Arboricultural Report

Impact Assessment & Method Statement

For planning purposes at

14 Eldon Grove
London
NW3 5PT

Dated
3rd March 2015

CROWN Consultants

Tree consultants throughout England and Wales

Contents

1. Introduction

1.1. Instruction

1.1.1. We are instructed by Doriana Barigelli of Schneider Designers to undertake an Arboricultural Survey at 14 Eldon Grove and produce our findings in a report. We are also instructed to assess the likely impact of development proposals and 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 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 principles 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. References

1.3.1. We have liaised with Schneider Designers throughout the writing of this report in order to attain an adequate understanding of the project to enable us to carry out an accurate assessment of the proposals and to specify suitable tree protection measures.

1.4. Drawings

1.4.1. The tree locations shown on the accompanying plans which are reproduced in Appendix 6 have been plotted according to measurements taken on site.

1.4.2. The *Tree Constraints Plan* shows the existing layout. 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 (RPAs) are indicated which are calculated according to the guidelines within BS 5837 (2012).

1.4.3. Where appropriate, the shapes of the RPAs have been amended to reflect actual site conditions or where trees have been heavily pruned. The 'original' RPAs are indicated as a dashed line whereas the amended RPAs are indicated as a solid line.

1.4.4. The *Impact Assessment Plan* indicates the tree constraints with the proposals overlaid. Where applicable, this plan shows where works are proposed in Root Protection Areas and which trees are to be pruned or removed. This plan accompanies the Impact Assessment which is to be found in Section 5.

1.4.5. The *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 6.

2. Site Overview

2.1. Brief Description (Existing Layout)

2.1.1. The site co-ordinates are 51.553428° -0.171438° and the altitude is 89m 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 trees surveyed are street trees growing in front of 14 Eldon Grove. They are a 9m tall Turkish Hazel and a 10m tall Hornbeam. They are approximately aligned with the side boundaries of number 14 and are growing in a paved footway approximately 2m away from the front boundary.

2.1.4. The Tree Constraints Plan and Tree Data Schedule should be referred to for descriptions and locations of all trees. Photographs of the site are included in Section 11.

2.2. Relevant Subsidence Damage

2.2.1. Subsidence damage has occurred to the property as is evidenced by several internal and external cracks (see Photographs 7 to 19). Damage has also occurred to the front boundary wall (see Photographs 3 and 4). I understand that an investigation by the insurers of Number 14 has concluded that the property subsidence is vegetation related and that the nearest two street trees (T1 and T2) are likely to have contributed to the previous movement and are likely to contribute to future movement unless the property foundations are strengthened or the trees are removed (or repeatedly reduced).

2.2.2. Geological maps (http://mapapps.bgs.ac.uk/geologyofbritain/home.html) indicate that the underlying geology of the area is clay with no recorded superficial deposits. This suggests that the subsidence movement is likely to be vegetation related.

2.2.3. The lack of other large vegetation (a wisteria and a small cherry have been removed) suggests that T1 and T2 probably did contribute to the previous movement and could contribute to future movement unless the foundations are strengthened or the trees are removed (or repeatedly reduced).

2.3. Proposals Overview

2.3.1. It is proposed to install a basement which will also serve to strengthen the property foundations.

3. Tree Survey and Data Schedule

This page is largely generic. Tree officers and other persons familiar with arboricultural reports may go straight to the following section and refer to the tree data in Appendix 6.

3.1. Survey Details

3.1.1. A ground level survey was undertaken on the 19th February 2015. 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. RPA calculation - Single Stems & Multiple Stems

3.3.1. For single stemmed trees, the RPA is calculated according to the following formula:

RPA radius = 12 x stem diameter (measures at 1.5m above ground level)

3.3.2. 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.

3.3.3. 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 (independent of proposals)

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

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 3rd March 2015, we were informed, by Tunde Adeola of London Borough of Camden that:

- The site is within St Johns Netherhall Conservation Area.
- There are no tree preservation orders affecting trees at the front of the property.
- There are no tree preservation orders on trees immediately adjacent to the property.
- Trees within the rear garden are protected by a tree preservation order.

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. Unauthorised works to protected trees may result in a criminal prosecution and a large fine (unlimited).

4.4.3. Where trees are located in a conservation area, works are not permitted without first giving the local authority 6 weeks' notice of intention. During this time the local authority may elect to create a tree preservation order or to inform the applicant that they have no objection to the proposed works. If the local authority does not respond within 6 weeks, then the intended work may be undertaken. Note: the local authority cannot refuse consent for works to trees within a conservation area; they may only create a tree preservation order if they wish to have further control over what works are undertaken.

4.4.4. 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* (rather than the actual tree *specimens*) included in the survey. 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
Hornbeam	25	14	Deciduous tree native to Southeast England and across Europe. Bark is smooth and grey on a stem which is often twisted and sinewy. Leaves sharply toothed and deeply veined. Tolerant of heavy clay soils. Formerly coppiced and prized for its durable timber which was used in wheel hubs, piano hammers, mill wheels and chopping blocks. Visit http://www.pfaf.org/user/Plant.aspx?LatinName=Carpinus+betulus for more info.
Turkish Hazel	14	12	Deciduous tree native to sw Europe. Often planted as a stret tree. Usually has a vertical straight stem with a regular, balanced canopy.

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. The figures quoted are not the maximum dimensions that the species may attain.

5. Arboricultural Impact Assessment

5.1. Overview

5.1.1. It is proposed install a basement which will extend into the front garden as indicated on the plans in Appendix 6. In order to minimise the impact on adjacent roots, it is proposed to utilise contiguous piling. This will ensure that adjacent soils are not disturbed during the excavation. The proposed layout of the garden is also shown on the attached plans.

5.1.1. The table below summarises the potential impact on trees due to various activities.

Activity	Trees Potentially Affected
Tree Removal: Retention Category A	None
Tree Removal: Retention Category B	None
Tree Removal: Retention Category C	None
Tree Removal: Retention Category U	None
Tree Pruning	None
RPA: Excavation	T1, T2
RPA: New Surface	T1, T2
RPA: Underground Services	None Anticipated
RPA: Change of Ground Levels	None
RPA: Soil Compaction	T1, T2 (preventable by installing tree protection measures)

5.1.2. Other potentially damaging activities often associated with construction sites include demolition or the careless use of plant machinery, hazardous materials, or fires.

5.1.3. All of the above potential impacts are considered in detail throughout this section. Section 6 specifies the measures proposed to minimise all possible potential risks of damage to the retained trees.

5.2. Tree Removal

5.2.1. All trees surveyed are to be retained.

5.3. Impact on Tree Canopies

5.3.1. The canopies of all retained trees are located sufficiently far from proposed building works and sufficiently high over access routes throughout the site that they should not be impacted upon by general construction activity. Consequently no pruning works are proposed to facilitate construction activity or access throughout the site. However, the proposed method of piling for the basement needs to be agreed with a piling contractor and approved by the local authority. If necessary, a small piling rig may be required which will be suitable for working beneath the tree canopies.

5.4. Impact on Tree Roots

5.4.1. Basement Excavation:

5.4.2. The proposal shall require excavation for foundations within the Root Protection Areas of T1 and T2. The portion of RPAs affected shall be as follows:

Tree No	Total RPA (m^2)	Area of RPA affected (m^2)	% of RPA affected
T1	35	5	**14.3**
T2	59	6.7	**11.4**

(Note: the calculations are based on an amended RPA which takes into account the impact of the adjacent road on the likely rooting zone of these trees. The Tree Constraints Plan indicates both a notional RPA shown as a dotted circle, along with a more realistic RPA which extends further in all directions except beneath the road.)

5.4.3. Tree rooting systems are dynamic and continually respond to changing site conditions by promoting root growth in areas where rooting conditions are favourable; and restricting root growth in areas where conditions are unfavourable or supplies of nutrients and water have been exhausted. Hence healthy trees can tolerate some root loss with no observable impact. Research has shown that healthy trees of most species are able to withstand the loss of some roots (to a maximum of about 20% of the rooting area) with no long term detrimental impact (Helliwell, D.R. and Fordham, S.F. (1992) Tree Roots and Tree Growth. Reading Agricultural Consultants, Didcot, UK.).

5.4.4. This suggests that trees t1 and T2 ought to be able to tolerate the incursion into 14.3% and 11.4% of their RPAS.

5.4.5. However, the incursion is sufficiently large to warrant some simultaneous pruning of the canopy. Pruning the canopy will result in a reduction in demand for water and nutrients from the root system. Maintaining a balanced root:shoot ratio in this manner will ensure no branches die back and no long term detrimental impact due to the incursion into the Root Protection Area.

5.4.6. We therefore recommend that the canopies of T1 and T2 are reduced by 15% in the same growing season as the excavation for the basement.

5.4.7. In order to ensure that the basement does not impact on a larger portion of the RPA, is it proposed to utilise contiguous piling (or similar). Using this method, narrow piles are driven deep into the ground along the edge of the proposed footprint of the basement and associated light-well / access. Excavation may then occur within the footprint of the basement without affecting soils, or roots beyond it. Any method of excavating which disturbs soils beyond the footprint of the basement will be unacceptable.

5.4.8. Garden Wall Foundations

5.4.9. One new brick pillar is proposed less than 2m from T2. At such proximity, there is a possibility of large roots being present. The pillar will therefore need to be excavated carefully using hand tools only and under arboricultural supervision. If any roots in excess of 50mm are encountered, it will need to be retained undamaged and the pillar relocated or the foundations designed around the root.

5.4.10. No excavation should occur beyond the existing wall foundations when building the new front boundary wall.

5.4.11. **Impact on Building Movement and Future Tree maintenance**

5.4.12. As a consequence of installing the basement, the building foundations shall effectively have been underpinned. This shall alleviate the potential risk of future subsidence occurring due to the roots of T1 and T2. Therefore the basement shall enable the trees to be retained without the need for excessive pruning.

5.4.13. **New Surfaces:**

5.4.14. Where the RPAs extend into parts of the front garden beyond the footprint of the basement, it is proposed to retain exiting ground levels. A bin store is proposed which should be founded on a porous surface which required minimal excavation (e.g. paving slabs). A planted area is also proposed which shall require no excavation beyond 150mm (for the purpose of cultivation).

5.4.15. **Underground Services**

5.4.16. No underground services are to be installed through any Root Protection Areas.

5.4.17. **Changes in Ground Levels:**

5.4.18. No changes to ground levels are proposed over Root Protection Areas other than discussed above.

5.4.19. **Soil Compaction:**

5.4.20. Tree protection measures specified are specified in Section 6. These include measures to minimise soil compaction. They should be maintained throughout the project to ensure minimal impact on tree roots due to construction activity.

5.5. Demolition Activities

5.5.1. The tree protection measures specified within Section 6 should be installed prior to the commencement of all demolition activities (including soil stripping) to prevent any detrimental impact on tree health.

5.6. Hazardous Materials

5.6.1. All hazardous materials (including cement and petrochemical products) will need to be controlled according to COSHH regulations in order to ensure there is no detrimental impact on tree health. Provision shall need to be made to ensure that cement and cement run-off are contained outside of all Root Protection Areas.

5.7. Cabins and Site Facilities

5.7.1. There is limited room for the siting of cabins and storage of materials / spoil during the construction phase so the logistics of the development shall need to be well organised to ensure that there is adequate space outside of the Tree Protection Zones for construction activity.

6. Method Statement

Section A: Introduction and Overview

6.1. Definition of Terms

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

6.1.2. **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.

6.1.3. **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.

6.2. Tree Protection Barriers - Overview

6.2.1. 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 9	Location
	In-Ground System or Back-Stay System	N/A
	Back-Stay System	N/A
	Barrier Mesh System	N/A
	Plywood Boxing	Around the stems of T1 and T2

6.2.2. 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 9.

6.2.3. The tree protection plan also indicates where ground protection measures shall be installed as specified in sections 6.6 onwards (Restricted Activity Zones) and Section 10–*Ground Protection Measures.*

6.3. Planning Status

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

6.3.2. 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.

6.3.3. 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 and installation of services.

6.4. Overview of Protection Measures

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

Reference	Comments	Potential Impact	Protection measures
T1, T2	Loss of up to 14% of root system	Imbalanced root:shoot ratio leading to reduction in vigour and some dieback of the canopy	Prior to excavating, pruning of the canopy shall be undertaken to balance the root:shoot ratio. The pruning is specified in Section 8 -*Tree Works Schedule*.
T2	Access is required over the Root Protection Area.	Compaction and contamination adjacent to proposed works.	Ground protection measures to be installed before commencement, and maintained throughout the project. See Section 6.6 for all restrictions that apply.
T2	Change of surface proposed over RPA (bin store).	Root severance. Soil compaction. Reduced water and oxygen uptake.	Restricted Activity Zone created. Ground protection measures installed. Excavation limited to 100mm using hand tools. Porous finish or dry jointed paving slabs utilised.
T1, T2	Basement/foundations to be installed in RPA.	Excessive root severance if excavation extends into the Root Protection Area beyond the basement footprint.	Contiguous piling to be installed adjacent the proposed footprint using narrow diameter piles. Tree officer or an appointed arborist invited to oversee. See Section 6.6.1 for all restrictions that apply.

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

6.5. Timing of Operations

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

Order	Phase	Activity
1st.	Pre-Construction Phase	Undertake all specified tree removal and pruning (see Section 8 -*Tree Works Schedule*).
2nd.		Install the tree protection barriers (see Tree Protection Plan and Section 9 -*Tree Protection Barriers*.
		Protection measures confirmed acceptable by the local authority
3rd.	Construction Phase	Install basement and landscape the front garden, taking into account restricted activities as specified in Section 6.
4th.	Post-Construction Phase	Remove protective barriers (fencing and ground protection measures as applicable).

Section B: Restrictions on Activities – Specific Zones

6.6. Restricted Activity Zone A

6.6.1. Within these zones this zone (indicated on the Tree Protection Plan) access will be required to facilitate construction. The following restrictions shall apply:

- No permanent or temporary structures shall be erected without written approval from the local authority.
- Removal of existing structures such as, walls, steps and hard surfaces shall be undertaken using hand tools or a mechanical excavator operating from outside the Restricted Activity Zone and carefully marshalled by an appointed arborist.
- Ground protection measures shall be installed as specified in Section 10 *–Ground Protection Measures*. These shall remain in place throughout the entire construction phase. *Note 1: where existing paving is retained and only pedestrian activity is proposed, no additional ground protection measures will be required*
- Vehicles or plant machinery in excess of 2 tonnes shall not be permitted in this area.
- Existing ground levels shall be retained undisturbed.
- The bin store shall be founded on a permeable hard surface with no excavation occurring beneath 150mm. Paving slabs shall be an acceptable base.
- The planted area shall be installed at the same level as the existing ground and without excavation below 150mm.
- No further excavation shall occur in this zone without consulting the appointed arborist and obtaining approval from the local authority.
- If roots are encountered in excess of 25mm diameter, they shall be retained wherever possible and protected with damp sacking during times that they are unearthed. Any roots in excess of 10mm that need to be severed shall be pruned with secateurs.
- 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 spoil shall be stored.
- No fires shall be permitted.
- All hazardous materials (including non-essential cement products) shall be forbidden.
- No machinery in excess of 3m tall shall pass through or operate in this zone.

6.6.1. It is also proposed to relocate one brick pillar within the RPA of T2. Because the foundations shall be within a Root Protection Area, the following restrictions shall apply.

- Excavation shall be undertaken using hand tools only.
- Excavation shall be kept to a minimum surface area to minimise root disturbance. No restrictions are placed on the depth of the excavation.
- Roots close to the edge of the excavation shall be retained wherever possible, otherwise pruned with sharp secateurs.
- If any roots in excess of 50mm are encountered, the post hole shall be relocated to avoid such roots.

6.7. Restricted Activity Zone B

6.7.1. Within this zone (indicated on the Tree Protection Plan) it is proposed to excavate for the basement.

6.7.2. Either contiguous piling shall be installed along the edge of the basement, OR pinning shall be undertaken in much the same way as when underpinning basement foundations. A typical method of pinning would be to excavate to a specified depth (e.g.

1m), install shuttering and then cast the concrete basement walls. Then to excavate short sections beneath this wall and cast deeper concrete. Then to excavate in between these deeper sections and infill with concrete. In this manner excavation may continue to any specified depth without disturbing soils beyond the footprint of the build.

6.7.3. The specific method adopted will vary between contractors. However, the following restrictions will apply and must be adhered to:

- No excavation or ground disturbance shall occur beyond the footprint of the basement.
- No large plant machinery shall operate beneath the canopy of T1 or T2.
- Where a small excavator is used, it shall operate from within the footprint of the basement,
- The excavator shall be marshalled to ensure no contact is made with the canopy of T1 or T2.

Section C: Restrictions on Activities – Throughout the Site

6.8. Canopy Protection

6.8.1. In order to protect tree canopies the following restrictions shall apply throughout the site:

- No machinery in excess of 2m 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.

6.9. Demolition and Initial Ground Works

6.9.1. No demolition, removal of surfaces, or soil stripping shall commence until the protective fencing and ground protection measures are installed to the satisfaction of the local authority.

6.10. Underground Services

6.10.1. No underground services (including soak-aways) shall be located in any part of the *Construction Exclusion Zones* or *Restricted Activity Zones* unless done so in a manner detailed in a specific Method Statement and approved by the local authority.

6.11. Hazardous Materials

6.11.1. Any mixing of cement based materials shall take place outside the 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. Mixers and barrows shall be cleaned within this area.

6.11.2. 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.

6.12. Removal of Tree Protection Barriers

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

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

7. Site Inspection

7.1. Inspection Schedule

7.1.1. In order to ensure that the trees are adequately protected it shall be necessary to periodically monitor the works. This will be done by the local authority tree officer or an appointed arborist (see Section 7.2 below) who will provide the tree officer with a copy of inspection details.

7.1.2. 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 Meeting After tree works completed & tree protection barriers / ground protection measures installed. Prior to any other activity, inc. demolition & soil stripping.	Site manager, appointed arborist and/or local authority tree officer. *	Tree protection fencing locations & specification checked. Additional ground protection measures checked. Further protection measures / restrictions agreed.
Intermediate Reporting Throughout the entire project. At least once per month.	N/A.	Site manager to liaise with the appointed arborist regarding any issues which may affect trees. General site photos indicating tree protection measures to be provided monthly.
Excavation in Restricted Zones A, and B including gate post excavation.	Site manager, appointed arborist and/or local authority tree officer.	At least one week's notice shall be given prior to commencing excavation.
Post-Construction Meeting Post major construction activity but prior to removal of fencing & landscaping operations.	Site manager, appointed arborist and/or local authority tree officer.	Retained trees inspected. Further landscaping operations and restrictions to be agreed.
Post-Landscaping Meeting Confirm landscaping and mitigation planting is acceptable.	Site manager, appointed arborist and/or local authority tree officer.	N/A.

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

7.2. The Appointed Arborist

7.2.1. 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.

7.2.2. 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.

7.2.3. 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.

8. Tree Works Schedule

8.1. Tree Works Specification

8.1.1. The following table specifies the tree works which will be required prior to the commencement of construction activity:

Tree Reference	Action Required	Notes
T1, T2	Crown reduce by 15%	Branches to be pruned back to a secondary branch junction or the branch collar wherever possible.

8.1.2. **Pruning Standards:** Sympathetic pruning shall be carried out to BS 3998 (2010). Lopping of branches is to be avoided. Instead as system of 'drop crothching' or 'reduction via thinning' is to be used to achieve the desired clearance without spoiling the appearance, or form, of the trees. All pruning cuts shall be made close to the branch collar or a secondary growth point. Cuts to be made with sharp, clean tools. No wound sealants to be used.

9. Tree Protection Barriers

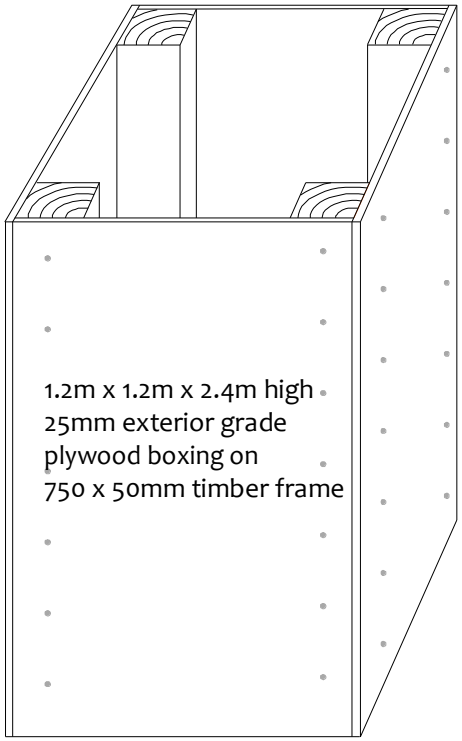
Detailed Specification

9.1.1. 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.

9.2. Stem Protection – Timber Boxing

9.2.1. 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.

Tree Protection Plywood Box

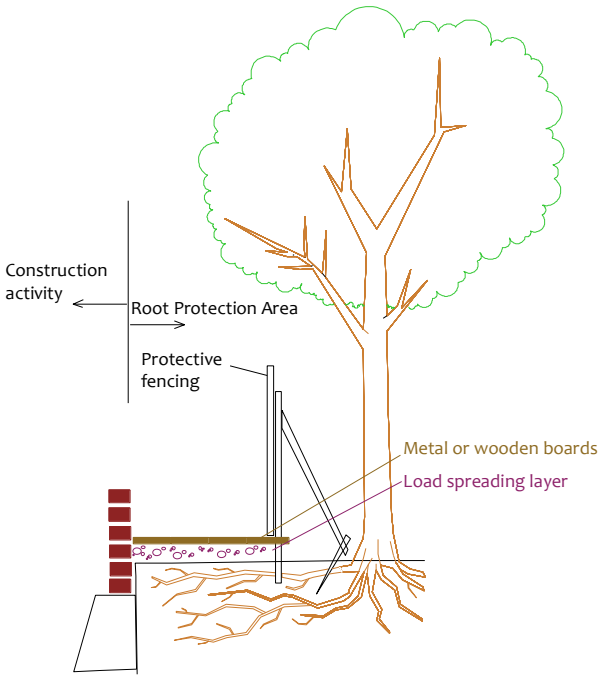


10. Ground Protection Measures

Detailed Specification

10.1.1. Where indicated on the Tree Protection Plan (Restricted Activity Zone A), existing hard surfacing shall need to be retained or suitable ground protection measures shall need to be installed over any soft landscaping 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



10.1.2. 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 in-filled with 7 – 40mm angular gravel (e.g. *Cellweb*^{TM}). 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.

10.1.3. 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

10.1.4. 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.

10.1.5. Where existing structures need to be removed this shall be done with temporary ground protection measures in place to enable this to be achieved without compacting soils.

10.1.6. **If a pile driver needs to operate in this zone, sturdier ground protection measures may need to be specified such as a 150mm reinforced concrete slab. This should be specified by engineers and approved by the local authority.**

10.1.7. 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.

11. Photographs

Refer to the Tree Constraints Plan for photo locations

Photo 1.

Photo 2.

Photo 3.

Photo 4.

Photo 5.

Photo 6.

Photo 7.

Photo 8.

Photo 9.

Photo 10.

Photo 11.

Photo 12.

Photo 13.

Photo 14.

Photo 15.

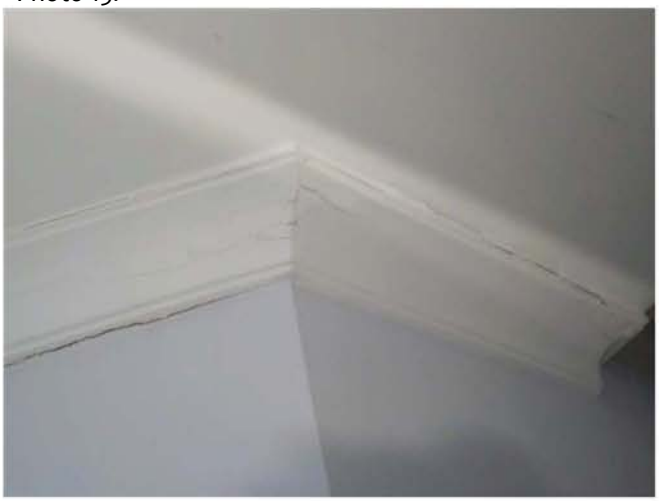


Photo 16.

Photo 17.

Photo 18.

Photo 19.

12. Signature

This report represents a true and factual account of the trees and potential impact of development along with proposed protection measures at

14 Eldon Grove
London
NW3 5PT

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

3rd March 2015

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. For single stemmed trees It is calculated according to the formula "radius of RPA" = "12 x stem diameter". For multiple-stemmed trees a more complex formula is used which may occasionally produce an RPA which seems inappropriately large relative to the trees canopy. This shape can then be modified to take into account site factors which influence rooting activity, e.g. foundations, soil type or impermeable surfaces. 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.** The previous Standard (BS 5837 2005) suggested that shade constraints should be indicated on the TCP. This are denoted as a circle-segment drawn northwest to due east with a radius equal to the height of the tree. These do not represent the actual shade pattern which varies through the seasons. Rather, they indicate 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. Where we consider it appropriate, we will include shade constraints information on our Impact Assessment Plan or Proposed Layout Plan.

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** (see Section 3 and Appendix 6).

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.**
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.
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.
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.
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.

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.**
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 8545:2014. Trees: From nursery to independence in the landscape – Recommendations
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.

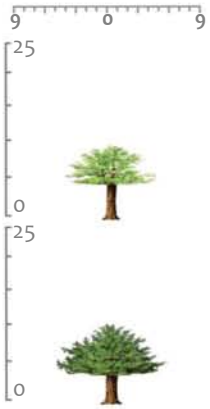
Reference (G = Group, H = Hedge)	Age & Species	Height (m)	Crown Ht (m)	Diameter (cm)	Crown Spread (m) N / W / E / S	Scaled Tree Diagram (m)	Notes	Recommendations (Independent of any development proposals)	Priority	Inspect Freq (yrs)	Vigour	Physiological Condition	Structural Condition	Amenity Value	Life Expectancy (yrs)	Retention Category
T1	Semi-Mature **Turkey Hazel** Cotinus coggygria.	9	5	28	N 4 / W 3.5 / E 3 / S 3		Position: Street tree. Form: Single stemmed and vertical with a well-formed crown. History: Occasional pruning wounds due to crown lifting (healing well). **Defects: No defects observed.** Other: Girdling root at base.	No action required.	n/a	3	Moderate	Good	Good	Moderate	40+	**B**
T2	Semi-Mature **Hornbeam** Carpinus betulus.	10	4	36	N 4.5 / W 4.5 / E 4 / S 5		Position: Street tree. Form: Multi-stemmed at 2.5m with a well-formed crown. History: No evidence of significant pruning. **Defects: No defects observed.**	No action required.	n/a	3	Moderate	Good	Good	High	40+	**A**

Photo 1

Photo 2

Photo 3

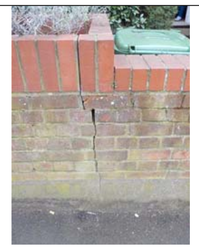


Photo 4

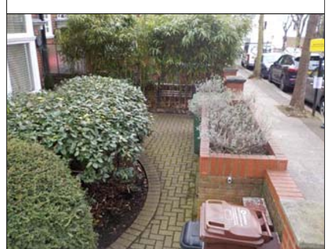
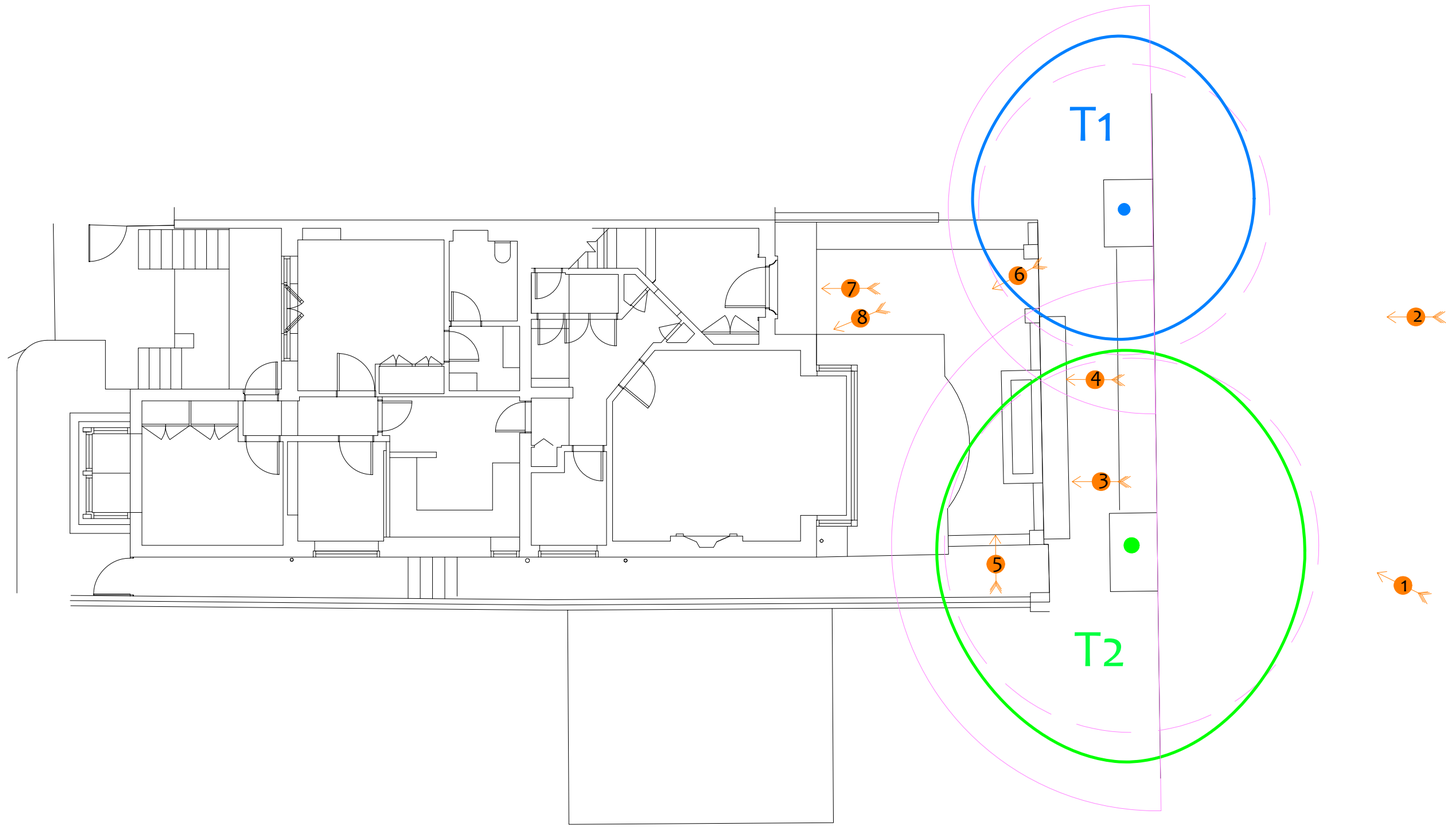


Photo 5



MN

Tree Constraints Plan

(Existing Layout)

Photo 6

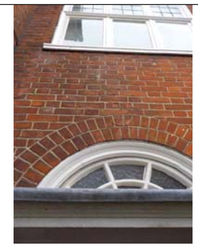


Photo 7

Photo 8

Drawing No:	CCL 09274 / TCP Rev: 1
Title:	Tree Constraints Plan (Existing Layout)
Site:	14 Eldon Grove NW3 5PT
Scale: 1:100	Paper Size: A2

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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

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

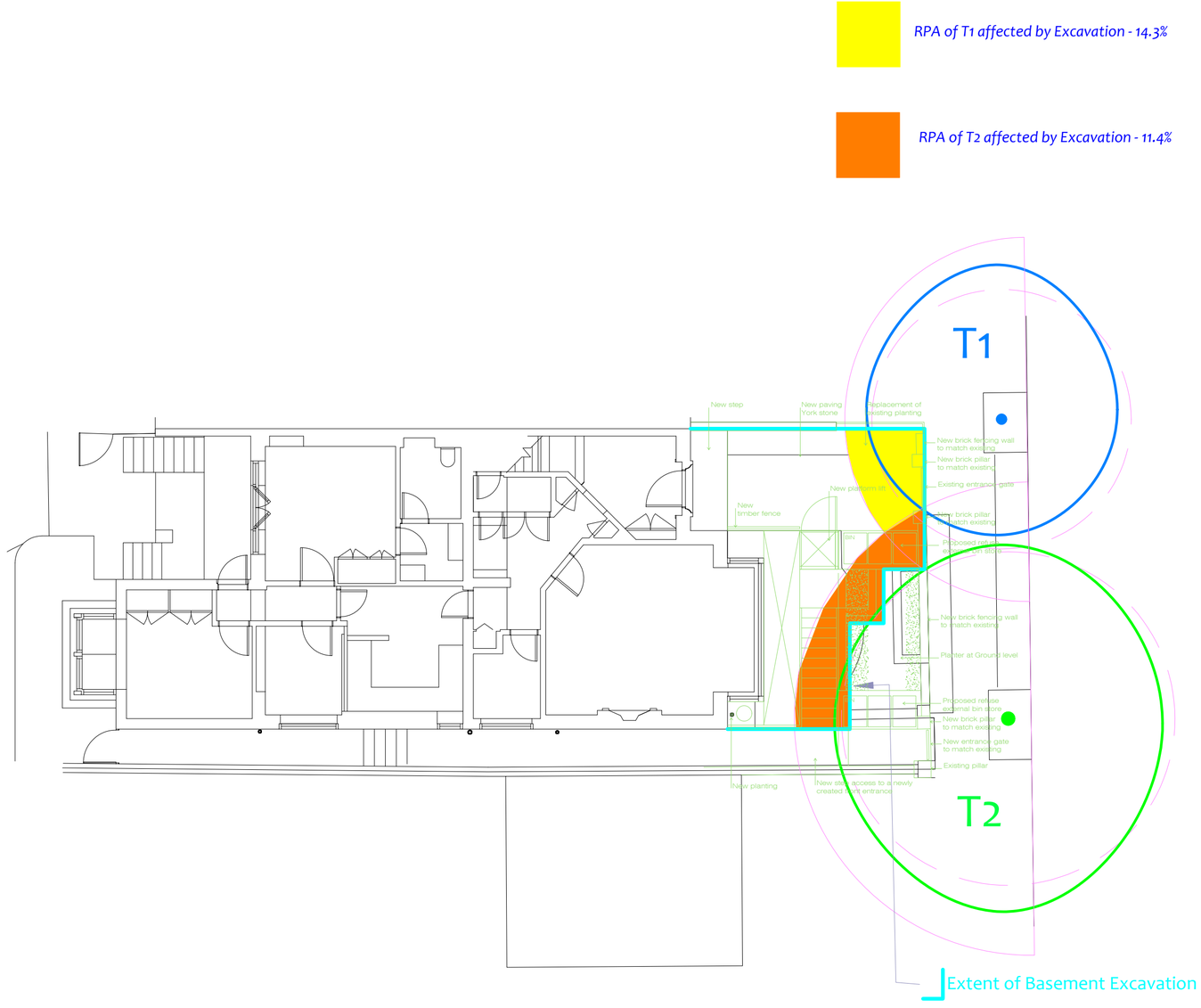
T1 = Tree No 1 G2 = Group No 2 H3 = Hedge No 3

1 Photo 1

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.

Tree Ref.	Species	Height (m)	Root Protection Area		
			Radius (m)	m²	Square (m)
T1	Turkey Hazel	9	3.4	35	6.0
T2	Hornbeam	10	4.3	59	7.7

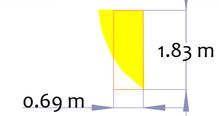


MN

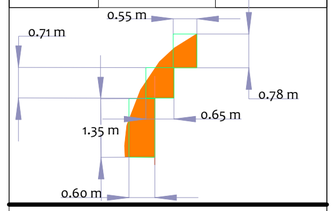
Impact Assessment Plan

(Existing Layout with Proposals Overlaid)

T1	RPA Affected by Excavation		
Total RPA (sqm)	RPA affected (sqm)	RPA affected (%)	
35	5	14.3	



T2	RPA Affected by Excavation		
Total RPA (sqm)	RPA affected (sqm)	RPA affected (%)	
59	6.7	11.4	



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Site:	14 Eldon Grove NW3 5PT
Scale: 1:100	Paper Size: A2

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Tree Retention Categories
Stems & canopies shown

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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.

Impact Assessment Plan

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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

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.

Tree Ref.	Species	Height (m)	Root Protection Area		
			Radius (m)	m²	Square (m)
T1	Turkey Hazel	9	3.4	35	6.0
T2	Hornbeam	10	4.3	59	7.7

6.6. Restricted Activity Zone A

6.6.1. Within these zones this zone (indicated on the Tree Protection Plan) access will be required to facilitate construction. The following restrictions shall apply:

- No permanent or temporary structures shall be erected without written approval from the local authority.
- Removal of existing structures such as, walls, steps and hard surfaces shall be undertaken using hand tools or a mechanical excavator operating from outside the Restricted Activity Zone and carefully marshalled by an appointed arborist.
- Ground protection measures shall be installed as specified in Section 10 *–Ground Protection Measures*. These shall remain in place throughout the entire construction phase. *Note 1: where existing paving is retained and only pedestrian activity is proposed, no additional ground protection measures will be required*
- Vehicles or plant machinery in excess of 2 tonnes shall not be permitted in this area.
- Existing ground levels shall be retained undisturbed.
- The bin store shall be founded on a permeable hard surface with no excavation occurring beneath 150mm. Paving slabs shall be an acceptable base.
- The planted area shall be installed at the same level as the existing ground and without excavation below 150mm.
- No further excavation shall occur in this zone without consulting the appointed arborist and obtaining approval from the local authority.
- If roots are encountered in excess of 25mm diameter, they shall be retained wherever possible and protected with damp sacking during times that they are unearthed. Any roots in excess of 10mm that need to be severed shall be pruned with secateurs.
- 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 spoil shall be stored.
- No fires shall be permitted.
- All hazardous materials (including non-essential cement products) shall be forbidden.
- No machinery in excess of 3m tall shall pass through or operate in this zone.

6.6.1. It is also proposed to relocate one brick pillar within the RPA of T2. Because the foundations shall be within a Root Protection Area, the following restrictions shall apply.

- Excavation shall be undertaken using hand tools only.
- Excavation shall be kept to a minimum surface area to minimise root disturbance. No restrictions are placed on the depth of the excavation.
- Roots close to the edge of the excavation shall be retained wherever possible, otherwise pruned with sharp secateurs.
- If any roots in excess of 50mm are encountered, the post hole shall be relocated to avoid such roots.

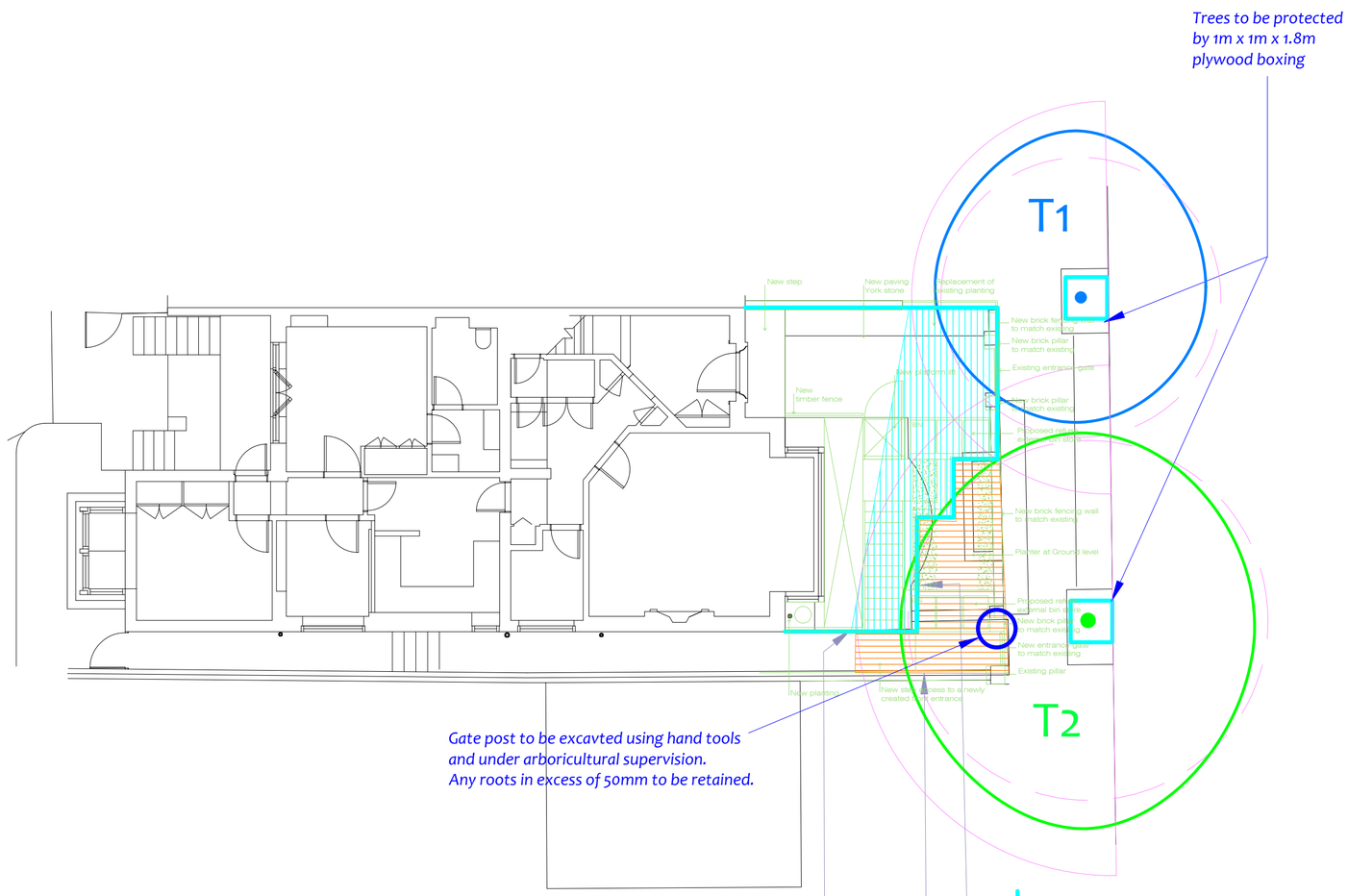
6.7. Restricted Activity Zone B

6.7.1. Within this zone (indicated on the Tree Protection Plan) it is proposed to excavate for the basement.

6.7.2. Either contiguous piling shall be installed along the edge of the basement, OR pinning shall be undertaken in much the same way as when underpinning basement foundations. A typical method of pinning would be to excavate to a specified depth (e.g. 1m), install shuttering and then cast the concrete basement walls. Then to excavate short sections beneath this wall and cast deeper concrete. Then to excavate in between these deeper sections and infill with concrete. In this manner excavation may continue to any specified depth without disturbing soils beyond the footprint of the build.

6.7.3. The specific method adopted will vary between contractors. However, the following restrictions will apply and must be adhered to:

- No excavation or ground disturbance shall occur beyond the footprint of the basement.
- No large plant machinery shall operate beneath the canopy of T1 or T2.
- Where a small excavator is used, it shall operate from within the footprint of the basement,
- The excavator shall be marshalled to ensure no contact is made with the canopy of T1 or T2.



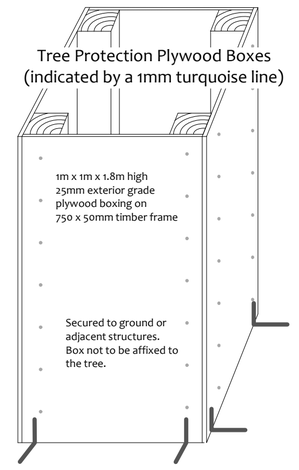
MN

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

Tree Protection Plywood Boxes (indicated by a 1mm turquoise line)

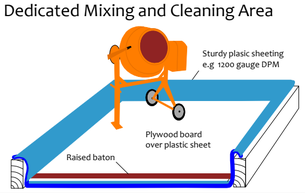


Restricted Activity Zones

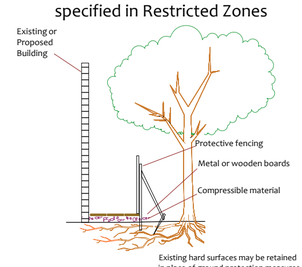
Restrictions are detailed within the accompanying Method Statement

Restricted Zone A | Restricted Zone B

Dedicated Mixing and Cleaning Area



Ground Protection where specified in Restricted Zones



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Site:	14 Eldon Grove NW3 5PT
Scale:	1:100
Paper Size:	A2

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