Arboricultural Impact Assessment & Method Statement





at

34 Hampstead Lane
London
N6 4NT

Dated
7th April 2016

CROWN Consultants

Tree consultants throughout England and Wales

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1. Introduction

1.1. Instruction

1.1.1. We are instructed by Ben Cousins of Cousins & Cousins Architects to assess the likely impact of development proposals and produce a Method Statement detailing how trees shall be protected from proposed construction activity at 34 Hampstead Lane. This report should be read in conjunction with our report dated 25th February 2015 which presents the results of our tree survey to British Standard 5837 (2012).

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 (for an outline planning applications) or via planning conditions.

1.3. Formatting

Text formatted in italics and within a light green box is non-site specific and is included to assist readers unfamiliar with tree surveys to understand the report. Tree officers may wish to skim through these sections.

1.4. Drawings

1.4.1. The tree locations shown on the accompanying plans which are reproduced in Appendix 6 are based on a measured plan of the site supplied to Crown Consultants. This plan had the tree positions already plotted. Where applicable, additional trees have been plotted by us 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). 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.

1.4.3. 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 2.

1.4.4. 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 3.

2. Arboricultural Impact Assessment

2.1. Overview

2.1.1. It is proposed to demolish the existing buildings and construct a new detached residential property consisting of basement level, plus three additional storeys. The arrangement of the basement and other storeys are indicated on the plans in Appendix 6.

2.1.1. 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	T10, T12
Tree Removal: Retention Category U	None
Tree Pruning	T1, T2
RPA: Foundations	T2, T5, T9
RPA: New Surface	None
RPA: Underground Services	To Be Confirmed
RPA: Change of Ground Levels	None
RPA: Soil Compaction	All trees (preventable by installing tree protection measures)

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

All of the above potential impacts are considered in detail throughout this section. Section 3 specifies the measures proposed to minimise all possible potential risks of damage to the retained trees.

2.2. Tree Removal

2.2.1. All trees to be removed are indicated on the Tree Removal Plan and are listed below:

- **Retention Category A:** It is proposed to retain all Retention Category A trees.
- **Retention Category B:** It is proposed to retain all Retention Category B trees.
- **Retention Category C:** It is proposed to remove the following Retention Category C trees: T1 and T2.

  These are relatively small trees (height 4m). They are located within a rear garden and are not visible from public vantage points. Consequently they are considered to have a low amenity value. Their removal shall not have a significant impact on the visual amenity of the locality and they are not considered to be a material planning consideration.

  They are not protected by a tree preservation order or considered worthy of special protection.
- **Retention Category U:** Our survey did not identify any Retention Category U trees.

2.3. Impact on Tree Canopies

2.3.1. It is proposed to prune back the canopy of the oak tree, T2. The canopy of this tree almost reaches the existing building and currently overly-dominates the front garden. It is proposed to reduce it on that side by approximately 2m.

2.3.2. This shall help to balance the canopy and shall only require the removal of relatively small secondary branches which should be pruned back to a secondary growth point So long as the pruning works are undertaken sympathetically (working to BS 3998: 2010 guidelines) the tree shall not be significantly harmed or disfigured. These works are specified within the Tree Works Schedule in Section 5.

2.3.3. It is also proposed to reduce the canopy of the sycamore, T1, to a radial spread of 2.5m so that it may be retained and pollarded back every five years. Similar management of this tree would be required with the existing arrangements because of its large growth potential and proximity to buildings.

2.4. Impact on Tree Roots

2.4.1. **Foundations:**

2.4.2. The proposal shall require excavation for foundations within the Root Protection Areas of T2, T5, and T9. The portion of RPAs affected shall be as follows:

Tree No	Total RPA (m^2)	Area of RPA affected (m^2)	% of RPA affected
T2	147	4.6	**3.1**
T5	335	10.7	**3.2**
T9	122	2.8	**2.3**

(Note: these calculations are based on an amended RPA which takes into account the impact of the adjacent road on the likely rooting zone of this tree. The Tree Constraints Plan indicates both a notional RPA shown as a pink circle, along within extended RPA shown as turquoise arcs.)

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. 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[1].

2.4.3. An impact on 2% or 3% of the root system of these trees should therefore be tolerated by without any long term detrimental impact. These trees are not currently exhibiting signs of stress and have not recently had to establish a new canopy (no recent heavy pruning has been undertaken). Therefore their starch reserves will be high. It is anticipated that they shall re-establish any root:shoot ratio imbalance within the first growing season with no observable impact.

2.4.4. Pruning works to the canopy of **T2** are also proposed. This pruning will result in some reduction in the demand for water and nutrients that will be placed on the root system. Maintaining a balanced root:shoot ratio in this manner will ensure no branches die back and no detrimental impact due to the minor incursion into the Root Protection Area.

2.4.5. The table in Section 2.4 shows that foundations for the single storey element of the building shall extend into the RPA of **T5** by 3.2%. In order to ensure the least possible impact, it is proposed to utilise a 200mm thick reinforced concrete raft in this area. This

[1] Helliwell, *D.R. and Fordham, S.F. (1992) Tree Roots and Tree Growth. Reading Agricultural Consultants, Didcot, UK.

will be founded on narrow corkscrew piles which will be located to avoid large roots (as determined by careful trial excavation). Also, the demolition of the existing building shall provide an additional 12.6 square metres of new ground into which this tree may root. This is slightly more than will be lost due to the installation of foundations.

2.4.6. The table shows that only a very small percentage of the RPA of **T9** shall be affected by the basement installation (2.3%). In order to ensure that the basement does not impact on more of the RPA, is it proposed to install the basement in a manner that does not disturb any of the soils beyond the footprint of the basement. This may be done via contiguous piling, sheet piling, pinning or any similar method which restricts excavation to the basement footprint.

2.4.7. **New Surfaces:**

2.4.8. No new hard surfaces are proposed within the Root Protection Areas of any trees. However, the existing hard surface throughout the front garden will need to be resurfaced in places as the project nears completion.

2.4.9. To ensure no roots are damaged, any excavation shall be limited to the removal of the existing surface and the associated sub-base. Soils in these areas are likely to be compacted already and no net increase in traffic is anticipated; therefore no significant detrimental impact shall occur as a result of resurfacing, and the installation of a 3D cellular confinement system beneath the surface is not considered necessary.

2.4.10. **Underground Services:**

No underground services should be installed through any Root Protection Area without consulting the appointed arborist and if necessary, gaining approval from the local authority.

2.4.11. Connecting to existing services beneath the adjacent could potentially have a major impact on the health of trees close to the front boundary (if a trench is excavated through their RPAs). The Tree Location Plan indicates where such a trench may be excavated with minimal impact on tree roots.

2.4.12. **Changes in Ground Levels:**

2.4.13. No changes to ground levels are proposed over Root Protection Areas.

2.4.14. **Soil Compaction:**

The majority of tree roots lie within the upper soil horizons. This is because the availability of oxygen decreases with depth and roots need to breathe to stay alive. In addition, nutrients are more readily available in the form of organic matter close to the soil surface.



Healthy soils contain about 25% air space between solid particles. Increased loading of the soils caused by construction activity causes air to be squeezed out as the soil becomes compacted preventing roots from breathing. Even an increase in pedestrian activity may cause some soil compaction.

2.4.15. In order to minimise any negative impact due to soil compaction, or contamination, on the roots of all trees throughout the site, it will be necessary to ensure that a suitable load spreading surface is in place in Restricted Activity Zone A (marked on the Tree Protection Plan). Such a surface should be in place at all times during the demolition and construction phases. Where applicable, existing hard surfaces may be retained;

otherwise ground protection measures shall be installed as specified in Section 7. This shall be fully in accordance with industry best practice as specified in BS 5837 (Section 6.2.3).

2.4.16. Root Protection Areas towards the rear of the site shall be protected within a Construction Exclusion Zone where all construction activity shall be excluded by protective fencing. This shall ensure no negative impact on the rooting environment due to soil compaction or contamination.

2.5. Demolition Activities

2.5.1. The tree protection measures specified within Section 3 should be installed prior to the commencement of all demolition activities (including soil stripping) to prevent any detrimental impact on tree health. Where this is not practicable, demolition of structures within Construction Exclusion Zones shall be undertaken very early on in the demolition phase and the protective barriers installed immediately thereafter.

2.6. Hazardous Materials

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.

2.7. Cabins and Site Facilities

Consideration should be given to the location of any site welfare facilities in terms of potential impact on trees. Where it is proposed to install cabins or site facilities in Root Protection Areas, the appointed arborist should be consulted and approval obtained from the local authority.

2.7.1. This site is quite heavily constrained by trees so the logistics of the development shall need to be well organised to ensure that there is adequate space outside of the Construction Exclusion Zones for construction activity.

2.8. Boundary Treatments

2.8.1. A new boundary wall and gate posts are proposed along the front boundary where there currently exists a low wall. Large buttress roots of T2 and T3 shall be present where the new wall is proposed. All works in this area shall need to be undertaken using hand tools and an air spade. Depending on the root morphology that is discovered, specialist foundations shall need to be designed. This is likely to require a combination of narrow corkscrew piles and beams spanning/cantilevering over the larger roots. Severing of such roots shall not be permitted as this could destabilise the trees.

2.9. Summary

2.9.1. In order to facilitate the development, it is proposed to remove two Retention Category C trees. These are all small trees and/or are hidden from public vantage points. Consequently the impact of tree removal on local amenity shall be minimal.

2.9.2. Two trees require some pruning to create an adequate clearance from the proposal. Because the existing property is very close to the canopy of these trees, similar pruning would be required at some point in the future, regardless of the development proposals.

2.9.3. No new hard surfacing is proposed in RPAs.

2.9.4. Foundations are proposed within the Root Protection Area of several trees. However, the small extent of RPA affected coupled with the sympathetic foundation design shall ensure no detrimental impact on trees.

2.9.5. Garden wall foundations are proposed within the Root Protection Areas of 2 and T3. Hand tools are to be used to excavate in these areas and a watching brief is proposed. Where the appointed arborist deems necessary, a shallow beam shall be incorporated into the foundation design to ensure that all roots in excess of 50mm and most roots in excess of 25mm are retained intact.

2.9.6. A suitable load spreading surface shall need to be maintained throughout the Restricted Activity Zone A in order to prevent soil compaction.

2.9.7. Tree protection measures are specified throughout Section 3 that will ensure no negative impact on retained trees due to construction activity.

3. Method Statement

Section A: Introduction and Overview

3.1. Definition of Terms

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

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.*

Construction Exclusion Zone (CEZ). *These zones are created to protect roots and canopies form inadvertent damage by construction activity – see Section 3.7. -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.*

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.*

3.2. Tree Protection Barriers - Overview

3.2.1. 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 6	Location
	In-Ground System or Back-Stay System	Around the Construction Exclusion Zones, close to where construction activity is proposed. As indicated on the Tree Protection Plan.
	Back-Stay System	N/A
	Barrier Mesh System	N/A

The barriers shall be installed prior to the commencement of any localised construction activity including soil stripping and delivery of materials. A detailed specification of the barriers can be found in Section 6.

The tree protection plan also indicates where ground protection measures shall be installed as specified in sections 3.8 onwards (Restricted Activity Zones) and Section 7–Ground Protection Measures.

3.3. Planning Status

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

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.

3.4. Overview of Protection Measures

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

Reference	Comments	Potential Impact	Protection measures
T1, T2	Canopy is close to proposed construction or demolition activity	Damage to branches.	Prior to commencement, pruning to be undertaken as specified in Section 5 -*Tree Works Schedule*).
T1, T2, T3, T4, T5, T11	Access is required over the Root Protection Area.	Compaction and contamination adjacent to proposed works.	Suitable load spreading surface to be maintained throughout the construction phase. No excavation or resurfacing shall occur other than after consultation with the appointed arborist and approval from the local authority. Construction exclusion zone to be created over remainder of Root Protection Area. See Section 3.8 for all restrictions that apply.
T1, T2, T3, T4	Existing hard surface to be replaced over RPA.	Root severance. Soil compaction. Reduced water and oxygen uptake.	Load spreading surface to be installed at all times. No excavation beyond existing surface and sub-base. Tree officer or an appointed arborist invited to oversee.
T5	Single storey foundations to be installed in RPA.	Rot severance.	Shallow raft (or beam) foundations to be installed. Excavation for raft (or beam) not to exceed a depth of 250mm (If piling is deemed necessary, piles not to exceed 250mm diameter). Tree officer or an appointed arborist invited to oversee. See Section 3.10 for all restrictions that apply.
T2, T3	Garden wall and gatepost foundations installed in RPA.	Root severance.	Excavation kept to a minimum and using hand tools and an air spade only. Excavation to be undertaken under supervision of the appointed arborist. All roots over 50mm diameter to be retained and foundations designed accordingly. Corkscrew piles and beams used to span/cantilever over roots. Tree officer or an appointed arborist invited to oversee. See Section 3.11 for all restrictions that apply.
T7, T8, T9, T11	Basement to be installed close to the edge of the RPA.	Excessive root severance if excavation extends significantly into the Root Protection Area.	Soils beyond the basement footprint to be retained undisturbed. To ensure this, contiguous piling, sheet piling, pinning, or a similar method shall be adopted. Tree officer or an appointed arborist invited to oversee. See Section 3.9 for all restrictions that apply.
Remainder of the site	No works proposed in Root Protection Areas.	Compaction and contamination from general construction activity.	Protective fencing installed as specified in Section 6 and *Construction Exclusion Zone* created where appropriate. No works permitted in Exclusion Zone.

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

3.5. Timing of Operations

3.5.1. 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 3.6 below). Discharge of any planning conditions relating to trees.
2nd.		Undertake all specified tree removal and pruning (see Section 5 -*Tree Works Schedule*).
3rd.		Install the tree protection barriers (see Tree Protection Plan and Section 6 -*Tree Protection Barriers*.
4th.		Maintain a suitable load spreading surface and exercise caution in Restricted Zone A. (see Tree Protection Plan and Section 7 –*Ground Protection Measures*)
Protection measures confirmed acceptable by the local authority		
5th.	Construction Phase	Demolish existing structures and remove existing surfaces where applicable.
6th.		Install new buildings, hard surfaces and services taking into account restricted activities as specified in Sections 3.7 onwards
7th.	Post-Construction Phase	Remove protective barriers (fencing and ground protection measures as applicable).
8th.		Undertake restricted landscaping operations within Root Protection Areas, including (where applicable) boundary treatments, pedestrian surfaces, decking and any proposed tree planting.

3.6. Confirming Detailed Proposals

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 (for an outline planning applications) or via planning conditions.

3.6.1. The table below highlights where such confirmation is required.

Nature of Activity	Areas Potentially Affected	To be Confirmed
Underground Services	All Root Protection Areas	Exact location of all underground services and trenches. Location of any proposed soak-aways. Method of installation where services pass through Root Protection Areas.
Garden wall Foundations	Front Boundary	Exact specification of foundations; including depth of excavation, diameter of piles or location of contiguous piling (where applicable). To be agreed and approved by engineers and the local authority.
Landscaping	All Root Protection Areas	Any specific landscaping proposals requiring approved by the local authority but not considered within this report.

3.6.2. 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

3.7. Construction Exclusion Zones

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

- Tree Protection Barriers shall be erected and maintained throughout the entire project as indicated on the Tree Protection Plan and specified in Section 6 -*Tree Protection Barriers*.
- No construction activity whatsoever shall occur.
- No vehicles or plant machinery shall be driven or parked.
- 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 shall occur.
- No temporary structures.
- No spoil shall be stored.
- No fires shall be permitted.
- All hazardous materials (including non-essential cement products) shall be forbidden.

3.7.2. Where hard surfaces are to be removed, this shall be done using hand tools or mechanical excavators operating from outside the Construction Exclusion Zone and marshalled by the appointed arborist.

3.7.3. Any structures shall be removed manually and without mechanical excavation.

3.8. Restricted Activity Zone A

3.8.1. Within this zone (indicated on the Tree Protection Plan) trees roots are likely to be present and access will be required to facilitate construction. In some areas existing hard surfacing will need to be removed and replaced with a new hard or soft surface. 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.
- A suitable load spreading surface shall be installed and maintained as specified in Section 7 –*Ground Protection Measures*. These shall remain in place throughout the entire construction phase.
- Existing ground levels shall be retained undisturbed or raised by no more than 150mm.
- Any resurfacing shall be done in accordance with the Guidelines in Section 8 -*New Surfaces*.
- Excavation shall be limited to the adjacent foundations and trenches immediately alongside the proposed building foundations (if required for underground services). Such trenches shall be excavated using hand tools or a mechanical excavator operating from outside the Restricted Zone and carefully marshalled by the appointed arborist.
- 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 2.5m tall shall pass through or operate in this zone unless carefully marshalled in order to avoid damage to branches.

3.9. Restricted Activity Zone B

3.9.1. Within this zone (indicated on the Tree Protection Plan) it is proposed to excavate for the basement. Either contiguous piling (or sheet piling) shall be installed along the edge of the basement, or an alternative method shall be adopted which does not disturb soils beyond the footprint of the basement (e.g. pinning). 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.

3.9.2. 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.
- Where a mechanical 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 adjacent trees.
- The appointed arborist shall be invited to oversee the initial stages of excavation or piling.

3.10. Restricted Activity Zone C

3.10.1. Within this zone (indicated on the Tree Protection Plan) it is proposed to install foundations for a single storey. The following restrictions shall apply:

- Concrete strip foundations shall not be acceptable in this area.
- Instead shallow foundations incorporating a raft or beam shall be installed. Excavation for the raft or beam shall be limited to 250mm and shall be undertaken using hand tools only and overseen by the local authority tree officer or an appointed arborist.
- Excavation shall not exceed 250mm unless approved in writing by the local authority.
- Roots in excess of 25mm which are located close to the bottom or the edge of the excavation are to be retained intact if possible and covered with wet sacking whilst exposed. All roots in excess of 10mm which cannot be retained shall be neatly pruned with secateurs.
- Narrow diameter piles may be installed to support the raft or beam foundation. In which case, trial pits shall be excavated to determine the location of the piles. Trial pits shall be 300mm x 300mm and excavated using hand tools to a depth of 600mm. Excavation shall be undertaken in the presence of the local authority tree officer or the appointed arborist. Soil shall first be loosened with a garden fork to ascertain if

large roots are present before the loosened soil is removed with a spade. If roots in excess of 25mm are encountered, they shall be retained intact wherever possible and the pile shall be relocated. Roots in excess of 10mm shall be pruned using sharp secateurs. Beyond this depth, piles may be installed using an auger or piling rig. Pile diameter shall not exceed 250mm unless agreed otherwise with the local authority.

- No auger or piling rig in excess of 4m shall be used beneath any tree canopy without being carefully marshalled by the appointed arborist.

3.11. Front Boundary Wall and Gates

3.11.1. Along the front boundary it is proposed to install garden wall foundations. In order to minimise impact on the root systems of T and T3, a watching brief is proposed during all excavation. The following restrictions shall apply:

- Exploratory excavation shall be undertaken to determine the root morphology. Only hand tools and an air spade shall be used during the excavation.
- This shall be overseen by an appointed arborist.
- All roots in excess of 50mm diameter shall be retained intact.
- A site specific foundation shall be designed and implemented which enables retention of the larger roots. This is likely to require the insertion of corkscrew piles between the roots and the installation of a beam which would span/cantilever over the roots

Section C: Restrictions on Activities – Throughout the Site

3.12. Canopy Protection

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

- No machinery in excess of 2.5m 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.

3.13. Site Hoarding

3.13.1. 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 3.22 - *Hazardous Materials*).

3.13.2. 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.

3.14. Fence Posts or Decking Posts

3.14.1. If permanent fencing or decking is to be installed within Root Protection Areas, the following restrictions shall apply:

- All post holes shall be excavated by hand and kept as narrow as possible (maximum diameter 300mm).
- Exploratory post holes shall be dug before committing to post / panel positions. If any roots in excess of 25mm are encountered they are to remain intact and the post hole shall be relocated slightly. The fencing system must permit such flexibility (i.e. where fixed panel widths are used, all post holes must be excavated before committing to the final location).
- Any roots in excess of 10mm which are severed shall be neatly pruned back with secateurs. This will encourage healing and reduce the likelihood of infection.

3.14.2. Walls shall be avoided over Root Protection Areas unless their foundations may be spanned over roots using a beam system.

3.14.3. Hedges may be planted within Root Protection Areas using hand tools to minimise excavation.

3.15. Demolition and Initial Ground Works

3.15.1. 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.

3.16. Underground Services

3.16.1. The Tree Protection Plan shows one location where underground services may be installed with minimal arboricultural impact. Any proposal to locate them in a different location could have a significant impact so the methodology off installation will need to be agreed with the local authority and detailed in a specific Method Statement and approved by the local authority.

3.17. Lighting, Bollards, CCTV and associated Cables

3.17.1. If any of the above are to be installed close to tree canopies or within Root Protection Areas of retained trees; installation methods shall be detailed in a specific Method Statement and approved by the local authority. Consideration should be given to the following:

- Pruning of branches to enable sufficient clearance for light and views. Branches should be removed to the *branch collar* as per British Standard 3998 (2010).
- Post holes must be excavated by hand or using an appropriate sized auger. No other form of mechanical excavation may be used.
- Wherever possible, cables should be routed in a direction directly away from the tree stem rather than tangentially across the rooting zone. The location of all such cables shall be determined after consultation with the appointed arborist and approval by the local authority.

3.18. Use of Heavy Plant

3.18.1. 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 3.7 onwards).

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

3.18.3. Mechanical excavators should have tracks rather than wheels to help spread their load. They should be carefully marshalled when working close to tree canopies.

3.19. Scaffolding

3.19.1. If scaffolding is required in areas containing ground protection measures, the protective boards shall need to remain in-situ and be strengthened and stabilised to bear the weight of scaffold poles.

3.19.2. Prior to the installation of any scaffolding within 0.5m of any tree branches, the appointed arborist shall be consulted to specify any pruning works that may be required.

3.20. Siting of Cabins and Storage of Materials

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

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

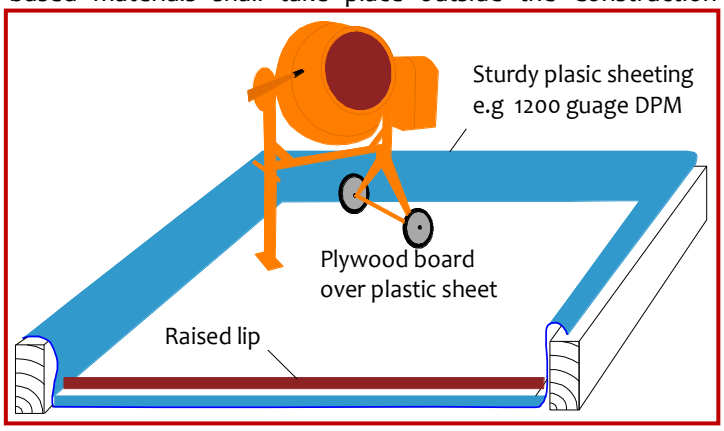
3.20.3. It may be acceptable to locate site cabins such that they act as a tree protection barrier and replace the specified protective fencing. Where this is being considered, written approval must be sought from the local authority.

3.21. Pedestrian Paving

3.21.1. If it is proposed to install new pedestrian surfaces over Root Protection Areas, excavation shall be limited to the removal of existing turf/vegetation plus an additional 50mm. Excavation shall be undertaken using hand tools only. Porous materials are preferred but not essential if the new surface covers less than 10% of the Root Protection Area. Paving with a thickness of 50mm bedded on mortar, or sand, bearing directly onto the ground, with a finished surface level with existing ground levels will be acceptable. No retaining kerbs shall be used.

3.22. Hazardous Materials

3.22.1. 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.



3.22.2. 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

3.23. Removal of Tree Protection Barriers

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

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

3.24. Ground Remediation

3.24.1. After all construction activity is completed a site meeting shall take place and the soil conditions assessed. The appointed arborist shall attend and the local authority tree officer shall be invited.

3.24.2. Where compaction is deemed to have occurred over any Root Protection Areas, suitable remediation measures shall be agreed and implemented (e.g. terraventing and mulching).

3.25. Landscaping

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

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

3.26. Tree Planting

3.26.1. Trees planted in poor soils or compacted soils are unlikely to become established, so prior consideration should be given to rooting conditions. Where compaction or contamination is believed to have occurred expert horticultural or arboricultural advice should be sought.

3.26.2. Any new tree planting shall be carried out after completion of all construction activity in the vicinity.

4. Site Inspection

4.1. Inspection Schedule

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 who will provide the tree officer with a copy of inspection details.

4.1.1. 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.
Removal of driveway in **Restricted Activity Zone A.**	Site manager, appointed arborist and/or local authority tree officer.	Attendance required at commencement.
Installation of piles in **Restricted Activity Zone B.**	Site manager, appointed arborist and/or local authority tree officer.	Attendance required at commencement.
Excavation and installation of foundations in **Restricted Activity Zone C**.	Site manager, appointed arborist and/or local authority tree officer.	Supervision required as well as an agreed methodology.
Excavation and installation of foundations for the front boundary wall and gateposts.	Site manager, appointed arborist and/or local authority tree officer.	Attendance required at commencement.
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. Ground conditions assessed and mitigation measures agreed where appropriate. Further landscaping operations and restrictions to be 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.

5. Tree Works Schedule

5.1. Tree Works Specification

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

Tree Reference	Action Required	Notes
T10, T12	Remove.	Stumps of trees within the RPAs of retained trees shall be removed with a stump grinder NOT a mechanical excavator.
T1	Crown reduce to a radial spread of 2.5m. Reduce height by approximately 4m.	Branches to be pruned back to a secondary branch junction or the branch collar wherever possible.
T2	Trim back the canopy extending towards the proposal to achieve a radial spread of approximately 5m.	Branches to be pruned back to a secondary branch junction or the branch collar wherever possible..

Pruning Standards: *Sympathetic pruning shall be carried out to BS 3998 (2010). Lopping of branches is to be avoided. Instead as system of 'drop crotching' 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.*

Additional works: *Any recommendations specified in the Tree Data Schedule (but not replicated in the above table) are intended to maintain the tree population in an acceptable condition. They are made for reasons of good arboricultural practice regardless of development proposals. However, they do not form part of this planning application. Where these trees are protected by a tree preservation order or are in a conservation area, consent must be sought from the local authority. Only the works listed in the table above form part of this planning application whereby no additional consent will be required if planning permission is granted.*

6. Tree Protection Barriers

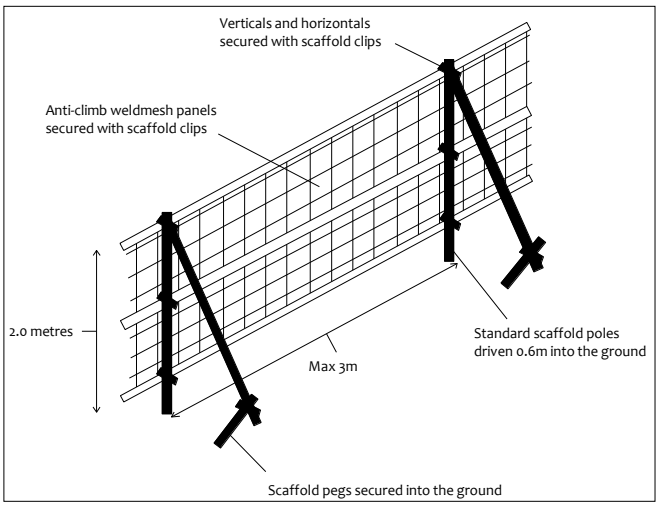
Detailed Specification

6.1.1. 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.

6.2. The In-Ground System

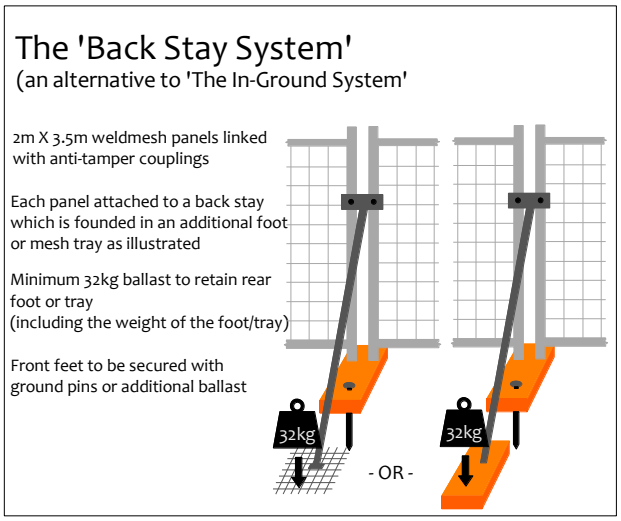
6.2.1. This system may be installed where indicated by a solid purple line on the Tree Protection Plan. It should be robust enough to withstand occasional knocks by plant machinery and, once installed, shall remain in place throughout the entire construction phase.

6.2.2. 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.



6.3. The Back-Stay System

6.3.1. 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.



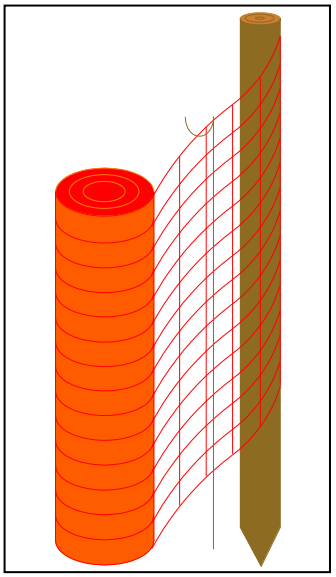
6.3.2. Within this system, weldmesh fencing panels (minimum height 2m) are affixed into rubber or concrete feet and clipped together with anti-tamper couplers. Where topography permits, two couplers should be used, spaced at least 1m apart. Alternate panels should be

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.

6.3.3. 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.

6.3.4. 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.

6.4. The Barrier-Mesh System



6.4.1. 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.

6.4.2. In this system, high visibility plastic safety fencing, 1m high, minimum grade 140g/m2, is secured onto alternate wooden posts and fencing pins. Wooden posts to be located at 5m intervals, minimum dimensions 75mm.

6.5. Notices

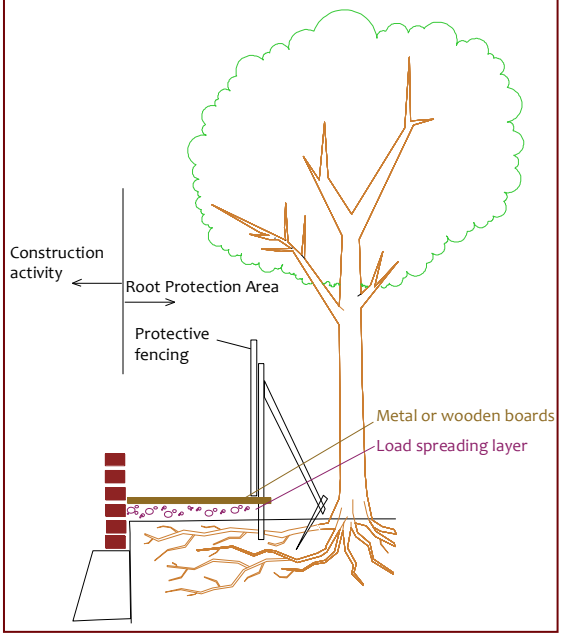
6.5.1. Suitable weather-proof notices should be displayed to identify tree protection zones. They should state the purpose of the fencing and that it should not be moved, or traversed, other than by authorised personnel.

7. Ground Protection Measures

Detailed Specification

7.1.1. Where indicated on the Tree Protection Plan (Restricted Activity Zone A), soils containing roots may be subject to compaction due to general construction activity (including pedestrian activity and use of plant machinery). In order to minimise compaction, it is proposed to ensure that a suitable load-spreading surface is in place at all times.

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



7.1.2. Any existing hard surfacing may be retained and reinforced (where applicable and adequate), otherwise suitable new ground protection measures shall be installed. The ground protection shall need to be able to adequately spread the load of construction traffic. Where existing hard surfacing is to be retained, 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.

7.1.3. Where only pedestrian traffic will occur, the ground protection measures may be as simple as timber boards, or scaffold planks installed directly onto a geotextile fabric on the ground. The ground should first be made even by raking, or by adding a few centimetres of sand or woodchip. Alternatively the boards may be supported by a scaffold framework. The scaffold may be founded on poles driven into the ground and/or onto blocks (to raise the scaffold) with additional couplings to make the framework secure.

7.1.4. Where only light vehicles are to operate (e.g. barrows, trolleys or occasional cars), thick wooden boards or scaffold planks should also suffice, though at least 150m of compressible woodchip will need to be installed first to help spread the load. Sturdier systems are specified below:

7.1.5. Where cars will regularly park or heavier vehicles/plant machinery will occasionally operate, sturdier ground protection measures will be required such as metal road plates, or purpose built synthetic road mats over a compression resistant layer such as 150mm of woodchip or 100mm of a 3D cellular confinement system in-filled with 7–40mm angular gravel (e.g. *Cellweb*^{TM}).

7.1.6. A temporary concrete slab may also be considered as a suitable load spreading platform. Where a pile driver needs to operate, a concrete slab may be the preferred option.

7.1.7. 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.

7.1.8. 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.

8. New Surfaces

Detailed Specification

8.1. Removing an Existing Hard Surface

8.1.1. If it is becomes necessary to remove an existing hard surface over Root Protection Areas the following restrictions shall apply:

- The existing hard surfacing shall remain in place throughout the entire construction project or until it is replaced with ground protection measures as specified in Section 7. 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.
- 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.
- Any soils used to raise ground levels back to the original level shall be fertile granular top soil. Proposed soil levels shall not exceed existing ground levels.

8.2. Resurfacing an Existing Hard Surface

8.2.1. If it is becomes necessary to replace an existing hard surface over Root Protection Areas 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 7 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.
- Any new sub-base shall not contain fine particles. Coarse sand or larger particles shall be acceptable. 7-14mm gravel is ideal.
- 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.

8.2.2. 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. Signature

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

34 Hampstead Lane
London
N6 4NT

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

7th April 2016

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

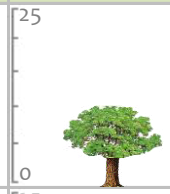
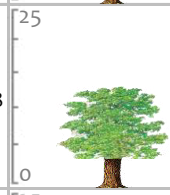
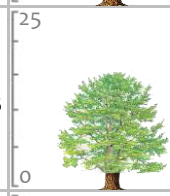
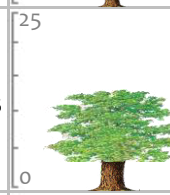
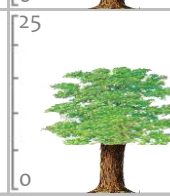
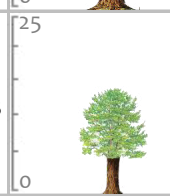
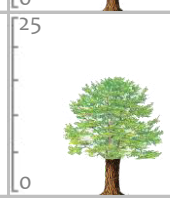
Communities and Local Government website with numerous downloadable documents, from: http://www.communities.gov.uk/planningandbuilding/planning/treeshighhedges/

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 any drawings accompanying this report follow this page. They are also provided as separate documents for ease of printing and screen viewing.

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)		Vigour / Physiological Condition / Structural Condition	Amenity Value / Life Expectancy (yrs) / Retention Category
								Priority	Inspect Freq (yrs)		
T1	Semi-Mature **Sycamore** Acer pseudoplatanus.	10	4	40	N 4 / W 3.5 / E 4 / S 4		Position: Situated within the front garden. Form: Twin-stemmed at 0.5m with a balanced crown. History: No evidence of significant pruning. **Defects: No defects observed.** Other: Tight union at 0.5m.	No action required.	n/a / 3	Moderate Good Good	Moderate 20-40 **B**
T2	Early-Mature **Oak** Quercus robur.	13	4	57	N 4.5 / W 5 / E 6.8 / S 2.5		Position: Situated within the front garden. Form: Single stemmed and vertical with a slightly unbalanced crown. History: No evidence of significant pruning. **Defects: No defects observed.**	No action required.	n/a / 3	Moderate Good Good	High 40+ **A**
T3	Semi-Mature **Beech** Fagus sylvatica.	16	2	47	N 3.5 / W 4 / E 5.5 / S 4		Position: Situated within the front garden. Form: Single stemmed and vertical with a well-formed crown. History: No evidence of significant pruning. **Defects: No defects observed.**	No action required.	n/a / 3	High Good Good	High 40+ **A**
T4	Mature **Oak** Quercus robur.	13	4	85	N 3.5 / W 6.5 / E 5.5 / S 7		Position: Situated within the front garden. Form: Single stemmed and vertical with a well-formed crown. History: Occasional pruning wounds due to crown lifting (healing slowly, reduced). **Defects: No defects observed.** Other: Minor decay at base.	No action required.	n/a / 3	Moderate Good Good	High 40+ **A**
T5	Mature **Oak** Quercus robur.	17	7	86	N 5 / W 6 / E 6 / S 7		Position: Street tree. Form: Single stemmed and vertical with a well-formed crown. History: Reduced. **Defects: No defects observed.**	No action required.	n/a / 3	Moderate Good Good	High 40+ **A**
T6	Semi-Mature **Beech** Fagus sylvatica.	14	5	39	N 2.5 / W 4 / E 2.5 / S 2.5		Position: Situated within the rear garden. Form: Single stemmed and vertical with a slightly unbalanced crown. History: Occasional pruning wounds due to crown lifting (healing well). **Defects: No defects observed.**	No action required.	n/a / 3	Moderate Good Good	Moderate 40+ **B**
T7	Early-Mature **Beech** Fagus sylvatica.	16	5	47	N 2 / W 5 / E 4 / S 5		Position: Situated within the rear garden. Form: Single stemmed and vertical 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**

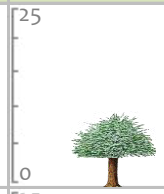
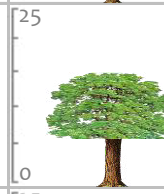
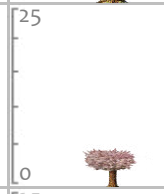
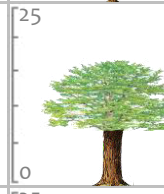
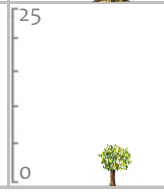
Reference (G = Group, H = Hedge)	Age & Species	Height (m)	Crown Ht (m)	Diameter (cm)	Crown Spread (m) N / W / E / S	Scaled Tree Diagram (m)	Notes	Recommendations (Independent of any development proposals)		Vigour / Physiological Condition / Structural Condition	Amenity Value / Life Expectancy (yrs) / Retention Category
								Priority	Inspect Freq (yrs)		
T8	Semi-Mature **Apple** Malus sp.	9	4	27	N 3.5, W 4, E 3, S 1.5		Position: Situated within the rear garden. Form: Multi-stemmed at 2m with a poorly formed crown. History: Occasional pruning wounds due to crown lifting (healing slowly). **Defects: No defects observed.** Other: Included bark at 2m. Poor form.	No action required.	n/a / 3	Low / Fair / Fair	Low / 10-20 / C
T9	Early-Mature **Sycamore** Acer pseudoplatanus.	15	7	52	N 5, W 5, E 6, S 6		Position: Situated within the rear garden. Form: Twin-stemmed at 2.5m with a balanced crown. History: Multiple pruning wounds due to crown lifting (cavities developing, acceptable condition at present). **Defects: No defects observed.**	No action required.	n/a / 3	Moderate / Good / Good	Moderate / 40+ / B
T10	Semi-Mature **Cherry** Prunus sp.	4	2	18	N 3.5, W 5, E 1, S 4		Position: Situated within the rear garden. Form: Twin-stemmed at ground level with a low, wide spreading habit. History: No evidence of significant pruning. **Defects: No defects observed.**	No action required.	n/a / 3	Moderate / Good / Good	Low / 10-20 / C
T11	Mature **Beech** Fagus sylvatica.	17	8	65	N 7, W 6, E 7, S 4.5		Position: Situated on third party land, overhanging the boundary. Form: Multi-stemmed at 4m with a slightly unbalanced crown. History: Reduced. **Defects: No defects observed.** Other: Limited inspection, dimensions estimated.	No action required.	n/a / 3	High / Good / Good	High / 40+ / A
T12	Young **Laburnum** Laburnum anagyroides.	4	2	8	N 0, W 2, E 1, S 2		Position: Situated within the rear garden. Form: Multi-stemmed at 0.5m with an unbalanced crown (suppressed). History: No evidence of significant pruning. **Defects: No defects observed.** Other: Actual stem diameters 4, 5, 3, 3 and 3cm.	No action required.	n/a / 3	Moderate / Good / Good	Low / 40+ / C



Photo 1



Photo 2

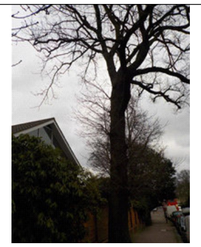


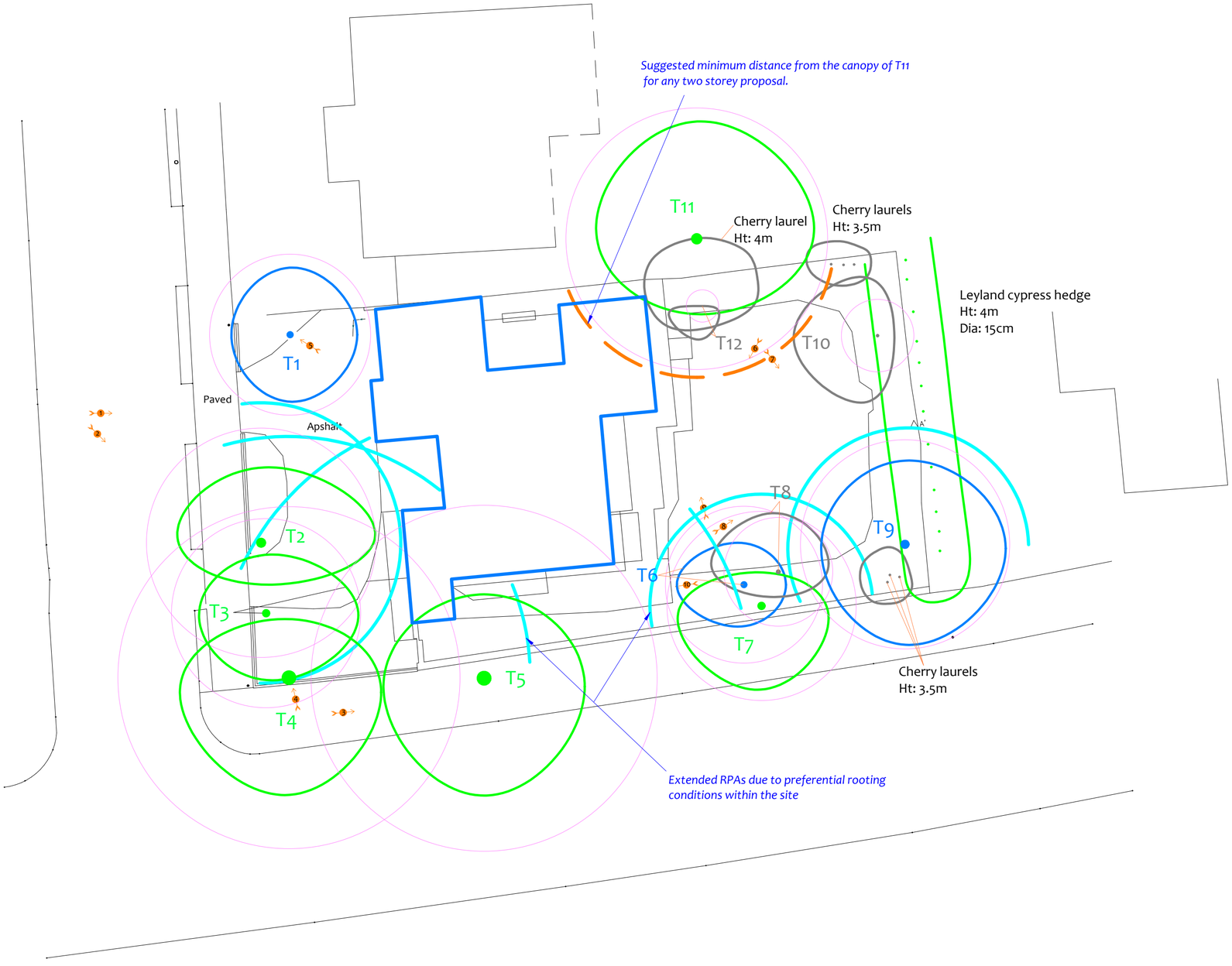
Photo 3



Photo 4



Photo 5



N

Tree Constraints Plan

(Existing Layout)



Photo 6



Photo 7



Photo 8

See the accompanying report for more photogrphs

Tree Ref.	Species	Height (m)	Root Protection Area		
			Radius (m)	m²	Square (m)
T1	Sycamore	10	4.8	72	8.5
T2	Oak	13	6.8	147	12.1
T3	Beech	16	5.6	100	10.0
T4	Oak	13	10.2	327	18.1
T5	Oak	17	10.3	335	18.3
T6	Beech	14	4.7	69	8.3
T7	Beech	16	5.6	100	10.0
T8	Apple	9	3.2	33	5.7
T9	Sycamore	15	6.2	122	11.1
T10	Cherry	4	2.2	15	3.8
T11	Beech	17	7.8	191	13.8
T12	Laburnum	4	1.0	3	1.7

Drawing No:	CCL 09275 / TCP Rev: 1
Title:	Tree Constraints Plan (Existing Layout)
Site:	34 Hampstead Lane N6 4NT
Scale: 1:200	Paper Size: A2

0 5 10m

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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.
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Tree Constraints Plan

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

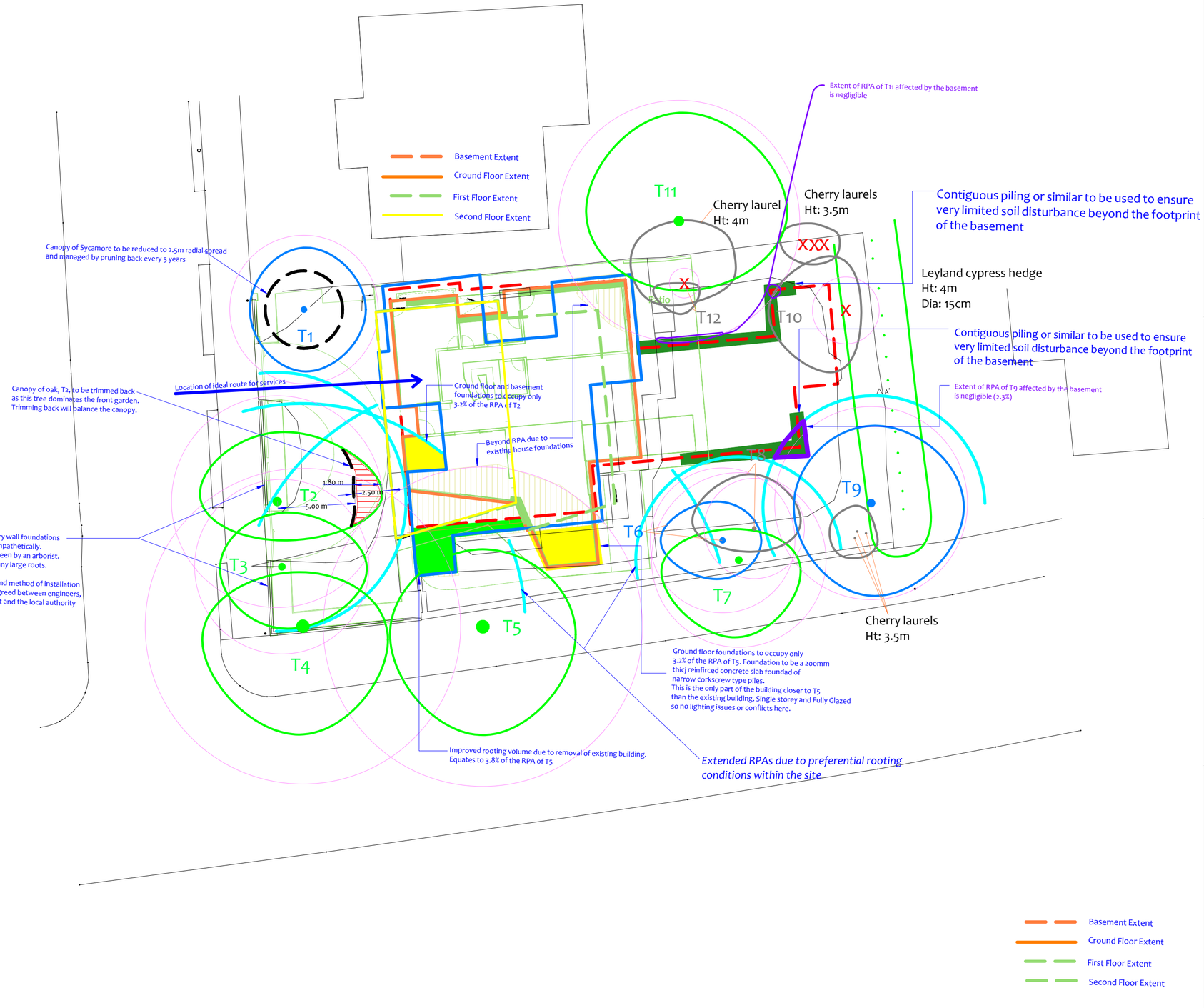
Root Protection Area having been amended to account for for site conditions

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

1 Photo 1

MN = Measured North:

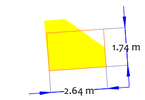
Canopy spreads are sometimes measured to an approximate N defined by site features. Often more accurate, especially where rows of trees are not aligned N-S or E-W.



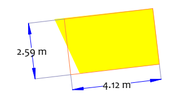
Impact Assessment Plan

(Existing Layout with Proposals Overlaid)

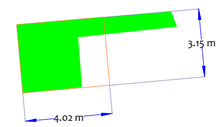
T2	RPA Affected by Foundations		
Total RPA (sqm)	RPA affected (sqm)	RPA affected (%)	
147	4.6	3.1	



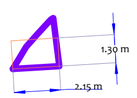
T5	RPA Affected by Foundations		
Total RPA (sqm)	RPA affected (sqm)	RPA affected (%)	
335	10.7	3.2	



T5	RPA Improved by Foundation Removal		
Total RPA (sqm)	RPA affected (sqm)	RPA affected (%)	
335	12.6	3.8	



T9	RPA Affected by Foundations		
Total RPA (sqm)	RPA affected (sqm)	RPA affected (%)	
122	2.8	2.3	



Tree Ref.	Species	Height (m)	Root Protection Area		
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Drawing No:	CCL 09275 / IAP Rev: 1
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Site:	34 Hampstead Lane N6 4NT
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Stems & canopies shown

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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

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.

Section B: Restrictions on Activities – Specific Zones

Construction Exclusion Zones

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

- Tree Protection Barriers shall be erected and maintained throughout the entire project as indicated on the Tree Protection Plan and specified in Section 6 -*Tree Protection Barriers*.
- No construction activity whatsoever shall occur.
- No vehicles or plant machinery shall be driven or parked.
- 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 shall occur.
- No temporary structures.
- No spoil shall be stored.
- No fires shall be permitted.
- All hazardous materials (including non-essential cement products) shall be forbidden.

Where hard surfaces are to be removed, this shall be done using hand tools or mechanical excavators operating from outside the Construction Exclusion Zone and marshalled by the appointed arborist.

Any structures shall be removed manually and without mechanical excavation.

Restricted Activity Zone A

Within this zone (indicated on the Tree Protection Plan) trees roots are likely to be present and access will be required to facilitate construction. In some areas existing hard surfacing will need to be removed and replaced with a new hard or soft surface. 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.
- A suitable load spreading surface shall be installed and maintained as specified in Section 7 – *Ground Protection Measures*. These shall remain in place throughout the entire construction phase.
- Existing ground levels shall be retained undisturbed or raised by no more than 150mm.
- Any resurfacing shall be done in accordance with the Guidelines in Section 8 -*New Surfaces*.
- Excavation shall be limited to the adjacent foundations and trenches immediately alongside the proposed building foundations (if required for underground services). Such trenches shall be excavated using hand tools or a mechanical excavator operating from outside the Restricted Zone and carefully marshalled by the appointed arborist.
- 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 2.5m tall shall pass through or operate in this zone unless carefully marshalled in order to avoid damage to branches.

Restricted Activity Zone B

Within this zone (indicated on the Tree Protection Plan) it is proposed to excavate for the basement. Either contiguous piling (or sheet piling) shall be installed along the edge of the basement, or an alternative method shall be adopted which does not disturb soils beyond the footprint of the basement (e.g. pinning). 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.

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.
- Where a mechanical 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 adjacent trees.
- The appointed arborist shall be invited to oversee the initial stages of excavation or piling.

Restricted Activity Zone C

Within this zone (indicated on the Tree Protection Plan) it is proposed to install foundations for a single storey. The following restrictions shall apply:

- Concrete strip foundations shall not be acceptable in this area.
- Instead shallow foundations incorporating a raft or beam shall be installed. Excavation for the raft or beam shall be limited to 250mm and shall be undertaken using hand tools only and overseen by the local authority tree officer or an appointed arborist.
- Excavation shall not exceed 250mm unless approved in writing by the local authority.
- Roots in excess of 25mm which are located close to the bottom or the edge of the excavation are to be retained intact if possible and covered with wet sacking whilst exposed. All roots in excess of 10mm which cannot be retained shall be neatly pruned with secateurs.
- Narrow diameter piles may be installed to support the raft or beam foundation. In which case, trial pits shall be excavated to determine the location of the piles. Trial pits shall be 300mm x 300mm and excavated using hand tools to a depth of 600mm. Excavation shall be undertaken in the presence of the local authority tree officer or the appointed arborist. Soil shall first be loosened with a garden fork to ascertain if secateurs. Beyond this depth, piles may be installed using an auger or piling rig. Pile diameter shall not exceed 250mm unless agreed otherwise with the local authority.
- No auger or piling rig in excess of 4m shall be used beneath any tree canopy without being carefully marshalled by the appointed arborist.

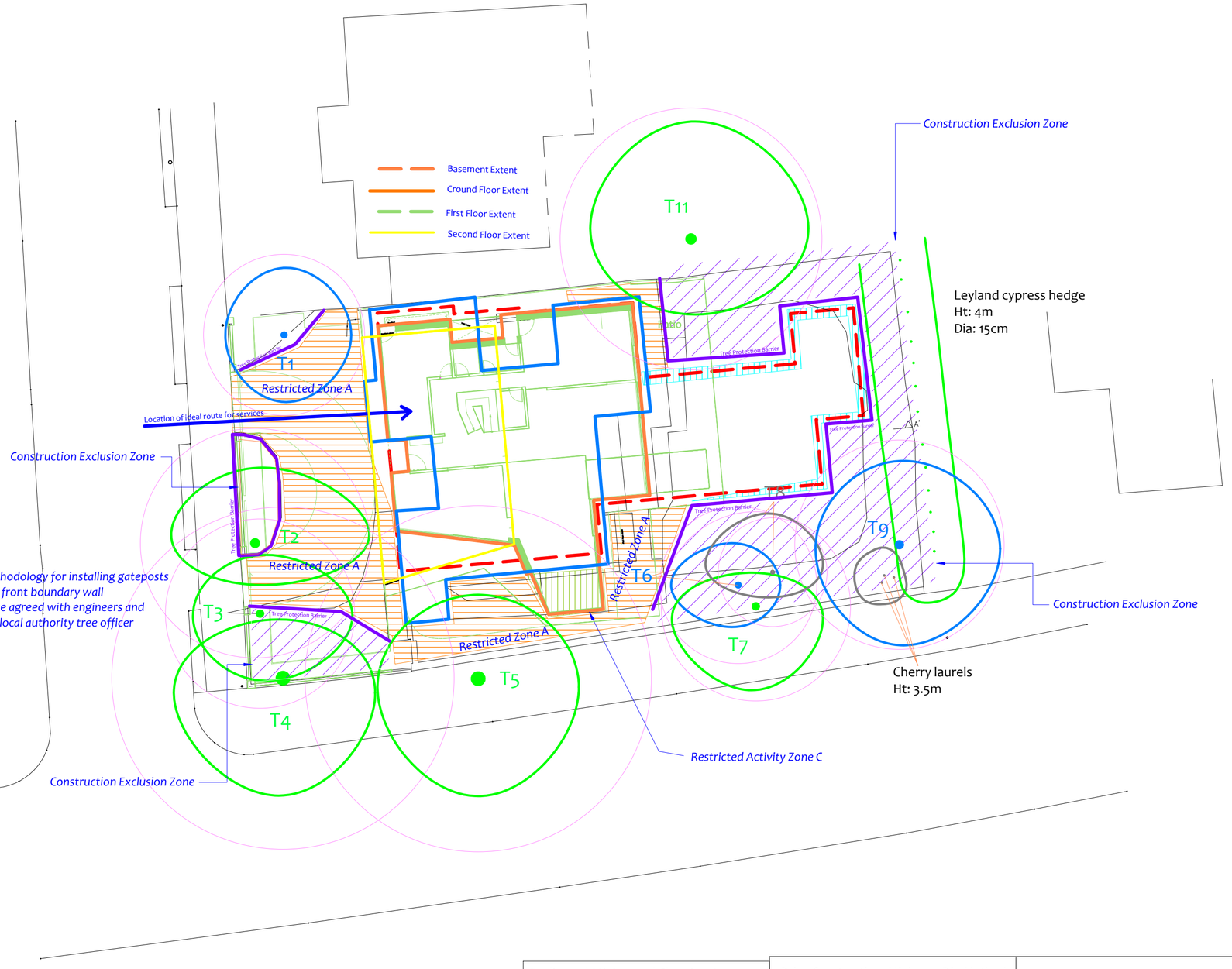
  Soil shall first be loosened with a garden fork to ascertain if

  large roots are present before the loosened soil is removed with a spade. If roots in excess of 25mm are encountered, they shall be retained intact wherever possible and the pile shall be relocated. Roots in excess of 10mm shall be pruned using sharp secateurs. Beyond this depth, piles may be installed using an auger or piling rig. Pile diameter shall not exceed 250mm unless agreed otherwise with the local authority.
- No auger or piling rig in excess of 4m shall be used beneath any tree canopy without being carefully marshalled by the appointed arborist.

Front Boundary Wall and Gates

Along the front boundary it is proposed to install garden wall foundations. In order to minimise impact on the root systems of T and T3, a watching brief is proposed during all excavation. The following restrictions shall apply:

- Exploratory excavation shall be undertaken to determine the root morphology. Only hand tools and an air spade shall be used during the excavation.
- This shall be overseen by an appointed arborist.
- All roots in excess of 50mm diameter shall be retained intact.
- A site specific foundation shall be designed and implemented which enables retention of the larger roots. This is likely to require the insertion of corkscrew piles between the roots and the installation of a beam which would span/cantilever over the roots



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

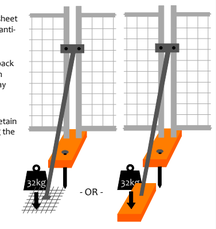
The 'Back Stay System'

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

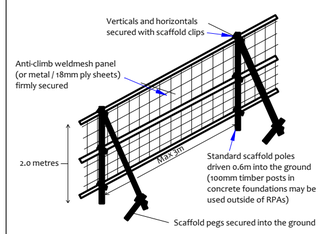
Each panel attached to a back stay which is founded in an additional foot or mesh tray as illustrated

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



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.

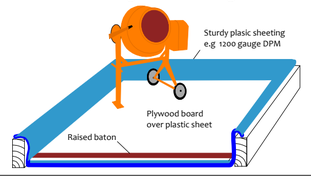
Restricted Activity Zones

Restrictions are detailed within the accompanying Method Statement

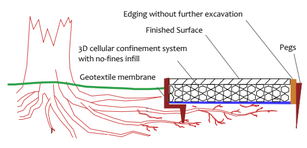
Restricted Zone A

Restricted Zone B

Dedicated Mixing and Cleaning Area



Drive Construction: Minimum-Dig Method



Basement Extent
Ground Floor Extent
First Floor Extent
Second Floor Extent

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Drawing No:	CCL 09275 / TPP Rev: 1
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Site:	34 Hampstead Lane N6 4NT
Scale:	1:200 (0, 5, 10m) Paper Size: A2

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