of high quality with an estimated life expectancy of 40+ years. Usually large trees with significant presence or smaller trees with excellent form. Retention of these trees is highly desirable.
Category B tree	Trees of moderate quality with a life expectancy of 20+ years. Usually maturing trees, or younger trees with good form. Retention of these trees is desirable though less than Category A trees
Category C tree	Unremarkable trees of low quality and merit. Individual specimens are not considered to be a material planning consideration.
Category U tree	Trees unsuitable for retention due to their very poor condition.

Tree Protection Plan (Proposed Layout)

BS 5837 Root Protection Area (radius = 12xstem diameter)

Root Protection Area needing amendment due to site conditions, e.g. presence of exising road or building.

Root Protection Area having been amended to account for for site conditions

T1 = Tree No 1 G2 = Group No 2 H3 = Hedge No 3

BS 5837 Shade Pattern

Photo 1

Tree to be removed to facilitate the proposal

Tree to be removed due to its low quality

Proposed pruning

MN = Measured North:

Canopy spreads are sometimes measured to an approximate N defined by site features. Often more accurate, especially where rows of trees are not aligned N-S or E-W.

N

Tree Protection Plan

Tree Protection Barriers:

Fixed protective barrier: The 'In-Ground System' or the 'Backstay System'. To remain in place for all construction activity		Construction Exclusion Zone Stem protected to a height of 2.5m with thick cloth & wire Tree Protection Boxing 1.2 x 1.2 x 2.4m high 25mm plywood	
Moveable protective barrier: The 'Backstay System'. To remain in place except when approved works are being undertaken in the Restricted Zone		Orange Barrier Mesh Fencing, Ht 1m, on steel fencing pins and wooden posts To remain in place throughout all construction activity	

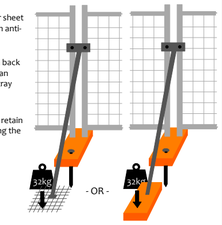
The 'Back Stay System'

2m X 3.5m weldmesh (or sheet metal) panels linked with anti-tamper couplings

Each panel attached to a back stay which is founded in an additional foot or mesh tray as illustrated

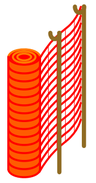
Minimum 32kg ballast to retain rear foot or tray (including the weight of the foot/tray)

Alternate front feet to be secured with ground pins or additional ballast



The 'In-Ground' System

Tree Protection Fencing



The Barrier Mesh System

In this system, high visibility plastic safety fencing, 1m high, minimum grade 140g/m2, supported on steel fencing pins located at 2.5m intervals and driven into the ground.

Construction Exclusion Zone

Within this area the following restrictions shall apply:

No excavation or land regrading whatsoever.
No storage of materials, rubble, soil or spoil.
No fires within the exclusion zone or within 10m of any tree canopy.
No site cabins or other temporary structures.
No discaharge of polluted water, cement or chemicals of any kind.
No use of any machinery, or passage or parking of vehicles.
No tree works without council consent.

Restricted Activity Zones

Restrictions are detailed within the accompanying Method Statement

Restricted Zone A		Restricted Zone B	
Restricted Zone C		Restricted Zone D	
Restricted Zone E		Restricted Zone F	